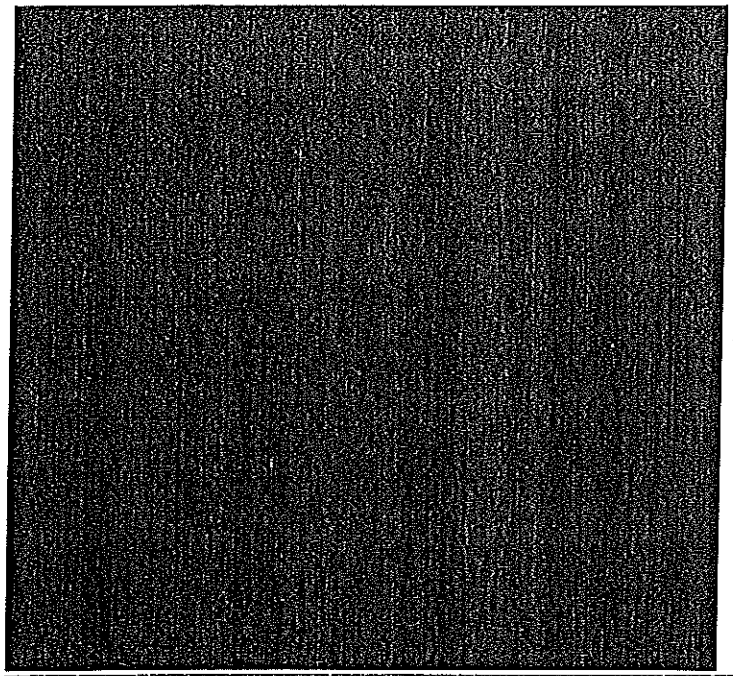
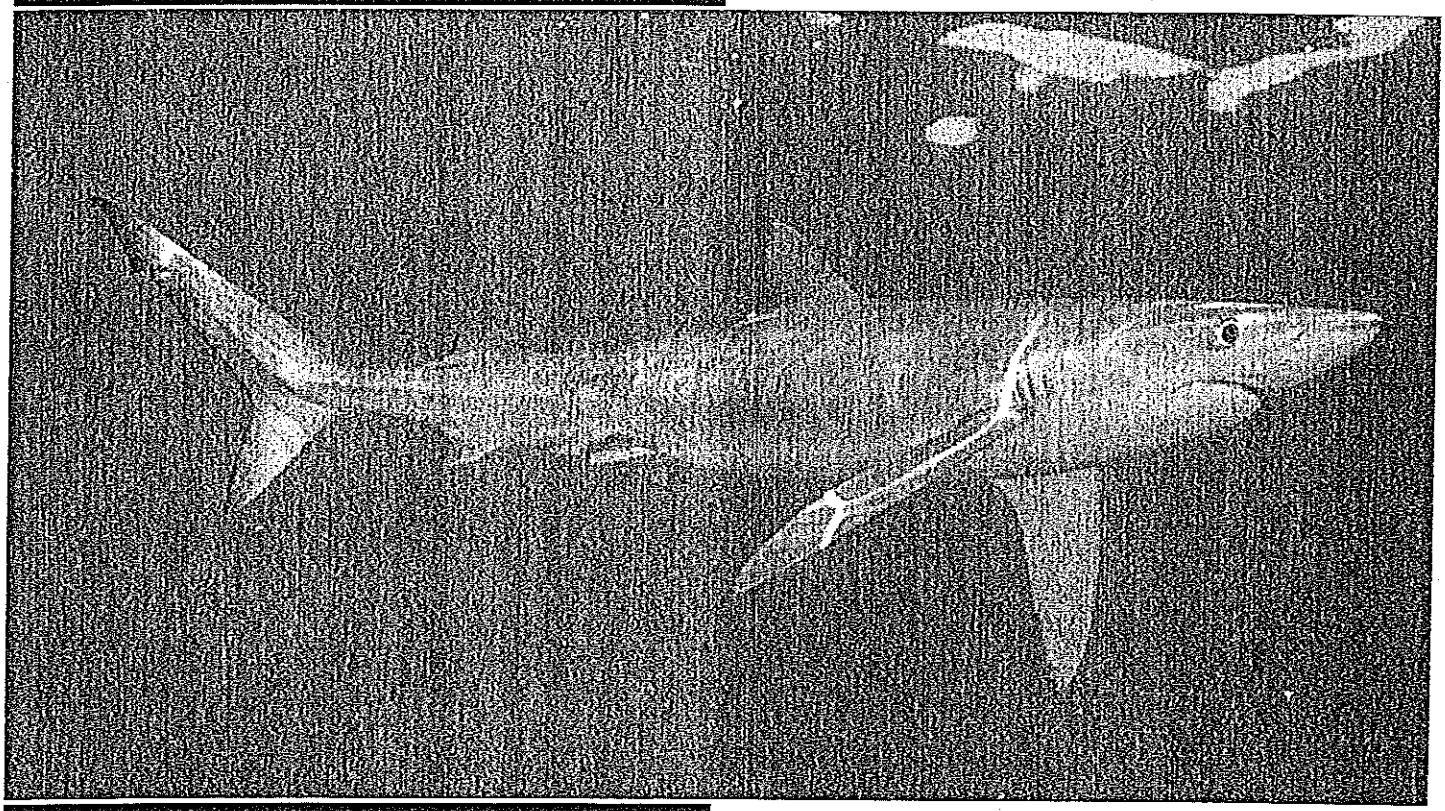


SHARK FISHERIES AND TRADE IN EUROPE

ELIZABETH H. FLEMING and PHILIPPE A. PAPAGEORGIOU

A TRAFFIC EUROPE REPORT



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1. INTRODUCTION

Cartilaginous (Chondrichthyan) fishes -- the sharks, skates, and rays (collectively known to scientists as elasmobranchs), and rabbitfishes and rat-fishes (chimaeras) -- have been fished in Europe in a variety of ways for centuries. These fishes have provided everything from basic sustenance to luxury items, and most of their body parts have been used at some stage or another for specific purposes. Certain species have been targeted locally and periodically in Europe for particular attributes. In the past, sharks and rays were caught for their liver oil, which was used for lighting, heating, lubrication and as a source of vitamin A. The Basking Shark is known to have been fished in European waters for several centuries for its liver oil, and the oil was used to light street lamps in Dublin and other cities as early as the 1740s (Berrow and Heardman, 1994). Until the 1930s, the Common Stingray was caught in the Wadden Sea for its liver oil. This oil was used to treat rheumatism and other ailments, and fishermen soaked their undergarments in it to protect themselves against cold weather (Walker, 1995). In more recent times, cartilaginous fishes have been taken primarily for use as food, however, their livers, fins, cartilage, skin and other derivatives continue to be used for a variety of purposes in Europe.

Despite the time-tested versatility and sustained use of these fishes, sharks and other cartilaginous fishes have until recently attracted little attention from fisheries scientists, managers and conservationists. There are huge gaps in the knowledge of basic biology, population dynamics, behaviour, and life history patterns of many species. There is also scarce documentation of present uses, and little is known about the effects of trade on particular species, and very few shark fisheries, most of which are incidental to other target fisheries, have been analyzed in Europe in much detail. Most of the sharks, skates and rays landed in Europe are actually retained bycatch, and while the term "bycatch" is often used synonymously with "not important" in fisheries literature, sharks are in many cases valuable fisheries resources in Europe.

Concern regarding the potential negative impacts of certain fisheries on shark species and shark populations prompted the TRAFFIC Network to initiate a global study of the fisheries and trade of sharks in early 1994. In November 1994, the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) adopted Resolution Conf. 9.17, *Status of International Trade in Shark Species*. This Resolution directed the CITES Animals Committee to research and report on the biological and trade status of shark species to the tenth meeting of the Conference of the Parties to CITES in 1997. To address the gap in knowledge related to present use of and trade in sharks, skates and rays in Europe, TRAFFIC Europe undertook a regional review of shark fisheries and trade. This report contains the findings of this review.

This report starts with an overview of the methodology and data sources used in this review, and looks at the limitations of existing statistical data. The report then examines the shark fisheries of the Northeast Atlantic and the Mediterranean, followed by a discussion of the trade in sharks and shark products in Europe and the regulation of shark fisheries. Finally, this report presents conclusions and recommendations for further action. Country-specific data are included in Annex 1 of this report.

Note:
For ease of reference, sharks, skates and rays are included in this report under the general heading "sharks", unless otherwise indicated.

2. METHODS

This report is the result of an analysis of existing literature, statistical data, and direct interviews. TRAFFIC focused its efforts on gathering first-hand information in countries for which there was very little available, and used existing literature and statistics to guide its inquiries in others.

In as much as possible, literature reviews, interviews with fisheries management and fisheries marketing personnel, interviews with shark specialists, collection and analysis of catch, landing and customs statistics, and market surveys were carried out for most of the countries reviewed. TRAFFIC Europe also interviewed a wide range of importers, exporters, processors, retailers and wholesalers of dogfish, shark and skate. In addition to several on-site and telephone interviews, TRAFFIC researchers conferred with many European, North American, African, Indian and Asian traders in shark species during seafood trade fairs in Europe. Data and information on shark fisheries and trade were collected in Italy, the Netherlands, Germany and France by TRAFFIC Europe national representatives, and by consultants to TRAFFIC Europe in Spain, France, Ireland, Greece, Turkey and Cyprus. The regional office in Brussels researched fisheries and trade in Belgium, the UK and the region as a whole, and was responsible for compiling the findings of this study.

In this report, currency conversion rates have been applied from the *International Herald Tribune* for 1996, and from the Trade and Commerce yearbooks of the Food and Agriculture Organization (FAO) of the United Nations for all other years.

2.1 Sources of information consulted, and their limitations

Catch and landing statistics

European catch and landing statistics are compiled by several sources. Fisheries management organizations compile these data at the national level. National statistics are then forwarded to FAO where they are compiled and recorded along with the statistics submitted by many other countries around the world.

Some countries report catch and landing figures from the country as a whole, while others report them for individual regions within the country. For example, in the UK, statistics are collected separately for England/Wales, Scotland and Northern Ireland and compiled by the Ministry of Agriculture, Fisheries and Food (MAFF) in London.

Statistics on a country's international trade — imports, exports and re-exports — in certain fisheries commodities are compiled by national customs officials and stored in national statistics centres. These national statistics are forwarded to FAO to be reported along with statistics of many other nations. Additionally, the 15 member countries of the European Union (EU) provide their international trade records to the European Community where they are compiled by Eurostat.

Within FAO, Mediterranean countries report national catch and landing statistics to the General Fisheries Council of the Mediterranean (GFCM). Several countries and territories in the Northeast Atlantic also forward national or regional statistics to the International Council for the Exploration of the Sea (ICES) for compilation and analysis [1]. ICES has been recording catch and landing data in its Northwest and Northeast Atlantic statistical areas since 1902.

FAO records catch and landings statistics for 10 shark species, nine ray species, one chimaera species and the aggregate categories "rays" and "sharks and rays." ICES has recorded landing data

1. In Europe, ICES collects catch and landing data from Belgium, Denmark, Estonia, Faeroe Islands, Finland, France, Germany, Greenland, Iceland, Ireland, Latvia, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden and UK (Channel Islands, Guernsey, England and Wales, Isle of Man, Northern Ireland and Scotland).

for sharks since 1903, and the categories for recording sharks have changed in time. Currently, the database includes the following categories: Porbeagle, Basking Shark, Piked Dogfish, Greenland Shark, Blue Shark, Shortfin Mako, Blue Skate, Thornback Ray, Spotted Ray, Shagreen Ray, Cuckoo Ray, Longnosed Skate, "catsharks Scyliorhinidae," "dogfishes and hounds," "dogfish sharks nei" (nei=not elsewhere indicated), "various sharks nei," "cartilaginous fishes nei" and "skates nei." However, not all countries specify their data to this level. When countries report any of the species included in the database to ICES, the species is logged into the database as that species. When publishing the *ICES Fisheries Statistics*, however, the Porbeagle, Basking Shark, Greenland Shark, Blue Shark, Shortfin Mako, catsharks and "various sharks nei" are grouped into one category: "cartilaginous fishes nei." Data on skates and rays are likewise grouped together under a single category (M. Zerecki, ICES, *in litt.*, 1996).

FAO reports imports and exports in the following shark commodities: fresh or chilled sharks; frozen sharks; fresh or chilled shark fillets; frozen shark fillets; sharks dried, salted or in brine; dried salted shark fins; shark oil; fresh or chilled sharks, rays and skates; frozen sharks, rays and chimaeras nei; fresh or chilled skates; and frozen skates.

Limitations of fisheries statistics

Shark fisheries are often incidental to those targeting other species, and are seasonal or opportunistic in nature. Because they have generally been considered of inferior value to other fisheries, international and national fisheries management organizations have accorded little consideration to collecting and recording data on shark species and exploitation. Consequently, there is a dearth of information on the volume and species composition of shark catches and landings (Rose, 1996). In Europe, and in most areas of the world, catch and landing statistics for sharks taken in commercial fisheries are limited owing to several factors:

- *The quality and content of the data submitted to FAO, ICES and other organizations differ markedly from country to country.* For instance, countries often categorize, separate or amalgamate species differently when compiling fisheries data, which make comparison and interpretation of these different sets of data difficult. Other difficulties arise when differing factors are applied by different countries to convert landed weight to live weight. National statistics often vary from those of ICES and FAO in terms of format, and wide variations occur in the monitoring and reporting capacities of individual countries submitting data, and this has important implications in terms of the quality and detail of their submissions to these international bodies. Identifying species can also pose particular problems for fisheries managers, particularly when fish have been processed at sea prior to landing.
- *Landing statistics compiled by FAO and ICES are compiled from the data provided to them by national governments.* Therefore, the level of quality and detail of these international data are dependant upon the quality and detail of the information contained in the national submissions. FAO and ICES data lack information from countries (such as Spain) that fail to report their national shark catch and landing statistics to these organizations.
- *National and international landing statistics often lack data for sharks caught as bycatch, particularly that which is discarded at sea.* Since sharks are taken indirectly by virtually every fishing gear used in Europe, this omission must represent a significant number of fish that are excluded from the statistics.
- *National and international landing statistics do not include any sharks sold, eaten or used as bait at sea.*

- *The practice of grouping several species together under headings such as "skates and rays" or "sharks" makes it impossible to identify fisheries trends for species included within these ambiguous categories.*
- *Sharks, skates and rays taken by recreational fisheries are not included in international landing statistics and sharks taken by subsistence fisheries are poorly recorded.*
- *Many countries do not report their production of sharks to FAO.* As a result, FAO production data do not record production of shark species in some countries landing, producing and exporting significant volumes of these fishes.
- *The statistics of a particular country may differ when reported nationally and internationally.* This may be owing to differences in detail and methods of reporting, and to a variety of other factors. In some countries, the fisheries statistics compiled on the national level are more specific than those reported by international fisheries management bodies. For example, France records catch and landing information on species that are not listed separately in the reports by some international bodies, and such species-specific information may become lost in the international figures once several species have been aggregated in the statistics.

Limitations of the trade data

International trade statistics compiled by international and regional bodies (such as FAO and Eurostat) are based on the national customs data submitted to them by national governments. International trade data on trade in shark species are limited by several factors:

- *Usually, the commodity categories used to record international trade in sharks and shark products are not specific enough to allow any determination of the particular species in trade.* International customs codes are often general, national governments do not always use existing customs codes, FAO uses general all-inclusive categories and Eurostat separates sharks only into dogfish and other shark meat. Most countries in Europe do not record species-specific information for sharks beyond Piked Dogfish and "other sharks."
- *International trade statistics are not kept for ray and skate species in Europe.* Although these are valued and traded as food in Europe, very few countries report trade in skates and rays to FAO.
- *Eurostat and most European countries do not report international trade in shark fin, cartilage, liver oil, squalene, skin, leather and other shark products.* FAO records trade in shark fin and oil, but can only do so when provided with these national data (though FAO does not record trade in shark skin, leather or cartilage, and its fin data are not species-specific). Spain is probably the only country in Europe recording international trade in shark fin, skin and leather, however, its data on fins are not reported to FAO for international reporting. Norway is the only country in the world reporting international trade in shark oil, yet these data are not species-specific.
- *Misidentification of species in trade impedes the accuracy of trade records.* Available trade data inevitably contain records for shark species that have been incorrectly identified and recorded. It is difficult to identify sharks and rays once they have been skinned and processed. For example, smooth-hound meat may be recorded within the category for Piked Dogfish, or Piked Dogfish meat recorded within "other sharks." Processed shark fin, which is largely unrecorded in trade by Europe, is virtually impossible to identify to the species level.
- *Trade data are often less specific than the national customs data.* As with the catch and landings information, this is the case with FAO and Eurostat trade data. For instance in Italy, the General Directorate of Veterinary Services records trade in Porbeagle and Smooth-hound,

whereas FAO trade data do not differentiate separate shark species, and Eurostat includes these species in the "other sharks" categories.

- *National data may also vary depending upon which agency compiles them.* In Italy for example, import and export records of fisheries products are compiled by customs and veterinary agencies, and these two sets of data often differ (Laurenti and Rocco, 1996).

3. SHARK FISHERIES OF THE NORTHEAST ATLANTIC

The Northeast Atlantic Ocean and the adjacent seas have supported a variety of fisheries for many centuries. Today they constitute one of the most heavily fished marine areas in the world (Kellecher *et al.*, 1995). Many countries currently exploit the fisheries of the Northeast Atlantic, including the European countries whose coastlines adjoin this area, and also visiting fleets from Russia, Japan and South Korea (Vas *et al.*, 1996).

The Northeast Atlantic Ocean is one of the 18 major marine fishing areas for which statistical records are kept by FAO (Map 1). FAO Area 27 is also the Northeast Atlantic region, as delineated by ICES. ICES further subdivides FAO Area 27 into 36 fishing areas (Map 2).

3.1 Fishing Methods

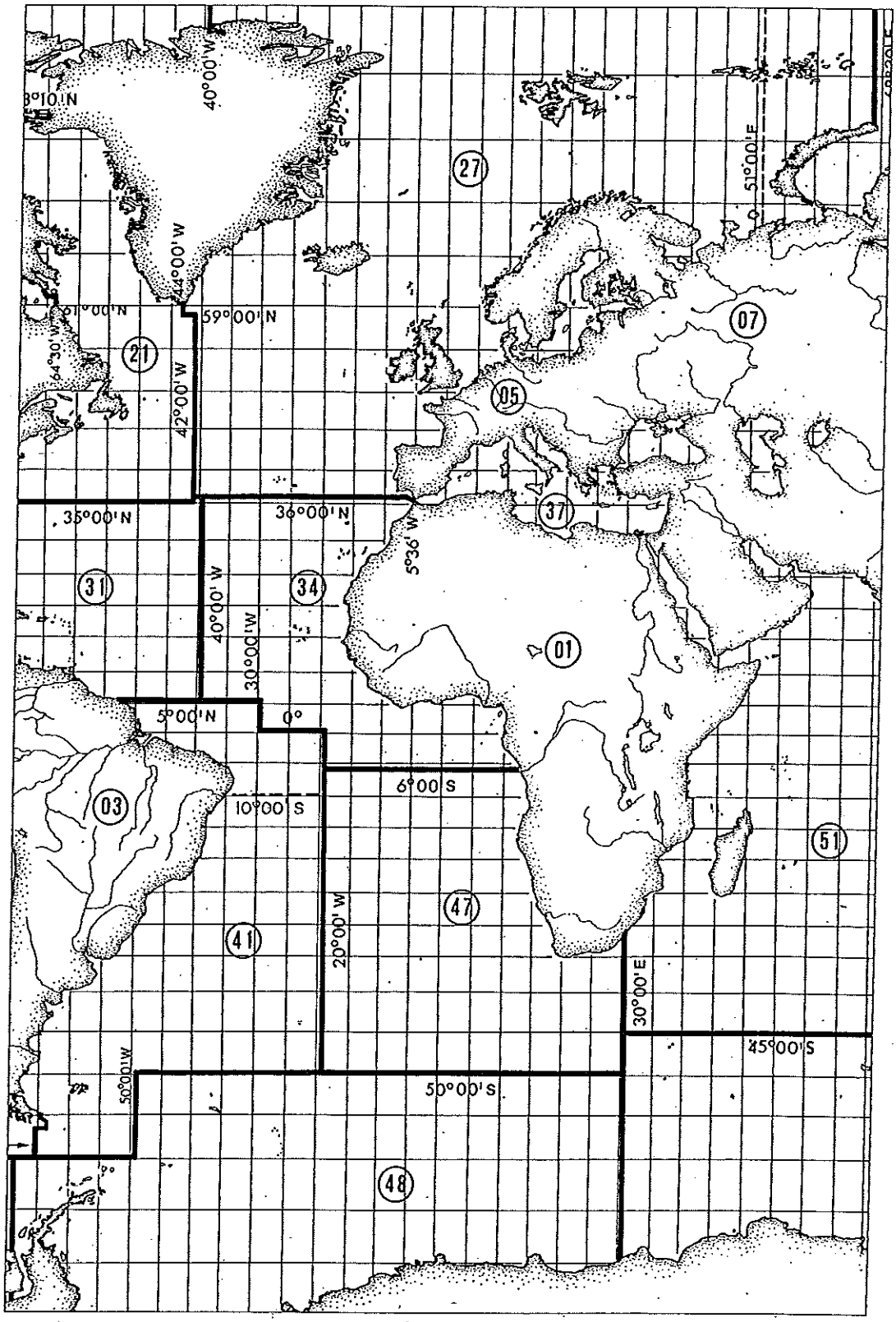
In the Northeast Atlantic, the coastal and open-water fisheries have evolved in response to local geological features. Except for Spain and Portugal, the Atlantic countries in Europe are proximate to the wide, shallow continental shelf of the Baltic and North Seas, British Isles, Irish and Celtic Seas, English Channel and the French side of the Bay of Biscay, and have traditionally fished in shallower areas. In Iberian Spain and Portugal, the continental slope runs along the coastline, and these nations have maintained a long-standing practice of open-water fisheries.

Coastal fisheries in the Northeast Atlantic area employ a variety of fishing vessels and gears. These include beam and pelagic trawlers, demersal otter trawlers, purse seiners, fixed gillnetters, dredges and small artisanal vessels. Open-water fisheries generally use pelagic trawlers, tuna and billfish longliners, open-water purse seiners, and driftnetters.

In response to declining catches of whitefish species such as cod, hake, and pollack, a deep-water fishery has recently developed along or beyond the continental slope, generally in depths greater than 200 metres (Anon., 1993). This fishery targets species such as grenadiers, argentines, and several shark species, which previously had not been targeted (Anon., 1993).

Map 1

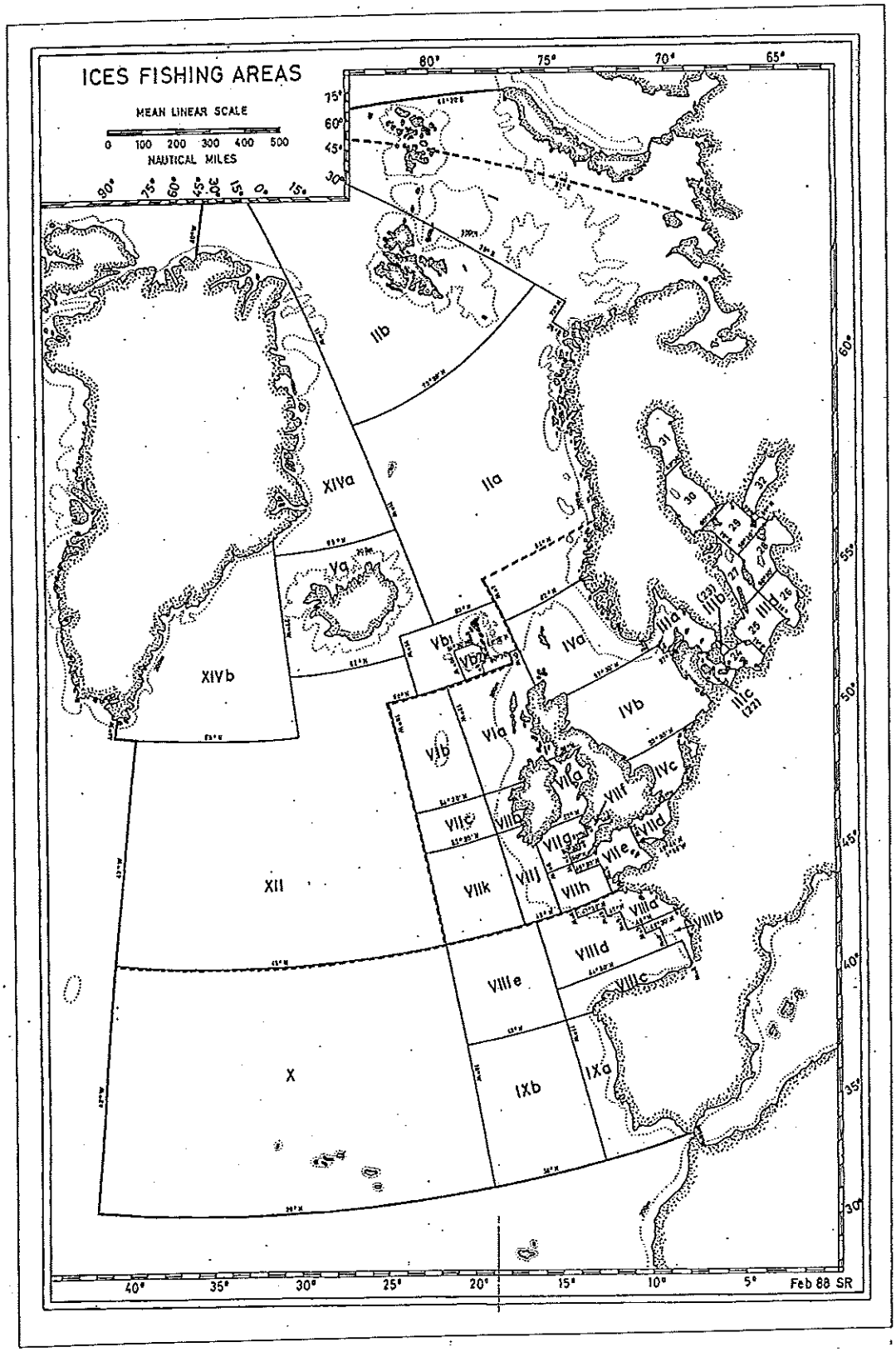
Major Fishing Areas for statistical purposes, as designated FAO. FAO Area 27 is the Northeast Atlantic and FAO Area 37 is the Mediterranean.



Source: Anon., 1995a.

Map 2

Major Fishing Areas of the Northeast Atlantic (FAO Area 27), as designated by ICES for statistical purposes.



Source: ICES.

Table 1

Cartilaginous fish species of the Northeast Atlantic

Coastal sharks	
Small-spotted Catshark	*Scyliorhinus canicula*
Nursehound	*Scyliorhinus stellaris*
Smooth-hound	*Mustelus mustelus*
Starry Smooth-hound	*Mustelus asterias*
Piked Dogfish	*Squalus acanthias*
Longnose Spurdog	*Squalus blainvillei*
Tope Shark	*Galeorhinus galeus*
Basking Shark	*Cetorhinus maximus*
Silky Shark	*Carcharhinus falciformis*
Scalloped Hammerhead	*Sphyrna lewini*
Smooth Hammerhead	*Sphyrna zygaena*
Nurse Shark	*Ginglymostoma cirratum*
False Catshark	*Pseudotriakis microdon*
Tiger Shark	*Galeocerdo cuvier*
Pelagic sharks	
Thresher Shark	*Alopias vulpinus*
Bigeye Thresher Shark	*Alopias superciliosus*
Shortfin Mako Shark	*Isurus oxyrinchus*
Longfin Mako Shark	*Isurus paucus*
Porbeagle	*Lamna nasus*
Blue Shark	*Prionace glauca*
Great White Shark	*Carcharodon carcharias*
Sandbar Shark	*Carcharhinus plumbeus*
Oceanic Whitetip Shark	*Carcharhinus longimanus*
Deep-water sharks	
Iceland Catshark	*Apristurus laurussoni*
Ghost Catshark	*Apristurus manis*
Frilled Shark	*Chlamydoselachus anguineus*
Lowfin Gulper Shark	*Centrophorus lusitanicus*
Gulper Shark	*Centrophorus granulosus*
Leafscale Gulper Shark	*Centrophorus squamosus*
Black Dogfish	*Centroscyllium fabricii*
Portuguese Dogfish	*Centroscymnus coelolepis*
Longnose Velvet Dogfish	*Centroscymnus crepidater*
Kitefin Shark	*Dalatias licha*
Birdbeak Dogfish	*Deania calcea*
Rough Longnose Dogfish	*Deania mauli*
Arrowhead Dogfish	*Deania profundorum*
Great Lanternshark	*Etmopterus princeps*
Smooth Lanternshark	*Etmopterus pusillus*
Velvet Belly	*Etmopterus spinax*
Bramble Shark	*Echinorhinus brucus*
Blackmouth Catshark	*Galeus melastomus*
Mouse Catshark	*Galeus murinus*
Sharpnose Sevengill Shark	*Heptranchias perlo*
Bluntnose Sixgill Shark	*Hexanchus griseus*
Goblin Shark	*Mitsukurina owstoni*
Angular Roughshark	*Oxynotus centrina*
Sailfin Roughshark	*Oxynotus paradoxus*
Smalltooth Sandtiger Shark	*Odontaspis ferox*

Table 1 continued

Angelshark	*Squatina squatina*
Smallmouth Velvet Dogfish	*Scymnodon obscurus*
Knifetooth Dogfish	*Scymnodon ringens*
Greenland Shark	*Somniosus microcephalus*
Little Sleeper Shark	*Somniosus rostratus*
Spined Pygmy Shark	*Squaliolus laticaudus*
Skates and rays (Rajids)	
Blue Skate	*Raja batis*
Starry Skate	*Raja radiata*
Longnosed Skate	*Raja oxyrinchus*
White Skate	*Raja alba*
Small-eyed Ray	*Raja microocellata*
Blonde Ray	*Raja brachyura*
Sandy Ray	*Raja circularis*
Thornback Ray	*Raja clavata*
Shagreen Ray	*Raja fullonica*
Spotted Ray	*Raja montagui*
Cuckoo Ray	*Raja naevus*
Undulate Ray	*Raja undulata*
Norwegian Skate	*Raja nidarosiensis*
Arctic Skate	*Raja hyperborea*
Krefft s Ray	*Raja kreffti*
Prickled Ray	*Raja spinacidermis*
Brown Ray	*Raja miraletus*
Deepwater Ray	*Raja bathyphilia*
Bigelow s Ray	*Raja bigelowi*
Round Ray	*Raja fyllae*
Sail Ray	*Raja lintea*
Pale Ray	*Bathyraja pallida*
Richardson s Ray	*Bathyraja richardsoni*
Spinetail Ray	*Bathyraja spinacauda*
Blue Ray	*Breviraja caerulea*
Other rays	
Electric Ray	*Torpedo nobiliana*
Marbled Electric Ray	*Torpedo marmorata*
Common Torpedo	*Torpedo torpedo*
Roughtail Stingray	*Dasyatis centroura*
Common Stingray	*Dasyatis pastinaca*
Spiny Butterfly Ray	*Gymnura altavela*
Common Eagle Ray	*Myliobatis aquila*
Bull Ray	*Pteromylaeus bovinus*
Devil Ray	*Mobular mobular*
Other elasmobranchs	
Blackchin Guitarfish	*Rhinobatos cemiculus*
Common Guitarfish	*Rhinobatos rhinobatos*
Smalltooth Sawfish	*Pristis pectinata*
Common Sawfish	*Pristis pristis*
Chimaeras	
Rabbitfish	*Chimaera monstrosa*
Large-eyed Rabbitfish	*Hydrolagus mirabilis*
Smalleyed Rabbitfish	*Hydrolagus affinis*
Bentnose Rabbitfish	*Hariotta raleighana*
Straightnose Rabbitfish	*Rhinochimaera atlantica*

Sources: Anon., 1995b; Compagno, 1984; Whitehead et al., 1984.

3.2 Landings

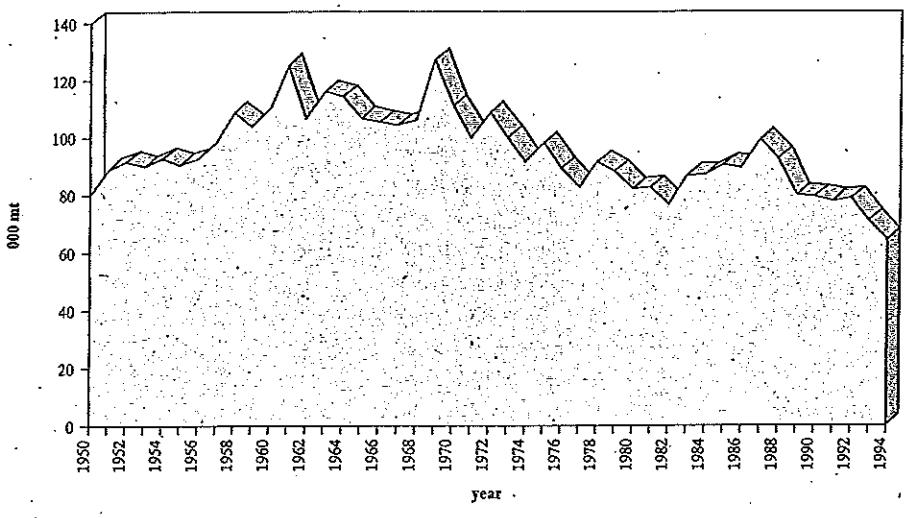
Total landings of marine fish from the Northeast Atlantic (FAO Area 27) were fairly stable from 1982 to 1993, averaging nearly 9.4 million metric tonnes (mt) per year. Most Atlantic countries in Europe fish in the area and land varying amounts of wild and cultured fish, molluscs and crustaceans. Together, Denmark, Norway and Iceland land over 60% of the total (Stamatopoulos, 1993a).

Shark landings from the Northeast Atlantic are higher than in other Atlantic Ocean fishing areas (Bonfil, 1994). The index of relative production (IRP) of the Northeast Atlantic area was the highest for catches of sharks worldwide for the period 1967-1991, with average annual catches of 94 800 metric tonnes, and a coefficient of variation of only 12%.

Landings of sharks in the area have been declining since the early 1970s (Anon., 1996a). A slight increase in total reported shark landings was observed in the mid 1980s, followed by a rapid decline (Figure 1). This decline, coupled with the fact that landings of other marine fish have remained relatively stable during the last decade, may show that the high levels of shark exploitation in the Northeast Atlantic are not sustainable (Bonfil, 1994). However, ICES notes that this decline is probably partly attributed to the fact that some countries, such as Spain, which took catches of several thousand metric tonnes in the 1980s, failed to report their landing data (Anon., 1995b).

Figure 1

Northeast Atlantic cartilaginous fish landings, 1950-1994



Source: Anon., 1996a.

Most Atlantic European nations land shark species from within the Northeast Atlantic area. France, the UK and Norway alone land some 75% of the area's total shark landings (Table 2). Non-European fishing vessels report taking only a small proportion of the area's total shark landings.

Table 2

Major shark fishing countries of the Northeast Atlantic in 1990

Country	Percentage of total sharks landed
France	38.15
UK	23.63
Norway	12.59
Portugal	7.00
Spain	6.01
Ireland	5.67
Belgium	2.15
Denmark	1.68
UK (N. Ireland)	0.92
USSR	0.52
Iceland	0.51
Others	1.17

Source: Stamatopoulos, 1993a.

3.3 Coastal shark fisheries

The main species caught in Northeast Atlantic coastal fisheries are the Piked Dogfish, the Small-spotted Catshark, and various skates and rays.

Piked Dogfish

The Piked Dogfish, frequently called the Spiny Dogfish, is by far the most important shark species landed commercially in the Northeast Atlantic. The species has been important to international fisheries in the area for the past 40 years (Vince, 1991).

The commercial interest in this species, along with its life history characteristics, have prompted significant research, especially regarding its migratory patterns (Gauld and McDonald, 1982; Holden, 1965; Vince, 1991). Holden (1965) suggested the presence of two separate Piked Dogfish stocks in the Northeast Atlantic area, a Scottish-Norwegian and a Channel stock, while others consider only one stock to exist in these waters (Gauld and McDonald, 1982; Vince, 1991).

According to Holden (1977), it has been fished in England since the beginning of this century. Landings did not exceed 2 850 mt per year until 1931, increasing to 7 000-8 000 mt in the late 1930s (Gauld, 1982). At the same time in Scotland, the Piked Dogfish was considered a nuisance for preying upon target fish caught in driftnets, often damaging the nets. Between 1920 and 1939, Scottish Piked Dogfish landings were a bycatch of other fisheries; annual landings fluctuated between 1 000-2 000 mt. From at least as early as 1930, Norway established an inshore fishery in the Norwegian Sea for Piked Dogfish (Bonfil, 1994; Gauld, 1982; Hjertenes, 1980). According to Gauld (1982), the dogfish landed by the English, Scottish and Norwegian fisheries at the time was destined for wholesale and retail markets in England. Piked Dogfish did not become an economically viable species to catch until after the Second World War, when the Norwegians developed an extensive offshore longline fishery and new markets, primarily in France, were established. The development of ports in remote areas, the building of ice plants, and improvements in road transportation

contributed to the establishment of the dogfish fishery in the UK. The increase in the market demand for Piked Dogfish increased the value of this fishery (Gauld, 1982).

Norwegian landings of Piked Dogfish increased steadily from 8 767 mt in 1937 to the maximum of roughly 34 000 mt in 1963 (Bonfil, 1994), and accounted for 87% of the total European landings for the species that year (Hjertenes, 1980). Following these record landings, the overexploitation of the Piked Dogfish stock appeared imminent and Norwegian authorities introduced a minimum legal catch size of 70 centimetres in March 1964. The Norwegian catch consisted mainly of large specimens, due in part to the size limit imposed and partly because mature female dogfish occurred most abundantly on rough, stony grounds which represented no problem to the Norwegian longliners (Holden, 1977).

Landings steadily declined, however, while the migration pattern of the dogfish had become so unpredictable that many fishers began to target other species. According to Fahy (1992), the collapse of the fishery for Piked Dogfish in the area was most likely caused by the removal of a large number of individuals off the southwest coast of Ireland. New shoals were later identified, and the fishery apparently evolved a stable pattern a few years later (Hjertenes, 1980).

English and Scottish (UK) landings remained between 6 000-10 000 mt annually from the mid-1950s to the late 1970s. Until the late 1970s, the bulk of the UK Piked Dogfish landings was taken by trawlers in the North Sea and middle-water ground, often to top up a whitefish catch when returning to port (Anon., 1991a). This was supplemented by landings from a small fleet of liners off the east coast working a seasonally directed fishery (Anon., 1991a).

Towards the 1970s, Norwegian vessels and gear were modernized with automatic baiting and handling systems and increased freezing and storage capacities, extending their time at sea. Yet Piked Dogfish landings continued to decline, and by 1978, declining landings and consequent economic problems caused the Norwegian fishery north of Scotland to collapse, and the fleet was subsequently reduced. At the same time, the UK fleet continued fishing without a size limit (Hjertenes, 1980).

Today, the Piked Dogfish is fished around the British Isles, in the North Sea and off the west coast of Norway. Although most individuals are caught as bycatch of other fisheries, directed fisheries for this species have been in operation locally and seasonally for many years. As in the past, the Piked Dogfish is exploited by towed and passive gear, such as trawlers, seine nets and deep longlines (Munoz-Chapuli *et al.*, 1993). In the Celtic Sea, this species is caught primarily by French trawlers, while English and Welsh longliners land most specimens from the Irish Sea. Scottish and Irish trawlers and seiners fish for Piked Dogfish off the west coast of Scotland, with the recent addition of some English longliners from the east coast that moved into the area after continuous poor fishing in the North Sea (Vince, 1991).

Total landings of Piked Dogfish within the Northeast Atlantic were variable from 1950 to 1994, exhibiting a fluctuation index of 7.25%, and declined over the period by 1.92% (Figure 2) (Anon., 1996a). Landings rapidly declined from the mid-1980s, falling to 19 621 mt in 1994, a drop of more than 50% from the 43 411 mt reported in 1987 (Anon., 1996a). According to Munoz-Chapuli *et al.* (1993), ICES noted a gradual decline in landings reported from the Scottish-Norwegian area of the Northeast Atlantic, followed steadily by the North Sea, while increases in landings have been reported in the west.

The dramatic decrease in Piked Dogfish landings in the mid 1980s is probably best illustrated by the French Atlantic fishery in which Piked Dogfish was the main shark species landed in the early 1980s. Landings of Piked Dogfish, which in 1983 were just under 15 000 mt, had decreased to 1 760 mt only a decade later, in 1993 (Anon., 1996b).

According to Munoz-Chapuli *et al.* (1993), the Piked Dogfish in the eastern Atlantic probably overcame the effects of overfishing in the past through its migratory behaviour and particular stock structure characteristics. However, the species will be in direct threat from over-exploitation if intensive fishing continues to occur throughout its range, as is currently taking place. Many European dogfish traders interviewed by TRAFFIC reported that European landings of Piked Dogfish have been lower in recent years, and that individuals in trade have become much smaller.

Small-spotted Catshark

The second most frequently landed shark species from the Northeast Atlantic fishing area is probably the Small-spotted Catshark, commonly called the Lesser-spotted Dogfish. Although landings of this species are relatively high, no fisheries research or management has been initiated for this species, probably owing to its low commercial value. Taken exclusively as bycatch, the Small-spotted Catshark is not recorded separately in most statistical tables, but is grouped with its close relative, the Nursehound or Greater-spotted Dogfish, under the family heading Scyliorhinidae.

As most fisheries statistics do not differentiate the Small-spotted Catshark from other species of the same genus, it is difficult to assess the scale or impact the unmanaged yet high-volume fisheries have on its populations. However, some information on local landing trends of this species may provide some insight as to the volume, seasonality and trends of this species in other areas of the Northeast Atlantic. For example, the Small-spotted Catshark is recorded separately in French landing statistics, and comprised an average of 23% of all sharks landed during the period 1988-1994. Munoz-Chapuli *et al.* (1993) reported catches of this species between 100-200 kilograms per day in spring and summer, and 50-100 kg/day in autumn and winter, from a single area off the French coast of Brittany. Landings of this species increased in France from 1982 to 1991, but have since declined in volume (Munoz-Chapuli *et al.*, 1993; P. Perrone and T. Leplat, pers. comm., 1996).

Skates and rays

Skates and rays comprise the third highest category of cartilaginous fishes (by volume) reported as landed from the coastal fisheries of the Northeast Atlantic area. Although statistical information by species is rare, some studies on particular species show that skates and rays are, in general, heavily exploited in the Northeast Atlantic. While not usually the target of directed fisheries, skates and rays represent an important retained bycatch of the bottom fishing effort, especially that of trawlers. Gray (1995) reports that new or previously unexploited ray resources are becoming a valuable alternative to traditional fisheries. There are also small-scale local seasonal directed fisheries in Wales and off the east coast of Britain.

French fisheries statistics, probably the most detailed in terms of sharks in Europe, report landings of skates and rays to the species level. Skates and rays comprised an average of almost half of the total landings of cartilaginous fishes by the French fishery operating in the Northeast Atlantic from 1988 to 1994 (P. Perrone and T. Leplat, pers. comm., 1996). To further illustrate the magnitude of this bycatch, Munoz-Chapuli *et al.* (1993) reported catches of 450 kilograms per day from a single area off the Britanny coast. Catches declined from around 55 000 mt per year in the mid 1950s to 25 000 mt in 1975, with an apparent increase, however, in the late 1980s, with 38 400 mt landed in 1988 (Anon., 1996b).

Similarly, FAO statistics show that between 20 000-30 000 mt of skates and rays are landed in northern Europe, with Cuckoo Ray and Thornback Ray the most common species, as declared by

France (Munoz-Chapuli *et al.*, 1993). Although total landings of skates and rays in the Northeast Atlantic area seem to follow a generally stable pattern, the relative abundance of some species has changed (Anon., 1989a; Dulvy, 1995a). The Blue or Common Skate, once one of the three most important species landed by France, is currently very rare in the landings (B. Séret, *in litt.*, 1996). Fished mainly in the Celtic Sea, the Blue Skate and Longnosed Skate account for only about 4% of the total cartilaginous fish landings in France (Anon., 1989a).

According to Munoz-Chapuli *et al.* (1993), White Skate, Blue Skate and Blonde Ray have all disappeared from the southern Bay of Biscay. More dramatically, Brander (1981) reported the extirpation of the Blue Skate from the Irish Sea, documenting "the first clear case of a fish brought to the brink of extinction by commercial fishing.". Furthermore, Dulvy (1995a) concludes that landings suggest a declining trend in spite of the relative stable fishing effort in the area.

In the North Sea, skates and rays have been subjected to intensive exploitation and have experienced similar declines (Walker, 1995). Walker (1994) reports that landings dropped from 12 000 to 5 000 mt between 1954 and 1974 despite an increase in fishing effort. At present Starry Skate is the most abundant Rajid species in the North Sea, comprising 80% of the biomass of the North Sea ray fauna, while in the past, Thornback Ray had been the most abundant ray species in the North Sea, a situation that seems to have been reversed (Walker, 1994). ICES (Anon., 1995b) reports that no rays were caught along the Dutch coast from 1958 to 1994 in an area in which the Thornback Ray previously had been very common.

3.4 Pelagic shark fisheries

The following species reviews should not be considered comprehensive or representative of the species diversity of the catch. Anecdotal information from literature and interviews with fisheries specialists suggest that large pelagic species such as Shortfin Mako Shark, Tope or Soupfin Shark, and others are exploited directly and/or indirectly in the Northeast Atlantic. There is a comparative lack of information from many fisheries, including the fisheries of visiting nations in the Northeast Atlantic, especially regarding bycatch. Vas *et al.* (1996) report with certainty that large numbers of sharks are taken incidentally to these and other operations, and deep-water sharks, such as Kitefin Shark, gulper sharks and others, are increasingly exploited in Europe (Anon., 1993; 1995a). Some of the main species caught in Northeast Atlantic pelagic fisheries are the Basking Shark, Blue Shark, and the Porbeagle.

Basking Shark

The Basking Shark occurs throughout the Northeast Atlantic but moves inshore seasonally during spring and summer; in most cases, the fishery has taken place at the time of its seasonal inshore movements. Several fisheries for this species developed around the time of the Second World War in response to shortages of liver oil products. These fisheries declined in part to the arrival of synthetic vitamin A production (Kunzlik, 1988). At present, targeted Basking Shark fishing takes place opportunistically with the availability of the sharks in shallow waters, in which case they are netted or harpooned near the surface (Anon., 1995b). Basking Shark carcasses are often discarded at sea once the livers are removed (Anon., 1995b; Kunzlik, 1988; Myklevoll, pers. comm., 1996).

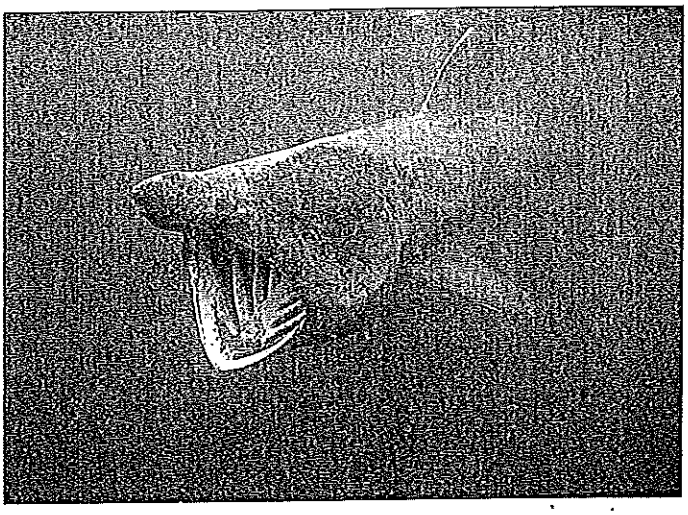
Basking Shark livers reportedly yield about 70% oil (Kunzlik, 1988; H. McCrindle, pers. comm., 1996). Kunzlik (1988) reports the Basking Shark liver may account for 25% of the animal's total weight, while others have estimated a 1:6 liver-to-body weight ratio, with the liver yielding up to

75% oil. The oil contains a high proportion of squalene, a hydrocarbon used in the cosmetic and aviation industries that has accounted for much of the commercial value of the fish (Kunzlik, 1988). Official records on the Scottish fisheries following the Second World War reported that the oil contains 38% squalene (Kunzlik, 1988).

The Basking Shark is targeted by the Norwegian fleet in domestic waters (Munoz-Chapuli *et al.*, 1993), and until recently, off the Scottish and Irish coasts by Norwegian, Irish and Scottish fishers (Vas, 1995). FAO statistics report a declining trend in the landings of this species from 1984 to 1993, with annual landings falling from 4 442 mt to 2 910 mt during that period. Basking Shark landings in the area fell to only 228 mt in 1988, after which landings started steadily increasing to the current status. Similarly Kunzlik (1988) reported a decline in Norwegian landings from 4 180 individuals in 1967 to just 631 in 1985.

Landing data alone, however, cannot provide an accurate indication of the status of the stock or the species. Recent information suggests that the demand and price for Basking Shark livers in Norway have declined from past levels as squalene-rich liver oil can also be obtained from the Gulper Shark and Kitefin Shark (Anon., 1995b; Kunzlik, 1988). According to ICES (Anon., 1995b), the value of Basking Shark oil has been so reduced in recent years that international demand for the fins of the species is likely the main reason the Norwegian fishery continues to operate.

Norway is currently allowed to take 100 mt of Basking Shark (liver weight) from EU waters (M. Vanbrabant, pers. comm., 1996).



J. Stafford-Deitsch / WWF UK

Basking Shark feeding off the Isle of Man

At the same time of the Norwegian fishery, the Irish fishery began to target this species mainly with nets, trading not only the liver but the flesh and fins as well (Kunzlik, 1988). The Irish (Achill area) fishery for this species seems to have ceased operating in 1975 (Kunzlik, 1988). For a variety of reasons, reportedly ranging from mechanical difficulties to poor weather, a single-boat Scottish fishery established in 1983 around the Clyde did not fish for sharks in 1995 or 1996. Plans are underway, however, for the fishery to reopen in the summer of 1997 (H. McCrindle, pers. comm., 1996).

Blue Shark

The Blue Shark is a common pelagic shark in the Northeast Atlantic. Most of the Blue Sharks in the area are young individuals that appear during the summer months (Munoz-Chapuli *et al.*, 1993). According to ICES (Anon., 1995b), Blue Sharks in the area are part of a very extensive North Atlantic stock. The distribution of this stock is dependant upon a number of factors, including environmental conditions and the distribution of its pelagic prey species.

Vas *et al.* (1996) have reviewed several inshore and offshore fisheries that commonly catch Blue Sharks in the Northeast Atlantic. The inshore fisheries are divided into those that target Blue Shark and those that land the sharks as retained bycatch. Both fisheries currently operate in Cornish waters off the UK. The directed fishery, which commenced in 1991, uses longlines, gillnets and crab pots; the incidental fishery employs gillnets. The offshore fisheries operate seasonally in

deeper waters of the Northeast Atlantic targeting tuna with longlines and purse seines. These fisheries are reported to take many Blue Sharks, most of which are discarded. The fishery also takes Porbeagle and Shortfin Mako Shark, which are retained and landed. Only Blue Sharks caught in the last sets of nets are usually landed at Newlyn (Vas *et al.*, 1996).

Munoz-Chapuli *et al.* (1993) report increasing catches of Blue Shark in the summer months in the western French area of Arachon. Additionally, the Spanish longline fishery, which has developed rapidly since the 1940s, is considered the most important in the Northeast Atlantic; this fishery is estimated to take 23 000 Blue Sharks annually, up to 82% of which are discarded (Vas, 1995).

FAO statistics inadequately reflect the high catches and landings in the Northeast Atlantic since commercial landings of Blue Shark are only reported from only three nations, Denmark, France and Portugal. Denmark and France landed 17 mt in 1983, increasing steadily until 1991 to 200 mt, followed by a sudden increase in reported landings to almost 640 mt with the inclusion of the Portuguese landings in 1993 (Anon., 1996a).

The Blue Shark in the Northeast Atlantic area has also been the object of recreational fisheries since the early 1950s (Vas, 1994). Recreational fisheries exist in both UK and Irish waters, although they are somewhat limited in their range. In England, anglers fish from Plymouth, Looe (Cornwall) and Penzance for Blue Sharks (Vas *et al.*, 1996). Vas (1994) reports that over 6 000 Blue Sharks were caught in 1960 by recreational fishers around the British Isles. However, the catches fell to between 2 000-4 000 individuals by 1975, to less than 300 sharks by the early 1980s, and to only 122 in 1986. Between 1990 and 1994, the Shark Angling Club of Great Britain reported catches of between 398 and 616 sharks per year from Looe, with an average of just over 400 Blue Sharks per year. According to Vas *et al.*, sport anglers have increasingly attempted to release all Blue Sharks caught. Only 5% of the sharks were landed in 1994-1995, while 14-19% were landed from 1991-1993.

In Ireland, Blue Sharks are taken along the southern and western coasts at much higher levels than in the English fishery. Anglers in Ireland catch an estimated minimum of around 1 500 Blue Sharks per year, with catch per unit effort (CPUE) values ranging between 2.8-3.5 Blue Sharks per boat per day (Vas *et al.*, 1996).

Porbeagle

FAO (Anon., 1996a) reports that landings of Porbeagle within the Northeast Atlantic from 1950-1994 exhibited a fast declining trend, with a relative trend index of -20.41%. Annual Porbeagle landings averaged 2 040 mt during the 1950s, and peaked at 4 400 mt in 1971. From 1982-1994, landings averaged only 586 mt per year, rising to 985 mt in 1994 (Anon., 1996a). Currently, Porbeagle is generally caught as bycatch, and owing to the small numbers landed, is not considered commercially important (Vas, 1995). The Porbeagle has been the occasional target of fisheries off of France, the Faeroe Islands and the Shetlands, Scotland (Earll, 1994). Munoz-Chapuli *et al.* (1993) report that Porbeagle has been the object of directed fisheries in the North Sea and off the Scottish coast by Norwegian and, to a lesser extent, Danish vessels, and by French vessels south and west of England. While Munoz-Chapuli *et al.* (1993) report that only the French fishery continues to target Porbeagle (the rest of the landings being bycatch), Vas (1995) states that Norway and Denmark also operate directed line fisheries for Porbeagle in EU waters.

FAO data show a decline in Norwegian Porbeagle landings from 96 to 23 mt per year for 1984 and 1993, respectively. The Norwegians fish in EU waters with a quota of 200 mt, and the Faeroe Islands are entitled to take 125 mt of Porbeagle in EU waters (M. Vanbrabant, pers. comm., 1996). Danish landings have increased during the same period from 39 to 91 mt. French Porbeagle

landings exhibit the highest increase for the same period from roughly 400 mt in 1984 to 610 mt in 1993 (Anon., 1996a). Commercial landings in Scotland were between 15-30 mt annually, before the introduction of a small-scale directed longline fishery off the Shetlands in the winter of 1987-1988, resulting in record landings of more than 300 individuals within a period of a few weeks, after which landings rapidly declined (Gauld, 1989).

Gauld (1989) confirmed the presence of a small flotilla of French vessels based in Brittany specifically targeting Porbeagles with longlines in offshore waters around the Bay of Biscay and in Irish waters during winter, and closer inshore and around the Channel Islands in spring. This fleet claims about 75% of the total French Porbeagle landings, with the remainder attributed to bycatch of the trawl and seine fisheries (Gauld, 1989). ICES, however, reported approximately six French vessels in the floating longline fishery for this species by 1989, accounting for only 60% of the landings of this species (Anon., 1989a). French landings of Porbeagle from this area have decreased since the beginning of the 1970s from 1 092 mt per year to 314 mt in 1993.

4. SHARK FISHERIES OF THE MEDITERRANEAN

The Mediterranean Sea, with its diverse fauna with a high degree of endemism, is a unique area of fishing activity (Northridge and Di Natale, 1991). The Mediterranean Sea has a surface area of 2.5 million square kilometres, is bordered by 46 000 kilometres of coastline with over 100 lagoons and estuaries, and is inhabited by nearly 100 commercial species of fish and shellfish (Anon., 1994). It is valued as a fishery resource, but it is also intimately linked to the culture and historical development of the region. However, a variety of man-made factors currently place the Mediterranean under considerable pressure (Northridge and Di Natale, 1991). For example, one-third of all international tourism is concentrated on 4 000 kilometres of Mediterranean coastline, ranking the area at the top of the world's tourist destinations, increasing the local demand for fish (Anon., 1994).

Estimates suggest that the fishing industry employs 200 000 fishers in the Mediterranean, with roughly 70 000 vessels fishing in the area (Anon., 1994). Fishing is the most widespread human activity throughout the Mediterranean environment with total annual landings estimated at some two million metric tonnes (Northridge and Di Natale, 1991).

4.1 Fishing Methods

Mediterranean fisheries employ a comparatively diverse range of harvesting methods that may be generally categorized as small-boat fishing, seining, trawling, and high-seas fishing (Tsimenidis, 1994). These four categories are based on the distance from the coast in which fishing activity takes place rather than the actual method of fishing.

The small-boat fishery operates close to the coast and is multi-species in nature, with the main target species rarely comprising more than 30% of the total catch (Tsimenides, 1994). Approximately 90% of the Mediterranean fishing fleet engages in coastal fisheries, using a variety of methods in response to local environmental and market conditions. The principal fishing methods used include gillnets and trammel nets, longlines, and small trawls.

Purse seines are used extensively in the Mediterranean. Depending upon the country, between 40-70% of the catches are taken by seine nets, primarily targeting small pelagic fish (Tsimenidis, 1994). Pelagic and bottom trawlers also operate widely in the region, targeting a variety of species.

High-seas fishing vessels target migratory pelagic species such as bluefin tuna *Thunnus* spp., Albacore Tuna *T. alalunga* and various other scombroids. The fishery employs various gear types including longlines, driftnets and purse seines, and usually operates in international waters (Tsimenides, 1994). Recently, French fishers have developed a deep-water fishery on the continental slope of the Mediterranean, targeting crustaceans. This fishery also takes a variety of fishes, including sharks, as bycatch (Anon., 1993).

The impact of each type of gear on the fisheries and marine ecosystem depends largely upon its selectivity. Trawls and driftnets appear to be the least selective in the Mediterranean Sea and are likely to have the greatest impact on non-target species. Northridge and Di Natale (1991) report that trawls and seines may retain juvenile skates and rays, even those recently hatched, as well as larger species, including sharks. Driftnets, used to target Swordfish *Xiphias gladius* and Albacore Tuna, have been reported to entrap large pelagic sharks and rays with some frequency (Northridge and Di Natale, 1991). Sharks, especially pelagic species, are taken as bycatch by the Mediterranean longline fishery in considerable numbers (Economou and Konteatis, 1993; Northridge and Di Natale, 1991).

4.2 Landings

In the Mediterranean and Black Seas, landings of all diadromous and marine fish, crustaceans and molluscs, fished and cultured, increased steadily from 1972 to 1988 from 1.14 million to 2.08 million metric tonnes. In 1991, however, total landings had decreased to 1.4 million metric tonnes, representing a 30% drop from the 1988 landing level (Stamatopoulos, 1995). According to FAO statisticians, the overall decline in these four years is due mainly to the significant decrease in landings from the Sea of Azov and the Black Sea and, to a lesser extent, from the Adriatic, Sardinia and the Balearic areas (Stamatopoulos, 1995). In contrast, landings in the Ionian, Aegean, Gulf of Lions, Levant and Sea of Marmara have shown a steady increase over the period 1972-1991. These regional increases, however, have not offset the general decline in the whole area of the Mediterranean and Black Sea over the last years (Stamatopoulos, 1995). In 1993, landings of fish, molluscs and crustaceans totalled 1.67 million metric tonnes, with marine fish landings representing 75.8% of the total (Anon., 1996a).

The landings of fish and shellfish in the Mediterranean by EU nations alone are estimated at some 700 000-800 000 mt (Anon., 1994). These represent 15% of the total EU landings in weight and 34% in value (Anon., 1994), and roughly 50% of the total landings from the Mediterranean and Black Sea (Anon., 1996a). EU fleets constitute about 70% of all vessels fishing in the region, thus playing an important role in determining the overall level of fishery impact on the marine environment (Northridge and Di Natale, 1991).

Of the approximately 900 shark, skate and ray species worldwide, 73 species belonging to 21 families occur in the Mediterranean Sea (Compagno, 1984; Whitehead *et al.*, 1984) (Table 3). Most Mediterranean fisheries are not directed at sharks, although certain species are targeted locally and seasonally. The majority of sharks are caught incidentally by most types of fishing gear, and landed in response to local and/or national market demands. They are sold predominantly for human consumption.

Despite the variety of shark species in the Mediterranean, not all are caught frequently nor are all of commercial interest. The species composition of the catch is determined by the gear, area and season. Available data suggest that the proportion of sharks landed in Mediterranean fisheries is fairly low relative to landings of bony fishes. Sharks were not included in a 1991 ranking of the top 22 species, but were probably included in the 16.6% making up the "other species" category (Stamatopoulos, 1995).

Table 3

Cartilaginous fish species occurring in the Mediterranean and Black Sea	
Hexanchidae	
Sharpnose Sevengill	*Heptranchias perlo*
Bluntnose Sixgill	*Hexanchus griseus*
Odontaspidae	
Sand Tiger Shark	*Eugomophodus taurus*
Smalltoothed Sandtiger	*Odontaspis ferox*
Lamnidae	
Great White Shark	*Carcharodon carcharias*
Shortfin Mako	*Isurus oxyrinchus*
Longfin Mako	*Isurus paucus*
Porbeagle	*Lamna nasus*
Cetorhinidae	
Basking Shark	*Cetorhinus maximus*
Alopidae	
Bigeye Thresher	*Alopias superciliosus*
Thresher Shark	*Alopias vulpinus*
Scyliorhinidae	
Small-spotted Catshark	*Scyliorhinus canicula*
Nursehound	*Scyliorhinus stellaris*
Blackmouth Catshark	*Galeus melastomus*
Carcharhinidae	
Blue Shark	*Prionace glauca*
Sandbar Shark	*Carcharhinus plumbeus*
Copper Shark	*Carcharhinus brachyurus*
Spinner Shark	*Carcharhinus brevipinna*
Blacktip Reef Shark	*Carcharhinus melanopterus*
Blacktip Shark	*Carcharhinus limbatus*
Silky Shark	*Carcharhinus falciformis*
Dusky Shark	*Carcharhinus obscurus*
Bignose Shark	*Carcharhinus altimus*
Triakidae	
Tope Shark	*Galeorhinus galeus*
Smoothound	*Mustelus mustelus*
Starry Smooth-hound	*Mustelus asterias*
Blackspotted Smooth-hound	*Mustelus punctulatus*
Sphyrnidae	
Great Hammerhead	*Sphyrna mokarran*
Smooth Hammerhead	*Sphyrna zygaena*
Scalloped Hammerhead	*Sphyrna lewini*
Squalidae	
Piked Dogfish	*Squalus acanthias*
Longnose Spurdog	*Squalus blainvillei*
Gulper Shark	*Centrophorus granulosus*
Little Gulper Shark	*Centrophorus uyato*
Portuguese Dogfish	*Centroscymnus coelolepis*
Velvet Belly Shark	*Etmopterus spinax*
Kitefin Shark	*Dalatias licha*
Little Sleeper Shark	*Somniosus rostratus*

Table 3 continued

Cookiecutter Shark	*Isistius brasilensis*
Echinorhinidae	
Bramble Shark	*Echinorhinus brucus*
Oxynotidae	
Angular Rough Shark	*Oxynotus centrina*
Squatinidae	
Smooth Back	*Squatina oculata*
Angelshark	*Squatina squatina*
Sawback Angelshark	*Squatina aculeata*
Rhinobatidae	
Blackchin Guitarfish	*Rhinobatos cemiculus*
Common Guitarfish	*Rhinobatos rhinobatos*
Rajidae	
Blue Skate	*Raja batis*
Longnosed Skate	*Raja oxyrinchus*
Sandy Ray	*Raja circularis*
Shagreen Ray	*Raja fullonica*
Maltese Ray	*Raja melitensis*
Cuckoo Ray	*Raja naevus*
Starry Ray	*Raja asterias*
Thornback Ray	*Raja clavata*
Brown Ray	*Raja miraletus*
Spotted Ray	*Raja montagui*
Rough Ray	*Raja radula*
White Skate	*Raja alba*
Speckled Ray	*Raja polystigma*
Torpedinidae	
Electric Ray	*Torpedo nobiliana*
Marbled Electric Ray	*Torpedo marmorata*
Common Torpedo	*Torpedo torpedo*
Dasyatidae	
Roughtail Stingray	*Dasyatis centroura*
Common Stingray	*Dasyatis pastinaca*
Tortoneses Stingray	*Dasyatis tortonesei*
Violet Stingray	*Dasyatis violacea*
Forsskal s Stingray	*Himantura uarnak*
Round Stingray	*Taeniura grabata*
Gymnuridae	
Spiny Butterfly Ray	*Gymnura altavela*
Myliobatidae	
Common Eagle Ray	*Myliobatis aquila*
Bull Ray	*Pteromylaeus bovinus*
Rhinopteridae	
Lusitanian Cownose Ray	*Rhinoptera marginata*
Mobulidae	
Devil Ray/Manta Ray	*Mobula mobular*
Chimaeridae	
Rabbitfish	*Chimaera monstrosa*

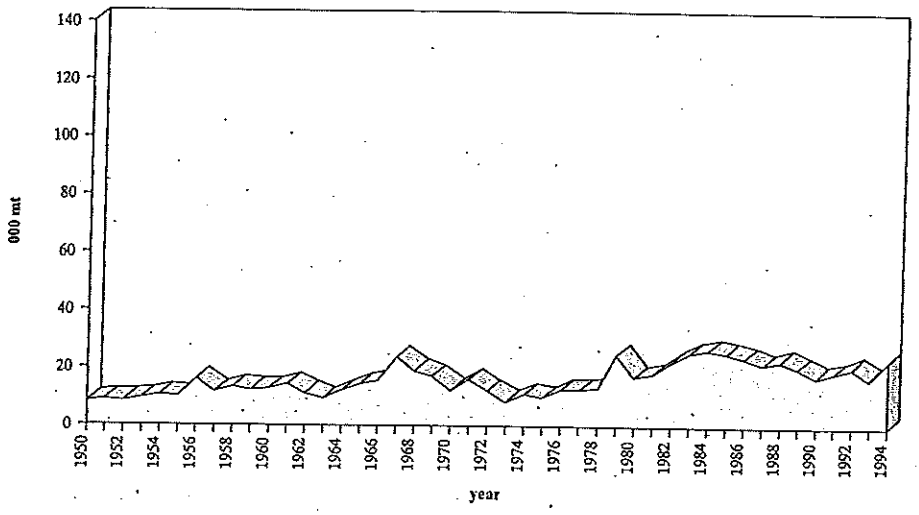
Sources: Compagno, 1984; Whitehead et al., 1984.

Data from 1980 to 1993 for the entire Mediterranean and Black Sea area show an annual average of shark landings of approximately 21 000 mt (R. Grainger, *in litt.*, 1995). The trend of the total shark landings for the period 1950-1994 is shown in Figure 2.

Shark landings in the Mediterranean have been highly variable since 1950. Landings first peaked at around 25 000 mt in 1967, then declined steeply, dropping to less than 10 000 mt in 1972 (Anon., 1996a). According to Bonfil (1994), this decline was the steepest noted worldwide at the time, in an area ranked as the second most productive overall in terms of the number of sharks landed per area fished. Landings rapidly increased to over 12 000 mt in the late 1970s, then fluctuating between 18 000- 25 000 mt per year until 1994. This relative average increase in shark landings during the last two decades may be a result of the introduction of data from additional countries in the international reporting system, as well as an increase in fishing effort. Bonfil (1994) concluded that shark stocks in the Mediterranean are close to being fully exploited. Table 4 lists the total shark landings for each country that operated in the area for the period 1980-1994.

Figure 2

Mediterranean and Black Sea cartilaginous fish landings, 1950-1994



Source: Anon., 1996a.

4.3 Coastal shark fisheries

Landing data from bottom/coastal fisheries in the Mediterranean indicate that the main bottom-dwelling shark species landed in the Mediterranean include the Small-spotted Catshark, Piked Dogfish, smooth-hound, Longnose Spurdog and several ray species, mainly Starry Ray, Cuckoo Ray and Thornback Ray (Anon., 1996a). The Blackmouth Catshark is also caught in large numbers, but is usually discarded (Munoz-Chapuli et al., 1993). GFCM (1993) statistics show a steady decrease in smooth-hound catches from around 13 000 mt per year to 8 500 mt per year from 1983 to 1991. Coastal species are mainly caught as bycatch of large trawlers, but with some also,

Table 4

Mediterranean and Black Sea cartilaginous fish landings by country, 1980-1994 (mt)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Albania				270	179	141	236	491	429	58	58	60	*	*	*
Algeria	610	710	820	826	832	840					474	709			
Bulgaria		27	20	52	53	68	153	90	51	28	16	16			
Cyprus	19	18	19	15	18	55	138	33	92	162	11	7			
Egypt	49	48	80	15	29	94	52	711	773	392	770	535			
France	543	454	492	495	422	9	14	6		296	238	240			
Gaza Strip	30	47	63	58	9	25	27	27	30	30	30	30			
Greece			1 525	1 341	1 224	1 083	1 115	826	1 065	855	862	917			
Israel	67	90	80	70	100	106	111	110	90	83	87	73			
Italy	4 324	3 730	4 609	6 281	11 028	13 344	12 297	8 366	8 786	6 523	7 522	9 514			
Japan					2										
Lebanon	0	0	0	0	0	0	0	50	50	50	40	50			
Malta	78	80	66	70	106	158	67	55	52	66	58	44			
Morocco	221	57	97	109	153	201	218	128	82	74	44	68			
Romania	3	8	19	93	134	77	52	49	25	30	45	26			
Spain	879	720	787	671	630	514		965	693						
Syria	30	25	22	20	24	24	18	30	25	31	33	31			
Tunisia	870	923	1 037	1 077	1 771	1 611	1 684	1 671	1 647	1 492	1 697	1 693			
Turkey	5 882	7 858	9 103	11 173	6 603	4 410	4 546	5 311	5 953	7 193	2 805	3 518			
Former USSR	2 796	2 947	3 085	2 088	2 680	2 314	2 645	2 254	2 397	2 004	2 165	1 107			
Yugoslavia	489	391	427	459	442	515	540	553	721	674	597	341			
TOTAL	16 890	18 133	22 351	25 183	26 439	25 589	23 913	21 726	22 962	20 041	17 552	18 979	20 662	16 590	22 082

* data not available by country
Source: Anon.,1996a.

landed by inshore fisheries using fixed-bottom or drifting longlines to target fish that fetch high prices, such as bream, hake, and grouper.

4.4 Deep-water shark fisheries

There are important stocks of deep-dwelling gulper sharks in fishing grounds off north Morocco and France, between Nice and Antibes (Munoz-Chapuli *et al.*, 1993). Fishers in Greece, Turkey, Cyprus and Malta report frequent annual landings of the Bluntnose Sixgill Shark, caught mainly by deeper set fixed-bottom longlines. However, quantitative information is lacking.

4.5 Pelagic shark fisheries

Pelagic sharks are caught mostly by surface longline and pelagic driftnet fisheries that target Swordfish and tuna in the Mediterranean. The shark bycatch from surface longliners is significant; according to data provided by fishery officials in Cyprus, retained shark bycatch comprised almost 20% of the Swordfish fishery landings (by volume) during the period 1988-1994 (E. Economou, pers. comm., 1996). For the Spanish Mediterranean surface longline fleet, sharks represented 11.7% and 14.2% of the total landings in 1984 and 1985, respectively (Munoz-Chapuli *et al.*, 1993).

The actual level of bycatch of pelagic sharks is expected to be notably higher if discarded bycatch is taken into account. A Spanish longline vessel operating in the Western Mediterranean is reported to have discarded two-thirds of its catch of Blue Sharks (Munoz-Chapuli *et al.*, 1993). Blue Shark is reported as the most frequently caught species by these longliners, followed by the Shortfin Mako and Thresher Shark. These findings were confirmed by TRAFFIC researchers in Spain, who report a 15.6% catch rate of sharks from the Spanish Mediterranean drift longline fishery in 1995 (Guzmán and Quintanilla, 1996). Other species caught included Smooth Hammerhead, Copper Shark, Tope, smooth-hound and Great White Shark (Munoz-Chapuli *et al.*, 1993). However, qualitative information on discarded bycatch is scarce.

5. TRADE IN SHARKS AND THEIR PRODUCTS IN EUROPE

Shark scientists, processors and fishers in Europe report that the most important use of sharks landed in the region is for direct human consumption (Anon., 1989a; 1995a; TRAFFIC Europe data). Besides the extensive use of these fishes for food, other parts of sharks are used or traded in varying degrees by most European countries. A more detailed compilation of survey and trade data by country is included in Annex 1 of this report.

5.1 Overview of the use of sharks

Whether directly or indirectly, the fishing fleets of every European country catch sharks, and at least some of this catch is valued for one attribute or another. A number of domestic uses are highlighted below.

France

France is a major fisher of cartilaginous fishes, catching a variety of species, especially Piked Dogfish, catsharks, skates and rays. These are marketed domestically, with Piked Dogfish exported to neighbouring countries. French fisheries catch significant numbers of deep-water sharks, such as the Portuguese Dogfish and other species taken for their liver oil and squalene, and used by French companies in the manufacture of cosmetic and pharmaceutical products (M. Todisco, *in litt.*, 1996). French tuna fisheries take a significant bycatch of sharks. Little is known about the fate of shark bycatch in France s distant water fisheries.

United Kingdom

The UK fleet takes Piked Dogfish, skates and rays incidentally and in targeted fisheries. The Piked Dogfish is used in the fish-and-chips trade in southern England, and processors export Piked Dogfish tails and fins to markets in the Far East. Skates and rays are consumed at home (being used widely in the fish-and-chips trade), and are exported to continental European countries. Porbeagle, Blue and other sharks caught by various fisheries are sold in fish markets or exported to France, Spain and other European countries where they are more highly valued. Small-spotted Catsharks and Nursehounds are used as bait in pot fisheries for crustaceans and molluscs (L. Whone., *in litt.*, 1996). Small quantities of Basking Shark meat have been sold to restaurants, and Basking Shark spine has been sold within the UK for medical research.

Ireland

Ireland has only recently come to appreciate Piked Dogfish, skates and rays as food. Taken as bycatch and through directed fisheries, dogfish and skate are used in the fish-and-chips trade in Ireland, or exported to other European countries, most notably the UK.

Norway

Norway operates directed fisheries for Piked Dogfish, Porbeagle and Basking Shark. Of these, most of the catch of Piked Dogfish (and skate) is exported to EU countries, Porbeagle is consumed at home and exported to the EU, and Basking Shark is taken for its liver oil. Dogfish and Porbeagle fins, byproducts of meat processing, and Basking Shark fins, byproducts of liver oil processing, are exported to the Far East. Piked Dogfish liver oil is also processed, although this market is reported to have declined markedly in recent years.

Germany

In Germany, Piked Dogfish and other sharks are bycatch species; their meat, fresh and smoked, is highly appreciated. Skates are also eaten, although not widely. Dogfish and Porbeagle fins, byproducts of meat processing, are exported to the Far East.

Belgium

Belgium incidentally takes Piked Dogfish, hound sharks, skates and rays, most of which are consumed within the country, though some of the catch is exported to neighbouring countries. Customs statistics of East Asian countries report imports of shark fin originating in Belgium.

The Netherlands

Most of the Dutch bycatch of Piked Dogfish and rays is exported to neighbouring countries. Most of the Small-spotted Catshark landed is consumed domestically (Jonkman and den Heijer, 1996). Asian trade statistics report shark fin originating in the Netherlands, perhaps as a byproduct of the shark processing industry. Shark and skate offal is used for making fishmeal (Anon., 1989a).

Spain

Sharks are usually considered a bycatch of Spanish fisheries, even if catches can be significant and sharks are often targeted (shark meat of a variety of species is enjoyed in Spain). Guzmán and Quintanilla (1996) report that surface drift longlines commonly catch Shortfin Mako and bottom gillnets take Tope. The fins of Blue Sharks and other large pelagic species are often removed, either as a byproduct of meat processing or directly at sea, and exported. The liver oil of several gulper shark species is an increasingly important export product, and Spain has recently begun exporting spinal cartilage to Asian countries. In addition, shark jaws, shark heads, and whole stuffed sharks, rays and other shark curios, originating from local Mediterranean fisheries, are sold in tourist resorts in southern Spain (I. Fergusson, *in litt.* to TRAFFIC International, 1996).

Italy

Sharks are retained as a bycatch of other Italian fisheries, and Italy is an avid consumer of dogfish, sharks and rays caught by its fishing fleets. No other uses of sharks landed in Italy have been reported.

Greece

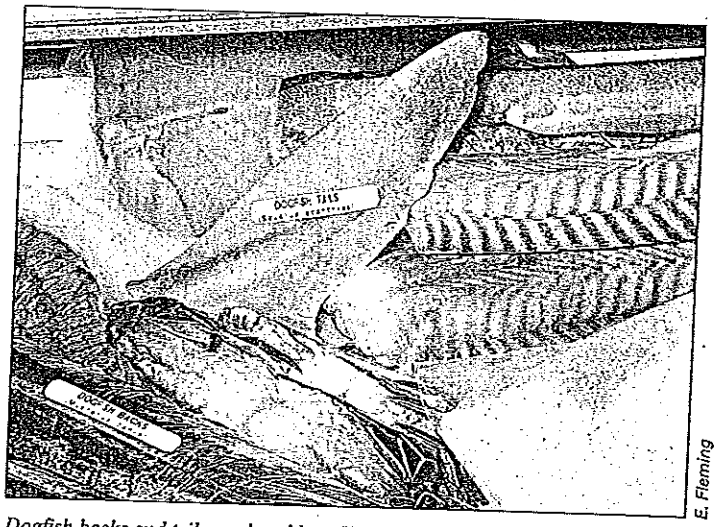
Greek fishers do not specifically target sharks, although specimens of these species are usually landed and sold for human consumption.

Cyprus

Former directed shark fisheries apparently no longer operate in Cyprus, having switched to more lucrative target fishes. However, dogfish, sharks and rays caught as bycatch are landed and the meat is marketed. Trade statistics of Asian nations also report imports of shark fin from Cyprus.

Turkey

The most frequently landed cartilaginous fishes in Turkey are the Piked Dogfish and common ray species. Not highly appreciated in Turkey, shark meat is sold inexpensively. Customs statistics from Asian countries in the 1980s and early 1990s reported imports of shark fin from Turkey.



E. Fleming

Dogfish backs and tails marketed by a US processor in Europe.

Portugal

ICES reports that rays and catsharks are eaten in Portugal (Anon., 1989a; 1995a). The Kitefin Shark is targeted for its meat, liver and skin, and other deep-water species are taken for their liver; offal is used for making fishmeal (Anon., 1989a). Asian trade data also include imports of shark fin originating in Portugal.

More detailed information is included in Annex 1 of this report.

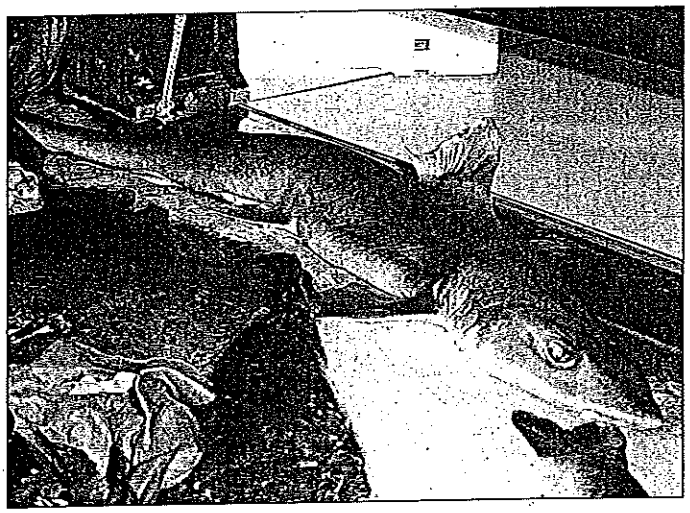
5.2 Overview of the shark meat trade

Europeans can have a large appetite for certain shark species, and the species, the forms in which they are eaten and the quantities eaten vary from country to country. In northern Europe, Piked Dogfish is in greatest demand, while Smooth-hound, Starry Smooth-hound and other hound sharks are favoured in the southern countries (Josupeit and de Franssu, 1992). The French market, the largest in Europe for Piked Dogfish, prefers headed, gutted skinless fish (Anon., 1991a), known to the processing sector as "backs" when the belly flaps are removed. Germany has long appreciated *dornhai* (Piked Dogfish) bellies and backs. *Schillerlocken* (locks of Schiller) is a traditional delicacy of smoked belly flaps, and backs are called *seeaal* (sea eel), which may be sold fresh or smoked. *Schillerlocken* and smoked *seeaal* obtain relatively high prices. Skates and rays, Small-spotted Catshark, Porbeagle, Shortfin Mako and other species also feature prominently in the diets of many Europeans.

Despite the large consumption of dogfish and other shark species in Europe, it is ironic that, in general, society at large maintains a longstanding abhorrence for sharks. For this reason, the shark origins of these fish have been disguised with a variety of names, so that consumers may be unaware

that they are purchasing shark (Josupeit and de Franssu, 1992). Piked Dogfish is most widely known in the UK as "rock salmon," and less frequently as "huss," and as *Schillerlocken* and *seeaal* in Germany. In France and Francophone Belgium, Piked Dogfish is called *aiguillat* or *aiguillat commun*, Small-spotted Catshark is *petite roussette* and Nursehound is *grande roussette*. In France, the pink skinless meat of Piked Dogfish, Small-spotted Catshark and Nursehound, Porbeagle and other Squalidae is called *saumonette*. In Spain, Shortfin Mako, Tope and other shark species are sometimes called *bienmesabe* (good taste) and Blue Shark is usually called "pickled fish." In Italy, smooth-hound is *palombo*, and *smeriglio* refers to Shortfin Mako and other sharks.

In another marketing strategy, sharks are sometimes falsely marketed as other fish, in part to take advantage of the higher retail prices of other fish (Laurenti and Rocco, 1996). In Greece, sharks are often sold as Swordfish and in Spain, frozen mako *Isurus* spp. fillets may be sold as Swordfish (Guzmán and Quintanilla, 1996). The difference in price between Swordfish and shark in Cyprus is approximately US$6.00/kg, which may encourage the misrepresentation of shark as Swordfish. Sharks may also be purposefully confused with other sharks. For example, Blue Shark is not widely considered palatable in Europe, and is consequently marketed as Piked Dogfish or smooth-hound in Italy (I. Bianchi, pers. comm., 1995)



E. Fleming

Piked Dogfish and skate on sale in Europe.

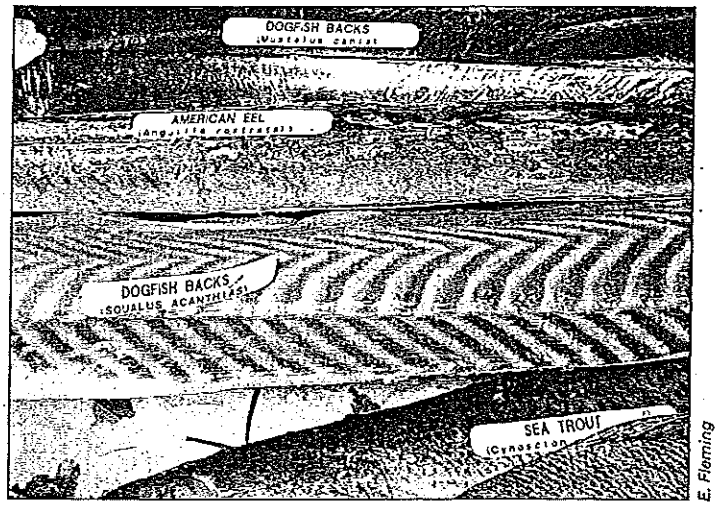
US dogfish traders attending seafood trade fairs in Europe explained that Piked Dogfish is not eaten in the USA, and that all of the country's exports are destined for Europe. Several of them described diminished landings in Europe, and increased demand in Europe for North American skate and dogfish products. One American company, which specializes in "underutilized and abundant" species, produces *Schillerlocken* in its smokehouse, while another established a company in France to distribute US dogfish products throughout Europe. Processors and exporters interviewed by TRAFFIC claimed to market Piked Dogfish to northern European countries and Dusky Smooth-hound *Mustelus canis* to countries in southern Europe.

US dogfish was reported to be larger and of better quality, with the larger size generally preferred on European markets. However, several traders remarked that individuals imported from the USA have become smaller over the years. Commonly, US dogfish is also less expensive than dogfish landed in Europe. Dogfish landed in Europe is often traded fresh to other European countries; fresh product is usually more expensive than frozen. Much of the US production is processed and frozen at sea and air freighted to Europe.

Skate meat is highly appreciated in France and Belgium, and is sold widely in fresh fish markets, supermarkets and restaurants. Buyers in France often prefer to buy whole skate with skin intact, while skinless skate wings are the preferred form in Belgium and other European countries. Skate is used throughout the UK and Ireland by the fish-and-chips industry. Large, meatier species are preferred; the Blonde Ray is of the highest grade in Ireland, while the Thornback Ray is the most sought after by French consumers. Large quantities of skate are imported to meet demand in Europe.

International trade in shark meat

International trade by EU nations in shark and dogfish meat has been growing quite steadily for over a decade. The importance of shark meat on the EU market, relative to other shark products, is reflected in the fact that, of all the shark products imported into and exported from the EU, only the meat is specifically recorded as "shark" in EU trade statistics. Shark-specific customs commodity codes record trade in meat for only two "species" groups: dogfish (Piked Dogfish and catsharks *Scyliorhinus* spp.) and all other dogfish and sharks (excluding Piked Dogfish and catsharks). Transactions are classified as fresh or chilled, frozen or frozen fillets.



Backs of Dusky Smooth-hound and Piked Dogfish, imported from the USA, on sale in Europe.

However, the trade data for shark meat are very difficult to interpret or translate into conservation significance. The reason for this is that total EU trade figures include both trade with partners external to the EU and trade among member states. Total imports (or exports), for example, refer to the sum of all imports from (or exports to) non-EU and EU member states. This approach works well when analyzing trade on the country level, however, on the EU level, a percentage of these figures may be double-counted as imports as well as the exports, because 12 countries are involved[2]. For example, if France imports two metric tonnes of dogfish meat from the USA, and re-exports one tonne of dogfish meat to Italy, total imports recorded in Eurostat trade statistics would be three metric tonnes. The record would show France imported two metric tonnes from an external country and Italy imported one metric tonne from a fellow EU member state. Therefore, in describing a single market as large and diverse as the EU, total trade figures do not accurately represent absolute values and are best used to illustrate trends. With this caveat in mind, the EU imported 27 000 mt of dogfish and shark meat in 1983, which rose to 42 000 mt in 1994 (Anon., 1996c; Josupeit and de Franssu, 1992).

Eurostat data from 1988-1994 illustrate that EU countries import far more dogfish and shark meat than they export (Anon., 1996c). From 1988-1994, the EU imported an average of over 37 000 mt of dogfish and shark per year, while it exported only 13 325 mt a year. Also, the EU imports more dogfish than other shark species. Of the total imports of dogfish and shark of over 261 400 mt from 1988-1994, dogfish comprised 55% of the total.

About two-thirds of the dogfish and shark meat imported by EU members is from countries outside the EU (67% of the imports from 1988-1994). Norway was the largest of nine non-EU suppliers of fresh or chilled Piked Dogfish during this period, followed by the USA. Frozen dogfish was supplied by 25 countries from all over the world, but was dominated by the USA and Argentina. Frozen sharks were supplied by 52 countries from 1990 to 1994, most importantly from Asia, South America and Africa. Japan, Argentina and South Africa were also prominent suppliers of frozen shark to EU countries. The vast majority of the EU's exports are to fellow EU member states (94% of the exports from 1988-1994). Only 3% of the EU's exports of dogfish and 8% of sharks are exported outside the EU. Italy is the largest importer of dogfish and other sharks in the EU, while France is the largest importer of dogfish. Germany is the most important exporter of dogfish, and the UK is the largest

2. The Eurostat data analysed in this report contain shark meat trade records through 1994. In 1994, the 12 EU member states included France, Belgium, Luxembourg, Netherlands, Germany, Denmark, UK, Ireland, Italy, Greece, Portugal and Spain. These figures do not include trade records of Austria, Sweden and Finland, which joined the EU on 1 January 1995.

dogfish supplier, followed by Denmark. Italy is the most important importer of sharks generally, while Germany is the largest EU exporter of sharks, followed by the UK and Spain (Anon., 1996c).

In addition to these imports and exports, figures for several additional commodity codes probably include shark transactions, although it is practically impossible to verify this under the current system. Some examples of these codes may be found in an annex to the *Official Journal of the European Communities* on the Integrated Tariff system (TARIC)[3]. This annex specifies several fish products and species to be recorded in certain "other" codes. Some of these general codes include sharks along with many different species of fish. For example, "other live saltwater fish" includes dogfish *Squalus* spp. and Porbeagles. "Fish fillets and other fish meat" includes Piked Dogfish, other sharks of the genus *Squalus*, and Porbeagle. The third code, "other" includes Piked Dogfish, other sharks of the genus *Squalus*, and Porbeagle. Between 1990-1994, the EU imported 12 547 mt of "other," 991 mt of "other live saltwater fish" and 22 839 mt of "other fish meat," an unknown proportion of which comprised sharks and probably skates and rays.

3. Annex to the Official Journal of the European communities, C 141 A, Vol. 37, 24 May 1994. Integrated Tariff of the European Communities (TARIC), Chapters 1-49, Vol. 1 94/C 141 A/01.

5.3 Overview of the trade in other shark products

A variety of other shark products, including skate meat, shark and ray leather, shark fin preparations, cartilage, liver oil and squalene, curios and possibly others are imported by or exported from EU countries, though there are no specific codes for these products on the EU level. Spain is likely the only EU member state to report trade in shark fin, leather and skin, but trade in shark fin products by a number of EU countries is reported in the trade statistics of countries in other regions.

Shark fin

A recent study of the shark fin trade concluded that Europe has a fairly low, but increasing interest in shark fins (Dockerty, 1992). After an examination of the customs statistics of nine Asian countries[4], the study classified several European countries as either net producers or consumers of shark fin during 1986-1990, based on country of origin or export data (Dockerty, 1992). The following countries were classified as net producers of shark fin from 1986-1990: Spain (811 469 kg), Norway (99 396 kg), Germany, F.R. (87 412 kg), UK (29 721 kg), the Netherlands (20 510 kg), Turkey (16 508 kg), Portugal (2 331 kg) and Belgium (304 kg). Net consumers during this period included Italy (852 kg), Sweden (753 kg), France (535 kg), Greece (45 kg), Cyprus (35 kg), Denmark (25 kg) and Ireland (24 kg) (Dockerty, 1992).

4. The trade statistics were of Hong Kong, Indonesia, Japan, Malaysia, Republic of Korea, Singapore, Sri Lanka, Taiwan and Thailand.

E. Fleming

Canned shark fin soup on sale in Europe

Interviews by TRAFFIC with Norwegian traders confirmed their exporting Piked Dogfish, Porbeagle and Basking Shark fins to Asian countries. A German fish processor reported exporting Piked Dogfish and Porbeagle fins as byproducts of meat processing, and UK Piked Dogfish processors reported exporting fins via a broker to the Far East. Belgian processors claimed not to export any byproducts, interviews in the Netherlands did not reveal Dutch involvement in the export of fins, and inquiries in Turkey and Cyprus did not reveal supportive evidence.

Guzmán and Quintanilla (1996) report that several firms dedicated to the export of pelagic shark fins from Spain operate in Vigo and possibly other locations.

TRAFFIC's market surveys in Italy, France, Germany, the Netherlands, Belgium, the UK, Ireland, Greece and Cyprus verified the availability of various imported shark fin products in Asian restaurants and shops catering to Asian consumers. Sweden and Denmark, recorded as importers in customs statistics, were not surveyed. A customs officer interviewed by TRAFFIC reported seeing large containers of shark fin arriving in the UK, though these would not be recorded as such in UK Customs statistics (C. Allan, *in litt.*, 1996). When asked under which commodity code canned shark fin soup would be logged, a statistician in the UK Ministry of Fisheries and Food replied it would be recorded under "preserved fish products."

Shark fin products most frequently marketed in Europe include canned fin soup; dried, processed fin cartilage with the skin and flesh removed; and whole fin. During the survey, 13 recognizable "brands" of shark fin and canned fin soup were identified among many others. Product labels stated these items have been manufactured in Singapore, Surinam, Hong Kong, Indonesia and China.

France appears to be one of the largest importers of shark fin products in Europe. Shark fin products originating in Surinam and imported from Singapore into France were subsequently found in Italy, and canned soup imported by a Dutch company from Surinam was found in Belgium, suggesting France and the Netherlands may serve as distribution centres for these products in Europe. A representative of a Greek import company that supplies shark fin products to Asian restaurants in that country told a TRAFFIC researcher that all these products are imported from another EU country. Spain reported combined imports of approximately 1 960 mt and exports of 730 mt of dried fin in 1994 and 1995. Trade statistics of Hong Kong record imports of 76 mt of dried or salted shark fin from Spain in 1994. Trade statistics for Singapore report exports of prepared shark fin to France, Germany and Italy, and customs statistics of several other Asian countries report importing shark fin from Portugal, Germany, France, Netherlands, Spain, UK and Belgium/Luxembourg.

Shark cartilage

Shark cartilage products are not marketed as widely in Europe as they are in the USA, though they appear to constitute a fast growing market in Europe. TRAFFIC found cartilage products in the UK, France, Belgium, the Netherlands, Germany, Italy, Spain and Greece. These appear to have been imported as finished products or as processed cartilage for manufacture and distribution within Europe.

E. Fleming

Shark cartilage goods on sale in Europe, 1996.

One US company with offices in the Netherlands and Spain distributes shark cartilage capsules and powder in Europe through its UK affiliate, labelling the items as originating in Australia. TRAFFIC researchers found these products in Greece during the survey, and the researchers were informed that shark cartilage is just starting to enter the Greek market. In Spain, at least seven different types of shark cartilage capsules and powder were noted during the survey, and these products appear to be imported, repackaged and

distributed by Spanish companies; TRAFFIC is aware of one capsule product, imported from Brazil, that is distributed by a Spanish affiliate of an international company. Researchers in Italy found shark cartilage capsules manufactured in Costa Rica and imported into Italy from the USA (M. Rocco, *in litt.*, 1996). In Belgium, one company has manufactured capsules for the past year from powder purchased from a national importer. A company representative explained there is a rapidly increasing market in Europe for shark cartilage, which is distributed to pharmacies and health products outlets and to homeopathic doctors and other health practitioners (F. Decroly, pers. comm., 1996). In Germany, 13 different cartilage products were found in the TRAFFIC survey. In addition, the use of shark cartilage by the veterinary practice is reportedly on the rise in Europe (J. Earl, *in litt.* to B.J. Kelso, 1996).

Shark li er oil and squalene

The European market for shark liver oil and squalene products also appears to be growing. TRAFFIC found products containing shark oil or squalene in Belgium, the UK, France, Germany the Netherlands, Greece and Iceland. A Belgian distributor of squalene reported increasing exports of the product to France, Portugal, Germany and Switzerland. In the UK, a company affiliated with a US company distributes to other European countries shark liver oil of Norwegian origin, manufactured by the parent company in the USA. TRAFFIC identified several establishments in France that use shark liver oil and squalene in the manufacture of cosmetic and pharmaceutical products (M. Todisco, *in litt.*, 1996), including a factory in southern France that processes shark liver oil used in perfumery (B. Séret, *in litt.*, 1996).

Shark skin and leather

Shark skin and leather are also traded in Europe. In 1994 and 1995, Spain imported an average of over 2 800 mt of shark skin and 125 mt of shark leather. Spain exported an average of more than 800 mt skin and 200 mt of shark leather during these two years. Despite these figures, there are no companies officially registered in Spain as trading in these (Guzmán and Quintanilla, 1996). In Germany, there used to be a substantial shark leather market that imported raw skins for the manufacture of furniture and bookbinding. Apparently, restrictions placed on the national tanning industry in the early 1990s prompted it to import tanned material from the UK, France and Italy. Today, the industry produces only watchstraps from shark skin. (Schillak, 1996).

E. Fleming

Shark products, including fin, cartilage, li er oil and squalene, found on sale in Europe during 1996.

Besides the German reference to Italy as a trader in shark skin and leather, a US manufacturer of cowboy boots, including shark skin boots, reported all its leather is manufactured in and imported from Italy. A 1995 magazine published an interview with a representative of the largest watchband producer in Italy in which he stated the company uses shark leather (Anon., 1995d).

However, TRAFFIC was unable to obtain information on the use and trade of shark skin and leather in Italy.

In France, shark and ray leather is used in the manufacture of luxury items such as handbags, wallets and jewellery. Ray skin, known as *galluchat*, is also used to cover furniture and in clothing design. TRAFFIC s surveys in France located shark skin watchstraps for sale throughout Paris, and also shark leather belts. One of the species reportedly used as *galluchat* is *Dasyatis sephen* of Asian origin (M. Todisco, *in litt.*, 1996).

Other shark derivatives

It is believed that curio or marine specialty shops throughout the EU sell or import shark products such as teeth and preserved jaws. An avid collector of preserved shark jaws, vertebrae and other body parts has imported these into the UK from North and South America (I. Fergusson, *in litt.* to TRAFFIC International, 1996).

More detailed information is included Annex 1 of this report.

6. REGULATION OF SHARK FISHERIES IN EUROPE

6.1 EC Common Fisheries Policy

In 1977, the European Community (the European Economic Community at the time) declared a 200-mile exclusive economic zone (EEZ) around its coastal member states. In 1983, the European Community established its Common Fisheries Policy (CFP) which set out common rules applicable to all EC member countries. The CFP included provisions for a wide range of fisheries and trade practices, from sea-based activities to the marketing of fisheries products. The original CFP was reviewed in the early 1990s and ratified in 1992. This version introduced the requirement for fisheries managers to take environmental protection into consideration, and included the application of the precautionary approach (I. Lutchman, *in litt.*, 1996). The principal policy objectives of the CFP are to protect fish stocks in EC waters from overfishing, guarantee fishers a future livelihood and ensure that the processing industry and consumers enjoy regular supplies of fish at reasonable prices (Anon., 1994).

Rules to protect fisheries resources from overharvesting are based on information provided by the Community's Scientific, Technical and Economic Committee for Fisheries (STECF) and by ICES. Each year, ICES and/or STECF assesses various fish stocks in each of the ICES areas, and under the Common Fisheries Policy, the management of these stocks is based on the concept of a Total Allowable Catch (TAC) for each stock in a given area. Total allowable catches are divided into national quotas, and fisheries for a particular stock must be closed once a total allowable catch or quota has been exhausted. In addition, Community legislation[5] applies several restrictions on fishing activity in the form of minimum mesh sizes, minimum landing sizes, seasonally closed areas, bycatch limits and other practical measures affecting the gear or the operations of fishers (Holden, 1991).

The Common Fisheries Policy recognizes that coastal states have exclusive access and authority to manage fisheries within their territorial waters, out to 12 nautical miles, subject to CFP regulations. Within the outer half of the territorial waters (6-12 nautical miles), other EU member states may

5: Council Regulation (EC) 3094/86 laying down certain technical measures for conservation of fishery resources (as amended); Council Regulation (EC) 1626/94 laying down certain technical measures for the conservation of fishery resources in the Mediterranean (OJ L 171, 6 July 1994).

have historic rights entitling them to limited access to certain fisheries (Gray, 1995). Responsibility for enforcing the regulations of the CFP rests with fisheries officers in EU member states.

The Northeast Atlantic

In the Northeast Atlantic there have been very few constraints on shark fishing effort (Anon., 1989a). While Total Allowable Catches, the standard tool in managing the stocks in the Northeast Atlantic area, have applied to approximately 15% of the fish caught or landed in the Community (Anon., 1994), there has never been a Community Total Allowable Catch or quota established for any shark species or stock to limit fishing by EU member states. As a rule, however, agreed Total Allowable Catches throughout FAO Area 27 have exceeded those recommended by ICES and actual catches have exceeded the agreed limits (Anon., 1994). Furthermore, there are no technical conservation measures laid down in Community legislation specific to any shark fishery.

The EU applies quota restrictions to certain fisheries in EU waters used by non-EU countries that had traditionally fished in them. For example, the EU-Norway and EU-Faeroe Islands fishing agreements allow Norway and the Faeroes continued access to certain fisheries resources in EU waters in exchange for equivalent opportunities in their waters. Each year, the Community and these countries agree on the following year's Total Allowable Catch and sharing of the joint stocks, and also an exchange of other stocks. The Total Allowable Catches of these fishing agreements are finalized each December for the following year. The original agreements entered into force in 1981, were renewed in 1991, and will run until June 1997.

Among the annual quotas established in 1982, Norway was entitled to fish 800 mt of Basking Shark (liver weight) and 500 mt of Porbeagle in EC waters[6] (M. Vanbrabant, pers. comm., 1996). These quotas were reduced in 1985 to 400 mt of Basking Shark (liver weight), or approximately 800-1 000 animals (S. Pollard, *in litt.*, 1996), and 200 mt of Porbeagle (M. Vanbrabant, pers. comm., 1996). Currently, the Porbeagle quota remains in effect at 200 mt, while the Basking Shark quota was reduced from 400 to 100 mt in 1994 (M. Vanbrabant, pers. comm., 1996), estimated to represent 250-300 Basking Sharks a year (S. Pollard, *in litt.*, 1996). Under the agreement with the EU, the Faeroe Islands are also entitled to take Porbeagle from EU waters (Gauld, 1989). An initial quota of 300 mt was agreed in 1982, reduced to 150 mt in 1984 and reduced further to 125 mt in 1985. The 125 mt quota remains unchanged today (M. Vanbrabant, pers. comm., 1996).

6. The EU agreement entitles Norway to take Basking Shark in ICES areas IV, VI and VII (North Sea, Irish Box and Shetland Box in the British Isles) and Porbeagle from all Community waters.

During the 1970s, the distant water fisheries activities of some European countries were limited by the adoption of 200 mile EEZs in many countries. To compensate for the loss of fishing rights in distant waters, the EU has concluded 28 fishing agreements with African and Indian Ocean countries, North Atlantic countries and a Latin American country (Anon., 1994).

The Mediterranean

No direct measures to regulate or manage sharks have been applied in the Mediterranean. In the absence of 200-mile EEZs, the Mediterranean is a region without a common legal framework for shared management of fisheries resources, and with limited enforcement of what legislation exists to regulate fishing on the high seas. In addition to the Mediterranean nations, several other countries, such as Japan and South Korea, have fishing interests in the region. A large number of fishing vessels flying flags of convenience also operate freely in the Mediterranean (D. Karavellas *in litt.*, 1996).

As far as the Common Fisheries Policy is concerned, only four countries of the Mediterranean

region are EU member states (Greece, Italy, Spain and France), so any measures adopted by the EU to regulate fisheries apply only to a minority of countries fishing in the region. While rules on the marketing of fish and aid for structural improvements apply to the four countries, those rules regulating fisheries conservation, management of resources and access to fishing grounds could not be applied in the Mediterranean (Anon., 1994). Therefore, in 1994, a separate regulation was adopted to apply technical conservation measures for the management of fish stocks in the area.

In order to manage fisheries resources in the Mediterranean, the EU seems set on supporting existing international management bodies. In the case of the Mediterranean, the main regional fisheries body is FAO's General Fisheries Council for the Mediterranean (GFCM). Management considerations for large pelagic species are effectively entrusted to the International Commission for the Conservation of Atlantic Tuna (ICCAT). However, while all 20 countries of the Mediterranean basin are GFCM members, only three EU nations are members of ICCAT (Spain, France and Morocco). Cooperation between ICCAT and GFCM has been established and a joint *ad hoc* working group has been formed in an attempt to bridge this management gap. Although the GFCM has adopted many of ICCAT s recommendations, these are rarely implemented, partly owing to a lack of political will in the member states, and partly due to the non-binding authority of GFCM (D. Karavellas, *in litt.*, 1996).

6.2 National and local restrictions

United Kingdom

On the national level, there is no legislation directly regulating any shark fishery in the UK, which is mainly a result of the low commercial interest in many of these species (L. Whone, *in litt.*, 1996). Three Sea Fisheries Committees (SFCs), however, have regional bylaws setting minimum catch sizes of skates and rays.

These bylaws were enacted largely in response to complaints from fisheries officers and fishers about the large numbers of immature skates and rays, especially Thornback Ray, being offered on the market (S. Murphy, Kent and Essex SFC, *in litt.*, 1995; M. Whitley, Southern Sea Fisheries District, pers. comm., 1996). The Southern Sea Fisheries District introduced the *Skates and Rays Minimum Size* bylaw in 1981, which established that whole skates and rays must measure at least 35 centimetres from wing tip to wing tip (disc width). When cut off, wings had to be at least 15 centimetres across (M. Whitley, *in litt.*, 1994). In 1992, the size limits were increased to 40 centimetres disc width and 20 centimetres for wings, again at the request of fishermen (M. Whitley, pers. comm., 1996). The Kent and Essex SFC passed a similar bylaw, *Minimum Fish Sizes for Certain Species*, in September 1992. It set minimum sizes for skates and rays at 35 cm disc width and 15 cm wings (S. Murphy, pers. comm., 1996). The Cumbria SFC requires that skates and rays measure at least 45 centimetres disc width, and cut wings must measure at least 22 centimetres across upon removal from the sea (M. Vince, *in litt.*, 1996).

The Basking Shark has been fully protected within a three-mile zone off the Isle of Man under the *Isle of Man Wildlife Act* since 1989 (Ken Watterson, pers. comm., 1996). The Basking Shark is being considered by the UK Department of Environment for inclusion in Schedule 5 of the *Wildlife and Countryside Act* of 1981. The Act prohibits the killing, injuring, taking, disturbing, possession, selling, offering or displaying for sale of listed species, throughout Great Britain and in adjacent territorial waters out to 12 miles. If accepted, the proposed listing will enter into force in 1997. The

Basking Shark has been nominated on two previous occasions but failed to gain protection due to the lack of supporting scientific evidence (P. Knapman, *in litt.*, 15 March 1996).

Ireland

There is no legislation in Ireland specifically regulating or restricting any shark fishery (E. Fahy, *in litt.*, 1996).

France

There are no specific management regulations for any shark species in French waters. (B. Séret, *in litt.*, 1996)

Norway

Norwegian fisheries officials have set a 70 centimetre size limit on Piked Dogfish catches as of March 1964 (Hjertenes, 1980; Holden, 1977). According to Hjertenes (1980), the efficiency of the catch size limit with regard to conserving the stocks has been debatable since it has concentrated fishing pressure on mature or maturing females, and in most cases, has led to high rates of discarding of males or immature specimens.

Germany

There are no direct management or regulatory measures for any shark fishery in Germany. Because of problems with quality, Germany stopped importing smooth-hound from Peru in the early 1980s (Josupeit and de Franssu, 1992).

The Netherlands

The Netherlands does not directly manage or regulate any shark fishery.

Belgium

Belgium has not enacted any direct measures to regulate or manage any shark fishery.

Spain

In Spain, directed shark fisheries and shark bycatch of other fisheries are not regulated. There no control on the number of shark specimens discarded. In the late 1980s, Spain stopped importir frozen shark fillets from Peru owing to problems with quality (Josupeit and de Franssu, 1992).

Italy

Shark fisheries are not directly regulated or managed in Italy. All fish exported to the country f human consumption must be accompanied with a certificate of analysis stating that mercury lev are not in excess of 1mg/kg (Laurenti and Rocco, 1996). The country has refused many impor such as Tope from France, on these grounds.

Greece

There is no specific management or regulation of any shark fishery in Greece.

Cyprus

No direct measures have been taken to regulate or restrict shark fisheries in Cyprus. Two measures that may indirectly affect these fisheries include a closed season for trawling from June through October and a size restriction to 250 hp for new trawlers entering the fishery in Cypriot waters. The total number of vessels is restricted to eight.

Turkey

Turkey does not directly regulate shark fisheries, however, fishing for some shark species is indirectly affected by a prohibition on trawling and purse seining from May until September (I. Mert, *in litt.*, 1996).

Malta

Shark fisheries are not directly regulated or managed in Malta (C. Busuttil, *in litt.*, 1996).

6.3 Proposed shark management

Shark fisheries *per se* are currently unregulated and unmanaged on the EU level. A proposal for an EC regulation has been put forward (Proposal for a Council Regulation (EC) COM(95) 322 final) establishing the lists of species to be recorded in the fisheries logbook and landing declaration. If adopted, it would mandate that several shark species and groups be recorded in the fisheries logbook and landing declaration. According to Council Regulation (EEC) 2847/93 establishing a control regime applicable to the Common Fisheries Policy, fishing vessel operators would have to keep a logbook of catches and submit landing declarations.

The explanatory memorandum of the proposal specifies that the list of species to be entered in the logbook and landing declaration will include species currently subject to EC Total Allowable Catches or quotas, technical conservation measures provided for in EC legislation, international conservation measures, and species of particular scientific or commercial interest. The sharks proposed in the list of species/categories include the Basking Shark, Piked Dogfish, dogfish sharks not elsewhere indicated-Squalidae, Porbeagle, smooth-hounds, rays and skates *Raja* spp. and Shortfin Mako.

7. CONCLUSIONS AND RECOMMENDATIONS

European shark fisheries are virtually unregulated or unmanaged at both national and regional levels. As such, cartilaginous fishes remain available for exploitation as quotas or other restrictions are applied to other fisheries. While several experts (such as the ICES Elasmobranch Study Group) have proposed that Total Allowable Catches and size limits be applied to certain shark species, there is concern that these measures may actually encourage discarding of sharks and/or dishonest reporting. Shark scientists believe that fisheries management models applied to bony fish species are generally not suitable for the management of shark fisheries, owing to the specific biological and life history characteristics of these fishes. It would appear also that no one fishery model would be suitable to a group of fishes as large and varied as the sharks.

The sustainability of the fisheries that are currently subject to regulation and management in Europe is often questioned. Enforcement of existing management measures for bony-fish fisheries

in Europe, such as Total Allowable Catches, logbook declarations, and minimum catch sizes for individual fish, are recognized as inadequate for a number of current fisheries because many of the regulated stocks are harvested in mixed fisheries. The reliability of reported landings statistics has deteriorated for some regulated stocks in Europe owing to management and enforcement problems. In addition, the scientific advice provided by ICES to the EU for the management of several fish stocks has not been considered in the allocation of Total Allowable Catches and other management measures (Holden, 1991).

Several promising initiatives have been undertaken in Europe to begin to address some of these information gaps and management needs. ICES established a Study Group on Elasmobranch Fishes in 1994 and is preparing posters to aid in the identification of skates and rays, including skate wings, and deep-water sharks. In 1995, the ICES Study Group compiled a list of 46 Northeas Atlantic shark species for which information is considered lacking on fisheries statistics, biology o status of exploitation (Anon., 1995b)(Table 5). In 1997, the Group will discuss improving th recording of shark species data (P. Walker, in litt., 1996). In October 1996, shark scientists launche a European Elasmobranch Association to further the conservation of sharks and increase th public s awareness on the biology and conservation requirements of these fishes through educatic and distribution of research findings.

Still, against this backdrop - gaps in the knowledge about sharks themselves, a lack understanding of their fisheries and trade, and the effects these are having on particular species stocks, and the unregulated and unmanaged nature of these fisheries and trade — there is a lack understanding by the public about what cartilaginous fishes are and why they should be conserve There is no doubt that a large segment of the human population would hardly be disturbed by t thought of a "man-eating" shark species being potentially threatened by trade. But, unless t public becomes enlightened about the ecological importance of sharks, skates and rays to mar ecosystems, the harmless nature of most species and the current potential threats to th conservation, governments will hardly be motivated to improve the management of shark fishe and trade and provide the necessary funding for research, training and other initiatives.

The TRAFFIC study in Europe has compiled a great deal of information on shark fisheries. species caught and landed in Europe, on destinations and uses of European landings, preferences for shark products in different countries, on products imported from other regions national and regional demand for imported products, on trade routes and trading partners, an prices and other knowledge that should provide a useful basis for further work in the region. W much of this information is fragmented or anecdotal, the study has shown that Europe as a re plays an important role as fisher, supplier, processor, trader and consumer of shark products.

The lack of information on so many aspects of the fisheries and trade has been a source of con frustration during this study, as has been the incompatibility of data. During the initial stages c study the authors attempted to compare Piked Dogfish landings in a single European country the national recorded trade data for this species. This proved impossible to do, even for th species for which the most information on fisheries and trade has been recorded nationall internationally. Landed weight could not be compared with traded weight, which can include product forms (e.g., whole fish, fresh, frozen, headed and gutted, filleted). A fisheries mana that country reported to TRAFFIC that other dogfish species are probably also included with landing data for Piked Dogfish due to identification mistakes made at the time of the decla Like Eurostat, the national customs data record Piked Dogfish together with catshark species "frozen fillet" category, although Piked Dogfish is believed to make up the bulk of these f The data would have been even more difficult to interpret in other countries, where the Dogfish would be placed under "dogfish and houndsharks" or simply under "sharks."

Table 5

Northeast Atlantic cartilaginous fish species for which ICES considers that information is required

Coastal sharks	Small-spotted Catshark	*Scyliorhinus canicula*
	Nursehound	*Scyliorhinus stellaris*
	Smooth-hound	*Mustelus mustelus*
	Starry Smooth-hound	*Mustelus asterias*
	Piked Dogfish	*Squalus acanthias*
	Tope Shark	*Galeorhinus galeus*
	Basking Shark	*Cetorhinus maximus*
	Silky Shark	*Carcharhinus falciformis*
	Scalloped Hammerhead	*Sphyrna lewini*
	Smooth Hammerhead	*Sphyrna zygaena*
Pelagic sharks	Thresher	*Alopias vulpinus*
	Bigeye Thresher	*Alopias superciliosus*
	Oceanic Whitetip Shark	*Carcharhinus longimanus*
	Shortfin Mako Shark	*Isurus oxyrinchus*
	Longfin Mako Shark	*Isurus paucus*
	Blue Shark	*Prionace glauca*
Deep-water sharks	Deep-water catsharks	*Apristurus spp.*
	Gulper Shark	*Centrophorus granulosus*
	Leafscale Gulper Shark	*Centrophorus squamosus*
	Black Dogfish	*Centroscyllium fabricii*
	Portuguese Dogfish	*Centroscymnus coelolepis*
	Longnose Velvet Dogfish	*Centroscymnus crepidater*
	Kitefin Shark	*Dalatias licha*
	Birdbeak Dogfish	*Deania calcea*
	Arrowhead Dogfish	*Deania profundorum*
	Great Lanternshark	*Etmopterus princeps*
	Smooth Lanternshark	*Etmopterus pusillus*
	Velvet Belly	*Etmopterus spinax*
	Blackmouth Catshark	*Galeus melastomus*
	Sharpnose Sevengill Shark	*Heptranchias perlo*
	Bluntnose Sixgill Shark	*Hexanchus griseus*
	Smalltooth Sandtiger	*Odontaspis ferox*
	Knifetooth Dogfish	*Scymnodon ringens*
	Greenland Shark	*Somniosus microcephalus*
	Little Sleeper Shark	*Somniosus rostratus*
Skates and rays	Blue Skate	*Raja batis*
	Blonde Ray	*Raja brachyura*
	Sandy Ray	*Raja circularis*
	Thornback Ray	*Raja clavata*
	Shagreen Ray	*Raja fullonica*
	Spotted Ray	*Raja montagui*
	Cuckoo Ray	*Raja naevus*
	Norwegian Skate	*Raja nidarosiensis*
	Longnosed Skate	*Raja oxyrinchus*
	Starry Skate	*Raja radiata*

Source: Anon., 1995b.

The lack of detailed information on many shark species in Europe and their associated fisheries makes it extremely difficult if not impossible to assess the extent to which sharks are being affected by European fisheries. Although landings have been declining in recent years in the Northeast Atlantic for a number of species, inconsistent reporting and insufficient information on catch per unit effort (CPUE) render stock assessment virtually impossible for most of the species involved.

However, from available information, the Piked Dogfish appears to be adversely affected by overfishing in Europe, particularly in France, Norway, Ireland and the UK. Landings have been decreasing overall in the Northeast Atlantic and a number of local fisheries have failed or nearly collapsed, at least in part because of overfishing. In the last few years, European demand for Piked Dogfish has been met with an increasing percentage of imports from the USA; virtually all the Piked Dogfish landed in the USA is exported to Europe.

Several skate and ray species are landed, consumed and traded in Europe. Overfishing was documented to be responsible for the disappearance of the Blue Skate from the Irish Sea and a number of other species have become less frequent in the landings. Without species specific landing and trade information, it will remain difficult to monitor and assess any effects fishing and trade may be exerting.

The study confirmed that the shark species landed in Europe are used primarily for their meat. The fins, cartilage, liver oil, squalene, preserved jaws and other derivatives of a variety of species are also used in Europe or exported.

During the processing of Piked Dogfish for meat, processors in several European countries (e.g., UK, Germany and Norway) retain the fins for export to countries in East Asia. Given the magnitude of the dogfish industry in Europe, this is potentially a large supply of smaller, low value fins entering trade as a byproduct. In addition, shark meat processors in Germany and Norway confirmed exporting Porbeagle fins to Asian markets. Although little is known about the Norwegian trade in Basking Shark fins, processors in Norway confirmed exporting fins to East Asia. Although the information gathered in Spain is fragmentary in places, the country appears to be the largest exporter of shark fin of any of the countries TRAFFIC examined in Europe; customs data of several Asian countries include larger imports of shark fin from Spain than from other European countries.

Shark fin preparations, as canned soup, dried processed shark fin, and dried whole fin, were located throughout Europe in Asian marketplaces. Most of these appear to have been imported from Singapore, Surinam, Hong Kong and China, and to a lesser extent, Thailand and Indonesia. Asian pharmacies and other Eastern outlets are becoming more numerous all over Europe, and this market has the potential to grow in Europe.

New fisheries for deep-water shark species are developing in Europe as new fishing grounds are exploited following the decline of traditional species. French fisheries in the Northeast Atlantic and the Mediterranean land deep-water sharks for their liver oil and squalene for the manufacture of pharmaceutical and cosmetic products. An experimental fishery for demersal species is being established in Spain along with a programme to encourage the development of the markets for shark oil and other derivatives.

Very little information was obtained about the sources of cartilage in trade beyond a report that Spain has begun exporting spinal cartilage to Asia, possibly for the manufacture of cartilage products. The market for shark cartilage capsules and other health products is relatively new and appears to be growing quickly. Most of the products located during market surveys in Europe have been manufactured in the USA or imported in powder form for packaging and labelling in Europe.

There is some trade in shark and ray leather in Europe, although the extent of this market is unknown. The only specific species reported during the study is of Asian origin.

Few definitive conclusions can be drawn regarding species potentially threatened by fisheries or trade in the region, given the current lack of information on biology, life history parameters, fisheries, trade and numerous other factors affecting the many species involved. However, this study has highlighted the urgent need to address these deficiencies. Without species specific information, the assessment of any management and conservation implications of the growing fisheries and trade of sharks will remain extremely difficult.

To address the many deficiencies with respect to monitoring and controlling the fisheries of and trade in shark, skate and ray species, TRAFFIC Europe recommends the following to conserve and manage sharks.

1. Specific and consistent data to monitor the catch, landings and trade in sharks are urgently needed. National governments, FAO, ICES and other international organizations must improve the collection, management and reporting of data on shark catches, landings, production and international trade.
    - To assist countries in data collection and reporting, FAO and other international fisheries bodies should develop a single set of internationally accepted, standardized guidelines for distribution to national governments. The guidelines should serve as a reference document for the preparation of these national reports.
    - In consultation with the IUCN/SSC Shark Specialist Group, ICES Elasmobranch Study Group, other shark scientists, wildlife trade specialists and fisheries managers, FAO and ICES should devise a list of species for which landing and international trade records should be kept and a definition of products in trade. A list of commonly exploited species compiled from information gathered by the TRAFFIC Network could provide a starting point.
    - Once these lists have been compiled, FAO should produce an expanded list of reporting categories.
    - Eurostat should expand its shark categories accordingly. Meanwhile, European countries should begin to record their international trade in a variety of shark species, skates and rays, shark fin and shark oil not currently reported to FAO. These should be reported as well by Eurostat.
    - Training materials in species identification, products in trade, conversion factors and other areas should be produced and distributed to fishers, customs officials and others involved in collecting and recording data on shark landings and trade could enhance the quality and content of fisheries and trade data. The ICES Elasmobranch Study Group has begun producing identification posters and seems well placed to assist in this regard in collaboration with the European Elasmobranch Association.
    - Since sharks comprise a significant bycatch of tuna and Swordfish fisheries, international tuna management organizations are well placed to monitor pelagic shark bycatch and should expand current efforts in this area. ICCAT and other organizations could create a valuable database to enable improvements in fisheries management.
2. It is essential that European shark stocks and fisheries be managed to prevent fisheries from negatively affecting populations.
    - The EU should adopt a comprehensive management plan for shark species in the Northeast Atlantic and Mediterranean regions. The plan should be formulated by shark

scientists and ICES, and apply the precautionary approach to shark management. The US management plan could serve a model on which to build. The European plan must allow for the management of Piked Dogfish and skates and rays. Reducing shark bycatch should be a primary objective of the management scheme. The EU should seek the cooperation of the non-EU nations in the Mediterranean Sea and the Atlantic Ocean in implementing the management plan for species that range into the waters of third countries.

- In Europe, the EU proposal for a regulation establishing a list of species to be recorded in the fisheries logbook and landings declaration has taken the first step of including several species of sharks. The EU should extend the list to include several other shark and ray species fished and traded heavily in Europe.
- European countries should ensure that their national fisheries legislation adequately addresses shark management.
- National governments and private organizations should place greater priority on funding research into shark related research, including life history characteristics, demographic studies, distribution, migratory patterns, ecological roles, and other relevant areas for which information is lacking. Fisheries studies, including gear selectivity studies, impacts of multi-species fisheries on sharks, and other inquiries must be explored to determine if these species are being taken at sustainable levels. Tagging and other studies should be extended in cooperation with counterparts in other range states.
- Efforts to monitor levels of bycatch and discarding of sharks must be expanded in Europe. Periodic surveys should be conducted by trained observers, particularly in areas in which landings of certain species are high, and in areas used as spawning or seasonal feeding grounds. Observers could also regularly provide information on seasonal/spatial shark catches from various fishing methods.

3. The status and development of established and emerging shark fisheries and markets in Europe should be monitored closely.
   - Shark and wildlife trade specialists should continue monitoring the developments in the different end use markets in Europe (e.g., food, perfume, cosmetic, pharmaceutical, and leather industries).
   - An effort to quantify the economic value of sharks and other sharks should be initiated. To understand the full value of these fisheries, the end markets have to be taken into account. Efforts to quantify the income generated by existing shark fisheries, the products marketed in Europe and other funds, such as revenue generated by shark exhibits in museums and aquaria, should be undertaken to facilitate the establishment of management control systems.
4. Public education and awareness-raising initiatives aimed at clarifying the top predator s role in the marine ecosystem, and at dispelling the negative images associated with sharks should be initiated, or strengthened to motivate commercial and recreational fishers, research scientists and governments to formulate effective management plans for shark species and the sustainability of the fisheries.
   - European shark angling clubs and competitions should stop setting minimum specimen weights and sizes that encourage or even reward the landing of immature fish.
   - Industry end users (e.g., food, cosmetic, perfume, biomedical, pharmaceutical, fin traders) should be educated about the resource they are using, and the need to keep shark populations viable and exploitation at sustainable levels.

ANNEX 1

Shark data by country

UNITED KINGDOM

The UK is one of the most important fishing countries operating in the Atlantic Ocean (Compagno, 1990), ranked eighth with regard to the area's total landings of fish, molluscs and crustaceans. Operating mainly in the Northeast Atlantic fishing area, it is also considered an important shark fishing country with 20 400 mt average annual landings from 1987 to 1993 (Anon., 1996a). In 1990, the UK was ranked the second most important shark fishing country in the Northeast Atlantic with landings accounting for almost 25% of the area total (Stamatopoulos, 1993a).

According to Bonfil (1994), the UK has one of the most stable shark fisheries in the world. FAO data illustrate a steady decrease from 35 000 mt per year in the early 1950s down to 23 000 mt per year a decade later. Landings have since stabilized to the current level of around 22 000 mt annually, although a drop under the 20 000 mt level was first observed in the early 1980s. A similar decline was also observed for the last two recorded years (1993 and 1994), with annual landings at just over 18 000 mt (Anon., 1996a).

In British waters, there are 28 recorded shark species and 21 skate and ray species (Dulvy, 1995b; Earll, 1994). A number of these are subject to both commercial and recreational exploitation around the British Isles, the level of exploitation varying by species, fishing method and area of operation. While sharks are not generally regarded as very important commercially, in certain regions, shark fishing is of economic importance on a seasonal basis (Vas, 1995; Vas *et al.*, 1996).

Dogfish species are by far the most abundant group of shark species landed in the UK. "Dogfish," as specified in UK statistical reports, includes Small-spotted Catshark and Nursehound under the family heading "Scyliorhinidae" and Piked Dogfish and related species under "Squalidae." Piked Dogfish is thought to comprise the bulk of these landings by volume.

Pelagic species, such as Blue Shark, Porbeagle and Tope, are taken incidentally by commercial and recreational fisheries. In the past, Basking Sharks had been targeted periodically by local fisheries.

Apart from the frequently landed coastal and pelagic species, a number of deep-water sharks have also been caught in international deep-water trawling grounds to the west of Britain at a bycatch rate of around 21% of the weight of the total catch (Bridge, 1978). A European Union-funded project is currently updating information on the development of this and other deep-water fisheries in the EU. Sharks, a number of which may be of commercial value, have been cited as an important component of the catches of the deep-water fisheries west of the British Isles (J.D.M. Gordon, *in litt.*, 1996).

Other countries fish in UK waters. A number of Spanish vessels are licensed in the UK and are legitimately entitled to share UK quotas from the EU of bony-fish species, and to longline for sharks while targeting hake and other pelagic fish (C. Campbell, *in litt.*, 1996; J.D.M. Gordon, in litt., 1996). Sharks landed by Spanish longliners are not identified to the species level (J.D.M. Gordon, *in litt.*, 1996). Every year, French trawlers land several hundred metric tonnes of deep-water sharks at Scottish ports; these species are reported collectively by the French as *siki*. *Siki* consists mostly of the Portuguese Dogfish but can also include the Leafscale Gulper Shark and other deep-water sharks (J.D.M. Gordon, *in litt.*, 1996).

While UK shark fisheries have been very stable overall, an analysis of individual sets of landing data from the 18 Sea Fisheries Committees (SFC) in England, Wales, Scotland and Northern

Ireland reveals fluctuations in Piked Dogfish landings that are not apparent in the FAO data for all the regions combined. Landing data for 1972-1993 from the 18 SFCs illustrate that landings in only three Piked Dogfish fisheries are currently increasing, and that all the others have ceased to operate at some point within this time period. A typical example is the small Hull fishery (0-200 mt annually) in England, which had ended and has subsequently recovered, although recent landings are less than half of what they had been during their highest peak (N. Dulvy, *in litt.*, 1996).

Piked Dogfish and shark meat

Although dogfish has been considered a second-rate fisheries product because it has been caught largely as bycatch in the UK, Piked Dogfish is of considerable interest to the domestic market, for which it is fished, processed, brokered and consumed (Anon., 1991a). Piked Dogfish is usually referred to as "rock salmon" by the trade in the UK.

Sales of Piked Dogfish for consumption in the home, although not very large (an average of 800 mt a year from 1983-1989), have been rising steadily (Anon., 1991a). Much of the Piked Dogfish landed in the UK, as well as in Ireland, is used in the fish-and-chips trade in London and southern England (e.g. D. Cleghorn and R. Lambert, pers. comm., 1996). Sales for use in the home also predominate in the southeastern part of the UK and London (Anon., 1991a). Approximately 30% of the fish-and-chips shops in the southern UK and 6% in the northern UK use dogfish (Anon., 1991a). Piked Dogfish comprises approximately 1-2% of all fish sales to the catering market, with fish-and-chips shops accounting for about 70% of these sales (Anon., 1991a). Earll (1994) reports that the Small-spotted Catshark is also used by the fish-and-chips industry, and may also be marketed as "rock salmon."

A fish auctioneer at the Billingsgate Market, who supplies most of his Piked Dogfish to the UK fish-and-chips market, explained that domestic landings of dogfish, produced mainly for sale in the UK, is considered to be of lesser quality, due to poor handling, than Piked Dogfish imported from the USA. Much of the Piked Dogfish imported from the USA is processed for export to France, Belgium, Germany and other discerning markets in Europe (Anon., 1989b; 1989d; S. Noons, pers. comm., 1996).

For many years, the largest supplier of Piked Dogfish to the UK market had been Norway, however, processors noted the growing importance of the USA as a supplier. All processors interviewed by TRAFFIC emphasized that declines in UK landings and other shortages in previously regular supplies over the last few years have necessitated that the UK import large quantities of dogfish from alternative sources, including the USA and Canada.

In the past, dogfish was processed in the UK for the domestic market, primarily Billingsgate and southern England (Anon., 1989b). For a number of the processors, up to 75% of the dogfish handled is now destined for export to Continental Europe. Processors particularly emphasized the importance of France as a consumer of Piked Dogfish backs. Prices in the UK are very much affected by French landings; when French buyers are unable to get enough dogfish from domestic sources, they turn to Irish and UK supplies (Anon., 1989b). UK processors of Piked Dogfish sell fresh backs for export to France, Germany, Belgium, Italy and other countries, as well as belly flaps for export to Germany. All processors interviewed reported that 100% of the belly flaps they produce are destined for Germany.

The market for Piked Dogfish is reported to be notoriously erratic, driven purely by supply and demand (Anon., 1989b; 1991a). Piked Dogfish are found in dense shoals and heavy landings in a short period of time have occurred on many occasions in the UK (Anon., 1991b). As the fish is

almost exclusively handled fresh, merchants are forced to sell quickly and prices fall (Anon., 1991a; 1991b). In 1996, several processors noted that the differences between UK and Continental prices for dogfish have become marginal in the past few years. In 1989, for example, it was reported that the UK retail market could pay as high as US$6.35-7.70/kg for large dogfish, while on the Continent the price could reach US$8.30/kg (Anon., 1989b). In 1992, the wholesale price of dogfish in France ranged from US$3.30-4.50/kg, about US$1.00/kg higher than the British price (Josupeit and De Franssu, 1992). In March 1996, a UK wholesaler reported that backs were sold to France and in the UK for the same price, US$3.30/kg, and belly flaps were delivered to Germany for US$4.50/kg.

In the UK, as with other EU countries, only imports and exports of "Piked Dogfish," "catsharks," and "other sharks and dogfish" are recorded by Eurostat. From 1990-1994, the UK imported an average of 2 712 mt per year of dogfish and shark meat, 75% of which was dogfish (Piked Dogfish and catshark species). According to Eurostat data, the majority of the dogfish was Piked Dogfish. The main exporting countries during this period included Ireland, Denmark, USA, Canada and Norway. The Sea Fish Industry Authority (SFIA) reports the UK imports fresh whole dogfish together with a small amount of fresh processed product (Anon., 1991a). Whole fresh fish are destined mainly for the processing industry, then for use in the home or export, while the processed product is marketed for domestic sales. According to SFIA, the import market for whole, fresh dogfish grew strongly from 1983-1986 and increased thereafter as Ireland began processing. Frozen products are imported mainly from the USA and Canada, especially for domestic consumption, but may also be exported via brokerage firms (Anon., 1991a). The UK imported an average of 680 mt of other sharks from 1990-1994, most of which were fresh/chilled. The main exporting countries included Ireland and Denmark for fresh products and Italy, Belgium, Germany, Norway, the USA and India for frozen sharks.

The UK is the largest exporter of sharks and dogfish in the EU, about 60% of which is dogfish. Most of the dogfish exported comprises fresh processed Piked Dogfish backs (Anon., 1991a). Historically, the major export destination had been France, which was the destination for 80% of the UK's export trade in fresh and frozen dogfish backs in the late 1980s and early 1990s (Anon., 1991a). Germany has since become the main destination for UK-processed dogfish (Anon., 1996c; C. Raymakers, *in litt.*, 1996). Exports of other sharks dropped more than 90% from nearly 2 500 mt in 1991 to just 230 mt in 1994.

Porbeagle

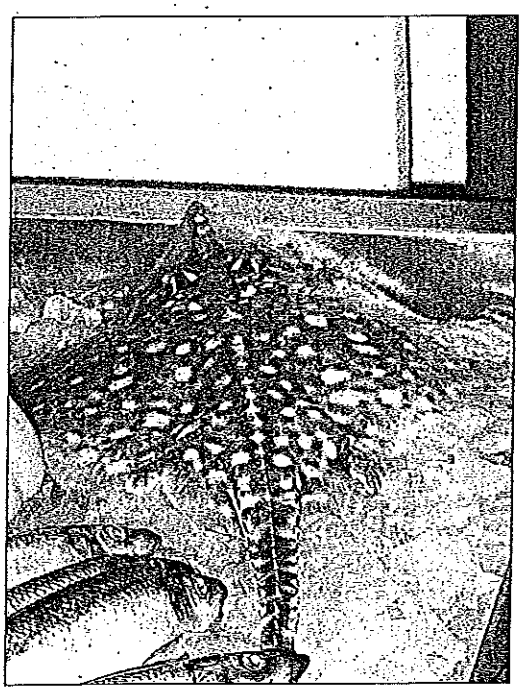
According to Gauld (1989), Porbeagle is one of the most valuable marine species (by weight) landed in Scotland. In England, Porbeagle meat supplied to the local market by the summer inshore longline fishery in the Bristol Channel retailed for US$3.30-6.60/kg in 1996 (N. Dulvy, *in litt.*, 1996). Porbeagle and Shortfin Mako Sharks landed at Newlyn in 1996 were auctioned at US$3.00-4.50/kg (Vas *et al.*, 1996).

Blue Shark

Blue Shark is not considered a highly valued food fish on the UK domestic market. In 1990, Blue Sharks landed at Dunmore East were sold for only US$1.30/kg (Crummey and Ronan, 1990), and Blue Shark offered for sale in the Newlyn fish market between 12-26 August 1995 retailed for only US$0.12/kg. Earlier in the same season, the quayside price had been as high as US$0.36/kg (S. Pollard, *in litt.*, 1996). Blue Sharks landed by the targeted longline fishery in Cornwall have been exported to France where they fetch a higher market price at US$1.50/kg (Vas, 1995); auction

prices for these Blue Sharks at the Newlyn market in 1996 reached between US$0.45 and 0.96/kg (Vas *et al.*, 1996). However, Blue Shark from Cornwall is increasingly sold in the UK (P. Vas, pers. comm., 1996). Fresh steaks retailed in Cambridge for US$12.50/kg in 1996.

Skates and rays



E. Fleming

Thornback Ray marketed by a Scottish processor.

Skates and rays fished in UK waters are processed for domestic use as well as for export to other European countries, especially France (A. Thomsen, pers. comm., 1996). Skate is processed whole and into fresh and frozen wings, with the skin either intact or removed. Skate is used throughout the UK by the fish-and-chips industry (D. Cleghorn and R. Lambert, pers. comm., 1996). Large, meatier species are preferred, particularly Thornback Ray (A. Thomsen, pers. comm., 1996), known widely as "roker" in the UK. In April 1996, UK processors sold whole Thornback Ray in the UK for US$1.20/kg and wing fillets for US$3/kg.

Shark fin

A few of the dogfish processors interviewed process Piked Dogfish pectoral fins and tails as byproducts, for export to markets in the Far East. These are exported through independent brokers. Although processors were unable to supply information on which countries the fins and tails were sent to, Hong Kong was cited by a Grimsby processor in 1989 (Anon., 1989b) and Thailand was reported as a destination for these products in a 1991 report (Anon., 1991a). UK processors have reportedly been supplying dogfish fins and tails to Asian countries for at least 15 years (C. Steel, pers. comm., 1996). One of the conclusions cited in a report prepared for UK dogfish processors was that ethnic Chinese groups across Europe could provide an outlet for dogfish byproducts currently being exported to the Far East (Anon., 1991a).

The Scottish Basking Shark fishery sold fins to a Norwegian firm up through 1994. The price for wet fins rose over the years, from US$6.00 in 1983 to US$26.25 in 1994. The largest price increase occurred from 1991 to 1992 (H. McCrindle, pers. comm., 1996).

TRAFFIC began collecting information on shark fin products in 1994, and TRAFFIC has observed shark fin products on sale in most Chinese supermarkets in the UK. In 1995, a wholesale supermarket in north London offered for sale a large bag of shredded fin (30 cm x 30 cm x 20 cm) priced at US$142. Surveys carried out in 1995 and 1996 revealed that imported shark fin is marketed in the UK as canned fin soup, as dried and processed, and dried whole, available in supermarkets, herbalist shops, pharmacies and restaurants catering to Asian consumers. The UK has one of the largest Chinese immigrant and naturalized Chinese populations in Europe with main centres in London, Manchester, Birmingham, Liverpool, Glasgow and Belfast. Shark fin products are readily available in these cities (C. Allan, *in litt.*, 1996).

A brief survey of six supermarkets in London's Chinatown in February 1996 found a variety of products. The most frequently encountered item was fully processed dried cartilage "noodles." One particular brand imported from Hong Kong was found in each of the shops surveyed in 500

gram packages for US$49.50-59.25. In one outlet, a sign advertised shark fin for US$14.40/kg, although no fins were seen. TRAFFIC also found canned shark fin soup priced at US$25.20 per tin, the most expensive of any of the canned soups observed in Europe. The soup is distributed through affiliate companies in Hong Kong, Singapore, Australia and Japan.

Shark liver oil

Beginning in 1983, a single-boat Basking Shark fishery in the UK offered industrial sales of Basking Shark liver oil to Norway. Until the end of the season in 1994, the fishery also sold fins and flesh, as byproducts, for human consumption. Although the fishery was initiated primarily for the liver, it ceased landing the livers in 1990 when it became unprofitable, and the focus of the fishery changed to supplying meat to UK restaurants (H. McCrindle, pers. comm., 1996). In recent years the fishery has taken sharks in response to pre-arranged orders by fish-and-chips shops and other restaurants in Aberdeen, Manchester, London and other cities. Basking Shark meat was sold to these outlets for US$0.45-1.20/kg, at the average rate of three sharks per week during the season (H. McCrindle, pers. comm., 1996).

Prices for Basking Shark liver oil have fallen in recent years. Between 1983 and 1990, the Scottish fishery supplied livers to a medicinal union in Norway. In the early 1980s, Scottish Basking Shark livers were sold to the Norwegian buyers for US$910/mt; by the late 1980s, the price had dropped to US$377/mt. Given the small scale of the fishery, and costs for transporting the liver to Norway of about US$221/mt, it became economically unfeasible for the Scottish fishery to continue to trade in liver (H. McCrindle, pers. comm., 1996). According to a Norwegian trader, however, the current value of Basking Shark liver oil is approximately US$1 250/mt.

This market has been depressed by large amounts of gulper shark liver oil supplied by Spanish fisheries (Anon., 1995b; Kunzlik, 1988; H. McCrindle, pers. comm., 1996; S. Myklevoll, pers. comm., 1996), as well as Kitefin Shark liver oil from Portugal (Anon., 1995b). The livers of the Gulper Shark and other deep-water species are reported to yield more oil than Basking Shark liver (H. McCrindle, pers. comm., 1996; S. Myklevoll, pers. comm., 1996); ICES reports that livers of deep-water sharks in Spain are one-third to one-fifth of the body weight, yielding 70-80% oil (Anon., 1995b); Kunzlik (1988) reports livers at 25% body weight, yielding up to 75% oil of which 33.6% is the valuable hydrocarbon squalene. Guzmán and Quintanilla (1996) report that gulper shark liver oil from Spain sells for approximately US$8.15-9.75/kg.

Imported shark cartilage and liver oil

Shark cartilage and liver oil products were found in several shops retailing health products and herbs in England. One company in particular, headquartered in the USA with branches in the UK, Netherlands, Spain and South Africa, distributes shark cartilage capsules and powder, and shark liver oil capsules. In the UK, these products are retailed in shops and available by mail order. Capsules of 740 mg shark cartilage are packaged in three sizes of 45, 90 and 180 capsules. Prices in April 1996 were US$19.35, US$35.80 and US$70, respectively. Cartilage powder is sold for US$87.00 for an eight ounce container. Shark liver oil originating from Norway is also sold in the UK. The product, containing 500 mg shark oil/250 mg squalene, sold for US$19.30.

Shark curios

Although very little is known about the extent of this trade, shark teeth and jaws have been observed for sale in various areas of the UK. It was reported to TRAFFIC in February 1996 that a

gift shop in central London sold shark teeth, jaws and other marine curios (D. Karavellas, pers. comm., 1996). There is at least one avid collector of shark jaws, vertebra and other parts in the UK, of a variety of species including the Great White Shark from the USA and South America and the Porbeagle from Scotland (I. Fergusson, *in litt.* to TRAFFIC International, 1996).

IRELAND

FAO landing data for 1990 rank Ireland as the sixth most important country in terms of its shark landings from the Northeast Atlantic area, with 5.7% of the total area's shark landings (Stamatopoulos, 1993a). Sharks in general have been taken as bycatch, although directed fisheries for certain species have developed by commercial and recreational fishermen. Commercial landings of sharks by the Irish fleet increased in the early 1950s exceeding 4 000 mt annually, followed by a slow decline the same decade, in which landings averaged 3 000 mt annually. A sharp decline was observed in 1961, after which landings stabilized for two decades at around 1 700 mt annually. In the 1980s a sudden and persistent increase in shark landings was observed reaching over 11 000 mt in the years 1985 and 1987. The declining volume trend observed in the preceding years still kept landings at a high level, dropping just under 4 000 mt in 1991 but increasing again to over 5 000 mt in 1994 (Anon., 1996a). The principal fishing methods used by commercial fisheries are trawling and gillnetting.

Piked Dogfish comprise most of the recorded dogfish landings, although some Small-spotted Catshark and Nursehound have been included under this heading at times (Fahy, 1989a). The directed Piked Dogfish fishery includes trawlers and gillnetters; gillnets take individuals of larger size than trawls (Fahy, 1989a; 1992).

Fishers regarded the Piked Dogfish as a nuisance in Ireland until the 1970s when commercial interest in the species sparked a rapid expansion of the fishery. Piked Dogfish landings reached a maximum of just under 8 000 mt in 1985, mainly from western ports (Fahy, 1989a). A sharp reduction in landings was observed off the northwestern coast in 1986, followed by a similar decline from the southwest the following year (Fahy and Gleeson, 1990). Towards the end of the 1980s, a relative increase in fishing effort from the north to the south had taken place (Fahy, 1989a). In January 1989, the Department of the Marine expressed concern because large mature females were becoming absent in the landings (Anon., 1989c). By 1991, although the catch per unit effort had declined substantially from the peak period, Piked Dogfish continued to be an important target species (Fahy, 1992).

The Irish fleet has a seasonally directed trawl fishery for Spotted Ray, Blonde Ray, Thornback Ray and Cuckoo Ray off the east and southeast coasts (Anon., 1995b). Fishing pressure has contributed to the depletion of the ray fauna in the Irish Sea (Fahy and O Reilly, 1990); the disappearance of the Blue Skate documented by Brander (1981) is a case in point.

Irish fisheries statistics do not specifically record commercial landings of Blue Shark. It is believed, however, that Blue Sharks are taken as bycatch in the gillnet fishery, particularly during the summer months. The catch levels cannot be evaluated owing to the absence of data regarding incidental captures of such species (Berrow, 1994).

In the past, commercial fisheries for Basking Sharks were important in Ireland. It not known when the traditional fishery off the west coast started, but as early as 1742 Basking Shark liver oil was used for public lighting in Dublin, Galway and Waterford (Berrow and Heardman, 1994). Landing records from the modern fishery date from 1947. The fishery operated off the west coast of Ireland

around Achill Island, and maximum landings of around 1 500 individuals per year were reached in the early to mid 1950s. The fishery was discontinued after only 38 Basking Sharks were landed in 1975.

Recreational fishing for sharks is an expanding sector of the well-organized sports fishing industry in Ireland (K. Linnane and P. Green, pers. comm., 1996; K. Morris, *in litt.*, 1996). Ireland is unique among European countries in recording landings statistics of a number of shark and ray species caught by recreational fishers. At present, there are approximately 80 recreational fishing boats in Ireland, 50 of which are involved in the Central Fisheries Board's voluntary tag and release scheme for sharks (Vas, 1995). The Blue Shark is considered one of Ireland's most valuable sport angling species (Crummy and Ronan, 1990; Fahy, 1992). Taken almost exclusively during the summer months off the Irish coast, individuals tend to be fairly large, and males comprise a relatively high proportion of the catch. Piked Dogfish, Small-spotted Catshark, Nursehound and Smooth-hound are also important species in fishing competitions (K. Linnane and P. Green, I, 1996; K. Morris, *in litt.*, 1996), and Porbeagles and Tope Sharks are also taken by sports anglers. Currently, Porbeagle catches have become rarer, with driftnet mortality thought to be responsible for the drop in catches (K. Linnane and P. Green, I, 1996; K. Morris, *in litt.*, 1996). Ireland records large catches of skates and rays (seven species) by recreational fishers with the Irish Specimen Fish Committee. In 1976, the Blue Skate was removed from this list (Brander, 1981; Earll, 1994).

Shark meat

Fahy (1989a) reports that the consumption of Piked Dogfish in Ireland had been very low until the late 1980s, when the country began processing dogfish. Until then, virtually all Piked Dogfish landed in Ireland had been exported to the UK and continental Europe, the majority of it unprocessed (85% of the fresh or chilled dogfish exported by Ireland was imported by the UK, and the rest by France, Belgium and Netherlands — C. Raymakers, *in litt.*, 1996). In 1994, fresh or chilled sharks were also imported by Spain.

Ireland is the smallest importer of shark and dogfish in the EU, having imported only 50 mt in total from 1990-1994, comprising 35 mt of dogfish and 15 mt of other sharks. Irish exports of dogfish increased from an average of 94 mt per year from 1990-1992 to roughly 280 mt in 1993 and 1994. During this period, Ireland was the fourth largest exporter of dogfish and the eighth for sharks in the EU. The Irish Sea Fisheries Board (BIM) reports that Irish dogfish are processed in the following forms: fresh, skinned whole fish and frozen, skinless backs (500-800 gram and 800 gram-1.5 kg), and frozen belly flaps.

According to BIM, Piked Dogfish and rays are today among the main fish species of commercial interest in Ireland. The large Blonde Ray is the most valuable and sought after ray species in Ireland (Fahy, 1989b). Fahy (1989b) notes the steady increase in the tonnage of rays landed from the Irish Sea following the Second World War was partly attributable to increasing consumption of rays in Ireland. Within Ireland, dogfish, rays and skates are sold through fish markets, fish-and-chips shops, restaurants and retail chain stores (K. Morris, *in litt.*, 1996).

The Irish catch is auctioned or directly sold to processors, traders and restaurants. A somewhat casual commercial grading system is employed in which fishermen box together rays of like size and similar appearance, especially in instances of light catches (Fahy, 1988; 1989b; 1989c; 1991). Approximately 16 different size/appearance grades are applied to nine commercial ray species in Ireland. The grading systems vary from region to region, and the values attributed to the various species recorded in commercial catches differ (Fahy, 1989b). The following grades are generally applied throughout Ireland: over 70 cm - large; 60-70 cm - medium; and less than 60 cm - small. BIM

reports that skates are sold as wings, with or without skin, in the range of 200-400 grams and ove 400 grams. An Irish processor confirmed the wings are used mainly for fish-and-chips shops i Ireland and the UK, while exports to continental Europe are on the rise.

Any other shark species caught by commercial or recreational fisheries may be sold upon landin to importers in the UK or Europe (K. Morris, *in litt.*, 1996). Fishers usually land all sharks caugh despite the absence of a definite market for them in Ireland. In some cases, arrangements may b made to sell specific species, such as Blue Shark, to particular buyers in port (K. Linnane and J Green, pers. comm. to K. Morris, 1996). Driftnet bycatch of Blue Sharks is sold to oth European countries, especially as food in Spain (K. Morris, *in litt.*, 1996). Crummey and Rona (1990) report that trials to develop a commercial longline fishery for Blue Shark in Ireland we undertaken in 1990 to assess the commercial potential and feasibility of shark fishing. Th absence of a readily available market in Dublin at the time, and the lack of information c processing the sharks, resulted in many difficulties in selling the Blue Sharks caught during th trials. The average price obtained by a co-operative participating in the trials was rough US$0.53/kg. By comparison, Porbeagle and mako sharks commanded the highest prices in Irelar of up to US$4.27/kg in 1990 (Crummey and Ronan, 1990). Following the trials, it was determin that Blue Shark longlining is uneconomical, and there is little likelihood of an Irish commerci fishery developing unless the market value of Blue Shark is at least tripled, or unless catch p unit effort can be increased.

Better offers were received from France, and a market for 450 kilograms of Blue Shark per we was established. One French company paid US$0.71/kg for 15 fish and requested further suppli at US$0.89/kg. Other French companies offered U$$1.78/kg, including delivery. At the time, t shark meat values to fishermen were calculated at US$1.38/kg. The overall value of the sharks w calculated to be US$2.07/kg, including an estimated value of the fins (Crummey and Ronan, 199

Shark fin

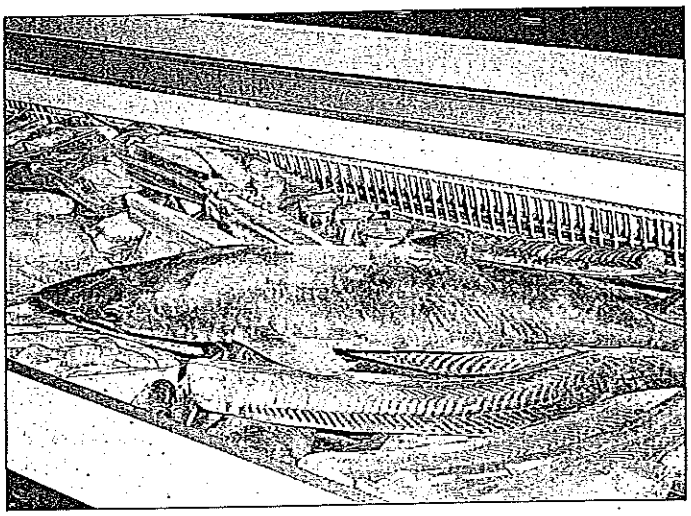
TRAFFIC visited three Asian shops in Dublin; one brand of canned fin soup from Singapore w retailed at US$13.00.

FRANCE

France is one of the major fishing nations not only in Europe but also in the world. French fishi vessels operate mainly in the Atlantic and Indian Oceans and in the Mediterranean S (Stamatopoulos, 1993b). France is considered the most important shark fishing country in Eurc (Du Buit, 1988). This sector of the commercial fishery has had two periods of relatively sta landings: initially from 1950 to 1977 when landings fluctuated around 26 000 mt per year, rising a higher more variable level from 1987 to 1989 of about 35 000 mt per year (Anon., 199(However, according to FAO, French landings of sharks have shown a persistent declining patt since the early 1990s, dropping to 19 455 mt in 1994 (Anon., 1996a). French Ministry of Agricult and Fisheries data for 1988-1994 are in rough agreement with these figures; the total shark landi averaged around 23 500 mt annually (P. Peronne and T. Leplat, pers. comm., 1996).

Although few fishing vessels specifically target sharks in France, the species caught are particul varied and numerous, with approximately 20 species of sharks recorded in French commer landings. Most of the landings come from the bycatch of the entire fishing fleet, with about 80%

the shark landings attributed to vessels, mostly trawlers, under 30 metres long (Anon., 1995b). The majority of these are benthic and coastal species, frequently including Small-spotted Catshark and Nursehound. Between 1988 and 1994, Small-spotted Catshark landings averaged 5 423 mt, or 23.1% of all cartilaginous fishes landed by the French fishery (T. Leplat and P. Perrone, pers. comm., 1996). Still, skate and rays comprise the largest proportion of the total reported landings of cartilaginous fishes in France. According to national data, skate and ray landings have ranged around 11 000 mt for the 1988-1992, decreasing to just under 9 000 mt in 1994.



E. Fleming

Dogfish meat from the USA sold in France.

The Piked Dogfish is the object of one of the country's few directed shark fisheries (Bonfil, 1994), and the second most frequently reported cartilaginous fish species in the landings. According to the French Ministry of Agriculture and Fish, landings began to decrease dramatically after 1988 when they fell to almost 8 000 mt; six years later, only 1 600 mt were landed. Tope, a commercial species landed mainly by trawlers, is the third most important shark species landed, comprising about 6% of the total shark landings. Smooth-hound and Starry Smooth-hound comprise about 1% of the total shark landings.

Pelagic sharks, especially Blue Shark and Porbeagle, are caught primarily by longliners and pelagic nets. Porbeagle, in particular, is taken almost entirely by longliners. This is a targeted fishery constituting about 3% of the shark landings (Bonfil, 1994). Additionally, the Shortfin Mako and Thresher Shark are occasionally caught as bycatch on longlines (Bonfil, 1994). The Blue Shark is caught by the pelagic gillnet fleet targeting tuna, and by longlines and coastal trawls. Discards of Blue Sharks by the tuna gillnet fishery were an estimated 400 mt in 1993 alone (Anon., 1995b).

ICES reported that there was no use of shark byproducts in France (Anon., 1989a). However, recently-developed deep-water fisheries take significant numbers of sharks, and the liver oil and squalene are used by French companies in the manufacture of cosmetic and pharmaceutical products (M. Todisco, *in litt.*, 1996). Since the early 1990s, French trawlers over 30 metres long have fished along the slope of the continental shelf to the west of the British Isles, at depths between 800-1 200 metres. Although the fishery takes about 15 deep-water species of sharks, only two are reported to be of commercial importance, the Leafscale Gulper Shark and Portuguese Dogfish. These account for 54% and 45%, respectively, of the total shark landings (other than dogfish) recorded for France by ICES (Anon., 1995b). In France, the Portuguese Dogfish is landed for its liver oil and squalene. This species is recorded only under "various sharks" in French landing statistics, though estimates from the port of Boulogne-sur-Mer for this species include 322 mt in 1990 and 1 400 mt in 1992 (M. Todisco, *in litt.*, 1996).

FAO began to report French shark landings in the Mediterranean separately from those of the rest of the country in 1953. Landings of shark species by the French Mediterranean fleet reached an all-time high in the second half of the 1950s with over 5 000 mt in 1956 (Anon., 1996a). However, landings stabilized from the early 1960s to the mid 1980s at around 606 mt annually. The latter period was followed by three years of minimal landings (under 100 mt/year), climbing to just under

300 mt in 1989 and then declining to 105 mt in 1994 (Anon., 1996a). FAO records only three categories of species: smooth-hounds, which are apparently only recorded from this area, exhibit steep landing increases from just 31 mt in 1992 to 271 mt the following year. During that same period, Piked Dogfish landings declined steadily from 63 m t in 1990 to just over 22 mt in 1993. Mediterranean landings of Rajiformes, comprising mainly rays, has ranged between about 150 to 200 mt per year.

The IUCN/SSC Shark Specialist Group reports that the pelagic fishery of sharks off the Côte d'Azur is small-scale, although Blue Sharks are caught with tuna drift nets at a rate of 150-200 specimens per cruise (Munoz-Chapuli *et al.*, 1993). The Group also reports that catches of the Basking Shark have become rare, while two to three Thresher Sharks are also caught with driftnets every year. However, about 100 Thresher Sharks per year are reported from the Sète area; although detailed information is lacking. Munoz-Chapuli *et al.* (1993) report that this shark fishery off the western Mediterranean coast is probably more important.

A fishery off the coast of Corsica reportedly operates to supply shark liver oil to the market in France (M. Todisco, *in litt.*, 1996). Additionally, the bycatch of a recently developed fishery on the Mediterranean continental slope includes several species of deep-dwelling sharks; these landings are recorded only as *siki* (Anon., 1993).

Shark meat

In the EU, the market demand for sharks as food in France is strong. Shark and skate meat are supplied from domestic landings and international trade. French fisheries product marketing organizations report that some of the most important commercial shark species landed in France include Piked Dogfish, Small-spotted Catshark, Nursehound, Starry Smooth-hound, Tope, Porbeagle, Angelshark, Blue Skate, Thornback Ray, Cuckoo Ray, Undulate Ray, Longnosed Skate, Shagreen Ray, Sandy Ray, Spotted Ray, Blonde Ray and Small-eyed Ray (commonly called the Painted Ray) (Anon., 1996d). Other commercial species include Round Ray, Sail Ray, White Skate, Marbled Electric Ray, and Common Stingray (M. Todisco, *in litt.*, 1996).

France is the EU's largest importer of dogfish (Piked Dogfish and catsharks), and the second largest importer of dogfish and shark products combined. The dogfish market in France has been important on a European scale for at least the last 50-60 years. According to Gauld (1982), following the Second World War, the newly discovered dogfish market in France was a driving force in the establishment and expansion of the fishery for Piked Dogfish by Norway and the UK.

From 1990-1994, France imported just over 40 000 mt of dogfish, at an average of 8 000 mt per year. Almost 98% of this dogfish was reported by Eurostat as Piked Dogfish (Anon., 1996c). European and North American dogfish processors report that the country is Europe's most important market for Piked Dogfish backs and an important market for whole, skinless fish. The meat is called *saumonette* in France. The size of the French domestic demand for Piked Dogfish *saumonette* and France's dominance of the mainland European market means that buyers in France ultimately set the price for dogfish in Europe (Anon., 1991a). UK processors report that French buyers look first at domestic supplies, and if unable to obtain what they want there, will look next in the UK and Ireland.

French landings of Piked Dogfish have been decreasing, from almost 15 000 mt in 1983 to less than 2 000 mt in 1993 and 1994, while imports have become increasingly important. From 1990-1994, France imported an average of over 8 000 mt of dogfish per year. In 1993 and 1994, imports of Piked Dogfish were substantially higher than domestic landings. From 1990-1991, France imported

slightly more fresh than frozen Piked Dogfish (an average of almost 4 000 mt per year of each). Processors report that French wholesalers prefer to buy fresh backs.

Within Europe, the UK is the largest supplier of dogfish to France. Two-thirds of France's Piked Dogfish imports were supplied by the UK in 1988 (Anon., 1991a). In 1990, France imported 90% of the fresh Piked Dogfish exported by the UK, which decreased gradually to 70% in 1994 (Anon., 1996c; C. Raymakers, *in litt.*, 1996). The UK has assumed a large market share previously held by Norway, which continues to decline as a supplier (Anon., 1991a). In Europe, Denmark, Ireland, and the Netherlands also export dogfish to France.

From 1990-1994, France imported 95% of its total frozen Piked Dogfish products from countries outside the EU. The most important of these, the USA, supplies 60% of its EU exports of frozen dogfish to France (Anon., 1996c; C. Raymakers, *in litt.*, 1996). In 1992, the USA supplied 40% of the fresh Piked Dogfish imported by France from countries outside the EU, and that increased to 99% in 1994. From 1991 to 1994, Norway's share of the import market declined (from 99% in 1991, 54% in 1992, 22% in 1993 and to only 0.5% in 1994) (Anon., 1996c; C. Raymakers, *in litt.*, 1996).

The market in Italy absorbs a high proportion of French dogfish exports (Anon., 1991a). French dogfish traders explain that France exports to Italy because dogfish obtains higher prices there than in other countries (export price of US$6.00/kg in 1988 (Anon., 1991a), and that the presumed deficit in domestic supply created by these exports must be offset by imports. Twenty percent of the fresh or chilled Piked Dogfish imported by France in 1990 and 1994 was re-exported to Italy (Anon., 1996a; C. Raymakers, *in litt.*, 1996). France also began re-exporting large quantities to Spain in 1994.

Saumonette refers not only to Piked Dogfish, but also to other dogfish and shark species. According to the French fish marketing organization *Fonds d'intervention et d'organisation des marchés des produits de la pêche maritime et des cultures marines* (FIOM), *saumonette* is a commercial name describing the skinless meat of *la roussette* (Small-spotted Catshark and Nursehound, or *petite roussette* and *grande roussette*) or any other Squaliformes (Anon., 1991c). This skinless meat from the headed and gutted fish is light pink, hence the association with salmon. FIOM reports some of the most popular species sold as saumonette include Small-spotted Catshark and Nursehound, Piked Dogfish (*aiguillat*), several smooth-hound species (*émissole*) and Tope (*requin-hâ*) (Anon., 1991c). However, the product literature of a French company specialized in processing and distributing fresh and frozen dogfish from the USA within Europe, defines the term *saumonette* as any small Galeoid or Squaloid species. Their product list includes the following species under the heading *saumonette*: Blackmouth Catshark, Iceland Catshark, Small-spotted Catshark, Nursehound, Smooth-hound, Blackspotted Smooth-hound, Starry Smooth-hound, Dusky Smooth-hound, Piked Dogfish, Longnose Spurdog and Gulper Shark.

Bonfil (1994) reports France has a strong and increasing domestic demand not only for Piked Dogfish, but also Porbeagle and Tope for *saumonette* in schools and restaurants. According to FIOM, the majority of the total French landings of Squaliformes in 1991 were sold for *saumonette* (Anon., 1991c). Landings were 55% Piked Dogfish, 35% Small-spotted Catshark and Nursehound, and 10% smooth-hound and Tope.

A recent magazine article describes French consumption of *roussette* and *saumonette* (Anon., 1996e). Owing to the ease with which *saumonette* is prepared and eaten, it is highly appreciated by schools, restaurants, hospitals and other outlets catering to large groups, and this market is increasing quickly. *Saumonette* is also consumed in the home and widely available in supermarkets and hypermarkets in France; the consumption of *saumonette* in French homes each year is 6 500 mt,

accounting for 3.2% of French fish consumption in the home (Anon., 1996e). In 1994, French supermarkets sold a total of 1 470 mt of *saumonette* and *roussette*, which accounted for 3.42% of their total fish sales, at an average price of US$9.92/kg. *Saumonette* is most appreciated in northern France (especially in Normandy and Brittany), while the Paris region constitutes an average market. In general, the *saumonette* sold in supermarkets is most often *roussette*, usually Small-spotted Catshark, while the larger species are sold for commercial use in restaurants, schools and hospitals.

According to Eurostat data, France imported almost 3 000 mt of "other" sharks from 1990-1994, or an average of nearly 600 mt annually. Although trade statistics do not distinguish species in trade, Bonfil (1994) reports exports of Porbeagle and Tope to Italy, and French imports of Blue Shark from Ireland and the UK have been reported (Crummey and Ronan, 1990; Crummey *et al.*, 1991).

According to Bonfil (1994), high French exports of Porbeagle and Tope to Italy have resulted in shortages of supply and subsequent increased French imports since 1982. ICES reports most of the Tope landed in France had been exported to Italy until the late 1980s, when Italy began refusing imports because of the mercury content of the fish (Anon., 1989a). Apparently, this action has limited French Porbeagle exports to Italy (Bonfil, 1994). In addition, Blue Shark has been exported to France from Ireland and the UK because of better prices obtained in France than in these countries (Crummey and Ronan, 1990; Vas, 1995). In 1996, whole Blue Shark was sold in France for up to US$20.00/kg and Porbeagle retailed for US$24.00-38.00.

The shark markets of the French overseas departments could not be examined during this review. It was reported, however, that shark meat featured on the menus of many restaurants in Martinique in June 1996 (A. Vanden Bloock, pers. comm., 1996). In Paris, restaurants offering French Antillean cuisine often offer shark dishes (M. Todisco, *in litt.*, 1996).

Skates obtained from domestic catches and through international trade are extremely important on the French market. Fahy (1989b) reports there are roughly 16 commercial grades for skates and rays in France, and Bonfil (1994) adds that each of the eight species caught commands a different price. Thornback Ray is actively sought by French fishermen for the highly desired meat (Bonfil, 1994).

Although a significant amount of rays and skates appear to be imported, FAO does not report French trade in these. A UK processor reported that the most sought after skate products by French buyers are fleshy wings, adding that Thornback Ray is in demand. This processor also said that a large portion of the skates and rays landed from UK waters is processed for export to France in particular, as well as to other continental European countries (A. Thomsen, pers. comm., 1996). The product list of a French processor includes trimmed, skinless Starry Skate wings, originating from the USA or New Zealand, for US$4.30/kg. During surveys in Paris in June 1996, TRAFFIC noted a variety of skate products, some reportedly from either France or the USA.

Shark fin

In May 1995, TRAFFIC noted the availability of dried fin noodles in four Asian supermarkets. Of these, two products were most widely retailed. The first, manufactured in Singapore, was retailed in 55 gram packages for US$16.40-$25. The second product, produced in Surinam, retailed at US$25 for 75 grams. Other dried fin products manufactured in Singapore (product of Surinam) and Hong Kong were priced from US$15-19. Canned fin soup, manufactured in Singapore, was also seen in several Asian supermarkets for US$8 per tin.

In February 1996, TRAFFIC noted large piles of whole, unprocessed shark fins in a variety of sizes in one Asian supermarket. The fins sold for US$69/kg, and as these were not observed during

subsequent visits to the shop, they may have been specifically made available for Chinese New Year celebrations. The fins appeared to originate from large pelagic sharks, as well as from smaller sharks, probably dogfish. Whole shark fin may retail for up to US$480/kg in France (B. Séret, *in litt.*, 1996).

One of the retail shops visited apparently also acts as an import company that supplies shark fin products to other European countries. Surveys in Italy and the Netherlands discovered dried fin products imported from Asia by this company and re-exported to import firms in these countries.

Shark cartilage

TRAFFIC found four different shark cartilage capsule products on sale in France in 1996; each was available through health shops or by mail order from the manufacturers in France. One product, 120 pills of 80% cartilage powder, was retailed for US$17.80 in Paris. Advertisements in 1994 for New Zealand shark cartilage hailed the virtues of the product as a best-selling book from the United States on shark cartilage was being introduced onto the French market. The shark cartilage, which had been imported into France as powder in 25 kilogram containers and manufactured into capsules by a French company, was removed from the market in July 1995 for alleging unsubstantiated health claims (M. Todisco, *in litt.*, 1996). In 1996, TRAFFIC located shark cartilage products manufactured in France on sale in Belgium and the Netherlands.

Shark liver oil

TRAFFIC identified several establishments in France that use shark liver oil and squalene in the manufacture of cosmetic and pharmaceutical products (M. Todisco, *in litt.*, 1996). A factory in southern France processes shark liver oil used in perfumery (B. Séret, *in litt.*, 1996). The Portuguese Dogfish is one of the deep-water species taken by French fisheries for the manufacture of cosmetic products such as lotions, creams and oils. It is not known whether France imports liver oil and squalene, or if shark liver derivatives of French origin are exported to other countries.

Shark liver oil capsules manufactured in France were found in Paris for US$20.00 per 120 capsules.

Shark and ray leather

In France, shark and ray leather is used in the manufacture of luxury items such as handbags, wallets and jewellery. At least two tanneries in France process shark and ray skin (M. Todisco, *in litt.*, 1996). During the surveys, TRAFFIC located shark skin watchstraps in many shops in Paris retailing for US$120-140. Shark leather belts were also found widely in France. Ray skin, known in France as *galluchat*, has been used to cover furniture and in the design of clothing. In 1996, a catalogue of a well-known French designer pictured garments fashioned out of ray leather (I. Bianchi, pers. comm., 1996). *Dasyatis sephen*, of Asian origin, is reportedly one of the species used as *galluchat* (M. Todisco, *in litt.*, 1996).

NORWAY

Norway, which is not an EU country, has carried out one of the most important shark fisheries in the North Atlantic fishing area. According to FAO data, shark landings have varied since the end of the Second World War, steadily increasing from 1950 to 1959 (averaging 18 000 mt annually), followed by variable but relatively high average landings of around 36 600 mt/year from the early

1960s to the mid-1970s (Anon., 1996a). From 1976 to 1981, landings declined, averaging roughly 21 000 mt/year, dropping further to around 10 000 mt per year in 1981, then falling to 7 400 mt in 1994.

Norwegian fisheries for Piked Dogfish, Basking Shark and Greenland Shark for liver oil were much more important in the past than at present. Sharks represent less than 0.05% of the total fishery landings of the country (Bonfil, 1994). Of these, only the Piked Dogfish, Basking Shark, Porbeagle, and skates and rays seem to be of importance in the Norwegian fishing industry, as reported by FAO and ICES (Anon., 1996a; 1996b). The Piked Dogfish fishery stabilized at roughly 5 000 mt per year during most of the 1980s, reaching a maximum of 9 634 mt in 1991 before declining to under 5 000 mt/year in 1994 (Anon., 1996a). ICES attributes this short-lived increase to the development of a local coastal water gillnet fishery targeting dogfish in the waters of Nort-Troendelag (Anon., 1995b).

The commercial Greenland Shark fishery, opened in the beginning of the century, is reported to have ceased in 1960 (Anon., 1995b; Bonfil, 1994). A Norwegian trader of shark oil reported that one of the main reasons the Greenland Shark fishery had been opened in the first place was to pacify Halibut fisherman, frustrated at losing their catch to sharks. The trader confirmed that this fishery has never been reopened, although ICES reports that sport fishing for Greenland Shark has gained in popularity in Norway in recent years (Anon., 1995b).

Norwegian fishermen began targeting the Basking Shark as early as the 16th century, when dried flesh was used for human consumption (Bonfil, 1994; Kunzlik, 1988; Myklevoll, 1989). More recently, the liver has been the most important derivative, although the fins have also been sold to Asian markets (Kunzlik, 1988). The Norwegian market for Basking Shark liver oil has recently been depressed by increased supplies of inexpensive liver oil from gulper shark and other deep-water species caught in Spain and Portugal. It is believed that out of the more than 30 vessels employed in the fishery during the 1960s-1970s, only a small number of these currently fish for Basking Shark (Anon., 1995b).

Landing data for the Northeast Atlantic Porbeagle fishery for the period 1970-1994 record average annual landings of just under 100 mt, following a declining trend that resulted in average annual landings of 28 mt for the period 1986-1994 (Anon., 1996b). Today Porbeagle is caught in purse seine, trawl and gillnet fisheries landing quantities far less than their 200 mt quota in EU waters (Bonfil,1994).

Skate and ray landings have remained relatively low, averaging 964 mt annually for the period 1970-1994, having been roughly 700 mt per year in the 1970s and just over 1 000 mt the following years (Anon., 1996b).

Shark meat

Norway has played an important role in Europe as a fisher of dogfish and other sharks and a supplier of these products. Frimodt (1993) reports the Norwegian market exports 90% of its total fish catch, and shark and dogfish appear no exception to this rule. According to Hjertenes (1980), the Norwegians have always exported almost all their catch of Piked Dogfish (fresh or frozen) to other European countries. Bonfil (1994), Gauld (1992), Holden (1977) and others report the historical importance of the French market and England's fish-and-chips industry to the expansion of this fishery after the Second World War. Crummey and Ronan (1990) report that Norway exported dogfish and shark meat in some quantity to Italy until the late 1960s, when overfishing and Italian policy on mercury contamination caused exports to decline.

Holden (1977) reports that the size and attractive appearance of the Norwegian dogfish has made them preferable on the markets to supplies from other countries. Norwegian dogfish was

competitively priced in the UK until changes in the relative values of the Norwegian kroner and UK pound occurred in the early 1970s. For example, in 1970, the average price of Piked Dogfish at first sale on the Norwegian market was US$66.75/mt compared with US$105.45/mt in England and Wales. By 1972, Norwegian dogfish had become far less competitive at US$108.00/mt, when English fish was selling for US$114.00/mt. Decreased Norwegian landings and supplies of dogfish in the 1960s and 1970s also prompted English and Scottish fisheries to expand and gain a larger share of the European market (Gauld, 1982; Holden, 1977).

The Norwegian dogfish fishery developed again in the 1980s and then declined. A number of European processors report having received decreasing supplies of Norwegian Piked Dogfish over the last 10 years. According to a Norwegian processor, the town of Maloy used to survive on dogfish exports to European countries. In recent years of smaller landings, fishers in the town have had to change to other professions.

From 1981-1995, Norway exported far more dogfish and shark meat than it imported. During this period, Norway imported on average only 18 mt of dogfish per year and exported 3 000 mt a year. As for sharks, from 1988-1995, the country imported only 3.4 mt/year, while exporting over 21 mt per year, on average during this period (Anon., 1996f).

From 1988-1995, most of Norway s exports were imported by EU countries. During this period, 68% of Norway's exports of dogfish were to Denmark, much of which was consequently re-exported to other EU countries. Denmark is the EU's third largest importer and the second largest exporter of dogfish, and from 1990-1994, the country imported 83% of its dogfish from Norway. Most of the remainder was imported by Italy, France, Germany, the UK and other EU countries. In 1993, Spain began to import small quantities of Norwegian dogfish. EU trade data show that the UK and the USA have gained on the EU market, replacing Norway as the prominent supplier of dogfish in the last few years (Anon., 1996c; C. Raymakers, *in litt.*, 1996).

Dogfish processors and wholesalers in Norway also point out that Norwegian dogfish landings have begun to increase in the last two years and that their supplies have improved. A Norwegian processor of Piked Dogfish and Porbeagle from Norwegian fisheries exports fresh and frozen backs and belly flaps to EU markets, and fins and tails to markets in the Far East.

One trader reported an increasing market for Basking Shark meat in Eastern Europe, quoting the value of the meat at about US$1.00/kg.

FAO reports Norwegian production and export of frozen skates, and a number of European processors reported importing skates and skate wings from Norway, however, TRAFFIC has no information on the species involved and the extent of this trade.

Shark fin

Norwegian processors reported that Piked Dogfish, Porbeagle and Basking Shark fins are exported to the Far East. One processor reported exporting Basking Shark and Piked Dogfish fins to China. Prices for Piked Dogfish fins fluctuate considerably, with larger fins commanding better prices than smaller fins. The processor reported that, as a result of diminished supplies of European dogfish, the trade of dogfish fins has shrunk considerably from what it had been in past years. In April 1996, a Norwegian trader reported that the price for dry Basking Shark fins was over US$130/kg. ICES reports that international demand for the fins sustains the fishery today (Anon., 1995b). Although Norwegian traders export the fins of at least three shark species, national trade statistics do not record trade in fins. Some of Norway's fin exports are recorded in the customs statistics of Asian countries.

Shark liver oil

In April 1996, a Norwegian processor quoted a price of Basking Shark oil of around US$1.25/kg. He explained the main market for shark liver oil is the cosmetic industry, and more recently as a health supplement. Piked Dogfish liver oil is also traded, though it is inexpensive (US$0.60/kg in June 1996) because of the low squalene content.

Norway is the only country that reports information to FAO on shark oil trade. From 1988-1994, imports fluctuated from 30 mt to a high of 358 mt in 1994. Norway exported minimal amounts of shark oil during this period, with an average of 3.6 mt per year until 1992 and a high of 11 mt in 1994.

GERMANY

Germany plays a minor role in the fishing industry of the European Union. Operating mainly in the Atlantic Ocean, Germany landed only 1.5% of the total landings in 1990 of fish, molluscs and crustaceans in the Atlantic Ocean area (Stamatopoulos, 1993a), and 3% of the total of these from the Northeast Atlantic (Stamatopoulos, 1993a). Landings reflect the size of the German fishing fleet, which numbers roughly 1 000 fishing vessels (with tonnage under 100 000 mt), or approximately 2.3% of the total European fishing fleet.

Germany landed just 0.1% of the total area landings of shark species (Stamatopoulos, 1993a). From the early 1950s to 1973, landings fluctuated around 1 500 mt annually. This was followed by a period of significantly lower landings (in 1974 landings dropped to under 700 mt), and the downward trend continued until 1991 when an all-time low was reached at only 14 mt. Nevertheless, landings increased after 1991, climbing to 521 mt in 1994. Most sharks landed by the German fleet are fished in the Northeast Atlantic. Minor catches were also reported by FAO from the Antarctic region between 1978 and 1986 (Anon., 1996a).

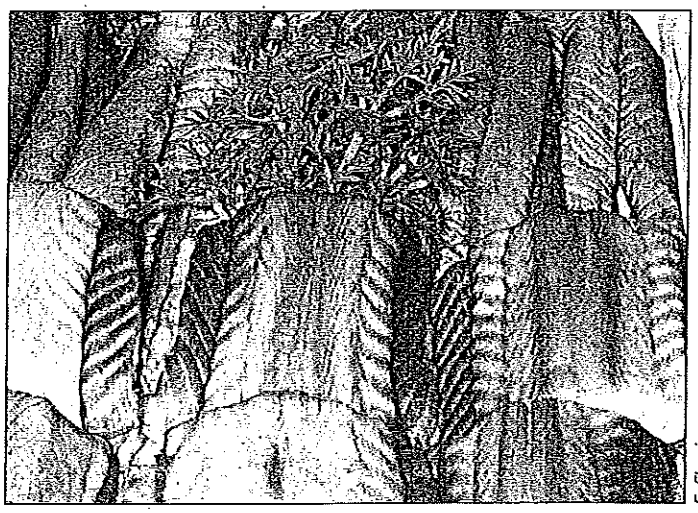
Piked Dogfish seems to comprise the bulk of the shark landings by weight, making up the highest proportion of total sharks landed from 1990-1993 (Anon., 1996b). ICES reports that landings of Piked Dogfish averaged 28 mt annually for the decade 1985-1994 (Anon., 1996b). In 1994, landings of Piked Dogfish totalled 22 mt (Anon., 1996b). The remainder of the landings are recorded by ICES as skates and as various sharks. Sharks are also reported to be processed for fishmeal on board factory trawlers (Anon., 1995b).

Limited recreational fisheries for sharks exist in Germany in the southern area of the North Sea, around the Isle of Helgoland. Coastal sharks such as Piked Dogfish, Small-spotted Catshark, Tope and Smooth-hound are the most commonly landed species.

Shark meat

Although not a major shark fishing nation, Germany is a relatively important trader of dogfish and shark in the EU. ICES reports that some of Germany's market demand, which is steady or increasing for certain shark species, is met with imports (Anon., 1995b). A steady or increasing demand in Germany has been noted for smoked Piked Dogfish, and for Porbeagle and mako shark steaks, usually sold frozen (Anon., 1995b). Josupeit and De Franssu (1992) report that smooth-hound or *hondshai*, is also imported by Germany in considerable quantities.

From 1990-1994, Germany was the EU's fourth largest importer of shark and dogfish products, importing an average of over 3 500 mt per year. Of this, dogfish (Piked Dogfish and catshark species) constituted just under 30% (an average of 1 000 mt/year), while other sharks comprised the majority of 70% (an average of over 2 500 mt/year). Dogfish was imported mainly from Denmark and Norway, and Japan was by far the largest supplier of the frozen sharks during this period (Anon., 1996c; C. Raymakers, *in litt.*, 1996; Schillak, 1996).



E. Fleming

Smoked Piked Dogfish bellies and backs on sale in Germany in 1996.

Germany is the EU's largest exporter of sharks, averaging over 1 900 mt per year from 1990-1994. German processors report that most of the imported Piked Dogfish is consumed within the country, while much of the imported shark meat is processed for export to other European countries. Net trade figures calculated from Eurostat data reveal that Germany re-exported only 15% of the dogfish but 85% of the shark meat it imported from 1990-1994. Fresh Piked Dogfish was re-exported to Italy and Belgium in 1993, while over half the frozen sharks were re-exported to Italy from 1990-1994 (Anon., 1996c; C. Raymakers, *in litt.*, 1996).

A German fish processing industry expert stated that sharks and dogfish constitute a limited and specialized market within Germany, citing Piked Dogfish and Porbeagle as the important for human consumption (H. Keysler, pers. comm., 1996). Other commercial cartilaginous fish species in Germany include Nursehound, Smooth-hound, Shortfin Mako Shark, Blue Shark, Angelshark, Undulate Ray and Cuckoo Ray. Apparently, skates and rays are not eaten widely in Germany, but are important to local markets in some areas (Anon., 1995b).

Piked Dogfish (known as *dornhai*) is processed into two main products in Germany, *Schillerlocken* and *seeaal*. *Schillerlocken* is a traditional delicacy of smoked belly flaps, named because the belly flaps curl during the smoking process, and are thought by some to resemble the locks of hair of the writer and poet Friedrich Schiller. It is marketed as somewhat of a relatively expensive gourmet specialty item. *Seeaal* (sea eel) refers to backs (whole, skinless, headed and gutted, bellies removed) which may be sold either fresh or smoked, the latter commanding higher prices. *Seeaal* is less expensive than *Schillerlocken* and is also sometimes sold as *seeaal* steak or fillet. In June 1996, smoked belly flaps retailed in Germany for US$27-30/kg, while smoked backs sold for US$13.50/kg. An industry expert reports that 500-1 000 mt of Piked Dogfish are processed in Germany each year, within the total of one to two million metric tonnes of all fish processed annually (H. Keysler, pers. comm., 1996).

Many German companies import belly flaps at a minimum of 30 centimetres long and 12.5 millimetres wide (representing about 7% of the total body weight) (Anon., 1991a). A German wholesaler's 1996 product catalogue describes *Schillerlocken* with the phrase "the longer the better," and explains that "20 centimetres or longer sells easier, despite the higher prices." A Dutch processor who supplies Piked Dogfish to Germany added that the larger, leaner fish obtained from the USA and Canada are preferred on the German market, although the smaller, fattier fish landed in Europe are actually better suited to the smoking processes employed in Germany.

In Germany, Porbeagle steak is considered one of the highest quality of all the shark steaks available (H. Keysler, pers. comm., 1996). In May 1996, German wholesalers sold fresh Porbeagle steaks in the country for US$8.10-8.75/kg.

ICES (Anon., 1995b) reports the bulk of the German shark imports are in the form of frozen shark meat, originating from tropical/subtropical Carcharhinid species. These and other sharks are further processed in Germany or other European countries (Anon., 1995b). A Dutch processor, who imports requiem sharks caught as bycatch and in targeted fisheries in Surinam, explained the shark is processed into frozen steaks for consumption in Germany and other European countries; frozen steaks sold in Germany for US$3.00/kg in 1996. During a seafood trade fair in June 1996, a German company offered fresh Blacktip Shark, Grey Reef Shark *Carcharhinus amblyrhynchos* and other shark fillets processed in Oman; these were sold in Germany for US$10.15/kg. Another German company, specialized in supplying exotic fish, marketed a variety of fresh whole and processed sharks from the Seychelles, including hammerhead, Blue Shark, dogfish and Grey Reef Shark. During a 1995 seafood fair in Germany, a trader marketed Goblin Shark landed by an Icelandic deep-water fishery (R. Lord, pers. comm., 1996).

Shark fin

As a byproduct of the meat processing, Piked Dogfish and Porbeagle fins may also be retained for export to the Far East or processing for Asian restaurants in Germany (H. Keysler, pers. comm., 1996). In May 1995, TRAFFIC surveyed Asian markets in Frankfurt, Wiesbaden, Hamburg, Düsseldorf and Berlin and found for sale two types of canned soup, manufactured in Singapore, retailing for US$4.60-6.40 per tin; two brands of dried fin noodles, manufactured in Singapore, retailed at US$23 for 55 gram packages; and one dried fin, labelled produce from Indonesia, was retailed for US$26 for 100 grams. Whole fin, marked made in Thailand, was also noted during the survey (C. Allan, *in litt.*, 1996).

In February and March 1996, TRAFFIC surveyed 62 Asian food retailers in cities across the country. Of these, 87% were found to sell shark fin products. Whole fin was found in only one shop, selling for US$30.00/kg. Canned shark fin soup was found in each of the Asian food markets visited, with prices ranging from US$3-8 per can. Dried shark fin noodles ranged from US$4.70-6.40 for 450 grams. TRAFFIC also conducted telephone interviews with representatives of 120 Asian restaurants in Germany. Ninety-two percent of these restaurants serve shark fin soup, and less than 23% of the menus include shark meat. Representatives claimed the shark fin and meat is imported from Japan, Hong Kong, Taiwan, China and Singapore (Schillak, 1996).

Shark cartilage

In 1996, thirteen different shark cartilage capsule products were found on the German market, at prices ranging from US$25.00-184.00 (Schillak, 1996).

Shark liver oil, squalene

According to representatives of the German pharmaceutical industry, over 40 products on the German market purport to contain shark oil. Products include liquids to be taken orally, ointments and capsules. Prices range from US$2.50-36.00; two types of shark oil capsules were priced at US$19.00 and US$27.00 (Schillak, 1996).

Shark oil is also used as a lubricant in the lathe industry (Schillak, 1996).

Shark leather

Until the early 1990s, the German market for shark leather was larger than it is today. Shark skins were imported into Germany as raw material and tanned. Increasing restrictions on the German tanning industry prompted it to have the skins tanned in Italy and the UK. Apparently, these arrangements were not profitable and were halted (Schillak, 1996).

Until recently, shark leather had been imported in amounts of up to 800 skins per year, used mainly as material for furniture, book binding, and occasionally for shoes and handbags. Only watch straps made from shark leather can presently be found on the German market (Schillak, 1996).

Representatives of the German leather industry report that companies in France, Italy and the UK import shark leather. Before the early 1990s, Germany imported shark skin from Mexico via Italy and Switzerland, re-exporting some to the UK. Other areas of origin for shark skin include Indonesia and northern South America (Pacific Coast). The leather representatives reported that Mexico exports considerable quantities of aprons and other shark leather items to the EU (Schillak, 1996).

Shark curios

Jaws and teeth of sharks are rarely observed on the German market, but are used occasionally as displays in shops or for other advertising purposes. German tourists sometimes return from abroad with jaw and teeth souvenirs (Schillak, 1996).

THE NETHERLANDS

The Netherlands, although not one of the major European fishing nations, is the eighth most important country operating in the Northeast Atlantic and, according to a 1990 FAO ranking, its production claimed 4.72% of the area's total (Stamatopoulos, 1993a). The Dutch fleet consists of 500 beam trawlers, 100 shrimp trawlers and 12 large freezer trawlers (Jonkman and den Heijer, 1996). Annual total landings are estimated at around 4 000 mt. Sharks account for less than 1% of the landings and are always regarded as bycatch. The Dutch fleet concentrates its fishing in an area 30-50 miles along the Dutch, German and Danish coasts, further than 12 miles offshore (Anon., 1995b).

In general, it seems that shark species do not comprise an important constituent of the total Dutch landings, which may explain in part the absence of any recording regarding this group in the latest FAO fishery landings yearbooks (1992 and 1993). Nevertheless, FAO data indicate average annual shark landings around 220 mt from 1950 to 1958, followed by higher but variable landings averaging roughly 600 mt/year from 1959 to 1983 (Anon., 1996a), after which landings were recorded in national statistics, but not reported. Data from one port, Den Helder, have been made available from 1970 to 1994 (P. Walker, *in litt.*, 1996).

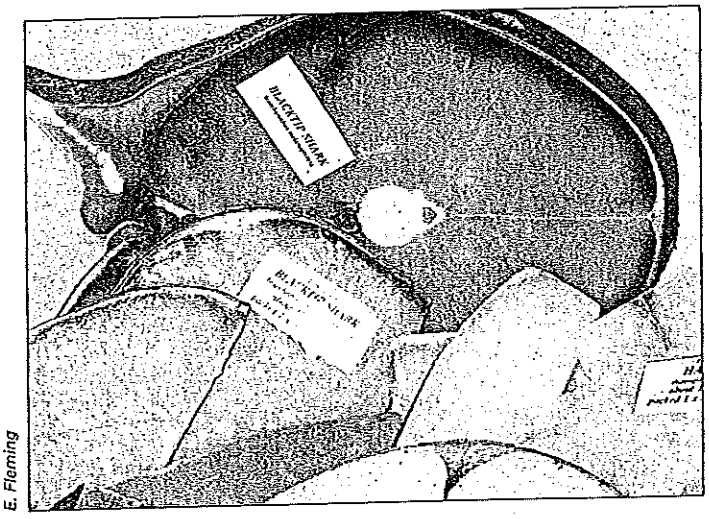
ICES reports an average of 360 mt/year for total landings of skates and rays and 50 mt/year for "dogfish" (which included all shark species) from 1930 to 1939 (Anon., 1995b). Landings fell during this period and remained low after the Second World War. National statistics on skate and ray landings were divided into skates (Blue Skate) and rays (all other species) until 1970, after which these categories were lumped together. On the international level, ICES recorded sharks as Piked Dogfish and "dogfishes and hounds." Data from Den Helder, however, are limited to sharks and rays (P. Walker, *in litt.*, 1996).

Landings of rays from all ports have increased since about 1973 (Anon., 1995b). According to ICES the major species landed are Thornback Ray and Spotted Ray (Anon., 1995b). Shark landings have decreased from all ports since 1975-1976, while shark landings at Den Helder increased until the early 1980s, after which a decline was observed (Anon., 1995b). Rays on the other hand, average around 36 mt annually for 1980-1994, exhibiting a very variable trend fluctuating between 20-50 mt from the early 1980s until 1989, where a sharp increase in landings is seen. The most common shark species landed is Piked Dogfish, most of which is exported according to ICES (Anon., 1995b). Small-spotted Catshark and Porbeagle are also occasionally landed (Anon., 1995b).

In addition to the incidental shark catches by the Dutch commercial fishery, sharks and rays are also taken incidentally by recreational fisheries. ICES reports the Common Stingray as the most commonly caught cartilaginous fish species caught in this type of fishery (around 20-30 individuals per year) (Anon., 1995b). Although other sharks are caught as well, there is no central registration of catches for recreational fisheries (Anon., 1995b).

Shark meat

According to ICES, most of the Dutch shark catch is comprised of skates, rays and dogfish for export to other European countries (Anon., 1995b). Walker (1995) reports that Starry Skate is discarded, but juvenile Thornback and Spotted Rays are sold at fish markets. According to Jonkman and den Heijer (1996), there are only a few small markets for certain cartilaginous fish species landed in the Netherlands, including rays and smoked shark bellies. Roughly 80-90% of the Small-spotted Catshark landed domestically is consumed at home for its meat and fins. Nevertheless, given the irregular landings of sharks and relatively low consumption of fish, there does not appear to be a very stable market in the Netherlands for domestic landings (Jonkman and den Heijer, 1996).



E. Fleming

Blacktip Reef Shark steaks, from Oman, sold by a Dutch processor.

The Netherlands is far more important as a trader of dogfish and shark than as a fisher. From 1990-1994, the country imported over 11 000 mt of dogfish and shark meat, 93% of which was shark other than Piked Dogfish and catshark. Imports grew during this period from only 58 mt in 1990 to almost 7 500 mt in 1994. The most heavily traded commodity during this period was frozen sharks, particularly since 1993, when the Italian market was discovered for re-exports (Jonkman and den Heijer, 1996). In 1994, Dutch trade in frozen shark products increased dramatically, with imports from Japan and South Africa and re-exports to Italy (Anon., 1996c; C. Raymakers, *in litt.*, 1996). Frozen shark fillets were imported mainly from Germany and partly re-exported to other countries in Europe.

Piked Dogfish is imported from the USA, Denmark and the UK and a minority of this is re-exported to other European countries. Catshark imports seem to be relatively more important to the Netherlands than to some other countries; while the actual numbers traded are less than in countries such as France and Spain, the percentage of the total dogfish traded by these countries is

reported to be higher in the Netherlands. Between 1990-1994, the Netherlands imported slightly more frozen catshark than Piked Dogfish, almost none of which was re-exported.

TRAFFIC interviewed a number of Dutch processors and wholesalers to get an idea of the species in trade and the origin of the shark products. One wholesaler reported imports shark, mainly mako from Japan, Taiwan and South America, Blacktip Reef Shark and Piked Dogfish. All are imported without the tail, fins and head, but with skin and bones. Less than 4% of the imported sharks are used in the Netherlands, with only a few smokehouses in the country interested in Piked Dogfish. The most important market for this wholesaler is Spain, followed by France and the UK. Approximately 200-250 mt of shark fillets are traded per year (imported and exported), without any processing in Holland. The wholesaler stores the shark meat in special refrigerated cool containers or freezer plants in the Netherlands and Germany.

Another wholesaler began trading in sharks five years ago. In 1994 and 1995, the company imported and re-exported 100 mt of shark meat. Small sharks (2-9 kg) are imported from all over the world. All the shark is processed in Surinam at the company's processing plant. In Surinam, sharks are landed after having been headed and gutted on board. The sharks are skinned, processed into steaks and transported to Africa, France, Italy, Holland and Germany. The Dutch market is very small (Germany is a growing market, being the destination of nearly 40% of the exports). The steaks are imported to Europe via Rotterdam and the company sells them to European countries.

One processor reported importing requiem sharks caught as bycatch and in targeted fisheries in Surinam. These are processed into frozen steaks for consumption in European countries. A second processor imports frozen Blacktip Reef Shark and Shortfin Mako Shark from Oman. These are imported headless and processed into steaks for distribution in the Netherlands, Germany and the UK. A third processor distributes frozen skate and dogfish in Europe. The skate is a bycatch in the Netherlands; the dogfish is imported mostly from the USA. A fourth processor interviewed obtains Piked Dogfish from domestic landings and the USA. Dutch Piked Dogfish is bought at fish auctions when customers are interested. Domestic-origin fish are exported mainly to Belgium, with small amounts to Germany and Denmark. Recent price at auction was US$2.40/kg. A fifth processor handles an average of 100 kilograms of Piked Dogfish per week (about 5 mt/year). Part of the Piked Dogfish is distributed on the national market and part is exported to Belgium and France. In times of limited domestic supplies, the company imports Piked Dogfish from Scotland. This processor also buys Porbeagle, which is very popular in Belgium, France and Italy, and occasionally Thresher Shark, which is displayed in fish shops to attract customers. A sixth processor claimed to export Piked Dogfish when it is landed at Dutch ports. The dogfish is skinned and filleted for export to France. The company stopped trading in Porbeagle a few years ago because permanent supplies were lacking and the market was small.

Shark fin

In May 1995, TRAFFIC located in Amsterdam and Rotterdam dried fin noodles, made in Indonesia, for US$7.60 for 50 grams; dried fin noodles, made in Surinam, for US$31.50 for 100 grams; and canned fin soup, manufactured in Singapore, for US$8.80 per tin (C. Allan, *in litt.*, 1996).

In February 1996, TRAFFIC visited six Asian shops and supermarkets in Amsterdam. Shark products were found in five of them. Each of these shops sold packaged dried fin noodles, and one shop retailed fins in frozen form; most were manufactured in Hong Kong. Prices for different sizes ranged from US$10.00-50.00. One package imported from Indonesia retailed for US$65.00. Several of these shops sold canned fin soup from Singapore for US$9.00 per tin. In Utrecht, several Asian

shops sell the dry noodle-like fin and canned soup at the same prices as in Amsterdam. A Dutch importer of the dry fin product and canned soup claimed the dry material is sold in small quantities. The company imports two brands of canned soup from Singapore, selling them for US$10.30 and US$10.90 (Jonkman and den Heijer, 1996).

Shark cartilage

An interview with a Dutch distributor of shark cartilage to health food shops revealed the product is imported from France and sold for US$21.20.

BELGIUM (trade data includes Luxembourg)

Belgium is a small fishing nation operating in the Northeast Atlantic area. Belgium was ranked seventh in terms of its shark landings, accounting for 2.15% of the total in the Northeast Atlantic (Stamatopoulos, 1993a). Fishing vessels are generally small to medium-sized, beam trawling over the North Sea, English Channel, Bristol Channel, the waters of South and West Ireland, Irish Sea and Icelandic waters. The shark species are therefore almost exclusively coastal. FAO data record landings of the following four categories: "Piked Dogfish," "dogfishes and hounds Squalidae," "catsharks Scyliorhinidae," and "skates and various sharks."

In general, landings of sharks averaged around 5 500 mt annually from the early 1950s to the mid-1960s after which a steadily declining trend was observed reaching just over 1 500 mt in 1994 (Anon., 1996a). Total landings of sharks steadily decreased between 1988 to 1993 from 2 229 mt to 1 787 mt respectively, a drop of almost 25% (Anon., 1996a). Landings of the Piked Dogfish in particular declined in 1993 to almost one-third of what they had been in 1988 and 1989, totalling under 50 mt. Similarly, other dogfish and houndshark landings decreased from 522 mt in 1988 to 288 mt in 1993, while landings of skates have remained fairly stable ranging from 1 300 to 1 500 mt annually (Anon., 1996a).

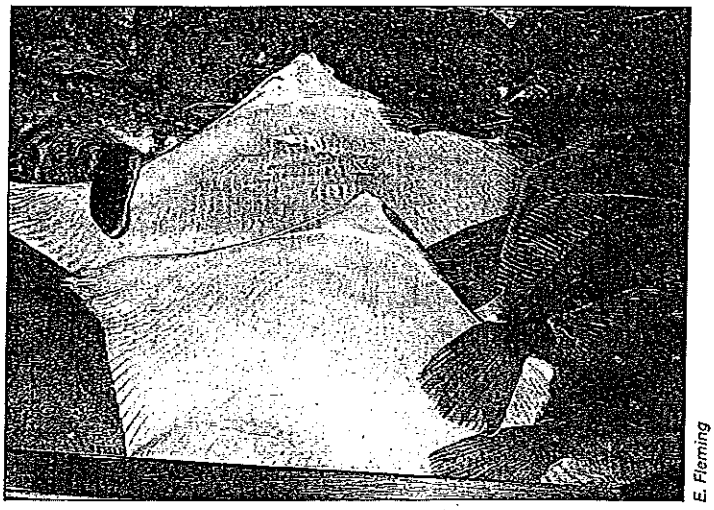
Shark meat

Belgium is a relatively stable trader of dogfish and shark meat. From 1990-1994, the country imported a total of 5 484 mt comprised of 80% dogfish (Piked Dogfish and catshark species) and 20% "other shark." Over half these imports included frozen product. Exports remained small, but peaked in 1994 at 354 mt when Belgium exported more than four times as much dogfish than in previous years.

According to European processors, Belgian markets for dogfish and skate are stable or increasing. A UK processing industry report states that there is a demand for large whole dogfish between Christmas and late summer and considerable demand for frozen dogfish (Anon., 1991a). A Belgian wholesaler reported that his company acquires some Piked Dogfish from domestic landings when available, but that most imports are from the USA, Scotland and Norway. The company also exports to other European countries, although supplies have been poor this year and most of the dogfish will be consumed within Belgium. Dogfish and skate are sold in fresh fish shops and supermarkets, and skate is available in many restaurants.

The company also buys and processes skate (wings only), most of which are acquired at auctions in the UK for distribution in Belgium. A processor of domestically landed skates distributes these in Belgium, France, Germany and Cyprus. Another processes skate from Norway, Scotland and Denmark for distribution in Belgium, Netherlands and Germany.

A Dutch processor reported Porbeagle is popular in Belgium



E. Fleming

Skate wings in a fresh fish shop in Belgium in 1996.

Shark fin

In 1996, TRAFFIC surveyed a number of Asian markets in Brussels. Various shark fin products were found, including canned fin soup, manufactured in Singapore, selling for US$8.50; canned fin soup, product of Singapore, for US$7.50; dried fin noodles, product of China, US$11.30 for a three-four person serving; dried fin material, made in Hong Kong, US$63 for an eight to ten-person serving; and frozen shark fin for US$3.30 for a two-person serving.

Shark cartilage and squalene

Two cartilage products were found in Belgium. The first sold for US$27 and is made in France and distributed in Belgium, the Netherlands, Portugal, Italy and Spain. The second was cartilage capsules which sell for US$30.50 from powder imported by a Belgian supplier. Capsules are distributed to pharmacies, homeopathic shops and health practitioners who prescribe them to patients. The label lists *ex Ceatarinus maximus pul is* as the species used.

The same company has distributed squalene capsules since 1992. Pre-fabricated capsules are acquired in Antwerp, Belgium as processing machinery is prohibitively expensive. The squalene is labelled as originating from the species *Centrophorus atromarginatus garman*. Both products are exported to France, Portugal, Germany and Switzerland.

SPAIN

Spain is a major European fishing nation. The country fishes in both the Atlantic Ocean and the Mediterranean Sea. According to 1991 FAO landing data, Spain was the sixth most important fishing nation operating in the Northeast Atlantic area, claiming roughly 6% of the total area catch (Stamatopoulos, 1993a). It was ranked fourth in the Mediterranean fishing area with landings accounting for 8.3% of the area total (Stamatopoulos, 1995). Sharks, particularly shark species, have become an important part of the catches since the 1940s when surface drift longliners were extensively introduced in the fishing industry. Although Spain is considered not to target shark species, landing them as a bycatch of the Swordfish fishery, Spain was ranked fifth in the Northeast Atlantic fishing area with regard to shark landings in 1991 (Stamatopoulos, 1993a).

In general total landings of sharks from 1950-1973 were fairly stable, averaging 11 730 mt per year, before dropping to 627 mt per year between 1973-1978 (though the latter figure may be attributed to poor recording). Landings increased in the second half of the 1980s reaching over 20 000 mt annually, being highly variable however averaging 10 000 mt per year between 1978-1994 (Anon., 1996a).

The principal fishing gears used by Spain in the Atlantic area include drift longlines, drift gillnets, bottom trawls, bottom gillnets and bottom longlines. Similarly, in the Mediterranean, gears most

commonly employed include drift longlines and bottom trawls. The Blue Shark and Shortfin Mako comprise most of the catch of the Atlantic longliners and gillnetters while coastal shark species such as Tope and Small-spotted Catshark are the most frequently landed sharks from the bottom trawlers and gillnetters. Deep-dwelling species such as Kitefin Shark, Birdbeak Dogfish, Portuguese Dogfish, Knifetooth Dogfish, and gulper sharks are the most commonly landed sharks by the bottom longline fishery (Guzmán and Quintanilla, 1996).

Information is slightly more detailed for the Mediterranean coast of Spain where shark meat of most marketed species is greatly appreciated (L. del Cerro, pers. comm., 1996). During the winter, coastal species such as Small-spotted Catshark, Piked Dogfish, gulper sharks, smooth-hounds and Blackmouth Catshark are the mostly frequently caught and marketed. Such species are caught either in trawls or fixed bottom longlines in which about 25 Blackmouth Catsharks are caught for every 100 Small-spotted Catsharks taken. Catches of smooth-hounds have started to decline, possibly due to overfishing. This was reportedly also the case for Nursehound, which just recently started showing signs of recovery in rocky-sandy bottoms (L. del Cerro, pers. comm., 1996). Similarly, following an extended period of declining landings of Piked Dogfish, a recent relative increase in landings may be indicative of an existing recovery potential. Certain skate and ray species, including Blue Skate, Longnosed Skate, White Skate, Sandy Ray, and Shagreen Ray have become rare in the catches. The Thornback Ray is the most abundant along with Cuckoo Ray and Starry Ray. These species are fished primarily with large all-weather trawlers operating on the wide continental shelf in the Mediterranean. Towards the end of the winter, fishermen frequently catch the Basking Shark in upwelling areas such as the Gulf of Lions (L. del Cerro, pers. comm., 1996)

The Spanish Mediterranean fleet moves into deeper waters from mid-June to mid-October to target Swordfish and pelagic sharks, including Shortfin Mako, Tope and Blue Shark, with surface longlines. This fishery also lands some specimens of Sandbar Shark, along with the very common Thresher Shark (fished predominantly in the Ebro Delta area from May to October) and its Atlantic counterpart, the Bigeye Thresher Shark, which is occasionally present in the area. The Spanish fleet in the Mediterranean claims around 46% of the total marine fish landings in the Balearic area and 20% of the marine fish landed in the Gulf of Lions (Stamatopoulos, 1995).

Guzmán and Quintanilla report a fairly steady increase in shark landings from 5 587 to 6 879 mt from 1985 to 1991.

Spain is important as a supplier and consumer of shark products in Europe. Although skates and rays are included in Spain's shark catch, TRAFFIC's brief market surveys were limited to documenting shark species in trade. TRAFFIC researchers surveyed fish markets in southern Spain and gathered market information from other regions through telephone interviews with sources knowledgeable about the marketing of shark products in Spain.

Shark meat

Guzmán and Quintanilla (1996) report that fresh and frozen shark meat, steaks and fillets are appreciated in most areas of the country, and that different species of sharks command varying values on the market. The meat of the Shortfin Mako Shark is probably the most valuable shark meat in Spain, occasionally selling at prices comparable to that of small Swordfish. The main species consumed in Andalucía, Valencia, La Mancha and Madrid, in descending order of value, include Shortfin Mako (US$5.30/kg in April 1996), Tope, Thresher Shark, Smooth Hammerhead, Blue Shark, Bigeye Thresher Shark, Small-spotted Catshark, gulper sharks, Kitefin Shark and Knifetooth Dogfish. Each of these species may be referred to as *marrajo* (Shortfin Mako) or *cazón* (Tope), or as *bienmesabe* (good taste). "Pickled fish" may also be used to describe these species,

however, this term is most often used for Tope and Blue Shark (Guzmán and Quintanilla, 1996).

Smooth-hound and Piked Dogfish, which are not landed in southern Spain, command a relatively high price, about US$4.90/kg (March 1996) in other regions of the country. Other shark species find their way to fish markets after being landed opportunistically. Every year, usually in late winter and spring, Basking Sharks caught incidentally in upwelling areas by gillnets, trawls and longlines and sold skinned, gutted and filleted in local fish markets for less than US$1.00/kg (L. del Cerro, *in litt.*, 1996; L. Silvani, *in litt.*, 1996). Although the fishermen receive very little for Basking Shark meat, the money helps to offset the costs of repairing damaged fishing gear (L. del Cerro, *in litt.*, 1996).

Among frozen shark products, Shortfin Mako Shark is the most important commercial shark species on a national level. It is usually marketed as Swordfish. Anecdotal accounts exist of longlining crew members consuming sharks, such as Sharpnose Sevengill Shark and Bluntnose Sixgill Shark, that are generally not of commercial importance in Spain.

Spain is a relatively important trader of shark meat in the EU. According to Eurostat data from 1990-1994, the country's average annual imports of dogfish and shark meat approached 24 000 mt, almost 90% of which was shark other than Piked Dogfish and catshark. After Italy, Spain is the EU's second largest importer of shark, and after Germany, the second most important exporter of shark meat. Frozen meat of dogfish and shark is most heavily traded, and catshark was imported in slightly larger quantities than Piked Dogfish, much of which was supplied by Portugal from 1990-1994.

Imports and exports of frozen shark increased over this period and involved a variety of trading partners. Imports from countries in Africa, Central and South America and Asia were prominent. In 1993, exports increased markedly as Spain exported large quantities of frozen shark to Italy.

Shark curios

In some locations, shark jaws and other curios are marketed to local and tourist markets. Fergusson (*in litt.* to TRAFFIC International, 1996) reports having seen curios fashioned from a variety of shark and ray species in tourist resorts in southern Spain since 1992, all taken from neighbouring Mediterranean waters. The most numerous curio offered for sale were dried, juvenile Shortfin Mako heads selling for US$65. Other curios observed in shops included stuffed smooth-hounds, mako jaws, a Smooth Hammerhead head (US$37), Nursehounds and Small-spotted Catshark (US$25), a juvenile stuffed Blue Shark (US$285), Portuguese Dogfish (US$160), and numerous juvenile Brown Rays and Starry Rays.

Shark offal

Shark offal, viscera and heads may be collected with other fish offal and processed into fishmeal, but this has greatly declined (Guzmán and Quintanilla, 1996).

Shark fin

For some of the species destined for the fish market, such as Shortfin Mako and thresher sharks, the fins are also retained and sold. During the processing of sharks aboard large freezer longliners the fins are removed prior to freezing. Fin values are often set according to species and size, and for a number of shark species, the fins are the most valuable part of the fish. The first dorsal fin, pectoral fins and caudal fins are taken (the anal fin is also taken from the Blue Shark). Finning at sea, the custom of cutting and retaining the fins and discarding the body, is practised in Spain (Guzmán and Quintanilla, 1996).

The Blue Shark accounts for 60-70% of the shark catch, and the species is frequently finned on board. In some areas, Smooth Hammerhead fins are more valuable than meat, so these are occasionally finned. Scalloped Hammerheads and Great Hammerheads are always finned. In 1996 large fins were generally sold wet for US$8.15-12.00/kg, while small fins have earned US$4.88-5.70/kg. These prices have increased rapidly from the former price of approximately US$4.00/kg. In some cases, fins from sharks finned at sea or specimens landed at port are sold at auction and purchased directly by export companies or brokerage firms that sell to export companies (Guzmán and Quintanilla, 1996).

All fins taken from sharks in Spain are exported to Asian countries, including South Korea, Thailand, China and Japan. However, TRAFFIC could not find exporters of shark fin in Vigo who were willing to be interviewed. Spanish trade in shark fin is recorded by the General Subdirection of Statistics and Planning (Guzmán and Quintanilla, 1996).

Several brands of processed dried fin noodles from Hong Kong and other East Asian countries were seen in Asian shops in Madrid. Canned fin soup, manufactured in Singapore and imported by a Spanish/Asian import company, retailed for US$7.30 (Guzmán and Quintanilla, 1996). Spain reported importing a total of approximately 1 960 mt of dried fin and exporting 730 mt of dried fin in 1994 and 1995 combined. Hong Kong trade statistics indicate that Spain exported 76 mt of dried or salted shark fin to Hong Kong in 1994 (Guzmán and Quintanilla, 1996).

Shark leather

Customs figures published by Spain's General Subdirection of Statistics and Planning indicate that the country imports and exports shark skin and and smaller quantities of shark leather. According to Guzmán and Quintanilla (1996), however, there are no companies in Spain registered as producing or processing, which suggests that the skins may be imported already processed, or semi-processed and re-exported to countries that process such items. Some fishermen, especially in southern Spain, prepare and use shark skin to polish and sand their boats, although this practice was more common in the past (Guzmán and Quintanilla, 1996).

Shark cartilage, liver oil and squalene

Three natural shark compounds have been authorized to date by the Ministry of Health and Consumption in Spain for use in pharmaceutical and cosmetic products: cartilage, squalene and liver oil.

In May 1996, surveys in herbal and homeopathic shops in Madrid revealed a large variety of cartilage products, including capsules, pills, powder and liquid, purporting to bring benefit to bone and joint ailments. Introduced within the last two to three years in Spain, these products are being tested by retailers to determine if they are popular with consumers. Cartilage products are already being prescribed by doctors, which suggests full incorporation of these products into the Spanish market. If successfully introduced, it is likely that other shark byproducts, such as liver oil capsules, will be also be marketed in Spain (Guzmán and Quintanilla, 1996).

In addition to the various cartilage products found during the survey, a Spain-based trading firm has begun wholesaling shark cartilage capsules manufactured in Brazil (100 capsules for US$30.20) (Guzmán and Quintanilla, 1996).

The market for shark liver seems to be recovering in Spain. In May 1996, the average value for gulper shark liver oil was around US$8.15-9.75/kg. In northern Spain, a research programme coupled with an experimental targeted demersal shark fishery is being established by the *Instituto Espanol de Oceanografia* in Vigo, Santander and Malaga. The project hopes to achieve the full utilization and

marketing of shark products caught in Spain. Among other objectives, the programme will explore ways in which to optimize the production and commercialization of shark liver oil. It is expected that gulper shark species will be important in these initiatives (Guzmán and Quintanilla, 1996).

Although no shark liver oil products were found in Spain during the survey, two products containing shark liver oil are currently being considered for official registration in the country. Squalene has been authorized in Spain as an active ingredient in cosmetic and pharmaceutical products, but no products containing squalene were found during the survey (Guzmán and Quintanilla, 1996).

ITALY

Italy is the most important fishing nation operating in the Mediterranean Sea, landing almost 30% of the total volume of marine fish, crustaceans and molluscs landed in the area (Stamatopoulos, 1995). Between 1977-1994, Italy's shark landings from the Mediterranean area averaged 82.4% of the total national shark landings. Other landings from the eastern central Atlantic accounted for 12.5% of the Italian shark landings, the Indian Ocean 2.7% and the Atlantic 2.4% (Anon., 1996a). From the early 1950s until the early 1980s, Italy's total shark landings fluctuated around 5 000 mt per year. In the early 1980s, shark landings began a steep increase, reaching an average of 12 000 mt per year, and a maximum level in 1994 of roughly 17 000 mt (Stamatopoulos, 1995).

Shark species are taken commercially as bycatch with driftnets, trawls and longlines. Driftnet fisheries targeting Swordfish between April and August, and Albacore Tuna between August and December, commonly take Thresher Shark, Blue Shark, Porbeagle, Devil Ray and the Common Eagle Ray (Laurenti and Rocco, 1996). Munoz-Chapuli *et al.* (1993) report that roughly 500 Blue Sharks are caught during the Swordfish season, at an average weight of 40 kilograms. The autumn Albacore Tuna season results in the bycatch of smaller specimens of about four kilograms, probably born a few months earlier, of two to three metric tonnes annually (600-1 000 individuals) (Munoz-Chapuli *et al.*, 1993). Blue Sharks are the most frequently caught shark species (as bycatch) from driftnets and longlines in Italy (Laurenti and Rocco, 1996).

In addition, driftnets also take the Basking Shark, Shortfin Mako and Smooth Hammerhead with less frequency. A variety of occasional species, including Bigeye Thresher Shark, Spinner Shark, Blacktip Shark, Dusky Shark, Sandbar Shark, Great White Shark, Sharpnose Sevengill Shark, Sand Tiger Shark, Smalltooth Sand Tiger, and hammerheads, are occasionally caught as bycatch (Laurenti and Rocco, 1996).

The Smooth-hound is the most frequently landed cartilaginous fish species in Italy, collected by trawlers in shallow-water fishing grounds. Other frequently landed species include smooth-hounds, skates and rays, torpedo rays, catsharks, dogfish, Blackmouth Catshark, and Velvet Belly, as well as a number of species that are also taken by driftnets (Laurenti and Rocco, 1996).

In general, shark landings ranged from 8 000-14 000 mt from 1984-1993, with an annual average of 11 741 mt for the same period. In 1993, Italian shark landings totalled 11 802 mt, exhibiting a 16% decrease from the two previous years (Anon., 1996a).

Recreational fisheries take place mainly in the eastern Adriatic Sea, in which Blue Sharks and Thresher Sharks are the most frequently landed shark species. The northern Adriatic Sea has been identified as an important nursery area for Blue Sharks. Two angling associations operate fishing tournaments in the eastern Adriatic: the Italian Federation of Sport Angling and Diving (FIPSAS), a large national organization, and Big Game Italia (BGI), founded by anglers. Shark specialists

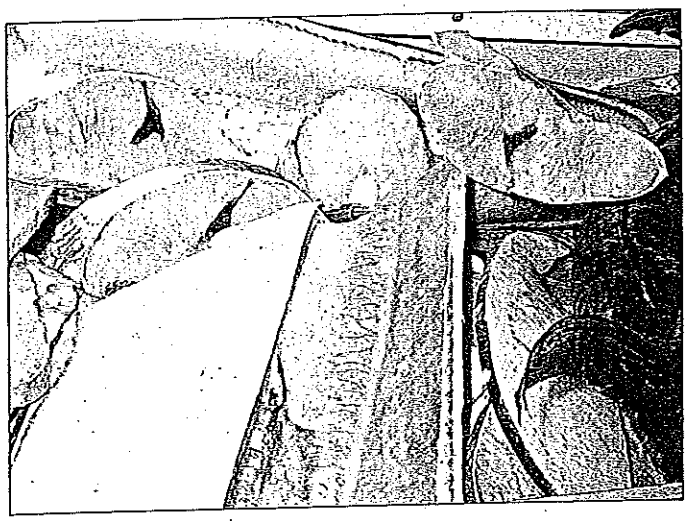
monitoring the tournaments since 1988 have expressed concern over the minimum sizes set for sharks during these competitions. For example, from 1988-1993, FIPSAS set a minimum size of three kilograms for any species of fish taken during the national championships. According to the shark specialists, a three kilogram Blue Shark is five to six months old and less than one metre long, and the majority of Blue Sharks taken by anglers over the years have been immature; in 1991, 30 boats landed 80 juvenile Blue Sharks. FIPSAS raised the minimum size for fish in 1994 to 10 kilograms, which corresponds to a one-year old Blue Shark, less than 1.5 metres long. BGI set slightly higher minimum sizes but which also rewarded the taking of juvenile fish. In 1994, BGI set a minimum size for Thresher Sharks at 150 kilograms, which was lowered in 1995 to 50 kilograms at the request of anglers (I. Bianchi, *in litt.*, 1996).

Shark meat

Italy is the largest importer of shark and dogfish meat in the EU. From 1990-1994, the country was a very stable consumer, importing an average of over 12 000 mt/year. These imports were comprised of 67% shark and 33% dogfish (Piked Dogfish and catsharks). Italy exported only 596 mt of dogfish and shark during this period, only 1% of the amount imported.

Most of Italy's trade involved frozen shark products. Germany, which re-exports frozen shark acquired from outside the EU, and France were the main EU suppliers, while Japan, Argentina and South Africa were the predominant exporting countries external to the EU. Since 1993, Japan and South Africa have been exporting to the Netherlands, which has subsequently re-exported to Italy (Anon., 1996; C. Raymakers, *in litt.*, 1996).

Laurenti and Rocco (1996) completed a detailed analysis of national trade data, compiled in Italy separately by two government bodies, the General Direction of Veterinary Services (DGSV) and the National Institute of Foreign Trade. In addition to the categories Eurostat uses, the DGSV records trade in skates and rays, Smooth-hound and Porbeagle. These researchers noted that, as a result of the relative geographic position of other EU countries, that these countries logically export much higher levels of fresh product to Italy, while frozen product is more often imported from non-EU countries. From 1985-1991, Italy imported almost equal amounts of sharks from inside and outside the EU. Piked Dogfish and Porbeagle were imported in the greatest amounts. Between the mid 1980s and early 1990s, the following amounts were imported: Piked Dogfish (38%), Porbeagle (29%), other sharks (25%) Smooth-hound (6%) and Small-spotted Catshark (2%) (Laurenti and Rocco, 1996).



E. Fleming

Shark trunks and steaks sold by an Italian processor in 1996.

Italy has begun producing increasing quantities of frozen sharks and rays, though Laurenti and Rocco (1996) note that this production appears aimed at the ever increasing domestic demand, rather than export markets.

In February 1996, TRAFFIC Europe surveyed the shark trade in fish markets in Rome (Lazio), Genoa (Liguria) and Mazzara del Vallo (Sicily). During the survey in Rome, 13 taxa were identified. Except for a few specimens of Porbeagle, most included bottom-dwelling species, apparently caught by trawling. Large

Squaliformes are rarely brought to the Rome market and are regularly removed by health officials owing to the high concentration of mercury in their tissues. Most sharks are offered for sale skinned, and the larger specimens had fins intact. Sharks were more prevalent than rays in the market. This may in part be attributed to the fact that sharks are available from domestic landings and imports, while rays are supplied mainly from Sicily, and their availability may be influenced by marine conditions that are not compensated for by imports. Among the species found during this survey the most valued were Starry Smooth-hound and Piked Dogfish, with an average price of US$8.80/kg. The rays were the least expensive among the sharks, with an average price of about US$5.15/kg. All rays at the market were fresh (Laurenti and Rocco, 1996).

In Genoa, most cartilaginous fish sold during this period appeared to be dogfish imported from the USA, France and England. Large quantities of Blackmouth Catshark were also available. Sharks again greatly outnumbered rays, and average prices were slightly higher than in Rome: US$8.70/kg for the sharks and US$7.55 for the rays (Laurenti and Rocco, 1996).

The fish market in Mazzara del Vallo in Sicily differs slightly from the markets in Rome and Genoa in that there are a series of warehouses offering fish at wholesale prices. Most of the fish at Mazzara del Vallo originate from local fishing activities. Fishermen sell their fish to the wholesalers who then sell it to retailers in south and central Italy; the prices in this market were 30-40% lower than elsewhere. Smooth-hounds and rays were prevalent in the market. During the survey, the sharks in this market were without fins (Laurenti and Rocco, 1996).

Shark fin

TRAFFIC conducted surveys in Asian markets in Rome, Florence, Genoa and Milan. In each of these cities, Asian restaurants, grocery stores and other shops were visited. During the surveys, dried, processed shark fin noodles and soup were the most frequently encountered shark products.

Ninety-three percent of the more than 135 Chinese restaurants surveyed in Italy served shark fin soup. The average price for a portion of soup was about US$4.15. Each Chinese restaurant in Italy uses an average of about three to four kilograms each year. The average price per kilogram of shark fin is about US$645/kg. Retail prices of the product do not vary much from the wholesale prices, so restaurants buy shark fin directly from the grocery shops. On average, each portion of soup served in restaurants contained from three to six grams of shark fin (Laurenti and Rocco, 1996).

The surveys carried out in Chinese warehouses and supermarkets noted that labels on the shark fin products often did not specify the origin of the product. The dried product was sold either processed (shredded) or whole. Packages of dried, processed product were noted in the following forms: 40 grams for US$20.65; 45 grams for US$23.20; 55 grams for US$18 and 200 grams for US$29. Dried, whole fins were also sold packaged, with seven to eight dried, whole fins selling for US$194; 50 grams for US$29; 100 grams for US$38; 200 grams for US$84, and one box containing 100 packets of dried fins, each weighing 100 grams, for US$645. Canned fin soup (450 gram tins), sold for US$7.75 (Laurenti and Rocco, 1996).

Most fins and fin products found during the survey had been re-exported by France. Shark fin was also exported to Italy by Singapore, Hong Kong and China. Products imported from France usually originated in Surinam (Laurenti and Rocco, 1996).

Shark cartilage

Shark cartilage manufactured in Costa Rica and imported from USA is offered for sale in Italy at US$110 for 30 capsules.

GREECE

Fisheries in Greece do not target sharks and rays, though in most cases any sharks caught are landed and sold for human consumption. Shark species landed by the Greek fishing fleet vary with the fishing methods employed, the areas and seasons of operation. Although detailed species landing information is lacking, the most frequently landed species are similar to those landed by other Mediterranean countries. These include coastal species such as Smooth-hound, Starry Smooth-hound, Piked Dogfish, Nursehound, Longnose Spurdog, catshark species, Tope and guitarfish, pelagic sharks such as Blue and Thresher Sharks, and deep-water species, such as the Bluntnose Sixgill in particular. Skate and ray species most frequently landed probably include the Thornback Ray, Sandy Ray, Starry Ray, Longnosed Skate and various stingrays (K. Papakonstantinou, pers. comm., 1996; P.S. Economidis, pers. comm., 1996).

Landing data show that the Greek fleet landed an average of 1 400 mt of sharks annually for the period 1950-1970. No data are available for the years 1971-1981. In 1982, shark landings reached roughly 1 600 mt. Landings subsequently declined until 1993, and in 1994 landings reached 1 650 mt (Anon., 1996a). From 1982 to 1994, shark landings averaged 1 100 mt/year. According to annual records kept by the National Statistics Service of Greece (NSSG), shark landings by the Greek fishery declined fairly steadily between 1985 to 1993 despite an increase in fishing effort. Landings of skates and rays declined during the same period, but appear to have begun recovering in 1993. Shark landings averaged 891 mt/year from 1984-1993 (ranging from 1 219 mt in 1984 to 492 mt in 1990). The percentage of sharks out of the total fish landed for this 10-year period ranges from 1.5% for 1984 to 0.5% for 1990, with an average of 0.9%.

Greece now lands approximately 1 100 mt of sharks per year. Despite the relative increase in landings observed in 1993 and 1994, total shark landings exhibit a slow declining trend while fishing effort has increased. Fishermen and fishmongers report a decline in the stock, the magnitude of which is unknown.

Shark meat

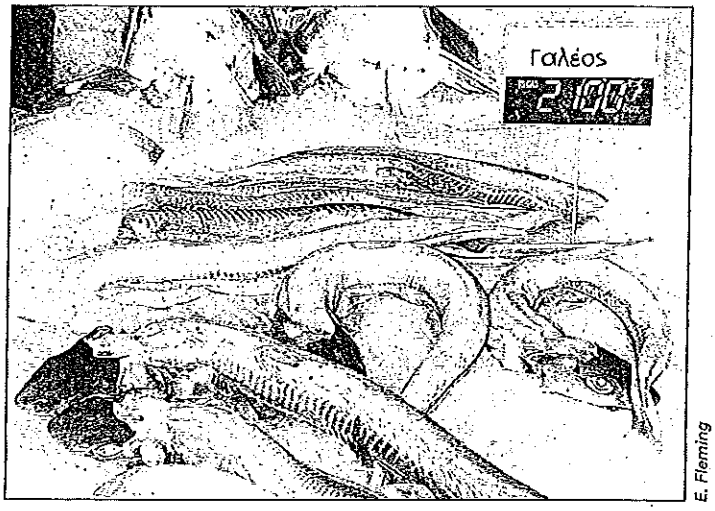
Relative to other EU countries, Greece is not an important trader of dogfish and shark meat. From 1990-1994, the country imported an average of 840 mt of dogfish and shark meat, 86% of which was sharks other than Piked Dogfish and catshark. From 1990-1992, Greece imported frozen sharks in excess of 1 000 mt/year from countries outside the EU, mainly Brazil, Argentina and Oman. Greece also exported an average of seven metric tonnes of dogfish and shark meat per year from 1990-1994.

In Greece, shark and skate meat, sold fresh, frozen, whole or filleted, is graded within the lowest of three categories in which Greek fish products are rated. Piked Dogfish is called many different names in Greece including *skylopsaro* (dogfish), *kentroni*, baby shark and *galeus*. Smoothound are usually marketed as *galeus*. Two Greek importers interviewed by TRAFFIC in April 1996 process *galeus* dogfish (cited as smooth-hound) steaks for distribution mostly within Greece. The fish is obtained from West Africa, South Africa, USA, and Arabic countries. The retail price for frozen steaks is US$3.50/kg; larger steaks for the catering market are sold for US$3.12/kg. The smaller steaks for the retail market are labelled *galeus* dogfish steaks; in supermarkets in Athens, fresh *galeus* retailed for US$8.75/kg in May 1996.

Shark fin

Dried, processed shark fin for soup were found only in Asian restaurants during TRAFFIC surveys

in Greece. There are no large Asian populations in Greece, and demand for shark fin is very low. Shark fin is apparently consumed by Europeans as a curiosity. One import company in Athens, perhaps the only such firm in Greece, supplies Asian restaurants with processed dried shark fin. A representative of the company revealed that they import this product from another EU country. A 50 gram package, or a 10-person serving, wholesales for US$21.



E. Fleming

Dogfish meat on sale in a Greek supermarket in 1996.

Shark cartilage and li er oil/squalene

A pharmacist reported that cartilage and shark liver oil products are just entering the Greek market. One health shop retailed shark cartilage capsules of Australian origin (45 capsules for US$21) and shark liver oil capsules of Norwegian origin (60 capsules for US$25). Both products are manufactured in the USA and distributed by a subsidiary in the UK. Neither product was displayed nor available at the shop, but could be ordered. Shark cartilage extract in 7 ml vials (US$130) was also available by special order.

CYPRUS

FAO data show that landings of shark species by the Cypriot fishing fleet for the period 1974-1984 were relatively stable, averaging 17.5 mt/year. Landings increased marginally in the second half of the 1980s, reaching over 140 mt in 1986 and 1989. Landings averaged 57 mt annually from 1984-1994. In 1994, landings of sharks totalled 19 mt (Anon., 1996a).

Non EU Cyprus lacks a targeted shark fishery, however, an important incidental fishery for sharks seems to have developed within the pelagic Swordfish fishery. Sharks and other cartilaginous fishes are taken as a bycatch of most types of fisheries (though the bycatch of dogfish and rays with nets and trawl nets is not significant in relation to the total fish landed). Larger sharks are caught with the Swordfish surface drift longlines in significant numbers. Shark catches comprised an average of 19% of the total Swordfish longline catch from 1988 to 1994 (E. Economou, pers. comm., 1996). Shark and ray catches averaged about 2% of the total catch in the last seven years, with a maximum of 6.7% in 1989 and a minimum of 0.3% in 1991 (Economou and Konteatis, 1993).

After reaching a maximum of almost 200 mt in 1989, shark landings dropped dramatically in subsequent years, with signs of a slow recovery for the last recorded years. Fishermen and fishmongers pointed out that populations of dogfish (probably smooth-hound, catsharks and Tope) seem to have decreased in the last years, and that populations of Blue Shark appear to have been reduced (E. Economou, pers. comm., 1996).

Shark meat

FAO reports imports of fresh or chilled shark of one metric tonne in 1989, 1990 and 1991, and 19 mt of frozen shark in 1990, the latter coinciding with the dramatic drop in landings by the local

fishery. Nothing further is reported by FAO until 1993 and 1994, when Cyprus imported one and two metric tonnes, respectively, of frozen shark.

Sharks, dogfish and ray meat are reported to be for human consumption only. Shark meat is sold for US$2/kg to fishmongers, while Swordfish is valued at more than US$8/kg. Due to the wide profit margin and to the similar appearance of the fillets, customers may mistakenly purchase shark instead of Swordfish.

Fisheries management officials reported that Cyprus has recently exported shark meat to the Ukraine. No data are available.

Shark fin

Asian restaurants are few in Cyprus, found only in the larger coastal towns frequented by tourists. In mid-January 1996, only one in four visited by TRAFFIC listed shark fin soup on the menu. TRAFFIC s inquiries in Cyprus did not reveal Cypriot involvement in the shark fin trade, although Customs statistics from Asian countries in the 1980s and early 1990s reported importing shark fin from Cyprus.

No other shark products were found in Cyprus.

TURKEY

Turkey is not a member of the EU. FAO landing data show great variability within the total shark landings by the Turkish fleet from 1957 to 1994. FAO landing data show that landings of sharks from 1957 to 1966 averaged 630 mt annually before reaching 10 600 mt in 1967, after which they steadily decreased until the mid 1970s. A steep increase then occurred, peaking at just over 15 000 mt in 1979. Turkish shark landings were highly variable but declining from the early 1980s to 1994 when landings totalled 4 133 mt (Anon., 1996a). The majority of these landings is taken from the Black Sea, averaging 83.8% of the national shark landings from 1970-1992. During this period, 7.5% of the landings were from the Sea of Marmara; 6.2% of the landings were from the Mediterranean Sea and 2.5% from Aegean Sea (A.C. Gucu, *in litt.*,1996).

The most frequently landed shark species by the Turkish fleet include coastal species such as Smooth-hound, Starry Smooth-hound, Piked Dogfish, Nursehound, Longnose Spurdog, guitarfish, and pelagic sharks such as Blue and Thresher Sharks. Landings of the Bluntnose Sixgill Shark are quite common in the deep-water fishing grounds of the northern Aegean Sea and other deep-water grounds of the Mediterranean (I. Mert, *in litt.*, 1995). Thornback Ray, Sandy Ray, Starry Ray, Longnosed Skate and various other stingrays are frequently landed. The Turkish fleet also lands Basking Shark, which appears seasonally in the North Aegean, Sea of Marmara and probably in the Black Sea (H. Kabasakal, pers. comm., 1996).

Some recreational fishers operate in southern Turkey, taking unrecorded numbers of Blue and Shortfin Mako sharks. Between 1980-to 1992, the Turkish fleet landed an average of some 5 000 mt per year, with a maximum production level of 7 193 mt in 1989, followed by a minimum of 2 805 mt in 1990. According to the data reported by the Turkish Institute of Statistics, the average percentage of the total sharks over the total fish landed from 1970-1992 is 1.6% (A.C.Gucu, *in litt.* 1996).

Shark meat

In general, the Turkish population does not appreciate shark meat, which is sold inexpensively. There is a slight increase in the demand for shark fillets during the summer months in coastal areas visited by tourists (H. Kabasakal, pers. comm., 1996).

FAO reports increasing exports of frozen sharks from 1985 to 1988, from 181 mt to 456 mt, which dropped to almost nothing through 1994. Exports of fresh or chilled sharks, rays and skates averaged 73 mt/year from 1985-1988 and 31 mt from 1989-1994.

Shark fin

Customs statistics from Asian countries in the 1980s and early 1990s reported importing shark fin from Turkey.

MALTA

Malta, which is also not a member of the EU, landed 100 mt of sharks during 1950-1973 as reported by FAO (Anon., 1996a). The accuracy of these data should be questioned, given the absolute stability of the recordings and the absence of records for three years within this period. Nevertheless, these figures provide an estimate of the landings. Landing records seem more reliable from 1974-1994, during which a variable but distinctive declining trend occurred (with the exception of the all time maximum value of almost 160 mt in 1984). In 1994, landings of shark species totalled roughly 50 mt (Anon., 1996a).

In Malta, commercial shark fishing was practised until a few years ago when local fishermen began to modernize their fishing vessels to target more valuable species further offshore, such as Swordfish and tuna (C. Busuttil, *in litt.*, 1996). Currently, most shark catches are incidental. Some inshore fishers, however, target some coastal dogfish and roughshark species, including catsharks, Piked Dogfish, smooth-hounds and gulper sharks, with fixed-bottom longlines, known locally as *ormeggios*. Fishermen themselves allocate *ormeggios* among themselves, without supervision by the fisheries department. Total annual landings of sharks from the mid-1980s to 1994 have ranged between 45 to 65 mt (Anon., 1996a), representing a significant proportion of the total marine fish landed in Malta.

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The TRAFFIC Network is the world's largest wildlife trade monitoring programme with offices covering most parts of the world. TRAFFIC is a programme of WWF (World Wide Fund For Nature) and IUCN (The World Conservation Union), established to monitor trade in wild plants and animals. It works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

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