

Devon and Severn IFCA response to NRW and MMO consultation for aggregate dredging, sampling from Area 531, North Bristol Deep, Severn Estuary, MLA/2019/00448 – further clarifications consultation.

Introduction and Scope of Response

Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) is the statutory manager of sea fisheries from baselines out to six nautical miles in English waters within the Authority's District. This includes the English waters of the Severn Estuary SAC. The powers and duties of the D&S IFCA are provided by the Marine and Coastal Access Act (2009). The ten regional IFCAs have a shared vision:

“Inshore Fisheries and Conservation Authorities will lead, champion and manage a sustainable marine environment and inshore fisheries, by successfully securing the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry.”

The D&S IFCA's response, below, focuses primarily on seafish rather than migratory fish (salmon, sea trout, river and sea lamprey, twaite and allis shad and European eel), though some points are also relevant to these migratory species. The Environment Agency is responsible for the management of migratory fish and fisheries relating to these species. The Devon and Severn IFCA fisheries expertise relates to the English waters of the Severn Estuary, although comments on fish and habitats are more generic to the Severn as a whole.

Devon and Severn IFCA has some concerns relating to the adequacy of the Environmental Statement which have not been assuaged by the contents of the Addendum to the ES supplied by the Applicants, and some additional concerns that have been raised during a review of the Addendum. This response will outline D&S IFCA's concerns in the order in which they are raised in the Addendum document. References are made throughout this response to the 'previous D&S IFCA response'; this refers to D&S IFCA's response to the consultation on the Environment Statement for MLA/2019/0448, submitted on 26th February 2020.

Acoustic disturbance

The Applicants state that additional assessments undertaken for the Addendum, in relation to comments on underwater noise, have concluded that effects would be of an insignificant nature given the magnitude of exposure. However, D&S IFCA deem it necessary to highlight that not all evidence or pathways to impact appear to have been considered. D&S IFCA recognise that some previous research has shown mixed responses of fish cortisol levels to acoustic stressors, that stress responses often differ between acute and chronic stressors, and that circulating cortisol levels may decline rapidly in some fish species after stress events. Though the Applicants appear to recognise that long-term cortisol levels may be variable following stress events, they do not appear to adequately account for the downstream physiological impacts of elevated cortisol levels. For example, elevated cortisol can contribute to reduced reproductive success, smaller egg sizes and smaller body sizes of fry. This is relevant to many fish species identified by the applicants as potentially spawning in the area, and to fish migrating through the area to breed. Elevated cortisol has also been

implicated in determining the success or failure of transitioning between salt- and freshwater environments in salmonids. These factors, and their implications for fish experiencing additional acoustic stress from proposed dredging activities, should be considered in greater detail. While the additional vessel movement introduced due to dredging activities is likely to be modest (as highlighted by the Applicants), this vessel movement will also be associated with additional noise from the dredging itself so should not be considered to represent the same level of disturbance as a similarly-sized vessel in transit. The Applicants further state that the noise created through dredging is unlikely to exceed TTS time thresholds due to the intermittent nature of dredging activities and fish movements; however, the Applicants should also consider evidence showing that under some circumstances, intermittent noise can more effectively induce stress than continuous noise (e.g. Nichols *et al.*, 2015), so intermittent noise is still relevant from the point of view of cortisol levels and behavioural avoidance. For further information on changes in cortisol and its physiological impacts, see for example Kalamarz-Kubiak (2017) and Birnie-Gauvin *et al.* (2019).

Representation of the 10m and under sector

In section 2.6 of the Addendum, the Applicants state that “it is important to note that the volume and value of landings from the 10 m and under sector are likely to be underestimated in the data presented below, as there is no statutory requirement for fishermen to declare their catches, which is only captured through sales notes associated with commercial sales of catches over 30 kg in weight. Additionally, the activity of these small vessels is not recorded by the VMS used on vessels over 12 m in length.” While this recognition is welcome, it is not clear how (or if) the applicants have dealt with the uncertainty arising from these points.

Concerns regarding the adequacy of the ES

The Addendum to the ES has not dealt with the concerns raised by D&S IFCA’s original response. Concerns relate to the interpretation of existing evidence, including the lack of critical review of the biases of existing data and how these data apply to the proposed site. The low level of sampling is a particular cause for concern, especially given the potentially inappropriate methodology for characterising the fish community, and the potentially outdated nature of much of the benthic sampling data (some of which is 48 years old). Again, a more critical review of the fish sampling work undertaken and an open discussion of the implications of this for the interpretation of results and resulting risks is urgently needed, alongside additional sampling that is more representative of the area and seasonality of the biological community.

The previous D&S IFCA response stated “The review by Ellis *et al.* (2012) highlights a number of issues relating to data quality which should be borne in mind when interpreting the data and in the introduction states that: “*This report describes the sources, spatial and temporal coverage and limitations of the data, including where there are data gaps. Using the maps in isolation may result in misrepresentations of the data, so in all cases the supporting rationale should be considered.*” Data from national groundfish surveys were the basis for the mapping of the occurrence of juvenile fish and nursery grounds in the Ellis *et al.* (2012) paper, and the methods and locations sampled will affect how well we know a particular location. Because the research vessels used in the surveys rarely fish in water

<20m deep, estuarine sites are not fully represented by the Ellis *et al.* (2012) report. The report also shows that the sampling stations do not enter into the Severn Estuary as far as the Area 531 site. Other biases are introduced when the gear types used are considered. The trawl surveys which underpin the Ellis *et al.* (2012) description of the Bristol Channel were originally designed to sample juvenile plaice and sole, therefore larger bodied species may be able to outswim the trawls and in particular adult rays and skate are likely to be underestimated. The surveys which underpin the Ellis *et al.* (2012) work were generally undertaken on an annual or sometimes biannual (spring and autumn) so do not capture seasonality, which is likely to be of critical importance in the Severn Estuary and inner Bristol Channel where many marine species move in and out of the estuary on a seasonal basis.” The Applicant’s have responded to this with the following, in Section 4.3 of the Addendum: “Ellis *et al.* (2012) caveat that ‘using the [study’s] maps in isolation may result in misrepresentations of the data, so in all cases the supporting rationale should be considered’. Ellis *et al.* (2012) was based on a large number of data sources which used a range of survey techniques including 4 m trawls and otter trawls. In the Bristol Channel, these surveys did not appear to cover the Inner Bristol Channel, instead stopping at the Outer Bristol Channel edge, and the study’s conclusions for the Inner Bristol Channel can thus not be viewed as conclusive. As noted in Section 9.1.1 of the ES, ‘within the Severn Estuary, the additional analyses were an extrapolation and did not survey within this area’. The gear employed in the study was both 4 m beam trawl and larger otter trawls; limitations with regard to trawl surveys were noted in the ES (footnote 8 in Section 9.2.2 of the ES), in that such surveys would only accidentally capture pelagic species, and would be unlikely to adequately sample most commercial shellfish species. Furthermore, as also outlined in the IFCA response, larger bodied species may be able to outswim the trawls and in particular adult rays and skates are likely to be underestimated by such studies.

Furthermore, as the underlying studies were undertaken on an annual or sometimes biannual basis, these would not have fully captured seasonality, which according to the IFCA *‘is likely to be of critical importance in the outer Severn Estuary and Inner Bristol Channel where many marine species move in and out of the estuary on a seasonal basis’.*”

D&S IFCA welcome the recognition that (a) the spatial coverage is insufficient for the purposes of the ES; (b) these surveys would be unlikely to adequately sample pelagic finfish species and shellfish, and that larger-bodied individuals would be unlikely to be present in the surveys; (c) because the underlying studies were undertaken on an annual or sometimes biannual basis, these would not have fully captured seasonality. However, the Applicants have not provided clarification on the implications of these inadequacies for their ES. D&S IFCA would like to reiterate that point (c) here is likely *to be of critical importance in the outer Severn Estuary and Inner Bristol Channel where many marine species move in and out of the estuary on a seasonal basis*, and that the inadequacies of the data suggest that further in-depth data collection is required to establish a formal baseline for the fish assemblage that uses Area 531 for all or part of its life cycle.

The initial D&S IFCA response stated that: “The ES refers to trawl surveys undertaken in Area 470 in 2000. The surveys are described as being undertaken to provide data on epibenthos and fish species and describes the use of a 2m beam trawl in two locations. D&S

IFCA would suggest that this is an insufficient survey to be able to describe the Area 531 fish community adequately. Firstly, a 2m beam trawl is not generally suitable for targeting small- and medium-bodied demersal fish (Cefas 2005), which are better sampled using a 4m-beam trawl (Cefas 2005). Whilst 2m beam trawls are used in Young Fish Surveys, these are specifically aimed at sampling very small juvenile fish, not describing a community. The methods cannot be deemed suitable for medium or large bodied fish which are likely to use the area such as turbot, brill, sole, plaice, flounder, small-eyed, blonde and thornback ray. A justification of the use of a 2m beam trawl and a critical review of its likely effectiveness should be provided in order to make any interpretation of the results meaningful. Additionally, this amount of sampling cannot account for seasonal variations in catch. This is critical in the Severn Estuary/ inner Bristol Channel where many fish move in and out of the area on a seasonal basis. In order to adequately describe the fish use of the area, seasonality must be taken into account, and more frequent surveys undertaken to describe the current (rather than historic) community composition. Similarly, different states of the tide should be considered within the sampling methods. Any survey which aims to characterise the fish use of the site should include seasonal sampling, or at least a critical review of the time of year of sampling and likely capture efficiency for certain species. These comments on the efficacy and relevance of 2m beam trawls also hold for the use of 1.5m Aggasiz trawls used in the 1999/2000 surveys of the North Middle Ground area, which are discussed in more detail below.”

In the Addendum (Section 4.4), the Applicants have stated in response: “Given the lack of other surveys having been undertaken in the Severn Estuary and in the vicinity of Area 531 (to our knowledge), the data presented and reviewed in the ES is considered the best available, robust, evidence to support the EIA. The same evidence has been used and accepted to support EIAs for other nearby dredging sites in the Severn Estuary and inner Bristol Channel. This is considered to be a proportionate approach given the very limited impacts to fish from aggregate dredging.”

Though the data may represent the best *available* evidence, and the same evidence has been used to support other EIAs, D&S IFCA would maintain that additional, more up to date evidence is required to characterise the fish assemblage and provide an adequate baseline for the fish assemblage and for impact assessments and future monitoring. Without a detailed, up-to-date baseline, which is not currently available, it is not possible to be sure that aggregate dredging has “very limited impacts to fish” as stated by the Applicant. For a dynamic environment that is experiencing the effects of climate change (i.e. the Severn Estuary), it is important to understand the *current* status of the fish assemblage, rather than the status of a proportion of that fish assemblage as it existed decades ago based on an assortment of data that was collected decades ago at spatially and/or temporally inappropriate resolutions using inadequate survey techniques.

Addendum Section 4.5: spawning/nursery areas and threatened species

In the concluding comments to Section 4.5, the Applicants state that “juveniles of the following species may nurse in and around Area 531, noting that actual nursery grounds would likely generally be further inshore (with the exception of sandeel): angler fish, bass,

cod, sole, dab, plaice, sandeel, whiting, thornback rays (and possibly other rays recorded in the wider area, such as undulate), tope (shark).”

Additional information has come to light from a charter vessel highlighting that female small-eyed ray have been caught offshore from Minehead, and that some of these females caught recently have had egg sacs ready to be laid. This indicates the potential for small-eyed ray to be spawning in the vicinity of Area 531. Small-eyed ray is a skate species with a preference for sandy substrates that is known to enter estuaries. This species is classified as ‘Near Threatened’ due to its restricted range and patchy distribution, with locally abundant populations that are vulnerable to, for example, overfishing and habitat destruction. The IUCN has stated that this species is near to meeting the criteria for classification as ‘Vulnerable’ (Ellis, 2006).

The Applicants have identified the area as a potential nursery ground for Tope shark. Tope (a) are known to enter large inshore estuaries and bays; (b) have pupping and nursery grounds in these areas, where the young can remain for up to two years; (c) exhibit diurnal patterns of movement between shallow and deeper water; (d) show some preference for sandy substrates, particularly in areas of high tidal flow; (e) are also classified as Critically Endangered by the IUCN, in part due to the steep population declines seen over recent years/ generations (Walker *et al.*, 2020). Factors (a) to (e) here suggest that Tope may be especially vulnerable to the effects of aggregate dredging and may be less likely to be detected reliably in surveys that do not account for diurnal movements. This should be a major concern when considering the potential impacts of the proposed activities.

Addendum Section 4.6

This section is broadly a response to D&S IFCA’s comment that: “The ES compares surveys of the North Middle Ground area (5 km north east of the site) with Cefas regional spawning/ nursery area information to indicate the significance of the North Middle Ground as a nursery/ spawning ground. However, the North Middle Ground surveys used different methods to the Cefas surveys, which were also carried out in very different regions and different depths. This raises further concerns about the relevance of the comparison, and the robustness of the conclusions drawn. Furthermore, the North Middle Ground surveys were conducted in 1999–2000 which, as highlighted above for other surveys, is problematic in terms of (a) the sampling frequency, (b) the age and contemporary relevance of the data, and (c) the lack of consideration of the potential effects of climate change on species’ distributions and abundances. Furthermore, the ES provides no information on the critical differences between Area 531 and North Middle Ground, despite the latter being at least partially intertidal, whereas Area 531 is subtidal and may therefore differ substantially in ecological terms.”

In this section, the applicants state their recognition that “[...]the different sampling methods, depths and comparisons across regions may reduce the confidence in the conclusions drawn. However, given the lack of other surveys having been undertaken in the Severn Estuary and in the vicinity of Area 531 (to our knowledge), the data presented and reviewed in the ES is considered the best available evidence to support the EIA”

As outlined above in relation to another comment, though the data may represent the best *available* evidence, D&S IFCA would maintain that additional, more up to date evidence is required to characterise the fish assemblage, and provide an adequate baseline for the fish assemblage. Only through additional data collection can the Applicants claim to present adequate data that relate specifically to Area 531. D&S IFCA are aware that discussions are ongoing among several organisations to investigate the feasibility of a joint research fund that would provide monetary or in-kind support to research that aims to investigate the marine and fish ecology of the Severn Estuary and Bristol Channel region. Such an initiative would be most welcome, and would provide a means to leverage commercial interest in the region to enhance environmental knowledge and improve outcomes of applications such as this.

Despite the Applicants' comments to the contrary (e.g. Addendum sections 4.7, 4.8, among others), it is not thought that the underlying data used (power station sampling, Ellis *et al.*, 2012 and very limited sampling) are sufficient to fully characterise the fish assemblage and therefore undertake an assessment. Though the Applicants state that "The data presented and reviewed in the ES is considered the best available evidence to support the EIA", and the Applicants also acknowledge that "the use of conventional fish sampling techniques in the Severn Estuary is difficult because of the large expanses of inaccessible intertidal areas and the macro-tidal conditions", D&S IFCA would encourage a more considered application of the precautionary principle.

In the Communication on the Precautionary Principle from 2000, the European Commission clarified that: "Recourse to the precautionary principle presupposes that potentially dangerous effects deriving from a phenomenon, product or process have been identified, and that scientific evaluation does not allow the risk to be determined with sufficient certainty. The implementation of an approach based on the precautionary principle should start with a scientific evaluation, as complete as possible, and where possible, identifying at each stage the degree of scientific uncertainty" (European Commission, 2000). Indeed, the Wingspread definition of the precautionary principle states that "When an activity raises threats of harm to human health or the environment... the proponent of an activity, rather than the public, should bear the burden of proof" (Science and Environmental Health Network, 1998). This has been widely supported. For example (from Science for Environmental Policy, 2017): "The EU REACH Regulation (EC) No. 1907/2006 on chemicals also places the burden of proof on to the supplier or manufacturer, requiring companies to identify and manage the risks associated with the substances they manufacture and market in the EU. They must demonstrate to the European Chemicals Agency how the substances can be safely used, and have to communicate health and safety information to the other users in the supply chain. The Regulation clearly states that its provisions "are underpinned by the precautionary principle" (Article 1(3))".

The parallels with this application are clear: that the burden of proof (in this case in terms of gathering additional, up-to-date, and spatially- and temporally-relevant evidence regarding the composition, local distribution and vulnerability of the fish assemblage) should lie with the Applicants.

Addendum section 4.8

In this section, the Applicants respond to D&S IFCA's previous comment that "because many of the fish species will move in and out of the estuary, seasonally, in relation to food supply and according to tides, many more fish may transition through the Area 531 site than use it habitually or for a specific function", by noting that "The seasonal variation in fish abundance in the Severn Estuary is noted throughout Section 9 and (and Section 12 where relevant). It is recognised because many of the fish species will move in and out of the estuary, seasonally, in relation to food supply and according to tides, many more fish may transition through the Area 531 site than use it habitually or for a specific function."

Though the seasonal fish variation is *noted*, the Applicants do not appear to account for the implications of this, in terms of the inadequacy of the data underpinning their assessments which do not take seasonal (or diurnal) variation into account and therefore cannot adequately characterise the fish assemblage of the area or determine the potential impacts of the proposed activities.

Several of the species highlighted in the ES and Addendum as being present in the area were not detected by site-specific surveys, but have been identified through consultations with the literature and local fishermen (e.g. conger, rays, herring). While these additional consultations have clearly been useful, this is problematic because it highlights that the survey methods used in areas near Area 531 have not been sufficient to accurately or reliably characterise the fish community. In addition, it seems likely that the high inter-survey variation in fish catch reflects not only inter-annual variation in the composition of the community, but also low reliability of the methods used in characterising the community.

Addendum section 4.9

This section deals with interactions between the proposed activities and existing fishing activities, in response to the following comment: "Local commercial fisheries operate out of Minehead, and significant commercial fisheries operate out of North Devon ports, particularly targeting whelk, crab and lobster. The region also has significant recreational sea angling interests. Because of the unsatisfactory coverage of potential impacts on fish in the ES and the potential for changes in estuaries to impact the health of sea fisheries (Elliot 2012), the MMO is not wholly satisfied that the proposed dredging will not interfere with existing fishing activities. Consideration must be made for the potential impacts on fish and potential for changes in estuaries to impact on the health of sea fisheries. It must be clearly outlined how the proposed dredging will not interfere with existing fishing activities."

It is welcome that, as reported in Addendum section 4.9, (a) some local fishers contacted by the Applicants have not been affected by the previous dredging activities; (b) captains / masters of dredging ships are required to report interactions with fishermen, where these occur whilst dredging; and (c) None of the ships operated by TM and HAM have reported interactions with fishermen whilst dredging in Area 470 for the past 10 years. However, this does not account for the nature of the marine environment, in that fish and water movements transcend boundaries such as the outline of the proposed dredging area. Therefore, in addition to concerns about direct physical interference with fishing activities within the dredged area, D&S IFCA has concerns about the impacts on fish within the dredged area that have knock-on effects on fish and fishing outside of the dredged area.

Addendum section 4.10

This section addresses the comment that “Information on changes to particle size collected from cargo gradings must also be used to assess/detect changes to sandeel habitat suitability during periodical monitoring reports and/or substantive reviews”, and the Applicants have stated that “This comment is noted, and sandeel considerations will be included in the regular monitoring reports, which will follow the Regional Seabed Monitoring Plan (RSMP) approach (see Section 8.1 for more detail on the latter).”.

This change from the use of cargo gradings to a RSMP approach is welcomed. However, the wording provided in Section 8.1 of the Addendum is too vague to provide reasonable assurances. The Applicants state that “RSMP *style*” surveys will be undertaken, and that Cefas and NRW will be consulted to define and agree suitable sampling points. However, if a licence is approved, this should only occur if (a) the applicants can commit to all aspects of the RSMP method, and (b) the suitable sampling points and reporting timescales are defined (in consultation with Cefas and NRW) and committed to by the Applicants.

Overall, however, D&S IFCA are also concerned that insufficient regard is given to the sandeel population thought to exist in and around Area 531. The ES states medium to high confidence in the fish ecology impact assessment (Section 9.4); this is despite the fact that the ES identified a potential adverse impact on sandeel (for which the nearby North Middle Ground area is a spawning and nursery ground) and the ES recognised that there is “limited specifically collected data [for sandeel in the Severn Estuary]”. These facts appear to be at odds with high or even medium confidence in any assessment of fish ecology impacts.

Addendum section 4.11

In this section, the Applicants state that they “[...]and their advisors feel that the baseline data [used for the ES] is sufficient for the application, and makes use of the best available, as well as the most recent known data.” While the data may be the *best available*, D&S IFCA maintain that the data are not sufficient grounds on which to conclude that the proposed activities will not have detrimental impacts upon the fish assemblage which forms part of the designated Estuary feature of the Severn Estuary SAC. D&S IFCA reiterate that additional, more up to date evidence is required to characterise the fish assemblage and provide an adequate baseline for impact assessments and future monitoring. Without a detailed, up-to-date baseline, which is not currently available, it is not possible to be sure that aggregate dredging has “very limited impacts to fish” as stated by the Applicant. For a dynamic environment that is experiencing the effects of climate change (i.e. the Severn Estuary), it is important to understand the *current* status of the fish assemblage, rather than the status of a proportion of that fish assemblage as it existed decades ago based on an assortment of data that was collected decades ago at spatially and/or temporally inappropriate resolutions using inadequate survey techniques. Furthermore, D&S IFCA suggest that, in the absence of up-to-date rigorous monitoring of the local area (that also accounts for seasonal and diurnal variation), the precautionary principle should be applied.

Though the Applicants go on to note that “dredging has been ongoing at the area intermittently for 10 years, and that the application requests a fairly small increase to the annual maximum tonnage, and thus a relatively minor increase in potential dredger presence

on the Area”, it is worth considering that the ‘relatively minor increase in potential dredger presence’ is not necessarily the key concern; instead, the majority of the concerns raised by D&S IFCA stem from the large quantities of aggregate proposed for removal from this area, and the impact of this process (rather than vessel presence) on the ecosystem.

Addendum section 5.3

The Applicants here provide additional data from monitoring of activities in Area 470. In Image 2 they show the quantities of material removed and the observed average lowering of the seabed. Though these values are somewhat useful, it would be much more informative if the Applicants were to provide information on the variation about the averages – including the standard deviation and standard error of the mean for the data they present, and the range of lowering observed. Ideally these data would be provided in both an aggregated and survey-by-survey basis, as averaged data, or data aggregated across multiple surveys, may be misleading and preclude the identification of any issues with dredged depths. Data on the depth of the capping layer left would also be beneficial (presented in terms of averages and measures of variation about the average) as this would allow assessment of the Applicants’ ability to leave suitable capping layers (suggested to be a minimum of 0.5m).

Addendum section 7.5

Overall, D&S IFCA dispute the assertion that removing a large quantity of the sandbank feature, as proposed by the Applicants, will not affect the integrity of said feature. The objectives for feature H1110 include the maintenance of the variety and distribution of sediment types across the feature, and the maintenance of the gross morphology of the feature (including its depth and profile). By the nature of the aggregate extraction process, these objectives will be directly impacted. The impact of the works on Annex I habitat in relation to the European Marine Site’s (EMS) integrity and functionality, alongside the protection of the overarching ‘estuary’ feature must be given thorough consideration when considering whether to grant the licence. Though the Severn is a dynamic environment, with a degree of flux in terms of sandbank morphology, aggregate extraction will of course alter the underlying natural processes.

Addendum section 8.3

With regards to monitoring for *Sabellaria*, the Applicants stated that “The applicants confirm that they anticipate including the findings of the Sabellaria sidescan review in the overall Area 531 baseline report”. The ES and Addendum would be stronger and more reassuring if the Applicants would commit to using firmer language throughout for commitments such as this. It would be expected that a statement such as this should read “The applicants confirm that they will include the findings of the Sabellaria sidescan review in the overall Area 531 baseline report”.

Concluding remarks

Overall, though the ES and Addendum provide some limited critical review of the primary data sources with regard to the fish assemblage, it is not clear that the limitations of these data have truly been taken into account when considering the impacts of the proposed activities or, indeed, whether the data even allow for a thorough assessment of the likely

impacts. D&S IFCA would like to reiterate the concerns raised previously over data quality and the implications for the ability of the Applicants to fully assess the impacts of their proposed activities.

It is worth reiterating that the proposed activities not only interact directly with a designated feature of the Severn Estuary SAC (H1110 sandbanks) in a way that would likely affect its integrity, but also may affect the fish assemblage which forms part of the estuary feature. The fish assemblage is diverse, and contains threatened species including the small-eyed ray (Near Threatened, approaching 'Vulnerable') and Tope (Critically Endangered), as outlined above.

D&S IFCA would also maintain that additional, more up-to-date evidence is required to characterise the fish assemblage and benthos, and provide an adequate baseline for the impact assessment and future monitoring of the fish assemblage and benthos. Only through additional data collection can the Applicants claim to present adequate data that relate specifically to Area 531 in its current state, and use this as the basis for a sound assessment of the impacts of the proposed activities, rather than relying on data which are often decades old, spatially distant and which do not account for seasonal and diurnal variations in fish distribution.

Furthermore, the Henderson and Bird (2010) paper cited by the ES shows that around 20% of marine species were undergoing rapid abundance changes, possibly linked to climate change; similarly, Henderson *et al.* (2011; also cited by the ES) suggested rapid changes in the Severn Estuary and Bristol Channel fish assemblages were occurring in response to rising sea temperatures. More recent evidence has also demonstrated distribution shifts for marine species around the UK in response to climate change (e.g. doi: 10.14465/2020.arc16.fsh & 10.14465/2020.arc20.fis). We are therefore in a position where the effects of activities must be scoped or predicted relative to a seemingly unstable system that is in a state of flux. This uncertainty, combined with the uncertainty surrounding the sparse ecological data utilised by the ES and high inter-sample variability, suggests that more ecological research is required to adequately characterise the fish community ecology of the target site and its surroundings.

It is also worth highlighting that the Ellis *et al.* (2012) report cited in the ES clearly states that "If biological data layers are to be used for spatial management in the future, there needs to be a process whereby data layers are updated periodically" and that "Dedicated field surveys to more accurately delineate the current distributions of the rarest fish species and their important habitats are needed, especially if spatial management is deemed appropriate for their conservation and management".

Additionally, and importantly, in Table A.1 (Appendix A.2) of the ES (which shows the Consultation log for joint MMO/NRW scoping opinion) it is stated that "Additional sampling must be considered to fill knowledge gaps, if the evidence base is determined to not be sufficient to characterise the fish ecology at the site." D&S IFCA recommend that the evidence base is not sufficient to characterise the fish (or benthic) ecology at the site, and

that additional sampling is required to fill knowledge gaps. Specifically, targeted and seasonal sampling is required to being to better describe the benthic, epibenthic and demersal marine assemblage, and to establish the importance (or otherwise) of the habitat for these species (including sandeel) and any pelagic species that may use the area (for example, as spawning habitat for herring, or pupping/nursery areas for e.g. tope).

D&S IFCA is aware that discussions are ongoing among several organisations to investigate the feasibility of a joint research fund that would provide monetary or in-kind support to research that aims to investigate the marine and fish ecology of the Severn Estuary and Bristol Channel region. Such an initiative would be most welcome, and would provide a means to leverage commercial interest in the region to enhance environmental knowledge and improve outcomes of applications such as this. Without the additional data, D&S IFCA would encourage the application of the precautionary principle in this case, as outlined above.

References

Birnie-Gauvin, K., Flávio, H., Kristensen, M.L. *et al.* Cortisol predicts migration timing and success in both Atlantic salmon and sea trout kelts. *Sci Rep* 9, 2422 (2019).

<https://doi.org/10.1038/s41598-019-39153-x>

Ellis, J. (2006). "*Raja microocellata*". *IUCN Red List of Threatened Species*. 2006: e.T39400A10225571. [doi:10.2305/IUCN.UK.2006.RLTS.T39400A10225571.en](https://doi.org/10.2305/IUCN.UK.2006.RLTS.T39400A10225571.en)

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N., and Brown, M.J. (2012) Spawning and Nursery Grounds of Selected Fish Species in UK Waters. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56p.

European Commission (2000) *Communication (COM (2000) 1final on the precautionary principle*. Available from: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3A132042>

Kalamarz-Kubiak (2017). Cortisol in Correlation to Other Indicators of Fish Welfare.

<https://doi.org/10.5772/intechopen.72392>

Nichols, T. A., Anderson, T. W., and Širović, A. (2015). Intermittent Noise Induces Physiological Stress in a Coastal Marine Fish. *PloS one*, 10(9), e0139157.

<https://doi.org/10.1371/journal.pone.0139157>

Science and Environmental Health Network (1998) Wingspread Conference on the Precautionary Principle.

Science for Environment Policy (2017) The Precautionary Principle: decision making under uncertainty. Future Brief 18. Produced for the European Commission DG Environment by

the Science Communication Unit, UWE, Bristol. Available at: <http://ec.europa.eu/science-environment-policy>

Walker, T.I., Rigby, C.L., Pacoureau, N., Ellis, J., Kulka, D.W., Chiaramonte, G.E. and Herman, K. 2020. *Galeorhinus galeus*. *The IUCN Red List of Threatened Species 2020*: e.T39352A2907336. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39352A2907336.en>