TRAWLING IN PORTUGAL

WHAT IF IT HAPPENED ON LAND?

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Bottom trawling can be compared to the clearing of rain forests, because of the devastation of habitats. However, as its consequences are hidden hundreds of metres down in the ocean, there is much less social pressure and concern about it.

Since January 2017 trawling is banned deeper than 800 m in the waters of the European Union. This is a positive measure, but it has little impact in Portuguese waters where trawling takes place less than 800 m deep.

In this Policy Brief we present evidence of some of the environmental impacts of bottom trawling, its relatively low social and economic importance, and how the subsidies it benefits from are disproportionate to the value it generates. We propose various provisional measures to accelerate a transition away from bottom trawling and towards the use of more sustainable fishing gears in Portugal, and make recommendations on planning this transition.

Sea bottom with cold water coral, before (a, b) and after (c) bottom trawling.
Reef is reduced to rubble and large gorgonians are broken apart in the trawled areas.

Source: J. M. Roberts, A. J. Wheeler, A. Freiwald, S. D. Cairns (2009). "Cold-water Corals: The Biology and Geology of Deep-sea Coral Habitats". Cambridge University Press, 334 pp. Images (a) and (b) were taken in 2005 from Stjernsund, courtesy of JAGO-Team, IFM-GEOMAR. Image (c) was taken in 1999 from an area close to Iverryggen, courtesy of J. H. Fossâ.

Trawling the seafloor:

HOW IT IS DONE AND ITS CONSEQUENCES

Trawling has been compared to the clearing of tropical forests. It is the less selective fishing gear in our seas and, without any doubt, the most destructive for the environment. In Portugal, the most frequently used technique is bottom trawling, targeting the animals living in, on, or near the seafloor (Figure 1).

The social concern about trawling would be much higher if we could directly see its consequences, just like the clearing of rain forests in the Amazon.

This technique destroys seafloor habitats, with repercussions throughout the rest of the marine environment:

/ **Seafloor habitats are irreparably depleted and destroyed.** Many algal or seagrass communities are destroyed when the seafloor where they live is trawled. These organisms are the home and shelter of many species of fish, and invertebrates (e.g. crustaceans, molluscs, polychaetes), thus affecting the marine food chain, including commercial species.

/ **Nearby habitats are modified.** Technological development has enabled trawling to reach seafloor at greater depths than ever before. Habitats near trawled areas are also affected by the higher turbidity of the water column.

/ **Too much of the catch is unwanted.** Up to 70% of catches from trawling in Portugal are discarded (i.e., thrown back to sea).[i] Yet, very few of these animals survive – damage during capture, manipulation and discarding is often fatal, or enough for discarded animals to be more easily caught by predators.

/ **Young fish are killed.** Because trawling is not a selective gear, it also catches and kills fish too small to have reproduced at least once (i.e., below the legal size to be captured in many species). Killing small fish is a twofold damage to fish stocks, since those animals have not yet reproduced, and therefore two generations are lost.

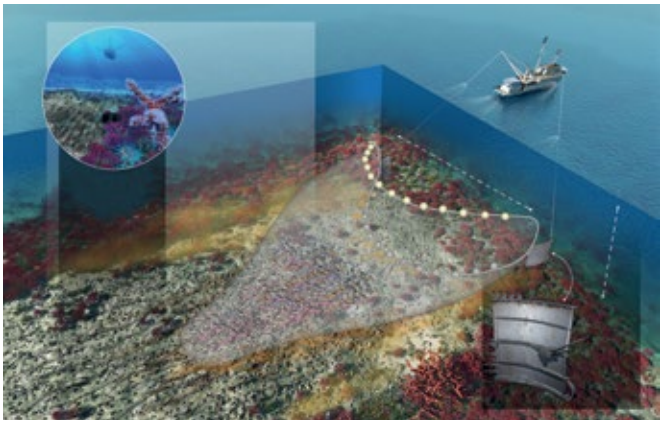
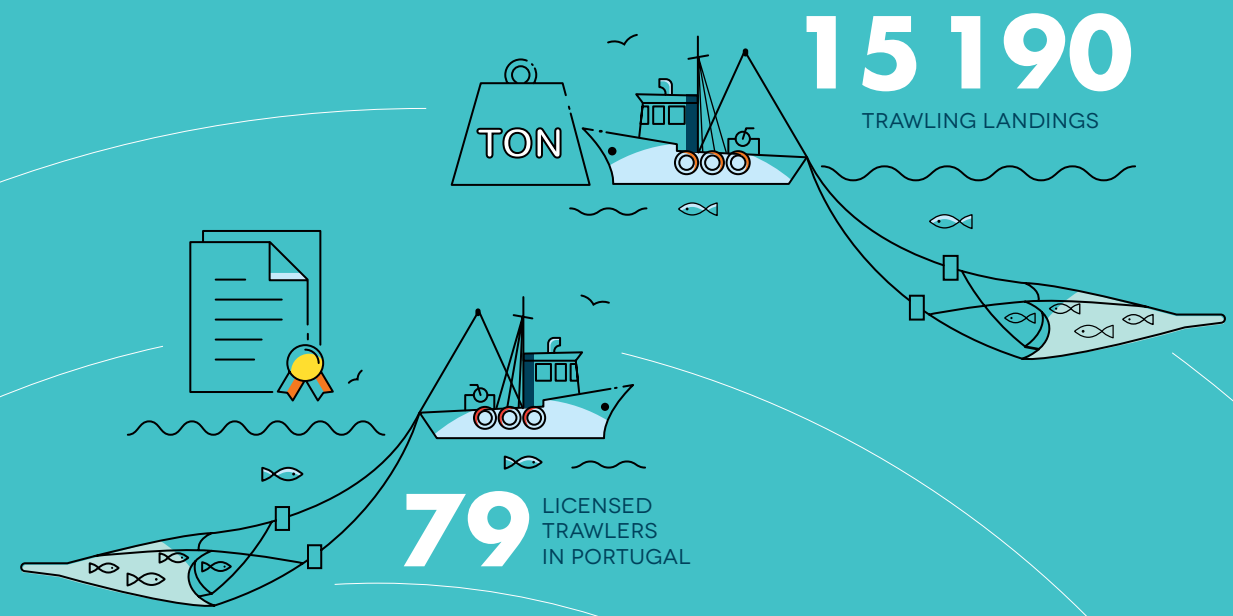


Figure 1/
Damage to seafloor by bottom trawling. © Don Foley.



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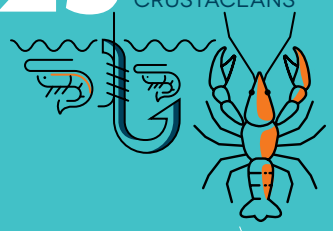
TRAWLING LANDINGS

79 LICENSED TRAWLERS IN PORTUGAL

Trawling in Portugal

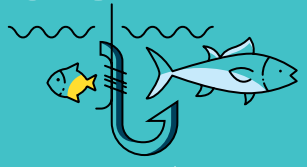
25 LICENSES TO CATCH CRUSTACEANS



In 2014,[ii] there were 79 licensed trawlers in Portugal, holding in total 25 licenses to catch crustaceans and 103 licences to catch fish.[iii] As a single trawler may have more than one license, it is estimated that no more than 31% of the trawling fleet targets crustaceans.

There were 1 241 licensed fishermen working in trawlers in 2014, corresponding to 8% of the total (16 779) number of licenced fishermen. Trawling landings amounted to 15 190 tons and their value was €30.85 million, which corresponded to 13% of the total catches and 12% of the total landed value in 2014.

103 LICENSES TO CATCH FISH



Environmental evidence

We present some evidence of unsustainability of the trawling fishing segment in Portugal by focusing on crustacean bottom trawling, as we were only able to obtain Vessel Monitoring System (VMS)[iv] data for these vessels.

In the framework of the project "**The Economic Valuation and Governance of Marine and Coastal Ecosystem Services**", it was estimated that crustacean trawlers exerted a fishing pressure of 52 000 trawling hours in Portuguese waters in 2014. This effort is mainly concentrated in the south coast of the Algarve (60%) and south-west coast of Alentejo (28%), meaning that s**everal 1 km^2 areas are completely trawled up to five times every single year** (Figure 2).[v]

ENVIRONMENTAL IMPACT OF TRAWLING IN PORTUGAL

Some southern areas are trawled up to five times per year

Trawled areas have lower biodiversity than non-trawled ones

Trawling throws back to the ocean up to 70% of its catches

Discards include several vulnerable species

ECONOMIC IMPACT OF TRAWLING IN PORTUGAL

Trawling is the fishing segment employing fewest people, with the lowest weight and value of landings, and the only one in which the value of landings has declined over the last 10 years

Trawling receives 32% of the harmful subsidies but only generates 14% of the landed value (2009)

For each €1 of landed value generated in 2009, trawling received €0.60 of capacity-enhancing/ harmful subsidies

Using VMS data provided by Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM)[vi] it was possible to estimate the depth of bottom trawling. This varies as a function of the region of Portugal evaluated (deeper in the south and south-west), which is associated with the location of the target species: a high percentage of cephalopods and fish in the north, and of crustaceans in the south.

In the north and central regions (from Minho river down to Cabo da Roca), crustacean trawlers exploit habitats no deeper than 200 m, while in the south-west and in the south coast of Algarve the effort reaches depths of 800 m.

In the south of Portugal, **lower biodiversity was found in regularly trawled seafloor**, and a higher biodiversity in non-trawled areas.[vii]

Bottom trawling causes resuspension of sediments, that is, it stirs the seafloor and its sediments go back into the water column. These sediments in the water column are problematic for nearby habitats,[viii] especially if they have filter feeding organisms. **A great amount of sediments in the water column is as harmful to filter feeding organisms as a desert sand storm is harmful to a person.** This is particularly disturbing if we consider that globally bottom trawling is able to resuspend as much sediment as that reaching continental shelves from rivers,[ix] and to affect sediments as deep as 35 cm.[x]

Trawling also negatively affects marine food webs due to the amount of accidental or unwanted catches (bycatch), some of which is thrown back to the sea (discards). **In southern Portugal, crustacean trawlers discard 70% of their catch** per trip, while fish trawlers discard 62%; these rates are the highest of all the fishing segments.[xi] Equally concerning is that discards regularly include species such as sharks that have long life spans, reproduce late in life, and produce only a few young at a time.[xii]

Damage to sea floor caused by bottom trawling can significantly reduce marine productivity. The good news is that if **the damage is stopped, organisms on the sea floor can recover relatively quickly**, with a study showing recovery from 50% to 95% of carrying capacity in less than seven years.[xiii]

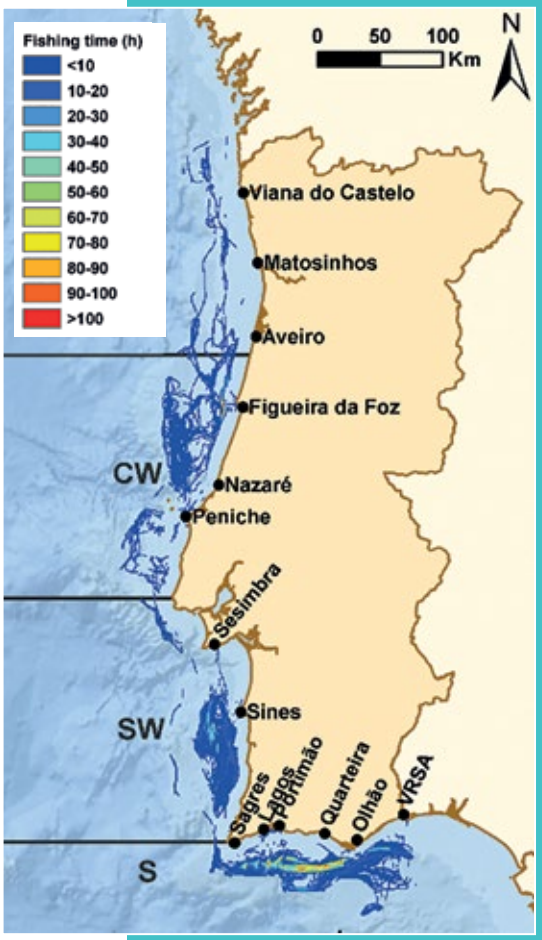


Figure 2/
Fishing pressure of crustacean trawlers in Portuguese waters in 2014. Source: Bueno-Pardo *et al.* (2017).[v]

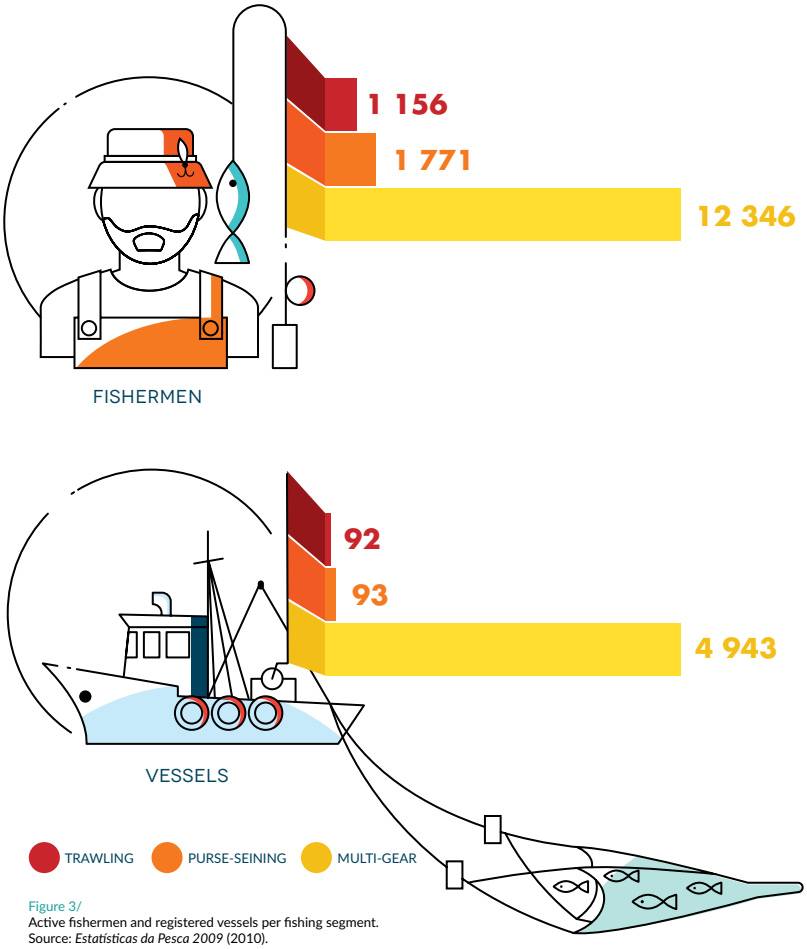


Figure 3/
Active fishermen and registered vessels per fishing segment.
Source: *Estatísticas da Pesca 2009* (2010).

Economic evidence

In 2009, trawling was the fishing segment employing fewest people (8%) in the smallest number of vessels (2%) (Figure 3). It was also the segment landing the lowest weight (11%), and value (14%) of captures (Figure 4).[xiii]

The quantity landed only accounts for the catches that are brought to land, and excludes the quantity discarded. If the quantity of catch that is wasted at sea was seriously considered for fisheries policy purposes instead of just the quantity landed, trawling would probably have been prohibited a long time ago, as environmental costs of trawling to society are likely to outweigh its benefits to employment and food security.

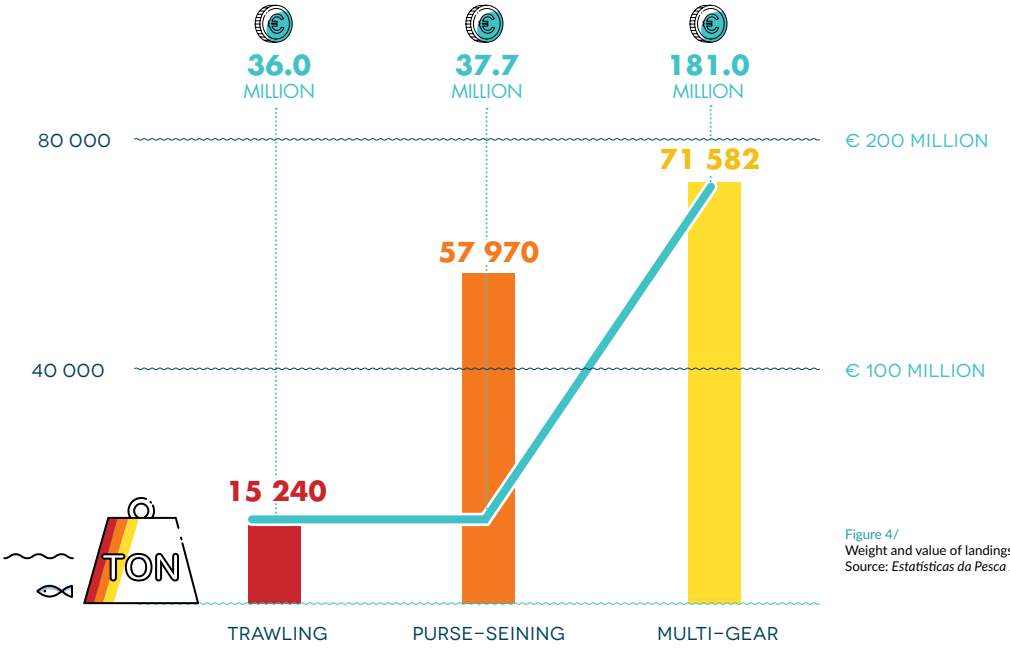


Figure 4/
Weight and value of landings per fishing segment.
Source: *Estatísticas da Pesca 2009* (2010).

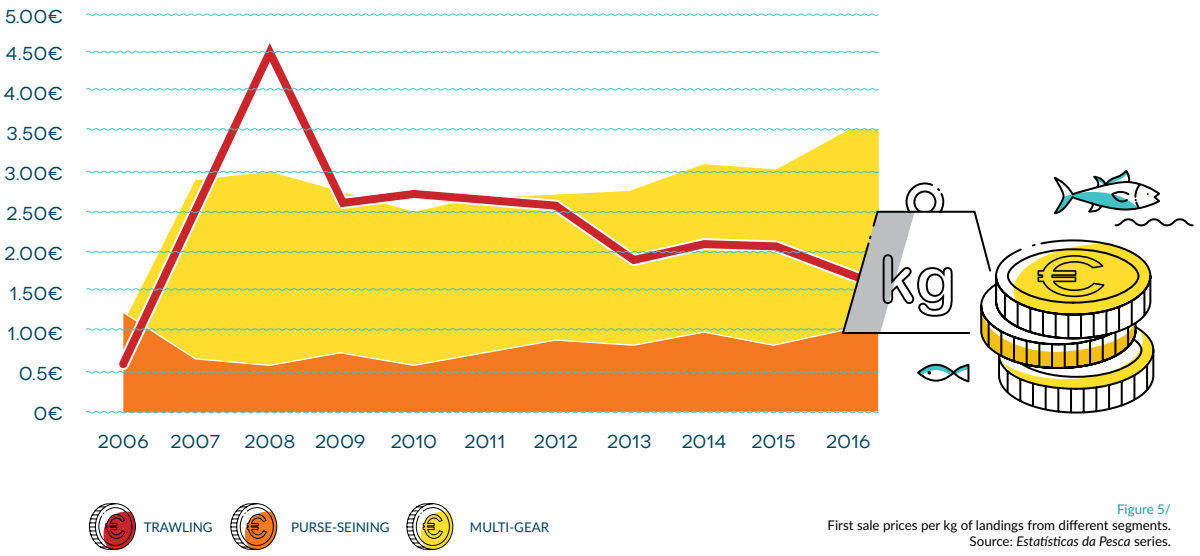


Figure 5/
First sale prices per kg of landings from different segments.
Source: *Estatísticas da Pesca* series.

Comparing the first sale price[xiv] of landings per fishing segment over the last 10 years (Figure 5), the decreasing economic importance of trawling becomes clear: the value of trawling landings has been declining, while for the multi-gear fleet it has been on the rise, as well as for purse-seining landings, although very slowly.

Trawling's economic viability is also brought into question by the amount of tax payer's money that goes into supporting it. Fisheries subsidies can be: **beneficial**, such as those for fisheries research and management; **capacity-enhancing**, such as direct payments for boat reconstruction, tax exemptions, and fuel subsidies; and **ambiguous**, such as assistance to fishermen.[xv]

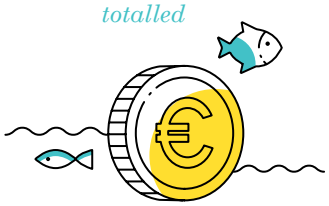
Capacity-enhancing subsidies were historically provided after World War II to promote the growth of industrial fisheries, and thus reduce the buying cost of seafood to a growing population. However, they have had the perverse effect of incentivizing overfishing as subsequent declines in catch were used as arguments to increase money transfers to the fisheries sector. Therefore, **capacity-enhancing subsidies are generally considered to be *harmful* to fish stocks and the marine environment and therefore harmful for the long-term sustainability of the fishing sector**.

In 2009, fisheries subsidies in Portugal totalled €142 655 936, and of these, **15% were beneficial** (€21 176 948), **38% were capacity-enhancing** (€53 184 935), and **47% were ambiguous** (€67 660 862).[xvi] Figure 6 (next page) shows the sharing of each type of subsidies among the fishing segments.[xvii]

Considering that in 2009 the value of trawling landings was 14% of the total, we can conclude that trawling received a disproportionally large share of subsidies.

Comparing only capacity-enhancing/harmful subsidies with landed value of trawling in 2009, it is clear that capacity-enhancing subsidies play an important role in trawling.

In 2009, fisheries subsidies in Portugal totalled



€142 655 936

Trawling receives a disproportionate amount of subsidies

14% OF THE LANDED VALUE
(€36 039 448)

24% OF BENEFICIAL SUBSIDIES
(€6 520 334)

32% OF CAPACITY-ENHANCING/ HARMFUL SUBSIDIES
(€21 977 944)

35% OF AMBIGUOUS SUBSIDIES
(€30 655 069)

Given the striking differences alluded to earlier between trawling and other fishing segments, it is plausible that the economic viability of trawling in Portugal is being ensured to a great extent by tax payer's money. In fact, France's largest long distance fleet was found not to be economically viable at all, after a close scrutiny of its accounts.[xviii]

Caution should however be used when referring to these values due to the uncertainties associated with them. Indeed, fisheries statistics are problematic in Portugal and elsewhere,[xix] and the effects of capacity-enhancing subsidies are greatly dependent on how well a fishery is doing and on how well it is managed.[xx]

In conclusion, taking into account the damage to the seafloor (with consequences far from being fully understood), the comparative amount of discards, the declining landing value, and the subsidies allocated to non-small-scale fisheries, trawling arises as the least profitable gear operating in Portuguese waters, both in economic and ecological terms.

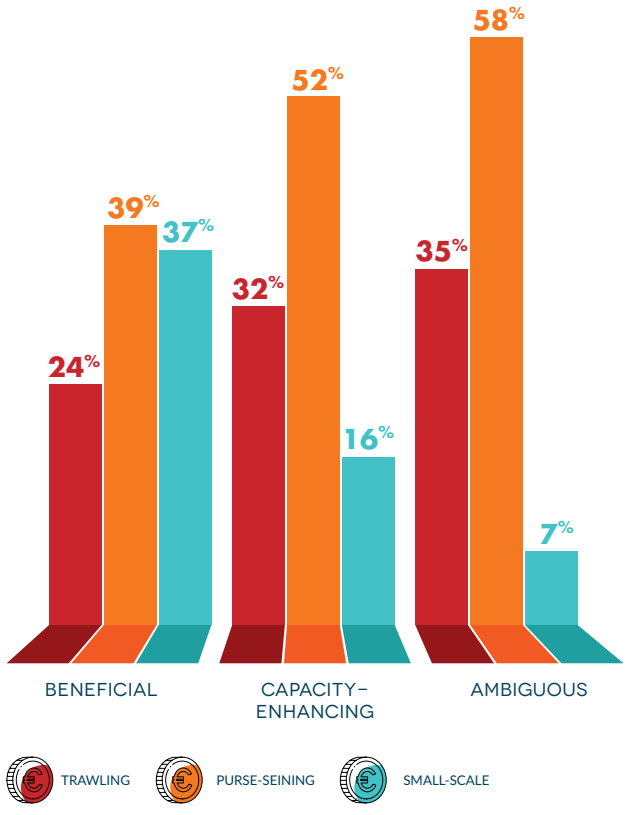


Figure 6/
Fisheries subsidies in Portugal in 2009. Adapted from: Schuhbauer *et al.* (2017)[xvi]; prices in euro calculated by the authors using yearly mean exchange rate.

Current policies

The environmental impact of trawling on the seafloor has been demonstrated to be unsustainable in the long term.[xxi] The commercial exploitation of the seafloor must be controlled and managed with attention to the nature and selectivity of the deployed gears, the vulnerability of the exploited habitats and the biology of the species affected, directly or indirectly. Failing to do this greatly reduces the productivity of the seabed habitat. Even if our harvesting of the remaining fish populations is "sustainable", the yields will be much lower than would be the case if we had a healthy seabed habitat.

In 2008, the European Parliament established a framework for community action in the field of marine environmental policy: the Marine Strategy Framework Directive. The aim of this directive is to protect more effectively the marine environment across Europe and achieve a good environmental status of European marine waters by 2020. Each Member State has therefore the "obligation to develop a Marine Strategy according to concerted approaches and standardized methodologies". This implies determining good environmental status using 11 standard descriptors. Descriptor 6 refers to seafloor integrity, which should be "at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic [i.e. seafloor] ecosystems, in particular, are not adversely affected". This descriptor is particularly relevant to human induced pressures related to trawling fisheries.

More recently, in June 2016, and after more than eight years of negotiations, the European Union finally adopted a series of measures for the protection of deep-water ecosystems from trawling.[xxii] The most important of these measures is the ban of trawling deeper than 800 m in European waters, which is a very positive step. This measure became effective on January 1st 2017 and may have some effect on Portuguese trawlers, although trawling depths in Portugal's mainland waters are, in general, shallower. However, if well implemented, this measure is likely to slow down the rate at which fisheries in the North Atlantic are moving to greater depths (32 m/decade).[xxiii]

At the state level, in 2005 Portugal pioneered fisheries legislation banning trawling in the waters of Madeira and Azores. Though the underlying reasons could be viewed as more political than environmental, as there were no Portuguese trawlers operating in those waters at the time, it was an important step to protect seafloor habitats. Later, in 2014, Portugal banned fishing in the deep-sea in an area of more than 2 million km^2 (four times the size of the Iberian Peninsula)[xxiv] to promote sustainable fisheries and the conservation of deep-sea ecosystems.

These measures have been applauded by the international community as a brave initiative that should encourage other countries with fishing interests to apply similar policies. However, Portuguese authorities need to be bolder in promoting the sustainability of national fisheries, and progressively reduce bottom trawling in Portugal.

The implementation of the United Nation's 2030 Agenda for Sustainable Development is likely to enable progress on this front. Under Sustainable Development Goal 14 (Life Below Water), countries should meet the goal of "**By 2020, prohibit certain forms of fisheries subsidies, which contribute to overcapacity and overfishing**, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies (…)". **Portugal has just over two years to act accordingly.**

Recommendations

DO NOT TOLERATE AT SEA WHAT WE ALREADY DON'T WANT ON LAND

Trawling is an unsustainable activity with no long-term future. As a society, we cannot allow the destruction of marine ecosystems, the waste of natural resources and the misspending of taxpayers money.
In order to guarantee the preservation of fish stocks and the sustainability of the sea economy in Portugal, and to offer the prospect of increased future fishery catches from more productive seas, we believe the **transition of Portuguese fisheries away from trawling needs to start immediately**.

We propose some **transitory measures to mitigate the effects of trawling** on benthic communities, to make the transition to more sustainable and more profitable fisheries in Portugal – necessarily without bottom trawling – a reality.

/ **Change the model of Portuguese fisheries.** Fisheries in Portugal need to be promoted and supported according to their performance in terms of sustainability – environmental, economic and social. Catching fewer fish but with higher quality, and in less harmful ways for the environment and for taxpayers, is more beneficial economically, socially and environmentally, and in the long-term should permit increased catches.

/ **Improve trawling's selectivity by increasing the mesh size or modifying the mesh shape.** Some studies [xxv] have pointed out important benefits for the target populations and even the increase of long-term landings when the mesh size is augmented. We must also improve our knowledge of how the mesh shape affects selectivity and create innovative escaping devices for non-target species.

/ **Land the entire catch.** The landing obligation must be immediately applied to trawling, without exceptions. Only this way it will be possible to determine how much waste it generates.

/ **Reduce public subsidies to trawling.** Trawling landings and landed value have decreased in recent years. This is a likely indication of a reduction in its economic viability, despite this segment benefiting substantially from public money. The current international developments towards elimination of harmful subsidies are another push towards a transition to more sustainable, less harmful, and more profitable fisheries. In Portugal, this implies decreasing state support to trawling.

/ **Shift public funding towards more sustainable fishing practices.** The benefits of eliminating subsidies to trawling would be twofold: reduction in the negative environmental impacts on marine ecosystems; and reconversion of harmful subsidies into beneficial subsidies for sustainable fishing practices.

/ **Know and protect habitats affected by trawling.** There is mounting evidence that trawling is environmentally and economically unsustainable. This evidence is sufficient for Portuguese authorities to act to impose greater restrictions on trawling. Yet, some questions remain unanswered, namely the type and location of seafloor habitats, how degraded they are and how they can be best protected.

Some of these transitory measures can be implemented in a phased fashion, while other can be simultaneous. Some measures may be triggered by the implementation of the Common Fisheries Policy, or may happen faster due to World Trade Organization's negotiations on harmful fisheries subsidies.

Portugal needs to plan its transition away from unsustainable fisheries and fishing practices towards sustainability of fish production.

This transition will not be easy, but its benefits will be greater than its costs. A transition to sustainable fisheries is recommended by the World Bank, which has recently demonstrated the weak economic performance of global fisheries by estimating at USD $83 000 million the economic benefits of fisheries that were wasted in 2012 because global fisheries are not sustainable.[xxvi] Some fisheries around the world have initiated that transition, with exciting results, but they are still too few in face of the challenges.[xxvii]

RECOMMENDATIONS

/ Convene a **participatory process with the goal of setting a vision for sustainable Portuguese fisheries in 2030**, and the conditions and means needed to make that vision a reality.

/ This process should also **inform the preparatory discussion of the next Common Fisheries Policy** so its budget can be used to support the transition, and this process' time frame is clearly restricted.

/ **Independent professionals should facilitate this process**, which should include **various experts** (in fisheries biology, marine biology, fisheries economics, public policies, prospective analysis, etc.) **and formal representatives of groups of interest** (fishermen and fisheries organizations, fisheries authorities, environmental NGOs, etc.).

Only this way we can stop waste and damage at sea that we do not tolerate on land.

NOTES

[i] T. C. Borges, K. Erzini, L. Bentes, M. E. Costa, J. M. S. Gonçalves, P. G. Lino, C. Pais, J. Ribeiro (2001). By-catch and discarding practices in five Algarve (southern Portugal) métiers. *Journal of Applied Ichthyology* Vol. 17: 104-114.

[ii] Though more recent data are available, for comparison purposes the data shown under Environmental evidence refers to 2014, the same year for which crustacean trawling data is available. Later under Economic evidence we present data from 2009, the same year for which fisheries subsidies data are available.

[iii] Instituto Nacional de Estatística (2015). *Estatísticas da Pesca 2014*. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=139431&PUBLICACOESmodo=2

[iv] Vessel Monitoring System is a program that allows tracking a vessel location and activity.

[v] Juan Bueno-Pardo, Sofia P. Ramalho, Ana García--Alegre, Mariana Morgado, Rui P. Vieira, Marina R. Cunha, Henrique Queiroga (2017). Deep-sea crustacean trawling fisheries in Portugal: quantification of effort and assessment of landings per unit effort using a Vessel Monitoring System (VMS). *Nature Scientific Reports*, 7:40795. https://www.nature.com/articles/srep40795?WT.feed_name=subjects_ecosystem-services

[vi] General-Directorate for Natural Resources, and Maritime Safety and Services http://www.dgrm.mm.gov.pt/

[vii] Paulo Fonseca, Fátima Abrantes, Ricardo Aguilar, Aida Campos, Marina Cunha, Daniel Ferreira, Teresa P. Fonseca, Silvia García, Victor Henriques, Margarida Machado, Ariadna Mechó, Paulo Relvas, Clara F. Rodrigues, Emília Salgueiro, Rui Vieira, Adrian Weetman, Margarida Castro (2014). A deep-water crinoid *Leptometra celtica* bed off the Portuguese south coast. *Marine Biodiversity*, 44(2): 223–228.

[viii] Jacobo Martín, Pere Puig, Albert Palanques, Marta Ribó (2014). Trawling-induced daily sediment resuspension in the flank of a Mediterranean submarine canyon. *Deep Sea Research Part II: Topical Studies in Oceanography*, Vol. 104: 174-183.

[ix] Ferdinand K. J. Oberle, Curt D. Storlazzi, Till J. J. Hanebuth (2016). What a drag: Quantifying the global impact of chronic bottom trawling on continental shelf sediment. *Journal of Marine Systems*, Vol. 159: 109- 119.

[x] Ferdinand K. J. Oberle, Peter W. Swarzenski, Christopher M. Reddy, Robert K. Nelson, Benjamin Baasch, Till J. J. Hanebuth (2016). Deciphering the lithological consequences of bottom trawling to sedimentary habitats on the shelf. *Journal of Marine Systems*, Vol. 159: 120- 131.

[xi] In Portugal, fisheries are composed of three main segments: trawling, purse seining, and multi-gear fisheries.

[xii] Instituto Nacional de Estatística (2010). *Estatísticas da Pesca 2009*. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=89988890&PUBLICACOESmodo=2

[xiii] Jan Geert Hiddink, Simon Jennings, Marija Sciberras, Claire L. Szostek, Kathryn M. Hughes, Nick Ellis, Adriaan D. Rijnsdorp, Robert A. McConnaughey, Tessa Mazor, Ray Hilborn, Jeremy S. Collie, C. Roland Pitcher, Ricardo O. Amoroso, Ana M. Parma, Petri Suuronen, Michel J. Kaiser (2017). Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance. Proceedings of the National Academy of Sciences of the United Stated of America. Published ahead of print July 17, 2017, doi:10.1073/pnas.1618858114.

[xiv] Data from *Estatísticas da Pesca* series from Instituto Nacional de Estatística, with landings value corrected for inflation (i.e., real prices) and presented as 2016 values.

[xv] Fisheries subsidies are divided into the following types: beneficial (fisheries management; fisheries research and development; marine protected area); capacity-enhancing (boat construction, renewal and modernization; development programs; port development; infrastructure for market and storage; tax exemptions; fishing access agreements); and ambiguous (fishermen assistance; vessel buyback and rural fisher community development programs).

[xvi] Anna Schuhbauer, Ratana Chuenpagdee, William W. L. Cheung, Krista Greer, U. Rashid Sumaila (2017). How subsidies affect the economic viability of small-scale fisheries. *Marine Policy* 82:114-121.

[xvii] Authors' calculations based on subsidies to Portuguese fisheries (total subsidies and subsidies to small-scale fisheries) in 2009 estimated by Schuhbauer *et al.* (2017), and on landing data as reported in *Estatísticas da Pesca 2009* (2010). The definition of "small-scale fisheries" used by Schuhbauer *et al*. (2017) was considered to be similar to the definition of "multi-gear fisheries" in Portuguese official statistics. It was also considered that the remaining subsidies (i.e., allocated to fishing segments other than small-scale) corresponded to subsidies allocated to trawling and purse-seining altogether. The subsidies to trawling and purse-seining were disaggregated by assuming that subsidies were divided between these two segments according to the proportion of the value landed by each. In 2009 the value of trawling landings was 48% of trawling and purse-seining landings altogether. It was based upon this proportion that preliminary estimates of fisheries subsidies allocated to trawling in Portugal were calculated.

[xviii] Bloom Association (2013). Analysis of the accounts of Scapêche - Intermarché's Fishing Fleet. Deep-Sea Case Study. http://www.bloomassociation.org/en/wp-content/uploads/2013/11/Accounts-Scap%C3%AAche-Eng.pdf

[xix] For example: not all catches are recorded, as part of them are illegal; catches of one species may be recorded as being of another similar species; in Portugal it is not possible to associated specific landings with a particular fishing gear; definitions of different fisheries segments vary from one country to another, making comparisons difficult.

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