The Marine Biological Association of the United Kingdom
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FINALISED LIST OF DEFINITIONS OF PRESSURES AND BENCHMARKS FOR SENSITIVITY ASSESSMENT

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Finalised pressure benchmarks. For completeness the MB0102 benchmarks and ICG-descriptions have been retained in the table.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Hydrological changes (inshore/local)	Emergence regime changes - local, including tidal level change considerations	*1) Intertidal species* and habitats not uniquely defined by intertidal zone): A 1 hour change in the time covered or not covered by the sea for a period of 1 year. *2) Habitats and landscapes defined by intertidal zone:* An increase in relative sea level or decrease in high water level of 1mm for one year over a shoreline length >1km.	Changes in water levels reducing the intertidal zone (and the associated/dependant habitats). The pressure relates to changes in both the spatial area and duration that intertidal species are immersed and exposed during tidal cycles (the percentage of immersion is dependent on the position or height on the shore relative to the tide). The spatial and temporal extent of the pressure will be dependent on the causal activities but can be delineated. This relates to anthropogenic causes that may directly influence the temporal and spatial extent of tidal immersion, e.g. upstream and downstream of a tidal barrage the emergence would be respectively reduced and increased, beach re-profiling could change gradients and therefore exposure times, capital dredging may change the natural tidal range, managed realignment, saltmarsh creation. Such alteration may be of importance in estuaries because of their influence on tidal flushing and potential wave propagation. Changes in tidal flushing can change the sediment dynamics and may lead to changing patterns of deposition and erosion. Changes in tidal levels will only affect the emergence regime in areas that are inundated for only part of the time. The effects that tidal level changes may have on sediment transport are not restricted to these areas, so a very large construction could significantly affect the tidal level at a deep site without changing the emergence regime. Such a change could still have a serious impact. This excludes pressure from sea level rise.
		Revised benchmark	**MBA Comment**
		A change in the time covered or not covered by the sea for a period of ≥ 1 year. OR An increase in relative sea level or decrease in high water level for ≥ 1 year.	**T**he benchmark is only considered relevant to intertidal habitats when applied in sensitivity assessments and habitats restricted to below Chart Datum (CD) are considered 'Not Sensitive'. The pressure benchmark does not expressly identify the role of 'desiccation' but sensitivity to desiccation will be discussed where known or relevant. In application, the majority of intertidal communities are sensitivity to changes in emergence, whether it is for one or more hours, or a due to changes in sea level and coastal squeeze. Therefore, we have removed that part of the MB0102 benchmark that refers to the daily change in emergence. However, we've retained the duration of the pressure as a year, based on the assumption that the effects on most communities would probably take a year to become apparent.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Hydrological changes (inshore/local)	Salinity changes - local	Increase from 35 to 38 units for one year. OR Decrease in Salinity by 4-10 units a year	Events or activities increasing or decreasing local salinity. This relates to anthropogenic sources/causes that have the potential to be controlled, e.g. freshwater discharges from pipelines that reduce salinity, or brine discharges from salt caverns washings that may increase salinity. This could also include hydromorphological modification, e.g. capital navigation dredging if this alters the halocline, or erection of barrages or weirs that alter freshwater/seawater flow/exchange rates. The pressure may be temporally and spatially delineated derived from the causal event/activity and local environment.
		Revised benchmark	**MBA Comment**
		A decrease / increase in one MNCR salinity category outside the usual range of the biotope/habitat for one year.	Assess increase and decrease in salinity separately.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Hydrological changes (inshore/local)	Temperature changes – local,	A 5°C change in temp for one month period, or 2°C for one year	Events or activities increasing or decreasing local water temperature. This is most likely from thermal discharges, e.g. the release of cooling waters from power stations. This could also relate to temperature changes in the vicinity of operational subsea power cables. This pressure only applies within the thermal plume generated by the pressure source. It excludes temperature changes from global warming which will be at a regional scale (and as such are addressed under the climate change pressures).
		Revised benchmark	**MBA Comment**
		A 5°C change in temp for one month period, or 2°C for one year	Assess increase and decrease separately.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Hydrological changes (inshore/local)	Water flow (tidal current) changes - local, including sediment transport considerations	A change in peak mean spring tide flow speed of between 0.1m/s to 0.2m/s over an areas > 1km2 or 50% if width of water body for more than 1 year.	Changes in water movement associated with tidal streams (the rise and fall of the tide, riverine flows), prevailing winds and ocean currents. The pressure is therefore associated with activities that have the potential to modify hydrological energy flows, e.g. tidal energy generation devices remove (convert) energy and such pressures could be manifested leeward of the device, capital dredging may deepen and widen a channel and therefore decrease the water flow, canalisation &/or structures may alter flow speed and direction; managed realignment (e.g. Wallasea, England). The pressure will be spatially delineated. The pressure extremes are a shift from a high to a low energy environment (or vice versa). The biota associated with these extremes will be markedly different as will the substratum, sediment supply/transport and associated seabed/ground elevation changes. The potential exists for profound changes (e.g. coastal erosion/deposition) to occur at long distances from the construction itself if an important sediment transport pathway was disrupted. As such these pressures could have multiple and complex impacts associated with them.
		Revised benchmark	**MBA Comment**
		A change in peak mean spring bed flow velocity of between 0.1m/s to 0.2m/s for more than 1 year	Adopted SNCB amendment (removal of specified impact footprint).
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Hydrological changes (inshore/local)	Wave exposure changes - local	A change in near shore significant wave height >3% but <5%	Local changes in wave length, height and frequency. Exposure on an open shore is dependent upon the distance of open seawater over which wind may blow to generate waves (the fetch) and the strength and incidence of winds. Anthropogenic sources of this pressure include artificial reefs, breakwaters, barrages, wrecks that can directly influence wave action or activities that may locally affect the incidence of winds, e.g. a dense network of wind turbines may have the potential to influence wave exposure, depending upon their location relative to the coastline.
		Revised benchmark	**MBA Comment**
		A change in near shore significant wave height >3% but <5% for more than 1 year	Retain existing benchmark. Research correlation between significant wave height and wave exposure scales.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical damage (Reversible Change)	Changes in suspended solids (water clarity)	A change in one rank on the WFD (Water Framework Directive) scale e.g. from clear to turbid for one year	Changes in water clarity from sediment & organic particulate matter concentrations. It is related to activities disturbing sediment and/or organic particulate matter and mobilising it into the water column. Could be 'natural' land run-off and riverine discharges or from anthropogenic activities such as all forms of dredging, disposal at sea, cable and pipeline burial, secondary effects of construction works, e.g. breakwaters. Particle size, hydrological energy (current speed & direction) and tidal excursion are all influencing factors on the spatial extent and temporal duration. This pressure also relates to changes in turbidity from suspended solids of organic origin (as such it excludes sediments - see the "changes in suspended sediment" pressure type). Salinity, turbulence, pH and temperature may result in flocculation of suspended organic matter. Anthropogenic sources mostly short lived and over relatively small spatial extents.
		Revised benchmark	**MBA Comment**
		A change in one rank on the WFD (Water Framework Directive) scale e.g. from clear to intermediate for one year	The SNCBs suggested that the MB0102 benchmark should be revised to: 'A change in one Water Framework Directive (WFD) ecological status class for one year'. We have revised this as the term ecological class is unclear. Changes in suspended sediment loads can also alter the scour experienced by species and habitats. Therefore, the effects of scour are also assessed as part of this pressure.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical damage (Reversible Change)	Habitat structure changes - removal of substratum (extraction)	Extraction of sediment to 30 cm	Unlike the "physical change" pressure type where there is a permanent change in sea bed type (e.g. sand to gravel, sediment to a hard artificial substratum) the "habitat structure change" pressure type relates to temporary and/or reversible change, e.g. from marine mineral extraction where a proportion of seabed sands or gravels are removed but a residual layer of seabed is similar to the pre-dredge structure and as such biological communities could re-colonize; navigation dredging to maintain channels where the silts or sands removed are replaced by non-anthropogenic mechanisms so the sediment typology is not changed.
		Revised benchmark	**MBA Comment**
		Extraction of substratum to 30 cm (where substratum includes sediments and soft rocks but excludes hard bedrock)	Adopted SCNB benchmark revision, with amendment

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical damage (Reversible Change)	Abrasion/disturbance at the surface of the substratum	Damage to seabed surface features	The disturbance of sediments where there is limited or no loss of substrata from the system. This pressure is associated with activities such as anchoring, taking of sediment/geological cores, cone penetration tests, cable burial (ploughing or jetting), propeller wash from vessels, certain fishing activities, e.g. scallop dredging, beam trawling. Agitation dredging where sediments are deliberately disturbed by and by gravity & hydraulic dredging where sediments are deliberately disturbed and moved by currents could also be associated with this pressure type. Compression of sediments, e.g. from the legs of a jack-up barge could also fit into this pressure type. Abrasion relates to the damage of the sea bed surface layers (typically up to 50cm depth). Activities associated with abrasion can cover relatively large spatial areas and include: fishing with towed demersal trawls (fish & shellfish); bio-prospecting such as harvesting of biogenic features such as maerl beds where, after extraction, conditions for recolonisation remain suitable or relatively localized activities including: seaweed harvesting, recreation, potting, aquaculture. Change from gravel to silt substrata would adversely affect herring spawning grounds.
		Revised benchmark	**MBA Comment**
		Damage to surface features (e.g. species and physical structures within the habitat)	Physical disturbance or abrasion at the surface of the substratum in sedimentary or rocky habitats. The effects are relevant to epiflora and epifauna living on the surface of the substratum. In intertidal and sublittoral fringe habitats, surface abrasion is likely to result from recreational access and trampling (inc. climbing) by human or livestock, vehicular access, moorings (ropes, chains), activities that increase scour and grounding of vessels (deliberate or accidental). In the sublittoral, surface abrasion is likely to result from pots or creels, cables and chains associated with fixed gears and moorings, anchoring of recreational vessels, objects placed on the seabed such as the legs of jack-up barges, and harvesting of seaweeds (e.g. kelps) or other intertidal species (trampling) or of epifaunal species (e.g. oysters). In sublittoral habitats, passing bottom gear (e.g. rock hopper gear) may also cause surface abrasion to epifaunal and epifloral communities, including epifaunal biogenic reef communities. Activities associated with surface abrasion can cover relatively large spatial areas e.g. bottom trawls or bio-prospecting or be relatively localized activities e.g. seaweed harvesting, recreation, potting, and aquaculture.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical damage (Reversible Change)	Penetration and/or disturbance of the substratum below the surface, including abrasion	MB0102 subdivided this pressure and used the following benchmarks. • Damage to seabed surface and penetration ≤25mm • Structural damage to seabed >25mm	The disturbance of sediments where there is limited or no loss of substratum from the system. This pressure is associated with activities such as anchoring, taking of sediment/geological cores, cone penetration tests, cable burial (ploughing or jetting), propeller wash from vessels, certain fishing activities, e.g. scallop dredging, beam trawling. Agitation dredging, where sediments are deliberately disturbed by and by gravity & hydraulic dredging where sediments are deliberately disturbed and moved by currents could also be associated with this pressure type. Compression of sediments, e.g. from the legs of a jack-up barge could also fit into this pressure type. Abrasion relates to the damage of the sea bed surface layers (typically up to 50cm depth). Activities associated with abrasion can cover relatively large spatial areas and include: fishing with towed demersal trawls (fish & shellfish); bio-prospecting such as harvesting of biogenic features such as maerl beds where, after extraction, conditions for recolonisation remain suitable or relatively localized activities including: seaweed harvesting, recreation, potting, aquaculture. Change from gravel to silt substrata would adversely affect herring spawning grounds.
		Revised benchmark	**MBA Comment**
		Damage to sub-surface features (e.g. species and physical structures within the habitat)	Loss, removal or modification of the substratum is not included within this pressure (see the physical loss pressure theme). Penetration and damage to the soft rock substrata are considered, however the penetration into hard bedrock is deemed unlikely.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical damage (Reversible Change)	Smothering and siltation rate changes(depth of vertical sediment overburden)	Light - 5cm of fine material added to the seabed in a single event Heavy -up to 30cm of fine material added to the seabed in a single event	When the natural rates of siltation are altered (increased or decreased). Siltation (or sedimentation) is the settling out of silt/sediments suspended in the water column. Activities associated with this pressure type include mariculture, land claim, navigation dredging, disposal at sea, marine mineral extraction, cable and pipeline laying and various construction activities. It can result in short lived sediment concentration gradients and the accumulation of sediments on the sea floor. This accumulation of sediments is synonymous with "light" smothering, which relates to the depth of vertical overburden. "Light" smothering relates to the deposition of layers of sediment on the seabed. It is associated with activities such as sea disposal of dredged materials where sediments are deliberately deposited on the sea bed. For "light" smothering most benthic biota may be able to adapt, i.e. vertically migrate through the deposited sediment. "Heavy" smothering also relates to the deposition of layers of sediment on the seabed but is associated with activities such as sea disposal of dredged materials where sediments are deliberately deposited on the sea bed. This accumulation of sediments relates to the depth of vertical overburden where the sediment type of the existing and deposited sediment has similar physical characteristics because, although most species of marine biota are unable to adapt, e.g. sessile organisms unable to make their way to the surface, a similar biota could, with time, re-establish. If the sediments were physically different this would fall under L2.
		Revised benchmark	**MBA Comment**
		'Light' deposition of up to 5 cm of fine material added to the habitat in a single, discrete event 'Heavy' deposition of up to 30 cm of fine material added to the habitat in a single discrete event	'Light' and 'Heavy' deposition assessed separately

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical loss (Permanent Change)	Physical change (to another substratum type)	Change in 1 folk class for 2 years	The permanent change of one marine habitat type to another marine habitat type, through the change in substratum, including to artificial (e.g. concrete). This therefore involves the permanent loss of one marine habitat type but has an equal creation of a different marine habitat type. Associated activities include the installation of infrastructure (e.g. surface of platforms or wind farm foundations, marinas, coastal defences, pipelines and cables), the placement of scour protection where soft sediment habitats are replaced by hard/coarse substratum habitats, removal of coarse substrata (marine mineral extraction) in those instances where surficial finer sediments are lost, capital dredging where the residual sedimentary habitat differs structurally from the pre-dredge state, creation of artificial reefs, mariculture i.e. mussel beds. Protection of pipes and cables using rock dumping and mattressing techniques. Placement of cuttings piles from oil & gas activities could fit this pressure type, however, there may be an additional pressures, e.g. "pollution and other chemical changes" theme. This pressure excludes navigation dredging where the depth of sediment is changes locally but the sediment typology is not changed.
		Revised benchmark	**MBA Comment**
		Change in sediment type by 1 Folk class (based on UK SeaMap simplified classification). Change from sedimentary or soft rock substrata to hard rock or artificial substrata or vice-versa.	Tillin & Tyler-Walters (2014) did not consider the change in one Folk class benchmark applicable to hard rock biotopes, but did assess the sensitivity of biotopes occurring on softer substrata, including chalk, peat, mud rock, and clay. The simplified Folk class referred to in the benchmark is based on the simplified classification used for UK SeaMap as described by Long (2006). The new benchmark (change from sediment to hard rock or vice versa) would affect all types of substratum, and all habitats would be assessed as highly sensitive. This pressure assumes a permanent change, while short term smothering of substrata with sediment is addressed under smothering (siltation).
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical loss (Permanent Change)	Physical loss (to land or freshwater habitat)	Permanent loss of existing saline habitat	The permanent loss of marine habitats. Associated activities are land claim, new coastal defences that encroach on and move the Mean High Water Springs mark seawards, the footprint of a wind turbine on the seabed, dredging if it alters the position of the halocline. This excludes changes from one marine habitat type to another marine habitat type.
		Revised benchmark	**MBA Comment**
		Permanent loss of existing saline habitat	No change.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical pressure (other)	Barrier to species movement	10% change in tidal excursion, or temporary barrier to species movement over ≥50% of water body width	The physical obstruction of species movements and including local movements (within & between roosting, breeding, feeding areas) and regional/global migrations (e.g. birds, eels, salmon, and whales). Both include up-river movements (where tidal barrages & devices or dams could obstruct movements) or movements across open waters (offshore wind farm, wave or tidal device arrays, mariculture infrastructure or fixed fishing gears). Species affected are mostly highly mobile birds, fish, and mammals.
		Revised benchmark	**MBA Comment**
		Permanent or temporary barrier to species movement ≥50% of water body width or a 10% change in tidal excursion	The pressure is clearly relevant to mobile species such as fish, birds, reptiles and mammals. However, it should also be considered relevant to species or macrofauna such as crabs that undertake migrations to over-winter or to breed, and where populations are dependent on larval or other propagule supply from outside the site.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical pressure (other)	Electromagnetic changes	Local electric field of 1V m-1. Local magnetic field of 10μT	Localized electric and magnetic fields associated with operational power cables and telecommunication cables (if equipped with power relays). Such cables may generate electric and magnetic fields that could alter behaviour and migration patterns of sensitive species (e.g. sharks and rays).
		Revised benchmark	**MBA Comment**
		Local electric field of 1V m-1. Local magnetic field of 10μT	The evidence to assess these effects against the pressure benchmark is very limited and the impact of this pressure could not be assessed for benthic species or habitats (Tillin & Tyler-Walters, 2014).
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical pressure (other)	Death or injury by collision	0.1% of tidal volume on average tide, passing through artificial structure	Injury or mortality from collisions of biota with both static &/or moving structures. Examples include: collision with rigs (e.g. birds) or screens in intake pipes (e.g. fish at power stations) (static) or collisions with wind turbine blades, fish & mammal collisions with tidal devices and shipping (moving). Activities increasing number of vessels transiting areas, e.g. new port development or construction works will influence the scale and intensity of this pressure.
		Revised benchmark	**MBA Comment**
		0.1% of tidal volume on average tide, passing through artificial structure	The benthic species benchmark is only relevant to larvae. Collison with benthic habitats due to grounding by vessels is addressed under 'abrasion'.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical pressure (other)	Introduction of light	None proposed	Direct inputs of light from anthropogenic activities, i.e. lighting on structures during construction or operation to allow 24 hour working; new tourist facilities, e.g. promenade or pier lighting, lighting on oil & gas facilities etc. Ecological effects may be the diversion of bird species from migration routes if they are disorientated by or attracted to the lights. It is also possible that continuous lighting may lead to increased algal growth.
		Revised benchmark	**MBA Comment**
		Change in incident light via anthropogenic means.	The introduction of light is unlikely to be relevant for most benthic invertebrates, except where it is possible to interfere with spawning cues. But we are not aware of evidence to that effect. The introduction of light could potentially be beneficial for immersed plants, but again, we are not aware of any relevant evidence. Alternatively, shading (e.g. due to overgrowth, construction of jetties or other artificial structures) could adversely affect shallow sublittoral macroalgae, seagrass, and pondweeds.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical pressure (other)	Litter	None proposed	Marine litter is any manufactured or processed solid material from anthropogenic activities discarded, disposed or abandoned (excluding legitimate disposal) once it enters the marine and coastal environment including: plastics, metals, timber, rope, fishing gear etc. and their degraded components, e.g. microplastic particles. Ecological effects can be physical (smothering), biological (ingestion, including uptake of microplastics; entangling; physical damage; accumulation of chemicals) and/or chemical (leaching, contamination).
		Revised benchmark	**MBA Comment**
		Introduction of man-made objects able to cause physical harm (surface, water column, sea floor and/or strandline)	We are not aware of any evidence on the effects of 'litter' on benthic marine species. While there is documented evidence of the accumulation of micro-plastics in some species, no ecological effects have been shown to date. The only exception is the effect of ghost fishing on large crustaceans (crabs etc.). Therefore, the sensitivity to litter was not assessed for habitats and was scored 'No evidence' by Tillin & Tyler-Walters (2014). Clearly it is relevant for large macrofauna such as fish, birds and mammals.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Physical pressure (other)	Noise changes	**Above water noise:** None **Underwater noise:** MSFD indicator levels (SEL or peak SPL) exceeded for 20% of days in calendar year	Increases over and above background noise levels (consisting of environmental noise (ambient) and incidental man-made/anthropogenic noise (apparent)) at a particular location. Species known to be affected are marine mammals and fish. The theoretical zones of noise influence (Richardson *et al.* 1995) are temporary or permanent hearing loss, discomfort & injury; response; masking and detection. In extreme cases noise pressures may lead to death. The physical or behavioural effects are dependent on a number of variables, including the sound pressure, loudness, sound exposure level and frequency. High amplitude low and mid-frequency impulsive sounds and low frequency continuous sound are of greatest concern for effects on marine mammals and fish. Some species may be responsive to the associated particle motion rather than the usual concept of noise. Noise propagation can be over large distances (tens of kilometres) but transmission losses can be attributable to factors such as water depth and sea bed topography. Noise levels associated with construction activities, such as pile-driving, are typically significantly greater than operational phases (i.e. shipping, operation of a wind farm).
		Revised benchmark	**MBA Comment**
		Above water noise: None Underwater noise: MSFD indicator levels (SEL or peak SPL) exceeded for 20% of days in calendar year	**Underwater noise** – description and benchmarks remain the same. **NB:** MSFD indicator (2010) states "the proportion of days within a calendar year, over areas of 15'N x 15'E/W in which anthropogenic sound sources exceed either of two levels, 183 dB re 1µPa2.s (i.e. measured as Sound Exposure Level, SEL) or 224 dB re 1µPa peak (i.e. measured as peak sound pressure level) when extrapolated to one metre, measured over the frequency band 10 Hz to 10 kHz"
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Physical pressure (other)	Visual disturbance	None proposed	The disturbance of biota by anthropogenic activities, e.g. increased vessel movements, such as during construction phases for new infrastructure (bridges, cranes, port buildings etc.), increased personnel movements, increased tourism, increased vehicular movements on shore etc. disturbing bird roosting areas, seal haul out areas etc.
		Revised benchmark	**MBA Comment**
		Daily duration of transient visual cues exceeds 10% of the period of site occupancy by the feature	Visual disturbance is only relevant to species that respond to visual cues, for hunting, behavioural responses or predator avoidance, and that have the visual range to perceive cues at distance. It is particularly relevant to fish, birds, reptiles and mammals that depend on sight but less relevant to benthic invertebrates. The cephalopods are an exception but they are only likely to response to visual disturbance at close range (from e.g. divers). Sea horses are disturbed by photographic flash units but again at close range. It is unlikely to be relevant to habitat sensitivity assessments.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Pollution and other chemical changes	Organic enrichment	A deposit of 100gC/m²/yr	Resulting from the degraded remains of dead biota & microbiota (land & sea); faecal matter from marine animals; flocculated colloidal organic matter and the degraded remains of: sewage material, domestic wastes, industrial wastes etc. Organic matter can enter marine waters from sewage discharges, aquaculture or terrestrial/agricultural runoff. Black carbon comes from the products of incomplete combustion (PIC) of fossil fuels and vegetation. Organic enrichment may lead to eutrophication (see also nutrient enrichment). Adverse environmental effects include deoxygenation, algal blooms, changes in community structure of benthos and macrophytes.
		Revised benchmark	**MBA Comment**
		A deposit of 100gC/m2/yr	Direct evidence on the effect of organic enrichment was used to make sensitivity assessments by Tillin & Tyler-Walters (2014). In the absence of direct evidence, reference was made to the AMBI index, supplemented by any other relevant evidence on the effects of organic enrichment on habitats.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Pollution and other chemical changes	De-oxygenation	**MB0102 benchmark:** compliance with WFD criteria for good status	Any deoxygenation that is not directly associated with nutrient or organic enrichment. The lowering, temporarily or more permanently, of oxygen levels in the water or substratum due to anthropogenic causes (some areas may naturally be deoxygenated due to stagnation of water masses, e.g. inner basins of fjords). This is typically associated with nutrient and organic enrichment, but it can also derive from the release of ballast water or other stagnant waters (where organic or nutrient enrichment may be absent). Ballast waters may be deliberately deoxygenated via treatment with inert gases to kill non-indigenous species.
		Revised benchmark	**MBA Comment**
		Exposure to dissolved oxygen concentration of less than or equal to 2mg/l for 1 week (a change from WFD poor status to bad status).	There is considerable evidence on the effects on de-oxygenation in the marine environment due to ongoing work and reviews by Diaz and Rosenberg among others. Therefore, we suggest a return to the MarLIN benchmark of a reduction in oxygen to ≤2mg/l for one week. The proposed benchmark would be based on the WFD status of 'poor' to 'bad' in marine waters and the 'action levels' for transitional waters (UKTAG, 2014).
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Pollution and other chemical changes	Introduction of other substances (solid, liquid or gas)	Compliance with all AA EQS, conformance with PELs, EACs/ER-Ls	The 'systematic or intentional release of liquids, gases …' (from MSFD Annex III Table 2) is being considered e.g. in relation to produced water from the oil industry. It should therefore be considered in parallel with P1, P2 and P3.
	Nutrient enrichment	Compliance with WFD criteria for good status	Increased levels of the elements nitrogen, phosphorus, silicon (and iron) in the marine environment compared to background concentrations. Nutrients can enter marine waters by natural processes (e.g. decomposition of detritus, riverine, direct and atmospheric inputs) or anthropogenic sources (e.g. waste water runoff, terrestrial/agricultural runoff, sewage discharges, aquaculture, atmospheric deposition). Nutrients can also enter marine regions from 'upstream' locations, e.g. via tidal currents to induce enrichment in the receiving area. Nutrient enrichment may lead to eutrophication (see also organic enrichment). Adverse environmental effects include deoxygenation, algal blooms, changes in community structure

			of benthos and macrophytes.
	Hydrocarbon & PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Compliance with all AA EQS, conformance with PELs, EACs/ER-Ls	Increases in the levels of these compounds compared with background concentrations. Naturally occurring compounds, complex mixtures of two basic molecular structures: - straight chained aliphatic hydrocarbons (relatively low toxicity and susceptible to degradation) - multiple ringed aromatic hydrocarbons (higher toxicity and more resistant to degradation) These fall into three categories based on source (includes both aliphatics and polyaromatic hydrocarbons): - petroleum hydrocarbons (from natural seeps, oil spills and surface water run-off) - pyrogenic hydrocarbons (from combustion of coal, woods and petroleum) - biogenic hydrocarbons (from plants & animals) Ecological consequences include tainting, some are acutely toxic, carcinomas, growth defects.
	Radionuclide contamination	An increase in 10µGy/h above background levels	Introduction of radionuclide material, raising levels above background concentrations. Such materials can come from nuclear installation discharges, and from land or sea-based operations (e.g. oil platforms, medical sources). The disposal of radioactive material at sea is prohibited unless it fulfils exemption criteria developed by the International Atomic Energy Agency (IAEA), namely that both the following radiological criteria are satisfied: (i) the effective dose expected to be incurred by any member of the public or ship's crew is 10 µSv or less in a year; (ii) the collective effective dose to the public or ship's crew is not more than 1 man Sv per annum, then the material is deemed to contain de minimis levels of radioactivity and may be disposed at sea pursuant to it fulfilling all the other provisions under the Convention. The individual dose criteria are placed in perspective (i.e. very low), given that the average background dose to the UK population is ~2700 µSv/a. Ports and coastal sediments can be affected by the authorised discharge of both current and historical low-level radioactive wastes from coastal nuclear establishments.
	Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Compliance with all AA EQS, conformance with PELs, EACs, ER-Ls	Increases in the levels of these compounds compared with background concentrations. Synthesised from a variety of industrial processes and commercial applications. Chlorinated compounds include polychlorinated biphenols (PCBs), dichlor-diphenyl-trichloroethane (DDT) & 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD) are persistent and often very toxic. Pesticides vary greatly in structure, composition, environmental persistence and toxicity to non-target organisms. Includes: insecticides, herbicides, rodenticides & fungicides. Pharmaceuticals and Personal Care Products originate from veterinary and human applications compiling a variety of products including, Over the counter medications, fungicides, chemotherapy drugs and animal therapeutics, such as growth hormones. Due to their biologically active nature, high levels of consumption, known combined effects, and their detection in most aquatic environments they have become an emerging concern. Ecological consequences include physiological changes (e.g. growth defects, carcinomas).

	Transition elements & organo-metal (e.g. TBT) contaminatio n. Includes those priority substances listed in Annex II of Directive 2008/105/EC	Compliance with all AA EQS, conformance with PELs, EACs, ER-Ls	The increase in transition elements levels compared with background concentrations, due to their input from land/riverine sources, by air or directly at sea. For marine sediments the main elements of concern are Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead and Zinc Organo-metallic compounds such as the butyl tins (Tri butyl tin and its derivatives) can be highly persistent and chronic exposure to low levels has adverse biological effects, e.g. Imposex in molluscs.
		Revised benchmark	**Steering Group Comment**
		Pollutant pressure benchmark: No change.	For all pollution pressures use the MB0102 benchmarks and do not use the MarLIN benchmarks. Where evidence about specific thresholds **is** available this should be presented in the evidence/justification section of the sensitivity assessments.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Biological pressures	Genetic modification & translocation of indigenous species	Translocation outside of a geographic areas; introduction of hatchery –reared juveniles outside of geographic area from which adult stick derives	Genetic modification can be either deliberate (e.g. introduction of farmed individuals to the wild, GM food production) or a by-product of other activities (e.g. mutations associated with radionuclide contamination). Former related to escapees or deliberate releases e.g. cultivated species such as farmed salmon, oysters, scallops if GM practices employed. Scale of pressure compounded if GM species "captured" and translocated in ballast water. Mutated organisms from the latter could be transferred on ships hulls, in ballast water, with imports for aquaculture, aquaria, live bait, species traded as live seafood or 'natural' migration.
		Revised benchmark	**MBA Comment**
		Translocation of indigenous species and/or introduction of genetically modified or genetically different populations of indigenous species that may result in changes in genetic structure of local populations, hybridization, or change in community structure.	Genetic modification can be either deliberate (e.g. introduction of farmed individuals to the wild, GM food production) or a by-product of other activities (e.g. mutations associated with radionuclide contamination). The former is related to escapees or deliberate releases e.g. cultivated species such as farmed salmon, oysters, and scallops if GM practices or breeding programmes are employed. The scale of pressure is compounded if GM species "captured" and translocated in ballast water. GM species could be transferred on ships hulls, in ballast water, with imports for aquaculture, aquaria, live bait, species traded as live seafood or 'natural' migration. The pressure also relates to the translocation of indigenous species which may compete with local populations of species, alter the community of the receiving habitat, or provide the opportunity for hybridization between similar species (e.g. *Spartina* spp. and *Mytilus* spp.).

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Biological pressures	Introduction of microbial pathogens	**SNCB Revised Benchmark:** the introduction of microbial pathogens *Bonamia* and *Martelia refringens* to an area where they are currently not present.	Untreated or insufficiently treated effluent discharges & run-off from terrestrial sources & vessels. It may also be a consequence of ballast water releases. In mussel or shellfisheries where seed stock is imported, 'infected' seed could be introduced, or it could be from accidental releases of effluvia. Escapees, e.g. farmed salmon could be infected and spread pathogens in the indigenous populations. Aquaculture could release contaminated faecal matter, from which pathogens could enter the food chain.
		Revised benchmark	**MBA Comment**
		The introduction of relevant microbial pathogens or metazoan disease vectors to an area where they are currently not present (e.g. *Martelia refringens* and *Bonamia*, Avian influenza virus, viral Haemorrhagic Septicaemia virus).	Any significant pathogens or disease vectors relevant to species or the species that characterize biotopes/ habitats identified during the evidence review phase will be noted in the review text.
Pressure theme	**ICG-C Pressure**	**MB0102 benchmark**	**ICG-C description**
Biological pressures	Introduction or spread of invasive non-indigenous species (INIS)	**MB0102 benchmark:** A significant pathway exists for introduction of one or more invasive non-indigenous species (INIS) (e.g. aquaculture of NIS, untreated ballast water exchange, local port, terminal harbour or marina); creation of new colonisation space >1ha. One or more NIS in Table C3 (Technical report) has been recorded in the relevant habitat. **SNCB revised benchmark:** the introduction of one of more invasive non-indigenous species (NIS)	The direct or indirect introduction of non-indigenous species, e.g. chinese mitten crabs, slipper limpets, Pacific oyster and their subsequent spreading and out-competing of native species. Ballast water, hull fouling, stepping stone effects (e.g. offshore wind farms) may facilitate the spread of such species. This pressure could be associated with aquaculture, mussel or shellfishery activities due to imported seed stock or from accidental releases.
		Revised benchmark	**MBA Comment**
		The introduction of one of more invasive non-indigenous species (IINIS)	Adopt SNCB revision. Sensitivity assessment will be made against a prescribed list of invasive non-indigenous species (INIS) based on the GBNNSIP list of potential invasive species.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Biological pressures	Removal of non-target species	Removal of features through pursuit of a target fishery at a commercial scale	By-catch associated with all fishing activities. The physical effects of fishing gear on sea bed communities are addressed by the "abrasion" pressure type (D2) so B6 addresses the direct removal of individuals associated with fishing/ harvesting. Ecological consequences include food web dependencies, population dynamics of fish, marine mammals, turtles and sea birds (including survival threats in extreme cases, e.g. Harbour Porpoise in Central and Eastern Baltic).
		Revised benchmark	**MBA Comment**
		Removal of features or incidental non-targeted catch (by-catch) through targeted fishery, shellfishery or harvesting at a commercial or recreational scale.	Defining this pressure has proven to be problematic for sensitivity assessment. It is considered that the pressure addresses only the biological effects of removal of species and not the effects of the removal process on the species, community or habitat itself, which results in confusion. Food-web impacts are only relevant to higher trophic levels (birds, fish, mammals and turtles): for benthic habitats and associated species the pressure has been interpreted as specifically referring to the risk of ecological effects arising from the removal of species that are not directly targeted by fisheries. The assessment considers whether species present in the biotope are likely to be damaged or removed by relevant activities and whether this removal is likely to result in measurable effects on biotope classification, structure (in terms of both biological structure e.g. species richness and diversity and the physical structure, sometimes referred to as habitat complexity) and function. Examples of biotopes that are sensitive to this pressure are therefore i) biogenic habitats that are created by species which may be removed by fishing activities, e.g. maerl beds and hard substrata that are dominated by plant and animal assemblages, ii) biotopes characterized by ecosystem engineers or keystone species that strongly determine the rate of some ecological processes, e.g. beds of suspension feeders that cycle nutrients between the water column and substratum and iii) biotopes with key characterizing species, (e.g. those named in the biotope description or identified as important by the biotope description) that are likely to be removed or displaced as by-catch.

Pressure theme	ICG-C Pressure	MB0102 benchmark	ICG-C description
Biological pressures	Removal of target species	**MB0102 pressure benchmark:** Removal of target species that are features of conservation importance or sub-features of habitats of conservation importance at a commercial scale.	The commercial exploitation of fish & shellfish stocks, including smaller scale harvesting, angling and scientific sampling. The physical effects of fishing gear on sea bed communities are addressed by the "abrasion" pressure type D2, so B5 addresses the direct removal / harvesting of biota. Ecological consequences include the sustainability of stocks, impacting energy flows through food webs and the size and age composition within fish stocks.
		Suggested benchmark	**MBA Comment**
		Benthic species and habitats: removal of species targeted by fishery, shellfishery or harvesting at a commercial or recreational scale	Defining this pressure has proven to be problematic for sensitivity assessment. It is considered that the pressure addresses only the biological effects of removal of species and not the effects of the removal process on the species, community or habitat itself, which results in confusion. Food-web impacts are only relevant to higher trophic levels (birds, fish, mammals and turtles): for benthic habitats and associated species the pressure has been interpreted as specifically referring to the risk of ecological effects arising from the removal of species that are directly targeted. The assessment considers whether species present in the biotope are likely to be directly targeted and whether this removal is likely to result in measurable effects on biotope classification, structure (in terms of both biological structure e.g. species richness and diversity and the physical structure, sometimes referred to as habitat complexity) and function. Examples of biotopes that are sensitive to this pressure are therefore i) biogenic habitats that are created by species which may be directly targeted, e.g. bivalve beds, kelp beds, *Ostrea edulis* reefs ii) biotopes characterized by ecosystem engineers or keystone species that strongly determine the rate of some ecological processes and that are directly targeted, e.g. *Echinus esculentus* as keystone grazers maintaining urchin barrens, and *Arenicola marina* which are key bioturbators that may be collected for bait, and iii) biotopes with key characterizing species, (e.g. those named in the biotope description or identified as important by the biotope description) that are likely to be removed as target species, e.g. collection of piddocks for bait or food from biotopes defined on the presence of piddocks.