SPANISH FISHING ACTIVITIES ALONG THE SAHARAN AND MOROCCAN COASTS

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ABSTRACT

Because of the geographical proximity between Spain and Africa, and the poor resources around the Canary Islands, the fishers from the southern region of the Spanish mainland (Andalusia) and from the Canary Islands have been fishing along the African coast very early in history. Boats operating from the Canaries exploited resources on the Saharan coast (former Spanish province in Africa situated between approximately 21°N and 28°N and since 1976 under Moroccan administration), while those from Andalusia used to fish along the Atlantic Moroccan coast (between approximately 28°N and 36°N). Considering its historical importance, we briefly describe each of the fisheries, the landing data and their sources.

INTRODUCTION

Spanish catches along the Saharan and Moroccan coasts (Figure 1) were taken from several sources:

1. Official Spanish statistics for all boats landing in the Canaries between 1933-1972, as collected by the Spanish fisheries authority. This dataset is contained in a series of statistical bulletins published annually by landing region (e.g. Canary region, Andalusia region, etc.) and by species or group of species. The publication was discontinued after 1972. Most landings in the Canary region can be separated by their fishing origin (i.e., Canary Islands, Saharan coast) applying some basic criteria. However, those made in the Andalusia region are almost impossible to differentiate according to their fishing origin (Spanish coast, Moroccan coast, Portuguese coast).
2. Statistics for the fleets fishing for cephalopods (trawlers), for hake (*Merluccius merluccius*, *Merluccius senegalensis*) and shrimp (trawlers, gillnetters, longliners), for sardine (*Sardina pilchardus*; purse seiners), and for other demersal species (artisanal fleet using handlines and pots) for years 1976-1998, are collected by the Instituto Español de Oceanografía (IEO). This dataset consists of actual landing data recorded by a network of IEO technicians located at the landing ports in the Canaries and Andalusia. They record information on landings by species or group of species of every single Spanish vessel by trip, and also collect details such as fishing effort, gears used and fishing grounds visited. The statistical network was first established in the Canarian ports in 1975 and in the major fishing ports of Andalusia in 1980. Thus, data series start in 1976 and 1981 for each of the regions respectively.
3. FAO electronic data for the years 1972-1997. This data is compiled by the FAO from the STATLANT forms officially submitted by fishing nations and is available via the Internet.
4. Various working group reports provided information on sardines (Anon., 1978b, 1990; Lamboeuf, 1997b), hakes (Anon., 1978c; Lamboeuf, 1997c), cephalopods (Anon., 1978a, 1982; Lamboeuf, 1997a) and seabreams (Anon., 1986). The Spanish data within the working groups reports contain the same information as obtained from source 2 that have been submitted by IEO scientists to the working groups.

Data from different sources often overlapped and were sometimes conflicting. Thus, the data were examined by species and area. We used different sources of data to reconstruct temporal series depending on their reliability.

The Spanish fishery on the Atlantic Moroccan coast (28°N-36°N) is dominated by demersal fish (mainly hake) and crustaceans (mainly shrimp). There is also a limited fishery for small pelagics, mainly anchovy (*Engraulis encrasicolus*), sardine (*Sardina pilchardus*), mackerel (*Scomber japonicus*) and horse mackerel (*Trachurus trachurus*) in the northern part of this coast (the 'North Zone') which extends from approximately 32°N to 36°N. As indicated in item 1 above, the reconstruction of long time series of landings from these fisheries is unreliable, mainly because of the mobility of vessels between fishing grounds and the similarity of the species that can be found in them, thus making it virtually impossible to discern the geographical origin of the catches. The only reliable statistical series on the Spanish catches made in this region starts in 1981 as stated in item 2 above . However, newly available information on landings in ports other than in the

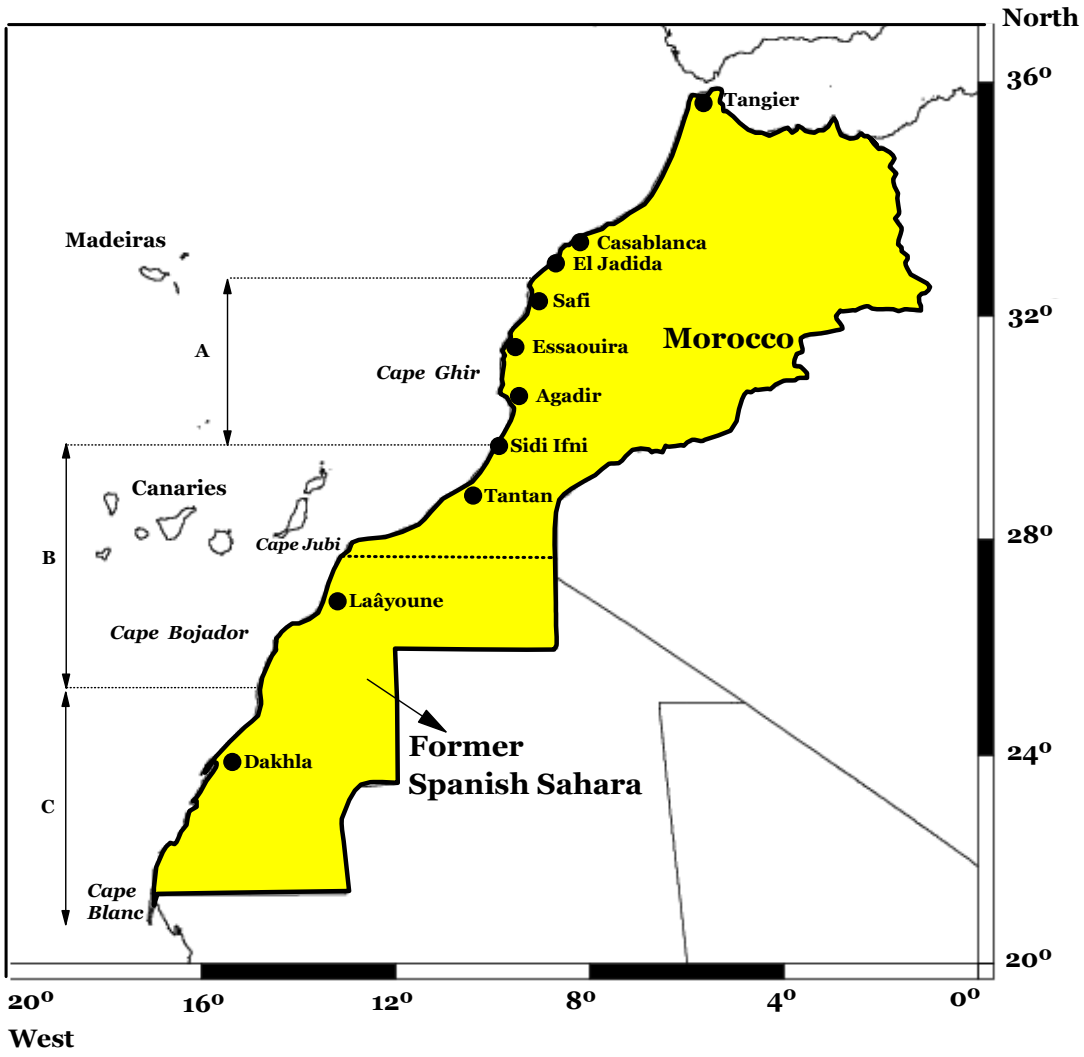

Figure 1. The Atlantic Moroccan coast and the former Spanish Sahara showing the principal fishing ports.

Andalusia region will be included in the dataset in the near future. In practical terms this means that figures on landings from some fishing gears (e.g., longliners fishing for hake) may be underestimated.

Major target species in the Saharan coast are sardines, demersal fish (mainly seabream) and cephalopods (octopus, cuttlefish and squid, Figure 2) for which the landings statistics are available since 1933. The first period, 1933 to 1972, was reconstructed using the Spanish official statistics described in source 1 above. There is a gap in data between 1935 and 1939 due to the Spanish Civil War. The second period in the series extends from 1975 onwards and was prepared using data gathered by the network of IEO technicians based at the landing ports (source 2 above). There is an intermediate period covering years 1973 and 1974 when the Spanish official statistics had already been terminated and the IEO network was not yet established. Therefore it was only possible to estimate landings of target species using alternative sources (e.g., professional associations). During this period, records of discarded species are absent. The rapid increase in catch in the 1960s in this region is due to the development of the specialized fisheries for sardine and cephalopods, which were landed in Canarian ports, as well as improved statistics gathering.

The Spanish fishing industry in these two regions can be divided into four main types of target species: the sardine (*Sardina pilchardus*), cephalopods (*Octopus vulgaris*, *Sepia hierredda*, *Loligo vulgaris*), hake (*Merluccius merluccius*, *Merluccius senegalensis*) and shrimps (*Parapenaeus longirostris*), and seabreams (family Sparidae) and other demersal fish.

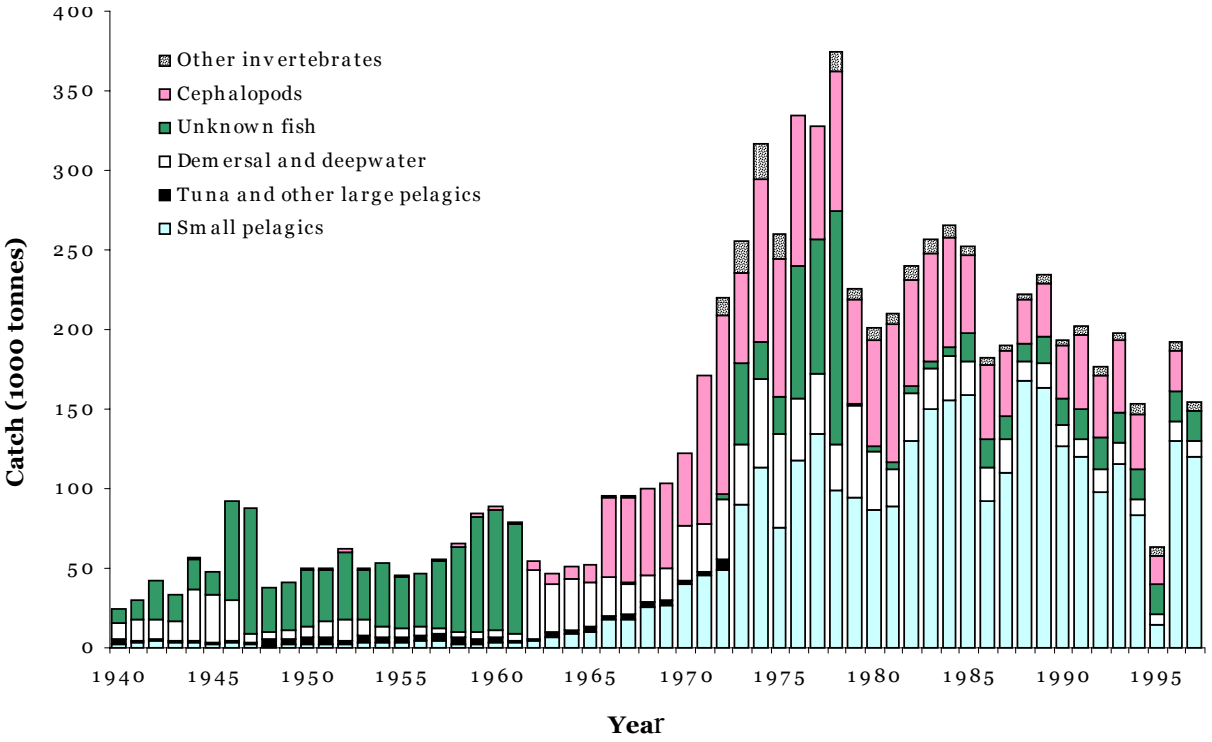

Figure 2. Spanish landings taken on the Saharan coast from 1940 to 1997.

The sardine fishery

Spanish vessels started fishing sardines, *Sardina pilchardus* (Clupeidae), along the northern Atlantic coast of Morocco in the North zone (32°N-36°N) in 1920 (García Santamaría, 1995). The only available data series on landings from this fishery starts in 1988 and indicates that currently the most important species in the catches is the anchovy (*Engraulis encrasicolus*), followed by the sardine, the mackerel (*Scomber japonicus*) and the horse-mackerel (*Trachurus* spp.). In the 1930s, the construction of ports in Safi and renovation of Essaouira attracted Spanish, Portuguese and French fleets further to the South (zone A, between 29°N and 32°N), which had a larger sardine stock than the north coast of Morocco. An artisanal Moroccan fleet also started to fish sardines around that time. In the 1950s, sardine catches were increasingly landed in Arrecife (Canaries) which had a canning plant. Then, in the 1960s, a fleet was established in the Canaries. Both Canarian and Spanish mainland fleets concentrated their effort in zone B (Saharan and Moroccan coasts, from 26°N to 29°N).

Looking at the series of global landing statistics for the Spanish fisheries in Morocco and Sahara reconstructed by combination of data from different sources, a sudden increase is observed in the 1960s. This increase in landings is very likely linked to the establishment of a fleet in the Canaries supplying raw fish to the canning factories which also facilitated the gathering of better statistics. In fact, the catch location is difficult to determine when all landings of larger boats were made in continental Spain, thus, statistics are not reliable before the 1960s. From the 1960s onwards, they correspond to catches made in zones B and C (zone C is in the Saharan coast between 22°N and 26°N) exclusively. According to these statistics, sardine landings from the Spanish fleet have remained high over the years, with an average yearly catch of 114 thousand tonnes between 1976 and 1997. Other species of small pelagics caught in the fishery, especially in the 1970s but little since, include the chub mackerels, mackerels, anchovy (Figure 3).

Since the end of the 1980s, access to the fishing grounds for the Spanish fleet has been increasingly restricted and the catches reduced accordingly. In 1995 the protocol between the European Union and Morocco led to the replacement of the Spanish fleet with the Moroccan fleet in zone B. The Spanish vessels were displaced further south (zone C), which had always been the active fishing area of other countries, principally the former USSR and other Eastern European countries. The dramatic decline in landings observed in 1995 is due to the seven months of inactivity of the Spanish fleet during the period of negotiation of a new fishing agreement between the European Union and Morocco.

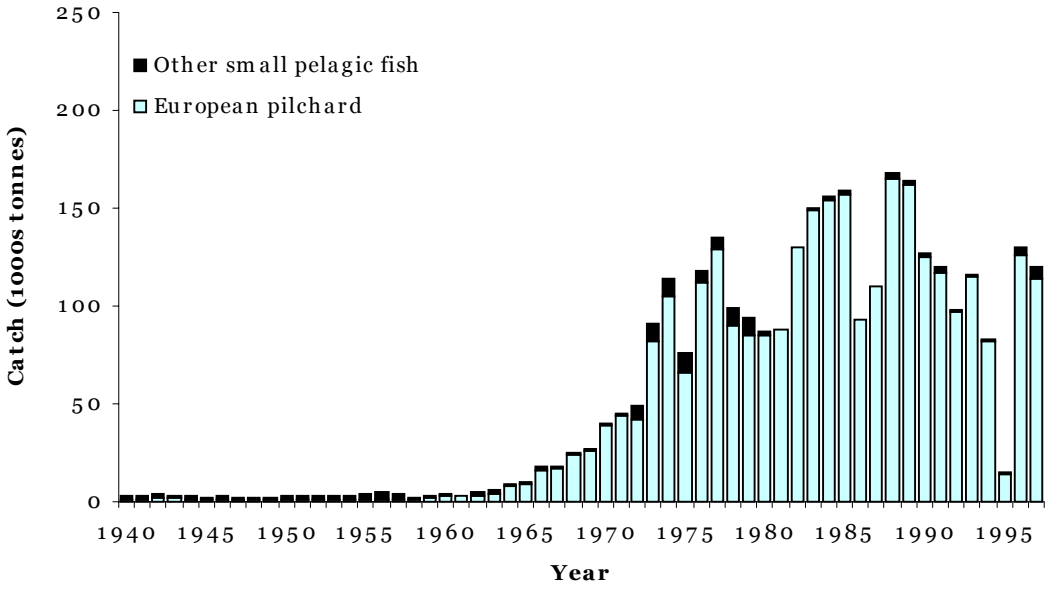

Figure 3. Spanish landings of small pelagics from Zones B and C.

Some discrepancies between the FAO data and the Spanish official statistics have been observed for these fisheries in the period 1982 to 1985 and from 1994 onwards. For the 1980s, the differences between datasets are unclear but they are most likely a result of transcription errors or reporting inaccuracies. For the 1990s, official statistics were not available thus, landings were estimated by FAO (Luca Garibaldi, FAO, Rome, pers. comm.). Considering this, we are more confident on the accuracy of data from the working groups as provided by the IEO which is based on individual surveys of every single Spanish vessel landing at the Canarian ports.

The cephalopod fishery

Cephalopods were always caught as a by-catch of the Saharan demersal fishery (between 21ºN and 28ºN) but it was only in the 1960s that significant markets opened for these species (Balguerías *et al.*, 2000). The Spanish cephalopod fishery started in 1963 in the region of Dakhla (located between Cap Blanc (21ºN) and Cap Bojador (26ºN)) using trawlers which, initially, were delivering their catches to processing boats. By 1969, the Spanish fleet had 39 freezer trawlers and very soon became completely autonomous from the processing boats. The number of Spanish vessels increased to 297 boats in 1980, then gradually decreased to around 80 in 1999 due to the restrictions introduced in successive fishing agreements between the European Union and Morocco. In parallel, the activity of the Moroccan fleet which started fishing for cephalopods in the region in 1978, increased continuously to 324 boats in 1991, decreasing slightly down to 300 boats during the last decade (Lamboeuf, 1997a).

Data on landings of cephalopods by Spanish vessels have been prepared using Spanish official statistics for the period 1933-1972 and statistics collected by the IEO and submitted to the various working groups for the period 1973-1997. The series shows that the fishery had its strongest years between 1973 and 1983, with an average yearly catch of 75 thousand tonnes (Figure 4). The average catch between 1984 and 1996 decreased substantially to 39 thousand tonnes, mostly due to the reduction in the number of vessels authorized to fish. Octopus (*Octopus vulgaris*), represents an average of 65% of the total catch in the period of the specialized fishery (1963-1996). Squids, mainly *Loligo vulgaris*, and cuttlefishes, mainly *Sepia hierredda*, constitute secondary targets. Their proportions in the catch vary considerably between years (Figure 4).

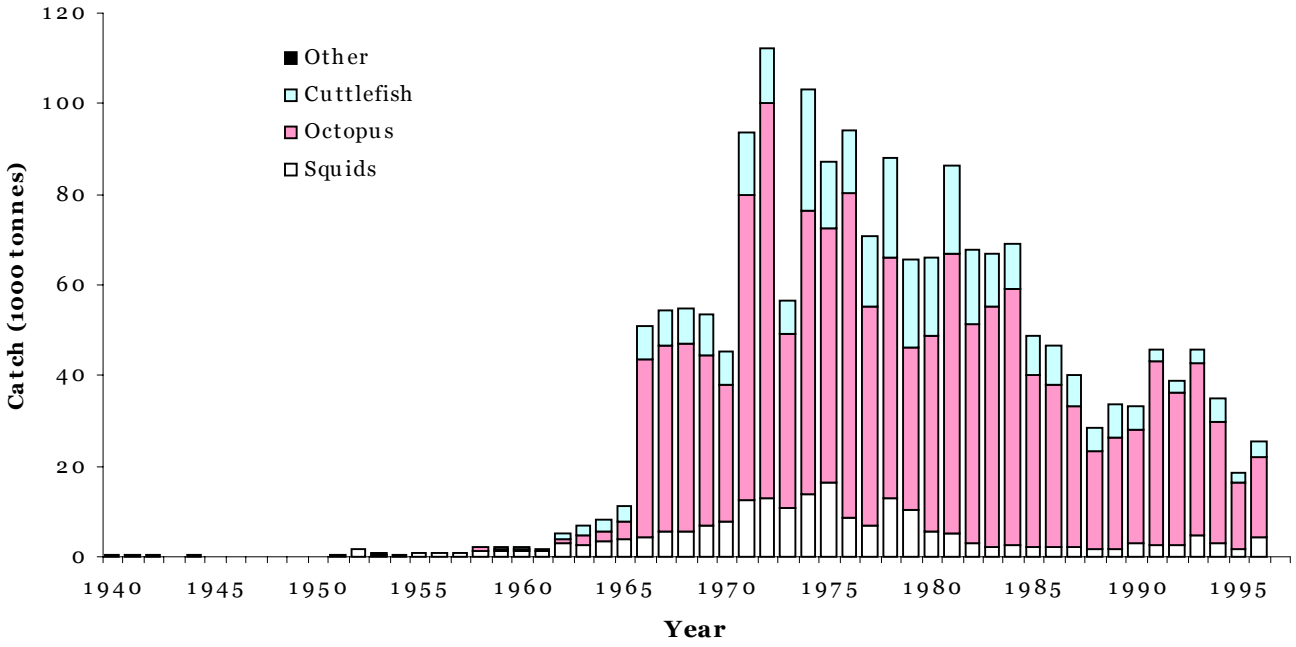

Figure 4. Breakdown of the cephalopod landings from the coast of the Sahara.

The hake and shrimp fishery

Two species of hake are found along the coasts of Morocco and Sahara. The white hake, *Merluccius merluccius*, is distributed approximately from the Strait of Gibraltar (36ºN) to Cap Blanc (21ºN). The Senegalese hake, *Merluccius senegalensis* has a more southerly distribution. It is found mixed with *M. merluccius* starting at Cap Cantin (33ºN), and occurs together with the black hake (*Merluccius polli*) in latitudes south to Cap Blanc (21ºN).

Spanish trawlers started to fish on the Moroccan coast in the middle of the 19th century, although the fishery developed rapidly only after the Spanish Civil War (1936-1939) (Sobrino, 1998). The boats presently in use were built in the 1940s, and target both hake and the deepwater shrimp *Parapenaeus longirostris*. The secondary species caught vary among landing sites and include blue whiting (*Micromesistius poutassou*), scarlet prawn (*Plesiopenaeus edwardsianus*) and Norway lobster (*Nephrops norvegicus*). The effort of the Spanish trawlers has declined over the years as fishing activity has become increasingly restricted in the successive agreements between the European Union and Morocco (Ramos *et al.*, 2000).

The use of gillnets started in 1977, developed particularly in 1992 and 1993, and decreased in 1994 after monofilament was banned. The main gillnet target is white hake although an important augmentation has been observed in catches of the Senegalese hake during the last years, probably due to the extension to the south of the traditional fishing grounds. Secondary species caught in the fishery are seabreams (*Pagellus* spp., *Dentex* spp.), anglerfishes (*Lophius* spp.) and John dory (*Zeus faber*).

Spanish longliners started fishing in Moroccan waters in 1982. The target species of the fleet is white hake, followed in importance by Senegalese hake and Atlantic pomfret (*Brama brama*). The latter species seems to have become more abundant and a part of the fleet is now targeting them exclusively. Their main fishing grounds extend between 31ºN and 36ºN but during the last years they have extended their activity to grounds along the Saharan coast (21ºN-28ºN) which is reflected in the augmentation of catches with the Senegalese hake.

There is also a specialized fishery targeting *Merluccius senegalensis* which is exclusively by Spanish trawlers in Saharan waters. Bycatch species in this fishery are mostly seabreams (*Dentex* spp.), John dory and anglerfishes.

The landing series of hake (*Merluccius* spp.) and shrimp (*Parapenaeus longirostris*) from all the Spanish fisheries (trawlers, gillnetters and longliners) in the Moroccan and the Saharan coasts have been prepared using the Spanish official statistics (from 1940 to 1972) and the statistics collected by the IEO and submitted to

the various working groups (from 1973 to 1997) (Lamboeuf, 1997c). Catches of hakes increased substantially in 1970 and remained high for several years while those of *Parapenaeus longirostris* have been relatively high in the period 1958-1969 and slightly lower but stable ever since (Figure 5). Nevertheless, the initial increase in hake landings may be attributed to improvements in reporting rather than actual catch increases, as catch estimates of any of these species before 1970 are considered unreliable (Anon., 1978c) and do not include the landings made in Andalusia where most of the fleet was based. The hake fisheries decreased somewhat in the mid and late 1980s before increasing again in the early 1990s (Figure 5). These latter changes are expected considering the concurrence of imposed restrictions by fishing agreements of the Spanish fleet in terms of number of vessels allowed to fish and the simultaneous establishment of new fisheries targeting hake (gillnetters, longliners).

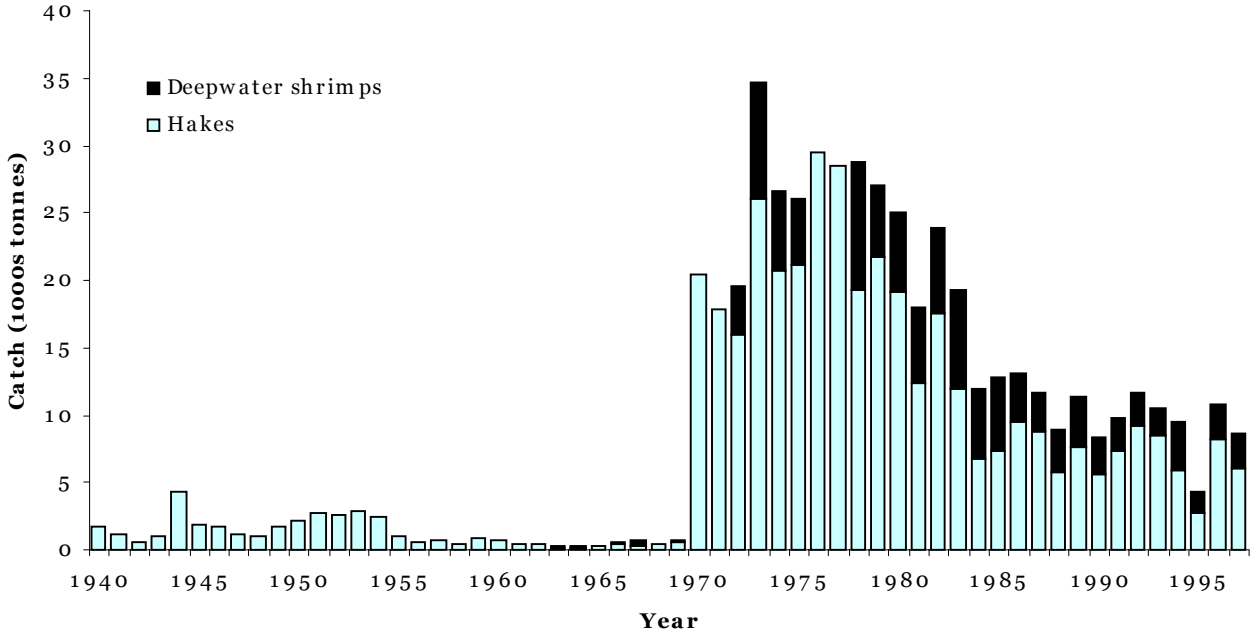

Figure 5. Landings of the Spanish hake and deep water shrimp (rose shrimp) fishery on Morocco and the coast of Sahara.

Sparids and other demersal fish (except hake)

Sparids are targeted by hook and line and trap fishers operating from the Canaries. This artisanal fishery which occurs in Saharan waters (21°N-26°N) started in the 15th century and was exclusively exploited by Canarian fishers until the middle of the 20th century. During the Second World War many trawlers displaced from their traditional fishing grounds went south to operate in the Sahara fishing for finfish. After the war the activity of these industrial fleets consolidated and diversified in the course of the years giving place to more specialized fisheries (e.g., cephalopods, hake). Meanwhile the Canarian artisanal fishery became gradually less important in relation to the newly established fisheries (Balguerías, 1995).

Consequently, nowadays sparids and other demersal fish are target species only for the Canarian artisanal fleet operating the Saharan coast, but are also fished incidentally by other industrial fleets working both the Moroccan and the Saharan coasts (Anon., 1986). Taking these circumstances into account, it is difficult (if not impossible) to reconstruct the catch series for these demersal species since most of them are not declared or recorded in the landings of the industrial vessels. Even when reported, these demersal species are usually grouped under the heading 'other fish'. This is clearly the case for Spanish fisheries occurring in the Moroccan coast (28°N-36°N).

Regarding the Spanish fisheries in the Sahara, there is a series of landing data extracted from the Spanish official statistics (from 1940 to 1972) and the statistics collected by the IEO (from 1973 to 1997, and submitted to the various working groups). The former provides information on global catches by species or group of species from

all fleets operating in the region. The latter has been gathered by fleet, but pools species in general groups except for the Canarian artisanal fleet for which there are complete records by species for the period 1980 to 1998. Major catches of this fleet are the Sparids *Dentex gibbosus* (30% on average over the total catch in the whole period) and *Spondyliosoma cantharus* (16%) and the Haemulid *Plectorhinchus mediterraneus* (14%). Other species have accounted for less than 10% of the total catch in the period 1980-1998. The importance of these annual catches in terms of weight is negligible compared to those of the industrial fleets. Annual catches range from a minimum of 1,100 tonnes in 1995 (due to the seven months of inactivity during the re-negotiation of the fishing agreement between the European Union and Morocco) to a maximum of 3,100 tonnes in 1993, with an average catch of around 2,000 tonnes over the whole period.

Landings of demersal fish by the Spanish freezer trawlers fishing for cephalopods on the Saharan coast from 1973 to 1998 have varied between 3,900 tonnes and 15,500 tonnes with a mean annual value of 9,700 tonnes. Most of these catches (around 20% in weight) were constituted of flatfishes (Pleuronectiformes, especially *Solea vulgaris* and *Dicologoglossa cuneata*), while sparids account for only 2% to the total catch in the period considered. The remaining Spanish industrial fleets operating in the area (trawlers, longliners and gillnetters fishing for hake) have smaller by-catch of demersal fish in their landings

Another apparent source of bias in estimating actual catches of demersal fish by Spanish vessels fishing off the Moroccan and Saharan coasts are discards. This practice has only been assessed in the Spanish cephalopod fishery occurring in the Sahara. Several experiments carried out on the subject in 1976, 1977, 1989 and 1990 showed that the mean percentage of discarded animals and plants in the fishery was approximately 62%. These discards were mostly comprised of invertebrates other than cephalopods and some sparid species (Balguerías, 1997). However, dramatic changes can be observed in discards depending on the season and the geographic location of the hauls. Discards in hake fisheries are unknown but they are believed to be much smaller giving the selectivity of some of the gears employed (specially the longlines) and the smaller biodiversity and abundance of other fish species at the depths where fishing takes place. No discards or negligible discards have been recorded in the Canarian artisanal fishery, based on observer coverage on some vessels of the fleet.

Looking at the complete catch series of demersal fish (except hake) from the Sahara, it seems that sparid landings have been periodic, with high values in the mid-1940s and the 1960s (Figure 6). This trend is most likely related to the establishment of the trawling fishery after the Second World War and the beginning of the cephalopod fishery. Catches of other demersals are low in comparison. Those of drums or croakers (Sciaenidae) and grunts (Haemulidae) have decreased since the 1960s, while those of flatfishes (Pleuronectiformes) have increased proportionally (Figure 6) because of their higher commercial value and their abundance in the cephalopod fishing grounds.

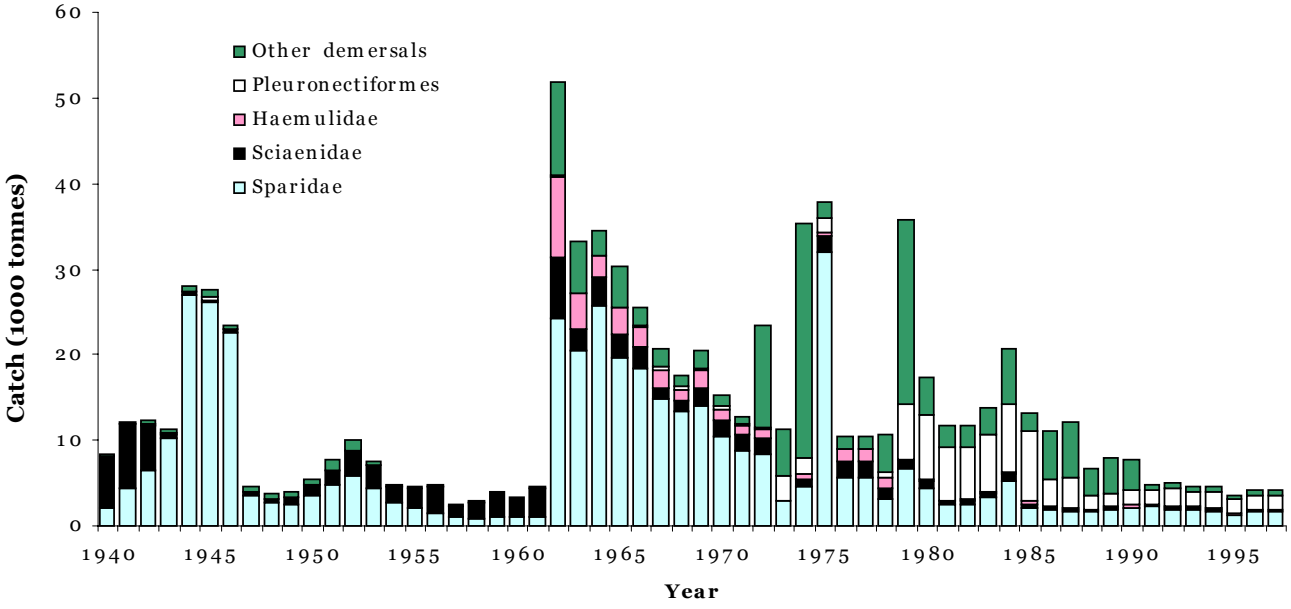

Figure 6. Landings of demersal fish other than hake from the Spanish demersal fishery on the coast of Sahara.

REFERENCES

Anonymous, 1978a. Rapport du Groupe de Travail *ad hoc* sur l'évaluation des stocks de cephalopodes. FAO, Rome, Santa Cruz de Tenerife, Canaries, Espagne, COPACE/PACE/Ser. No. 78/11, 135 pp.

Anonymous, 1978b. Report of the *ad hoc* Working Group on sardine (*Sardina pilchardus* Walb.). FAO, Rome, Casablanca, Morocco, CECAF/ECAF/Ser. No. 78/7, 35 pp.

Anonymous, 1978c. Report of the first *ad hoc* Working Group on hakes (*Merluccius merluccius* (Linnaeus), *Merluccius senegalensis* (Cadenat), *Merluccius cadenati* (Doutre)) in the norther zone of CECAF. FAO, Rome, Santa Cruz de Tenerife, Canariy Islands, Spain, CECAF/ECAF/Ser. No. 78/9, 93 pp.

Anonymous, 1982. Report of the Special Working Group on cephalopod stocks in the northern region of CECAF. FAO, Rome, Santa Cruz de Tenerife, Canary Islands, Spain, CECAF/ECAF/Ser. No. 82/24, 178 pp.

Anonymous, 1986. Report of the first ad hoc Working Group on seabreams (Sparidae) stocks on the Northern CECAF zone. FAO, Rome, COPACE/PACE/Ser. No. 86/38, 422 pp.

Anonymous, 1990. Rapport des groupes de travail ad hoc sur la sardine et sur les chinchards et les maquereaux dans la région nord du COPACE. FAO, Santa Cruz de Tenerife, Canaries, 372 pp.

Balguerías, E., 1995. La pesca de los costeros canarios en el banco sahariano: antecedentes históricos y situación actual. La chopa (*Spondyliosoma cantharus*) como ejemplo de aplicación de métodos simples para la evaluación de stocks en la pesquería artesanal. Microfichas Instituto Español de Oceanografía, número 6, 382 pp.

Balguerías, E., 1997. Discards in Fisheries form the Eastern Central Atlantic (CECAF region). *In*: Technical consultation on reduction of wastage in fisheries, pp. 183-214 Tokyo, Japan, FAO, Rome. FAO Fisheries Report No. 547 Supplement.

Balguerías, E., Quintero, M. E., and Hernández-González, C. L. 2000. The origin of the Saharan Bank cephalopod fishery. ICES Journal of Marine Science, 57:15-23.

García Santamaría, M. T., 1995. Actividad de la flota sardinal española en Africa Occidental. Aspectos biológicos de la sardina (*Sardina pilchardus*(Walbaum, 1792)), dinámica y evaluación del recurso. Microfichas del Instituto Español de Oceanografía, 1995. 5, 394 pp.

Lamboeuf, M., ed. 1997a. Groupe de travail *ad hoc* sur les céphalopodes. FAO, Rome, Ténérife, Canaries, Vol. COPACE/PACE/Ser. No. 97/63, 103 pp.

Lamboeuf, M., ed. 1997b. Groupe de travail *ad hoc* sur les sardines et atelier COPACE sur les méthodes avancées pour l'évaluation des stocks. FAO, Rome, Casablanca, Vol. COPACE/PACE/Ser. No. 97/61, 164 pp.

Lamboeuf, M., ed. 1997c. Rapport du Groupe de travail *ad hoc* sur les merlus et les crevettes profondes. FAO, Rome, Tenerife, Espagne, 26 mai-1 juin1997, Vol. COPACE/PACE/Ser. No. 97/62, 90 pp.

Ramos, A., González, R., Garcia, T., Sobrino, I., and Fernández, L., 2000. La crisis en acceso al caladero marroquí: análisis de la evolución y situación de las pesquerías y recursos de merluzas y crustáceos. Inf. Técnico del Instituto Español de Oceanografía, 178, 171 pp.

Sobrino, I., 1998. Biologia y pesca de la gamba blanca (*Parapenaeus longirostris*, Lucas 1846) en el Atlantico nororiental. PhD, Universidad de Sevilla, Sevilla, Spain.