

**Conclusions in the Scientific Literature on  
FISH FARMS *versus* MAERL**

(Click on [hyperlinked](#) URLs to obtain texts)

**Birkett, D.A., C.A. Maggs & M.J. Dring (1998).** Maerl (volume V). *An overview of dynamic and sensitivity characteristics for conservation management of marine SACs.* Scottish Association for Marine Science. (UK Marine SACs Project).

<http://www.ukmarinesac.org.uk/pdfs/maerl.pdf>

*“The positioning of cages over a maerl biotope is likely to lead to fish faeces and partly consumed food pellets contaminating the maerl bed and resulting in anaerobiosis due to the oxygen demand of the decomposing material. The detrital rain from the cages could act in a similar way to terrigenous silt, reducing light penetration through the water column and smothering the maerl surface so that the stabilizing epiphytic algae could no longer establish themselves. As a minimum impact the increase in nutrient levels might produce local eutrophication effects.”*

**Grall, J. & J.M. Hall-Spencer (2003).** Problems facing maerl conservation in Brittany. *Aquatic Conservation: Marine & Freshwater Ecosystems.* 13: S55-S64.

[http://www.ukmpas.org/pdf/Grall\\_Hall-Spencer\\_2003.pdf](http://www.ukmpas.org/pdf/Grall_Hall-Spencer_2003.pdf)

*“Other major impacts on local maerl bed habitats include the spread of the invasive gastropod *Crepidula fornicata*, industrial and urban sewage, aquaculture and demersal fishing. These impacts have increased sharply since the 1970s and are causing widespread damage to Breton maerl beds.*

*“Such declines in one of the most diverse habitats of European waters (BIOMAERL, 1999) have not previously been reported and emphasize the urgent need for maerl bed conservation in France and Europe. The west coasts of Norway, Scotland and Ireland provide similar ‘hot-spots’ for maerl (Birkett et al., 1998; BIOMAERL, 1999) where active conservation policies are essential if the Breton experience is to be avoided.”*

**Hall-Spencer, J., N. White, E. Gillespie, K. Gillham & A. Foggo (2006).** Impact of fish farms on maerl beds in strongly tidal areas. *Marine Ecology-Progress.* 326: 1-9. Grall J, Hall-Spencer JM (2003). Problems facing maerl conservation in Brittany. *Aquatic Conservation: Marine Freshwater Ecosystems.* 13:55-64.

<http://www.int-res.com/articles/feature/m326p001.pdf>

*“Visible waste was noted up to 100 m from cage edges, and all 3 farms caused significant reductions in live maerl cover, upon which this habitat depends. Near-cage infaunal samples showed significant reductions in biodiversity, with small Crustacea (ostracods, isopods, tanaids and cumaceans) being particularly impoverished in the vicinity of cages, and significant increases in the abundance of species tolerant of organic enrichment (e.g. *Capitella* spp. complex, *Ophryotrocha hartmanni*). Relocation of fish farms to areas with strong currents is unlikely to prevent detrimental effects to the structure and organisation of the benthos, and ‘fallowing’ (whereby sites are left unstocked for a period of time to allow*

*benthic recovery) is inadvisable where slow-growing biogenic habitats such as maerl are concerned, as this may expand the area impacted.”*

**Haskoning UK Ltd. (2006).** Investigation into the impact of marine fish farm depositions on maerl beds. *SNH/SEPA/Marine Harvest Commissioned Report No. 213.*

[http://www.snh.org.uk/pdfs/publications/commissioned\\_reports/reportno213.pdf](http://www.snh.org.uk/pdfs/publications/commissioned_reports/reportno213.pdf)

*“All three fish farm sites had a significant build-up of feed and faeces trapped within maerl near the cages. Evidence of gross organic enrichment was recorded up to 100m away from the cage edges. The organic enrichment was found to affect a number of different aspects of the benthic community.*

*“Deposition from the fish farms affected the percentage of maerl on the seabed that was live versus dead. All three sites had more dead/dying maerl near to the cages than at the reference sites and at stations distant from the cages. Live maerl close to cage edges had a mottled, unhealthy appearance due to phycobilin pigment loss.*

*“Marked reductions in species diversity of infaunal communities associated with the maerl were recorded around the fish farms in Shetland and Orkney. Organic enrichment effects on community structure were also noted around the fish farms in Shetland and South Uist.*

*“... maerl fragments are often transported in and out of areas of the seabed during storm events. Thus “impacted” maerl fragments close to a fish farm may be transported by waves to a nonimpacted area of seabed. The effect of this is essentially to increase the area of seabed affected by the fish farm.”*

**Hall-Spencer, J. & R. Bamber (2007).** Effects of salmon farming on benthic crustaceans. *Ciencias Marinas*. 33(4): 353-336.

<http://redalyc.uaemex.mx/src/inicio/ArtPdfRed.jsp?iCve=48033403>

*“... this study confirmed that maerl habitats are highly susceptible to the effects of fish-farm deposition (possibly compounded by the effects of lice treatment toxicity), showing significant disturbances to the associated crustacean fauna. High organic loading results in the long-term loss of living maerl, upon which formation of the [maerl] habitat depends, and many species are intolerant of smothering by inorganic particulates.”*

**Sanz-Lázaro, C., M.D. Belando, L. Marín-Guirao, F. Navarrete-Mier, A. Marín (2011).** Relationship between sedimentation rates and benthic impact on Maerl beds derived from fish farming in the Mediterranean. *Marine Environmental Research*. 71(1): 22–30.

[http://www.researchgate.net/publication/47532981\\_Relationship\\_between\\_sedimentation\\_rates\\_and\\_benthic\\_impact\\_on\\_Marl\\_beds\\_derived\\_from\\_fish\\_farming\\_in\\_the\\_Mediterranean](http://www.researchgate.net/publication/47532981_Relationship_between_sedimentation_rates_and_benthic_impact_on_Marl_beds_derived_from_fish_farming_in_the_Mediterranean)

*“This work shows that the level of fish farm impact on the benthic community might be underestimated if it is assessed by only taking into account data obtained from waste dispersion rates. The unattached coralline algae habitat studied [maerl] seems to be very sensitive to fish farming compared with other unvegetated benthic habitats.”*

**The Scottish Government,** Scotland’s Marine Atlas, Inshore and Shelf Subtidal Sediments, Priority Marine Features. <http://www.scotland.gov.uk/Publications/2011/03/16182005/48>

*“Maerl beds are extremely sensitive to physical disturbance and smothering, as a result of scallop dredging, bottom trawling, aquaculture and extraction as a fertiliser.”*

**European Community Directive** on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC).

<http://jncc.defra.gov.uk/pdf/Article17/FCS2007-S1377-audit-Final.pdf>

*“... evidence suggests that maerl continues to be under threat from damaging human activities, such as fisheries and fish farm operations. Eutrophication is also considered to be an important threat to maerl beds.*

*“The positioning of [fish farm] cages over a maerl bed is likely to lead to fish faeces and partly consumed food pellets contaminating the maerl bed and resulting in anaerobiosis (due to the oxygen demand of the decomposing material). The detrital rain from cages could act in a similar way to terrigenous [land-derived] silt, reducing light penetration through the water column and smothering the maerl surface so that the stabilizing epiphytic algae could no longer establish themselves. As a minimum impact the increase in nutrient levels might produce local eutrophication effects. Indeed, Maggs and Guiry (1987a) noted that maerl below fish cages was covered with *Beggiatoa* sp., which had a detrimental impact on this habitat.*

*“Hall-Spencer et al. (2006) have demonstrated the impacts of Scottish salmon fish farms on maerl and revealed significant reductions in live maerl cover. Indeed visible waste was noted up to 100 m from cage edges and near-cage infaunal samples showed significant reductions in biodiversity, with small Crustacea being particularly impoverished in the vicinity of the cages and significant increases in the abundance of species tolerant of organic enrichment. Maerl is particularly sensitive to hydrogen sulphide, as that generated by fish farm waste (Wilson et al. 2004).”*

**Greathead, G., E. Guirey & B. Rabe (2012).** Development of a GIS Based Aquaculture Decision Support Tool (ADST) to Determine the Potential Benthic Impacts Associated with the Expansion of Salmon farming in Scottish Sea Lochs. *Scottish Marine and Freshwater Science* Vol 3 No 6. <http://www.scotland.gov.uk/Resource/0040/00405906.pdf>

*“Within sea lochs there are varying proportions of Priority Marine Features (PMFs), such as Maerl beds that are particularly sensitive to sedimentation and organic enrichment (Hall-Spencer et al., 2006).”*