ICES CM 2014/ 3863 G:18

Fuel use in fishing- an important indicator for sustainable fisheries

Friederike Ziegler, Sara Hornborg

SIK- The Swedish Institute for Food and Biotechnology, Sustainable Food Production, PO Box 5401, 402 29 Göteborg, Sweden. E-mail: fz@sik.se, Tel. +46-10-516 66 54

Summary

Life Cycle Assessment (LCA) quantifies environmental impacts of products, primarily regarding emission-based impacts such as greenhouse gas emissions, acidification and eutrophication. Indicators to quantify also biotic impacts of fishing in relation to seafood products have recently been presented. Fuel use in fishing often drives the emission-based LCA impacts. As fuel data is scarce, especially on a detailed level, we present an approach for utilizing official fleet-wide fuel data to estimate the fuel use of individual fisheries. We show that the fuel efficiency of Swedish demersal trawl fisheries has improved. The difference in fuel efficiency per kilo landed between large and small trawlers was small, unless catch capacity was lowered by use of species-selective grids. Stock rebuilding was shown to determine fuel use, as fuel efficiency was correlated to increasing biomass of Eastern Baltic cod. However, rebuilding efforts can also lead to tradeoffs e.g. in the case of selective crustacean trawling; protection of depleted fish stocks decreases the fuel efficiency per landing. Results suggest that fuel use is one of several important indicators for sustainable fisheries that should be considered by fisheries management and certification, motivated by the great importance of fuel use for both environmental and economic performance of fisheries.

Introduction

Life Cycle Assessment (LCA) quantifies the resource use and environmental impacts of products and has been applied to seafood production systems for around a decade. In fisheries, fuel use has often been the dominating input (Parker 2012) and it is an important indicator both for the environmental and economic performance of fisheries. Data on fuel use of fisheries, however, is sparse, and often too aggregated to be useful to assess the fuel use of single fisheries. Collecting these detailed data is a difficult and time-consuming undertaking. We wanted to explore if and how the detailed (per vessel) fuel data that is collected under the EU data collection framework and published on a fleet level could be used to approximate the fuel use in specific fisheries.

Methods

We combined fuel data, as reported in the Annual Economic Report of the European fishing fleet (e.g. Anderson et al. 2012), with detailed logbook data for 2002-2010 in order to separate the fleet "Swedish demersal trawling" into its most important components; cod trawling in the Baltic Sea, *Nephrops* trawling in the Skagerrak, shrimp trawling in the Skagerrak and mixed trawling for fish and crustaceans along the Swedish west coast. This was done by assuming a correlation between fishing effort and fuel use per landing and the total fuel use of each vessel size segment (as reported in the AER) was split equally on all hours trawled in that segment (as reported in the logbook). Overall temporal trends in the data for the entire fleet were first studied and then our model was applied to distribute the total fuel use of the fleet on the different fisheries.

Results and Discussion

Results demonstrated that the overall fuel use per landing has decreased in the fleet segment over the study period, mainly due to rebuilding of the Eastern Baltic cod stock. The decrease was most pronounced in medium-sized and large vessels (12-24m and >24m, respectively). However, the differences in fuel efficiency per kilo landed between large and small trawlers were small, which means that the higher catch rate (landing per effort) of large vessels is outbalanced by higher fuel use per effort. The medium-sized trawlers were the most fuel-efficient ones. Fuel use per effort was more stable during the studied time period, indicating that not much technological improvement has taken place during the period.

Fuel efficiency was also shown to be highly correlated with stock rebuilding, as it was correlated for all vessel size segments to the increase in biomass of Eastern Baltic cod during the studied time period. This decreasing trend in fuel use over time holds also for the crustacean fisheries on the Swedish west coast targeting Norway lobster (*Nephrops norvegicus*) and northern shrimp (*Pandalus borealis*). However, in the case of *Nephrops* trawling, rebuilding of depleted fish stocks by species-selective demersal trawling was shown to lead to a tradeoff; the fuel efficiency per landing of selective trawling consistently was shown to be lower than for mixed demersal trawling targeting *Nephrops*. Finally, tax exemption of fuel use in fisheries was shown to maintain inefficient fisheries.

We show that this model, despite being rough, can provide data on fuel use of single fisheries in the absence of more detailed data. However, efforts should even so be done to monitor fuel use of fishing as part of fisheries management, as it is one of several important indicators for sustainable fisheries that should be considered by fisheries management and certification, motivated by the great importance of fuel use for both environmental and economic performance of fisheries (Abernethy et al. 2010). Also, the data that is already collected should in addition be made more readily available for independent research.

References

Abernethy, K. E., Trebilcock, P., Kebede, B., Allison, E. H. & Dulvy, N. K. 2010. Fuelling the decline in UK fishing communities? ICES Journal of Marine Science: Journal du Conseil, 67(5): 1076–1085.

Anderson J, Carvalho N, Contini F, Virtanen J. 2012. The 2012 Annual Economic Report on the EU Fishing Fleet (STECF-12-10). Scientific, Technical and Economic Committee for Fisheries (STECF) JRC Scientific and Policy Reports. 2012; Report EUR 25425 EN Joint Research Centre, Maritime Affairs and Fisheries, Ispra, Italy.

Parker, R., 2012. Review of life cycle assessments research on products derived from fisheries and aquaculture: a review for Seafish as part of the collective action to address GHG in seafood. Sea Fish Industry Authority, Edinburgh, UK.

Ziegler, F., Hornborg, S. 2014. Stock size matters more than vessel size: The fuel efficiency of Swedish demersal trawl fisheries 2002-2010. Marine Policy (2014): 72–81.