

## ON THE ENVIRONMENTAL IMPACT OF FISHERIES SUBSIDIES

A short report by the Icelandic Ministry of Fisheries  
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*Submission by Iceland*

### I. INTRODUCTION

1. The economics of the world's marine fisheries are heavily distorted not only by the well known fisheries common property problem but also by direct and indirect government subsidies to the fishing industry. Both kinds of distortions work in the same direction. They encourage excessive fishing effort, overinvestment in fishing capital and overexploitation of the fish stocks. Thus, fisheries subsidies, generally speaking, tend to be environmentally damaging.

2. It is useful to distinguish between two kinds of environmental damage due to fisheries. On the one hand overexploitation of specific fish stocks leads to an excessive biomass reduction that implies ecological readjustments that may or may not be reversible. On the other hand excessive fishing effort may cause unnecessary damage to the marine habitat that will reduce its biological carrying capacity more or less permanently.

3. It is important to realise that the environmental effects of fisheries subsidies depend on the fisheries management system in place. Thus, adding government subsidies to a common property fishery generally results in more economic waste and a greater risk of permanent damage to the biological resource. By contrast, government subsidies to a property-rights based fishery, i.e. a fishery where the common property problem has been substantially alleviated, may in certain cases merely amount to a non-distortive financial transfer to the holders of fishing property rights.

### II. ESTIMATES OF THE GLOBAL AMOUNT OF FISHERIES SUBSIDIES

4. The extent of subsidies, direct and indirect, in ocean fisheries is, perhaps understandably, not a well-researched topic. However, by all available accounts, the amount of fisheries subsidies world-wide can hardly be described as anything but very substantial, at least relative to the total revenues of the industry. Thus, based on 1989 data, FAO in 1993 (FAO 1993) estimated that global fisheries costs exceeded revenues by 54.5 billion USD or 78 per cent. According to FAO, this shortfall must have been met by direct or indirect subsidies.

5. More recently, in a World Bank publication, Milazzo (1998) has produced a much more detailed examination of the subsidy issue. According to his results aggregate global fisheries subsidies are between 14 and 20 billion USD annually. This amounts to some 17-25 per cent of the industry's revenues.

6. Although Milazzo's (1998) World Bank study carefully avoids pointing a finger to the most extravagant fisheries subsidisers around the world, it is possible to glean from his report that the

European Union, Japan and China feature close to the top of the list. In fact, per volume of catch, the European Union may very well be the world champion of fisheries subsidies.

7. It is informative to compare fisheries subsidies with other food industry subsidies. Many agricultural food products are notorious as recipients of high subsidies. According to Milazzo's study, fisheries are firmly placed in the same premier class of subsidy receivers. Thus, including global trade protection (e.g. tariff barriers) on top of financial subsidies, Milazzo's study produced the following comparison:

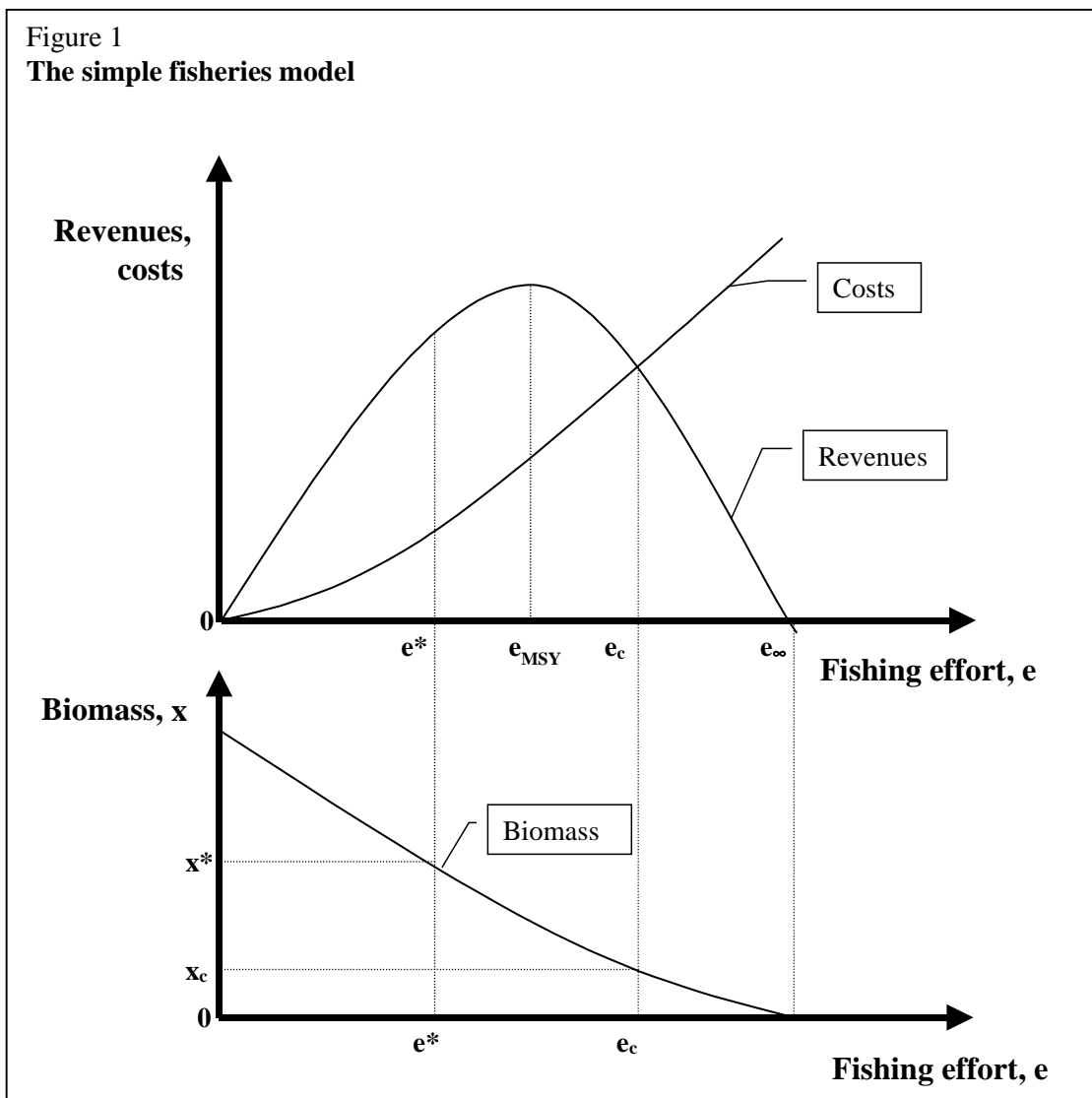
Table 1: Average Global Food Subsidies  
(Including Trade Barriers)

Product	Subsidy
Wheat	48%
Coarse grains	36%
Rice	86%
Oilseeds	24%
Sugar	48%
Beef and veal	35%
Pork	22%
Poultry	14%
Lamb and mutton	45%
Eggs	14%
Fish	30-35%

Source: Milazzo, 1998

### III. THE ENVIRONMENTAL IMPACT OF SUBSIDIES

8. Subsidies to fisheries usually lead to increased fishing effort and, consequently, to (a) lower fish stocks and (b) more habitat damage than would otherwise be the case. The only significant exception from this rule may, as previously mentioned, occur when the fishery is subject to a property rights-based fisheries management regimes such as ITQs (individual transferable quotas). The basic impact of subsidies on fishing effort and biomass can be analysed with the help of the standard simple fisheries model (see e.g. Gordon 1954) as depicted in Figure 1.



9. The upper part of this diagram represents sustainable fisheries harvest and costs<sup>1</sup> as a function of fishing effort. The volume of harvest or yield initially increases with increasing fishing effort but at a declining rate as the fish stocks are reduced. It reaches a maximum, usually referred to as the maximum sustainable yield (MSY), at an effort level  $e_{MSY}$  in the diagram. Any increase in fishing effort above this level merely reduces the sustainable yield until finally the fishery collapses. In the diagram this happens at effort level  $e_{\infty}$ . The optimal fishing effort, i.e. the fishing effort that maximises net profits from the fishery is at  $e^*$  in the diagram. The bionomic equilibrium for the fishery is found at fishing effort level  $e_c$ . At this level of fishing effort, costs equal revenues so there are no net profits in the fishery. This is generally at a much higher fishing effort level than the optimal one. Due to the forces of competition, this is the point at which most fisheries operate unless subjected to an efficient property rights-based fisheries management system.

10. The lower part of Figure 1 illustrates the relationship between fishing effort and biomass. As shown, biomass declines monotonically as fishing effort increases. Thus the bionomic equilibrium

<sup>1</sup> Measured in units of yield.

fishing effort,  $e_c$ , corresponds to a relatively low biomass level, while the profit maximising fishing effort level,  $e^*$ , corresponds to a relatively high biomass level. In fact, the biomass corresponding to the optimal fishing effort is higher than the one corresponding to the MSY. In this sense, profit maximising fisheries are even more environmentally protective than the MSY policy.

11. Now, consider subsidies. The effect of subsidies is either to reduce fishing costs (cost reduction subsidies) or increase revenues (price supports and price supplements). The effects of both on fish stock biomass and fishing effort are similar as illustrated in Figures 2 and 3.

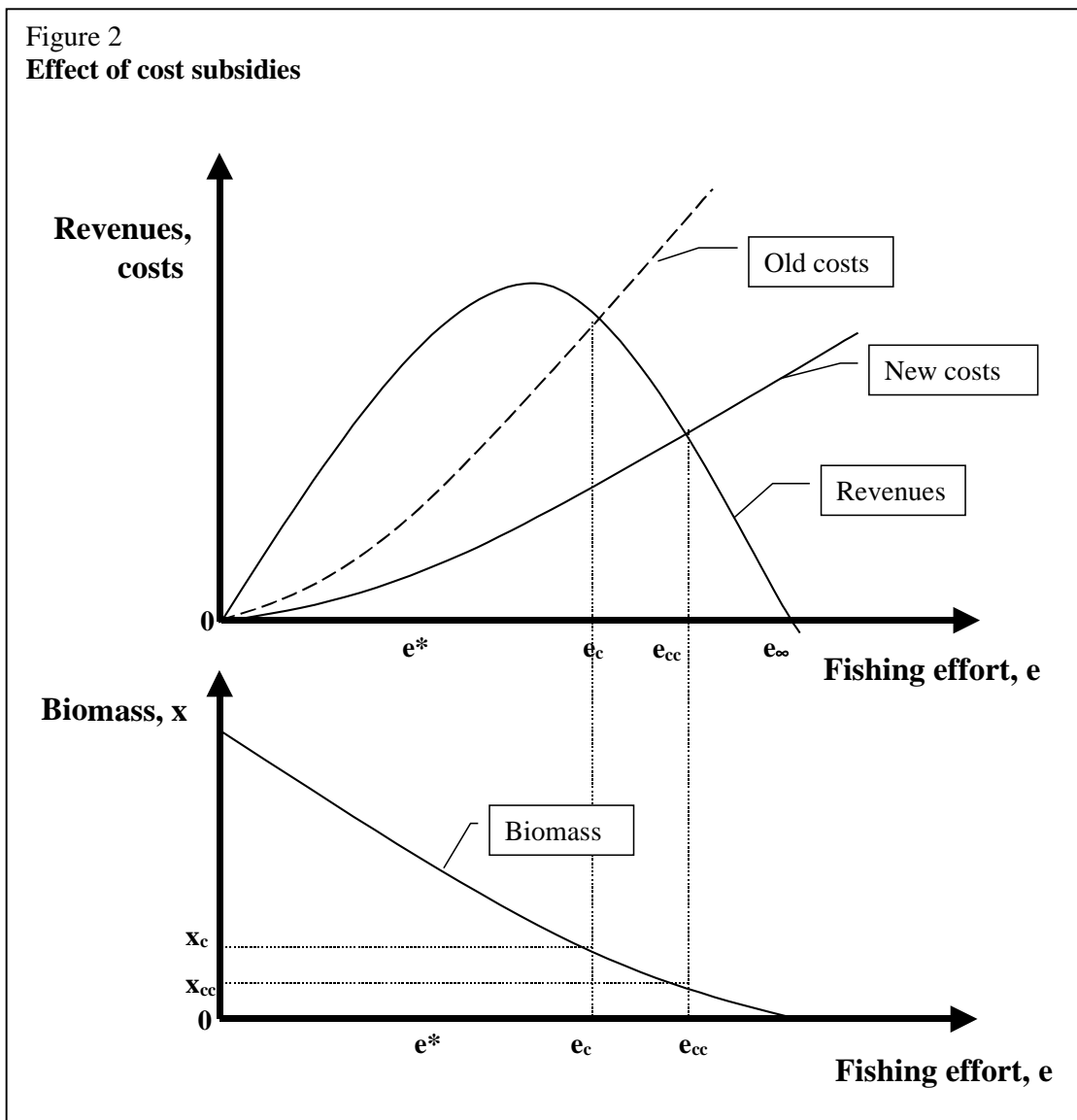
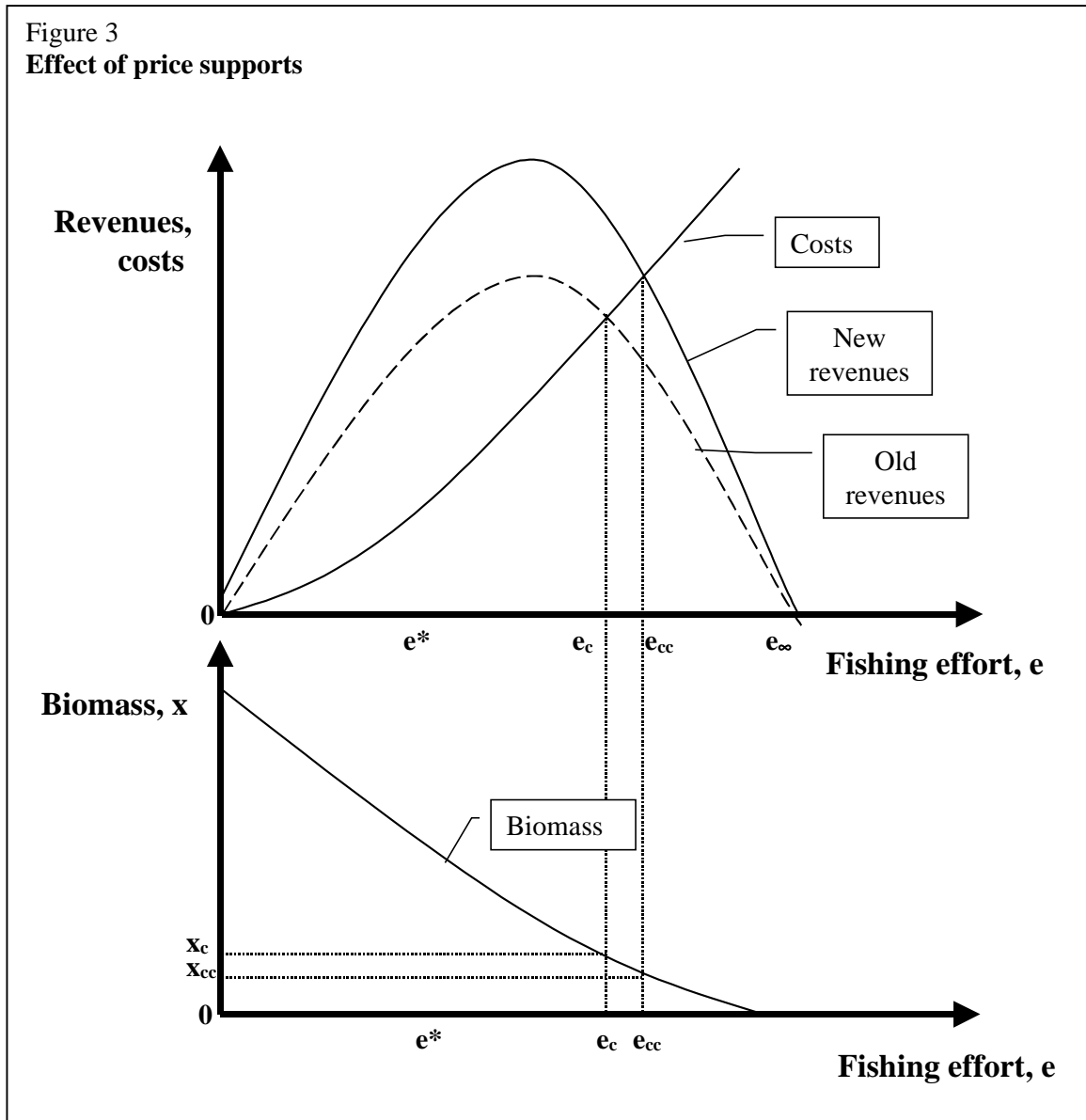


Figure 3  
Effect of price supports



12. As illustrated in Figures 2 and 3, both types of subsidies increase bionomic equilibrium fishing effort (from  $e_c$  to  $e_{cc}$ ) and reduce fish stock biomass (from  $x_c$  to  $x_{cc}$ ) compared to what would otherwise be the case. This effect is easy to understand. Both types of subsidies make fishing effort more profitable to the fishing firms (albeit not society as a whole). As a result fishing firms find it to their advantage to expand fishing effort. The environmental impact is twofold. First, the fish stock biomass is reduced. Second, habitat damage from fishing operations and the use of fishing gear is increased. Given the current overexploitation of most valuable fish stocks and marine habitats both effects must be regarded as negative.

13. Although, the diagrams are drawn in terms of a zero-profit, bionomic equilibrium, it is important to realise that the same effect also applies in a fundamental way to fisheries that are not operating at the bionomic equilibrium point,  $e_c$ , due, for instance, to fisheries management measures. Also in these fisheries, the subsidies create incentives for the fishing firms to expand fishing effort. Under most fisheries management regimes, except perhaps the ITQ system, this would be extremely difficult to counteract.

#### **IV. OVERCAPITALIZATION IN FISHERIES**

14. Given the above analysis and the high level of subsidies, in addition to the common property problem in the world's fisheries, it not surprising that fisheries are heavily overcapitalized. According to a recent FAO estimate (FAO 1995), the global fishing fleet in 1992 measured some 26 million GRT. Since then the fleet has still expanded by 0.7 million GRT (Newton 1998). More importantly, however, due to technological advancement and refitting, the harvesting capacity of the fleet has increased much more, perhaps as much as 22 per cent (Newton 1998 and Fitzpatrick and Newton, 1998).

15. FAO has not published estimates of the needed reduction in the world's fishing fleets. However, high-ranking FAO experts have proved willing to come forward with such estimates. According to one recent estimate, the reduction in global fishing capacity required for reasonably efficient sustainable fisheries is of the order of magnitude 50 per cent (Garcia and Newton 1997).

16. This estimate may well be too conservative. Given an optimal sustainable yield in ocean capture fisheries of 80 million metric tonnes this will lead to a catch per unit of fleet of approximately 6 metric tonnes per GRT. In Iceland, however, the actual yield per unit fleet capacity has in recent years ranged between 12-15.mt/GRT. Moreover, similar performance has been registered in several other property rights based fisheries around the world. If the same level of capital efficiency can be replicated on average in the remainder of the world's fisheries, the fleet size required to take a sustainable yield of 80 million would be about 6 million GRT, or just over 1/5 of its current size.

17. Irrespective of whether the current overcapacity of the world's fishing fleets is 50 per cent or 80 per cent, it is safe to assume that excessive fishing effort is of a similar magnitude.

#### **V. CONCLUSION**

18. Fisheries subsidies, irrespective of whether they take the form of cost reduction or price supports, encourage increased fishing effort. Thus, fisheries subsidies exacerbate the already serious common property problem of ocean fisheries. The environmental impact is twofold. First, increased fishing effort further diminishes exploited fish stocks. Second, increased fishing effort implies more ocean habitat damage due to fishing operations. Both effects further destabilize the underlying ecosystem, already under considerable stress, increasing the risk of irreversible ecological shifts that may be difficult to reverse and even of permanent environmental damage.

19. The magnitude of the environmental impact depends on the size of the subsidies and several other variables. However, given recent estimates of fisheries subsidies world-wide (Milazzo 1998, FAO, 1993), it appears that a substantial part of the current overexploitation of the world's fish stocks and habit damage in the oceans is a direct consequence of past and current fisheries subsidies.

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