

<p align="center"><b>Draft Advice</b></p> <p align="center"><b>Scottish MPAs and fisheries</b></p> <p align="center"><b>BURROWED MUD, INSHORE DEEP MUD WITH BURROWING HEART URCHINS and OFFSHORE DEEP SEA MUDS</b></p>	
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## BURROWED MUD HABITATS

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This advice covers burrowed muds, inshore deep mud with burrowing heart urchins and offshore deep sea mud. Muddy sediments develop in low-energy environments and species found in such habitats are adapted to life in relatively low-oxygen environments<sup>1</sup>. Deep sea mud support communities of burrowing animals such as *Nephrops*, polychaete worms, bivalve molluscs, brittlestars and foraminifera<sup>2</sup>.

### Impacts

#### **Demersal towed gears (including beam trawl, demersal otter trawl, seine net and scallop dredge)**

Studies in the Irish Sea and in a Scottish sea loch have shown that fished areas support a modified biological community with lower diversity, reduction or loss of long-lived filter-feeding species and increased abundance of opportunistic scavengers<sup>3,4</sup>. This effect was greatest in the more heavily fished offshore areas suggesting that impact is related to the intensity of fishing<sup>3</sup>. Modelling studies suggest that the greatest impact is produced by the first pass of a trawl with subsequent exposure having less effect<sup>5</sup>. The sea pen *Virgularia mirabilis* does not appear to be negatively affected by trawling at low levels, possibly as a result of its ability to withdraw into the sediment<sup>4</sup>, however *Funiculina quadrangularis* has no such ability and its distribution in Scottish waters may have been reduced as a result of *Nephrops* trawling<sup>6</sup>. *Nephrops* may be an important component of the benthic community so fisheries that greatly alter its abundance or size composition may be seen to have a negative impact. Further, damage to sea pen species is likely to take place as a result of greater sediment disturbance as a result of towed demersal gear<sup>10</sup>.

#### **Demersal static gears (including pots, traps, lines and nets)**

Studies on the impacts of pots on seapens have shown limited adverse effect on seapens from a 'single' fishing operation<sup>7,8,9</sup>. Research has shown that certain species of sea pen are caught during the recovery of creels or damaged from heavier gear, although the extent of damage and the impacts of repeated exposure to these types of fishing gear at high levels of fishing activity are less well understood<sup>8,10</sup>.

If fishing activity is low, direct impact on habitat is likely to be minimal and seabed structure is likely to be maintained in a slightly modified state<sup>10</sup>. *Nephrops* may be an important component of the benthic community so fisheries that greatly alter its abundance or size composition may be seen to have a negative impact.

### **JNCC/SNH fisheries management Advice**

**Demersal towed gears** - If habitats have been impacted by fishing, reduction in effort may be required to allow recovery to favourable condition. However, the degree of reduction that will be required is unknown and further studies or "adaptive" management will be required to establish this. There is risk that cumulative effects of ongoing fishing may result in increasing degrees of modification. Consideration should be given to spatial and/or temporal measures as a mechanism to manage fishing intensity.

**Demersal static gears** - On the basis of current knowledge it would be reasonable to assume that management action to maintain a creel fishery within sustainable limits would be likely to similarly maintain a population of epibenthic species. Fisheries should be managed to ensure that *Nephrops* stocks are maintained within sustainable limits.

## Confidence in advice

**Demersal towed and static gears** – Medium certainty. The conclusions are supported by good quality, directly relevant scientific information. Some assumptions have been made regarding impacts to offshore mud habitats.

## Evidence

<sup>1</sup> Dernie <i>et al.</i> , 2003; <sup>2</sup> Baxter <i>et al.</i> , 2011; <sup>3</sup> Ball <i>et al.</i> , 2000; <sup>4</sup> Tuck <i>et al.</i> , 2000; <sup>5</sup> Hiddink <i>et al.</i> , 2006; <sup>6</sup> Hughes, 1998; <sup>7</sup> Eno <i>et al.</i> , 1996; <sup>8</sup> Eno <i>et al.</i> , 2001; <sup>9</sup> Kinnear <i>et al.</i> , 1996, <sup>10</sup> Adey, 2007.							
There is abundant evidence for the effects of trawling on muddy habitats including seapen and burrowing megafauna. The evidence is from UK and Irish waters and so is considered to be directly applicable to Scottish MPAs.							
There is some evidence for the impacts of potting on this habitat. The evidence is from UK waters so can be regarded as directly applicable to Scottish waters. There is no direct evidence for the impacts of netting or longlining so the assessment is based on the assumption of similar effects to potting.							
Directly relevant peer reviewed literature	<input checked="" type="checkbox"/>	Directly relevant grey literature	<input checked="" type="checkbox"/>	Inference from studies on comparable habitats, gears or geographical areas.	<input checked="" type="checkbox"/>	Expert judgement	<input checked="" type="checkbox"/>