## SUBTIDAL BEDROCK REEF INCLUDING CHALK and SUBTIDAL COBBLE AND BOULDER REEF

| ***Gear and feature/subfeature combination:*** | **Towed (demersal trawl) and bedrock reef** |
|---|---|
| ***Matrix risk category* - RED** | **Explanation for categorisation:**<br>Evidence describing impacts of towed gears to rocky reefs is limited. Empirical studies are restricted to non-UK habitats and generally assess the impact as a consequence of experimental trawling. There is some grey literature which describes impact to UK reef habitat. Despite this limitation in the evidence base, it is considered that the risk of significant impact is sufficient to require a categorisation of RED in the Matrix. However, it should also be noted that rocky habitats are very variable in terms of associated communities. This varies according to the substrate topography (e.g. upstanding reef, flat bedrock reef or boulder and cobble reef will have variable levels of accessibility and hence vulnerability to towed demersal fishing gears) and the prevailing background environmental conditions (e.g. tidal flows, wave exposure etc). This rating of RED may therefore be precautionary for some highly exposed reef communities. |
| ***Impacts***<br>Empirical studies quantifying the impact of fisheries to hard bottom habitats are few. However, it is known that towing trawls across rocky substrates will cause damage or death to a significant proportion of large, upright attached species such as sponges and corals (Løkkeborg 2005). 67% of sponges were damaged during to a single trawl pass, in the Gulf of Alaska (Freese et al 1999). Other species such as hydroids, anenomes, bryozoans, tunicates and echinoderms are vulnerable to mobile fishing gear (McConnaughey et al 2000, Sewell and Hiscock 2005). Trawling may also reduce habitat complexity as boulders and cobbles associated with the hard substrate are moved around (Engel and Kvitek 2008, Freese et al 1999). Resistance to damage at a physical level is variable with substrate type, with mudstone reefs particularly vulnerable to structural damage (Attrill et al 2011).<br><br>Recovery of sponges to (experimental) trawling has been variable with water temperature and depth (Van Dolah et al 1987) with no recovery identified after a year in the Gulf of Alaska (Freese 2001). Recovery of corals is also slow (Attrill et al 2011) with deep water species especially sensitive (Hall-Spencer et al 2002). | |
| ***Evidence*** Løkkeborg (2005), Freese et al (1999), McConnaughey et al (2000), Sewell and Hiscock (2005), Engel and Kvitek (2008), Attrill et al (2011), Van Dolah et al (1987), Freese | |

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|---|---|---|---|
| (2001) and Hall-Spencer et al (2002) | | | |
| All peer-reviewed literature is from the USA. Grey literature is from the UK. | | | |
| Directly relevant peer reviewed literature | Directly relevant grey literature | Inference from studies on comparable habitats, gears or geographical areas. | Expert judgement |
| | × | × | |
| ***Confidence***<br>**Medium**<br>The conclusions are supported by directly relevant scientific information from a number of different sources. However, this is partly from grey literature based on expert inference and t peer reviewed empirical evidence of the impacts of fishing gear to similar habitats in other parts of the world. | | | |

| ***Gear and feature/subfeature combination:*** | **Dredge (Towed) and bedrock reef** |
|---|---|
| ***Matrix risk category* - RED** | **Explanation for categorisation:**<br>There is some variation within the literature describing the impact of towed dredges to reef. While it has been widely accepted that scallop dredging is damaging to reef structures and biota, more recent empirical work suggests impacts will have a patchy incidence if there is some topographical variation in the substrate. This is identified as resulting either from the dredge 'bouncing' off the substrate or as a result of some species receiving protection in crevices. However, it is certain that where the scallop dredge contacts the substrate and/or associated epifauna, significant impacts are consequent in terms of damage. As a result, it is appropriate to include this gear category in the red category. However, it should be emphasised that there is no evidence describing the impacts of other shellfish dredges (e.g. oyster and mussel) available and therefore applying this categorisation to these sub-categories of gear is very precautionary and they may warrant an amber category. As in reality these gears are unlikely to be used over reef habitats, this may make little different in practice. |

***Impacts***

Towed dredges may impact on reef communities by i) damaging and removing epifauna and ii) by modifying and homogenising the substrate, as soft rocks may be broken up (Attrill et al 2011) and rolling/ moving boulders (Hall-Spencer and Moore 2000), and reducing habitat complexity. Impacts of dredging to biodiversity can be significant (Dorset Wildlife Trust 2004, Goodwin et al 2011) although this will be variable according to the intensity of the activity and the degree of relief of the rock (Hinz et al 2011). Boulcott and Howell 2011 found that experimental scalloping over uneven rocky reef resulted in a patchy distribution of impacts.

***Evidence*** Attrill et al (2011). Hall-Spencer and Moore (2000), Dorset Wildlife Trust (2004), Goodwin et al (2011), Hinz et al (2011), Boulcott and Howell (2011).

All peer-reviewed literature is from the USA. Grey literature is from the UK.

| Directly relevant peer reviewed literature | Directly relevant grey literature | Inference from studies on comparable habitats, gears or geographical areas. | Expert judgement |
|---|---|---|---|
| × | × | | |

***Confidence***

**High**
There is peer reviewed, highly relevant scientific information to directly support the conclusions.

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