Reconstructing discards profiles of unreported catches

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Summary: In Portugal it has been estimated that unreported catches represent one third of total catches. Herein, information on landings and total unreported catches (discards) by commercial métier were disaggregated into high taxonomic detail using published scientific studies. Fish accounted for 93.5% (115493 t) of overall unreported catches per year, followed by cephalopods (2345 t, 1.9%) and crustaceans (1754 t, 1.4%). Sharks accounted for 1.3% of total unreported catches in weight (1638 t/y). Unreported taxa consisted mostly of the commercial landed fish species: Scomber colias, Boops boops, Trachurus picturatus, T. trachurus, Merluccius merluccius, Sardina pilchardus, Liza aurata and Micromesistius poutassou, which together accounted for 70% of the unreported discarded catches. The number of unreported/discarded species was highest in artisanal fisheries, followed by trawl and purse seine. In artisanal fisheries, L. aurata, S. colias, T. picturatus, T. draco and B. boops accounted for 76.4% of the unreported discards. B. boops, S. colias and S. pilchardus were also among the most discarded purse seine species, together with Belone belone accounting for 79% of the unreported catches. In trawl fisheries, T. picturatus (16%), M. merluccius (13%), S. colias (13%) and M. poutassou (13%) accounted for 55% of the trawl discarded unreported catches. The discarded species that most contribute to overall unreported catches are those that are most frequently landed and that most contribute to overall landings in weight.

Keywords: unwanted catches; discards; commercial fisheries; trawl discards; seine discards; multispecies discards.

Reconstrucción del perfil de descartes pesqueros en capturas no declaradas

Resumen: Para Portugal se estima que las capturas no declaradas representan un tercio de las capturas pesqueras totales. Aquí se aporta información sobre las descargas y las capturas totales no declaradas (descartes) por estrategia de pesca, detalladas al máximo nivel taxonómico posible, a partir del análisis de estudios científicos publicados. Los peces óseos constituyen el 93.5% (115493 toneladas) de las capturas no declaradas anuales, seguidos por los cefalópodos (2345 toneladas, 1.9%) y los crustáceos (1754 toneladas, 1.4%). Los peces cartilaginosos representan el 1.3% de las capturas totales no declaradas, con un volumen de 1638 toneladas anuales. La composición taxonómica de las capturas no declaradas se corresponde con las especies de mayor volumen en las descargas; Scomber colias, Boops boops, Trachurus picturatus, T. trachurus, Merluccius merluccius, Sardina pilchardus, Liza aurata y Micromesistius poutassou que conforman un 70% de las capturas no declaradas/descartadas. El número de especies no declaradas/descartadas es más elevado en las pesquerías artesanales, seguido del arrastre y el cerco. En las pesquerías artesanales, el 76.4% de los descartes no declarados corresponden a L. aurata, S. colias, S. pilchardas, Trachinus draco y B. boops. B. boops, S. colias y S. pilchardus también fueron entre los más desechados, junto con Belone belone, que representa el 79% de las descargas no declaradas. En pesca de cerco, T. picturatus (16%), M. merluccius (13%), S. colias (13%) y M. poutassou (13%) proporcionan el 55% de las descargas no declaradas. Las especies descartadas que más contribuyen al total de las capturas no declaradas coinciden con las especies más frecuentemente presentes en las descargas y que más contribuyen al volumen total de descargas.

Palabras clave: capturas no deseadas; descartes; pesquerías comerciales; descartes de arrastre; descartes de cerco; descartes multifespeíificos.

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INTRODUCTION

Coastal and maritime activities have traditionally been important for the national economy and the historical, social, and cultural identity of Portugal (Leitão and Baptista 2017). The country has long relied on fishing as a major means of subsistence and many coastal communities depend almost exclusively on small-scale coastal and estuarine fisheries and related activities. However, over time substantial technological improvements and changes have been made in the fisheries. For example, in the around 1850, steam-powered vessels were introduced to the fishing fleets, resulting in a reduction of total fishers (Alves 1991). Additionally, fishers began to deploy for the first time an industrial gear, the otter trawl, which immediately created conflicts between the small-scale sector and this newly developing industrial sector (Baldaque da Silva 1891, Alves 1991). According to Hill and Coelho (2001), there was a decrease in the number of vessels in the Portuguese fishing fleet between 1989 and 1999, but this was compensated by an increase in vessel power. By 1996, 98% of the fishing fleet was motorized—a 2% increase from 1986. Today, in mainland Portugal, a variety of gears/métiers are used in the coastal fisheries, ranging from trawls to static gears such as gill nets and traps. Therefore, a wide variety of unwanted species are captured along with the target species (Gaspar et al. 2003, Gonalves et al. 2007, Bordalo-Machado et al. 2009). Different types of gear often compete for the same resources (Borges et al. 2001). However, as different gear types and métiers target different organisms (Watson et al. 2006 a, b), unreported catches such as discards also differ from métier to métier.

Discards refer to the part of the catch that is not retained on board during commercial fishing operations but is returned to the sea. Discarding of marine organisms is a widespread feature of commercial fishing operations. Discard patterns are affected initially by catch compositions, which are determined by environmental factors, the fishing gear and fishing tactics used, and ultimately by fishers themselves when they decide which parts of the catch to retain. This decision is influenced by both market and regulatory conditions, and is constrained by space and time: storage space on board the vessel and sorting time (Catchpole et al. 2014). None of the historical accounts published between 1800 and 1950 on Portuguese fisheries address unreported catches, by-catch or discards. The first study for the purse seine was published by Borges et al. (2001) in 1997. The lack of information on by-catch and discards from this period might suggest that either most of the nearshore, artisanal catches were consumed or used and not discarded, or that discarding may have been low and utterly ignored. Brandão et al. (2000) describes how all fish were processed, salted, and dried by Portuguese women, indicating that fish discards may have been minimal between 1800 and 1950.

The way different gears operate suggests that long-term monitoring is required to improve our understanding of the factors affecting discarding and of the implications of the levels of discarding on the marine community structure (Hollingworth 2000, Kaiser and de Groot 2000). The knowledge of the overall quantity of species caught in coastal marine systems (including unreported catches) is key to understanding the indirect effects of removal of particular taxa from the system. In fact, over the past three decades, renewed interest in a more ecological approach to fisheries (an ecosystem-based management approach) has emerged.

The new European Union Common Fisheries Policy, which started to be implemented in 2014, sets out a gradual elimination of discards by reducing unwanted catches and ensuring that all catches are landed. Illegal, unreported and unregulated catches (IUU) are one of the most important topics in fisheries from both an economic and an environmental point of view (Alverson and Hughes 1996, Kelleher 2005, FAO 2010). The quantification and composition of the unreported catches and the understanding of the fate and impact of these unreported actions are key issues in fisheries (Zeller et al. 2007, 2011).

In Portugal it was estimated that an average of 123,495 t/y (35.5% of the total catch) was unreported between 1938 and 2009 (Leitão et al. 2014). Overall, reconstructed total catches in Portugal amounted to just under 21.6 million t in 1950-2010, which is slightly more than twice the 10,592,310 t of landings officially reported by Portugal for the same time period. Discards contributed the most to the unreported catches, accounting for 7.6 million (i.e. 35%) t of total catches.

Many fisheries around the world have reached unsustainable levels and therefore deliver poor income to fishers. An effective fisheries management is urgently needed to improve the economic situation of fishing communities. Part of the solution is to reduce discards by finding market-based approaches that will increase the value for all by-catch fish (Leitão and Baptista 2017). The necessity of each country to manage all fisheries within their Exclusive Economic Zones (EEZ), a consequence of the United Nations Convention on the Law of the Sea (UNCLOS), led to attempts to find sustainable indicators for marine fisheries and ecosystems at the national level, including economic effects. However, information about unreported discard ban species that can comprise additional alternative value to the fishery sector is still scarce. Prohibited for the first time in some EU fisheries in 2009, economic-led high-grading is today illegal for all quota species, under amendments to fisheries technical measures enacted by the European Parliament and Council in March 2013 (Regulation (EU) No 227/2013). This means that fish that were discarded before should now have an economic value independently of their final use. Furthermore, sales of this fish will have to be accounted for and included in the country’s economy (Leitão and Baptista 2017). However, so far the amount of information regarding total volumes and species discarded is lacking. Underestimation of catches is especially important in countries where fishing fleets are highly diversified, the enforcement of fishery management is low, data availability is poor, and there is high demand for fish products in local markets (Coll et al. 2014). Estimation of unreported catches for Portuguese fishery
was based on a fishery-by-fishery approach by Leitão et al. (2014). Herein we used information of unreported catches, for each commercial métier (from Leitão et al. 2014) and we reconstructed taxonomic profiles of unreported catches, namely discards by commercial fishing sector.

MATERIALS AND METHODS

Taxonomic rebuilding of unreported discards

Details on the estimation of the amount of unreported catch per métier and for the recreational/subsistence sector are provided elsewhere (Leitão et al. 2014). Briefly, Leitão et al. (2014) used two data sources from the INE (Portuguese National Statistical office) to acquire data: the digital data series starting in 2000, and the data from manuscripts (http://inenetv02.ine.pt:8080/biblioteca/logon.do;jsessionid=6D32727FEDCD9F222333F2D3D81BD70; last accessed in April 2012) for the years 1934-1999. Many species were described by the fishing sector during the time series (e.g. sardine, European hake, horse mackerel, mackerel and octopus, which together accounted for most of the landed catches). As of the 1970s, data were available by fishing gear and many species were reported by fishing sector (trawl, seine and multi-gear). Since the gear-specific data were less complete, and taxon-specific landings before the 1970s were usually higher than gear-specific data, probable actual catches by gear-type were derived from taxonomic landings. In summary:

– First the amount of landings was estimated for each major métier (seine, trawl and multi-gear, corresponding to small-scale artisanal fishery) to allow estimation of unreported discards, using available information on gear- and sometimes target-specific discard ratios. Overall, the authors used this gear-specific data period to assign catches to major gear types for the earlier period/years when data per gear were not available. Considering that the three segments of the Portuguese fleet kept their relative proportions (Baeta 2009), no significant changes were assumed between 1938 and 1968. This approach is supported by the long time series of landings of sardine, the dominant species in Portuguese landings, which is caught mainly by purse seine. Moreover, the multi-gear sector fishery has been the main component of coastal fisheries (numbers of boats), with few technological changes. The assignment of several periods was carried out by subtracting different reported sectors from total landings (the simplest procedure). In other cases, for instance purse seine, landings estimates were based on sardine data, considering purse seine catchability and selectivity to be constant over time.

– Multi-gear estimates were straightforward, as reported landings for 1979-1982 were only available as ‘total’, ‘trawl’ and ‘purse seine’ categories. Thus, multi-gear reported landings for this period were estimated by subtracting trawl and purse seine landings from total landings.

– Trawl estimates (based on total and seine results) were assigned for 1938-1968. As both trawl components have similar discard rates (see Leitão et al. 2014), unreported estimates would not be biased by estimation of unreported landings from combined crustacean and finfish trawl statistics. Therefore, the percentage contribution of each gear to total landings was estimated for years with gear-specific data and used to reconstruct those trawl years where data were missing.

– Multi-gear landings were further disaggregated into more specific métiers. Therefore, the average percentage contribution of a single multi-gear fishery was estimated in relation to the overall multi-gear catches and used for years with no gear-specific data. The following multi-gear target fisheries were identified and differentiated and unreported discards in them were estimated: i) sardine (demersal coastal nearshore purse seine), ii) cephalopods using pots (e.g. octopus) or traps (e.g. octopus and cuttlefish); iii) bivalves; iv) crustaceans (lobster); v) other fishes (scabbardfish and large pelagics); and vi) recreational/subsistence and big-game sport fishing.

Based on the yearly total amounts of unreported catches, namely discards, per métier (and in several circumstances per species due to available information in the INE (see Leitão et al. 2014), the amounts of discards by commercial fisheries per taxa/species are estimated herein. Literature with high taxonomic detail regarding discards (covering the period 1996 to 2007) was used for this purpose (Table 1). Thus, for the commercial fishery (trawl, seine and multi-gear or small-scale artisanal fisheries) the percentage of discards per métier per taxa was compiled and total discards per taxa for each métier were estimated per year. Whenever more than one study was available for the same métier and taxa, the average value was used.

| Métier                  | Scientific source                        | Time frame                  | Regional scale                      |
|------------------------|-----------------------------------------|-----------------------------|------------------------------------|
| Black scabbardfish longline | Borgado-Machado et al. 2009              | 2005 to 2007                | Portuguese mainland and Madeira Island |
| Demersal seine (rapa)  | Borges et al. 2001                       | March 1996 to June 1997     | Algarve (southern Portugal)        |
| Dredge                 | Leitão et al. 2009                       | May 2006                    | Southwestern Portugal (Sines)      |
| Gill net and longline  | Santos et al. 2002                       | February to March 1998      | Algarve (southern Portugal)        |
| Trammel net            | Batista et al. 2009                      | October 2004 to August 2005 | Central coast of Portugal (Setúbal and Sesimbra) |
|                       | Borges et al. 2001                       | March 1996 to June 1997     | Algarve (southern Portugal)        |
|                       | Gonçalves et al. 2007                    | 1999-2000                   | Algarve (southern Portugal)        |
| Trap                   | Saldanha 2001                            | March 1996 to June 1997     | Algarve (southern Portugal)        |
| Purse seine (pelagic)  | Borges et al. 2001                       | March 1996 to June 1997     | Algarve (southern Portugal)        |
| Trawl                  | Borges et al. 2001                       | February 1999 to March 2001 | Algarve (southern Portugal)        |
|                       | Costa et al. 2008                        |                             |                                    |
The discard rates of unreported catches per sector are presented in Supplementary Material Table S1.

In addition to the INE data, we used the detailed database of the Direcção Geral das Pescas e Aquicultura (DGPA), available for the years 1989 to 2009. The DGPA database comprises information of landing per fishing sector and by species (or groups, e.g. *Diplodus* spp.). Based on the landings of each taxonomic group (and gear) from the DGPA, we estimated the number of species and proportion in catches for the INE data, to group the following categories.

The amount of shrimps, prawns and *Nephrops norvegicus* since 1969 depends mostly on trawl crustacean fisheries that specifically target these groups. Before 1969 little was known about the crustacean fishery in Portugal. Therefore, for these groups catches before 1969 were not rebuilt.

For Mollusca the same procedure as for crustacea was followed, since the resolution of the data also only increased after 1969 in the INE database. In the DGPA database cephalopods account for four reported taxa: octopus (*Octopus vulgaris*), squid (*Loligo vulgaris*), *Octopus vulgaris* (and gear) from the DGPA database comprises information of landing per fishing sector and by species (or groups, e.g. *Diplodus* spp.). Based on the landings of each taxonomic group (and gear) from the DGPA, we estimated the number of species and proportion in catches for the INE data, to group the following categories.

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Until 1969, most landed fish taxa were included as non-specified marine fish (INE category = “Diverse marine fish”), which include both *Osteichthyes* and *Chondrichthyes*. Based on INE data available from recent years (between 1991 and 2009), the proportion of “Other fish” was re-estimated (5.83%), with the remaining proportion being used to re-distribute “Other fish” by taxa category whenever data per taxa were missing (using the DGPA database). The average percentage contribution of each taxa to total catch was therefore used to rebuild and redistribute “Other fish” by each taxa. The categories of commercial groups in the INE database include the following:

- Other crustaceans (crabs, such as *Maja squinado* and *Cancer pagurus* and other non-specified crustaceans).

- Bivalves, including subtidal coastal clams (*Donax* spp., clams and razor clam), herein considered to be mainly caught by the artisanal/multispecies dredge fishery/sector.

- Pagellus spp. (*Pagellus bogaraveo* and *Pagellus erythrinus*).

- Pleuronectiformes (Turbot, *Microchirus* spp., *Microchirus variegatus*, Flatichthys flesus, *Psetta maxima*, Solea spp., *Solea lascaris*, Solea solea, *Lepidorhombus boscii*, *Lepidorhombus hiihiagoonis* and *Pleuronectes platessa*).

- Sparidae (*Spondylusosoma cantharus*, *Sparus aurata*, *Diplodus* spp. and *Sarpa salpa*).

- *Thunnus* spp. and other tunas (*Thunnus thynnus*, *Katsuwonus pelamis*, *Thunnus albacares* and *Auxis rochei*).

- The “Other fish” category includes *Pagrus* spp., *Dentex* spp., *Merluccius* spp., *Beryx splendens*, *Merlangius merlangus*, *Polyprion americanus*, *Argyrosomus regius*, *Dicentrachus* spp., *Aloso* spp., *Lophius* spp., *Gurnards*, *Mullets*, *Helicolenus dactylopterus*, *Serranidae*, *Zeus faber*, *Beryx decodontus*, *Anguilla anguilla* and *Brama brama*.

RESULTS

There are few studies on reconstruction of unreported discards with higher taxonomic resolution, because of the enormous time required for obtaining sound fisheries information, processing the data and developing/applying accurate methodologies. After we estimated IUU in a previous study (see methods in Leitão et al. 2014), we reconstructed unreported discard profiles, because enhancing taxonomic information on discards is imperative for fisheries management within the new CFP and the landing obligation directive. Inevitably, reconstructions of catches are largely based on assumptions derived by analyses of recent data (e.g. discards studies, Table 1). For example, in the present work, the catch composition and discard ratios were mainly based on studies dating from after the mid-1990s but the reconstruction goes back to 1938. Furthermore, the recent studies may cover a small region, raising the question of whether the discards estimates apply to the whole Portuguese mainland. The Portuguese fishery is characterized by nearshore fisheries with the top rank preference in terms of species changing little over time (Almeida et al. 2015). In fact, small pelagics (Sardine *pilchardus*, *Trachurus* spp. and *Scomber* spp.) and European hake, for instance, account for the greater proportion of the catches (landed and discards). These groups/species are data rich in the INE long-term database. Therefore, for the main métiers and traditionally consumed species, the rebuilding and taxonomic disaggregation of the discarded species (most of which match the landed species) should be considered more accurate, whereas in the case of species with smaller catches, rebuilding procedures may introduce larger estimation errors. However, the number of unreported species discarded is independent of the percentage in weight of the unreported discards estimated. That is, we can assume that qualitative analyses might be less affected than quantitative estimations in rebuilding methods. The average total number of marketable taxa landed per year is around 296 (Source: DGPA 1989-2009), with 225 taxa being discarded. Of the 225 species discarded, approximately half (109 taxa, 48%) are also landed or reported/discriminated at auction (according to the DGPA database). Therefore, this study showed that 89% of unreported bony fish and shark species are thought to have commercial value.

The compositions of unreported and landed catches do not vary much in terms of the main groups caught (Fig. 1, Table 2). In the Portuguese mainland fisheries the landings comprised mostly fish (84.5%), with cephalopods and crustaceans accounting for 2.9% and 1.3% of the total catches, respectively. For the period 1938 to 2009, the average landings of fish, cephalopods and crustaceans were 207419, 7162 and 3187 t (Fig. 1, Table 2). In the Portuguese mainland fisheries, the landings comprised mostly fish (84.5%), with cephalopods and crustaceans accounting for 2.9% and 1.3% of the total catches, respectively. For the period 1938 to 2009, the average landings of fish, cephalopods and crustaceans were 207419, 7162 and 3187 t (Fig. 1, Ta-
Fish accounted for 93.5% of the total unreported catches, with an average of 115493 t/y. The contributions of cephalopods and crustaceans to the unreported catches are minor compared with those of fish: 1.9% and 1.4% of total unreported catches, with averages of 2345 and 1754 t/y, respectively (Fig. 1, Table 2). The shark group accounts for 1.3% of total unreported catches in weight (1638 t/y). The recreational/subsistence fishery focuses mainly on fish, but there are no studies or data available on recreational fisheries/harvesting that target small invertebrates such as mussels, goose-barnacles or, more recently, sea urchins.
Table 2. – Average catches in weight (±SD) of landed and unreported (discarded) catches per commercial groups, with respective relative contribution (%) of each group to total group catch and overall catch, for the period 1938-2009.

| Commercial group | Landed (MT) | % landed | Unreported (MT) | % unreported | Total catch (MT) | Ratio IUU/total group catch (%IUU) | Ratio IUU/total catch (%IUU) |
|------------------|-------------|----------|-----------------|--------------|-----------------|-----------------------------------|------------------------------|
| Fish             | 207419 (±57399) | 84.5     | 115493 (±38008) | 93.5         | 322911 (±94492) | 35.8                              | 33.2                         |
| Sharks           | 649 (±467)    | 0.3      | 1638 (±725)     | 1.3          | 2287 (±1106)    | 71.6                              | 0.47                         |
| Rays             | 1971 (±850)   | 0.8      | 154 (±64)       | 0.1          | 2125 (±872)     | 7.2                               | 0.04                         |
| Bivalvia         | 1959 (±3049)  | 0.8      | 50 (±101)       | 0.0          | 2009 (±3140)    | 2.5                               | 0.0                          |
| Cephalopoda      | 7162 (±3932)  | 2.9      | 2345 (±1007)    | 1.9          | 9508 (±3762)    | 24.7                              | 0.68                         |
| Gastropoda       | 55 (±21)      | 0.04     | 55 (±21)        | 100.0        | 55 (±21)        | 100.0                             | 0.02                         |
| Other Mollusca    | 1563 (±1535)  | 0.6      |                 |              | 1563 (±1535)    | 0.0                               | 0.0                          |
| Crustacea        | 3187 (±4489)  | 1.3      | 1745 (±721)     | 1.4          | 4931 (±4322)    | 35.4                              | 0.5                          |
| Other fish and invertebrates | 8.7 | 2016 (±833) | 1.6 | 2016 (±833) | 100.0 | 0.6 |

Between 1938 and 2009, sardine (S. pilchardus, 44.8%), horse mackerel (T. trachurus, 14.8%), hake (M. merluccius, 5.7%), chub mackerel (Scomber colias, 5.6%) and octopus (Octopus vulgaris, 2.3%) together accounted for an average of 73.2% of the landings (163826 t/year) and 36.8% of unreported catches (450411 t/year) (Table 3, Fig. 2). The unreported species included mainly S. colias (17.6%), Boops boops (9%), Trachurus picturatus (8.6%), M. merluccius (8.3%), S. pilchardus (7%), Liza aurata (7%), Micromesistius poutassou (6.9%) and T. trachurus (3.6%), all marketable species, making the sorting of large catches uneconomical, tivity of trammel nets (Erzini et al. 2006, Stergiou et al. 2006). In the Algarve (south coast of Portugal), one exhaustive study showed that more than 900 species can be caught and discarded by the commercial fishery (trawls, purse seine and trammel nets): 69% are always discarded, 27% are frequently discarded and only 4% are occasionally discarded (Borges 2007). The number of taxa recorded above is far greater than those reported herein that were based on specific scientific literature. This finding might be related to the fact that scientific surveys are usually restricted to short time periods and are also limited in terms of the geographic area surveyed (scientific surveys onboard commercial boats allow exhaustive faunistic records to be obtained).

In multi-gear fisheries the unreported catches consisted mainly of L. aurata, S. colias, S. pilchardus, Trachinus draco and B. boops (Fig. 2, Table 3). Together, the latter species account for 76.4% of the multi-gear discards, with an average of 17935 t/y. The unreported multi-gear catches of S. colias, S. pilchardus and B. boops were mostly due to demersal seine and trammel net discards, while those of L. aurata were mostly due to demersal purse seine discards (see Supplementary Material Table S2).

As in the multi-gear category, B. boops, S. colias and S. pilchardus were the species most discarded by purse seiners (Table 3). Together with Belone belone, these species accounted for 79% of the unreported purse seine discards, with an average of approximately 19027 t/y. In purse seiners that use electronic equipment to detect the schools around which the seine net is set, the lack of success in determining the species and/or size composition of the fish in the school before setting the net is a major factor leading to high volume discards. In fact, the target species (sardine or horse mackerel) may also be captured and discarded when mixed with by-catch species, making the sorting of large catches uneconomical, and when the sizes caught are not suitable for the market or for canning (Borges et al. 2001).

In Portugal, the “trawling” category includes two different fleet components: deepwater trawlers that target crustaceans, and fish trawlers that operate mainly on the continental shelf (CEC 1993). Fishing
Table 3. – Top ten species landed and unreported in Portugal Mainland fisheries, for the period 1938-2009.

| Species                      | Taxa Group | Tonnes (±SD) | %   |
|------------------------------|------------|--------------|-----|
| **Total catch**              |            |              |     |
| Sardina pilchardus           | Fish       | 109004 (±27351) | 31.4|
| Trachurus trachurus          | Fish       | 37689 (±1097) | 10.8|
| Scomber colias               | Fish       | 34342 (±12533) | 9.9 |
| Merluccius merluccius        | Fish       | 22923 (±13171) | 6.6 |
| Micromesistius poutassou     | Fish       | 12689 (±5140) | 5.5 |
| Trachurus picturatus         | Fish       | 12378 (±5291) | 3.6 |
| Boops Boops                  | Fish       | 12022 (±3199) | 3.5 |
| Liza aurata                  | Fish       | 8650 (±6239) | 2.5 |
| Scomber scombrus             | Fish       | 6251 (±1967) | 1.8 |
| Octopus vulgaris             | Cephalopoda| 5729 (±2970) | 1.5 |
| Others                       |            | 86178 (±27906) | 24.8|
| **Landed**                   |            |              |     |
| Sardina pilchardus           | Fish       | 100312 (±25625) | 44.8|
| Trachurus trachurus          | Fish       | 33187 (±15418) | 14.8|
| Merluccius merluccius        | Fish       | 12652 (±8936) | 5.7 |
| Scomber colias               | Fish       | 12559 (±7265) | 5.6 |
| Occopus vulgaris             | Cephalopoda| 11616 (±3001) | 2.3 |
| Micromesistius poutassou     | Fish       | 4188 (±218) | 1.9 |
| Trisopterus laticaudus       | Fish       | 3940 (±1549) | 1.8 |
| Scomber scombrus             | Fish       | 3045 (±1454) | 1.4 |
| Lepidopus caudatus           | Fish       | 2621 (±7225) | 1.2 |
| Pagellus spp.                | Fish       | 2234 (±944) | 1.0 |
| Others                       |            | 44055 (±15820) | 19.7|
| **Unreported**               |            |              |     |
| Scomber colias               | Fish       | 21784 (±7048) | 17.6|
| Boops Boops                  | Fish       | 11162 (±2868) | 9.0 |
| Trachurus picturatus         | Fish       | 10659 (±4865) | 8.6 |
| Merluccius merluccius        | Fish       | 10271 (±4529) | 8.3 |
| Sardina pilchardus           | Fish       | 8692 (±2476) | 7.0 |
| Liza aurata                  | Fish       | 8650 (±6239) | 7.0 |
| Micromesistius poutassou     | Fish       | 8501 (±3879) | 6.9 |
| Trachurus trachurus          | Fish       | 4502 (±1886) | 3.6 |
| Belone belone                | Fish       | 3614 (±966) | 2.9 |
| Scomber scombrus             | Fish       | 3205 (±1026) | 2.6 |
| Others                       |            | 32454 (±11688) | 26.3|
| **Unreported - multi-gear**  |            |              |     |
| Liza aurata                  | Fish       | 8650 (±6239) | 35.9|
| Scomber colias               | Fish       | 4382 (±2597) | 18.2|
| Sardina pilchardus           | Fish       | 3133 (±1304) | 13.0|
| Trachinus draco              | Fish       | 930 (±387) | 3.9 |
| Boops Boops                  | Fish       | 840 (±628) | 3.5 |
| Microchirus azevia           | Fish       | 830 (±345) | 3.4 |
| Chelidonichthys obscurus     | Fish       | 745 (±310) | 3.1 |
| Merluccius merluccius        | Fish       | 708 (±581) | 2.9 |
| Scopinaea notata             | Fish       | 614 (±639) | 2.5 |
| Pagellus acarne              | Fish       | 465 (±193) | 1.9 |
| Others                       |            | 2793 (±952) | 11.6|
| **Unreported - seine**       |            |              |     |
| Boops hoops                  | Fish       | 7466 (±1995) | 31.3|
| Scomber colias               | Fish       | 4335 (±1159) | 18.2|
| Belone belone                | Fish       | 3613 (±965) | 15.2|
| Sardina pilchardus           | Fish       | 3613 (±965) | 15.2|
| Macroramphous scolopax       | Fish       | 2649 (±708) | 11.1|
| Scomber scombrus             | Fish       | 1445 (±386) | 6.1 |
| Halobatrachus didactylus     | Fish       | 241 (±64) | 1.0 |
| Spicara flexuosa             | Fish       | 241 (±64) | 1.0 |
| Trachurus trachurus          | Fish       | 241 (±64) | 1.0 |
| **Unreported - trawl**       |            |              |     |
| Trachurus picturatus         | Fish       | 10659 (±4865) | 15.9|
| Merluccius merluccius        | Fish       | 8854 (±4041) | 13.2|
| Scomber colias               | Fish       | 8642 (±3944) | 12.9|
| Micromesistius poutassou     | Fish       | 8494 (±3877) | 12.6|
| Trachurus trachurus          | Fish       | 3888 (±1775) | 5.8 |
| Capros aper                  | Fish       | 2522 (±1151) | 3.8 |
| Chondrichthyes               | Fish       | 2178 (±994) | 3.2 |
| Boops hoops                  | Fish       | 1985 (±906) | 3.0 |
| Conger conger                | Fish       | 1974 (±901) | 2.9 |
| Sardina pilchardus           | Fish       | 1947 (±888) | 2.9 |
| Others                       |            | 16082 (±7340) | 23.9|

Trip duration is one of the most important factors influencing the proportion of the fish by-catch that is commercialized, and the quantity of by-catch landed is inversely related to trip duration (Clucas 1997, Costa et al. 2008). The main species unreported due to trawl discards differed from both the multi-gear (small-scale/artisanal) and purse seine fleets. For the trawls, *T. picturatus* (16%) and *M. merluccius* (13%)
were the most discarded species, accounting for 29% of the unreported catches and approximately 19514 t/y. Together with *S. colias* (13%) and *M. poutassou* (13%) these species comprised more than half (55%) of the unreported trawl catches. The occurrence of high concentrations of small, non-commercial species such as *Capros aper* and *Macroramphosus scolopax* accounts for the occasional high volume discards witnessed onboard trawlers (Borges et al. 2001). However, in this analysis different trawl studies were used and *C. aper* was the sixth most important species in terms of trawl discards.

Despite some overlap in the species that contribute most to unreported discards of different metiers, some
significant differences were found. In fact, the discards of sharks were always higher than landings in all the time series, which is not surprising in view of discard rates for most species (see studies on trawl, Table 1). In fact, the catch ratio of IUU sharks/total sharks showed that 71.6% of the sharks are discarded without being reported (Table 2). The discards of sharks have increased in the last few decades although landings of sharks have not. This finding may also be related to discards of deepwater sharks, which were formerly used to produce liver oil, including during the Second World War. Compared with other sectors (see also Supplementary Material Table S2), trawlers (mainly crustacean trawls) discard considerable quantities of mainly deepwater sharks such as Scylliorhinus canicula, Galeus melastomus, Etmopterus pusillus and Hexanchus griseus, which may have poor resilience to high levels of fishing mortality because of their life history characteristics (Stevens et al. 2000). In such deepwater communities with long-lived, slow growing, low-fecundity species, fishing activity with associated discard-related mortality may be expected to severely impact some populations of non-commercial species and in the long-term result in community changes (Kaiser and de Groot 2000).

DISCUSSION

The results showed that independently of the métier, common marketable species account for most of the unreported discarded catches. In fact, the species that most contribute to overall unreported catches are among the most frequently landed and are those that contribute most to overall landings. This point is important, because these species are considered choke species under the new Common Fisheries Policy landing obligation. So what are the implications of the landing obligation in relation to this finding and what is the value of this study? The identification of discarded species is a key factor for launching the debate regarding their use, particularly because most of them have quotas/total allowed catches (TACs). Until recently, the EU prohibited discards of fish with established quotas which could be legally landed (high-grading). However, it was legal to discard non-commercial fish and other organisms. As discussed by Leitão and Baptista (2017), it is difficult to know with certainty whether there will be any costs for fishermen if they land more fish than their quota for one or more species. In short, fish caught in excess of individual quotas can be marketed normally and “by-catch quotas” can be set as part of the fishing opportunities established by the EU council each year.

The difficulty of managing Portuguese fisheries can be largely attributed to their multi-gear nature, insufficient research (funding and lack of support for monitoring and analysis of non-target fisheries) and unreported catches, which affect stock assessment and management. Fisheries data collection, advice and management have traditionally been based on single-species approaches. However, ignoring interactions between métiers and species could lead to an undesirable situation in which fishing for one species may lead to discarding of another whose quota has already been exceeded. Moreover, the by-catch and discarding of non-target species may have negative consequences for non-commercial as well as commercial species due to influences on species interactions and consequent cascading effects throughout the trophic web (Harris and Poiner 1990, Hill and Wassenberg 1990, Yamamura 1997).

Borges (2007) state that the main reasons for discarding are economic restrictions (e.g. low or no commercial value of the species with no immediate market) and technical restrictions (fishing gear selectivity). Moreover, Bellido et al. (2011) reported that discarding may have a number of adverse ecological impacts on marine ecosystems, causing changes in the overall structure of trophic webs and habitats, which could in turn pose risks for the sustainability of current fisheries. Discarding is less frequently associated with legal/administrative restrictions such as quotas, minimum landing size and TACs. However, given the overfished state of many of the world’s most important stocks (Pauly et al. 2002, Leitão 2015), there has been great interest in documenting and finding solutions to the economic, political, and ecological implications of by-catch and discarding (Costa et al. 2008). Research on by-catch utilization is rapidly moving to the field of food and nutrition research, creating value-added fish products from by-catch or discarded fish: extracting gelatin from Alaska pollock (Theragra chalcogramma; Zhou and Regestein 2005) and shark cartilage (Isurus oxyrinchus, Cho et al. 2004), and even using these value-added products as alternatives to the use of mammalian gelatin (Karim and Bhat 2009).

There are still few summaries of estimates of unreported discards, especially with taxonomic detail. However, a complete review of IUU catches was made by Pauly and Zeller (2016). Overall, world results show that the taxonomic composition of unreported catches of the main target species vary considerably among areas, which is an expected result as fish assemblages, and target species, differ among regions. However, small pelagics and some demersal species are some of the most frequently reported species in the Mediterranean and Southern Europe (Coll et al. 2014, Pauly and Zeller 2016). Coll et al. (2014) showed that in Southern Europe unreported catches were due to (i) illegal catches of commercial species (undersized or with quotas, such as bluefin tuna), (ii) illegal fishing techniques (such as the Spanish drift net fishery after the 1992 ban), and (iii) portions of misreported catches of protected species or species at risk (such as pelagic sharks). Illegal catches in the study area were mainly identified as juvenile commercial species such as juveniles of demersal species as hake or small pelagic fish such as sardines and anchovies. These results are similar to those found herein for unreported discards of species/groups. In Italy the main taxa discarded were clams (Bivalvia; 12.0%), sharks (Selachimorpha; 8.9%), jacks (Trachurus spp. 6.7%) and rays (Rajidae; 5.6%) (Piroddi et al. 2015). In fact, the worldwide unreported proportion is most often due to the dis-
carded component (Pauly and Zeller 2016). It remains, however, to be determined whether worldwide total unreported discard species also match the commercial species most frequently landed and with the highest contribution to total catch, as in Portugal.

From an economic perspective, there are possibilities for making better use of some discarded species, thereby possibly reducing the pressure on target species (Leitão and Baptista 2017). Most of the discarded species in Portuguese fisheries have been shown to have economic potential. The critical factor is that sustainable management of fishing resources must take place in the ecosystem context, with a good understanding of all the possible effects of fishing activities (Borges 2007). Any effect on one stock, population or species may produce a change in another, resulting in readjustment in both populations (Hongskul 1979, Saita 1983, Kennelly 1995). Moreover, discard estimates are necessary, not only to evaluate the impact of fishing on non-commercial species but also on ecosystems as a whole (Alverson et al. 1994, Hall 1999), since they are not usually taken into account in stock assessments (Borges et al. 2005). Knowledge of unreported catches may change the way we assess the marine ecosystem, including the poorly understood trophic effects of fisher- ies in the marine environment, thereby improving our understanding of fishing trend variability and catch predictions.

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Reconstructing discards profiles of unreported catches

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Supplementary material
| Métier   | Species                                                                 | % of the discards |
|----------|------------------------------------------------------------------------|-------------------|
| Trawl    | Argentia sphyraena                                                    | 0.02551           |
|          | Argobuccinum olearium                                                 | 0.02551           |
|          | Boops boops                                                           | 2.95311           |
|          | Caelorinchus caelorhincus                                              | 0.01276           |
|          | Capros aper                                                           | 3.75166           |
|          | Cassidaria tyrrhena                                                   | 0.02551           |
|          | Cephalophodida                                                        | 1.14808           |
|          | Chimaira monstrosa                                                    | 0.00255           |
|          | Chondrichthyes                                                        | 3.24013           |
|          | Citharus linguatula                                                   | 0.00255           |
|          | Conger conger                                                         | 2.93652           |
|          | Dardanus arsoros                                                      | 0.05103           |
|          | Diverse                                                               | 1.65833           |
|          | Echinoidea                                                            | 0.14032           |
|          | Eledone cirrhosa                                                       | 0.00383           |
|          | Eledone moschata                                                       | 0.00128           |
|          | Enomepterus pusillus                                                   | 0.00128           |
|          | Gadilusus argentus                                                    | 1.12384           |
|          | Galeus melastomus                                                     | 0.60465           |
|          | Helicoleucus dactylopterus                                             | 0.30870           |
|          | Hexanchus griseus                                                     | 0.00128           |
|          | Holothuroidea                                                         | 0.79090           |
|          | Hoplostethus mediterraneanus                                           | 0.00128           |
|          | Illex coindetii                                                       | 0.00638           |
|          | Lepidopus caudatus                                                    | 1.17869           |
|          | Lepidorrhombus spp.                                                   | 0.03827           |
|          | Lophius piscatorinus                                                   | 0.00255           |
|          | Lophius spp.                                                          | 1.25013           |
|          | Macropippus tuberculatus                                               | 0.06378           |
|          | Macroramphosus scopolax                                                | 0.35463           |
|          | Maja squinado                                                         | 0.38269           |
|          | Malacoclypeus laevis                                                  | 0.01403           |
|          | Melicthias mellicus                                                   | 13.17099          |
|          | Micromesistius poutassou                                              | 12.63522          |
|          | Mullus spp.                                                           | 0.44647           |
|          | Mullus sartellatus                                                     | 0.02551           |
|          | Octopodidae                                                           | 1.60731           |
|          | Octopus salutii                                                       | 0.00255           |
|          | Octopus vulgaris                                                      | 0.24237           |
|          | Ophiur us serpen                                                      | 0.00510           |
|          | Pagellus bogaraveo                                                    | 0.00128           |
|          | Pagellus spp.                                                          | 0.38269           |
|          | Pagrus pagrus                                                          | 0.25513           |
|          | Pagrus spp.                                                           | 0.35718           |
|          | Pagrus alatus                                                         | 0.03827           |
|          | Parapeneaus longirostris                                              | 0.93122           |
|          | Peristedion cataphractum                                               | 0.00128           |
|          | Physic blemnoideas                                                    | 0.00128           |
|          | Physic spp.                                                           | 0.94397           |
|          | Plesiokika spp.                                                       | 0.19135           |
|          | Pleuronectes platessa                                                 | 0.10205           |
|          | Polybrius hensolovi                                                   | 0.76538           |
|          | Raja clavata                                                          | 0.00128           |
|          | Raja oxyrinchus                                                       | 0.00128           |
|          | Rajaeicetes                                                           | 0.16583           |
|          | Rossia macrosum                                                       | 0.05230           |
|          | Ruvettus pretiosus                                                    | 0.00128           |
|          | Sardina pilchardus                                                    | 2.89570           |
|          | Sarpa salpa                                                           | 0.25513           |
|          | Scomber colias                                                        | 12.85463          |
|          | Scomber scobras                                                        | 2.60231           |
|          | Scyllorhinus canalicus                                                | 1.74125           |
|          | Serranoides costatus                                                  | 0.20410           |
|          | Solea spp.                                                            | 0.05103           |
|          | Spiochoides catanuscornus                                              | 0.00510           |
|          | Spiochoides pachygyaster                                               | 0.39545           |
|          | Spondyllossomatella canthus                                            | 0.21686           |
|          | Tealia spp.                                                           | 0.15308           |
|          | Todaropsis eblana                                                     | 0.00255           |
|          | Torpedo nobiliana                                                     | 0.01913           |
|          | Trachurus mediterraneanus                                              | 0.00128           |
|          | Trachurus picturatus                                                  | 15.85621          |
|          | Trachurus spp.                                                         | 0.38269           |
|          | Trachurus trachurus                                                   | 5.78375           |
|          | Triglidae                                                              | 1.17359           |

| Métier   | Species                                                                 | % of the discards |
|----------|------------------------------------------------------------------------|-------------------|
| Gill net and Long-line | Bentheodynamus elongatus                                           | 3.02126           |
|          | Brama brama                                                           | 0.52991           |
|          | Centrophorus monstrosa                                                | 0.14273           |
|          | Chimaera monstrosa                                                    | 0.13071           |
|          | Conger conger                                                          | 0.19096           |
|          | Dalatias lica                                                         | 0.10915           |

| Métier   | Species                                                                 | % of the discards |
|----------|------------------------------------------------------------------------|-------------------|
| Black scabbardfish longline | Alepisaurus ferox                                                   | 0.43956           |
|          | Alepocephalus bairdii                                                  | 7.69231           |
|          | Aphanopus carbo                                                        | 0.10989           |
|          | Benthodeomes elongates                                                 | 0.32967           |
|          | Centrophorus granulosus                                                | 0.32967           |
|          | Centrophorus launicatus                                                | 0.10989           |
|          | Centrophorus squamosus                                                 | 17.03297          |
|          | Centrosymphus coeleolipis                                              | 0.32967           |
|          | Centrosymphius crepidate                                               | 1.31868           |
|          | Corypheneus hippurus                                                  | 0.10989           |
|          | Corypheneoids ruprestris                                               | 0.10989           |
|          | Deania calcea                                                          | 18.57143          |
|          | Deania profundorum                                                    | 0.10989           |
|          | Epinoicus telescopus                                                   | 0.21978           |
|          | Enomepterus pusillus                                                   | 35.60440          |
|          | Enomepterus spinax                                                     | 5.71429           |
|          | Galeus melastomus                                                      | 1.75824           |
|          | Hexanchus griseus                                                      | 0.21978           |
|          | Isurus oxyrinchus                                                      | 0.10989           |
|          | Lepidion guentheri                                                    | 0.65934           |
|          | Lepidion spp.                                                          | 0.32967           |
|          | Nesiuarcs nasatus                                                      | 0.76923           |
|          | Physic blemnoides                                                     | 0.76923           |
|          | Prionace glaucus                                                       | 0.32967           |
|          | Raja spp.                                                              | 0.10989           |
|          | Scymnodon ringens                                                     | 0.54945           |
|          | Synaphebranchus kaupii                                                 | 5.27473           |
|          | Thanus alabangra                                                      | 0.10989           |
|          | Trachyrincusa scabros                                                  | 0.87912           |

| Métier   | Species                                                                 | % of the discards |
|----------|------------------------------------------------------------------------|-------------------|
| Purse seine | Belone belone                                                    | 15.15152          |
|          | Boops boops                                                           | 31.31313          |
|          | Halobatrachus didactylus                                              | 1.01010           |
|          | Macronemertes scorpiolalus                                             | 11.11111          |
|          | Sardina pilchardus                                                    | 15.15152          |
|          | Scomber colias                                                         | 18.18182          |
|          | Scomber scombrus                                                       | 6.00601           |
|          | Spicara flexuosa                                                      | 1.01010           |
|          | Trachurus trachurus                                                   | 1.01010           |
| Métier | Species | % of the discards |
|--------|---------|------------------|
| Trammel net | Alosa fallax | 0.00332 |
| | Ammodites tobianus | 0.00037 |
| | Aplysia punctata | 0.00051 |
| | Argentina sphyraena | 0.00010 |
| | Armoglossus imperialis | 0.00061 |
| | Armoglossus laterna | 0.00045 |
| | Armoglossus spp. | 0.00051 |
| | Armoglossus thori | 0.00008 |
| | Aspitrigla cuculus | 0.00100 |
| | Asterias rubens | 0.00138 |
| | Astrotepecen araricaeus | 0.02587 |
| | Athinapectina | 0.02003 |
| | Balistes capitatus | 0.10595 |
| | Balistes carolensis | 0.01098 |
| | Belone belone | 0.00940 |
| | Boops boops | 0.08790 |
| | Bothidae | 0.00004 |
| | Botus podas | 0.00015 |
| | Calappa granulata | 0.00049 |
| | Callionymus lyra | 0.09803 |
| | Callionymus reticulatus | 0.00001 |
| | Capros aper | 0.01261 |
| | Carcinos maenas | 0.00011 |
| | Centrolabes exolutes | 0.00170 |
| | Chelidondichthys lastoviza | 0.01619 |
| | Chelidondichthys lucernus | 0.01978 |
| | Chelidondichthys obscurus | 4.63812 |
| | Chelon labrosus | 0.00425 |
| | Citharus linguatula | 1.32968 |
| | Conger conger | 0.00081 |
| | Coris jala | 0.00040 |
| | Cymbium olla | 0.11782 |
| | Dardanus arrosor | 0.00179 |
| | Dentex dentex | 0.00143 |
| | Dentex macrophthalminus | 0.00053 |
| | Dentex marocanus | 0.00100 |
| | Dentex spp. | 0.00075 |
| | Dicentrarchus labrax | 0.00621 |
| | Dicoglossa cuneata | 0.02471 |
| | Diploids annularis | 0.00077 |
| | Diploids bellottii | 0.01098 |
| | Diploids sargus | 0.00055 |
| | Diploids spp. | 0.00081 |
| | Echinus acutus | 0.00137 |
| | Goneplax rhomboides | 0.00003 |
| | Gymnammodytes cicerelus | 0.00018 |
| | Halobatrachus didactylus | 0.02503 |
| | Holothuroidea | 0.00517 |
| | Labridae | 0.00082 |
| | Labrus mixtus | 0.00085 |
| | Lepidodromus hogei | 0.00111 |
| | Lepidodromus elegans | 0.00958 |
| | Lepidotrigla dieuzeidei | 0.00067 |
| | Liocarcinus holsatus | 0.00002 |
| | Liza ramada | 0.02964 |
| | Liza spp. | 0.00022 |
| | Loligo spp. | 0.00577 |
| | Macroramphous scolopax | 0.08791 |
| | Maja goltzianna | 0.00008 |
| | Maja squinado | 0.01776 |
| | Marmorastria glacialis | 0.00201 |
| | Merluccius merluccius | 1.51962 |
| | Microchirus aeglea | 5.16478 |
| | Microchirus cellatus | 0.00128 |
| | Microchirus variegatus | 0.00211 |
| | Micromesistius poutassou | 0.00697 |
| | Molia nola | 0.04104 |
| | Mugil cephalus | 0.01307 |
| | Mullus barbatulus | 0.00478 |
| | Mullus spp. | 0.00434 |
| | Mullus surmuletus | 0.00111 |
| | Mylobole aquila | 0.02242 |
| | Nucella lapillus | 0.00023 |
| | Pagellus acarne | 2.89204 |
| | Pagellus erythrinus | 0.01855 |
| | Pagellus spp. | 0.00142 |
| | Pagurus pagurus | 0.00526 |
| | Pagurus forbesii | 0.00006 |
| | Palmarus elephas | 0.00019 |
| | Paraenecentra livida | 0.00133 |
| | Pecten maximus | 0.00320 |
| | Physic physicus | 1.21960 |
| | Pleuronectiformes | 0.00026 |
| | Polybius henslowii | 0.00004 |
| | Raja brachyura | 0.01713 |
| | Raja clavata | 0.02768 |
| | Raja miraletus | 0.04638 |
| | Raja spp. | 0.00111 |
| | Raja undulata | 0.01940 |
| | Sarda pitchardus | 19.49873 |
| | Scomber colias | 34.75575 |
| | Scomberomorus | 0.00679 |
| | Scomber spp. | 0.00047 |
| | Scophthalmus maximus | 0.00107 |
| | Scophthalmus rhombus | 0.00261 |
| | Scoperaena notata | 7.18370 |
| | Scoperaena porcus | 0.00503 |
| | Scyliorhinus canicula | 0.00733 |
| | Sepia officinalis | 1.66134 |
| | Serranidae | 2.25352 |
| | Serranus cabrilla | 0.00019 |
| | Serranus heptus | 0.00049 |
| | Solea lascaris | 0.05993 |
| | Solea seneglaensis | 0.05684 |
| | Solea solea | 0.00183 |
| | Solea spp. | 0.00286 |
| | Soleaide | 0.00046 |
| | Sparus aurata | 0.00382 |
| | Spondyllosoma canthus | 0.03863 |
| | Symphodus bailloni | 0.00016 |
| | Symphodus spp. | 0.00028 |
| | Torpedojulius | 0.03430 |
| | Trachinus longipes | 5.78890 |
| | Trachinus trachurus | 2.32199 |
| | Trigla lyra | 0.00077 |
| | Trigla sp. | 0.02197 |
| | Trigloporus lastoviza | 0.00198 |
| | Trisopterus luscus | 0.08946 |
| | Uranoscopus scaber | 0.00068 |
| | Zeugopterus punctatus | 0.00009 |
| | Zea faber | 0.01073 |
Table S2. – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species | Taxa Group | Tonnes (SD) | % |
|---------|------------|-------------|---|
| Unreported | | | |
| Scomber colias | Fish | 21783.6 (±7048.2) | 17.63919 |
| Boops boops | Fish | 11162.3 (±2868.3) | 9.03861 |
| Trachurus picturatus | Fish | 10659.5 (±4864.9) | 8.63148 |
| Merluccius merluccius | Fish | 10270.8 (±4526.6) | 8.31675 |
| Sardina pilchardus | Fish | 8692 (±2476.4) | 7.03830 |
| Liza aurata | Fish | 8500.9 (±3878.9) | 6.88560 |
| Micromesistius poutassou | Fish | 4502.1 (±1886.5) | 3.64554 |
| Trachurus trachurus | Fish | 3614.3 (±965.6) | 2.92666 |
| Belone belone | Fish | 3205.3 (±1026.1) | 2.59552 |
| Conger conger | Fish | 2901.9 (±499.9) | 0.99467 |
| Scyliorhinus canicula | Sharks | 2178.2 (±994.1) | 1.76379 |
| Other fish and Invertebrates | Other Fish and Invertebrates | 1114.8 (±508.8) | 0.90273 |
| Octopodidae | Cephalopoda | 1080.5 (±493.1) | 0.87495 |
| Diplopus sargus | Fish | 930 (±387) | 0.75307 |
| Trachinus draco | Fish | 840.4 (±534.8) | 0.68052 |
| Lophius spp. | Fish | 745.1 (±310.1) | 0.61177 |
| Other fish and Invertebrates | Other Fish and Invertebrates | 545 (±245.5) | 0.44135 |
| Polybius henslowii | Fish | 516 (±234) | 0.41781 |
| Serranus cabrilla | Fish | 491.5 (±187) | 0.39799 |
| Pagellus acarne | Fish | 464.6 (±193.3) | 0.37622 |
| Galeus melastomus | Sharks | 409.7 (±186.3) | 0.32174 |
| Serpa salpa | Fish | 403.6 (±156.6) | 0.32678 |
| Trisopterus luscus | Fish | 366 (±63.6) | 0.29634 |
| Mullus spp. | Fish | 300.8 (±137.1) | 0.24361 |
| Sepia officinalis | Fish | 267.4 (±111) | 0.21649 |
| Sphoeroides pachygaster | Fish | 265.8 (±121.3) | 0.21527 |
| Maja squinado | Fish | 260.3 (±118) | 0.20704 |
| Pagellus spp. | Fish | 257.5 (±117.5) | 0.20851 |
| Trachurus spp. | Fish | 257.3 (±117.4) | 0.20832 |
| Spicara flexuosa | Fish | 243.8 (±64.5) | 0.19744 |
| Pagrus spp. | Fish | 240.1 (±109.6) | 0.19443 |
| Citharus linguatula | Fish | 229.2 (±91.4) | 0.18558 |
| Helicolenus dactylopterus | Fish | 207.5 (±94.7) | 0.16805 |
| Physic spp. | Fish | 195.9 (±81.5) | 0.15866 |
| Pagrus pagrus | Fish | 171.9 (±78.4) | 0.13891 |
| Xiphias gladius | Fish | 171.5 (±78.3) | 0.13888 |
| Octopus vulgaris | Cephalopoda | 162.9 (±74.4) | 0.13194 |
| Mugilidae | Fish | 142.4 (±55.6) | 0.11528 |
| Liza ramada | Fish | 132 (±91.9) | 0.10686 |
| Zeus faber | Fish | 130.4 (±59.1) | 0.10556 |
| Plesiokia spp. | Fish | 128.6 (±58.7) | 0.10416 |
| Diplodus vulgaris | Fish | 122.6 (±30.4) | 0.09925 |
| Rajiade (+ other similar) | Rays | 111.9 (±50.9) | 0.09060 |
| Tealia spp. | Other Invertebrates | 102.9 (±47) | 0.08333 |
| Pagurus spp. | Crustacea | 96.8 (±231.3) | 0.07837 |
| Dicentrarchus labrax | Fish | 96.8 (±242.4) | 0.07836 |
| Echinidea | Other Invertebrates | 94.3 (±43.1) | 0.07638 |
| Sperus aurata | Fish | 93.8 (±23.5) | 0.07595 |
| Astropcenten aranciacus | Other Invertebrates | 87.8 (±32.2) | 0.07112 |
| Balistes carpio | Fish | 81.7 (±21.8) | 0.06618 |
| Pleuronectes platessa | Fish | 48.6 (±31.3) | 0.05555 |
| Echinocardium cordatum | Other Invertebrates | 40.9 (±134) | 0.04928 |
| Diplodus bellotti | Fish | 44.8 (±15.9) | 0.03630 |
| Macropipus tuberculatus | Crustacea | 42.9 (±19.6) | 0.03472 |
| Bentheudosmus elongatus | Fish | 38.4 (±5.7) | 0.03107 |
| Rossia maclova | Cephalopoda | 35.2 (±16) | 0.02847 |
| Soleidae | Cephalopoda | 34.8 (±15.8) | 0.02821 |
| Dardanus arroso | Crustacea | 34.6 (±15.7) | 0.02801 |
| Lepidorrhampus spp. | Fish | 25.7 (±11.7) | 0.02083 |
Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species                     | Taxa Group       | Tonnes (SD)        | %      |
|-----------------------------|------------------|--------------------|--------|
| Pagurus alatus              | Crustacea        | 25.7 (±11.7)       | 0.02083|
| Dosinia exoleta             | Bivalvia         | 22.4 (±49.3)       | 0.01813|
| Eumoptheras pusillus        | Sharks           | 21.5 (±7.5)        | 0.01743|
| Tellina tenus               | Bivalvia         | 19.9 (±3.7)        | 0.01607|
| Cymbium olla                | Gastropoda       | 18.9 (±7.9)        | 0.01533|
| Mullus surmuletus           | Fish             | 17.3 (±7.9)        | 0.01403|
| Argentina sphyraena         | Fish             | 17.2 (±7.8)        | 0.01390|
| Argopectum olearium         | Gastropoda       | 17.2 (±7.8)        | 0.01389|
| Cuspidaria tyrrhena         | Gastropoda       | 17.2 (±7.8)        | 0.01389|
| Tadaropsis ebanae           | Cephalopoda      | 15.9 (±6.6)        | 0.01291|
| Callichthys lyra            | Fish             | 15.7 (±6.6)        | 0.01275|
| Dicentrarchus punctatus     | Fish             | 14.2 (±6.6)        | 0.01153|
| Torpedo nobiliana           | Rays             | 12.9 (±5.9)        | 0.01042|
| Eumoptheras spinax          | Sharks           | 12.4 (±4.6)        | 0.01008|
| Solea lascaris              | Fish             | 9.6 (±4)           | 0.00780|
| Molacocephalus laevis       | Fish             | 9.6 (±4.4)         | 0.00777|
| Solea senegalensis          | Fish             | 9.1 (±3.8)         | 0.00739|
| Sphaerianus granularis      | Other Invertebrates | 8.6 (±3.1)     | 0.00700|
| Caelorinchus caelorhincus   | Fish             | 8.6 (±3.9)         | 0.00694|
| Deania calceae              | Sharks           | 8.5 (±9.3)         | 0.00690|
| Squilla mantis              | Crustacea        | 8.2 (±18)          | 0.00661|
| Centrophorus squamosus      | Sharks           | 7.8 (±8.5)         | 0.00633|
| Raja mirabilis              | Rays             | 7.5 (±3.1)         | 0.00603|
| Brama brama                 | Fish             | 6.7 (±2.8)         | 0.00543|
| Mola mola                   | Fish             | 6.6 (±2.7)         | 0.00534|
| Illeis coindetii            | Cephalopoda      | 5.6 (±2.4)         | 0.00450|
| Torpedo torpedo             | Rays             | 5.5 (±2.3)         | 0.00446|
| Raja clavata                | Rays             | 5.3 (±2.1)         | 0.00430|
| Zenopsis conchifer          | Fish             | 4.3 (±2)           | 0.00347|
| Liocarcinus depurator       | Crustacea        | 4 (±8.8)           | 0.00324|
| Dicologlossa cuneata        | Fish             | 4 (±17)            | 0.00322|
| Myliobatis aquila           | Rays             | 3.6 (±1.5)         | 0.00292|
| Alepocephalus bairdi        | Fish             | 3.5 (±3.8)         | 0.00286|
| Ophiusurus serpens          | Fish             | 3.4 (±1.6)         | 0.00278|
| Spheoeroides cutaneus       | Fish             | 3.4 (±1.6)         | 0.00278|
| Chimaera monstrosa          | Fish             | 3.4 (±1.4)         | 0.00273|
| Atrina pectinata            | Bivalvia         | 3.2 (±1.3)         | 0.00261|
| Chelidonichthys lucernus    | Fish             | 3.2 (±1.3)         | 0.00257|
| Diplodus annularis          | Fish             | 3.1 (±1.1)         | 0.00254|
| Raja undulata               | Rays             | 3.1 (±1.3)         | 0.00252|
| Pagellus erythrinus         | Fish             | 3 (±1.2)           | 0.00241|
| Raja brachyura              | Rays             | 2.8 (±1.1)         | 0.00223|
| Chelidonichthys lastoviza   | Fish             | 2.6 (±1.1)         | 0.00211|
| Eledone cirrhosa            | Cephalopoda      | 2.6 (±2.2)         | 0.00208|
| Synaphobranchus kaupii      | Fish             | 2.4 (±2.6)         | 0.00196|
| Donax vitatus               | Bivalvia         | 2.3 (±5.2)         | 0.00190|
| Mugil cephalus              | Fish             | 2.1 (±0.9)         | 0.00170|
| Physic blennoides           | Fish             | 1.8 (±0.7)         | 0.00149|
| Centrophorus monstrosa      | Sharks           | 1.8 (±0.7)         | 0.00146|
| Balistes carolinesis        | Fish             | 1.8 (±0.7)         | 0.00143|
| Trioglossus lastoviza       | Fish             | 1.8 (±0.7)         | 0.00143|
| Lophius piscatorius         | Fish             | 1.7 (±0.8)         | 0.00139|
| Octopus salutii             | Cephalopoda      | 1.7 (±0.8)         | 0.00139|
| Symphodus bailloni          | Fish             | 1.6 (±0.6)         | 0.00128|
| Lepidotrigla cavilloni      | Fish             | 1.5 (±0.6)         | 0.00125|
| Dalatias licha              | Sharks           | 1.4 (±0.6)         | 0.00112|
| Aplysia punctata            | Gastropoda       | 1.3 (±0.6)         | 0.00108|
| Aetecyclops undexcidenseatus| Crustacea        | 1.2 (±2.6)         | 0.00095|
| Ensis siligua               | Bivalvia         | 1.1 (±2.4)         | 0.00087|
| Armoglossus imperialis      | Fish             | 1 (±0.4)           | 0.00083|
| Hoplostethus mediterraneus  | Fish             | 1 (±0.4)           | 0.00078|
| Hexanchus griseus           | Sharks           | 1 (±0.4)           | 0.00078|
| Loligo spp.                 | Cephalopoda      | 0.9 (±0.7)         | 0.00075|
| Eledone moschata            | Cephalopoda      | 0.9 (±0.4)         | 0.00069|
| Pagellus bogaraveo          | Fish             | 0.9 (±0.4)         | 0.00069|
| Periistion cataphractum     | Fish             | 0.9 (±0.4)         | 0.00069|
| Raja oxyrinchus             | Rays             | 0.9 (±0.4)         | 0.00069|
| Ruvettus pretiosus          | Fish             | 0.9 (±0.4)         | 0.00069|
| Trachurus mediterraneus     | Fish             | 0.9 (±0.4)         | 0.00069|
| Scorpaena porcus            | Fish             | 0.8 (±0.3)         | 0.00065|
| Mullus barbatas             | Fish             | 0.8 (±0.3)         | 0.00062|
| Chelon labrosus             | Fish             | 0.7 (±0.3)         | 0.00055|
| Centrospermus crepidatus    | Sharks           | 0.6 (±0.7)         | 0.00049|
| Polychoaetes                | Other Invertebrates | 0.6 (±1.3)     | 0.00048|
| Acanthocardia spinosa       | Bivalvia         | 0.5 (±0.2)         | 0.00043|
| Species                  | Taxa Group     | Tonnes (SD) | %     |
|--------------------------|----------------|-------------|-------|
| Alosa fallax             | Fish           | 0.5 (±0.2)  | 0.00043 |
| Pecten maximus           | Bivalvia       | 0.5 (±0.2)  | 0.00042 |
| Scophthalmus rhombus     | Fish           | 0.4 (±0.2)  | 0.00034 |
| Trachyrincus scabrus     | Fish           | 0.4 (±0.4)  | 0.00033 |
| Nesiarchus nasutus       | Fish           | 0.4 (±0.4)  | 0.00029 |
| Microchirus variegatus   | Fish           | 0.3 (±0.1)  | 0.00027 |
| Marthasterias glacialis  | Other Invertebrates | 0.3 (±0.1) | 0.00026 |
| Hymenocephalus italicus | Fish           | 0.3 (±0.1)  | 0.00026 |
| Lepidion guentheri       | Fish           | 0.3 (±0.3)  | 0.00024 |
| Solea solea              | Fish           | 0.3 (±0.1)  | 0.00024 |
| Serranus hepatitis       | Fish           | 0.3 (±0.1)  | 0.00024 |
| Centrolabrus exoletus    | Fish           | 0.3 (±0.1)  | 0.00022 |
| Trachinus vipera         | Fish           | 0.3 (±0.6)  | 0.00021 |
| Scymnodon ringens        | Sharks         | 0.3 (±0.3)  | 0.00020 |
| Dentex dentex            | Fish           | 0.2 (±0.1)  | 0.00019 |
| Asterias rubens          | Other Invertebrates | 0.2 (±0.1) | 0.00018 |
| Echinus acutus           | Other Invertebrates | 0.2 (±0.1) | 0.00018 |
| Paracentrotus lividus    | Other Invertebrates | 0.2 (±0.1) | 0.00017 |
| Microchirus ocellatus    | Fish           | 0.2 (±0.1)  | 0.00017 |
| Alepisaurus ferox        | Fish           | 0.2 (±0.1)  | 0.00016 |
| Murex trunculus          | Gastropoda     | 0.2 (±0.1)  | 0.00016 |
| Spisula solida           | Bivalvia       | 0.2 (±0.4)  | 0.00016 |
| Lepidorhombus boscii     | Fish           | 0.2 (±0.1)  | 0.00015 |
| Scophthalmus maximus     | Fish           | 0.2 (±0.1)  | 0.00014 |
| Bothus podas             | Fish           | 0.2 (±0.1)  | 0.00014 |
| Dayatis violacea         | Rays           | 0.2 (±0.1)  | 0.00013 |
| Lagocephalus lagocephalus | Fish           | 0.2 (±0.1)  | 0.00013 |
| Aspitrigla cuclus        | Fish           | 0.2 (±0.1)  | 0.00013 |
| Dentex maroccanus        | Fish           | 0.2 (±0.1)  | 0.00013 |
| Mactra corallina stultorum | Bivalvia     | 0.2 (±0.4)  | 0.00013 |
| Homala barbarra          | Crustacea      | 0.2 (±0.1)  | 0.00013 |
| Centrophorus granulosus  | Sharks         | 0.2 (±0.2)  | 0.00012 |
| Centroscymnus coelolepis | Sharks       | 0.2 (±0.2)  | 0.00012 |
| Lepidion spp.            | Fish           | 0.2 (±0.2)  | 0.00012 |
| Prionace glauca          | Sharks         | 0.2 (±0.2)  | 0.00012 |
| Labrus mixtus           | Fish           | 0.1 (±0.1)  | 0.00011 |
| Labridae                 | Fish           | 0.1 (±0.1)  | 0.00011 |
| Diploids spp.            | Fish           | 0.1 (±0.1)  | 0.00011 |
| Trigla lyra              | Fish           | 0.1 (±0.1)  | 0.00010 |
| Dentex spp.              | Fish           | 0.1 (±0.1)  | 0.00010 |
| Uranoscopus scaber       | Fish           | 0.1 (±0)    | 0.00009 |
| Lepidotrigla diezeidel   | Fish           | 0.1 (±0)    | 0.00009 |
| Nacratres ductor         | Fish           | 0.1 (±0)    | 0.00009 |
| Nephrops norvegicus      | Crustacea      | 0.1 (±0)    | 0.00009 |
| Epigonus telecosteus     | Fish           | 0.1 (±0.1)  | 0.00008 |
| Dentex mackrophthalus    | Fish           | 0.1 (±0)    | 0.00007 |
| Ciliappa granulata       | Crustacea      | 0.1 (±0)    | 0.00006 |
| Scamber spp.             | Fish           | 0.1 (±0)    | 0.00006 |
| Arnoglossus laterna     | Fish           | 0.1 (±0)    | 0.00006 |
| Coris julis              | Fish           | 0.1 (±0)    | 0.00005 |
| Anmodytes tobians        | Fish           | 0.1 (±0)    | 0.00005 |
| Aphanopus carbo          | Fish           | 0.1 (±0.1)  | 0.00004 |
| Centrophorus lastanicus  | Sharks         | 0.1 (±0.1)  | 0.00004 |
| Coryphaena hippurus      | Fish           | 0.1 (±0.1)  | 0.00004 |
| Coryphaenoides rupestris | Fish           | 0.1 (±0.1)  | 0.00004 |
| Deania profundorum       | Sharks         | 0.1 (±0.1)  | 0.00004 |
| Isurus oxyrinchus        | Sharks         | 0.1 (±0.1)  | 0.00004 |
| Thunnus alalanga         | Fish           | 0.1 (±0.1)  | 0.00004 |
| Arnostegus spp.          | Fish           | 0.05 (±0.02) | 0.00004 |
| Symphodius spp.          | Fish           | 0.04 (±0.02) | 0.00004 |
| Pleuronectiformes        | Fish           | 0.04 (±0.02) | 0.00003 |
| Nucella lapillus         | Gastropoda     | 0.04 (±0.02) | 0.00003 |
| Venus striatula          | Bivalvia       | 0.04 (±0.08) | 0.00003 |
| Liza spp.                | Fish           | 0.04 (±0.01) | 0.00003 |
| Palinarus elephas        | Crustacea      | 0.03 (±0.01) | 0.00002 |
| Ophioderma longicaudum   | Other Invertebrates | 0.03 (±0.01) | 0.00002 |
| Gymnammodytes cicerela   | Other Invertebrates | 0.03 (±0.01) | 0.00002 |
| Carcinus maenas          | Crustacea      | 0.02 (±0.01) | 0.00001 |
| Zeugopterus punctatus    | Fish           | 0.01 (±0.01) | 0.00001 |
| Arnostegus thori         | Fish           | 0.01 (±0.01) | 0.00001 |
| Maja golfitzana          | Crustacea      | 0.01 (±0.01) | 0.00001 |
| Pagurus forbesii         | Crustacea      | 0.009 (±0.0001)| 0.00001 |
| Bothidae                 | Fish           | 0.006 (±0.0002) | 0.000005 |
| Goneplax rhomboides      | Crustacea      | 0.005 (±0.0002) | 0.000004 |
| Lithocrinus holatus      | Crustacea      | 0.003 (±0.001) | 0.000003 |
Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species                          | Taxa Group | Tonnes (SD) | %   |
|----------------------------------|------------|-------------|-----|
| **Callionymus reticulatus**      | Fish       | 0.002 ±0.001 | 0.000002 |
| **Black scabbardfish longline**  |            |             |     |
| *Etmopterus pusillus*            | Sharks     | 16.33 ±17.74 | 35.6 |
| *Deania calcea*                  | Sharks     | 0.52 ±9.25  | 16.6 |
| *Centrophorus squammosus*        | Sharks     | 7.81 ±8.49  | 17.0 |
| *Alepocephalus bairdii*          | Fish       | 3.53 ±3.83  | 7.7  |
| *Etmopterus spinax*              | Sharks     | 2.62 ±2.85  | 5.7  |
| *Sphyrophorobanchus kaupii*      | Fish       | 2.42 ±2.63  | 5.3  |
| *Galeus melastomus*              | Sharks     | 0.81 ±0.88  | 1.8  |
| *Centroscymnus crepidater*       | Fish       | 0.6 ±0.66   | 1.3  |
| *Trachyrincus scabrus*           | Fish       | 0.4 ±0.44   | 0.9  |
| *Nesiarchus nasutus*             | Fish       | 0.35 ±0.38  | 0.8  |
| *Phylys blemnoidea*              | Fish       | 0.35 ±0.38  | 0.8  |
| *Lepidion guentheri*             | Fish       | 0.3 ±0.33   | 0.7  |
| *Scymnodon ringsens*             | Sharks     | 0.25 ±0.27  | 0.5  |
| *Alepissaurus ferox*             | Fish       | 0.2 ±0.22   | 0.4  |
| *Benihodesmus elongatus*         | Fish       | 0.15 ±0.16  | 0.3  |
| *Lepidion spp.*                  | Fish       | 0.15 ±0.16  | 0.3  |
| *Centrophorus granulosus*        | Sharks     | 0.15 ±0.16  | 0.3  |
| *Centroscymnus coeleopelcis*     | Sharks     | 0.15 ±0.16  | 0.3  |
| *Prionace glauca*                | Sharks     | 0.15 ±0.16  | 0.3  |
| *Epigonus telescopus*            | Fish       | 0.1 ±0.11   | 0.2  |
| *Hexanchus griseus*              | Sharks     | 0.1 ±0.11   | 0.2  |
| *Aphanopus carbo*                | Fish       | 0.05 ±0.05  | 0.1  |
| *Coryphaena hippurus*            | Fish       | 0.05 ±0.05  | 0.1  |
| *Coryphaenoides rupestris*       | Fish       | 0.05 ±0.05  | 0.1  |
| *Thunnus alalunga*               | Fish       | 0.05 ±0.05  | 0.1  |
| *Raja spp.*                      | Rays       | 0.05 ±0.05  | 0.1  |
| *Centrophorus lusitanicus*       | Sharks     | 0.05 ±0.05  | 0.1  |
| *Deania profandorum*             | Sharks     | 0.05 ±0.05  | 0.1  |
| *Isurus oxyrinchus*              | Sharks     | 0.05 ±0.05  | 0.1  |
| **Demersal Seine (“rapa”)**      |            |             |     |
| *Liza aurata*                    | Fish       | 8650 ±6239  | 69   |
| *Scomber colias*                 | Fish       | 3180 ±2294  | 26   |
| *Boops boops*                    | Fish       | 382 ±275   | 3    |
| *Liza ramada*                    | Fish       | 127 ±92    | 1    |
| *Sarpa salpa*                    | Fish       | 127 ±92    | 1    |
| **Dredge**                       |            |             |     |
| *Pagurus spp.*                   | Crustacea  | 96.8 ±213.1 | 41.431 |
| *Echinocardium cordatum*         | Echinodermata | 60.9 ±134.0 | 26.051 |
| *Dosinia exoleta*                | Bivalvia   | 22.4 ±49.3  | 9.582 |
| *Tellina tenuis*                 | Bivalvia   | 19.9 ±43.7  | 8.497 |
| *Citharus linguatula*            | Fish       | 13.8 ±50.5  | 5.292 |
| *Squilla mantis*                 | Crustacea  | 8.2 ±18.0   | 3.497 |
| *Liocarcinus depurator*          | Crustacea  | 4 ±8.8     | 1.711 |
| *Donax vitatus*                  | Bivalvia   | 2.3 ±5.2   | 1.002 |
| *Polystias henslovi*             | Crustacea  | 1.4 ±4.2   | 0.613 |
| *Atelecyclus undecimdentatus*    | Crustacea  | 1.2 ±2.6   | 0.501 |
| *Ensiss siliqua*                 | Bivalvia   | 1.1 ±2.4   | 0.458 |
| *Polychaeetes*                   | Other invertebrates | 0.6 ±1.3 | 0.254 |
| *Seppia officinalis*             | Cephalopoda | 0.5 ±1.0  | 0.197 |
| *Trachinus vipera*               | Fish       | 0.3 ±0.6   | 0.109 |
| *Spisula solida*                 | Bivalvia   | 0.2 ±0.4   | 0.083 |
| *Mactra corallina stultorum*     | Bivalvia   | 0.2 ±0.4   | 0.069 |
| *Venus striatula*                | Bivalvia   | 0.04 ±0.1  | 0.015 |
| *Dicelloglossa cuneata*          | Fish       | 0.002 ±0.005 | 0.001 |
| **Gill net and Long-line**       |            |             |     |
| *Merluccius merluccius*          | Fish       | 1172.4 ±482.2 | 92.689 |
| *Benthodesmus elongatus*         | Fish       | 38.2 ±15.7  | 3.021 |
| *Todaropsis eblanae*             | Cephalopoda | 14.2 ±5.9 | 1.25  |
| *Etmopterus spinax*              | Sharks     | 9.8 ±4.7   | 0.777 |
| *Brana bruna*                    | Fish       | 6.7 ±2.8   | 0.530 |
| *Micromesistius poutassou*       | Fish       | 5.7 ±2.3   | 0.448 |
| *Etmopterus pusillus*            | Sharks     | 4.3 ±1.8   | 0.343 |
| *Conger conger*                  | Fish       | 2.4 ±1.1   | 0.191 |
| *Galeus melastomus*              | Sharks     | 2.4 ±1.1   | 0.189 |
| *Centrolophus monstrosa*         | Sharks     | 1.8 ±0.7   | 0.143 |
| *Chimaera monstrosa*             | Fish       | 1.7 ±0.7   | 0.131 |
| *Dalatias licha*                 | Sharks     | 1.4 ±0.6   | 0.109 |
| *Illex coindetii*                | Cephalopoda | 1.3 ±0.5 | 0.101 |
| *Scylliorhinus canicula*          | Sharks     | 0.8 ±0.3   | 0.064 |
| *Phylys blemnoidea*              | Fish       | 0.6 ±0.3   | 0.050 |
| *Hymenocephalus italicus*        | Fish       | 0.3 ±0.1   | 0.025 |
| *Lagocephalus lagocephalus*      | Fish       | 0.2 ±0.1   | 0.013 |
| *Malacocephalus laevis*          | Fish       | 0.2 ±0.1   | 0.013 |
Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species               | Taxa Group         | Tonnes (SD)       | %     |
|-----------------------|--------------------|-------------------|-------|
| Dasyatis violacea     | Rays               | 0.2 (±0.1)        | 0.013 |
| Nephtys norvegicus    | Crustacea          | 0.1 (±0.04)       | 0.008 |
| Hippolsthesus mediterraneus | Fish          | 0.1 (±0.04)       | 0.008 |
| Nucrates dactor       | Fish               | 0.1 (±0.04)       | 0.008 |
| Trammel net           |                     |                   |       |
| Scomber colias        | Fish               | 5583.62 (±2323.6) | 34.7557 |
| Sardina pilchardus    | Fish               | 3132.53 (±3035.59) | 19.4987 |
| Boops boops           | Fish               | 1297.9 (±540.12)  | 0.0789 |
| Scorpnaena notata     | Fish               | 1154.08 (±480.27) | 0.0737 |
| Trachinus draco       | Fish               | 930 (±387.02)     | 0.0589 |
| Microchirus azevia    | Fish               | 829.74 (±455.29)  | 0.0568 |
| Chelidonichthy obscurus | Fish           | 745.13 (±310.08)  | 0.0464 |
| Pagellus acarne       | Fish               | 466.61 (±193.35)  | 0.0296 |
| Trachurus trachurus   | Fish               | 373.03 (±155.24)  | 0.0232 |
| Serranus cabrilla     | Fish               | 354.29 (±147.44)  | 0.0220 |
| Sepia officinalis     | Cephalopoda        | 266.9 (±111.07)   | 0.0163 |
| Merluccius merluccius | Fish               | 244.13 (±88.9)    | 0.0152 |
| Citharus linguata     | Fish               | 213.62 (±78.8)    | 0.0131 |
| Physic sphyx          | Fish               | 195.93 (±81.54)   | 0.0126 |
| Astreptechn aranciaus | Echinodermata      | 52.79 (±21.97)    | 0.0326 |
| Cymbium ola           | Gastropoda         | 18.93 (±7.88)     | 0.0118 |
| Balistes capricus     | Fish               | 17.02 (±7.08)     | 0.0106 |
| Callionymus lyra      | Fish               | 15.75 (±6.55)     | 0.0098 |
| Trisopterus luscus     | Fish               | 14.37 (±5.98)     | 0.0085 |
| Macrocrampous scolopax | Fish              | 14.12 (±5.88)     | 0.0087 |
| Holothuroidea         | Echinodermata      | 13.36 (±5.56)     | 0.0083 |
| Scomber scombrus       | Fish               | 10.81 (±4.5)      | 0.0067 |
| Solea lascaris        | Fish               | 9.63 (±4.01)      | 0.0059 |
| Solea senegalensis    | Fish               | 9.13 (±3.8)       | 0.0056 |
| Raja miraletus        | Rays               | 7.45 (±3.1)       | 0.0046 |
| Mola mola             | Fish               | 6.59 (±2.74)      | 0.0041 |
| Spondylosoma canthusus | Fish             | 6.21 (±2.58)      | 0.0036 |
| Torpedo torpado       | Rays               | 5.51 (±2.92)      | 0.0034 |
| Lica ramada           | Fish               | 4.76 (±1.98)      | 0.0029 |
| Raja clavata          | Rays               | 4.45 (±1.85)      | 0.0027 |
| Holothuracrus didaclyus | Fish             | 4.02 (±1.67)      | 0.0025 |
| Dicologlossa cuneata  | Fish               | 3.97 (±1.65)      | 0.0024 |
| Myliobatis aquila     | Fish               | 3.53 (±1.47)      | 0.0022 |
| Trigla sp.            | Fish               | 3.22 (±1.34)      | 0.0020 |
| Atrinapectinata       | Bivalyma           | 3.18 (±1.32)      | 0.0019 |
| Chelidonichthy lucernus | Fish             | 3.12 (±1.3)       | 0.0019 |
| Raja undulata         | Fish               | 2.98 (±1.24)      | 0.0018 |
| Pagellus erythrinus   | Fish               | 2.85 (±1.19)      | 0.0017 |
| Maja squamato         | Crustacea          | 2.75 (±1.15)      | 0.0017 |
| Raja brachyura        | Rays               | 2.6 (±1.08)       | 0.0016 |
| Chelidonichthy lastoviza | Fish            | 2.1 (±0.87)       | 0.0013 |
| Megil cepalus         | Fish               | 2.03 (±0.84)      | 0.0012 |
| Capros aper           | Fish               | 1.76 (±0.73)      | 0.0011 |
| Balistes cardinensis  | Fish               | 1.76 (±0.73)      | 0.0011 |
| Diplodus bellottii    | Fish               | 1.76 (±0.73)      | 0.0011 |
| Trigloporus lastoviza | Fish               | 1.76 (±0.73)      | 0.0010 |
| Zeas fabel            | Fish               | 1.72 (±0.72)      | 0.0010 |
| Lepidotrigla cassillene | Fish             | 1.54 (±0.64)      | 0.0009 |
| Belone belone         | Fish               | 1.51 (±0.63)      | 0.0009 |
| Aplysia punctata      | Fish               | 1.34 (±0.56)      | 0.0008 |
| Scyllorhinus canicula | Sharks             | 1.18 (±0.49)      | 0.0007 |
| Micromesistius poutassou | Fish              | 1.12 (±0.47)      | 0.0007 |
| Arnoeglossis imperialis | Fish           | 1.03 (±0.43)      | 0.0006 |
| Dicentrarchus labrax  | Fish               | 1 (±0.42)         | 0.0006 |
| Loligo spp.           | Cephalopoda        | 0.93 (±0.39)      | 0.0005 |
| Scorpnaena parcaus    | Fish               | 0.81 (±0.34)      | 0.0005 |
| Mullus barbatus       | Fish               | 0.77 (±0.32)      | 0.0004 |
| Mullus spp.           | Fish               | 0.7 (±0.29)       | 0.0003 |
| Chelon labrous        | Fish               | 0.68 (±0.28)      | 0.0002 |
| Sparus aurata        | Fish               | 0.61 (±0.26)      | 0.0003 |
| Alosa fallax         | Fish               | 0.53 (±0.22)      | 0.0003 |
| Pecten maximus        | Bivalyma           | 0.51 (±0.21)      | 0.0003 |
| Solea spp.           | Fish               | 0.46 (±0.19)      | 0.0002 |
| Scorplhalus rhombus   | Fish               | 0.42 (±0.17)      | 0.0002 |
| Pagrus pagrus        | Fish               | 0.41 (±0.17)      | 0.0002 |
| Raja spp.            | Rays               | 0.36 (±0.15)      | 0.0002 |
| Microchirus variegatus | Fish              | 0.34 (±0.14)      | 0.0002 |
| Muthbarstesia glyceria | Acidinomata       | 0.32 (±0.13)      | 0.0002 |
| Solea solea          | Fish               | 0.29 (±0.12)      | 0.0001 |
| Dardanus arroso       | Crustacea          | 0.29 (±0.12)      | 0.0001 |
### Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species                  | Taxa Group     | Tonnes (SD)       | %     |
|--------------------------|----------------|-------------------|-------|
| Centrolabrus exoletus    | Fish           | 0.27 (±0.11)      | 0.0017|
| Dentex dentex            | Fish           | 0.23 (±0.1)       | 0.0014|
| Pagellus spp.            | Fish           | 0.23 (±0.09)      | 0.0014|
| Asterias rubens          | Echinodermata  | 0.22 (±0.09)      | 0.0014|
| Echinus acutus           | Echinodermata  | 0.22 (±0.09)      | 0.0014|
| Paracentrotus lividus    | Echinodermata  | 0.21 (±0.09)      | 0.0013|
| Microchirus ocellatus    | Fish           | 0.21 (±0.09)      | 0.0013|
| Lepidopera boscusii      | Fish           | 0.18 (±0.07)      | 0.0011|
| Mullus surmoleus         | Fish           | 0.18 (±0.07)      | 0.0011|
| Scophthalmus maximus     | Fish           | 0.17 (±0.07)      | 0.0011|
| Bothus podas             | Fish           | 0.17 (±0.07)      | 0.0011|
| Aspistria cuculosa       | Fish           | 0.16 (±0.07)      | 0.0010|
| Dentex marocanus         | Fish           | 0.16 (±0.07)      | 0.0010|
| Labrus mixtus            | Fish           | 0.14 (±0.06)      | 0.0009|
| Labridae                 | Fish           | 0.13 (±0.05)      | 0.0008|
| Conger conger            | Fish           | 0.13 (±0.05)      | 0.0008|
| Diplodus spp.            | Fish           | 0.13 (±0.05)      | 0.0008|
| Trigla lyra              | Fish           | 0.12 (±0.05)      | 0.0008|
| Diplodus annularis       | Fish           | 0.12 (±0.05)      | 0.0008|
| Dentex spp.              | Fish           | 0.12 (±0.05)      | 0.0007|
| Uranoscoops scaber       | Fish           | 0.11 (±0.05)      | 0.0007|
| Lepidopera diezeidei     | Fish           | 0.11 (±0.04)      | 0.0007|
| Diplodus sargus          | Fish           | 0.09 (±0.04)      | 0.0005|
| Dentex macrophthalmus    | Fish           | 0.09 (±0.04)      | 0.0005|
| Calappa granulata        | Crustacea      | 0.08 (±0.03)      | 0.0005|
| Serranus hepatus         | Fish           | 0.08 (±0.03)      | 0.0005|
| Scomber spp.             | Fish           | 0.08 (±0.03)      | 0.0005|
| Soleidae                 | Fish           | 0.07 (±0.03)      | 0.0005|
| Arno glossus laterna     | Fish           | 0.07 (±0.03)      | 0.0005|
| Coris julis              | Fish           | 0.06 (±0.03)      | 0.0004|
| Ammodotes tobianus       | Fish           | 0.06 (±0.02)      | 0.0004|
| Arno glossus spp.        | Fish           | 0.05 (±0.02)      | 0.0003|
| Symphodus spp.           | Fish           | 0.04 (±0.02)      | 0.0003|
| Pleuronectiformes        | Fish           | 0.04 (±0.02)      | 0.0003|
| Nucella lapillus         | Gastropoda     | 0.04 (±0.02)      | 0.0002|
| Liza spp.                | Fish           | 0.04 (±0.01)      | 0.0002|
| Palinurus elephas        | Crustacea      | 0.03 (±0.01)      | 0.0002|
| Gymnammodytes cicerelus  | Echinodermata  | 0.03 (±0.01)      | 0.0002|
| Symphodus bailloni       | Fish           | 0.03 (±0.01)      | 0.0002|
| Carcinus maenas          | Crustacea      | 0.02 (±0.01)      | 0.0001|
| Argentia sphyraena       | Fish           | 0.02 (±0.01)      | 0.0001|
| Zeagaopterus punctatus   | Fish           | 0.01 (±0.01)      | 0.0001|
| Maja goltziana           | Crustacea      | 0.01 (±0.01)      | 0.0001|
| Arnoglossus thorii       | Fish           | 0.01 (±0.01)      | 0.0001|
| Pagurus forbesii         | Crustacea      | 0.01 (±0)         | 0.0001|
| Polylbys henslovii       | Fish           | 0.01 (±0)         | 0.00004|
| Bothidae                | Fish           | 0.01 (±0)         | 0.00004|
| Goneplax rhomboides     | Crustacea      | 0.005 (±0.002)    | 0.00003|
| Lioarcinus holsatus      | Crustacea      | 0.003 (±0.001)    | 0.00002|
| Callionymus reticulatus  | Fish           | 0.002 (±0.001)    | 0.00001|

### Trap

| Species                  | Taxa Group     | Tonnes (SD)       | %     |
|--------------------------|----------------|-------------------|-------|
| Halobatrachus didactylus | Fish           | 380.2 (±135.4)    | 68.184|
| Scorpheana notata        | Fish           | 74.3 (±26.5)      | 13.325|
| Diplodus belliotti       | Fish           | 43.1 (±15.3)      | 7.232 |
| Astrotecten aranciatus   | Echinodermata  | 35 (±12.5)        | 6.286 |
| Sphaerechinus granularis | Echinodermata  | 8.6 (±3.1)        | 1.550 |
| Spondylusma cantharos   | Fish           | 5.3 (±1.9)        | 0.954 |
| Diplodus annularis       | Fish           | 3 (±1.1)          | 0.540 |
| Spicara flexuosa        | Fish           | 3 (±1.1)          | 0.535 |
| Diplodus vulgaris        | Fish           | 2.2 (±0.8)        | 0.395 |
| Symphodus bailloni       | Fish           | 1.6 (±0.6)        | 0.279 |
| Acanthocardus spinosa    | Bivalvia       | 0.5 (±0.2)        | 0.096 |
| Serranus hepatus         | Fish           | 0.2 (±0.1)        | 0.038 |
| Murex trunculus          | Gastropoda     | 0.2 (±0.1)        | 0.036 |
| Homala barbara           | Crustacea      | 0.2 (±0.1)        | 0.029 |
| Maja squinado            | Crustacea      | 0.1 (±0.05)       | 0.024 |

### Artisanal/multi-gear

| Species                  | Taxa Group     | Tonnes (SD)       | %     |
|--------------------------|----------------|-------------------|-------|
| Liza aurata              | Fish           | 8650.35 (±6238.89)| 36.87007|
| Scomber colus            | Fish           | 4381.95 (±2397.49)| 18.67701|
| Sardina pilchardus       | Fish           | 3122.53 (±1303.59)| 13.35167|
| Trachinus draco          | Fish           | 930 (±387.02)     | 3.96392|
| Boops boops              | Fish           | 839.77 (±627.54)  | 3.57931|
| Microchirus azevia       | Fish           | 829.74 (±345.29)  | 3.35656|
| Chelidonichthys obscurs  | Fish           | 745.13 (±310.08)  | 3.17593|

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Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species                      | Taxa Group | Tonnes (SD)     | %     |
|------------------------------|------------|-----------------|-------|
| Merluccius merluccius        | Fish       | 708.24 (±580.94) | 3.01873 |
| Scorpaena notata             | Fish       | 614.19 (±639.06) | 2.61782 |
| Pagellus acarne              | Fish       | 464.61 (±193.35) | 1.98031 |
| Trachurus trachurus          | Fish       | 373.03 (±155.24) | 1.58997 |
| Serranus cabrilla            | Fish       | 354.29 (±147.44) | 1.51008 |
| Physic picis                 | Fish       | 195.93 (±81.54)  | 0.83511 |
| Halobatrachus didactylus     | Fish       | 192.09 (±211.47) | 0.81782 |
| Sepia officinalis            | Cephalopoda| 133.68 (±154.91) | 0.56798 |
| Sarpa salpa                  | Fish       | 127.21 (±91.75)  | 0.54881 |
| Citharus linguatula          | Fish       | 113.73 (±120.13) | 0.48376 |
| Pagurus spp.                 | Crustacea  | 96.79 (±213.13)  | 0.41254 |
| Liza ranada                  | Fish       | 65.99 (±89.2)    | 0.28125 |
| Echinocardium cordatum       | Echinodermata| 60.86 (±134.01) | 0.25939 |
| Astpocereus aranciacus       | Echinodermata| 43.92 (±17.99)  | 0.18719 |
| Diplodus bellotti            | Fish       | 22.38 (±49.29)   | 0.09541 |
| Tellina tenuis               | Bivalvia   | 19.85 (±43.71)   | 0.08461 |
| Benthodesmus elongates       | Fish       | 19.81 (±22.08)   | 0.08172 |
| Cymbium cymbrum              | Gasteropoda| 18.93 (±7.88)    | 0.08068 |
| Balistes capriscus           | Sharks     | 17.02 (±7.08)    | 0.07255 |
| Citharus linguatula          | Fish       | 16.45 (±8.49)    | 0.06713 |
| Etmopterus spinax            | Sharks     | 14.37 (±5.85)    | 0.06020 |
| Sphoeroides luteus           | Fish       | 13.36 (±5.56)    | 0.05695 |
| Scomber scombrus             | Fish       | 10.81 (±4.5)     | 0.04608 |
| Etmopterus spinax            | Sharks     | 10.33 (±4.5)     | 0.04405 |
| Solea luscaris               | Fish       | 9.63 (±4.5)      | 0.04104 |
| Sphoeroides luteus           | Fish       | 9.13 (±3.8)      | 0.03892 |
| Sphaerechinus granularis     | Echinodermata| 8.64 (±3.8)     | 0.03684 |
| Deania calceata              | Sharks     | 8.52 (±9.2)      | 0.03631 |
| Squalus manti              | Crustacea  | 8.17 (±17.99)    | 0.03482 |
| Centrophorus squamosus       | Sharks     | 7.81 (±8.49)     | 0.03330 |
| Raja miraletus               | Fish       | 7.45 (±3.1)      | 0.03176 |
| Brama braha                  | Fish       | 6.7 (±2.76)      | 0.02857 |
| Mola mola                    | Fish       | 6.59 (±2.74)     | 0.02811 |
| Etmopterus spinax            | Sharks     | 6.22 (±5.02)     | 0.02652 |
| Spondylusosoma canthus       | Fish       | 5.76 (±2.3)      | 0.02456 |
| Torpedo torpado             | Rays       | 5.51 (±2.9)      | 0.02348 |
| Raja clavata                 | Rays       | 4.45 (±1.85)     | 0.01895 |
| Liocarcinus depurator        | Crustacea  | 4 (±8.8)         | 0.01704 |
| Myliobatis australis         | Rays       | 3.6 (±1.5)       | 0.01535 |
| Trigla spb                   | Fish       | 3.53 (±1.47)     | 0.01504 |
| Alepsechus bairdi            | Fish       | 3.53 (±8.3)      | 0.01504 |
| Micromesistus poutassou      | Fish       | 3.39 (±2.83)     | 0.01446 |
| Atrina pectinata             | Bivalvia   | 3.22 (±1.34)     | 0.01371 |
| Chelidonichthys lucernus     | Fish       | 3.18 (±1.32)     | 0.01354 |
| Raja undulata                | Rays       | 3.12 (±1.3)      | 0.01329 |
| Scipara flexuosa             | Fish       | 2.98 (±1.06)     | 0.01271 |
| Pagellus erythrinus          | Fish       | 2.98 (±1.24)     | 0.01270 |
| Raja brachyura               | Rays       | 2.75 (±1.15)     | 0.01173 |
| Chelidonichthys lastoviza    | Fish       | 2.6 (±1.08)      | 0.01109 |
| Synaphobranchus kaupii       | Fish       | 2.42 (±2.63)     | 0.01031 |
| Donax vittatus               | Bivalvia   | 2.34 (±5.15)     | 0.00998 |
| Diplophus vulgaris           | Fish       | 2.2 (±0.78)      | 0.00939 |
| Megil cephalus               | Fish       | 2.1 (±0.87)      | 0.00895 |
| Capros aper                  | Fish       | 2.03 (±0.84)     | 0.00863 |
| Dicologlossa cuneata         | Fish       | 1.99 (±2.31)     | 0.00846 |
| Centrophorus monstrosa       | Sharks     | 1.81 (±0.74)     | 0.00769 |
| Balistes carolinensis        | Fish       | 1.76 (±0.73)     | 0.00752 |
| Trigloperus lastoviza        | Fish       | 1.76 (±0.73)     | 0.00752 |
| Zeus faver                   | Fish       | 1.72 (±0.72)     | 0.00734 |
| Chimaera monstrosa           | Fish       | 1.65 (±0.68)     | 0.00705 |
| Galeus melastomus            | Sharks     | 1.6 (±1.22)      | 0.00682 |
| Diplophus annularis          | Fish       | 1.57 (±1.63)     | 0.00668 |
| Lepidotrigla cavillone       | Fish       | 1.54 (±0.64)     | 0.00656 |
| Belone belone                | Fish       | 1.51 (±0.63)     | 0.00644 |
| Maja squinado                | Crustacea  | 1.49 (±1.6)      | 0.00636 |
| Dalatias ticha               | Sharks     | 1.38 (±0.57)     | 0.00588 |
| Aplomyta punctata            | Gastropoda | 1.34 (±0.56)     | 0.00569 |
| Illex coindetii              | Cephalopoda| 1.27 (±0.52)     | 0.00543 |
| Conger conger                | Fish       | 1.27 (±1.34)     | 0.00543 |
| Atelecyclus undecimdentatus  | Crustacea  | 1.17 (±2.58)     | 0.00499 |
| Ensis silique                | Bivalvia   | 1.07 (±2.36)     | 0.00456 |
| Arnoglossus imperialis       | Fish       | 1.03 (±0.43)     | 0.00439 |
Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species | Taxa Group | Tonnes (SD) | % |
|---------|------------|-------------|---|
| Dicentrarchus labrax | Fish | 1 (±0.42) | 0.00425 |
| Scyllophorus canicula | Sharks | 0.99 (±0.46) | 0.00422 |
| Loligo spp. | Cephalopoda | 0.93 (±0.39) | 0.00395 |
| Scorpopsa porcus | Fish | 0.81 (±0.34) | 0.00345 |
| Symphodus baillonii | Fish | 0.79 (±0.86) | 0.00337 |
| Mullus barbatu | Fish | 0.77 (±0.32) | 0.00327 |
| Polybia henslowii | Fish | 0.7 (±0.29) | 0.00297 |
| Chelon labrosus | Fish | 0.68 (±0.28) | 0.00291 |
| Sparus aurata | Fish | 0.61 (±0.26) | 0.00261 |
| Centropygus crepellae | Fish | 0.59 (±1.31) | 0.00253 |
| Acanthocardia spinosa | Bivalvia | 0.54 (±0.19) | 0.00228 |
| Alosa fallax | Fish | 0.53 (±0.22) | 0.00227 |
| Pecten maximus | Fish | 0.51 (±0.21) | 0.00219 |
| Physic blemnoides | Fish | 0.49 (±0.55) | 0.00209 |
| Solea spp. | Fish | 0.46 (±0.19) | 0.00196 |
| Scophthalmus rhombus | Fish | 0.42 (±0.17) | 0.00197 |
| Pagrus pagrus | Fish | 0.41 (±0.17) | 0.00176 |
| Trachyrincus scabrosus | Fish | 0.4 (±0.44) | 0.00172 |
| Nesiarchus nasutus | Fish | 0.35 (±0.38) | 0.00150 |
| Microchirus ocellatus | Fish | 0.34 (±0.14) | 0.00145 |
| Paracentrotus lividus | Echinodermata | 0.32 (±0.09) | 0.00136 |
| Lepidion guentheri | Fish | 0.3 (±0.33) | 0.00129 |
| Solea solea | Fish | 0.29 (±0.12) | 0.00122 |
| Dardanus arrosor | Crustacea | 0.29 (±0.12) | 0.00122 |
| Centrolabrus exoletus | Fish | 0.27 (±0.11) | 0.00116 |
| Trachinus vipera | Fish | 0.26 (±0.56) | 0.00109 |
| Scymnus ringens | Sharks | 0.25 (±0.27) | 0.00107 |
| Dentex dentex | Fish | 0.23 (±0.09) | 0.00097 |
| Pagellus spp. | Fish | 0.23 (±0.09) | 0.00097 |
| Asterias rubens | Echinodermata | 0.22 (±0.09) | 0.00095 |
| Echinus acutus | Echinodermata | 0.22 (±0.09) | 0.00094 |
| Echinus acutus | Echinodermata | 0.22 (±0.09) | 0.00094 |
| Paracentrotus lividus | Echinodermata | 0.21 (±0.09) | 0.00091 |
| Microchirus ocellatus | Fish | 0.2 (±0.09) | 0.00088 |
| Rajas spp. | Fish | 0.2 (±0.19) | 0.00087 |
| Alepisaurus ferox | Fish | 0.2 (±0.22) | 0.00086 |
| Myrops trunculus | Gastropoda | 0.2 (±0.07) | 0.00086 |
| Spisula solida | Bivalvia | 0.19 (±0.43) | 0.00083 |
| Lepidorhombus boscius | Fish | 0.18 (±0.07) | 0.00076 |
| Mullus surmuletus | Fish | 0.18 (±0.07) | 0.00076 |
| Scophthalmus maximus | Fish | 0.17 (±0.07) | 0.00073 |
| Bothus podas | Fish | 0.17 (±0.07) | 0.00072 |
| Lagocephalus lagocephalus | Fish | 0.17 (±0.07) | 0.00071 |
| Malacochepalus laevius | Fish | 0.17 (±0.07) | 0.00071 |
| Diaptychus violaceus | Fish | 0.17 (±0.07) | 0.00071 |
| Aspitrigla cuculus | Fish | 0.16 (±0.07) | 0.00069 |
| Dentex marocanus | Fish | 0.16 (±0.07) | 0.00069 |
| Macroura corallina stultorium | Bivalvia | 0.16 (±0.35) | 0.00068 |
| Homarus barbata | Crustacea | 0.16 (±0.06) | 0.00068 |
| Lepidone spp. | Fish | 0.15 (±0.16) | 0.00064 |
| Centrophorus granulosus | Sharks | 0.15 (±0.16) | 0.00064 |
| Centropygus coelelepis | Sharks | 0.15 (±0.16) | 0.00064 |
| Prionace glauca | Sharks | 0.15 (±0.16) | 0.00064 |
| Serranus hepatus | Fish | 0.15 (±0.09) | 0.00062 |
| Labrus mixtus | Fish | 0.14 (±0.06) | 0.00059 |
| Labridae | Fish | 0.13 (±0.05) | 0.00056 |
| Diplodus spp. | Fish | 0.13 (±0.05) | 0.00056 |
| Trigla lyra | Fish | 0.12 (±0.05) | 0.00053 |
| Dentex spp. | Fish | 0.12 (±0.05) | 0.00051 |
| Uranoscopus saxatilis | Fish | 0.11 (±0.05) | 0.00046 |
| Lepidopsetra dieselae | Fish | 0.11 (±0.04) | 0.00046 |
| Nephrops norvegicus | Crustacea | 0.11 (±0.04) | 0.00045 |
| Hoplostethus mediterraneus | Fish | 0.11 (±0.04) | 0.00045 |
| Naucrates ductor | Fish | 0.11 (±0.04) | 0.00045 |
| Epigonus telescopus | Fish | 0.1 (±0.11) | 0.00043 |
| Hexanchus griseus | Sharks | 0.1 (±0.11) | 0.00043 |
| Diplodus sargus | Fish | 0.09 (±0.04) | 0.00038 |
| Dentex macroplatus | Fish | 0.09 (±0.04) | 0.00036 |
| Calappa granulata | Crustacea | 0.08 (±0.03) | 0.00034 |
| Scomber spp. | Fish | 0.08 (±0.03) | 0.00032 |
| Solea | Fish | 0.07 (±0.03) | 0.00031 |
| Aroginostoma laterna | Fish | 0.07 (±0.03) | 0.00031 |
| Cortis julis | Fish | 0.06 (±0.03) | 0.00027 |
Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species | Taxa Group | Tonnes (SD) | % |
|---------|------------|-------------|---|
| Ammodites tobianus | Fish | 0.06 (±0.02) | 0.00025 |
| Aphanopus carbo | Fish | 0.05 (±0.05) | 0.00021 |
| Coryphaena hippurus | Fish | 0.05 (±0.05) | 0.00021 |
| Coryphaenoides rupestris | Fish | 0.05 (±0.05) | 0.00021 |
| Thunnus alalunga | Fish | 0.05 (±0.05) | 0.00021 |
| Centrophorus lunaticus | Sharks | 0.05 (±0.05) | 0.00021 |
| Deania profundorum | Sharks | 0.05 (±0.05) | 0.00021 |
| Iurus oxyrinchus | Sharks | 0.05 (±0.05) | 0.00021 |
| Arnoglossus spp. | Fish | 0.05 (±0.02) | 0.00021 |
| Symphodus spp. | Fish | 0.04 (±0.02) | 0.00019 |
| Pleuronectiformes | Fish | 0.04 (±0.02) | 0.00018 |
| Nucella lapillus | Gastropoda | 0.04 (±0.02) | 0.00015 |
| Venus striatula | Bivalvia | 0.04 (±0.08) | 0.00015 |
| Arnoglossus spp. | Fish | 0.05 (±0.02) | 0.00021 |
| Symphodus spp. | Fish | 0.04 (±0.02) | 0.00019 |
| Pleuronectiformes | Fish | 0.04 (±0.02) | 0.00018 |
| Nucella lapillus | Gastropoda | 0.04 (±0.02) | 0.00015 |
| Venus striatula | Bivalvia | 0.04 (±0.08) | 0.00015 |
| Liza spp. | Fish | 0.04 (±0.01) | 0.00015 |
| Palinurus elephas | Crustacea | 0.03 (±0.01) | 0.00013 |
| Ophioderma longicaudum | Echinodermata | 0.03 (±0.01) | 0.00012 |
| Gymnammodytes cicerelus | Echinodermata | 0.03 (±0.01) | 0.00012 |
| Carcinosoma maenadis | Crustacea | 0.02 (±0.01) | 0.00011 |
| Zancloteuthis punctata | Fish | 0.01 (±0.01) | 0.00006 |
| Maja goltziana | Crustacea | 0.01 (±0.01) | 0.00005 |
| Aronoglossus thori | Fish | 0.01 (±0.01) | 0.00005 |
| Pagurus forbesi | Fish | 0.01 (±0.01) | 0.00004 |
| Bothidae | Fish | 0.01 (±0.01) | 0.00002 |
| Ophioderma longicaudum | Echinodermata | 0.01 (±0.01) | 0.00002 |
| Gymnammodytes cicerelus | Echinodermata | 0.01 (±0.01) | 0.00002 |
| Carcinosoma maenadis | Crustacea | 0.002 (±0.001) | 0.00001 |
| Callophrys reticulatus | Fish | 0.002 (±0.001) | 0.00001 |

Seine

| Species | Taxa Group | Tonnes (SD) | % |
|---------|------------|-------------|---|
| Boops boops | Fish | 7466.0 (±1995.0) | 31 |
| Scomber colias | Fish | 4335.5 (±1159.2) | 18 |
| Belone belone | Fish | 3613.0 (±965.2) | 15 |
| Sardina pilchardus | Fish | 3613.0 (±965.2) | 15 |
| Macroramphosus scolopax | Fish | 2649.0 (±708.2) | 11 |
| Scomber colias | Fish | 1445.0 (±386.4) | 6 |
| Halobatrachus didactylus | Fish | 241.0 (±64.1) | 1 |
| Spicara flexuosa | Fish | 241.0 (±64.1) | 1 |
| Trachurus trachurus | Fish | 10659.5 (±4864.9) | 15.856 |
| Merluccius merluccius | Fish | 8854.3 (±4041.2) | 13.171 |
| Scomber colias | Fish | 8641.6 (±3943.9) | 12.855 |
| Micromesistius poutassou | Fish | 4944.1 (±876.6) | 12.635 |
| Trachurus trachurus | Fish | 3888.2 (±774.5) | 5.784 |
| Capros aper | Fish | 2522.1 (±1151.1) | 3.752 |
| Chondrichthytes | | 2178.2 (±994.1) | 3.240 |
| Boops boops | Fish | 1985.3 (±906.2) | 2.953 |
| Conger conger | Fish | 1974.1 (±901.2) | 2.937 |
| Sardina pilchardus | Fish | 1946.7 (±888.4) | 2.896 |
| Scomber colias | Fish | 1749.4 (±794.8) | 2.602 |
| Scyliorhinus caniculus | Fish | 1710.6 (±580.8) | 1.741 |
| Diverse | | 1114.8 (±580.8) | 1.658 |
| Octopodidae | Cephalopoda | 1080.5 (±493.1) | 1.607 |
| Lophius spp. | Fish | 840.4 (±383.6) | 1.250 |
| Lepidopus caudatus | Fish | 792.4 (±361.6) | 1.179 |
| Triglidae | Fish | 789.0 (±360.1) | 1.174 |
| Cephalopoda | Cephalopoda | 771.8 (±352.2) | 1.148 |
| Gadilus argenteus | Fish | 755.5 (±344.8) | 1.124 |
| Physid spp. | Fish | 634.6 (±289.6) | 0.944 |
| Pargnanaeus longirostris | Fish | 626.0 (±285.7) | 0.931 |
| Holothuroidea | Echinodermata | 531.7 (±242.7) | 0.791 |
| Polybuthus henslowii | Cephalopoda | 514.5 (±234.8) | 0.765 |
| Galeus melastomus | Sharks | 406.5 (±185.5) | 0.605 |
| Trisopterus luscus | Fish | 351.6 (±160.5) | 0.523 |
| Mullus spp. | Fish | 300.1 (±137.1) | 0.446 |
| Sphoeroides pachygaster | Fish | 265.8 (±121.3) | 0.395 |
| Maja squinado | Crustacea | 257.3 (±117.4) | 0.383 |
| Pachias spp. | Fish | 257.3 (±117.4) | 0.383 |
| Trachurus trachurus | Fish | 257.3 (±117.4) | 0.383 |
| Pagrus spp. | Fish | 240.1 (±109.6) | 0.357 |
| Macroramphosus scolopax | Fish | 238.4 (±108.8) | 0.355 |
| Helicolenus dactylopterus | Fish | 207.5 (±94.7) | 0.309 |
| Pagrus pagrus | Fish | 171.5 (±78.3) | 0.255 |
| Sarpa salpa | Fish | 171.5 (±78.3) | 0.255 |
| Xiphias gladius | Fish | 171.5 (±78.3) | 0.255 |
| Octopus vulgaris | Fish | 162.9 (±74.4) | 0.242 |
### Table S2 (Cont.). – Taxonomic list with the average absolute and relative weight contribution of each taxa to total unreported catch, per métier, for the period between 1938 and 2009.

| Species                      | Taxa Group       | Tonnes (SD)     | %    |
|------------------------------|------------------|-----------------|------|
| *Spondyliosoma cantharus*    | Fish             | 145.8 (±66.5)   | 0.217|
| *Serranus cabrilla*          | Fish             | 137.2 (±62.6)   | 0.204|
| *Pleuronectes platessa*      | Fish             | 128.6 (±58.7)   | 0.191|
| *Zeus faber*                 | Fish             | 128.6 (±58.7)   | 0.191|
| *Rajidae*                    | Rays             | 111.5 (±50.9)   | 0.166|
| *Tealia spp.*                | Other invertebrates | 102.9 (±47)   | 0.153|
| *Echinoidae*                 | Fish             | 94.3 (±43.1)    | 0.140|
| *Macropipus tuberculatus*    | Crustacea        | 42.9 (±19.6)    | 0.064|
| *Rossia macrosea*            | Cephalopoda      | 35.2 (±16)      | 0.052|
| *Dardanus arrosor*           | Crustacea        | 34.3 (±15.7)    | 0.051|
| *Solea spp.*                 | Fish             | 34.3 (±15.7)    | 0.051|
| *Pagurus alatus*             | Crustacea        | 25.7 (±11.7)    | 0.038|
| *Lepidorhombus spp.*         | Fish             | 25.7 (±11.7)    | 0.038|
| *Argentina sphyraena*        | Fish             | 17.2 (±7.8)     | 0.026|
| *Mullus surmuletus*          | Fish             | 17.2 (±7.8)     | 0.026|
| *Argobaccinum olearium*      | Gastropoda       | 17.2 (±7.8)     | 0.026|
| *Cassidaria tyrithena*       | Gastropoda       | 17.2 (±7.8)     | 0.026|
| *Torpedo nobiliana*          | Rays             | 12.9 (±5.9)     | 0.019|
| *Malacocephalus laevis*      | Fish             | 9.4 (±4.3)      | 0.014|
| *Caenorhinus caeliarhinscus* | Fish             | 8.6 (±3.9)      | 0.013|
| *Illex coindetii*            | Cephalopoda      | 4.3 (±2)        | 0.006|
| *Zenopsis conchifer*         | Fish             | 4.3 (±2)        | 0.006|
| *Opisturus serpens*          | Fish             | 3.4 (±1.6)      | 0.005|
| *Spheroideos cutaneus*       | Fish             | 3.4 (±1.6)      | 0.005|
| *Eledone cirrhosa*           | Cephalopoda      | 2.6 (±1.2)      | 0.004|
| *Octopus salutii*            | Cephalopoda      | 1.7 (±0.8)      | 0.003|
| *Uroarospis eblanae*         | Cephalopoda      | 1.7 (±0.8)      | 0.003|
| *Chimaera monstrosa*         | Fish             | 1.7 (±0.8)      | 0.003|
| *Citharus linguatula*        | Fish             | 1.7 (±0.8)      | 0.003|
| *Lepis piscatorius*          | Fish             | 1.7 (±0.8)      | 0.003|
| *Eledone moschata*           | Cephalopoda      | 0.9 (±0.4)      | 0.001|
| *Hoplostethus mediterraneus* | Fish             | 0.9 (±0.4)      | 0.001|
| *Pagellus bogaraveo*         | Fish             | 0.9 (±0.4)      | 0.001|
| *Peristion cataractatum*     | Fish             | 0.9 (±0.4)      | 0.001|
| *Phycis blemnoideis*         | Fish             | 0.9 (±0.4)      | 0.001|
| *Ruvettus pretiosus*         | Fish             | 0.9 (±0.4)      | 0.001|
| *Trachurus mediterraneus*    | Fish             | 0.9 (±0.4)      | 0.001|
| *Raja clavata*               | Rays             | 0.9 (±0.4)      | 0.001|
| *Raja oxyrinchus*            | Rays             | 0.9 (±0.4)      | 0.001|
| *Etmopterus pusillus*        | Sharks           | 0.9 (±0.4)      | 0.001|
| *Hexanchus griseus*          | Sharks           | 0.9 (±0.4)      | 0.001|