Pots, Traps & Creels Interactions with Submarine Structures made by Leaking Gases

1. Introduction

The Assessing Welsh Fishing Activities (AWFA) Project is a structured risk-based approach to determining impacts from current and potential fishing activities (undertaken from licensed and registered commercial fishing vessels), upon the features of European marine sites (EMS) in Wales.

Further details of the AWFA Project, and all completed assessments to date, can be found on the AWFA website.

The methods and process used to classify the risk of interactions between fishing gears and EMS features, as either purple (high), orange (medium) or green (low) risk, can be found in the AWFA Project Phase 1 outputs: Principles and Prioritisation Report and resulting Matrix spreadsheet.

2. Assessment summary

Assessment Summary: **Pots, Traps & Creels Interactions with Submarine Structures made by Leaking Gases**	**<u>Assessment of impact pathway 1: Physical damage to a designated habitat feature:</u>** No studies were found that directly or indirectly measured or estimated impacts of potting on Submarine Structures made by Leaking Gases or similar habitats. Expert judgement suggests the impacts from pots, weights or anchors making contact with Submarine Structures made by Leaking Gases habitat could cause permanent or long-term damage to the substrate. **<u>Assessment of impact pathway 2: Damage to a designated habitat feature via removal of, or other detrimental impact to, typical species:</u>** No studies were found that directly or indirectly measured or estimated impacts of potting on Submarine Structures made by Leaking Gases or similar habitats. Expert judgement and indicative MarLIN sensitivity assessments suggest the impacts from pots, weights or anchors making contact with Submarine Structures made by Leaking Gases habitat could cause damage to some of the biological communities. Confidence in this assessment is **low** (please see section 8).

3. Feature description

Feature Description: Submarine Structures made by Leaking Gases	Submarine structures made by leaking gases consist of sandstone slabs, pavements, and pillars up to 4m high, formed by aggregation of sediment by carbonate cement resulting from microbial oxidation of gas emissions, mainly methane (Noble-James *et al*., 2017). The formations are interspersed with gas vents that intermittently release gas. The methane most likely originates from the microbial decomposition of fossil plant materials (Tyler-Walters, 2018a, b). There are two types of submarine structures. The first type of submarine structures are known as "bubbling reefs in the aphotic zone" [EUNIS: A5.712]. These formations support a zonation of diverse benthic communities consisting of algae and/or invertebrate specialists of hard marine substrates different to that of the surrounding habitat. A variety of sublittoral topographic features are included in this habitat such as: overhangs, vertical pillars and stratified leaf-like structures with numerous caves. Animals seeking shelter in the numerous caves further enhance the biodiversity. (Tyler-Walters, 2018a, b). Fauna found in "Bubbling reefs" consist of a large diversity of invertebrates from the phyla Porifera, Anthozoa, Polychaeta, Gastropoda, Decapoda and Echinodermata as well as a number of fish species. The polychaete *Polycirrus norwegicus* and the bivalve *Kellia suborbicularis* are typically associated with the habitat and rare elsewhere in the region (Tyler-Walters, 2018a, b). Flora found in photic zone "Bubbling reefs" may consist of marine macroalgae such as Laminariales, other foliose and filamentous brown and red algae (Tyler-Walters, 2018a, b). The second type are "seeps and vents in sublittoral sediments" [EUNIS: A5.71]. Seeps and vents lead to carbonate structures within "pockmarks" formed by leaking gases. Pockmarks are depressions in soft sediment seabed areas, they can be up to 45m deep and a few hundred meters wide. Methane gas escapes the seabed leaving a circular depression. It is suspected that pockmarks form by sudden "catastrophic" gas or porewater eruption and that they periodically have short outbursts followed by long periods of quiescence or micro seepage (Hovland *et al*, 2005). Pockmarks comprise benthic communities of invertebrate specialists, some preferring hard marine substrata which differs from the communities comprising the surrounding (usually) muddy habitat (Tyler-Walters, 2018a, b; Noble-James *et al*., 2017). Invertebrate specialists of hard substrate include Hydrozoa, Anthozoa, Ophiuroidea and Gastropoda. The diversity of the infauna community in the muddy slope surrounding the "pockmark" may be high (Tyler-Walters, 2018a, b). One species has been recognised as endemic to pockmarks, the beard worm *Siboglinum poseidoni*. The worm lives in the surrounding soft sediment, not on the carbonate structures (Seffel, 2010). In the soft

	sediment surrounding the pockmark Nematodae, Polychaeta and Crustacea are also present. (Tyler-Walters, 2018a, b). No flora is usually found in “Pockmarks” (Tyler-Walters, 2018a, b). There are thought to be several submarine structures (“bubbling reefs”) in Welsh waters, the main one is called Holden’s reef, it is described as: nodular boulders and consolidated carbonate-bound sand forming a low-lying reef surrounded by a sand plain. Filamentous and foliose red and brown algae covered the upward-facing surfaces with patches of the sea squirt *Molgula manhattensis,* bryozoans, hydroids, sponges, the soft coral *Alcyonium digitatum* and barnacles also present. Rock-boring fauna were apparent in most of the hard substrata including piddocks *Hiatella arctica* and the sponge *Cliona celata*. The rugged nature of the reef provides many holes and crevices for mobile crustacea, fish and echinoderms (NRW, 2018).

4. Gear description

Gear Description: Pots, Traps & Creels	Pots, traps and creels (pots) are rigid cage-like structures designed to capture fish or shellfish species living on or near the seabed (FAO, 2001; Seafish, 2020a). They typically comprise one or more funnel-shaped entrances that guide fish or shellfish into one or more easily accessed and usually baited compartments (FAO, 2001; Seafish, 2020a). UK pot designs, sizes and construction materials vary geographically and according to target species, environmental conditions and fisher’s preference (Seafish, 2020a). Top-entry inkwell pots (0.28-0.47 m^2 footprint) and side or top-entry parlour pots or ‘D-creels’ (0.24-0.55 m^2 footprint) weighing 15-20kg are used to catch crab or lobster and are made from wire, rubber, metal and netting (Gravestock, 2018; Cornwall Creels, 2020; Seafish, 2020a). Solid sided 20-30 litre rectangular containers with holes in the sides (0.09-0.14 m^2 footprint), a mesh funnel at the top, a concrete bottom and weighing 6-12kg are used to target whelks (Channel Pots, 2020; Seafish, 2020c). Lightweight plastic tubular pots with small-mesh sides and funnel entries at either end are used to target prawns (Coastal Nets, 2020; Seafish, 2020a). Pots can be fished individually or in strings (fleets), where several pots are attached to a length of rope, laid along the seabed and marked at either end with a rope to the surface and a marker buoy (Seafish, 2020a). The number of pots in a fleet will depend on factors including pot design, target species, habitat fished, fisher’s preference, vessel size and the available deck space to store the pots once they have been hauled (Seafish, 2020b).

	Fishers can have multiple strings of pots deployed at any one time, hauled following a soak time of 24-48 hours (Seafish, 2020a). Multi-compartment 'parlour' pots generally retain catch for longer periods making them more suitable for longer soak times, whereas single-compartment 'inkwell' pots are subject to more escapees during longer soak times (Swarbrick & Arkley, 2002). Strings of lighter traps, such as prawn creels, use anchors or weights at either end to reduce movement in tides (Seafish, 2020a). Other pots are designed to be heavy or utilise concrete-weighted end-pots that replace the need for anchors or weights (Seafish, 2020b). Strings of pots are deployed (or shot) one at a time whilst the boat slowly moves over the target fishing ground (Seafish, 2020a). Single pots are generally set in rocky inshore areas and can be bounced along the seabed until they contact rock or reef (FAO, 2001). Baited pots can capture undersized target species, non-target invertebrates and occasionally fish species (Pantin *et al*., 2015). However, the use of appropriate-sized mesh coverings, or the addition of large-mesh panels or escape-gaps, can ensure smaller individuals and non-target species are able to escape (Seafish, 2020a).

5. Assessment of impact pathways

Assessment of impact pathway 1	**1. Physical damage to a designated habitat feature (Physical Impacts)** No studies were found that directly or indirectly measured or estimated impacts of potting on Submarine Structures made by Leaking Gases or similar habitats. Assessments based on expert knowledge suggest carbonate reefs take a long time to develop and are more delicate than typical rocky reef features (Tyler-Walters, 2018a, b). Potting activities could potentially cause permanent or long-term damage to the substrate and the smothering of sedimentary bedforms. If potting were to occur across Submarine Structures made by Leaking Gases, the general impacts from static gear, including pots, weights or anchors, making contact with the carbonate reef structure during gear deployment could cause surface disturbance and abrasion (JNCC & NE, 2011; Walmsley *et al*., 2015). Where pots are fixed in strings, the retrieval of pots, or incidences of rough weather, could lead to ropes, pots and anchors dragging over or entangling seabed structures, potentially causing physical damage or abrasion to the carbonate reefs (MacDonald *et al*., 1996; Roberts *et al*., 2010; JNCC & NE, 2011). During spring tides, strong wind and large waves may cause unintentional movement of pots and any associated seabed abrasion could be increased (Eno *et al*., 2001; Sørensen *et al*., 2015; Stephenson *et al*., 2015).

	Depending on the footprint and the intensity of potting it is possible that the impacts from pots, weights or anchors making contact with Submarine Structures made by Leaking Gases could cause permanent or long-term damage to the substrate.
Assessment of impact pathway 2	**2. Damage to a designated habitat feature via removal of, or other detrimental impact to, associated biological communities (Impacts on biological communities)** No studies were found that directly or indirectly measured impacts of potting on biological communities of Submarine Structures made by Leaking Gases or similar habitats. Submarine structures exposed over time to the natural removal of sediment provides a habitat for suitable species. Expert judgement suggests, the impact of pots, weights and anchors on submarine structures could result in the loss of erect and sessile epifauna. A consequent loss of fauna may occur if the physical complexity of the carbonate reef structures are removed. If potting were to occur across Submarine Structures made by Leaking Gases, the general physical impacts from static gear, including pots, weights or anchors, making contact with the carbonate reef structure during gear deployment could cause surface disturbance and abrasion to the biological communities (JNCC & NE, 2011; Walmsley *et al*., 2015). Where pots are fixed in strings, the retrieval of pots, or incidences of rough weather, could lead to ropes, pots and anchors dragging over or entangling carbonate reef structures, potentially causing physical damage or abrasion to the biological communities (MacDonald *et al*., 1996; Roberts *et al*., 2010; JNCC & NE, 2011, Gall, 2020). During spring tides, strong wind and large waves may cause unintentional movement of pots and any associated carbonate reef abrasion could be increased (Eno *et al*., 2001; Sørensen *et al*., 2015; Stephenson *et al*., 2015). Submarine Structures made by Leaking Gases biotopes (see Annex 1 for definition) have been assessed to a range of pressures by MarLIN (Tyler-Walters, 2018a, b). Relevant pressures for the assessment of potting impacts are primarily abrasion and penetration of the sediment. MarLIN abrasion and penetration sensitivity assessments for Submarine Structures made by Leaking Gases biotopes shown in Annex 1 conclude: both biotopes listed are of medium sensitivity to penetration and abrasion. Please refer to the MarLIN website which provides further information about the assessment methodology and supporting evidence (www.marlin.ac.uk/). Depending on the footprint and the intensity of potting it is possible that the impacts from pots, weights or anchors making contact with Submarine Structures made by Leaking Gases habitat could cause damage to some of the biological communities.

6. SACs where the habitat occurs as a component of a designated feature

Lleyn Peninsula and the Sarnau SAC	The Lleyn Peninsula and the Sarnau SAC contains examples of the submarine structures made by leaking gases habitat, as evidenced by data and relevant literature (NRW, 2018). Please see the latest SAC feature condition assessment for information on the location and condition of features. The following features contain submarine structures made by leaking gases habitat within the Lleyn Peninsula and the Sarnau SAC: 1. Reefs
Croker Carbonate Slabs SAC	The Croker Carbonate Slabs SAC contains examples of the submarine structures made by leaking habitat, as evidenced by data and relevant literature (Noble-James *et al*., 2017). Please see the latest SAC feature condition assessment for information on the location and condition of features. The following features contain submarine structures made by leaking habitat within the Croker Carbonate Slabs SAC: 1. Submarine structures made by leaking gases

7. Evidence Gaps

- Direct studies to measure the impacts from potting on Submarine Structures made by Leaking Gases.
- A study comparing the impacts from different types of pots and methods of potting.

8. Confidence assessment

The confidence score is the sum of scores from three evidence components: quality, applicability and agreement. These are qualitatively assessed as high, medium or low using the most appropriate statements in the table below, and these are numerically represented as scores of 3, 2, or 1 respectively.

A total confidence score of 3 – 5 represents low confidence, 6 or 7 shows medium confidence and 8 or 9 demonstrates high confidence in the evidence used in the assessment.

This assessment scores 4, representing low confidence in the evidence.

Confidence	Evidence quality	Evidence applicability	Evidence agreement
High	Based on more than 3 recent and relevant peer reviewed papers or grey literature from established agencies.	Based on the fishing gear acting on the feature in the UK.	Strong agreement between multiple (>3) evidence sources.
Medium	Based on either relevant but older peer reviewed papers or grey literature from less established agencies; or based on only 2-3 recent and relevant peer reviewed evidence sources.	Based on similar fishing gears, or other activities with a similar impact, acting on the feature in the UK.	**Some disagreement but majority of evidence agrees. Or fewer than 3 evidence sources used.** **Score 2.**
Low	**Based on either less relevant or older grey literature from less established agencies; or based on only 1 recent and relevant peer reviewed evidence source.** **Score 1.**	**Based on similar fishing gears acting on the feature in other areas, or the fishing gear acting upon a similar feature in the UK.** **Score 1.**	Little agreement between evidence.

9. References

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Annex 1: Welsh biotopes included in the AWFA potting and Submarine Structures made by Leaking Gases assessment

The term ‘biotope’ refers to both the physical environment (e.g. substrate) and the unique set of species associated with that environment (Tyler-Walters and Jackson, 1999). Biotopes are defined by the JNCC Marine Habitat Classification for Britain and Ireland Version 15.03 (https://mhc.jncc.gov.uk/) and sensitivities to abrasion and penetration are from the Marine Evidence based Sensitivity Assessment (MarESA) (https://www.marlin.ac.uk/sensitivity/sensitivity_rationale). The MarESA approach considers a range of pressures and benchmarks for all biotopes using all available evidence and expertise (Tyler-Walters *et al*., 2018). The MarESA sensitivity to abrasion and penetration assessments highlighted in the table below consider any type of potential abrasion to the surface substratum and associated biology and do not specifically refer to potting activity (Tyler-Walters *et al*., 2018). High sensitivity indicates a significant loss of species combined with a recovery time of more than 10 years. Medium sensitivity indicates either significant mortality combined with medium recovery times (2-10 years) or lower mortality with recovery times varying from 2 to 25+ years. Whilst a low sensitivity indicates a full recovery within 2 years.

EUNIS code	MarESA sensitivity to abrasion	MarESA sensitivity to penetration
A5.712 Bubbling reefs in the aphotic zone	Medium	Medium
A5.71 Seeps and vents in sublittoral sediments	Medium	Medium