

# Mussels as nitrogen sinks – should society support the west-coast mussel industry?

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## 1 Introduction

There is a well-established mussel-producing industry on the west coast of Sweden, in the north-western fjords of Bohuslän. Existing production is about 2000 tonnes per year, corresponding to the removal of 20 tonnes of nitrogen. This is about 3% of the inflow to these waters. Such nitrogen is a pollutant in coastal waters, and hence its removal is an external benefit of the production process for which mussel producers are currently uncompensated [2].

It is reasonable to suppose that if producers were compensated for the benefit to society they provide (by removing nitrogen) then they would expand the scale of their production, thus increasing these benefits. This would allow one (or both) of two things to happen: (i) costly abatement measures elsewhere (such as use of catch crops) could be scaled back; (ii) the quality of the coastal water could be improved. Common sense (and economic theory) suggest that at least some level of compensation (and hence increased production / N removal) ought to be socially desirable, given that current production is carried on entirely without subsidy.<sup>1</sup>

We propose research to find out what scale of mussel production in the area is socioeconomically desirable, and to investigate possible practical ways in which the industry could be encouraged to grow, as well as considering potential barriers to increased production.

## 2 Optimal scale of production

Costly measures are currently being taken in Bohuslän to remove nitrogen from the waters flowing into the fjords. These include the establishment and maintenance of water treatment plants, and changes to agricultural practice such as the use of catch crops. In theory, for each tonne of nitrogen removed through mussel cultivation, a corresponding reduction in the intensity of upstream abatement efforts could be made while leaving the situation in coastal waters unchanged.

The first aim of the study would therefore be to get an estimate of the existing costs of upstream nitrogen abatement measures, and the likely future costs in the event of abatement efforts being increased in the future (in line with international agreements). This cost (in kronor per tonne of nitrogen at the coast) would serve as a baseline for potential payments to mussel producers. The second (and connected) aim would be to investigate the sort of expansion in production to which such payments might lead.

To achieve the above aims we would need both data and methodological tools. Many of these are readily available. We would use the work of Brady

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<sup>1</sup>The economic argument can be found in Hart [3].

[1] on nitrogen abatement from farms, and data from SMHI on retention of nitrogen on its way to the coast. Furthermore, allowance might be made (as in Hart [3]) for the temporal advantage of coastal measures — they have an instant effect on coastal nitrogen levels, whereas the effect of upstream measures must work its way through the system of surface and sub-surface flows. Data would also have to be found on the costs of water treatment. Finally, a study of mussel production and marketing systems would be needed in order to estimate the net costs of increasing production. Included here would be the inherent production problems such as toxicity.<sup>2</sup>

### 3 Measures to encourage production

Measures to encourage production would inevitably involve money being channelled from some source into mussel production. This could be via direct subsidies, but these might be hard to justify politically. Alternatively, it is possible to envisage a kind of emissions trading scheme in which farmers or water treatment plants paid mussel producers to produce more (and hence sequester more nitrogen) in return for which they themselves would be able to relax their own (costly) abatement measures. Schemes of this type have long been in practice in the US (particularly for air pollution), and are also envisaged as part of the Kyoto protocol for carbon dioxide abatement. In the Kyoto case, one country (with high abatement costs) might pay another country in order for the second country to expand its forest plantation effort (thus sequestering CO<sub>2</sub>) allowing the first country to reduce its abatement. Furthermore, such schemes have also been mooted in order to encourage mussel production and reduce costs of nitrogen abatement in southern Norway (ref??).

In order to investigate possible ways in which mussel production might be encouraged, it would be essential first of all to map out what regulations and payments are in operation today which affect sources and sinks of nitrogen. How do the regulations work, and who picks up the bill for current abatement efforts? On the basis of this, possible win-win solutions could be suggested. To go further, it would be essential to take up a dialogue with decision-making bodies such as the local government authority.

### 4 Barriers to increased production

Barriers to increased production, other than the difficulties involved in raising the cash for any incentive scheme, include possible resistance to increased mussel production from other stakeholders. For instance, it has been asserted (ref?) that mussel production facilities detract from the landscape value in areas of great beauty which generate a lot of income from tourism.

## References

- [1] Mark Brady. The relative cost-efficiency of Swedish policies for large-scale agricultural nitrogen control. *Ecological Economics*, **this issue**, 2003.
- [2] Joel Haamer. Improving water quality in a eutrophied fjord system with mussel farming. *Ambio*, 25(5):356–362, 1996.
- [3] Rob Hart. Dynamic pollution control—time lags and optimal restoration of marine ecosystems. *Ecological Economics*, Forthcoming:pp ??, 2003.
- [4] Sven Kollberg. Beskrivning av den svenska musselnäringen (Description of the Swedish mussel industry). Technical report, Vattenbukarnas Riksförbund, Göteborg, 1999. In Swedish.

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<sup>2</sup>See Kollberg [4] for a review of the prospects of the Swedish mussel industry.