

# Systematic review of effects of fishing on benthic biota and habitats

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*Journal of Animal  
Ecology* 2000,  
**69**, 785–798

# A quantitative analysis of fishing impacts on shelf-sea benthos

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## Summary

1. The effects of towed bottom-fishing gear on benthic communities is the subject of heated debate, but the generality of trawl effects with respect to gear and habitat types is poorly understood. To address this deficiency we undertook a meta-analysis of 39 published fishing impact studies.
2. Our analysis shows that inter-tidal dredging and scallop dredging have the greatest initial effects on benthic biota, while trawling has less effect. Fauna in stable gravel, mud and biogenic habitats are more adversely affected than those in less consolidated coarse sediments.

## Gear and habitat effects but no interactions: 39 studies



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## FEATURE ARTICLE

## Global analysis of response and recovery of benthic biota to fishing

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**ABSTRACT:** Towed bottom-fishing gears are thought to constitute one of the largest global anthropogenic sources of disturbance to the seabed and its biota. The current drive towards an ecosystem approach in fisheries management requires a consideration of the implications of habitat deterioration and an understanding of the potential for restoration. We undertook a meta-analysis of 101 different fishing impact manipulations. The direct effects of different types of fishing gear were strongly habitat-specific. The most severe impact occurred in biogenic habitats in response to scallop-dredging. Analysis of the response of different feeding guilds to disturbance from fishing revealed that both deposit- and suspension-feeders were consistently vulnerable to scallop dredging



A meta-analysis of 101 experimental fishing impact studies identified the types of fishing gear that have the greatest impact on the seabed and on the groups of organisms that are most vulnerable to fishing activities. Scallop dredges

# Habitat x gear x faunal interactions 101 studies



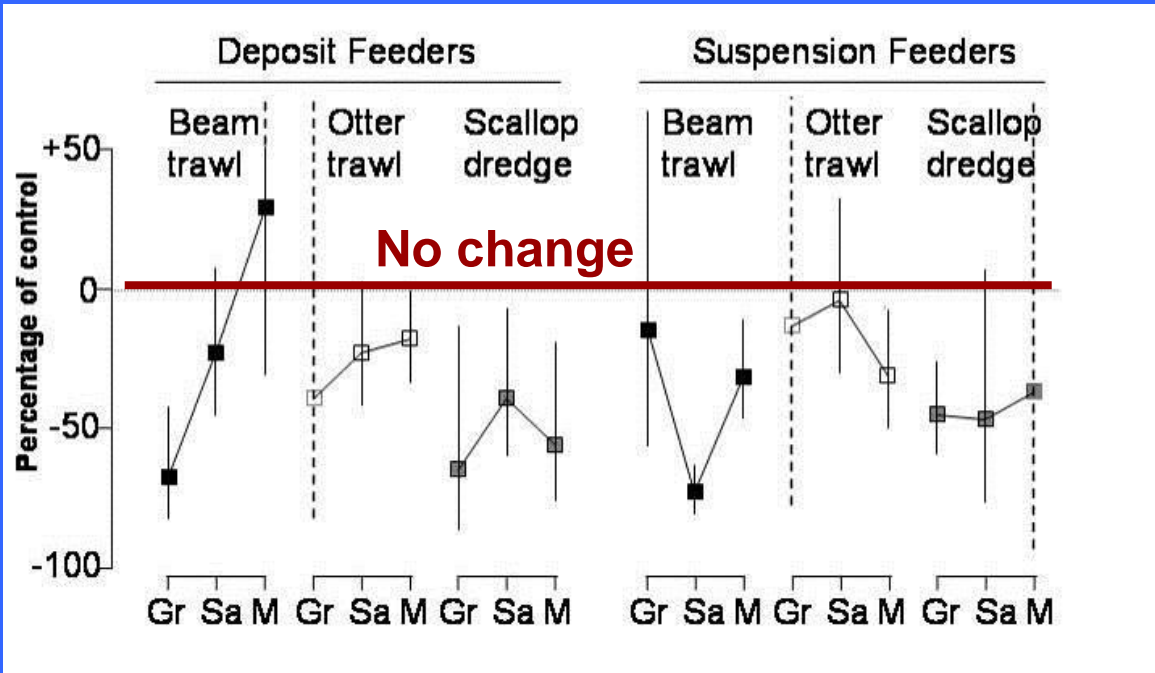
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# Useful outputs



Habitat type (gravel, sand, mud)



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# Why are we updating the database?

- Most up to date entry is 2004 – 9 yr lag
- Paper was difficult to publish due to methodology
- Want to apply the most robust techniques



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Scores of how robust reviews of policy relevance in marine science.....

Lots of room for improvement given top score could be 39!

**Supplementary Table S1: Sample reviews used to evaluate the Review Scoring System (RSS).** 'Question' refers to the principal topic(s) of the review for which RSS was appropriate. 'Citations' is the number of citations given by Web of Knowledge as at **13 May 2013** (NI=Not Indexed). 'Type' is the type of review (MA=Meta-Analysis, NAR=Narrative, VC=Vote-Counting). The three scores listed are based on scoring systems in which reviews receive 2, 3 or 4 points for GREEN, with 1 and 0 points for AMBER and RED respectively. A 3-1-0 system was utilised in this study and the scores below represent the average across two assessors.

Review	Question	Cited	Type	3-1-0
<u>Broadhurst et al. (2006)</u>	Causes, extent and solutions to collateral mortality from towed fishing gear	67	NAR	3
<u>Claudet et al. (2008)</u>	Does the duration of protection, size, and spacing of Marine Protected Areas influence effectiveness?	114	MA	16
<u>Cote et al. (2001)</u>	Effects of Marine Protected Area characteristics on fish diversity and abundance	118	MA	20.5
<u>Guidetti &amp; Sala (2007)</u>	Effectiveness of Marine Protected Areas	81	MA	15.5
<u>Kaiser et al. (2006)</u>	Global analysis of response and recovery of benthic biota to fishing	200	MA	16.0
<u>Lester &amp; Halpern (2008)</u>	How effective are partially protected marine reserves?	33	MA	11.5
<u>Lester et al. (2009)</u>	Effects of Marine Protected Area characteristics on biomass, density and species richness	139	MA	14.5
<u>Thrush &amp; Dayton (2002)</u>	Effects of trawling and dredging on marine	191	NAR	1.5

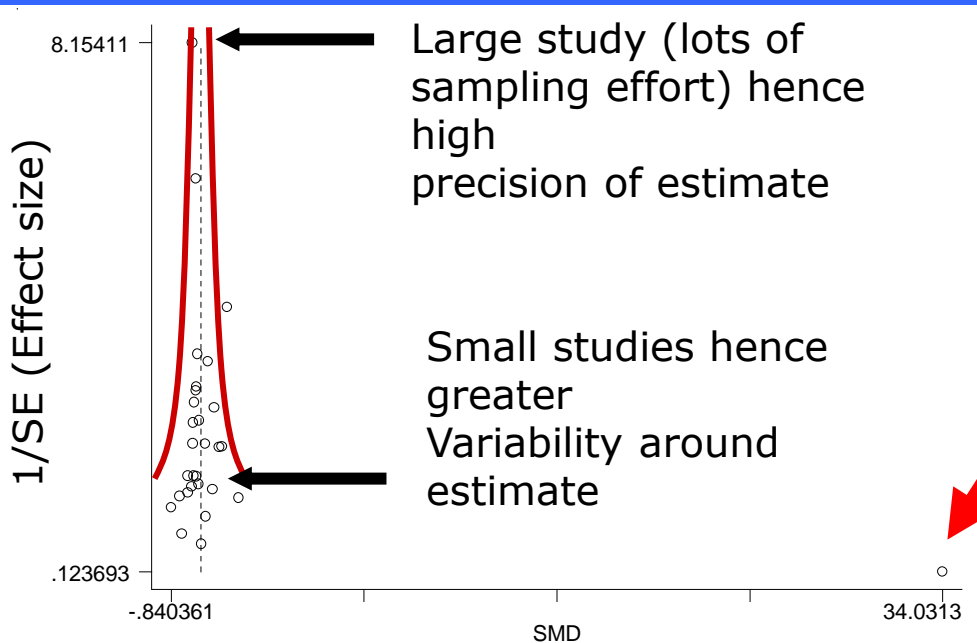


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### Centre for Evidence-Based Conservation



The Centre for Evidence-Based Conservation (CEBC) was established in 2003 with the goal of supporting decision making in conservation and environmental management. CEBC promotes evidence-based practice through the production and dissemination of systematic reviews on both the effectiveness of management and policy interventions and on the impact of human activities on the natural environment. With support from a wide range of organisations in the environmental and academic

#### News

» CEBC has been used as the model for the establishment of a new centre for Evidence-Based Environmental Management (EviEM) in Sweden. CEBC Director, Prof. Andrew Pullin comments on this exciting development in the EviEM Annual Report.







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The Collaboration for Environmental Evidence is an open community of scientists and managers working towards a sustainable global environment and the conservation of biodiversity. The collaboration seeks to synthesise evidence on issues of greatest concern to environmental policy and practice.

**News Headlines**

**13/05/13 - The CEE Annual Report for 2012 has now been approved by the Board of Trustees.** [Read the report here](#)

**02/04/13 - The CEE is very pleased to welcome a new Centre based in Sweden** The Mistra Council for Evidence-based Environmental Management (MISTRA EviEM) is based in Stockholm at the Swedish Royal Academy of Sciences. Andrew Pullin, Chair of CEE Trustees, commented "The addition of MISTRA EviEM greatly strengthens the CEE network of centres and is a key step in our programme to establish a global network. Mistra EviEM is currently running a 5-year programme to conduct systematic reviews on questions of concern to the Swedish environment. You can find more information at [> Find out more information here....](#)



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*The protection of the environment and conservation of biodiversity through preparation, maintenance promotion and dissemination of systematic reviews of the effects and impacts of environment management interventions for the public benefit.*



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# What we need to do

- Define questions - (largely done) with stakeholder input
- Define boundaries
- Define inclusion/exclusion criteria
- Define search terms
- Compile commentary on each study



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# Outputs (papers) and key attributes

1. Update of Collie 2000 and Kaiser 2006, fauna x habitat x gear impacts and recovery
2. Compile and analyze comparative studies of response to gradients of trawling
3. Secondary analysis with raw datasets (discuss)
4. Include faunal traits as well as abundance, biomass, diversity measures
5. Build framework to include MSC and ERA habitat guidelines



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# Issues for discussion

- Getting input from this group on the systematic review criteria
- Defining search terms and identifying grey literature (e.g. Russian reports MSC Barents Sea cod)
- Agree prioritization of outputs
- Bycatch effects (should we define the review?)



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# Tasks for tomorrow:

- Refine questions, re-word and reduce
- Start thinking about search terms
- Think about how we could include MSC etc in our analyses.....and hence funding.



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