Natural England Evidence Information Note EIN034

Marine recreation evidence briefing: general beach life

This briefing note provides evidence of the impacts and potential management options for marine and coastal recreational activities in Marine Protected Areas (MPAs). This note is an output from a study commissioned by Natural England and the Marine Management Organisation to collate and update the evidence base on the significance of impacts from recreational activities. The significance of any impact on the Conservation Objectives for an MPA will depend on a range of site specific factors. This note is intended to provide an overview of the evidence base and is complementary to Natural England's *Conservation Advice* and *Advice on Operations* which should be referred to when assessing potential impacts. This note relates to general beach leisure. Other notes are available for other recreational activities, for details see *Further information* below.

General beach life

Definition

Activities undertaken on the foreshore including beach games, beachcombing, sunbathing, rockpooling, and swimming. This note does not cover any beach activities which use motorised or non-motorised vehicles, wildlife watching, coasteering, bait digging, shore angling or walking/dog walking.

Distribution of activity

The beach leisure activities focussed on in this note are generally undertaken on sandy, gravel, shingle, or rocky shores and are mostly focused on areas with easy public access. Sandy (soft sediment) shores have been considered to include sand, muddy sand, sandy mud, mixed sediments and coarse sediments. It has been assumed that, in general, beach leisure activities do not occur on muddy shores.

Levels of activity

In 2015, there were approximately 11 million domestic overnight trips in England which involved visiting a beach and 37 million day visits which involved visiting a beach (Visit England, 2015). Whilst to some extent, beach activities will occur throughout the year, visitor numbers will be substantially higher during the summer months.

Pressures

This note summarises the evidence on the pressures and impacts arising from general beach leisure activities in the intertidal zone. In this Information Note, access to the beach/sea and general leisure activities have not been considered separately, as the activities are considered to be associated with the same pressures (see Table 1).

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The direct pressures considered to arise from general beach leisure activities are shown in Table 1 and the potential biological receptor groups affected by these pressures are shown in Table 2.

The information presented on pressures associated with the activity builds upon, and is complementary to, Natural England's Conservation Advice and Advice on Operations which should be referred to for MPA specific information and sensitivities of specific MPA features to those pressures[1].

The main pressure-receptor impact pathways arising from this activity are considered to be:

- Abrasion/disturbance of the substrate surface in intertidal and shallow subtidal areas, through general footfall (trampling), including accessing the sea.
- Abrasion/disturbance of the substrate below the surface in intertidal areas, for example, from digging holes in the sand.
- Noise and visual disturbance, of hauled out seals and birds, from the presence and movement of people on the shore.

Activities undertaken in the sea (eg swimming) are not considered to result in underwater noise changes above ambient background levels. As such this pressure has been considered to be negligible and has not been considered further.

For Tables 1 & 2 see page 12.

Impacts

Where an impact pathway has been identified between the pressures arising from the activity and a biological receptor group, a summary of the evidence of impacts has been presented below.

Intertidal habitat and Subtidal habitats

Abrasion/disturbance of the substrate surface (and surface features) in the intertidal and shallow subtidal areas from trampling

In a comprehensive review of the literature of trampling impacts on intertidal habitats, Tyler-Walters and Arnold (2008) concluded that the impacts of trampling on intertidal shores depend on the nature of the receiving habitat and the intensity, duration and frequency of trampling. Increasing trampling pressure resulted in reduced biodiversity, abundance or biomass of affected species, increased bare space and in some cases, clear paths (eg across rocky shores and through *Sabellaria alveolata* reefs; Tyler-Walters and Arnold, 2008 and references therein). Trampling impacts were also dependent on the type of footwear worn.

In relation to rocky habitats, Tyler-Walters and Arnold (2008) summarised that:

- Foliose canopy forming algae (eg fucoids) were particularly intolerant and sensitive to trampling impacts.

[1] https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas

- Trampling damaged erect coralline turfs, barnacles, and resulted in an increase in bare space; in some cases paths across the shore were visible.
- On brown algae dominated shores, understorey algae could suffer due to increased desiccation but algal turf species, opportunists and gastropod grazers (eg limpets) could increase in abundance as an indirect effect of trampling.

In areas subject to visitor pressure, rockpools are probably impacted by trampling by rock poolers and their biodiversity is probably lower than in areas not accessed by visitors. However, access across the shore will probably have little impact on deep pools or overhangs, while shallow pools may be trampled through on route. Trampling may damage shallow pools dominated by coralline turfs, foliose red algae and fucoids (Tyler-Walters and Arnold, 2008). Davenport & Davenport (2006, cited in Tyler-Walters and Arnold, (2008) noted that boulder turning during collecting and gathering adversely affects intertidal boulder habitats.

In relation to sedimentary habitats Tyler-Walters and Arnold (2008) summarised that:

- Trampling of intertidal muddy sands and muds was shown to reduce the abundance of some infauna while increasing the abundance of presumably opportunistic infaunal polychaetes and meiofauna, while bivalves (macrofauna) were adversely affected (judged by the authors to have high sensitivity at high levels of trampling and medium sensitivity at moderate and low levels of trampling[2]).
- The sensitivity to trampling is likely to vary with the relative proportion of mud to sand (sediment porosity), the dominant infauna (nematodes and polychaetes vs. bivalves) and the presence of burrows.
- Seagrass beds were damaged by trampling (judged by the authors to have high sensitivity at high levels of trampling and medium sensitivity at moderate and low levels of trampling).

In relation to *Sabellaria alveolata* (honeycomb worm reefs), Tyler-Walters and Arnold (2008 and references therein) summarised that:

- *Sabellaria alveolata* reefs are probably of intermediate intolerance to trampling and although worms can repair and stabilize the reefs relatively quickly, complete recovery will probably take several years once trampling has ceased. However, if a gap is formed, continuous trampling through the gap would probably remove any growing 'crust' of worms and the gap could not be repaired. While the authors found no evidence of the effects of different trampling intensities on *S. alveolata* reefs, information presented in Holt *et al*. (1998) regarding reefs in Brittany, suggested that continued, regular access across a reef is likely to result in paths through the reef structure.

[2] Intensity definitions for foot access (in this instance to fishing grounds) in Tyler-Walters and Arnold were adapted from Hall *et al.* 2008 and defined as: Heavy – access by > 10 people per hectare per day; large numbers of individuals mainly concentrated in one area; Moderate – access by 3-9 people per hectare per day; Light – access by 1-2 people per hectare per day; Single – access on a single occasion.

Liley *et al*. (2012) noted that saltmarshes, and particularly mudflats, do not lend themselves to easy access and therefore have a degree of self-protection from trampling damage. Comparative studies of trampling impacts on different coastal habitats indicate that saltmarsh is the most resilient habitat relative to other coastal habitats such as sand dunes (Andersen 1995; Coombes 2007, cited in Liley *et al*. 2012). However, where trampling does occur it may still have significant effects, leading to vegetation loss (for example, Chandrasekara & Frid 1996, cited in Liley *et al*. 2012), which potentially can leave the marsh more vulnerable to erosion.

Abrasion/disturbance of sub-surface sediments in intertidal areas – for example from digging/placement of objects in the sand

No direct evidence relating to sub-surface abrasion/disturbance arising from general beach leisure activities was sourced. No analogous pressure was considered relevant (bait digging for example is likely to occur predominately in more muddy habitats).

Marine mammals

Noise and visual disturbance – hauled out seals

It is considered difficult to disentangle the combined effects of noise and human physical/visual presence which could in combination or separately cause disturbance. Therefore, these pressures are reviewed collectively.

Hauled out seals can be vulnerable to disturbance as a result of human access on the foreshore (Bishop *et al.,* 2015). For example, Anderson *et al.,* (2012) found that common seals were alerted to disturbance by human pedestrians at distances of 200-425 m with a fleeing response observed at 165-260 m. However, both grey and common seals typically haul out along remote rocky coasts, islands and sandbanks in the UK (SCOS, 2016). These isolated locations generally have difficult access and are away from popular tourist leisure beaches therefore limiting potential disturbance.

Nevertheless, several seal colonies are present on beaches with relatively easy access. In particular, there has been considerable expansion of grey seal breeding colonies along beaches in the eastern coast of England (at sites such as Donna Nook, Lincolnshire and Horsey, Norfolk). However, these sites are generally not used in the winter (when seals are on the beaches) for beach leisure activities. Furthermore, these sites are popular wildlife watching tourist attractions and specific haul outs have been actively managed for many years to prevent disturbance (through the uses of fences to limit direct access) with the seals habituated to human presence in the area (Bishop *et al.,* 2015).

Birds

Noise and visual disturbance

It is considered difficult to disentangle the combined effects of noise and human physical/visual presence which could in combination or separately cause disturbance. Therefore, these pressures are reviewed collectively.

Beach leisure activities have the potential to cause disturbance to feeding, roosting and nesting coastal waterbirds. The primary responses observed are likely to include increased vigilance, avoidance walking and flight responses. The level of response will vary depending on a range of factors including the type of beach activity, the frequency of disturbance and the level of habituation as a result of existing activity

(IECS, 2009). Some disturbance effects may have more direct negative impacts (loss or failure of eggs or chicks leading to decreased breeding productivity) to birds than others (temporary displacement from feeding or roosting areas leading to increased but non-lethal energetic expenditure).

Evidence suggests that waterbirds generally show a flight response to human presence on the foreshore at approach distances of between 20 m and 100 m. However, distances over 200 m have been recorded for some sensitive species (McLeod, *et al.,* 2013; IECS, 2009; Dwyer, 2010; Glover *et al*., 2015). Repetitive disturbance events can result in possible long-term effects such as loss of weight, condition and a reduction in reproductive success, leading to population impacts (Durell *et al.,* 2005; Gill, 2007; Goss-Custard *et al*., 2006; Belanger and Bedard, 1990). Birds typically show a dispersive response to disturbance with prolonged disturbance causing displacement (Dwyer, 2010; Navedo and Herrera, 2012). For example, Martin *et al.,* (2015) found that a rapid increase in the recreational use of a beach in summer reduced the number of shorebirds and gulls which occur in the area. In addition, the presence of people at the beach significantly reduced the time that resident species spent consuming prey.

Literature suggests that in general, human presence is considered to cause greater disturbance (in terms of response distances) than vehicles or watercraft (Glover *et al*., 2015; McLeod, *et al*., 2013; Guay *et al*., 2014; IECS, 2009a; Schlacher *et al*. 2013). For example, McLeod *et al*. (2013) conducted 730 experimental approaches to 39 species of waterbird, using five stimulus types (single walker, three walkers, bicycle, car and bus). Across species, where differences existed, motor vehicles always evoked shorter flight-initiation distances than humans on foot.

Assessment of significance of activity pressure

The following assessment uses the evidence base summarised above, combined with generic information about the likely overlap of the activity with designated features and the sensitivity range of the receptor groups, to provide an indication of the likelihood of:

i) an observable/measurable effect on the feature group; and

ii) significant impact on Conservation Objectives based on the effect on the feature group.

The assessment of significance of impacts has been based on the potential risk to the achievement of the conservation objectives for the features for which a site has been designated. The assessment is made using expert judgement and is designed to help identify those activities that are likely to be of greatest or least concern, and, where possible, suggest at what point impacts may need further investigation to determine potential management requirements within MPAs to reduce the risk of an adverse effect on the integrity of the site. Note, the assessment only considers the impact pathways considered in the evidence section (pressures which were considered negligible in Tables 1 and 2 are not considered in this assessment).

The outputs are shown in Table 3. The relative ratings of likelihood of significant impact on Conservation Objectives are defined as:

- Low – possible observable/measurable effect on the feature group but unlikely to compromise COs.

- Medium – observable/measurable effect on the feature group that potentially could compromise COs.
- High – observable/measurable effect on the feature group that almost certainly would compromise COs.

The relative risk ratings are based on the activity occurring without any management options, which would be considered current good practice, being applied. The influence that such management may have on the risk rating is discussed in the *Management options* section below.

It must be noted that the above assessment only provides a generic indication of the likelihood of significant impacts, as site-specific factors, such as the frequency and intensity of the activity, will greatly influence this likelihood. As such, further investigation of the risk to achieving COs will need to be done on a site specific basis, considering the following key site-specific factors:

- The spatial extent of overlap between the activity/pressure and the feature, including whether this is highly localised or widespread.
- The frequency of disturbance eg rare, intermittent, constant etc.
- The severity/intensity of disturbance.
- The sensitivity of specific features (rather than the receptor groups assessed in Table 3) to pressure, and whether the disturbance occurs when the feature may be most sensitive to the pressure (eg when feeding, breeding etc).
- The level of habituation of the feature to the pressure.
- Any cumulative and in-combination effects of different recreational activities.

For Table 3 see page 13.

Management options

Potential management options for marine recreational activities (note, not specific to general beach leisure) include:

On-site access management, for example:

- designated areas for particular activities (voluntary agreements or underpinned by byelaws);
- provision of designated access points eg slipways, in locations likely to be away from nature conservation access (voluntary or permit condition or underpinned by byelaw);

Education and communication with the public and site users, for example:

- signs, interpretation and leaflets;
- voluntary codes of conduct and good practice guidance;
- wardening;
- provision of off-site education/information to local clubs/training centres and/or residents

Legal enforcement of, for example:

- byelaws which can be created by a range of bodies including regulators, Local Authorities and landowners (collectively referred to as Relevant Authorities); and
- permitting or licence conditions.

Specific examples of management measures which have been applied to general beach leisure activities are described further in a Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities** and include:

- Codes of Conduct (eg the Sea Shore Code, Codes of Conduct for Coastal users etc).

Based on expert judgement, it is considered that where management measures, which would be considered current good practice, are applied to general beach leisure activities, adhered to and enforced, the likely risk of significant impact on a site's Conservation Objectives would be **Low** in relation to all activity/pressure impact pathways.

For further information and recommendations regarding management measures, good practice messaging dissemination and uptake, refer to the accompanying project report which can be accessed from **Marine evidence > Marine recreational activities**

Good practice messages for general beach leisure activities

Unlike other marine recreational activities, general beach leisure activities are not covered by a national governing body or representative organisation. Good practice messaging regarding minimising impacts on the marine and coastal environment, including wildlife, tend to come from relevant authorities (eg Local Authorities) and environmental Non-Governmental Organisations (NGOs). Examples include interpretation boards, signage (eg to prevent trampling on sand dunes or directions to less sensitive sites), leaflets promoting codes of conduct and wardens (often volunteers) encouraging adherence to codes of conduct. Examples of some of the key messages from various seashore and coastal codes include:

Exploring the seashore:

- leave animals where you find them;
- take care when touching soft-bodied animals;
- carefully lift and replace any rocks you may have moved;
- leave attached seaweed in place;
- do not trample through rockpools;
- be careful not to dislodge or crush small creatures. do not force limpets off rocks;
- take photos not living animals;

Avoid disturbing wildlife

- where present, pay attention to signs that help you minimise your impact on wildlife;
- aim to watch wildlife unseen (be cautious, stealthy and quiet);

- watch from a distance through binoculars if possible, especially if they are nesting birds or pupping seals;
- be careful where walking to avoid crushing burrows, eggs or animals;
- let animals move away and do not chase, feed or touch wild animals;
- remember it is illegal to harass many species of birds and animals;

To protect the coast

- keep to established paths and boardwalks;
- avoid trampling vegetation that might increase the chance of erosion;
- do not use beaches or dunes for scrambling motorcycles or other off-road vehicles; and
- if you dig holes in the beach, please fill them up again.

Further information

Further information about good practice messaging resources, site specific conservation advice and management of marine recreational activities can be found through the following links:

- The Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities**
- Conservation Advice - Advice on Operations
  For site specific information, please refer to Natural England's conservation advice for each English MPA which can be found on the Designated Sites System **https://designatedsites.naturalengland.org.uk/** This includes Advice on Operations which identifies pressures associated with the most commonly occurring marine activities, and provides a broad scale assessment of the sensitivity of the designated features of the site to these pressures.
- For further species specific sensitivity information a database of disturbance distances for birds (Kent et al, 2016) is available here: **http://www.fwspubs.org/doi/abs/10.3996/082015-JFWM-078?code=ufws-site**
- Some marine species are protected by EU and UK wildlife legislation from intentional or deliberate disturbance. For more information on the potential requirement for a wildlife licence: **https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident**

Notes for other marine recreational activities can be accessed from **Marine evidence > Marine recreational activities** and include:

- Boardsports with a sail
- Boardsports without a sail
- Coasteering
- Diving and snorkelling
- Drones

- Hovercraft
- Motorised and non-motorised land vehicles
- Motorised watercraft
- Light aircraft
- Non-motorised watercraft
- Personal watercraft
- Wildlife watching

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Table 1 Potential direct pressures arising from general beach leisure

	Abrasion/disturbance of the substrate surface	Abrasion/disturbance below substrate surface	Underwater noise changes	Above water noise changes	Visual disturbance
General Beach Leisure (e.g. trampling, digging in the sand, swimming)	✓[1]	✓[2]	Negligible	✓[3]	✓[3]

X - No Impact Pathway

1 - Pressure relates to the potential abrasion/disturbance of the substratum surface through high volumes of people walking and undertaking general leisure activities (e.g. rockpooling) in the intertidal zone

2 – Pressure relates to the potential abrasion/disturbance of the substrate below the surface for example through digging in the sand, placing objects (e.g. wind breaks) in the sand etc.

3 – Pressure relates to potential noise and visual disturbance relating to the presence of people on the shore

Table 2 Biological receptors potentially affected by the pressures arising from general beach leisure

	Abrasion/disturbance of the substrate surface	Abrasion/disturbance below substrate surface	Underwater noise changes	Above water noise changes	Visual disturbance
Intertidal Habitats	✓	✓	Impact pathways scoped out	Impact pathways scoped out	Impact pathways scoped out
Subtidal Habitats	✓	Impact pathways scoped out			
Fish	Impact pathways scoped out		Negligible		Negligible
Marine Mammals				✓ (hauled out seals)	✓ (hauled out seals)
Birds				✓	✓

Table 3 Assessment of indicative likelihood of significant impacts from general beach leisure activity

Pressure	Likely overlap between activity and feature (confidence)	Evidence of impact (confidence)	Sensitivity of feature to pressure (confidence)	Likelihood of observable/measurable effect on the feature	Likelihood of significant impact on Conservation Objectives
Surface disturbance – intertidal and shallow subtidal habitats (from trampling and access to sea)	**High** – beach leisure occurs on intertidal habitats	Evidence of impacts, the magnitude of which vary depending on the habitat, intensity and duration of trampling (i.e. impacts will be site-specific) (high)	**Low-High** depending on habitat (site-specific assessment will be required)	**Low-High** based on high degree of overlap with features (intertidal habitats) and range of sensitivities	**Low-Medium**
Sub-surface sediment disturbance in intertidal areas (e.g. from digging in sand)	**Medium – High** depending on suitability of beach for digging/placement of objects in the substratum (e.g. sand as opposed to cobbles)	No direct evidence of the impacts of this specific pressure on intertidal habitats No analogous pressure considered relevant (e.g. bait digging likely to take place on different shore types)	**Low - Medium** (depends on habitat i.e. will be site specific)	**Low –** based on judgement that most activity will occur on sandy beaches with relatively low sensitivity to this pressure	**Low**
Above water noise changes and visual disturbance – seals (hauled out only)	**Low – Medium** depending on geographical location of activity	Evidence of 'flight response' of seals to general human presence on the foreshore (high)	**High** - hauled out seals are sensitive to visual disturbance (medium)	**Low – Medium** based on the relatively low likelihood of overlap of pressure and feature	**Low-Medium**

Above water noise changes and visual disturbance – Birds	**Low-Medium** depending on geographical location of activity (expert judgement)	Evidence of disturbance (increased vigilance, avoidance walking and flight responses) from general human presence on the foreshore (high confidence)	**Low–High** (medium) Sensitivity will differ between species. Some species e.g. red-throated diver, curlew, are highly sensitive to disturbance; other species e.g. gulls, have high thresholds (low sensitivity) to disturbance Certain behavioural activities are considered more susceptible to disturbance e.g. nesting seabirds or breeding birds (expert judgement)	**Low - Medium** **Lower end of range** based on relatively low likelihood of overlap between large numbers of visitors to the coast and highly sensitive features Medium likelihood if overlap with more sensitive feature occurs, although, in general this is not considered to occur frequently (expert judgement)	**Low**