Natural England Evidence Information Note EIN030

Marine recreation evidence briefing: wildlife watching

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 wildlife watching. Other notes are available for other recreational activities, for details see *Further information* below.

Wildlife watching

Definition

Wildlife Watching includes viewing a range of marine species such as marine mammals, basking sharks and birds either from the land or the water.

This note focuses particularly on commercial wildlife watching tours or organised groups which have a dedicated focus on viewing coastal or marine wildlife in the natural environment. This activity can be broadly split into water-based wildlife watching from a vessel (or other craft) and land based wildlife watching.

First edition 27 November 2017

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Distribution of activity

There are numerous areas around the whole of the UK which attract visitors for marine wildlife watching. In England, such areas include the south west coast (eg for cetaceans and basking sharks) and the east and north east coast (eg for seals). Examples of areas where colonies of seabirds attract visitors include Northumberland, the Yorkshire coast, Cumbia and Devon (including Lundy Island). People also view coastal wading and waterfowl species, particularly from hides and viewing platforms, with popular locations including estuaries and sheltered bays such as the Humber Estuary, North Norfolk coast, Morecambe Bay, the Solent, Poole Harbour and the Thames Estuary.

Levels of activity

To the best of our knowledge there is no central repository of information relating to marine wildlife watching participation statistics. Due to the strong tourism related aspect of this activity it is likely that the highest activity will be in the summer months. However, this will be influenced by the seasonal presence of the animals being viewed. For example, the best time to view migratory wading bird species in large numbers is during the autumn and spring passage periods and the winter months.

Pressures

This note summarises the evidence on the pressures and impacts arising from wildlife watching on land or from vessels at sea. The direct pressures considered to arise from each functional aspect of the activity are shown in Table 1 and the potential biological receptor groups affected by the pressures are shown in Table 2 (for land-based activity) and Table 3 (for sea-based activity). 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 on land are considered to be:

- Abrasion/disturbance of the surface of the intertidal substrate from access to the viewing point (ie trampling). Whilst some wildlife watching on land is conducted from high vantage points above the foreshore (eg cliffs, hides) this has been included to capture any wildlife watching activity which may access intertidal habitats such as saltmarsh, for example, to watch birds[2].
- Above water noise disturbance, of hauled out seals or birds, related to the presence of people.
- Visual disturbance, hauled out seals and birds, related to the presence of people during the activity.

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

[2] Note the impacts of trampling on other intertidal habitats are considered in the Information Note on General beach leisure.

For this activity access to the viewing point and the activity itself (walking, sitting or standing to view wildlife) have been considered to be equivalent pressures and are therefore not considered separately. Although it has been assumed that access to high shore habitats such as saltmarsh may occur during land-based wildlife watching tours, it has not been considered that the levels of trampling would likely result in sub-surface substratum abrasion and hence this pressure has been considered negligible and not considered further. As this aspect of the activity is land-based there will be no associated changes in underwater noise.

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

- Abrasion/disturbance of the surface/sub-surface sediment in shallow subtidal habitats through propeller/engine wash.
- Underwater noise disturbance, of fish (basking sharks), marine mammals and birds related to engine operation during the activity.
- Above water noise disturbance, of hauled out seals and birds from people noise, engine operation and the vessel moving through waves (craft striking waves or 'hull slap') during the activity.
- Visual disturbance, of fish (basking sharks), marine mammals and birds related to the presence of people and the vessel during the activity.

As this note focuses on commercial wildlife watching tours/trips, it has been assumed that vessels used for wildlife watching will be kept in the water and hence any abrasion/disturbance pressure on intertidal habitats arising from the launch or recovery of vessels is not a pressure that needs to be considered here.

Although in general motorised vessels can cause engine/propeller damage to the seabed when they operate in shallow water, commercial wildlife watching vessels will likely operate out of marinas and harbours, utilising designated navigation channels. Furthermore, while boat wash may cause localised erosion of marine features its impact is generally minimal in the context of natural effects (UK CEED, 2000). Hence any abrasion/disturbance pressure of subtidal habitats associated with the operation of motorised vessels during wildlife watching at sea has also been considered negligible.

For Tables 1, 2 & 3 see page 15 & 16

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 habitats

Land-based wildlife watching: abrasion / disturbance of substratum surface – from access/participation in activity

Evidence relating to the impacts of trampling on saltmarsh is summarised below as it was considered that this habitat may be accessed for wildlife viewing (eg bird watching), although this is not thought to be common (expert judgement).

While trampling may favour some plants with high growth rates and low growth forms in coastal plant communities, other species such as *Salicornia* sp. are intolerant of trampling. Trampling may also affect the substratum, either through destabilisation of creek walls and loss of vegetation, or may result in compaction of sediments and reduced aeration. Some plants will be damaged and invertebrates may be displaced but effects are likely to be restricted in area (Tyler-Walters, 2008).

In a review of the impacts of trampling, Tyler-Walters and Arnold (2008) summarised that saltmarsh is relatively resistant to foot trampling, based on studies which indicated saltmarsh vegetation was more resistant to trampling than sand dunes and coastal grasslands (Andersen, 1995; study in Denmark) and a study in the UK which showed that the susceptibility of the saltmarsh infauna to human trampling depended upon the intensity of the trampling disturbance and the nature of the habitat. For example, it was noted that continual trampling along a track reduced vegetation cover and increased the area of bare mud Chandrasekara and Frid (1996).

Fish

Underwater noise changes and visual disturbance

Small motorised craft (including wildlife watching vessels) produce relatively low levels of noise (75-159 dB re 1µPa m) with the output characteristics highly dependent on speed and other operational characteristics (OSPAR, 2009). Many of these sources have greater sound energy in higher frequency bands (ie above 1,000 Hz) than large ships.

With respect to recreational vessel movements, few specific scientific studies have been undertaken on the impacts of vessel noise on fish although vessels have been shown to increase stress response and potentially mask vocalizations (Celi *et al*., 2015; Neenan *et al.,* 2016). The response of fish will be dependent on sensitivity of these species with fish with a swimbladder generally considered to have better hearing than those without (Nedwell *et al.,* 2004).

Fish species are generally not considered sensitive to visual disturbance. However, the foraging and courtship behaviour of basking sharks occur at the surface in UK waters (particularly South West England) seasonally in the spring and summer (Sims, 2008). This makes them potentially sensitive to the visual presence of a motorised vessel as well as due to noise stimuli. Therefore, these pressures on basking sharks[3] are reviewed collectively.

Compared with cetaceans, basking sharks are considered more difficult to disturb (Speedie and Johnson, 2008). However, specific research on the impacts of vessel related disturbance on basking sharks is limited. One study documented that short-term displacement responses occurred when a basking shark was in the vicinity of a small motorised boat. The observations only recorded a reaction to the approach of a vessel at a maximum distance of approximately 10 m. The study also found that the angle of approach and engine noise were contributory factors to disturbance. In addition, repeated approaches appeared to increase the disturbance response (Wilson, 2000).

[3] Although basking sharks are not a feature of any MCZs, they are protected under Schedule 5 of the Wildlife and Countryside Act 1981, making it illegal to intentionally kill, injure or recklessly disturb or harass them in British Waters. Furthermore when these species are present in an area they are likely to be of interest to commercial wildlife watching operators.

Marine mammals

Underwater noise changes and visual disturbance

It is considered difficult to disentangle the combined effects of noise and boat physical/visual presence which could in combination or separately cause disturbance (Pirotta *et al.,* 2015). Therefore, these pressures are reviewed collectively.

Motorised craft (including those used in wildlife watching) produce relatively low levels of noise (75-159 dB re 1µ Pa m), and the output characteristics are highly dependent on speed and other operational characteristics (OSPAR, 2009). Many of these sources have greater sound energy in higher frequency bands (i.e. above 1,000 Hz) than large ships. Noise injury at these levels is considered unlikely although a range of studies have demonstrated that vessels can cause behavioural responses in marine mammals and also mask important acoustic cues (Pirotta *et al*., 2015).

Dedicated vessel based marine mammal wildlife watching has the potential to induce behavioural changes (Christiansen and Lusseau, 2014). In a comprehensive meta-analysis review, disruptions of activity budget and of path directionality were identified as the most consistent responses towards whale-watching and other ecotourism vessels. In a similar manner across species, animals were more likely to travel and less likely to rest and forage in the presence of vessels (Senigaglia, 2016). These responses may interrupt social interactions, carry energetic costs and in the long term could affect individual fitness (Lundquist *et al.,* 2012).

Vessel speed, manoeuvring and approach angle are all important factors in cetacean responses with high impact approaches (crossing path of the animals and boats approaching closely and with high speed) generally resulting in increased disturbance of the animals (Peters *et al*., 2013).

Responses towards wildlife watching vessels that are not considered adverse (typically involving moving towards a vessel to bow ride) are also regularly observed in a range of cetacean species. For example, monitoring of bottlenose dolphins in Cardigan Bay, Wales found that the species generally showed a neural or positive response to tourist boats (Gregory and Rowden, 2001).

Above water noise changes and visual disturbance (hauled out seals only)

It is very difficult to separate out the relative contribution of noise and visual stimuli in causing a disturbance response to hauled out seals due to motorised vessels and the available literature generally makes no distinction. Therefore, these pressures are reviewed collectively.

Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Hoover-Miller *et al*., 2013). The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source.

Seals hauled out on land can be susceptible from disturbance due to wildlife watching from both vessels and from the foreshore which are discussed separately below.

Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150 -200m (Wilson, 2014; Young, 1998; Suryan and Harvey, 1999; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels

approaching at distances between 5 m and 25 m resulted in over 64% of seals entering the water, but at distances of between 50 m and 100 m only 1% entered the water (Curtin *et al*., 2009).

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, 2015). These isolated locations generally have difficult access for people wanting to wildlife watch from the shore, 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). These sites are popular wildlife watching 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

Above water noise changes and visual disturbance

It is very difficult to separate out the relative contribution of noise and visual stimuli in causing a disturbance response to birds due to motorised vessels and the available literature generally makes no distinction. Therefore, these pressures are reviewed collectively.

Birds can be susceptible from disturbance due to wildlife watching from both vessels and from the foreshore which are discussed separately below. In general, 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 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).

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).

Most disturbance events from powered vessels occur within 50-100 m of the receptor with vessels approaching at faster speeds eliciting higher disturbance (Rodgers and Schwikert, 2002; Bellefleur *et al.,* 2009; Burger, 1998; Schwemmer *et al*., 2011). Chatwin (2013) found that motorboats generally caused disturbance to birds at greater distances than non-powered craft.

Predictability and randomness are also factors which may explain variation in waterbird response. Literature also suggests that vessels consistently using defined routes (such as ferries or cargo ships) elicit less of a disturbance response than recreational craft (including wildlife watching boats) which are more unpredictable in terms of speed and course and thus their disturbance potential for birds may be enhanced (Rodgers and Schwikert, 2002; Burger, 1998; Schwemmer *et al.,* 2011).

Evidence suggests that birds generally show a flight response to human presence on the foreshore (such as birdwatchers) at approach distances of between 20 m and 100 m. However, flight response distances of over 200 m have been recorded for some sensitive species (McLeod, *et al.,* 2013; IECS, 2009; Dwyer, 2010; Glover *et al*., 2015).

Underwater noise changes

Hearing is considered likely to be an important underwater sense for diving birds although information on the sensitivity of birds to underwater noise and responses to vessel disturbance is limited (Dooling, 2012). However, underwater noise from recreational motorised vessels is likely to cause evasion responses in diving birds.

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, 2 and 3 are not considered in this assessment).

The outputs are shown in Table 4. The relative ratings of likelihood of significant impact on Conservation Objectives (COs) 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; and
- any cumulative and in-combination effects of different recreational activities.

For table 4 please see page 17

Management options

Potential management options for marine recreational activities (note, not specific to wildlife watching activities) include:

On-site access management, for example:

- designated areas for particular activities (voluntary agreements or underpinned by byelaws)
- provision of designated access points e.g. 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 wildlife watching activities are described further in a Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities** and include:

- Codes of conduct for wildlife watching from land and vessels, including a training and accreditation scheme for boat operators and commercial wildlife cruise operators.
- Voluntary Wardening Scheme - to protect hauled out seals from disturbance by the public via encouraging visitors to respect a voluntary beach closure during winter.

Based on expert judgement, it is considered that where management measures, which would be considered current good practice, are applied to wildlife watching activities (from land or from a vessel at sea), 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**.

National governing body and good practice messages for wildlife watching activities

National Governing Body

There is no National Governing Body for commercial wildlife watching activities.

The WiSe Scheme, is the UK standard for commercial marine wildlife watching at sea. The core element of this scheme is a training and accreditation course aimed primarily at professional boat operators (eg dive boats, industry service boats, yacht skippers) and commercial wildlife watching tour operators. There is also a training course for recreational boaters and members of the public who want to minimise their disturbance on marine wildlife whilst on the water. WiSe have produced codes of conduct in relation to: sociable solitary dolphins, otters, basking shark, seals and cetaceans, which are available here: **http://www.wisescheme.org/information/codes-of-conduct/**

The Royal Yachting Association (RYA) is the National Governing Body for all forms of recreational boating (cruising and racing, not specifically wildlife watching tour operators). The RYA works closely with The Green Blue, an environmental charity part funded by RYA and the British Marine Federation, which produces good practice guidance and environmental education, including in relation to wildlife and disturbance for marine recreational boat users. Good practice resources relating to wildlife disturbance include:

- The Green Wildlife Guide for Boaters: a guidance document which educates participants regarding what disturbance is, what may cause it, signs of disturbance and what to do/not to do in certain situations. The guidance also includes signposting to information about legislation and reporting wildlife sightings. **http://thegreenblue.org.uk/~/media/TheGreenBlue/Files-and-Documents/Leaflets/The-Green-Wildlife-Guide-for-Boaters.ashx?la=en**
- A guide to Writing a Green Wildlife Guide for Boaters: an accompanying leaflet with guidance on how to produce local guidance that is specific to the local audience and area. **http://thegreenblue.org.uk/~/media/TheGreenBlue/Files-and-Documents/Leaflets/Writing-a-Green-Wildlife-Guide-for-Boaters.ashx?la=en**

In addition to the guidance documents above, an additional comprehensive ‘national’ level Code of Conduct for wildlife watching is the Scottish Natural Heritage (SNH) Marine Wildlife Watching Code (MWWC). This Code was developed by SNH under the Nature Conservation (Scotland) Act and is a non-statutory Code designed to provide recommendations which, if followed, should ensure all participant’s behaviour remains within the law. A revised version of the MWWC will be relaunched in April 2017 and will be available here: **http://www.marinecode.org/**.

Good practice messaging

The guidance documents above promote conduct to minimise all of the main pressures arising from wildlife watching from the shore or from a vessel at sea. Key high level messages to minimise impacts are summarised below. It is important to refer to the individual codes of conducts for more detailed

species specific guidance about distances to keep between vessels and wildlife and maximum vessel speeds:

On land – abrasion, noise and visual disturbance:

- if visiting a wildlife viewing site, follow any recommended routes to avoid disturbance;
- avoid trampling and damage that could lead to erosion;
- don't get too close to wildlife (use binoculars to get a better view);
- approach wildlife slowly and cautiously with steady and predictable movements. do not approach directly;
- if you see signs of disturbance move away;
- make sure that animals are not surrounded;
- do not chase, feed or touch animals;
- take extra care during sensitive times of year where animals may be feeding, resting, breeding or with their young, for example:
- be careful not to scare birds off nests or trample burrows;
- do not intentionally break up or put up flocks of birds or flush seals into the sea; and
- be careful not to split up groups, or mothers and young, and never approach apparently lone young animals

At sea – noise and visual disturbance:

- when animals are sighted at a distance, stay on course at a steady speed slowing down when within the recommended distance (see WiSe Codes of Conduct and the Green Blue Guide for Wildlife for Boaters for specified distances and speeds);
- if observing animals at a distance that minimises disturbance, spend no more than 15 minutes observing quietly; leave immediately if you notice any sign of distress (see WiSe Codes of Conduct and the Green Blue Guide for Wildlife for Boaters for specified distances);
- do not turn the propeller towards the animals, chase, change course, steer directly towards them, overcrowd, box them in, split or steer through a group;
- if they choose to approach your vessel, or bow-ride, maintain a steady speed and course. Do not follow marine animals that appear alongside your vessel;
- allow groups of animals to remain together. Avoid deliberately driving through, or between, animals. Allow them an escape route;
- avoid close approach to animals with young;
- do not swim with, touch or feed animals;
- refrain from calling other vessels to join you;
- move away slowly if you notice signs of disturbance; and
- boats should be operated at the lowest possible engine speed. All noise should be kept to a minimum.

In addition to the above codes of conduct, numerous Local Authorities, non-governmental organisations (NGOs; eg the Shark Trust, the Wildlife Trusts) and partnership groups (e.g. Coastal Forums, Coastal Code Groups, Outdoor Charter groups etc) have produced codes of conduct which include information in relation to minimising disturbance to wildlife.

Some of these examples are described in further detail in the Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities**.

Further information

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

- WiSe: **http://www.wisescheme.org/**;
- the Royal Yachting Association: **http://www.rya.org.uk/Pages/Home.aspx**;
- the Green Blue: **http://thegreenblue.org.uk/**;
- 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**;
- the Management Toolkit which can be accessed from **Marine evidence > Marine recreational activities**.

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

- boardsports with a sail (windsurfing and kitesurfing);
- boardsports without a sail (surfing);
- coasteering;
- diving and snorkelling;
- drones (recreational use at the coast);
- general beach leisure;
- hovercraft;
- motorised and non-motorised land vehicles (including: the use of quad bikes, scramble bikes and cars on the foreshore and the activities of sand yachting, kite buggying and landboarding);
- light aircraft (including small planes and helicopters, microlights, paramotors and hang gliding);
- motorised watercraft;

- non-motorised watercraft (including dinghy, day boats or other small keelboat without a motor and the paddlesports sea kayaking, surf kayaking, sit-on-top kayaking, canadian canoeing and stand up paddle boarding);
- personal watercraft.

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ISBN 978-1-78354-460-8

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Table 1 Potential direct pressures arising from Wildlife Watching on land or from a vessel at sea

	Abrasion/disturbance of the substrate surface	Abrasion/disturbance below substrate surface	Underwater noise changes	Above water noise changes	Visual disturbance
Wildlife Watching on land (access to site and activity)	✓[1]	Negligible	X	✓[2]	✓[3]
Wildlife Watching at sea (activity)	Negligible	Negligible	✓[4]	✓[4]	✓[5]

X - No Impact Pathway

1 - Pressure relates to the potential abrasion of the substratum surface through access to the viewing point (i.e. from trampling)

2 - Pressure relates to changes in above water (airborne) noise during the activity on land

3 - Pressure relates to visual disturbance, from the presence of people, during the activity on land

4 – Pressure relates to changes in underwater and air-borne noise created by the engine/propeller on a motorised vessel during the activity at sea

5 – Pressure relates to the presence of the vessel during the activity at sea

Table 2 Biological receptors potentially affected by the pressures arising from Wildlife Watching on land

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

Table 3 Biological receptors potentially affected by the pressures arising from Wildlife Watching from a vessel at sea

<table>
<tr><th></th><th>Abrasion/disturbance of the substrate surface</th><th>Abrasion/disturbance below substrate surface</th><th>Underwater noise changes</th><th>Above water noise changes</th><th>Visual disturbance</th></tr>
<tr><td>Intertidal Habitats</td><td>Impact pathway scoped out</td><td>Impact pathway scoped out</td><td rowspan="2">Impact pathways scoped out</td><td rowspan="3">Impact pathways scoped out</td><td rowspan="2">Impact pathways scoped out</td></tr>
<tr><td>Subtidal Habitats</td><td>Negligible</td><td>Negligible</td></tr>
<tr><td>Fish</td><td rowspan="3">Impact pathways scoped out</td><td rowspan="3">Impact pathways scoped out</td><td>✓ (basking sharks)</td><td>✓ (basking sharks)</td></tr>
<tr><td>Marine Mammals</td><td>✓</td><td>✓ (hauled out seals)</td><td>✓</td></tr>
<tr><td>Birds</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>

Table 4 Assessment of indicative likelihood of significant impacts from wildlife watching activity on land or from a vessel at sea

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
Abrasion/disturbance of surface substratum (and associated features) – intertidal and habitats (from trampling – wildlife watching on land)	**Low** – wildlife watching from intertidal habitats (foreshore) considered relatively unlikely, although possible with respect to viewing birds or seals (expert judgement)	Little evidence relating specifically to impacts of wildlife-watching related trampling effects in the intertidal (noting rockpooling is not included under this activity) Evidence that one habitat (saltmarsh) potentially exposed to this pressure is relatively resistant to foot-trampling, although the effect on infauna is dependent on trampling intensity. Evidence that continual trampling reduced vegetation and increased are of bare mud from one study (low)	**Low – High** depending on habitat type. An example of an intertidal habitat with medium sensitivity is saltmarsh	**Low –** based on the relatively low likelihood of overlap between the pressure and the feature (intertidal habitats)	**Low**
Underwater noise changes and visual disturbance – Fish (from wildlife watching at sea)	**Low–High** depending on location of activity (low) Increased likelihood of overlap with basking sharks in some areas at certain times, especially as likely to be seeking interaction with feature (expert judgement)	Little direct evidence of vessel noise on fish, although some evidence of increased stress response and masking of vocalisations from this pressure (medium) Limited evidence on the impact of vessel related disturbance on basking sharks. Evidence of short-term displacement response to small motorised vessel from one study (low)	**Low–High** (fish general) depending on species **Medium** (basking shark) during sensitive periods (low)	**Low–Medium (fish general)** depending on species **Medium (basking shark) –** based on the potential of overlap between pressure and feature (in some locations) during periods of important feature behaviour and feature response to pressure	**Low (fish general)** **Low-Medium (basking shark)**

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
Underwater noise changes and visual disturbance – Marine mammals (seals and cetaceans from wildlife watching at sea)	**Medium-High** depending geographical location of activity and as vessel likely to be seeking interaction, particularly with cetaceans (expert judgement)	Evidence of pressure causing changes behaviour, including reduced resting and foraging and changes in swimming direction. Vessels crossing feature path, travelling at speed and approaching closely result in increased disturbance (medium) Neutral or positive responses of cetaceans to vessels (bow riding) also regularly observed (high)	**Medium–High**	**Medium–High** based on confidence in evidence base showing disturbance effects and sensitivity to pressure. Higher risk may occur where there are relatively high (or increasing) numbers of commercial tour operators (i.e. cumulative impacts) (expert stakeholder opinion)	**Medium**
Above water noise changes and visual disturbance – seals (hauled out only; activity on land and at sea)	**Low–High** depending on geographical location of activity (e.g. in relation to accessibility of colony) and time of year (expert judgement)	**On land** - Evidence of 'flight response' of seals to general human presence on the foreshore (high) **At sea** - Evidence of seals dispersing into sea (flushing) when motorised vessels generally within 150-200m and response being more influenced by boat speed of approach rather than distance (high)	**High** - hauled out seals sensitive to visual disturbance (medium) Evidence suggests common seals more sensitive to pressure than grey seals (high)	**Medium–High** based on strong evidence base for impact and high feature sensitivity	**Medium**
Above water noise changes and visual disturbance – Birds (activity on land and at sea)	**Low-High** depending on geographical location of activity and whether activity on land (potentially lower level of overlap) or at sea (potentially higher level of overlap if vessel specifically seeking interaction e.g. with seabird colonies) (expert	**On land** – Evidence of flight response to human presence on the foreshore (such as birdwatchers) at approach distances of between 20 m and 100 m, with flight response, with distances > 200m for some sensitive species (high) **At sea** - Evidence of	**Low-High** 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 (high)	**Medium–High** based on the range of potential for overlap between pressure and feature and the high sensitivity of some species to the pressure	**Low-Medium**

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
	judgement)	disturbance events from motorised vessels occuriing within 50-100m of the receptor, with vessels approaching at faster speeds eliciting higher disturbance (high) Direct evidence of impact on diving seabirds limited, however, pressure is likely to cause an evasion responses (expert judgement)	Certain behavioural activities are considered more susceptible to disturbance e.g. nesting seabirds or breeding birds (expert judgement)		