Summary of Evidence and Reasoning for the Introduction of Management Measures to the Live Wrasse Pot Fishery

Wrasse are used as cleaner fish in Scottish salmon farms to control sea lice populations. To meet demand, wild wrasse are being sourced from southwest England. In the Devon and Severn IFCA district, vessels have been operating out of Plymouth since 2015 and a fishery is expected to start in Torbay this year (2017). The fishery uses specially designed pots and targets five species of wrasse. Although the fishery emerged in the 1990's in Norway, Scotland, Ireland and England, there is little information on the impact of these fisheries. Where data exists, local depletions and changes to size structures and sex ratios have been noted. One of D&S IFCA's main duties is to seek to ensure that the exploitation of sea fisheries resources is carried out in a sustainable way.

Wrasse are coastal inshore species occupying habitats such as rocky reefs and seagrass beds. Most of these habitats in the Devon and Severn IFCA District are protected under Marine Protected Areas (MPA). The IFCA has a duty to assess the interactions of fishing activities on the habitats of the MPAs. These are in the form of Habitat Regulation Assessments (HRA) for Special Areas of Conservation (SAC) and Marine Conservation Zones (MCZs) Assessments. These assessments will include the impacts of abrasion, removal of wrasse and by-catch of species.

Wrasse pots are lightweight (~4kg) and due to the footprint of the gear and the small area of seabed in direct contact, habitats are generally thought to be unaffected by pots (Eno *et al.* 2001). Selectivity of the pots results in low by-catch of species and species can be returned to sea alive. Information from log books on the **location and level of effort** will help to inform the MPA assessments.

Impacts of the Removal of Wrasse

Wrasse are adapted to grazing small invertebrates such as isopods, gastropods, amphipods and bryozoans (Norderhaug *et al.* 2005). A negative impact of their removal may be seen in kelp forests with a shift in community structure. Two studies have looked at the relationship of wrasse predating on small invertebrate grazers living on brown seaweeds. The wrasse studied are native to New Zealand and experiments were carried out in controlled environments. Wrasse reduced epifaunal grazing on seaweeds and in experiments without wrasse seaweed biomass was reduced (Pérez-Matus and Shima, 2010; Newcombe and Taylor, 2010). However, these findings were not consistent with field survey sites. Verbal information from fishermen has suggested that in areas where there has been a significant removal of wrasse, there has been an increase in the presence of amphipods and isopods

Studies have found goldsinny and rock cook to be facultative cleaners, meaning their diet is not wholly dependent on cleaning activity (Henriques and Almada, 1997; Galeote and Otero, 1998; Hilldan, 1983). There have been some observations of the cleaning behaviour of wrasse in the wild and the removal of wrasse may have implications for parasite populations on other species of fish and fish health. Additionally, it is unknown their importance as prey for predators. Wrasse have been identified in the diet of a variety of species including cod

(Halvorsen *et al.* 2016a), cormorants, shags (Steven, 1933) and grey seals (Gosch *et al.* 2014).

The five common species of wrasse, all have relatively different life history characteristics such as habitat requirements, maximum age, size at sexual maturity, spawning season and depth range (Darwall *et al.* 1992). Wrasse have complex reproductive biology; with ballan and cuckoo changing sex from female to male, most have nest guarding males (exception of goldsinny) and corkwing and goldsinny have 'sneaker' males who mimic females to steal fertilisation of eggs from territorial males.

There is some information available regarding wrasse fisheries in other locations. Darwall *et al.* (1992) and Deady *et al.* (1993) looked at the impact of the first two years of a wrasse fishery in Mulroy Bay and Lettercallow Bay, Ireland. Catch Per Unit Effort (CPUE) decreased and was significantly lower in the second year, there was also a lower percentage frequency of larger wrasse and a reduction of corkwing males greater than 13cm in the second year. Halvorsen *et al.* (2016b) found corkwing males attained larger sizes compared to females and sneaker males and there was a higher capture probability for males, resulting in sex-selective harvesting.

Population structure may be altered by the removal of wrasse. For smaller wrasse species such as the goldsinny, corkwing and rock cook, their size at maturity is thought to be around 10cm so this would enable some spawning before removal and the population may be ensured as individuals under 12cm are returned. However, as mature species are targeted it is expected that the size and age of maturity would be expected to decrease over time (Darwall *et al.* 1992).

For the larger species, ballan and cuckoo, their size at sexual maturity is higher than 12cm (ballan: females 16-18cm, males 28cm; cuckoo: females 16cm, males 24cm) and therefore individuals are removed before maturing and hence having a chance to spawn. Therefore the **minimum and maximum conservation reference sizes** proposed are important in maintaining a sustainable fishery. . A recognised management measure to protect a fish stock and allow for its sustainability is to allow a proportion of that stock a chance to spawn at least once before capture. The size of maturity of local populations will be identified during **on board catch surveys.**

Wrasse are territorial and occupy small spatial areas (Villegas-Rios *et al.* 2013b). Recorded home range for ballan wrasse is 91m² (Villegas-Rios *et al.* 2013b), <50m for corkwing (Potts, 1985) and a territory of 2m² for goldsinny (Hillden, 1981). Wrasse populations may be genetically isolated (Skiftesvik *et al.* 2014) and the production of benthic eggs (with exception of goldsinny) suggests limited dispersal from nesting areas. A relatively long planktonic larval stage and inshore water currents along the coast may contribute to lowering genetic differentiation between areas (D'Arcy *et al.* 2013). However, Gonzalez *et al.* (2016) found habitat fragmentation from a long stretch of sand (26km) along the Norwegian coast is the cause of genetic differentiation between western and southern populations of corkwing. They concluded that if wrasse populations are spatially fine structured, local populations experiencing high fishing intensity might be overfished. Deady *et al.* (1993) also stated that their study of the wrasse fishery for goldsinny and corkwing in Ireland, demonstrates that overexploitation of wrasse stocks within a confined area (such as Lettercallow Bay) could occur in a relatively short time span (less than 2 years).

Wrasse have dominance hierarchies, and males have been found to grow faster, attain larger sizes and have a higher capture probability (Halvorsen *et al*. 2016c). The removal of large males may alter the social structures and subsequently change sex ratios within the population. There is also an unknown impact the removal of large, territorial males will have on sneaker males (Darwall *et al.* 1992). The catch composition and sex ratios of local populations will be identified during **on board catch surveys,** which will inform future management measures.

The fishery for wrasse coincides with the wrasse spawning season which ranges from April to September depending on the species (Skiftesvik *et al*. 2015). The removal of a significant amount of wrasse within this period would reduce spawning and egg production. Once eggs are laid in a nest, they may take up to 16 days to hatch (Potts, 1974) and during this period the male guards the nest. So the removal of nest guarding males may reduce egg survival (Darwall *et al.* 1992). Hence the **closed spawning season** proposed will ensure sufficient reproduction within the population and sustainability of the fishery. More detailed information on the spawning season of local populations in Devon will be collected during **on board catch surveys.**

A recent report from Cefas relating to wrasse in regard of their commercial use, fisheries and implications for management summarises:

- The use of ‘cleaner fish’ (fish species that feed on ectoparasites) is of increasing focus to the salmon farming industry as an alternative to chemical (organophosphate) treatments. The preferred species of cleaner fish are various species of wrasse (Labridae), and there is also increasing interest in lumpfish *Cyclopterus lumpus*.

- As the use of wrasse (and lumpfish) as cleaner fish has increased, there is growing concern regarding the potential localised over-exploitation of wrasse populations around parts of the UK, and in relation to the potential impacts of transporting wrasse from one part of the country to another.

- There are very limited data on wrasse populations from existing survey programmes, as trawl surveys tend to avoid rocky inshore grounds where wrasses are usually most abundant. Therefore, there are insufficient data to examine 'stock trends'.

- Wrasse have biological characteristics (e.g. site fidelity, hermaphroditism in some species, nest guarding) that would make them susceptible to localised over-exploitation and potentially localised depletion.

- The scale of the wrasse fishery around the coasts of the UK is uncertain, and there are limited data on the species composition as well as the size range and sex ratio of landed fish.

- Whilst there is the potential for localised depletion, wrasse fisheries can be an important economic element of the diversification of inshore fisheries. Hence, options for precautionary management measures could usefully be developed with IFCAs and the fishing industry to ensure the sustainability of these fisheries.

- Precautionary management measures could include quota management (which could be applied over zonal areas of coastline), spatial management (especially if aligned with the current MCZ network) and seasonal restrictions (to minimise fishing impacts during the spawning season). Size restrictions would need more careful consideration, in order to balance market demands with the need to ensure an appropriate size range and sex ratio of fish in the wild.

- Further studies on wrasse could usefully consider the population dynamics of wild populations (life history, movements, population structure and status, parasites and genetic structure), wild capture fisheries, transportation and husbandry, and captive breeding. Such work would require close cooperation of the various sectors involved in this fishery.

This report concurs with the proposed management options that D&S IFCA has documented in the live wrasse pot fishery consultation that management of the stock, fishing season or areas fished is needed. The report also highlights the need for further information about the fishery and the recommendation for a documented fishery will facilitate this.

D&S IFCA Potential Wrasse Management

The wrasse fishery can be managed through the D&S IFCA Potting Permit Byelaw, via the flexible permit conditions.

Management of this emerging fishery is seen as important as there are a number of risks that have been identified from the information gathered on the species ecology, biology, the expected fishing effort and data collection requirements. The risks are:

- Whilst information on the level of effort has been provided by the salmon farms directly or by their agents, the IFCA is aware that fishermen within the district can act independently to engage with the salmon farm companies to offer a supply of wrasse to them. One agent in Weymouth has advertised through the website 'Find a Fishing Boat' for more boats to supply wrasse to them. Therefore, the IFCA does not know if the effort in its district will increase further than currently predicted in 2017.
- There is uncertainty in the fishery, in terms of the impact of the removal of wrasse from the habitats and ecosystems in which they live. The uncertainty includes how the removal of mature wrasse will affect their population structure, reduction in their cleaning capability leading to disease prevalence/ infestation on other fish species, kelp epifauna ecosystem impacts and populations of those species wrasse currently predate on, such as amphipods and isopods – 'trophic cascade' impacts.
- For Ballan and cuckoo wrasse the impact on the populations of the removal of the dominant males is largely unknown.
- No stock assessment has been undertaken on this species so baseline data are not available.
- The wrasse fishery in the UK is largely undocumented although in Scotland it has been taking place for many years. This lack of data leads to the uncertainty on the impact of the fishery.
- Anecdotal evidence from fishermen targeting wrasse in Scotland suggests there is a decline in the wrasse numbers being landed. Work done in Ireland suggests that the fishery has declined in areas after two years of the fishery taking place.
- The fishery period partly coincides with the spawning period for all species

The benefits of the emerging fishery are:

- It allows small inshore vessels to diversify for some of the year.
- It potentially can remove or lessen the pressure on other fisheries and species
- This is an opportunity of the IFCA to help the development of a new fishery whilst introducing management that ensures its sustainability and increases the IFCA's knowledge of any impact on the inshore ecosystems where the activity takes place.

Management Options

Fully Documented Fishery

To date, the landings from the fishery appear to have gone unrecorded. The boats are under 10m in size and as such, the requirement for landings figures is not obligatory. However, sales notes for those purchasing the fish and the transport documents should be available. The MMO is looking at what data exists.

In order to ensure as much information is available, a fully documented fishery is recommended where data are made available to D&S IFCA including:

- daily records of fish removed from the fishery (landings to the shore / into store cages) are kept
- number of pots deployed
- frequency of hauling per day
- number of strings fished
- number of pots per string
- days at sea,
- areas worked (GPS location for start and end of strings).

These data will provide information on landings per unit effort (LPUE).

Part of the requirement for the fishery would be to allow observers on board the vessels on a regular basis to verify the logbooks and to collect further data on the whole catch rather than just those fish landed. The data would include catch composition by species, size distribution and determine size at sexual maturity and allow for catch per unit effort (CPUE) to be determined. This together with LPUE will help inform assessment of stock abundance and highlight changes over time.

In order to support the data collected from fishermen and on board survey work, it is important to have sales figures and transport document data so that additional movement mortality can be assessed.

Slot Size

From the information collected, the introduction of a formal slot size might appear appropriate. This could tally with the salmon farm industry sizes to reinforce these voluntary minimum and maximum sizes. It would also allow potential harmonisation with CIFCA and SIFCA should these IFCAs decide to manage the sizes of wrasse through a byelaw. Slot sizes allow the larger fish to remain in the population so affording protection to the breeding stock.

The salmon farms have informed the IFCA they ensure that the fishermen adhere to their industry led slot sizes, which are between 12 cm and 23 cm. The current industry slot size

does allow a proportion of all species to reach sexual maturity. Protection is afforded to the larger Ballan and Cuckoo wrasse individuals as the maximum size is below the maximum size they grow too. There has been suggestions from the industry that an increase in minimum size for Ballan wrasse might be considered and acceptable. For Rock Cook, Goldsinney and Corkwing wrasse the minimum size is close to the maximum size to which the species grow. These three species mature at 9 to 10 cm, which is 2 to 3 cm below the minimum industry size, and therefore a small proportion of the breeding stock is protected.

Effort Limitation

An estimate for the current and future level of effort in the South West is in the range 35 pots to a maximum of 150/200 pots per vessel. As the stock levels of wrasse, in areas where the wrasse fishery currently takes place and in areas where expansion is proposed, are unknown, quota management at this time is not appropriate as the demand by the salmon farms may impact the local populations. Therefore, in order to allow for a wrasse fishery to develop but avoiding over exploitation of the stock, effort control via pot limitations is a solution. This management of effort would establish a viable additional fishery, in the form of diversification, rather than a few vessels solely targeting the wrasse fishery. D&S IFCA officers are hoping to gather more data during on board surveys, as part of the fully documented fishery proposal. However, these data are not yet available to help inform management of the fishery and therefore a precautionary approach may be necessary.

Seasonal Fishery

From the literature reviewed wrasse spawn in spring and summer. For some species, the spawning season starts in April and continues to September, whereas the spawning season for other wrasse species is shorter extending from May to July inclusive. As there is no literature for the wrasse populations' spawning seasons in the South West, the on-board surveys will gather more data on this aspect of the biology of each species. The industry led slot sizes will take the larger breeding fish from three species of wrasse: rock cock, goldsinney and corkwing. Therefore, to provide some protection to these species, a closure for part of the spawning season might be a suitable management measure. In 2016, the fishery in Norway was prohibited until 11th July as a conservation measure to allow some nesting males and females to breed at least once before being harvested and allow nests to be protected. A closure during some of the spawning months would afford some protection but allow the fishery to progress later in the summer months.

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