

Conservation and Management Advice

RED ROCKS AND LONGAY POSSIBLE MPA

FEBRUARY 2022

This document provides advice to Public Authorities and stakeholders about the activities that may affect the protected features of Red Rocks and Longay possible Marine Protected Area (MPA). It provides advice from Scottish Natural Heritage, (operating under the name of and hereinafter referred to as NatureScot) under Section 80 of the Marine (Scotland) Act 2010, to public authorities as to matters which are capable of damaging or otherwise affecting the protected features of MPAs, how the Conservation Objectives of the site may be furthered or their achievement hindered and how the effects of activities on MPAs may be mitigated. It covers a range of different activities and developments but is not exhaustive. It focuses on where there is a risk to achieving the Conservation Objectives. The paper does not attempt to cover all possible future activities or eventualities (e.g. as a result of accidents) and does not consider cumulative effects.

Further information on marine protected areas and management is available at -

<https://www2.gov.scot/Topics/marine/marine-environment/mpanetwork>

For the full range of MPA site documents and more on the fascinating range of marine life to be found in Scotland's seas, please visit -

www.nature.scot/mpas or www.jncc.defra.gov.uk/scottishmpas

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1 Overview of document

This document provides details of the Conservation and Management Advice for Red Rocks and Longay possible Marine Protected Area (pMPA) and it is divided into eight main sections. The introduction in section 2 gives an overview of Red Rocks and Longay pMPA and its contribution in terms of conservation and wider benefits. Section 3 provides an overview of the roles of the various bodies involved with advising, regulating and managing the marine protected area. Section 4 describes the protected features and their condition and section 5 introduces the Conservation Objectives for the site. Section 6 describes the threats and pressures to which the protected features are sensitive and section 7 provides the management advice for these activities. Section 8 identifies what further research and surveys may be required to increase our understanding of how the protected features utilise the site for which they are designated.

2 Introduction

2.1 Purpose statement

The Red Rocks and Longay pMPA has been proposed to protect flapper skate as well as the geodiversity feature Quaternary of Scotland. By doing so it contributes to the Scottish, UK and other wider MPA networks, the conservation of the wider marine environment around Scotland, and progress towards Good Environmental Status. The main purpose of the Red Rocks and Longay pMPA is to conserve the protected features in favourable condition. This makes a contribution to the OSPAR MPA network in the North-East Atlantic.

2.2 Conservation benefits

Red Rocks and Longay pMPA provides conservation benefits by affording protection to flapper skate (biodiversity) and the Quaternary of Scotland (geodiversity). Flapper skate is a species listed by OSPAR as a threatened and declining species and also considered Critically Endangered in the NE Atlantic by the IUCN. In summary the conservation benefits of this designation are:

- Protecting flapper skate adults whilst using the egg-laying habitat.
- Protecting flapper skate eggs for the duration of their development from laying to hatching.
- Protecting juvenile flapper skate as they hatch and emerge from the eggs.
- Protecting important egg-laying habitat to ensure ongoing use by multiple adult females.
- Affording protection to an outstanding range of glacial bedforms that are of international scientific importance for our understanding of these historic processes and which underpin the flapper skate egg-laying habitat in this site.

2.3 Wider benefits

The protected features of the pMPA provide ecosystem services locally and to the wider marine environment. We describe these ecosystem services in terms of their functions and natural resources, which in turn lead to benefits for people.

Figure 1 illustrates how the protected features of Red Rocks and Longay pMPA contribute to benefits for people. There can be many complex interactions and

dependencies amongst the protected features, their functions, associated natural resources and the benefits we gain from them.

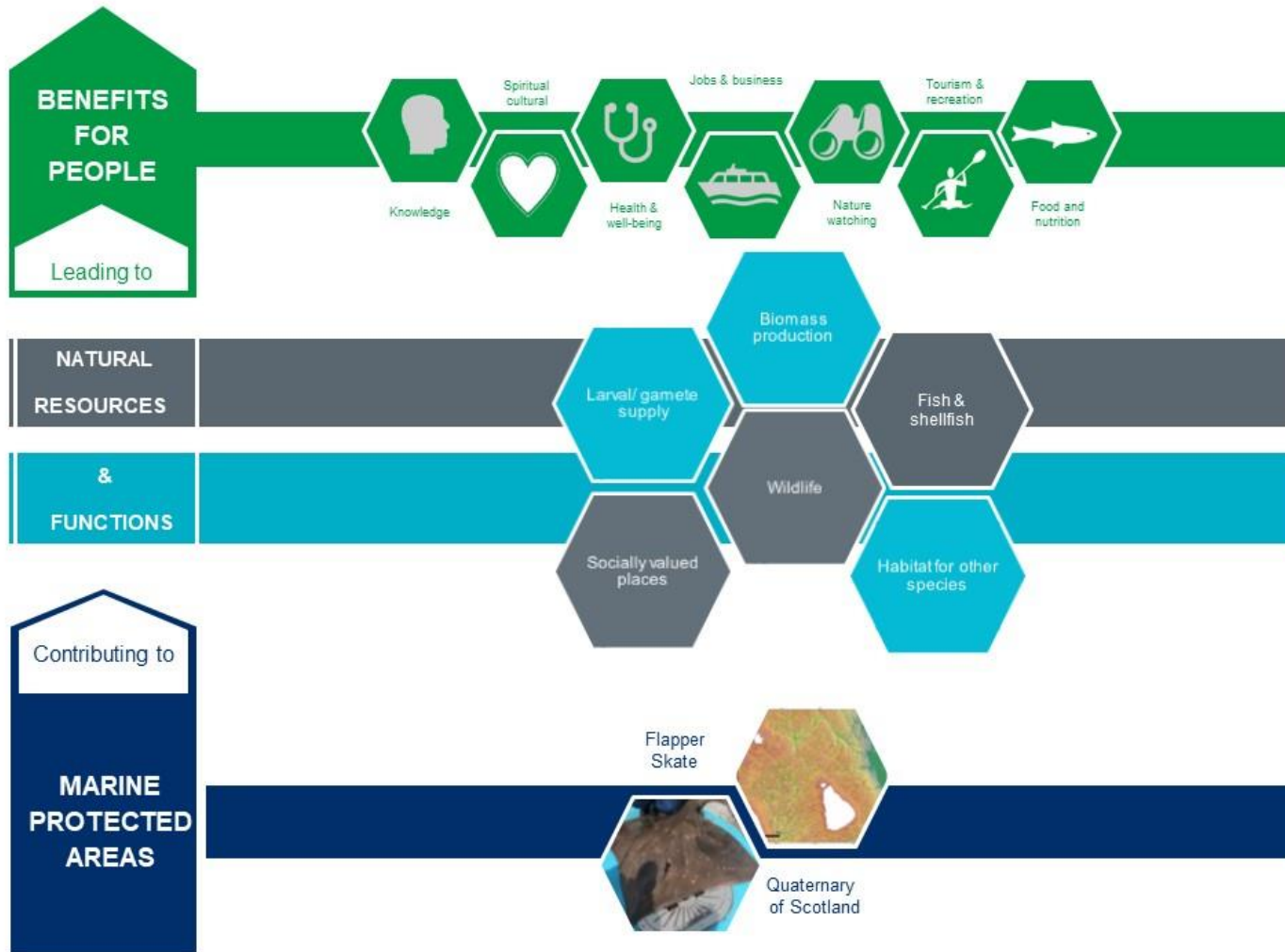
The functions associated with the protected features of Red Rocks and Longay pMPA are described in Annex 1, as part of the site's Conservation Objectives. Flapper skate, especially when taken within the context of the whole MPA and/or local ecosystem, contribute to certain functions more than others (e.g. biomass production) and are fundamental to the continued supply of natural resources and benefits associated with this pMPA, and to the long-term health of the protected feature.

In terms of resources, the pMPA sits within the Inner Sound between Skye and the Applecross peninsula on the mainland. The narrowing of the sound, with its many islands and open northern end to the Minch provides unique and varied conditions that support an array of wildlife. The pMPA itself sits on a raised bedrock platform that has numerous rocky outcrops often fringed and overlain by boulders and cobbles, remnants from glacial times. Mixed sandy sediments are widespread amongst the rocky outcrops and boulder banks with scattered pockets of finer silty sands and mud. This range of seabed habitats provides protection and homes for a diversity of associated flora and fauna.

The rich and varied natural resources present within the pMPA contribute to a wide range of benefits for people. The wider area supports fish and shellfish, including juveniles, and offers opportunities for tourism, recreational boating and diving, and wildlife watching, all of which encourage local jobs and businesses. Further benefits relating to health and well-being, food and nutrition also arise from the site's natural resources, resulting in a place where communities and visitors can spend time connecting with and enjoying nature.

The benefits that arise from the functions and natural resources of the pMPA are typically small in the context of the whole of Scotland, but some are of greater importance for this pMPA and the people that use it. There is potential for benefits to be enhanced. This may be achieved by improving the quantity or quality (health) of the protected features themselves and/or through promoting, for example, more recreational enjoyment or use of natural resources that is compatible with the site's Conservation Objectives.

Figure 1 Benefits to people associated with protected features of the Red Rocks and Longay pMPA.



2.4 Contribution to policy commitments

Managing this MPA to conserve flapper skate and the Quaternary of Scotland geodiversity feature will ensure the continued provision of the benefits above as well as the site's contribution to:

- An ecologically coherent network of MPAs which are well managed under the OSPAR convention and national legislation.
- The protection of flapper skate which is an OSPAR threatened and/or declining species.
- Progress towards achieving Good Environmental Status in relation to biological diversity and marine food webs.
- Protection, enhancement and health of the marine area under the Marine (Scotland) Act 2010.
- Restoring marine and coastal ecosystems and increasing the environmental status of our seas under the Scottish Biodiversity Strategy.
- Helping to adapt to climate change under The Scottish Climate Change Adaptation Programme by increasing the resilience of habitats and species.

3 Roles

This document provides advice for Red Rocks and Longay pMPA in relation to activities that may affect the protected features. More detailed advice can be provided to public authorities to inform their decision-making as required. In doing this, our aim is to ensure the Conservation Objectives for the protected features are met.

Section 80 of the Marine (Scotland) Act 2010 gives NatureScot the remit to provide advice and guidance to public authorities as to the matters which are capable of damaging or otherwise affecting the protected features of Nature Conservation MPAs, how the conservation objectives of the site may be furthered or their achievement hindered, and how the effects of activities on MPAs may be mitigated.

It is the role of public authorities to ensure that the activities they regulate, permit or licence do not hinder the achievement of the Conservation Objectives of Red Rocks and Longay pMPA. The management advice in this document is provided to assist public authorities in managing the activities outlined in Table 2 and carrying out their duties under Section 82 and 83 of the Marine (Scotland) Act 2010.

Stakeholders can provide additional evidence to support the development of management including local knowledge of the environment and of activities. This will contribute to the development of well-designed and effective management measures.

4 Protected features and status

The Red Rocks and Longay pMPA has been selected to become part of Scotland's MPA network that in turn has been established to help conserve and recover a range of Scotland's important marine habitats, wildlife, geology and landforms.

Table 1 provides a summary of the protected features within the pMPA, their condition within the site, and where applicable, their broader conservation status.

The locations and extent of the protected features within the Red Rocks and Longay pMPA are shown on Figure 2. The most up-to-date distribution of the biodiversity features described will be available to view at [National Marine Plan Interactive in due course](#).

Table 1. Protected features and condition for the Red Rocks and Longay pMPA. Feature condition refers to the condition of the protected feature assessed at a site level. Broader conservation status is the overall condition of the feature throughout its range as outlined by the footnotes.

Protected Feature	Feature condition	Assessment date	Broader conservation status (NE Atlantic)
Flapper Skate	Favourable	2021/22	OSPAR: Threatened and/or Declining IUCN: Critically Endangered
Quaternary of Scotland	Favourable	2021/22	N/A

Figure 2i Location of the Red Rocks and Longay possible MPA and distribution of the proposed biodiversity protected feature.

Two single skate egg records that lie outside the boundary of the possible MPA are shown for reference on Figure 2i.

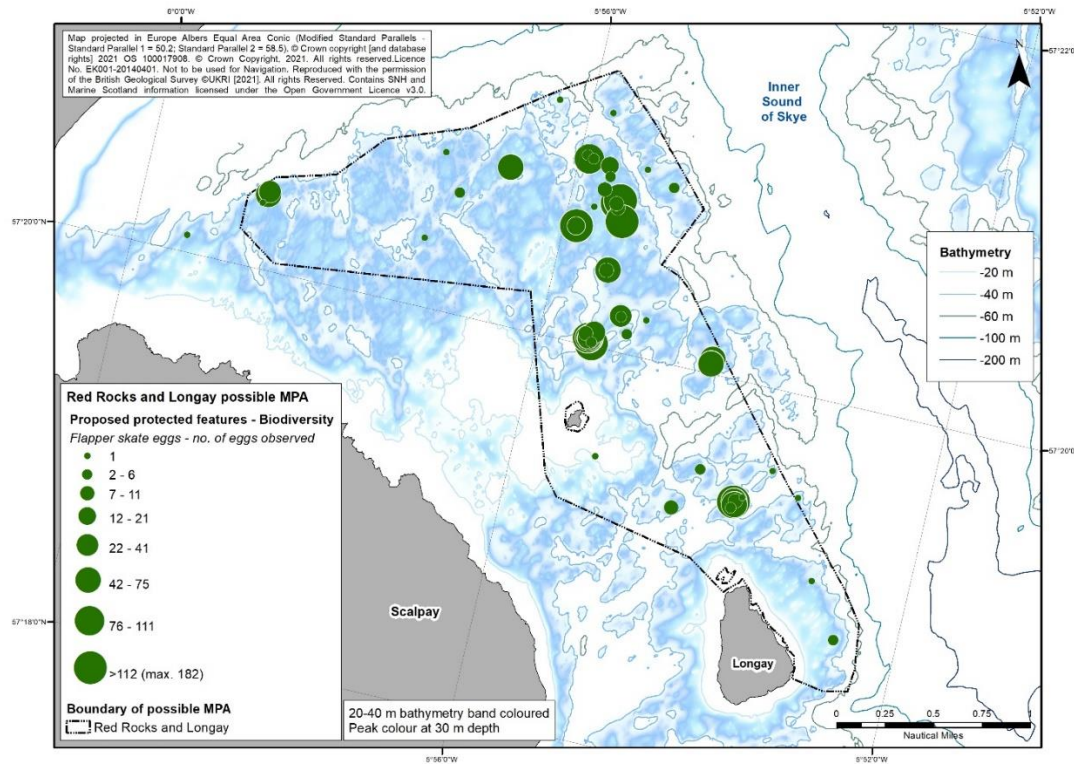
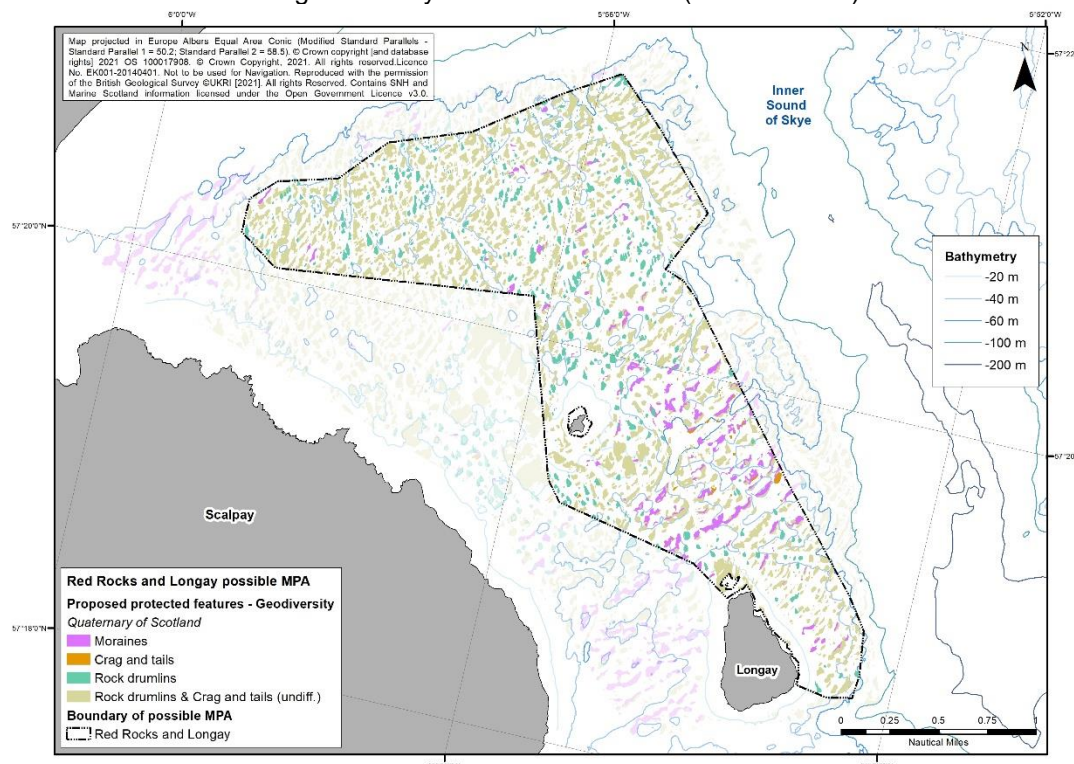


Figure 2ii Location of the Red Rocks and Longay pMPA and distribution of the proposed geodiversity protected feature.

The wider distribution of geodiversity interests are shown (faded colours) for reference on Figure 2ii.



5 Conservation objectives

5.1 Background

Conservation objectives set out the desired quality of the protected features within the Red Rocks and Longay pMPA (Annex 1) and they are in place at the time the site is formally designated. They provide the framework for the setting of site conservation measures (management) and for public authorities in managing the activities outlined in Table 2 and carrying out their duties under Section 82 and 83 of the Marine (Scotland) Act 2010.

5.2 Relationship between feature condition and Conservation Objectives

The Conservation Objectives seek to *conserve* protected feature(s) of a MPA where evidence exists that it is in favourable condition in the site, or where there is uncertainty concerning the assessed condition of a feature (see section 4) but no reason to suspect deterioration in condition since designation. Where evidence exists that a feature is declining and/or damaged and therefore is in unfavourable condition in the site, the Conservation Objectives will seek to *recover* the protected feature.

The proposed protected features are in favourable condition at Red Rocks and Longay pMPA and therefore the Conservation Objectives seek to *conserve* this condition.

6 Feature sensitivity

The following sections provide an overview of the pressures most relevant to the protected features. Further information on feature sensitivity, can be found on the NatureScot webpage - [Feature Activity Sensitivity Tool \(FeAST\)](#). The information in FeAST reflects our current understanding of the interactions between activities, pressures and features. It highlights that activities can give rise to a range of pressures, which the protected features may be sensitive to. Our assessment of sensitivity is based on a feature's tolerance (response to change) and its ability to recover.

6.1 Flapper skate

Flapper skate adults and juveniles are considered to have medium sensitivity to surface abrasion, as they may be able to avoid activities causing this pressure. Flapper skate adults are considered to have low sensitivity to collision since they spend limited time in water shallower than 20 m (Wearmouth and Simms 2009) and are large. Flapper skate are assessed as having a low sensitivity to noise although there is no published work on this topic.

Adults and juveniles are at risk of being captured in trawls and dredges and although they are required to be returned unharmed ([Council regulation 2020/123](#), as amended by [The Common Fisheries Policy \(Amendment etc.\) \(EU Exit\) Regulations 2020](#)) and [SSI 2012 No 63](#)) they could be damaged during this process and assessed as having a medium sensitivity. See also the MPA [Fisheries Guidance note](#) for flapper skate.

Flapper skate eggs are considered to have high sensitivity to surface abrasion since they could be damaged in trawls or dredges and even if they survive could be returned to the seabed in suboptimal conditions for embryo development. Flapper skate eggs are considered to have medium sensitivity to changes in siltation. If eggs were buried by silt this could prevent flow of water through the egg case and prevent embryo development.

6.2 Quaternary of Scotland (moraines, crag and tails, and rock drumlins)

In the vast majority of instances, most pressures associated with marine anthropogenic activities will not be sufficient to impact geological and geomorphological seabed features (Brooks, 2013). However, as all the landforms comprising this feature are relicts of past processes, they are considered to have no resilience or recovery potential (Stewart *et al.*, 2022).

Moraines are generally considered highly sensitive to removal of substrates and have a medium sensitivity to changes in tidal water flow, wave exposure and sub-surface abrasion. The moraines within the Red Rocks and Longay pMPA are likely to be less sensitive due to the large size and robust nature of the boulders. The crag and tails and rock drumlins are likely to be highly resistant (having been formed originally by glacial erosion) and might be considered not sensitive or to have a low sensitivity to pressures arising from human activities.

7 Management

7.1 Advice to support management

Table 2 provides NatureScot's advice to support management for activities where we consider this may be necessary to achieve the Conservation Objectives for the protected features. The advice is focused on the activities that cause an effect (a pressure) that a feature is sensitive to. Pressures can be physical (e.g. abrasion of the seabed), chemical or biological. Different activities may cause the same pressure, e.g. fishing using bottom-contacting gears and aggregate dredging both cause abrasion that can damage the surface of the seabed and associated species.

Our advice takes a risk-based approach, i.e. we are focusing on providing advice where we believe there is a risk to achieving the Conservation Objectives. We have identified risks to achieving the Conservation Objectives where there is an overlap between protected features and activities associated with pressures that the features are sensitive to. We have provided management advice to support public authorities and others in managing these risks. Our advice is based on existing data and information on protected features and relevant activities and our understanding of the relationships between the features and activities. We have identified a range of management advice:

- management to remove or avoid pressures;
- management to reduce or limit pressures; or
- no additional management required.

For our advice on fisheries management we have also stated where we think this should be 'considered' or 'recommended'. The term 'considered' is included to highlight that a fishery-feature interaction exists, but circumstances mean that a

specific recommendation for action cannot / or need not be made at this point. However, there is sufficient cause to make fishery managers aware and for them to consider if a fishery management measure may be helpful in achieving the Conservation Objectives - particularly where there may be a synergy between the benefits of management actions for the fishery and the Conservation Objectives for the feature. The term 'recommended' highlights that a fishery-feature interaction exists, there is a reasonable evidence base and a specific recommendation can be made / justified.

New or other activities would need to be considered on a case-by-case basis.

We recognise that stakeholders can provide local environmental knowledge and more detailed information on activities, including in relation to intensity, frequency and methods. This additional information will help public authorities and others develop more specific management, focussed on the interaction between features and activities. If new information becomes available, our management advice may be revised.

Activities that are considered not likely to affect the protected features other than insignificantly) are listed in Table 3. Spatial data relating to the location and extent of the activities listed can be accessed on [Marine Scotland's National Marine Plan Interactive](#) (where available).

7.2 Best Practice

In our management advice for activities in Table 2 we refer to the development, adoption or use of 'best practice' as a way of managing interactions between activities and the features. Best practice is taken to mean approaches or procedures that are developed and accepted by regulators and relevant stakeholders as being an effective way of dealing with an interaction between a habitat or species and the pressures created by an activity. Much of this best practice is already being implemented by sectors and regulators, e.g. pre-application discussions between developers and regulators, the Scottish Marine Wildlife Watching Code and Technical Standards for Scottish Finfish Aquaculture.

7.3 Conservation Measures

Activities and developments subject to licensing that could affect the protected features of the pMPA also need to be assessed. Authorities need to determine whether if by carrying out their duties e.g. permitting an activity to take place, it would hinder the achievement of the Conservation Objectives of the pMPA. This is referred to as an assessment under Section 82 or Section 83 of the Marine (Scotland) Act 2010.

There is currently a [Marine Conservation Order](#) in place for the Red Rocks and Longay Urgent MPA, which highlights site-specific conservation measures in place for flapper skate. Marine Scotland is consulting on the permanent management measures..

8 Research and survey requirements

We recognise that there are still important gaps in our understanding and knowledge of the features of this site. We will identify research and survey projects to inform our

understanding of these aspects. The requirements identified below are not a commitment to undertake this work. However, by highlighting these gaps we hope to inform future discussions with parties interested in undertaking research in this site and/or on these features, to help direct research and aid monitoring priorities.

- Further research to investigate the movements of adult flapper skate around Red Rocks, when they are visiting the site and where they are coming from.
- Analysis of DNA samples collected from eggs in the MPA to determine how many female skate are using the site for egg laying and where the females come from.
- Further research to investigate presence / absence of juveniles in the site and where they go after hatching.
- Additional seabed habitat sampling to define the full extent of suitable habitat across the MPA and the density of flapper skate eggs in different areas.

Table 2. NatureScot’s advice to support management for Red Rocks and Longay possible MPA for activities that are considered capable of affecting the proposed protected features

The potential for cumulative effects (e.g. related to noise, disturbance) needs to be taken into account. The geodiversity feature is closely associated with the skate egg-laying habitat (although much less sensitive), therefore advice to support management for the egg-laying habitat is also applicable for the geodiversity feature - so it is not considered separately in the table below.

Activities considered capable of affecting the proposed protected features	Advice to support management for flapper skate
Aquaculture	<p>Remove or avoid pressures Avoid potential impacts from pressures associated with new farms and undeveloped consents as well as the expansion or relocation of existing farms (e.g. physical and waste depositional footprints, including the anchoring/mooring of any associated vessels/infrastructure), by avoiding overlap with flapper skate egg-laying habitat.</p>
Anchorage and moorings	<p>Remove or avoid pressures Avoid the potential effects from pressures associated with new anchorages and moorings (e.g. abrasion and siltation and physical change) by avoiding overlap with flapper skate egg-laying habitat.</p>
Cables and pipelines	<p>Remove or avoid pressures Avoid the potential impacts from pressures associated with new cables and pipelines (e.g. abrasion, physical change and siltation), by avoiding overlap with flapper skate egg-laying habitat.</p>
Coastal development e.g. construction of piers, slipways, jetties etc.	<p>Remove or avoid pressures Avoid the likely effects from pressures associated with new coastal development (e.g. siltation, abrasion, physical change and chemical contamination) by avoiding overlap with egg-laying habitat.</p> <p>Reduce or limit pressures Reduce the potential risks of disturbance to flapper skate from activities associated with high source levels of underwater noise within elasmobranch hearing range (~20Hz – 1kHz) or from barotrauma e.g. pile-driving and blasting (note there is no published work for flapper skate directly). We encourage early pre-application discussions to discuss techniques and methods to decrease the potential impacts from underwater noise on flapper skate. This may involve noise abatement technology, pile management strategies etc.</p>

Activities considered capable of affecting the proposed protected features	Advice to support management for flapper skate
Fishing - demersal mobile/active gear	<p>Remove or avoid pressures</p> <p>The exclusion of mobile/active bottom-contacting gear over flapper skate egg-laying habitat <i>is recommended</i>, to avoid potential impacts from pressures associated with this (e.g. mortality of eggs and impact on suitability of habitat to support eggs as a result of surface abrasion, siltation and physical change).</p>
Fishing - static gear	<p>Remove or avoid pressures</p> <p>Management measures to remove or avoid fishing with long-lines, drift nets and nets set on the seabed (tangle, trammel, gill) from areas used by flapper skate <i>is recommended</i> (to avoid mortality of adults through bycatch or entanglement).</p> <p>Reduce or limit pressures</p> <p>Management measures to reduce or limit the intensity of creel fishing within flapper skate egg-laying habitat <i>should be considered</i> to reduce potential impacts from pressures associated with creeling (surface abrasion, physical change).</p>
Fishing - recreational	<p>Remove or avoid pressures</p> <p>The exclusion of angling for flapper skate <i>is recommended</i>, to avoid impacts from potential disturbance or stress associated with angling (e.g. premature egg deposition), as adult females in the site are more likely to be at the egg-laying stage of their life cycle.</p>
Marine deposit sites	<p>Remove or avoid pressures</p> <p>Avoid the potential impact from pressures of new deposit sites and or reopening of disused/closed sites (e.g. siltation and chemical contamination affecting eggs directly or indirectly via changing habitat) to ensure that the egg-laying habitat is maintained in extent and suitability.</p>

Activities considered capable of affecting the proposed protected features	Advice to support management for flapper skate
Military - planned exercises	<p>Reduce or limit pressures</p> <p>Reduce the risks of potential disturbance to flapper skate from activities associated with high source levels of underwater noise in hearing range (~20Hz – 1kHz) or barotrauma (e.g. sonar activities, explosives) or potential impacts to eggs and egg-laying habitat from seabed surface activity by following the advice of Environmental Protection Guidelines (Maritime) (EPG(M)) when in the vicinity of MPAs. The Maritime Environmental and Sustainability Assessment Tool (MESAT) will be used to undertake an assessment when military exercises are required contrary to the advice of EPG(M). See Royal Navy - Environmental Protection for more details.</p>
Scientific survey/research (incl. scientific diving/citizen science)	<p>Reduce or limit pressures</p> <p>Pressures associated with scientific survey and studies (including diving and citizen science) with the potential to cause impacts, disturbance to or removal of flapper skate and / or their eggs, or the alteration of egg-laying habitat should be minimised. An assessment of risk (including cumulative) and agreement of methodology and/or best practice would achieve this, either through the Marine Licence exempted activity process, or through consideration of unlicensed activities (as described in the Marine (Scotland) Act 2010 – Section 95).</p>
Seismic and other broadscale acoustic surveys	<p>Reduce or limit pressures</p> <p>Minimise the potential impact of pressures associated with seismic or other acoustic surveys which may cause injury or disturbance to flapper skate (e.g. high source levels in hearing range (~20Hz- 1kHz), barotrauma, and cumulative sound issues). We encourage early engagement to discuss techniques and methods to decrease the potential impacts from underwater noise on flapper skate.</p>

Table 3. Activities that are considered not likely to affect the proposed protected features (other than insignificantly). The table lists specific examples of activities rather than the broad activity types. New plans or projects will still need to be considered by the relevant competent authority (see Table 2 for further details)

Activity	Comments
Commercial hand diving for scallops or other species	Existing or new commercial hand diving for shellfish species is considered unlikely to disturb flapper skate (other than insignificantly) or cause impacts to the eggs, or egg-laying habitat. Commercial, hand-gathered shellfish species occur on different substrate to the boulder and cobble habitat where eggs have been found at this site.
Recreational diving	Recreational diving involving the <i>in situ</i> observation of marine life is considered unlikely to disturb flapper skate (other than insignificantly) or cause impacts to the eggs, or egg-laying habitat provided that the eggs are not handled (although see Scientific survey/research in Table 2).

Annex 1. Red Rocks and Longay possible MPA Conservation Objectives

The box below provides the high-level Conservation Objective statements. The full Conservation Objectives, which includes site-specific advice and information on the feature of this possible MPA, are provided in the tables that follow.

The site-specific advice and information provides more detail in relation to each of the high-level Conservation Objective statements for each feature type, e.g. detail on the extent of a habitat within a site and what the supporting features are for a species.

Information is also provided below on how minor changes to features should be considered and the influence of environmental change on features, particularly in relation to climate change for context.

A definition of the terms used is in the Glossary (Annex 2).

A map of the possible MPA, the location of the features and the place names mentioned in the site-specific information is provided in Figure 2.

Red Rocks and Longay possible MPA
Protected features: Species - Flapper skate Geomorphological features - Quaternary of Scotland (moraines, crag and tails, rock drumlins)
<p>The Conservation Objectives of the Red Rocks and Longay possible MPA, are that the protected features</p> <ul style="list-style-type: none">• so far as already in favourable condition, remain in such condition; and• so far as not already in favourable condition, be brought into such condition, and remain in such condition. <p>“Favourable condition”, with respect to a mobile species of marine fauna, means that</p> <ol style="list-style-type: none">a) the species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;b) the extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; andc) the structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating. <p>“Favourable condition”, with respect to a feature of geomorphological interest, means that</p> <ol style="list-style-type: none">a) its extent, component elements and integrity are maintained;b) its structure and functioning are unimpaired; and

- c) its surface remains sufficiently unobscured for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied.

For the purpose of determining whether a feature of geomorphological interest is sufficiently unobscured under paragraph (3)(c), any obscuring of that feature entirely by natural processes is to be disregarded.

For the purpose of determining whether a protected feature is in favourable condition any alteration to that feature brought about entirely by natural processes is to be disregarded.

Consideration of minor changes to features

Temporary short-term and/or minor changes in the proposed protected features due to human activity may be considered not to compromise the Conservation Objectives and will be considered on a case-by-case basis. Assessments should consider the timing, duration and scale of the impact on the features and their ability to recover. Factors determining the potential for features to recover following temporary deterioration vary between features. These are described in more detail in Annex 2 “*Factors determining the potential for features to recover*”.

Environmental change

The Conservation Objectives recognise and acknowledge that the protected features of the pMPA are part of a complex, dynamic and multi-dimensional marine environment. Mobile species are exposed to a wide range of drivers of change. This may include changes to the habitats or resources that they rely on during their natural life cycle, and also broader environmental changes, i.e. those related to climate change and environmental variability that are beyond the scope of the pMPA.

Any alterations to the proposed protected features that are brought about entirely by natural processes are to be disregarded when assessing against the Conservation Objectives.

In relation to the Red Rocks and Longay pMPA and its protected features, the following effects of climate change are relevant as outlined below. These effects should be taken into account when considering plans and projects within Red Rocks and Longay pMPA as additional pressures may reduce the protected feature’s resilience to climate change, and additionally climate change impacts may start to hinder their ability to recover from human activities.

Flapper skate

Adult flapper skate are mobile and capable of swimming large distances yet remain resident in selected areas such as the Loch Sunart to the Sound of Jura MPA (Neat *et al.*, 2015). Flapper skate eggs, juveniles and adults are thought to require different habitats to sustain them through the different life stages (Dodd *et al.*, in press). Climate change is expected to produce a shift in the range of flapper skate as it is anticipated they will track water temperature changes in order to remain within their ecological niche. This has the potential to move them away from optimal physical conditions (e.g. temperature, salinity and water flow) for the development of eggs, the growth of

	<p>juveniles and the reproduction of adults and may hinder their ability to recover from impacts caused by human activities. In a recent paper flapper skate were described as inhabiting more variable and cooler areas which suggests they might be relatively resilient to climate change requiring less range shift (Frost <i>et al.</i>, 2020). However, large, mature flapper skate have a preference for deep (100+ m) trenches and are known to forage and lay their eggs in shallow water (Thorburn <i>et al.</i> 2021, Dodd <i>et al.</i> in press) so if the temperatures at any of these habitats are altered as a result of climate change it could place the flapper skate at increased risk. Ecosystem change involving the loss of apex predators such as flapper skate could also lead to an alteration in ecosystem functioning, however it is possible that the ecological niche vacated by flapper skate could be filled by another species, which also alters its range because of climate change.</p>
<p>Quaternary of Scotland</p>	<p>As erosional features formed by ice over millennia, the crag and tails, and rock drumlins are likely to be highly resistant to climate change. The resilience of the moraine deposits depends upon the composition and level of consolidation of the sediment. Most morainic material observed to date within the MPA comprises large, well-consolidated boulders which are likely to be resistant to climate driven large-scale changes in water flow, wave exposure and sedimentation.</p>

MOBILE SPECIES

Species is conserved		
<p>The boxes below provide the site-specific advice on the ‘<i>species is conserved</i>’ element of the Conservation Objectives. Information on ‘<i>Continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds</i>’ is provided separately below.</p>		
Feature	Site specific advice	Site specific information
Flapper skate	<p>Conserve the distribution and numbers of flapper skate eggs within the site.</p> <p>and</p> <p>Flapper skate within the Red Rocks and Longay pMPA are not at significant risk from injury or killing.</p>	<p>The number of eggs and their distribution is unique to the site in Scotland (and there are no comparable records globally that we are aware of), based on current survey information and is of significant importance for flapper skate. Egg numbers range from individual records to multiple clusters of numerous eggs (>50-60 eggs per cluster at some locations), many slotted into crevices with others in looser piles/clumps. The greatest number of eggs observed at a survey station in 2021 was 182. This was on a 40-minute remotely operated vehicle (ROV) ‘flight’ (NatureScot, 2021, 2022). There are still aspects around biology of egg laying that we do not fully understand such as how many eggs are laid at a time, how frequently eggs are laid and whether individuals have preferred locations in which to lay eggs. Egg distribution is intrinsically linked to the distribution of suitable habitat, which in this location comprises large boulders and cobbles (and the recesses in between) at waters depths between 25 and 40 m. Whilst potentially suitable egg-laying habitat extends across the whole of the possible MPA, current egg records have an uneven distribution reflecting some repeat sampling of previous stations; the application of multiple survey methods at a subset of confirmed egg sites in 2021 and the targeting of the depth band previously known to support eggs in this location. Future studies may extend the known egg depth range and further egg records are anticipated both within and potentially around the margins of the pMPA.</p> <p>This Objective seeks to conserve flapper skate by minimising the risk to the animals from injury or killing. For the purposes of MPA assessments flapper skate are only protected when they are within the site. Any activities that take place within or outside the pMPA that could potentially kill or injure flapper skate in the pMPA should be considered in assessments.</p>

		<p>The interpretation of 'significant' risk from killing or injury will depend on factors including the scale of the impact, the duration of the activity and measures that are put in place to minimise the risk. An important consideration is whether any killing or injury would result in reduced densities within the site, from which recovery cannot be expected. Flapper skate are classed as Critically Endangered by the IUCN. The pMPA is one of very few known areas in North East Atlantic and the world where flapper skate lay eggs in such large numbers and densities. Significant levels of killing or injury within the pMPA therefore could affect flapper skate at a wider scale due to the importance of the pMPA for egg laying.</p> <p>Distribution and numbers of adults within the site is unknown, although the records of large number of eggs and the range of stages of their development points to multiple female adults using the site for laying eggs.</p> <p>Little is known about how long juvenile skate remain close to their hatching locations. Observations of other species of skate show they use separate egg and juvenile nursery habitats with each having suitable conditions for their successful development (Hoff 2008, Hoff 2016). Limited bycatch and survey information in Scotland suggests that juvenile flapper skate move to shallow muddy substrate immediately after hatching.</p> <p>The pMPA complements existing fisheries measures for the protection of flapper skate provided by both domestic legislation (SSI 2012 No 63) and Council regulation 2020/123, as amended by The Common Fisheries Policy (Amendment etc.) (EU Exit) Regulations 2020 prohibiting the retention on board or landing of flapper skate (and blue skate) by both commercial and recreational fishers.</p> <p>Licensed activities should consider flapper skate in the pMPA via consenting processes and focus on pressures from activities likely to cause injury to adults, juveniles or eggs</p>
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		Unregulated activities (e.g. not subject to licensing, consenting) should be considered against this conservation objective.
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Continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds.

The boxes below provide the site-specific advice on the ‘*continued access...*’ element of the Conservation Objectives. Information on ‘*The species is conserved*’ is provided separately above.

Feature	Site specific advice	Site specific information
Flapper skate	<p>Conserve the access for adult flapper skate to resources provided by the pMPA.</p> <p>and</p>	<p>For the purposes of the pMPA assessments any activities, whether they take place within or outside the pMPA, should be considered if they have the potential to reduce access to resources within the pMPA by flapper skate.</p> <p>Resource in this context is the egg-laying habitat, where evidence highlights this consists of large boulders and cobbles on elevated or sloping ground in 25- 40 m of water. This habitat provides crevices where eggs can be lodged such that they are prevented from being moved about. Egg-laying habitat is closely associated with the Quaternary of Scotland geodiversity feature of the pMPA. Analysis of a recent acoustic multibeam dataset from the area, initially undertaken to guide the 2021 survey work, subsequently underpinned the development of predictive seabed habitat and geodiversity feature mapping (Stewart <i>et al.</i>, 2022). These products provide a detailed interpretation of seabed terrain and illustrate the distribution of potentially suitable egg-laying habitat across the site. The mapped moraine geodiversity features appear to offer particularly favourable egg-laying habitat in terms of the quantity, extent and elevation of boulder substrates where other physical parameters are also suitable (e.g. water depth, water flow, silt levels etc.). Extensive areas of boulder and cobble moraines present around and on top of the numerous rocky crag and tails, and rock drumlins are also used for egg laying. However, these areas of habitat cannot be distinguished from the adjacent / underpinning bedrock due to similarities in their acoustic signatures.</p> <p>Access to egg-laying habitat resource could be restricted by physical barriers and /or significant disturbance.</p>

	<p>Conserve the access of flapper skate to resources within the site by avoiding significant disturbance.</p>	<p><u>Physical barriers</u> Only large-scale or multiple physical barriers or obstructions are likely to restrict access to resources to the extent that may result in significant impacts to egg-laying.</p> <p><u>Significant disturbance.</u> Angling for adult flapper skate has the potential to cause physical damage, physiological stress (Cole <i>et al.</i>, <i>in prep</i>) and irregular post-release behaviour in the individuals captured (Lavender <i>et al.</i>, <i>in prep</i>). This can include occasional premature deposition of eggs by pregnant females (Benjamins <i>et al.</i>, 2021). It is currently not clear how significant these disturbances are to flapper skate egg laying behaviour. Angling has been linked to morbidity and mortality for other elasmobranchs (e.g. Skomel, 2007, Gallagher <i>et al.</i>, 2017), but continued recapture of flapper skate by anglers at the same site suggests disturbance and damage of adults captured is minimal (Neat <i>et al.</i>, 2015 and evidence from Skatespotter, Jan 2022).</p> <p>Disturbance could also potentially occur from activities causing underwater noise at high sources levels (within elasmobranch/skate hearing range, ~20Hz - 1kHz or via barotrauma), although note there is no published literature for flapper skate and this is assumed from literature on elasmobranchs in general (Casper <i>et al.</i>, 2012). Underwater presence of commercial or recreational divers is not considered to cause significant disturbance in light of available video evidence (from elsewhere) of apparent normal skate behaviour captured by recreational divers whilst in close proximity (e.g. https://www.youtube.com/watch?v=iq368l2Rh0&t=188s).</p> <p>It is considered that ‘significant disturbance’ could result in the following effects:</p> <ul style="list-style-type: none"> • long term decline in the use of the site by flapper skate, and consequently a reduced numbers of eggs being laid there; and • changes to flapper skate behaviour such that it reduces the ability of the species to use the site and a subsequent reduced number of eggs being laid there.
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Extent and distribution of any supporting feature and Structure and function of any supporting feature, including any associated processes supporting the species		
Feature	Site specific advice	Site specific information
Flapper skate	<p>Conserve the extent and distribution of any supporting feature upon which flapper skate are dependent</p> <p>and</p>	<p>The main supporting feature for flapper skate is the egg-laying habitat where large numbers of eggs laid by multiple females over multiple years are found in crevices amongst large boulders and cobbles in water depths of 25 to 40 m across the pMPA. This habitat is part of the Quaternary of Scotland geodiversity feature (see below for further detail). In particular, boulder moraines appear to represent preferred habitat for egg-laying at this location. Some of the moraines occur as distinctive ridges mapped in their own right but others form a mosaic around the margins of, and sometimes overlying the crag and tails and rock drumlins that are also broadly distributed across the seafloor of the pMPA.</p>

	<p>Conserve the structure and function of supporting features, including processes to ensure flapper skate are healthy and not deteriorating</p>	<p><u>Extent and distribution</u> Assessments should focus on activities associated with pressures that can reduce the habitat footprint or its distribution across the site. Examples include surface and sub-surface abrasion, physical change and siltation.</p> <p><u>Structure and function</u> Assessments should focus on activities associated with pressures that can damage or alter the physical and biological nature of the habitat and in particular anything reducing the availability of crevices/crannies between the boulders. Examples include surface and sub-surface abrasion, physical change, and siltation, which may displace, remove or alter boulder and cobble habitats.</p> <p>There may be other supporting habitats important for flapper skate, such as deeper muddy water adjacent to the egg-laying habitat, to support adults or other habitats to support emerging juveniles.</p> <p>Note that whilst there is evidence of adult flapper skate using deep (100 m+) muddy/soft sediment habitat in the Loch Sunart to the Sound of Jura MPA (Neat <i>et al.</i>, 2015; Thorburn <i>et al.</i>, 2021), there is currently no evidence to show the use of this habitat close to the Red Rocks and Longay pMPA. Very little is known about habitat preferences of juvenile skate, although there is anecdotal evidence from prawn fishers who have reported catching them on prawn ground (mud in 20 - 30m, <i>pers. comm.</i> James Thorburn).</p>
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GEOMORPHOLOGICAL FEATURES

a) Extent, component elements and integrity		
Feature	Site specific advice	Site specific information
Quaternary of Scotland -	Conserve the extent, component elements	'Component elements' refers to the landforms which make up the feature, namely moraines, crag and tails and rock drumlins (see <i>Glossary for geodiversity terms</i> for

<p><i>moraines, crag and tails, and rock drumlins</i></p>	<p>and integrity of the Quaternary of Scotland feature.</p>	<p>further details), whilst integrity relates to the collective assemblage of these landforms and their inter-relationships.</p> <p>The component elements are distributed throughout the pMPA and the extent of individual interests has been mapped where practicable using high-resolution multibeam data (see Figure 2ii). It is not possible to map all moraine deposits where these overlie bedrock, due to the similarities in acoustic signatures (Stewart <i>et al.</i>, 2022). A number of boulder moraines were amenable to mapping in the centre and northern parts of the pMPA often with a belt-like shape running from the SW to NE. Crag and tails and rock drumlins are found across the entire site, and all components also occur across the wider rock platform outside the pMPA boundaries.</p> <p>The depositional boulder moraines present within the pMPA are likely to have a moderate to high resistance to human activities due to the large size and robust nature of the substrates. Created by the flow of ice over bedrock, the crag and tails and rock drumlins are characterised by erosion resistant geology. As a result, they are also considered to be highly resistant to human activities and are considered not sensitive or to have a low sensitivity, to most pressures arising from human activities. Whilst a loss in the extent of these elements of the Quaternary of Scotland feature is not anticipated, unless they are physically removed it should be noted that all three landforms are relicts of past processes and are considered to have no resilience or recovery potential (Stewart <i>et al.</i>, 2022).</p> <p>Assessments should focus on activities that may significantly alter water flow characteristics as well as those involving significant abrasion or disruption of seabed sediments. A consideration of the scale of the impact or activity in relation to individual component elements and to the full feature should be undertaken in assessments in order to conserve the integrity of the feature.</p>
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(b) Its structure and functioning are unimpaired		
Feature	Site specific advice	Site specific information
Quaternary of Scotland - <i>moraines, crag and tails, and rock drumlins</i>	Conserve the structure and functioning of the feature so that they are unimpaired.	<p>Structurally the Quaternary of Scotland feature is preserved in unsorted mixed and coarse sediments and in bedrock. Given its static and relict status, from a geodiversity perspective the feature has few active functions. The structure of the Quaternary of Scotland feature is considered not sensitive where the landforms are in bedrock. In contrast, the structure of landforms consisting of sediment is likely to have a highly variable sensitivity to pressures arising from human activities. Activities involving the physical removal of sediments, sub-surface abrasion/ penetration of the seabed or changes to local tidal currents may lead to a loss of structure in such landforms.</p> <p>In its entirety, the feature has a function of 'scientific importance' for the understanding of Quaternary ice sheet dynamics and late glacial climate change (Brooks, 2013; Stoker <i>et al.</i>, 2009). This is largely due to the exceptional quality and continuity in which the Quaternary of Scotland feature is preserved. The feature's function of scientific importance may be impaired by activities which are detrimental to its extent, component elements and integrity, as set out above under (a). The geodiversity feature is also functionally linked to the biodiversity feature in providing suitable habitat for flapper skate egg laying (see above for more detail). In addition, the complex and rugged nature of the geodiversity components across the seabed may enhance water mixing and increase productivity.</p> <p>Assessments should focus on activities which may significantly alter water flow characteristics as well as those involving significant abrasion or disruption of seabed sediments. A consideration of the scale of the impact or activity in relation to individual component elements and to the full feature should be undertaken in assessments in order to conserve the integrity of the feature.</p>

(c) Its surface remains sufficiently unobscured for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied.		
Feature	Site specific advice	Site specific information
Quaternary of Scotland - <i>moraines, crag and tails, and rock drumlins</i>	Conserve the surface of the feature so that it remains sufficiently unobscured for the purposes of determining whether the criteria in conservation objectives (a) and (b) are satisfied.	Assessments should focus on whether the activity or development has the potential to obscure the surface of the moraines, crag and tails, or rock drumlins significantly and to the extent that conservation objectives (a) and (b) could not be fully assessed. Whilst the feature as a whole is of a size that is unlikely to be obscured, assessments should consider the degree to which any of the component landforms might be obscured. This will vary greatly according to the size and nature of the component elements concerned. Therefore, the type of data and/or assessment required will vary likewise.

Annex 2. Supporting information

Factors determining the potential for features to recover

Flapper skate

Life history characteristics of flapper skate make them vulnerable and limit their ability to recover: their fecundity is unknown but is thought to be low, their eggs have a long incubation period (18 months, Benjamins *et al.*, 2021) and their age at sexual maturity is high, between 9-26 years for females and 7-16 years for males (Regnier *et al.*, 2021). Their vulnerability is evidenced from historical fishing practices and their current status of Critically Endangered in the North East Atlantic (IUCN), and their inclusion on the OSPAR list of threatened and / or declining species and habitats (as the common skate). The habits of the different life history stages of the flapper skate are not yet fully understood but it is thought that adults, juveniles and eggs spend the majority of their time in very different habitats; this should be recognised in assessments.

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Glossary for Conservation Objectives

Conservation Objective term	Definition
Extent (and distribution)	The “extent” of a feature is the total area that it covers. This should also include consideration of the “distribution” i.e. how it is spread out within the MPA. A feature could be continuous and contained within one area, dispersed in smaller patches over a wider area, or as a mosaic with other habitats/features. Indeed, it could also be a combination of these.
Favourable condition	Favourable condition for each protected feature type for NC MPAs is defined in the box at the start of Annex 1 which summarises the conservation objectives for the site.
Function	The habitat must be able to be maintained in terms of the growth and reproduction of the habitat-forming species (e.g. through self-recruitment of larvae) and also help to maintain the provision of essential ecosystem services that the habitat provides. The text within the supplementary advice explains function in relation to both of these factors for the feature concerned where information is available.
Supporting environment	This includes the following environmental conditions (but is not limited to) which are important for maintaining/restoring the protected features, e.g. hydrography and supporting water

Conservation Objective term	Definition
	currents, chemical water quality parameters, suspended sediment levels, radionuclide levels.
Structure	The structure of a habitat/feature includes what it is created from and what it requires to exist, e.g. habitat forming species, geological features or sediment; the depth of the substrate or thickness or height of the biogenic structures from the seabed; biogenic material forming the structure should still retain a live component where this exists at baseline.

Glossary for Geodiversity terms

Term	Definition
Quaternary of Scotland	<p><i>Interests of scientific importance -</i></p> <p>A range of landforms and deposits associated with the last and earlier British-Irish Ice Sheets, important for:</p> <ul style="list-style-type: none"> • understanding the dynamics of palaeo-ice streams and marine based ice sheets and the links to climate forcing and sea level; • insights into the coupling of ice sheet dynamics, ocean processes, climate, the rheology of the upper mantle, glacio-isostatic adjustment and relative sea-level change; • geomorphological and sedimentary records that augment the terrestrial evidence for the later stages of deglaciation of the last BIS and the subsequent re-expansion of glaciers in the north and west Highlands during the Loch Lomond Stade; • the length and continuity of palaeo-environmental archives that elucidate regional-scale changes in palaeoceanography and climate variations, fluctuations in the timing and extent of the last BIS and changing sedimentation patterns and processes.
Moraines	Moraines are classically defined as constructional ridges composed of till and other glacial deposits, found at the margins of glaciers. Typically they form due to a combination of processes, principally the meltout and flowage of material incorporated into basal ice facies brought to the snout by ice flow; the transport and deposition of material carried supraglacially; and the 'bulldozing' of sediments by the glacier snout. Consequently their compositions vary greatly both spatially and temporally. In cross section subaerial moraines exhibit steep ice-distal slopes,

Term	Definition
	and shallower iceproximal or ice-contact slopes. Morainic forms vary greatly in size from <1m to >250m in height, and their widths and lengths reflect present and past extents of actively melting ice margin. There are many classifications of moraines based on their situation, composition, architecture or genesis.
Crag and tails	Bedrock eminence with an elongate streamlined lee slope, orientated in the direction of former ice flow. Crag and tails result from preferential glacial erosion beneath a mobile ice mass. The stoss end is often a steep knob of resistant bedrock, whilst the lee end is a gently tapering slope of weaker rock or sediment. They are commonly formed beneath zones of relatively fast flowing ice. Crag and tails range from ~10 m to 1 km in length. Larger features >1 km in length are classified as large-scale crag and tails, and may grade into mega-scale glacial lineations. Good large-scale examples are found within the Tweed Valley, Berwickshire, and of course Edinburgh Castle/Royal Mile.
Rock drumlins	Elongate asymmetrical bedrock eminence orientated in the direction of ice flow, with a gentle lee slope and a steeper stoss face. Rock drumlins are the same shape and size as soft-sediment drumlins, with length:width ratios >2:1, lengths typically >10 m and heights <30 m. They have greater morphological diversity than sediment drumlins, often as a result of bedrock structure. Larger forms grade into mega-scale rockdrumlins at lengths >1000 m, and bedrock megafutes at greater elongation ratios (>5:1.) Rock drumlins form by preferential glacial erosion of the surrounding substrate by a warm-based mobile ice mass. Good examples occur on Great Bernera, Lewis; large-scale examples occur in the Annan Valley, Dumfriesshire.