



## Subsidies to high seas bottom trawl fleets and the sustainability of deep-sea demersal fish stocks

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### ABSTRACT

The life spans of demersal species of fishes occurring in deep-waters are much longer and their potential growth rates much lower than those of related shallow water species. As a result, deep-sea demersal fish species are more vulnerable to exploitation. This is because low growth rates relative to the available market discount rate for capital makes it desirable for fishing firms to mine, rather than sustainably exploit, these resources even in the absence of fisheries subsidies. However, it is common knowledge that governments around the world do provide subsidies to their fishing industries. The objective of this contribution is to estimate the global amount of subsidies paid to bottom trawl fleets operating in the high seas, i.e., outside of the Exclusive Economic Zones of maritime countries. Our study suggests that fisheries subsidies to these fleets stand at about US\$152 million per year, which constitutes 25% of the total landed value of the fleet. Economic data for bottom trawlers suggest that the profit achieved by this vessel group is normally not more than 10% of landed value. The implication of this finding is that without subsidies, the bulk of the world's bottom trawl fleet operating in the high seas will be operating at a loss, and unable to fish, thereby reducing the current threat to deep-sea and high seas fish stocks.

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### 1. Introduction

There is evidence that bottom trawling is extending into the deep ocean, where fishing effort, especially on seamounts, has intensified [1]. The life spans of deep-sea fishes are much longer and their potential growth rates are much lower than those of related shallow water species. As a result, deep-sea fish species are more vulnerable to exploitation [2–5]. The point is reinforced when one takes into account the incentives that commercial fishers face. The low growth rates of the fishes that inhabit the deep and high seas make it desirable for fishing firms to mine rather than sustainably exploit these resources. In the absence of effective regulation, fleets compete to catch as much as they can before others do [6]. Fisheries subsidies make matters worse by keeping fleets at sea beyond the time when fishing is profitable [7]. Even if there were no competition for deep-sea resources, low biological regeneration rates provide economic incentives to run down fish stocks as quickly as possible, and then invest the profits in other sectors of the economy [8,9].

Global estimates of fishery subsidies in general have been provided earlier by the FAO [10] and Milazzo [11]. Khan et al. [12] provide the latest estimate of global non-fuel subsidies, while

Sumaila et al. [13] provide an estimate of global fuel subsidies. The sum of the two recent estimates provides an intermediate global fishery subsidy value that is nicely bracketed by the two earlier estimates. The current contribution is the first to provide a global estimate of subsidies to the global bottom trawl fleets operating in the high seas, and belonging to the 12 leading high seas bottom trawl fishing nations.

This study is timely because of the current ecological concerns expressed on the increasing activity by bottom trawlers in the high seas, and the general view that this could not be possible without the existence of fisheries subsidies [14]. Of the three major gear types targeting deep-sea bottom species, i.e., gillnets, longlines and bottom trawlers, the latter are by far the most commonly used and most damaging. Around 80% of high seas catch of bottom species are taken by bottom trawlers [14]. The main species fished by these trawlers on the high seas are roundnose grenadier (*Coryphaenoides rupestris*), blue ling (*Molva dypterigia*), smoothheads (*Alepocephalus* spp.), black scabbardfish (*Aphanopus carbo*), Greenland halibut (*Rheinhardtius hippoglossoides*), orange roughy (*Hoplostethus atlanticus*) and deep-water sharks [14].

### 2. Method

We first generated a list of all countries that have landings by bottom trawlers in the *Sea Around Us* Project catch database

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([www.seaaroundus.org](http://www.seaaroundus.org)). We then identified the world's 12 current leading high seas bottom trawl fishing nations. The countries that made this list were: Japan, Russia, Spain, Korea, Australia, Ukraine, Faeroe Island/Denmark, Estonia, Iceland, Lithuania, Latvia and France (Table 1). New Zealand would have been in this list but for the fact that our research informs us that the country does not give subsidies to its fisheries. It should be noted that the 10 countries included in [14] are all included in our list. [14] notes that fishing vessels flagged by 13 countries took over 95% of the reported high seas bottom trawl catch in 2001. We then estimated the amount of fisheries subsidies received by their high seas bottom trawlers using the results reported in Khan et al. [12] and Sumaila et al. [13], as explained below.

Khan et al. [12] and Sumaila et al. [13] identified 12 types of subsidies, i.e., (i) boat construction, renewal and modernization; (ii) fishing port construction and renovation; (iii) marketing support, processing and storage infrastructure; (iv) tax exemption; (v) vessel buyback; (vi) fuel subsidies; (vii) rural fisheries community development; (viii) fisheries management and services; (ix) fishery research and development; (x) fishery development projects and support services; (xi) foreign access agreements; and (xii) fisher assistance programs. Of these, only (i)–(vi) appeared to be applicable to high seas bottom trawlers. We therefore estimated and ascribed only these subsidies to the class of vessels under study.

### 2.1. Estimating fuel subsidies to high seas bottom trawlers

We obtained the quantity of fuel consumed by bottom trawlers operating in the high seas (defined as ocean areas outside of countries' EEZ) from each of these countries from Tyedmers et al. [16], and subsidy per liter by country reported in Sumaila et al. [13]. From these two sets of data, the total subsidy to bottom trawlers in each of the 12 countries was calculated. For the purposes of further analysis, we also compiled total catch, and catch by high seas bottom trawlers in each of these countries based on the geo-referenced catches of the *Sea Around Us* Project (see [www.seaaroundus.org](http://www.seaaroundus.org); and Watson et al. [17]). Finally, we

assessed the total landed value of bottom trawl catches using information in Sumaila et al. [15].

### 2.2. Estimating non-fuel subsidies to high seas bottom trawlers

Non-fuel subsidy estimates relevant to bottom trawlers active in the high seas, for the 12 high seas bottom trawling nations being studied, were taken from Khan et al. [12]. We then used the ratio of bottom trawl catch to total catch by all the fleets active in each of the 12 countries to prorate the total relevant non-fuel subsidies in each country to the portion of the relevant non-fuel subsidies that can be ascribed to high seas bottom trawlers.

### 2.3. How profitable are bottom trawlers?

According to Statistics Iceland, profit per revenue of about 3.5% was recorded in 2000 (the year for our analysis); while Statistics Norway reported 7% operating profits for trawlers that process fish onboard in 2002. We assumed that profits from other trawl fisheries from around the world are not likely to be higher than these numbers.

## 3. Results

The results of the analysis are given in Table 1. The following observation can be made from that table:

- Total amount of fuel consumed by the high seas bottom fleet (HSBT) of the 12 countries studied is 433 million litres a year.
- Total catch by those countries by all fishing gear in all areas including the high seas stands at just over 15.5 million tonnes, while the equivalent catch by only the HSBT fleet is 400 thousand tonnes. Thus, the HSBT catch is about 2% of the total catch of the 12 countries and less than 1% of the global marine catch.

**Table 1**  
Summary of data in fisheries subsidies to high seas bottom trawl (HSBT) fleets.

Country	HSBT fuel used (m liters) <sup>a</sup>	Subsidy per liter (US\$) <sup>b</sup>	HSBT fuel subsidy (US\$M) <sup>c</sup>	HSBT non-fuel subsidy (US\$M) <sup>d</sup>	HSBT total subsidy (US\$M) <sup>e</sup>	Total catch all species ('000 t) <sup>f</sup>	HSBT catch ('000 t) <sup>g</sup>	Total real catch value all species (US\$M) <sup>h</sup>	HSBT real value (US\$M) <sup>i</sup>
Japan	101.76	0.25	25.44	9.48	34.92	4,895	92	13,463	125
South Korea	96.57	0.18	17.38	9.74	27.12	1,805	88	3,348	92
Russia	90.93	0.18	16.37	13.69	30.06	3668	66	2,753	126
Spain	69.70	0.10	6.97	12.70	19.68	1132	66	1,414	103
Australia	5.17	0.20	1.03	8.92	9.95	183	6	1,673	9
Ukraine	24.40	0.15	3.66	3.20	6.86	393	27	235	20
Faeroe Isl. <sup>j</sup>	19.01	0.15	2.85	12.49	15.34	454	18	778	45
Estonia	8.37	0.15	1.26	3.68	4.94	109	14	59	27
Iceland	9.88	0.18	1.78	0.16	1.94	1,981	11	852	33
Lithuania	3.04	0.15	0.46	0.00	0.46	77	5	55	10
Latvia	1.94	0.15	0.29	0.00	0.29	135	3	56	7
France	2.66	0.14	0.37	0.24	0.61	621	2	1,287	5
<b>Total</b>	<b>433</b>	–	<b>78</b>	<b>74</b>	<b>152</b>	<b>15,453</b>	<b>400</b>	<b>25,972</b>	<b>601</b>

<sup>a</sup> Adapted from Tyedmers et al. [16].

<sup>b</sup> Based on Sumaila et al. [13].

<sup>c</sup> This is the product of high seas bottom trawl fuel consumption, and subsidy per liter.

<sup>d</sup> Calculated using data in Khan et al. [12].

<sup>e</sup> This is the sum of (c) and (d).

<sup>f,g</sup> Are calculated using data in Watson et al. [17].

<sup>h,i</sup> Are obtained from Sumaila et al. [15].

<sup>j</sup> Data for Denmark reported in Sumaila et al. [13] is used to make the calculation here. We assumed that Estonia, Lithuania and Latvia give fuel subsidies to their fishing fleets.

- The total landed value from all fish catch of the 12 countries is about \$26 billion a year. The total HSBT landed value is estimated at about \$601 million, which is less than 3% of the total landed value of these countries, and about 1% of total global marine catch value.
- Total fuel subsidies to this fleet are estimated at about \$78 million, while the non-fuel subsidy estimate stands at \$74 million per year. Therefore, fuel subsidies account for just over 50% of the total subsidy to the HSBT fleet of about \$152 million a year.
- Total subsidy to the HSBT fleet is about 25% of the total landed values from the catch of these fleets in the high seas, which is higher than the reported profit per landed value of not more than 10% for trawlers [18,19].

#### 4. Discussion

Our analysis shows that the bottom trawl fleets operating in the high seas contribute only small percentages of global marine fish catch and landed values, as was also found by Gianni [14]. The fleets consume a large quantity of fuel, which is subsidized by governments around the world. In fact, these subsidies represent the overwhelming portion of the financial transfers received by these fleets.

Expressing the numbers in percentage of the world's catch reveals that the HSBT of the 12 countries do not contribute much, and therefore should not subject the high seas ecosystem and species to such high risk. Simply put, the risk-return equation does not favor continued exploitation in the high seas by bottom trawlers.

There is at present two fora to which these findings are relevant (see Gianni [14]):

- WTO negotiations on global subsidies disciplines in agriculture and fisheries (see [12]); and
- The ongoing debate at the U.N., where a proposal is being considered to establish a moratorium on high seas bottom trawling due to the damage to the habitats that trawlers cause.

Given the current profitability of trawlers, it appears that subsidies, in particular, fuel subsidies may prove to be the Achilles' heel of the deep-sea trawl fleets: their huge fuel consumption makes them extremely sensitive to fuel price increases [16].

Thus, combining (i) and (ii) above, we believe that given continued increases in petroleum prices, many of the conservation goals of NGOs may be achieved by focusing their efforts on persuading governments not to increase fuel subsidies in particular, to these fleets [20]. The key argument in favor of this stance is that—given climate change driven by the burning of fossil fuels—there surely is a better way for governments to spend

money than by increasing subsidies to a fleet that wastes fuel to maintain paltry catches of fish, from highly vulnerable stocks, while destroying their habitat in the process.

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