



Market Opportunities for Octopus in the Atlantic Area

CEPHS & CHEFS
Summary of Main Achievements

Technical information

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About Ceph & Chef



In 2017, the INTERREG Atlantic Area European funding programme funded the project **Ceph & Chef – “Octopus, Squid, Cuttlefish, Sustainable Fisheries and Chefs”**¹ which has the overall aim of promoting sustainable fishing on octopus, squid and cuttlefish.

The four main objectives of the Ceph & Chef project are to:

- a) **Add value to cephalopod products**, by developing and promoting new products, new market initiatives (e.g., certification) and business opportunities for the sector;
- b) Improve knowledge of the **value chain** (“from sea to table”), the factors affecting sustainability in the short term (e.g., low prices, imports, consumer demand), and **potential market developments** in the long term;
- c) Improve knowledge of the **eating habits** and acceptance of **new cephalopod food products** by consumers in Northern and Southern Europe;
- d) Ensure the **sustainability of the fishing activity** by assessing the status of stocks, fisheries and ecosystems based on biological indicators.

¹<https://www.cephsandchefs.com>



In the **Atlantic Area**, fishing for cephalopods has a regional flavour. For example, the fisheries for common octopus (*Octopus vulgaris*) are incredibly important in the South – in regions such as the Algarve (Portugal), Galicia and Andalusia (Spain) – where they form the basis of traditional cuisine. However, squid and cuttlefish are also important. On the other hand, in Northern countries (Ireland and United Kingdom), squid fisheries (mainly for veined squid *Loligo forbesii*) are much more important than fishing for octopus. In addition, in the English Channel, cuttlefish fisheries (for common cuttlefish *Sepia officinalis*) also play an important role for France and the United Kingdom (UK), along with European squid (*Loligo vulgaris*) and veined squid.

As quotas for many finfish stocks are insufficient to meet demand, often because of past overexploitation, there is the need to stimulate consumers in the North to eat alternative sources of sustainable seafood – including octopus, squid and cuttlefish. Cephs & Chefs worked with chefs (including chefs of the future via Institutes of Technology such as the School Culinary Arts & Gastronomy of Galway-Mayo IT), to raise the profile of these delicious and healthy seafoods among the general public (see Cephs & Chefs Recipe Book²), while ensuring that they are fished sustainably. In the South, new products such as smoked octopus were developed as interesting alternatives to add value to this fisheries resource.

To ensure everything is done sustainably, a large part of the research has been analysing data collected from landings, via the European

Union (EU) Data Collection Framework, and fisheries surveys in the relevant fishery areas (International Council for the Exploration of the Sea (ICES) fishery divisions 4, 6, 7, 8 and 9), to examine status and trends. In order to encourage cephalopod fisheries along the pathway towards increased sustainability, we developed a “Sustainability Toolkit”³, which provides step-wise guidance on how to enter a Fisheries Improvement Project (FIP) and/or to achieve certification.

In the Cephs & Chefs project, we have also tried to understand the importance of octopus, squid and cuttlefish in global value chains, as well as conducting consumer surveys to identify people's eating habits, barriers and drivers to consumption of cephalopods and their preferences for and perception about sustainable labelling initiatives.

This booklet provides a **summary of the main results** obtained during the last three and a quarter years (2018-2021) of the Cephs & Chefs project, including: a brief overview of the octopus global trade network, with focus on the Portuguese and Spanish markets and value chains; an outline of market initiatives for cephalopod fisheries; insights about consumer choices and preferences for seafood, focused on cephalopods; and, finally, alternatives for adding value to cephalopod products.

Our main aim is to provide information for stakeholders in the fishing industry and value chain as well as for scientists, managers, regulatory authorities, governments, and the general public.

²<https://www.cephsandchefs.com/recipe-book/>

³<https://www.cephsandchefs.com/sustainability-toolkit/>



Cephalopods as Fishery Resources

Cephalopods are marine molluscs. These animals play an important ecological role as both predators and prey in marine ecosystems, and are also a relevant resource as food for human consumption. The exploited **octopus, squid and cuttlefish** in European waters have not received the same protection as commercially exploited finfish, since they fall outside the quota (Total Allowable Catch) regulations under the Common Fisheries Policy (CFP) and management of these fisheries is the responsibility of the Member States⁴. This is an opportunity, because it allows fishers to switch to targetting cephalopods when they reach their allowable catch limits for other fish and shellfish species, and indeed they can always land and sell bycatches of cephalopods. However, it is also a threat, since the resource is not protected (at EU level) from overexploitation. In practice, exploitation rates tend to be highly variable from year to year⁵. With decentralized regulation, different rules are applied in different countries (e.g., minimum landing size), and most of these rules apply only to small-scale fisheries targetting cephalopods.

The **commercially important cephalopods** in Europe mostly belong to four families: Octopodidae (octopuses), Sepiidae (cuttlefish, with which we may group their small relatives the Sepiolidae), Loliginidae (long-finned squids) and Ommastrephidae (short-finned squids).

Cephalopods are very short-lived species, with most commercial species only living for 1-2 years, during which they reproduce only once before dying. This is what is known as a 'semelparous' reproductive strategy, and it results in little or no overlap in time between successive generations. The importance of this is that a single very bad year (e.g., breeding failure due to overfishing or adverse environmental conditions) could be sufficient to wipe out a stock. However, within a stock, flexibility in when, where, and at what size they reproduce offers cephalopods a strategy for overcoming this obvious risk, while also having the down-side (from our point of view) of making stock assessment trickier.

Many studies have shown that environmental conditions have an unusually large impact on cephalopod **abundance and distribution**, and this may be the main reason why abundance can vary dramatically from year to year. It is important to understand the socioeconomic impact of these fluctuations in catch and indeed their effect on the health of marine ecosystems. The recent implementation report of the Marine Strategy Framework Directive⁶, showed that sufficient data are not yet available for cephalopods. This is a matter of concern due to their importance, as predators, as prey for marine mammals, larger fish and elasmobranchs, and as fishery resources⁷.

⁴Pita, C. et al. 2021. Fisheries for common octopus in Europe: socioeconomic importance and management. Fisheries Research 235. 105820. <https://doi.org/10.1016/j.fishres.2020.105820>

⁵ICES, 2020. Working Group on Cephalopod Fisheries and Life History (WGCEPH; outputs from 2019 meeting). ICES Scientific Reports, 2:46. 121 pp. <http://doi.org/10.17895/ices.pub.6032>

⁶Report from the Commission to the European Parliament and the Council on the Implementation of the MSFD. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0259>

⁷Lishchenko, F. et al. 2021. A review of recent studies on the life history and ecology of European cephalopods with emphasis on species with the greatest commercial fishery and culture potential. Fisheries Research, 236, 105847. <https://doi.org/10.1016/j.fishres.2020.105847>

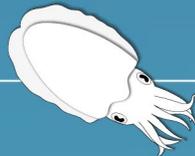


Octopus, Squid and Cuttlefish are not all the same



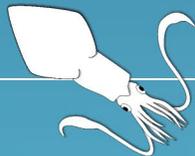
Octopus

There are around 300 species of octopus described worldwide. Octopus juveniles and adults are benthic and move around very little. Opportunities for large-scale movement are restricted to the planktonic paralarvae. Octopus species are more likely to exist as many separate stocks.



Cuttlefish

Migratory largely benthopelagic species but their migrations occur over relatively small distances, mainly within continental shelf waters. Cuttlefish lack a planktonic paralarval stage. While more mobile than octopus they are generally less mobile than squid. Nevertheless, there are unlikely to be many different stocks.



Long-finned squids

Loliginid squids are also migratory benthopelagic species, although again mainly restricted to continental shelf waters. They have planktonic paralarvae. There are likely to be rather few distinct stocks within each species.



Short-finned squids

Ommastrephid squids are mainly pelagic species, which undertake extensive migrations often extending into oceanic waters. Unlike the previously mentioned groups, which all attach their eggs to hard structures on the seabed, ommastrephid egg masses float in the water column. This group is most likely to exist as single stocks covering large areas and they are also the most variable and least predictable group.

more than
800
cephalopod
species described



Cephalopods are highly valuable **fishery resources**, with at least 50 species commercially exploited worldwide.

Cephalopods grow very fast, with most commercial species having a **short lifespan of 1-2 years**, usually, with non-overlapping generations.

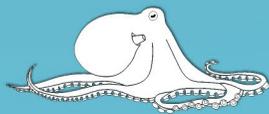
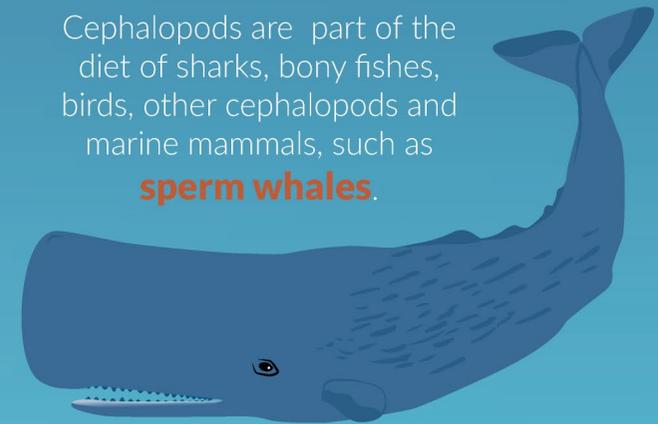
The word 'cephalopods' derives from the greek words, κεφαλή (kephalé) + ποδός (podós), meaning **head + foot**.

Squids contribute around 80% of the total landings worldwide, while **octopus and cuttlefish** contribute about 10% each.

Cephalopods are part of the diet of sharks, bony fishes, birds, other cephalopods and marine mammals, such as **sperm whales**.

Most cephalopods are **active visual predators** with complex feeding behaviours. Cephalopods' prey items include crustaceans, molluscs, fishes, detritus and even birds.

Most cephalopods use their ink — a dark-coloured substance composed mainly of melatonin, to escape from their predators. The ink can also be used for **culinary purposes**.





Octopus Markets and Value Chains

Squid make up around 80% of the total global cephalopod landings, while octopus and cuttlefish each contribute 10% of the landings. Consequently, squid are also the most important of the three in international seafood trade. While most squids are targeted by large-scale fisheries **octopus** species are targeted mostly by small-scale fishers employing static gears in coastal waters and are of considerable socio-economic importance, providing employment and income to many coastal fishing communities around the globe. They are also, increasingly, a global traded commodity.

The octopus global trade network currently includes around 220 countries with the most important cluster centred around Asia (China, India, Republic of Korea, Thailand, Vietnam), the EU (Netherlands, Spain) and North America (USA). Other EU countries (Belgium, Denmark), Canada and several developing countries (Argentina, Chile, Malaysia, Morocco, Philippines, Senegal, South Africa, United Arab Emirates) comprise the second most important trade cluster.

The EU plays an important role in global octopus seafood markets, mainly through Spain, Portugal and Italy. Spain is an especially important actor in the octopus global supply chain, being both a major importer and a key global supplier of octopus.

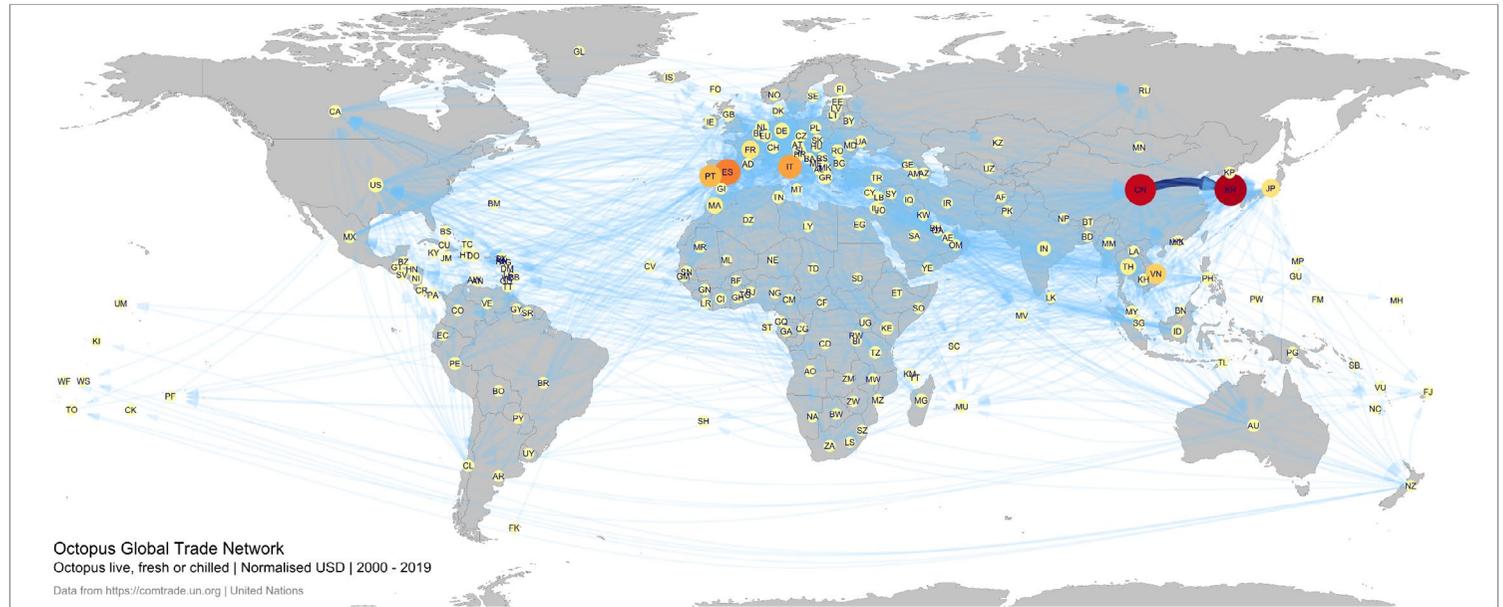
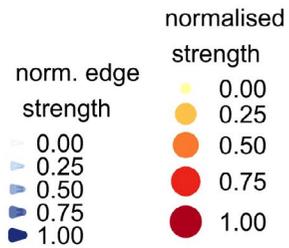
For more detail, go to the project Ceph & Chefs Webtool:

<https://webtool.cephsandchefs.com>

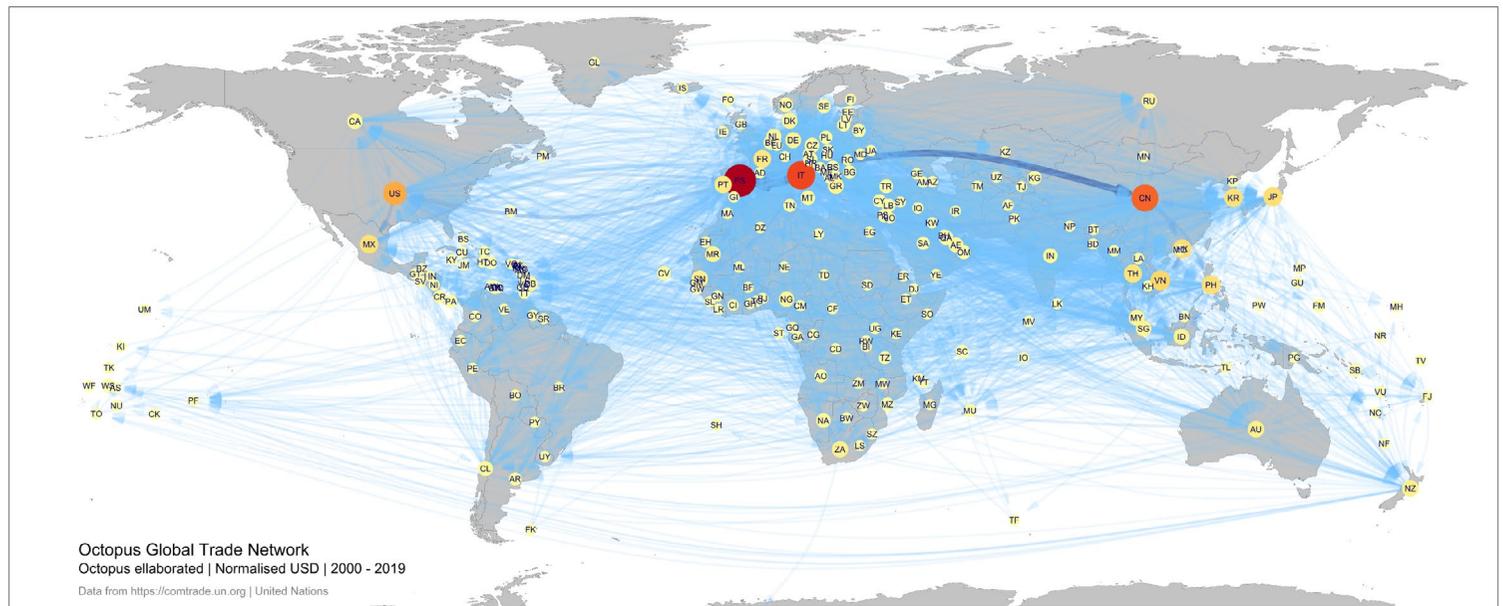
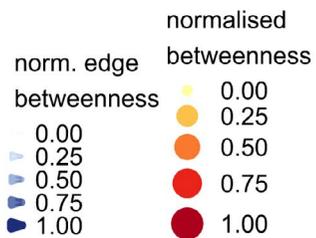


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Octopus global trade network in monetary value (\$USD) for live, fresh or chilled products.

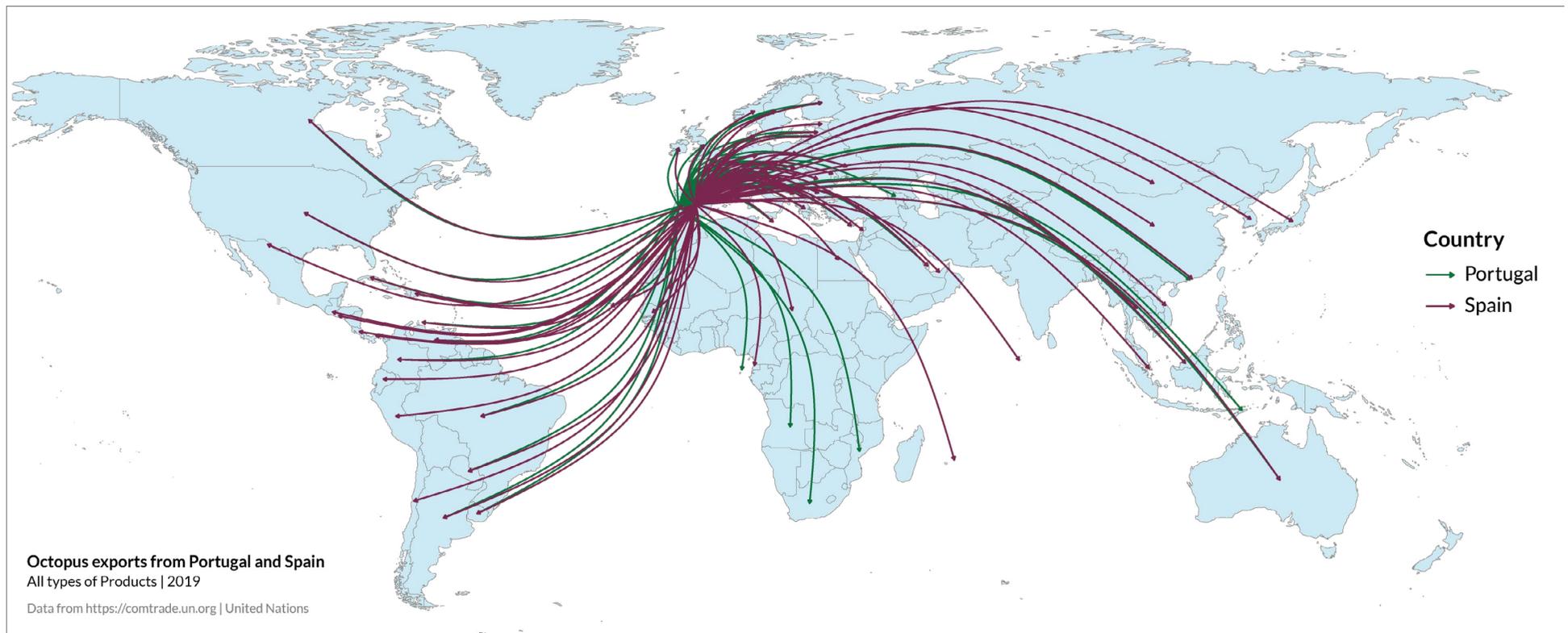


Octopus global trade network in monetary value (\$USD) for elaborated products.



Markets for Portuguese and Spanish Octopus

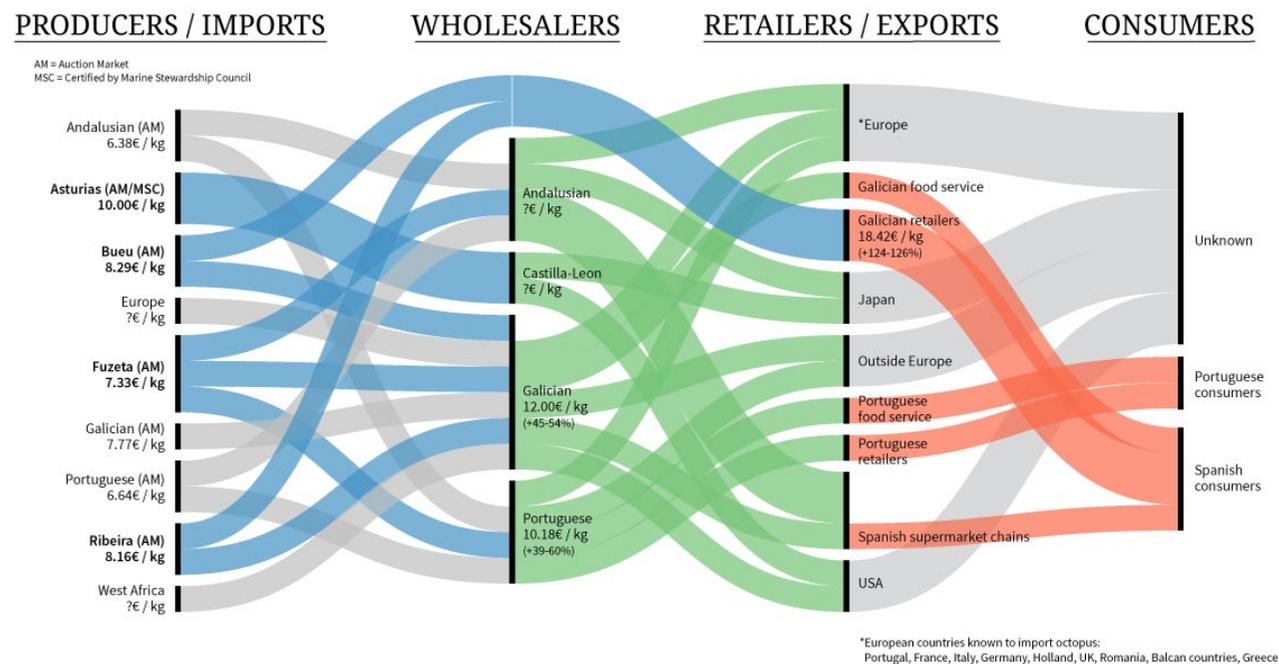
Spain and Portugal are important markets for the common octopus *Octopus vulgaris*, where this species is regularly consumed as part of the traditional diet. These two countries are also important, well-connected, actors in the **global trade of octopus products**, exporting octopus to most parts of the globe. They are important traders of fresh octopus products, as well as elaborated octopus products. Spain and Portugal trade between themselves and also provide a significant amount of octopus to the rest of the EU (especially to Italy and Greece). Exports to the USA continue to grow, with the USA market having become increasingly important to both countries.



Octopus Value Chain

Consumption of octopus has deep roots in the gastronomy, traditions and popular culture of Portugal and Spain (especially in Galicia). Galicia acts as a logistics hub for global octopus trade. However, much information is lacking on the octopus value chain and marketing in those two countries.

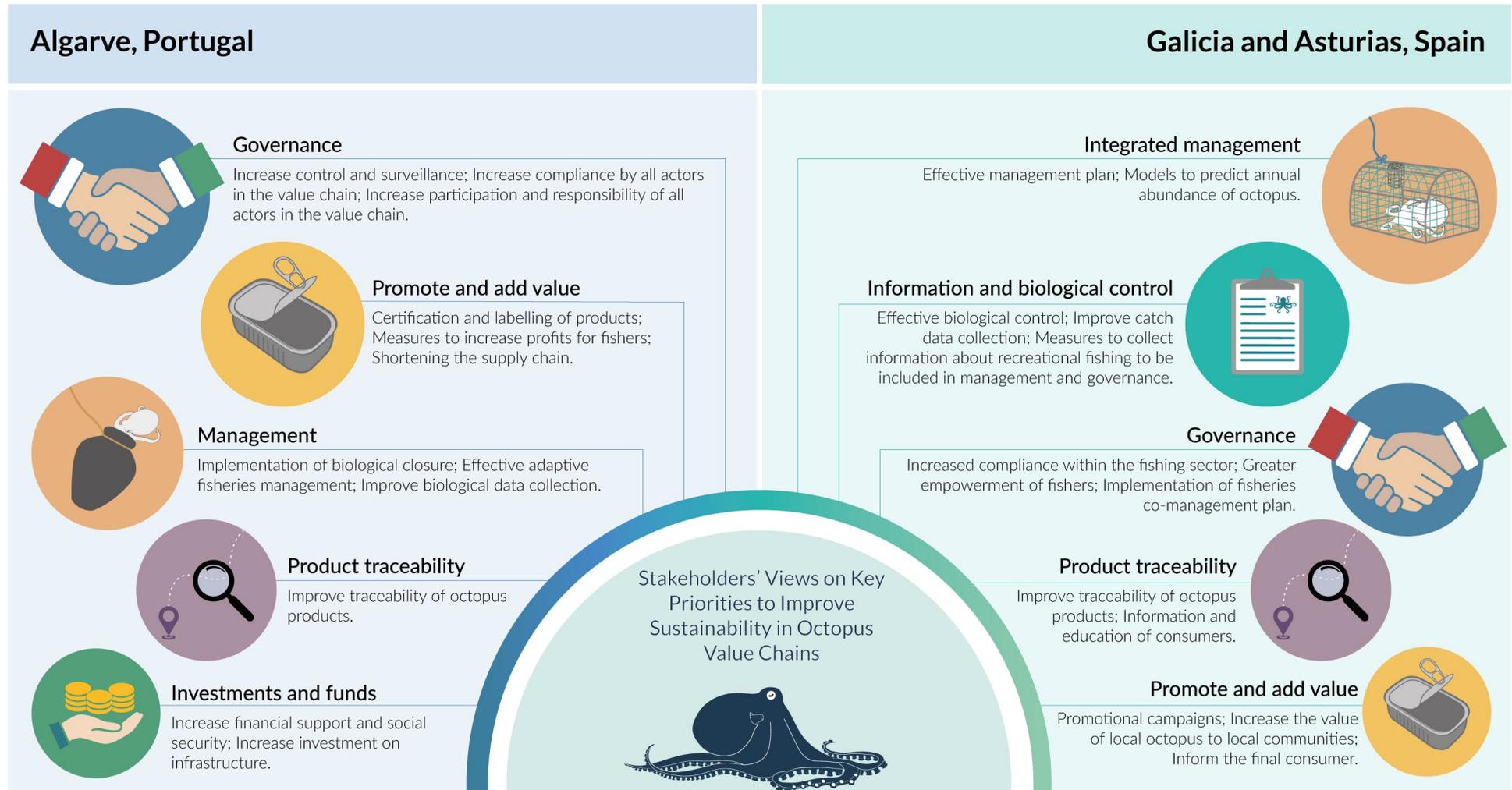
An example of octopus value chains from the ports of **Fuzeta** (Portugal), **Bueu** and **Ribeira** (Galicia) and **Asturias** (Spain) shows the importance of Galicia. The strong internal demand for octopus in the region fuels an important fishery in the ports of Bueu and Ribeira (in which octopus contribute around 80-85% of the total landings), and imports from across the entire species distribution area, especially from North Africa (Morocco and Mauritania), Portugal (Algarve, in this case Fuzeta) and neighbouring regions of northern Spain (Asturias). Once processed, octopus is sold in local, national and international markets including Germany, Italy and the USA. Strong domestic demand and increased international demands along with fluctuations in landings driven by effects of oceanography (especially upwelling) on the larval stages⁸, has led to an increase in the economic value of the species. Half of the final price paid by consumers is directly dependent on the expenses and profit of the producers, while the other half is distributed approximately equally between wholesalers and retailers.



⁸Otero, J., et al. (2016). Wind-driven upwelling effects on cephalopod paralarvae: *Octopus vulgaris* and Loliginidae off the Galician coast (NE Atlantic). Prog. Oceanogr. 141, 130-143. <https://doi.org/10.1016/j.pocean.2015.12.008>

Priorities and Actions for Achieving Sustainability in Octopus Fisheries

To identify the main priorities and actions to increase **environmental, economic and social sustainability**, we interviewed stakeholders in fisheries for octopus (producers, business, public administration, NGOs and scientists) from the Algarve (Portugal) and carried out a workshop with stakeholders from Galicia and Asturias (Spain) (n=30 representatives in each country). A summary of main results follows below.





Market Initiatives for Cephalopods Fisheries

There are several ways of communicating to consumers about the environmental sustainability of seafood products and fishing activities. This is mostly done through **labelling, certification and ratings programs**, in some cases also supported by guides for consumers, and most of them are operated by non-governmental organizations (NGOs)⁹. These initiatives enable the consumers to make informed choices about the products they purchase.

There are several labelling, certification and rating programs for seafood products and fishing activities; a few of them global, many focused at the national or local level. The most rigorous and credible ones have been recognized by international initiatives, such as the Global Sustainable Seafood Initiative (GSSI)¹⁰, and the Certification and Ratings Collaboration¹¹, that analyze the alignment of these programs with the Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries¹² and the FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries¹³.

Beyond recognizing sustainability, several market actors are interested in recognizing progress towards achieving sustainability.

⁹ <https://webtool.cephsandchefs.com/searcher>

¹⁰ <https://www.ourgssi.org>

¹¹ <https://www.certificationandratings.org>

¹² <http://www.fao.org/resilience/resources/resources-detail/en/c/273397/>

¹³ <http://www.fao.org/publications/card/en/c/2a34c2bc-6275-5cf3-b8b9-08771baaf059/>

¹⁴ <https://fisheryprogress.org>

¹⁵ <https://www.cephsandchefs.com/sustainability-toolkit/>

The most popular way to do this is through **Fishery Improvement Projects (FIPs)**¹⁴. The main goals of FIPs are to enable the supply chain to recognize those particular fisheries actively working to overcome their sustainability challenges, and to attract market stakeholders to support those fisheries and projects.

Other initiatives that have gained consumers' attention include **certification of origin** (i.e., indicating the geographical origin of the product) and the **certification of production system** (e.g., exclusively small-scale or artisanal techniques). It is important to emphasize that this type of certification, although may be a useful tool to improve the traceability of products, does not always address sustainability concerns.

Next, we provide a brief summary of certification, rating schemes and FIPs for cephalopod fisheries. A roadmap on how cephalopod fisheries can enter a FIP or achieve Marine Stewardship Council (MSC) certification is provided in the Sustainability Toolkit¹⁵.



Certification

The FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries¹⁶ define certification as “a procedure by which a third party gives written or equivalent assurance that a product, process or service conforms to specified requirements”. Thus, certification must address, through the direct engagement with fisheries stakeholders and the supply chain, social and environmental challenges that must be overcome by the fisheries so to achieve a verified level of performance¹⁷. The Marine Stewardship Council (MSC)¹⁸ is the largest certifier of seafood globally. According to MSC, fisheries certification “is a way of showing that a fishery meets international best practice for sustainable fishing”. Ecolabelling of seafood products provides information about the sustainability of fished (or farmed) seafood.

★ ★ ★ Ratings Schemes

★ ★ ★ As defined by the Certification and Ratings Collaboration, rating schemes “focus on assessing as many seafood sources as possible in key markets to provide information on the full spectrum of low-to-high performance for fisheries and aquaculture. This information can be used to identify opportunities for producers to pursue improvement projects and certifications, as well as help businesses evaluate sourcing options.” While ratings evidently refer to sustainability, the process by which

¹⁶ FAO Fisheries and Aquaculture Dep., Rome (Italy). Guidelines for the ecolabelling of fish and fishery products from marine capture fisheries. FAO, Rome (Italy), 2009.

¹⁷ https://certificationandratings.org/wp-content/uploads/2019/06/Sustainable_Seafood_A_Global_Benchmark.pdf

¹⁸ <https://www.msc.org/for-business/fisheries>

¹⁹ <https://solutionsforseafood.org/resources/fishery-improvement/>

²⁰ <https://www.cephsandchefs.com/sustainability-toolkit/>

the ratings are determined is not always transparent.



Fishery Improvement Projects (FIPs)

A FIP is a “multi-stakeholder effort to address environmental or social challenges in a fishery”¹⁹. Active FIPs can be 'basic' or 'comprehensive' (for a detailed explanation, see the Sustainability Toolkit²⁰). Although there is no established best practice to develop FIPs, various such initiatives exist, aiming to assure the quality, homogeneity, robustness and credibility of these projects. The most authoritative source is Fishery Progress, which is a collective effort to compile public information about FIPs around the world and to standardize the way improvements and progress towards sustainability goals are measured and reported.



Certification of Origin and Production System

Some labels focus on communicating the geographical origin of the product, the nature of the production system (e.g., exclusively small-scale or artisanal techniques) or quality and freshness of the products (e.g., catch of the day).

Main differences between seafood certification, rating schemes and Fishery Improvement Projects (FIPs).

Assessment Element	Certification	Rating schemes	FIPs
Scheme	MSC	Seafood Watch (MBA), Good Fish Guide (MCS) & Ocean Wise	Fishery Progress (FishChoice)
Participation	Voluntary decision of fishery	Selected by the rating scheme	Voluntary decision of fishery
Cost to producers	Paid by fishery (unless subsidised by NGOs, government, supply chain actors)	None	Some (usually co-paid by stakeholders in all or some part)
Assessment review	Independent accredited 3 rd party auditors	Independent experts selected by rating scheme	Independent experts selected by the fishery
Transparency of process	Public during the process	Public once complete	Public during the process
Stakeholder input	At multiple stages of the process	Rare to none	Throughout the whole process
Objection process	Formal arbitration process	Not formalized	Not applicable
Geographic & harvest method scope of assessment	The certificate applies to the client (specific boats targeting determined species using a particular gear in a delimited fishing area)	Selected by the rating scheme (can include whole management area/species/fleet/multiple gears)	The FIP covers a particular fishery (or fisheries), targeting determined species using particular gear(s) in a delimited fishing area
Traceability system	Chain of custody certification	None	None
Products that are eligible for sustainability claims	Harvest from the boats, gear, species and area that were assessed	Generic about the fishing area	Not applicable
Industry marks/labels	Business-to-Business available	Rare to none	Not applicable
Consumer marks/labels	On-product ecolabel	Rare to none	Not applicable

Table modified from: FishChoice, "Understanding Seafood Ratings and Seafood Certifications".

Mapping market initiatives for cephalopod fisheries

Here, we map the **market-based initiatives for cephalopod fisheries** (up to April 2021). We considered the certified fisheries from GSSI members and fisheries in rating programs from Certification and Ratings Collaboration and others. Among the certification programs, only the MSC²¹ has certified cephalopod fisheries. In terms of rating schemes, we considered cephalopod fisheries positively rated by: the Seafood Watch of the Monterey Bay Aquarium (MBA; those considered best choice or good alternative), the Good Fish Guide of the Marine Conservation Society (MCS; those rated 1-3) and the Ocean Wise Seafood of the Vancouver Aquarium (OWS; those rated 3-5)²². In total, there are 53 market-based initiatives for cephalopods, including 22 different species (11 octopus, 10 squids and 1 cuttlefish): 4 fisheries are MSC-certified, 38 are positively rated (19 MBA; 4 MCS; 15 OWS) and there are 11 FIPs (none in Europe). OWS uses the criteria developed by MBA, thus their rated cephalopod fisheries overlap with those rated by MBA. North America, Europe and Asia together account for around 80% of these market initiatives. In addition to these initiatives, we have included in the map other initiatives²³, which include cephalopod fisheries working towards entering a FIP, backed up by octopus and squid Supply Chain Roundtables from Sustainable Fisheries Partnership (SFP), or in MSC programs (BluFish, MedFish, Fish for Good and SWIOCeph) towards sustainability. Below, we briefly describe the only MSC-certified cephalopod fishery in Europe and two examples of FIPs.

²¹<https://www.msc.org>

²²<https://www.seafoodwatch.org>; <https://www.mcsuk.org/goodfishguide>; <https://seafood.ocean.org>

²³<https://www.msc.org/what-we-are-doing/pathway-to-sustainability>; <http://www.project-medfish.com>; <https://www.fishsource.org>; <https://www.sustainablefish.org>

● MSC-Certified Fisheries

- 1 Western Asturias Octopus (traps), Spain
- 2 Western Australian Octopus (traps), Australia
- 3 US Northeast Longfin Squid (trawls; bottom trawls; otter trawls), USA
- 4 US Northeastern Coast Longfin Squid and Northern Shortfin Squid (trawls; bottom trawls; otter trawls), USA

● Fisheries in a FIP

- 5 Southwest Madagascar Octopus (diver-caught; hand gathered; harpoon), Madagascar
- 6 Yucatan Octopus (handline; jig), Mexico
- 7 Bahia de Los Angeles Octopus (diver-caught, hand gathered; pots; traps), Mexico
- 8 Gulf of California Squid (jig), Mexico
- 9 Peruvian Jumbo Flying Squid (jig), Peru
- 10 Patagonian Octopus (diver-caught), Chile
- 11 Kerala Shrimp & Cephalopods (trawl), India
- 12 North Sumatra Squid (handline), Indonesia
- 13 Shantou-Taiwan Chinese Squid and Octopus (jig), China
- 14 East China Sea & Yellow Sea Japanese Flying Squid (trawl), China
- 15 Tomamae Octopus (barrel flowing), Japan

● Fisheries Positively Rated

Seafood Watch (MBA), Good Fish Guide (MCS), Ocean Wise Seafood (OWS)

- 16 Giant Pacific Octopus, Bering Sea (pots), USA
- 17 Giant Pacific Octopus, Gulf of Alaska (pots), USA
- 18 Giant Pacific Octopus (hard substrate; soft substrate), Canada
- 19 Big Blue Octopus (hand implements; hand-operated pole-and-lines; handlines), USA

- 20 White-striped Octopus (hand implements; hand-operated pole-and-lines; handlines), USA

- 21 California Market Squid (purse seines), USA

- 22 Jumbo Squid (jigs), Mexico

- 23 Jumbo Squid (jigs), Peru

- 24 Jumbo Squid (jigs), Chile

- 25 Common Octopus (pots; jigs), Senegal

- 26 Common Octopus (pots; traps), Portugal

- 27 Common Octopus (pots; traps), Spain

- 28 Squid (jig; demersal otter trawl), England

- 29 Squid (demersal otter trawl), India

- 30 Jumbo Squid (jigs), China

- 31 Flying Squid (jigs), Japan

● Other Initiatives

- 32 Horned Octopus (trawl), Italy (BluFish)

- 33 Common Octopus (pots), Italy (BluFish)

- 34 Common Octopus (pot; traps), France (Medfish)

- 35 Common Octopus (pot; traps), Spain (Medfish)

- 36 Cape Hope Squid (jig), South Africa (Fish for Good)

- 37 Octopus Fisheries in various countries (Kenya, Tanzania, Zanzibar, Comoros, Seychelles, Madagascar, Mozambique, Mauritius and South Africa) (SWIOCeph)

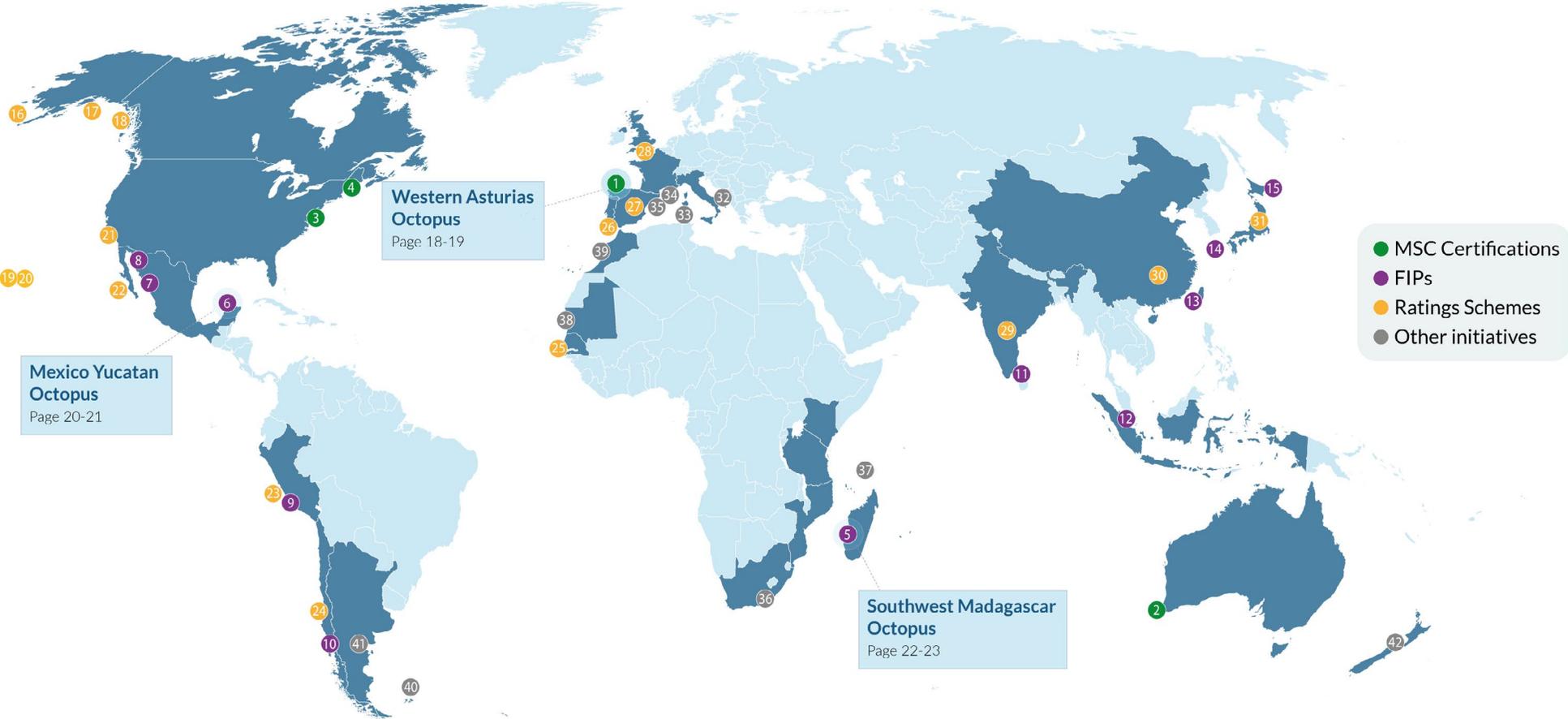
- 38 Common Octopus (pots, traps, trawl), Mauritania (SFP Supply Chain Roundtables)

- 39 Common Octopus (pots, traps, trawl), Morocco (SFP Supply Chain Roundtables)

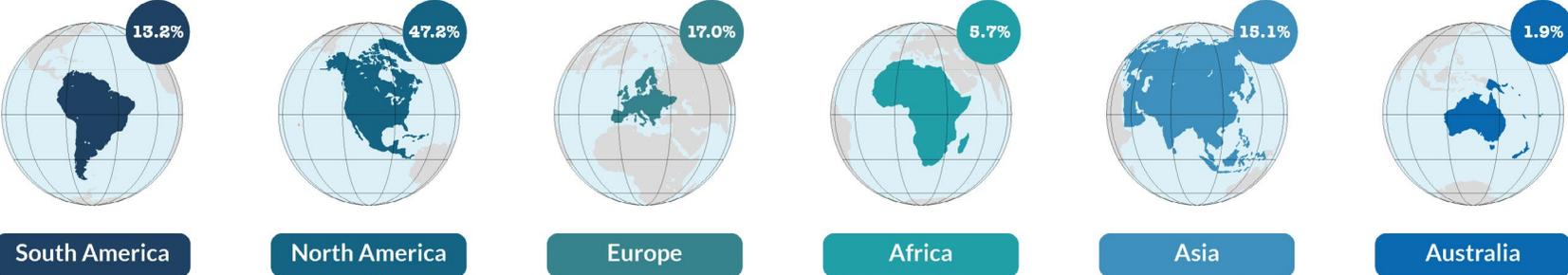
- 40 Patagonian Squid (bottom trawl), Falkland Islands

- 41 Argentine Shortfin Squid (otter trawl; vertical lines), Argentina

- 42 Flying Squid (bottom trawl; midwater trawl), New Zealand



Proportion of market-based initiatives (certification programs, rating schemes and FIPs) for cephalopod fisheries by region:



The MSC-certified Western Asturias Octopus Traps Fishery

The Western Asturias Octopus Fishery was the first **MSC-certified cephalopod fishery** in the world and it is still the only one in European waters. Certified in 2016, this small-scale fishery integrates 29 boats targeting *Octopus vulgaris* using traps. The certificate is managed by a skippers association (ARPESOS) including boats from 7 different guilds in Asturias, landing in five different ports. In 2010, this group of fishers' guilds, supported by the Local Rural Development Action Group, undertook an analysis of the challenges faced by the fishery and decided to work towards MSC certification. The support of the Asturias fisheries administration (Dirección General de Pesca Marítima) and especially its advice centre (Centro Experimentación Pesquera) was fundamental to meet this ambitious goal. The steps to date are summarized below:

<p>Pre-Assessment (Sep. 2013 – Feb. 2014)</p> <p>Preparation of the Fishery (Mar.–Sep. 2014)</p> <p>MSC Full Assessment (Dec. 2014 – Feb. 2016)</p> <p>MSC Certification (Feb. 2016)</p> <p>Action Plans (2016 – 2020)</p> <p>1st Annual Surveillance Audit (ASA) (2017)</p> <p>2nd ASA (2018)</p> <p>3rd ASA (2019)</p> <p>4th ASA (2020)</p> <p>MSC Re-Assessment (announced Nov. 2020)</p> <p>Site visit (2021)</p>	<ul style="list-style-type: none"> ● Gap analysis to identify weak points and obstacles in the fishery and the likelihood of achieving certification. ● Measures to improve weaknesses before starting the certification process. Start to collect information of fishery impact on species, habitats and ecosystem. ● Analysis to assess the fishery against the MSC Standards. ● MSC certification obtained. ● Implement measures to meet the four conditions raised in the certification in order to improve the sustainability of the fishery. ● An Octopus Fishery Monitoring Commission is created as a consultative body for the management plan; Stakeholders (fishers, administrators, NGOs, scientists) work together. ● GPS/GPRS tracking devices installed on all vessels to determine the fishing areas/effort. Fishery working on two possible Harvest Control Rules (HCR) to be tested. ● New objectives have been incorporated into the management plan related to the sustainability of the stock and the impact on other species. ● Octopus stock assessment done for the first time. Implementation of new decision-making process and marking program for traps (ID seals); Protocol for surveillance established. ● Another evaluation of the fishery started. ● The fishery has established a HCR based on the stock assessment. The Monitoring Control & Surveillance system demonstrates its ability to eliminate excessive fishing effort in the fishery.
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Species

Common octopus
(*Octopus vulgaris*)



Type of initiative

Certification



Leadership

Fishers' association



Fishing gear

Traps



Fishing fleet and fishers

29 small-scale vessels
58 fishers



Landings

39 tonnes

More information at: <https://fisheries.msc.org/en/fisheries/western-asturias-octopus-traps-fishery-of-artisanal-cofradias/>

Mexico Yucatan Octopus Fisheries

Mexico is one of the largest octopus producers in the world. The Mexico Yucatan octopus fishery is a **Comprehensive FIP**, targeting both the red octopus *Octopus maya*, an endemic species of the Yucatan Peninsula, and the common octopus *Octopus americanus**. These species are caught using handline and jig by small and medium-scale fleets in Yucatan, Mexico. The total landings from the part of the fishery covered by the FIP are around 10,000 metric tonnes, which are mostly exported to Europe. Led by Comunidad y Biodiversidad, A.C. (COBI)²⁴ in collaboration with several stakeholders, the FIP is currently at stage 5 (Improvements on the Water) and its objective is to obtain MSC full assessment in 2023.

<p>Octopus Fishery Management Plan (2014)</p>	<ul style="list-style-type: none"> An Octopus Fishery Management Plan for <i>O. maya</i> and <i>O. americanus</i> in the Gulf of Mexico and the Caribbean Sea was implemented. The plan includes social, economic, biological and ecological objectives and establishes strategies and management measures.
<p>Regulatory Measures Implemented (2015)</p>	<ul style="list-style-type: none"> The octopus fishery is regulated. Management measures include: specifications of fishing gear and methods, species, minimum landing sizes, temporal closures and the condition of establishing an annual total allowable catch (TAC).
<p>MSC Pre-Assessment (Jul.-Nov. 2018)</p>	<ul style="list-style-type: none"> The fishery was pre-assessed according to the MSC criteria. Several gaps were found in all principles, mainly regarding stock assessment method, endangered, threatened and protected species (ETP) by-catch and compliance and enforcement. An agreement with the Sustainable Fisheries Partnership was established and the fishery entered the Supply Chain Roundtable. Funds and support from the processing/marketing industry were obtained to improve the fishery.
<p>FIP Launching Workshop (Jan. 2019)</p>	<ul style="list-style-type: none"> A workshop with representatives of different sectors (producers, processors, exporters, distributors, buyers, research institutions and NGOs) to launch the FIP was carried out.
<p>FIP Workplan (Aug. 2019)</p>	<ul style="list-style-type: none"> A FIP workplan including potential actions and activities to be implemented under each one of the MSC principles was implemented. Some progress has already been achieved.

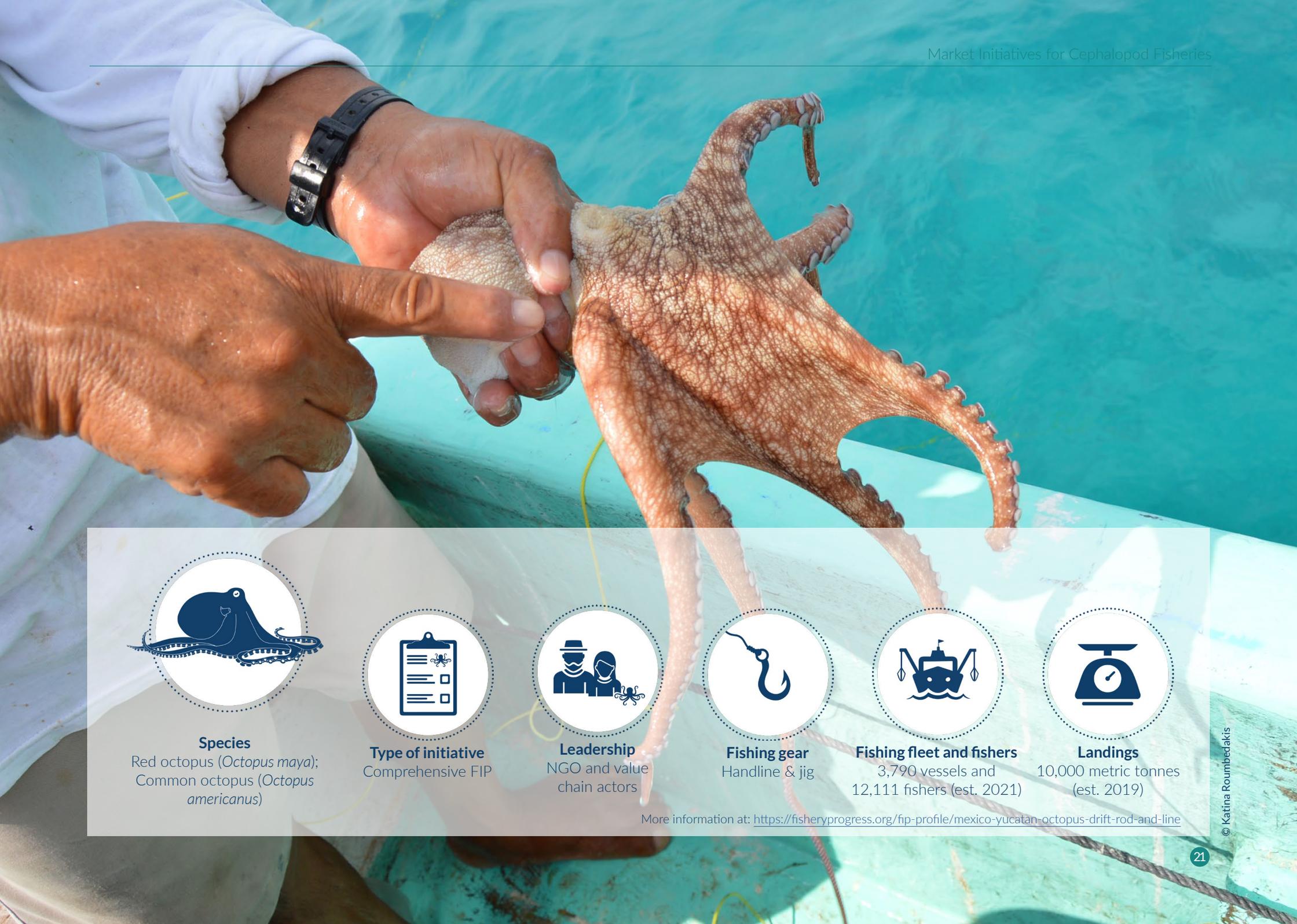


*This species was part of the *Octopus vulgaris* “cryptic species complex” and was recently redescribed²⁵. The common octopus *Octopus vulgaris* dominates octopus landings and trade globally but a recent study suggests that what we thought of as one species is a species complex comprised of multiple *Octopus vulgaris*-like species²⁶. Europe gets to keep the name *Octopus vulgaris* for its common octopus, in both Atlantic and Mediterranean waters. However, future international trade in common octopus may need to start recognizing that not all common octopus are the same.

²⁴ <https://cobi.org.mx/en/>

²⁵ Avendaño, O. et al. 2020. *Octopus americanus*: a cryptic species of the *O. vulgaris* species complex redescribed from the Caribbean. *Aquat. Ecol.*, 54(4), 909-925. <https://doi.org/10.1007/s10452-020-09778-6>

²⁶ Amor, M.D. et al. 2017. Morphological assessment of the *Octopus vulgaris* species complex evaluated in light of molecular-based phylogenetic inferences. *Zool. Scr.* 46, 275–288. <https://doi.org/10.1111/zsc.12207>



Species

Red octopus (*Octopus maya*);
Common octopus (*Octopus americanus*)



Type of initiative
Comprehensive FIP



Leadership
NGO and value
chain actors



Fishing gear
Handline & jig



Fishing fleet and fishers
3,790 vessels and
12,111 fishers (est. 2021)



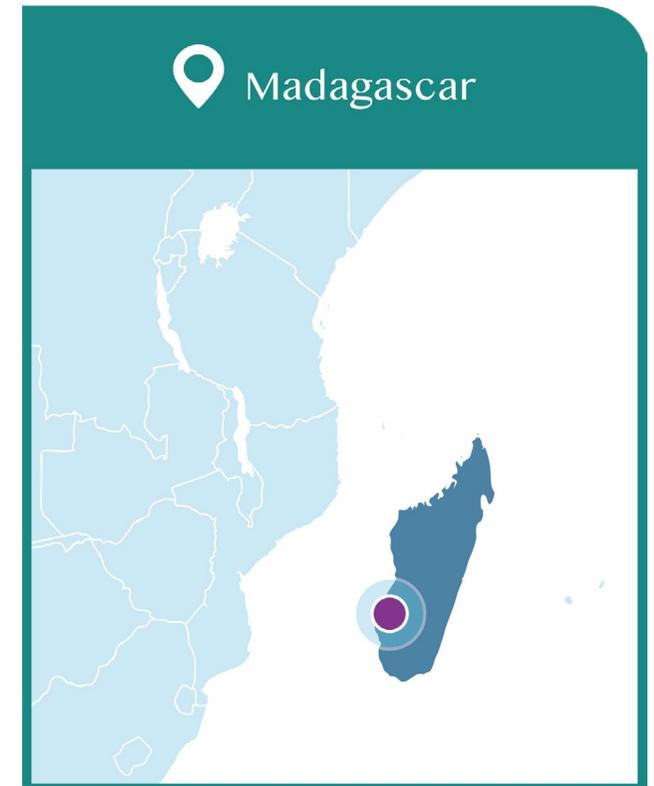
Landings
10,000 metric tonnes
(est. 2019)

More information at: <https://fisheryprogress.org/fip-profile/mexico-yucatan-octopus-drift-rod-and-line>

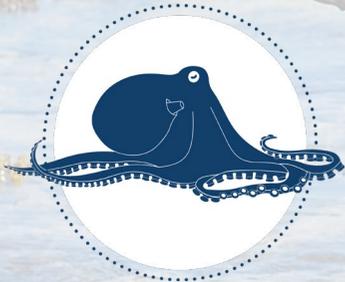
Southwest Madagascar Octopus Fishery

The Southwest Madagascar day octopus (*Octopus cyanea*) diving and gleaning fishery is the subject of a **Comprehensive FIP** (2019), the first and only one in the country. The fishery is managed through the Velondriake Locally Managed Marine Area (LMMA) by Vezo (“the people who fish”) fishing communities. Octopus fishing is crucial for the livelihood of the Vezo people, particularly women, for whom there are few other ways of earning money, and the fishery has become a key driver of economic and subsistence activity in the region. The FIP is led by Blue Ventures (BV)²⁷ in collaboration with multiple partners via the Comité de Gestion de la Pêche aux Poulpes (CGPP). The fishery takes place in 32 villages, engaging around 2,400 fishers and landing around 22 tonnes (€18,600) of octopus every year, mainly exported to the EU. BV has been involved with this fishery for almost 20 years, supporting the community in the steps towards sustainability and improving local livelihoods.

1st Velondriake Closure (Nov. 2004)	● A 7-month octopus fishing closure on a shallow reef was implemented for the first time in Andavadoaka, based on a traditional law, known as 'Dina', agreed upon by communal consensus. Catches and fisher incomes were higher when the fishery re-opened.
1st National Closure (2005)	● The national government formalized the community initiative by closing the entire southwest region octopus fishery for 1.5 months. A minimum catch weight (350 g) was also imposed.
1st LMMA established (2006)	● Velondriake LMMA was created, becoming the country's first LMMA, which was governed by a network of 25 fishing villages.
More Conservation & Fishing Measures (2006-2008)	● More ambitious coastal management efforts were set in motion, leading to the banning of destructive fishing practices, engagement in ecological monitoring, and the establishment of the first permanent community-enforced no-take area.
Data Collection Program (2011)	● Blue Ventures established an on-going data collection program in the LMMA; collecting data on fishing effort, catches, CPUE, sales, weights and biological data are collected.
MIHARI (2012)	● A Madagascar LMMA Network (MIHARI) was established in 2012 to facilitate networking and learning exchanges between LMMAs.
Stock Assessment (2018)	● A stock assessment of the Octopus fishery in Southwest Madagascar was carried out, indicating a stock status below full exploitation, and not over-fished.
MSC Pre-assessment (Oct. 2018)	● A MSC pre-assessment was completed, indicating the weak points to work on in the near future, including the harvesting strategy, fishery impacts on species and habitats, the decision-making process, compliance and enforcement.
FIP Launched (Jan. 2019)	● A comprehensive FIP (2019-22) was launched, incorporating several NGOs, the CGPP, the Madagascar fisheries administration (DREAP & SRPA) and the exporting industry. The FIP is making good progress, with 27% of the actions already completed by March 2021.



²⁷ <https://blueventures.org>



Species
Day octopus
(*Octopus cyanea*)



Type of initiative
Comprehensive FIP



Leadership
NGO



Fishing gear
Diver-caught, hand
gathering & harpoon



Fishing fleet and fishers
2400 fishers



Landings
300 metric tonnes
(est. 2019)

More information at: <https://fisheryprogress.org/fip-profile/southwest-madagascar-octopus-diving-gleaning>



Consumer Choices and Preferences

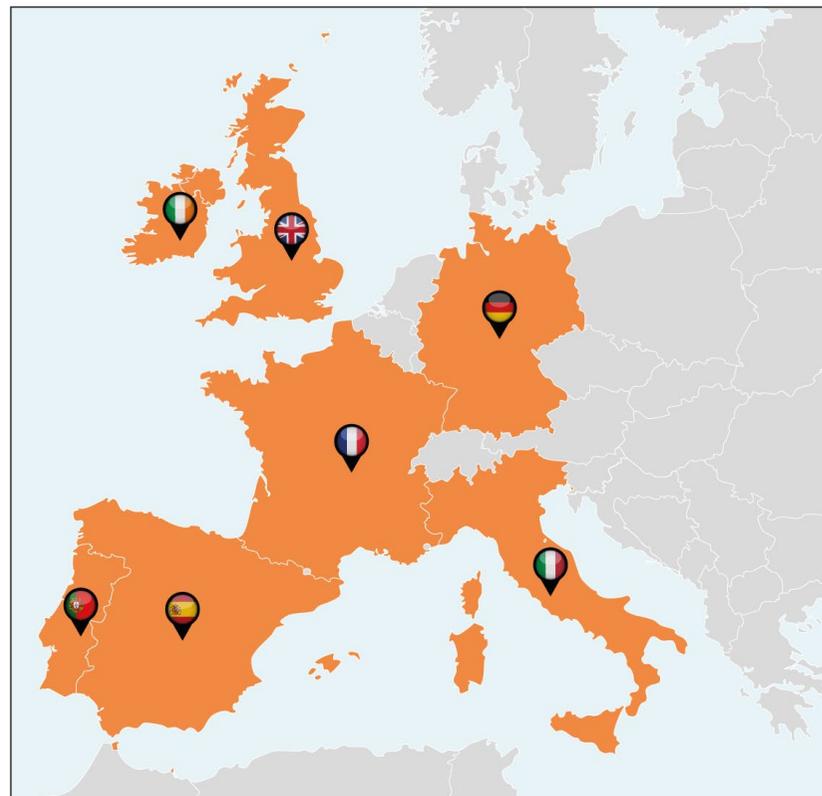
In December 2019, the project Ceph & Chefs carried out a **consumer survey** in seven European countries (France, Germany, Ireland, Italy, Portugal, Spain and United Kingdom), collecting information from 3,517 consumers. These countries were selected in order to cover countries located in the INTERREG Atlantic Arc (France, Ireland, Portugal, Spain and United Kingdom), including countries with widely varying cultural habits and traditions of seafood consumption. Italy and Germany were also included in this survey due to the important consumption of cephalopods and high prevalence of environmentally aware consumers, respectively.

The main objectives of the survey were to:

- Determine seafood **consumption habits** across the different countries;
- Identify **drivers and barriers** for seafood consumption;
- Understand which factors influence decisions about **seafood purchase**;
- Explore **label information** preferences;
- Investigate consumers' willingness to try **different species and formats/presentations** of cephalopod products.

For more detail, go to the project Ceph & Chefs Webtool:

<https://webtool.cephsandchefs.com>



NUMBER OF RESPONDENTS PER COUNTRY



France (FR)
503 respondents



Germany (DE)
501 respondents



Ireland (IE)
508 respondents



Italy (IT)
500 respondents



Portugal (PT)
501 respondents



Spain (SP)
504 respondents

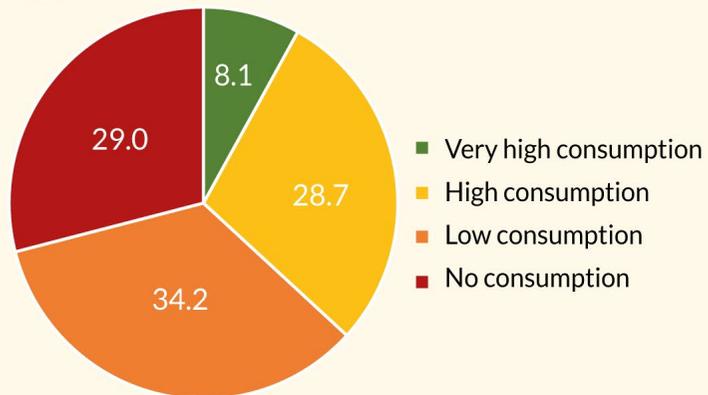


United Kingdom (UK)
500 respondents

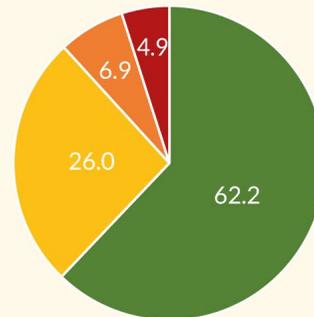
FREQUENCY OF SEAFOOD CONSUMPTION (ALL COUNTRIES)



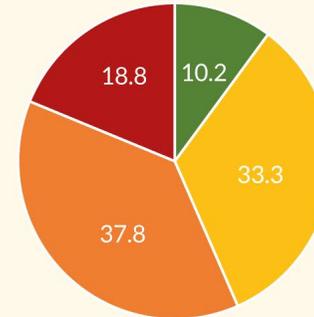
CEPHALOPODS



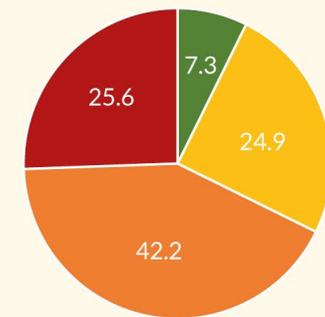
FISH



CRUSTACEANS



BIVALVES



Very high consumption: at least once a week; High consumption: at least once a month; Low consumption: less than once a month.

3 main
cephalopod
consumers

- Spain
- Portugal
- Italy

Around **one third** of respondents eat cephalopods at least **once a month**.



Among **Spanish, Portuguese and Italian** consumers, this proportion is higher, reaching more than 70%.

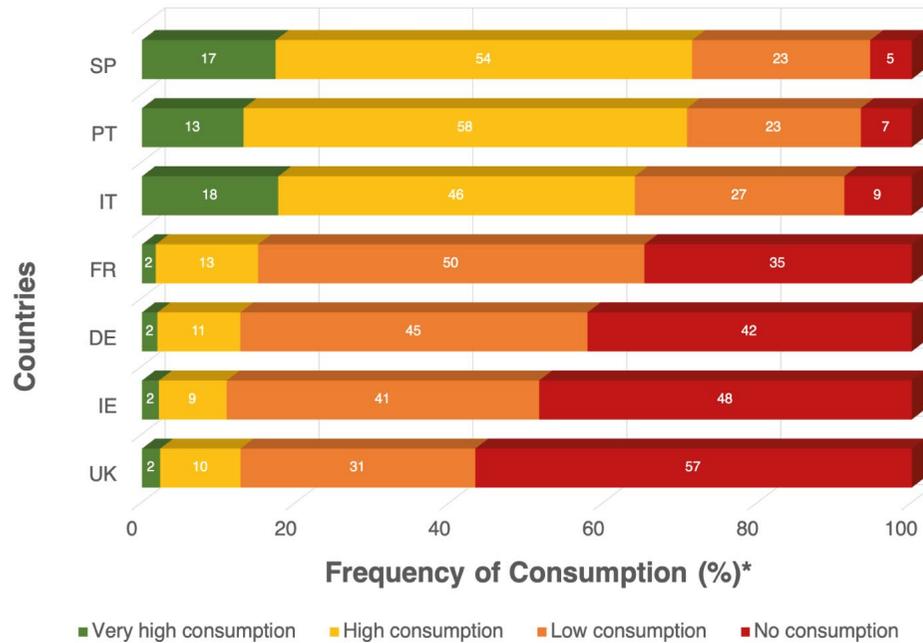


Over 6 in 10 Spanish, Portuguese, Italian and French consumers eat cephalopods **at home**.

Over 5 in 10 Irish, German and British consumers eat cephalopods during **holidays abroad**.



FREQUENCY OF CEPHALOPOD CONSUMPTION



*Very high consumption: at least once a week; High consumption: at least once a month; Low consumption: less than once a month.



In general, the frequency of cephalopod consumption is higher in families with a higher **annual household income**. This is more evident in the countries that traditionally consume these products, such as Spain, Portugal and Italy.

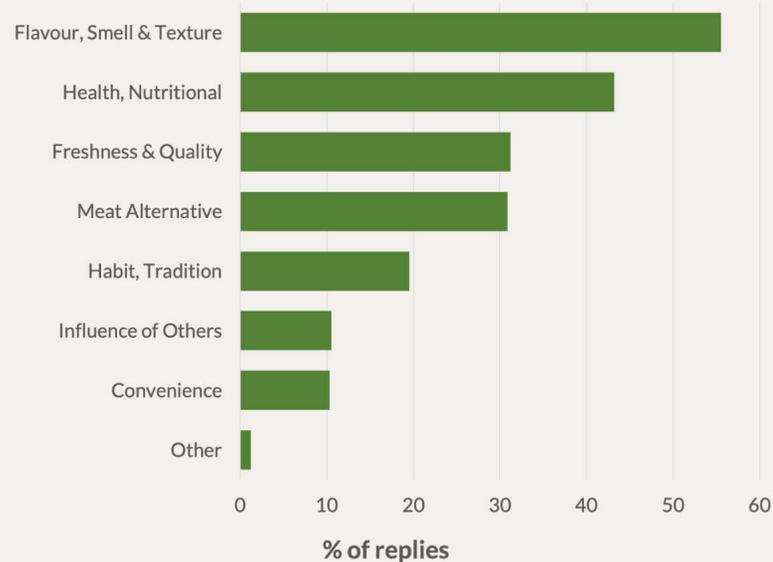


In general, **men** report eating cephalopods more frequently than do **women**. Differences are more evident among Spanish, Portuguese, French, German and British consumers.



Among people who consume cephalopods on a regular basis, **younger consumers** from Spain, Portugal and Germany eat cephalopods less frequently than **older consumers** (55 years or more). This may be related to the tradition of cephalopod consumption in these countries and the high prices of these products. On the contrary, younger Italian, Irish and British consumers eat cephalopods more frequently than the older ones, maybe related to the increase in popularity of these species amongst a generation more willing to try new products.

MAIN DRIVERS OF CEPHALOPOD CONSUMPTION



Consumers from all countries identified **flavour, smell and texture** and the **health and nutritional** benefits of cephalopods as the main reasons to consume them. Cephalopods as an **alternative to meat** is also an important driver of consumption for Germans and Italians, while consumers from all other countries considered **freshness and quality** to also be an important driver for consumption.

MAIN BARRIERS OF CEPHALOPOD CONSUMPTION

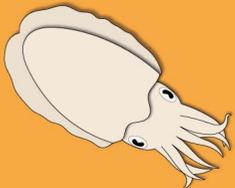


There is a clear difference regarding the main barrier to cephalopod consumption among consumers from different countries. While for Southern European and French consumers the **price** is by far the most important barrier, consumers from Ireland, Germany and the United Kingdom consider **flavour, smell and texture** and **appearance** of these animals to be the main barriers restricting consumption.

RELEVANT INFORMATION AFFECTING DECISION FOR SEAFOOD PURCHASE



- ▶ The **origin of the products** when buying seafood was considered the most relevant information on labels, selected as “relevant” or “very relevant” by more than seven in ten consumers (73%). Information about the origin of seafood is **particularly relevant for Italian and Irish consumers**. British consumers were the least concerned about seeing this kind of information on seafood labels.
- ▶ **Cooking recommendations** and **Socially responsible/Fairtrade** were considered to be the least relevant information for labels, but still considered “relevant” or “very relevant” by 57% of the consumers. Italian and Irish consumers were the most interested in finding Cooking Recommendations on the labels, while German consumers were the least interested. Regarding Social responsibility, no difference was observed among consumers from different countries.



5 in 10

Consumers would like to try **new cephalopod species**. Spanish, Portuguese and Irish consumers were more willing to try them.

4 in 10

Consumers would like to try **new cephalopod products and/or presentations**. Spanish and Italian consumers were more open to try these products.





New Products

The food sector is constantly changing due to globalization and new lifestyles. Consumers are becoming more attentive to health-promoting products, and value the safety and quality of food and the ease of cooking. Many are also increasingly more open to try new products. In view of current trends, companies have to respond to market needs.

Cephalopods are low in energy and lipids, and high in protein. They are an excellent source of vitamins and minerals, especially calcium, magnesium, phosphorus, iron and zinc, as well as vitamins A, B6 and B12. The nutritional characteristics of cephalopods, together with the current trend in the consumption of easily prepared products, constitute a good opportunity to create **new cephalopod-based products**.

Smoked Octopus

The Ceph's & Chefs project developed **liquid-smoked octopus**, an innovative product with very interesting sensory characteristics, which can be sold with several presentations, both in refrigerated and preserved form, and can be an ingredient for different types of cuisine (e.g., Asian, Italian). Smoked octopus can also constitute a new type of ready-to-eat product, being marketed in a snack format in order to be added, for example, in salads.

Smoking allows **diversification and increased the value of the products**, offering an additional marketing option to increase the consumption of seafood products.



©Helena Vieira

Smoked Octopus. Source: IPMA.

Development of New Markets for New Products

In general, compared to fish products, the variety of products based on cephalopods is very limited, especially ready-to-eat products. Thus, the valorization of cephalopods, coupled with consumer preference for healthy and practical foods, justifies the development of this type of innovative product.

This smoking technique allows for the development of several cephalopod products, for example a smoked octopus pâté, increasing the consumption of these species as an appetizer or main meal. The pâté, as long as it is nutritionally balanced, can also be directed especially towards **children and the elderly**, since it is a creamy product that is easy to chew.

By increasing the portfolio of products based on cephalopods, companies can target the needs of consumers and conquer/create **new markets**.



©Henry R. C. Carneiro

Squid Sandwich

Smoked Cuttlefish Products

In order to test the versatility of this smoking technique the Ceph's & Chefs project also produced **smoked cuttlefish**. Cuttlefish are an important resource in the English Channel and are usually sold in French supermarkets as a frozen product, so transforming the products is a way of adding value.

The Ceph's & Chefs also worked on the development of three new products derived from smoked cuttlefish (hot and cold processes applied): the cuttlefish rillette "AperoSeich", the ravioli "Seich'ioi" and the cuttlefish roll "Sea'N Roll".



"AperoSeich".



"Seich'ioi" (top) and "Sea'N Roll" (bottom).

Diversification of Consumption, Chefs' Capacity and Consumers' Education

A series of events was carried out during the Cephis & Chefs project with the aim to **diversify seafood consumption** and **engage chefs** who wish to use octopus, squid and cuttlefish, especially in Northern countries, where these products are not traditionally consumed. These events included workshops, chefs' meetings to develop new cephalopod recipes, cookery classes, cephalopod preparation and cookery demonstration, educational videos and chefs' training. **Consumer education** was carried out during gastronomic meetings and food festivals. A **cephalopod recipe book** was also produced.



Chefs' Capacity

Culinary classes; Cookery demonstrations; Workshops.

Educational Cephalopod Videos*

Cephalopod preparation videos; One-minute recipes; Culinary lectures.



*Available at:

https://www.youtube.com/channel/UC7V91pHJa7Y7KKYPMUpB_xg

Cephalopod Recipes

Cephalopod recipes; Recipe book.



Available at:

<https://www.cephsandchefs.com/tag/recipe/>



Available at:

<https://www.cephsandchefs.com/recipe-book/>

Consumers' Education

Gastronomic events; Food Festivals.



More information at:

<https://www.cephsandchefs.com/all-news/>

Fraud Detection

One of the barriers limiting consumption of octopus species reported by consumers (for instance in Portugal) is the fact that their expectations do not always correspond to the product purchased, namely with regard to the exaggerated reduction in volume and weight after cooking. Studies have shown that water addition can account for over 50% of the weight of octopus²⁸. This phenomenon is a consequence of the fraudulent practice of addition of water and/or other additives that results in a change in the moisture content and weight of the raw material. The purpose of this practice is to attract a higher price of the products.

Therefore, it is necessary to develop technologies/methodologies to be applied for the quality control of products in relation to abusive processing techniques, which will help to guarantee food safety and consumer protection. A recent promising technology is the one used by the Sequid RFQ-Scan® equipment²⁹ which measures the dielectric properties of the tissues to detect added water.

Food safety and fraud are important issues that should be addressed to enable innovative, high quality cephalopod products to penetrate new markets.

²⁸ Mendes, R. et al. 2017. Water uptake and cooking losses in *Octopus vulgaris* during industrial and domestic processing. LWT, 78, 8-15. <https://doi.org/10.1016/j.lwt.2016.11.087>

²⁹ <https://www.sequid.de/en/>





Final Highlights

Cephalopods are already part of the traditional cuisine of southern Europe but are still seen as relatively novel food in the North of Europe. The development of new cephalopod products to encourage increased consumption of cephalopods in both the North and the South of Europe could benefit producers, markets and consumers – but it is also potentially at odds with the overarching need to ensure that fishing for cephalopods is sustainable, especially in the current system where there is little assessment of the state of European cephalopod stocks and virtually no regulation of the amounts which may be caught. Thus, as we appeal to value chain actors, chefs and consumers to consider the opportunities offered by the consumption of these very nutritious and tasty molluscs, we also appeal to national authorities and the industry to approach fishing of these species responsibly. There is an opportunity here but we must be careful not to squander it.

Additional information at: <https://www.cephsandchefs.com>.

For general information of the project: Anne Marie Power; Cephalopod biology and fisheries: Graham J. Pierce; Markets and value chains in Portugal, Global market initiatives, Consumer choices and preferences: Cristina Pita; Markets and value chains in Spain: Sebastián Villasante; Smoked products and anti-fraud equipment: Rogério Mendes.



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Acknowledgements

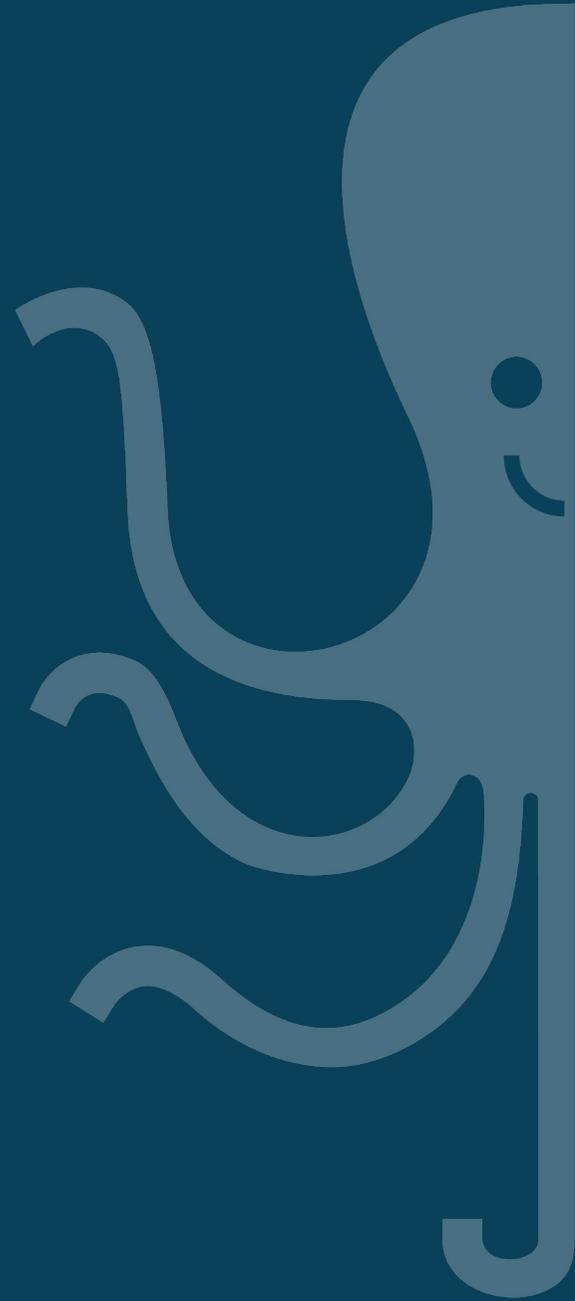
We would like to thank to all Cephys & Chefs project partners for their contribution and INTERREG Atlantic Area for financial support. We are also grateful to all stakeholders who collaborate with us in the project.

Project Partners:



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 **Interreg**
Atlantic Area
European Regional Development Fund

