LIVE WRASSE FISHING IN SOUTHERN ENGLAND:

THE LEGAL PROBLEMS SURROUNDING A BIOLOGICAL SOLUTION

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Abstract

The fishing of live wrasse has been occurring in the waters of Southern England since around 2015. The scale of this fishing and the resulting impacts are largely unknown. “Cleaner fish” such as wrasse are used as a biological solution to the sea lice problem plaguing commercial salmon farms in Scotland. This thesis provides a legal analysis of live wrasse fishing, exploring the legal and regulatory measures that are, in theory, preventing any environmental or ecological impacts on relevant species or habitats. European, national and local law will be dissected and the efficacy of these management mechanisms, in reality, will be explored. Some suggestions for future change will be proposed, in the fields of law, economics and science.

Keywords: wrasse, cleaner fish, Southern England, salmon farming, sea lice

Introduction

Wrasse are a relatively unknown species, considered largely unimportant outside of recreational angling. For one very particular sector of the global economy, however, wrasse are increasingly *sine qua non*. As natural cleaner fish, commercial salmon farms buy wrasse in large quantities to add into salmon pens.[1]They eat parasites, mainly sea lice, off the salmon.[2] Scottish farms are afflicted with sea lice more so than salmon farms in any other country.[3] Having depleted local wrasse stocks, since around 2015 the farms have begun to

[1] Text to n 32 in pt 1, s 1.2
[2] ibid.
[3] Text to n 29 in pt 1, s 1.2

source live wrasse from locations along the south coast of England.[4] This article will consider issues related to the legality of live wrasse fishing in Southern England.

The first part will explore the legal and policy situation as it stands in both English and Scottish contexts and their interrelationship. Next, the Scottish aquaculture industry is examined, and the issues of both sea lice and wrasse fishing examined. Following on from this, the legal protection mechanisms that are theoretically in place to protect the relevant species and habitats will be analysed.

Part two outlines existing legal structures and assesses their effectiveness. There is a current knowledge gap in data on UK wrasse populations. By comparison, research from other countries informs discussion of the impact of live wrasse fishing on the ecosystem. This raises a question as to whether, where live wrasse fishing occurs within a Special Area of Conservation (SAC), the relevant authority should have completed a proper impact assessment to allowing fishing. The focus will then move back on to local management. The article will conclude by, having taken account of other countries' experiences, suggesting modifications to improve the current position. The final section outlines the scientific developments currently underway in relation to salmon farming and sea lice, and new, non-biological, ways of combatting sea lice.

Live wrasse fishing is taking place along the south coast of England. However, this article will focus on the Plymouth marine area as an illustrative example. Live wrasse fishing is occurring in the Plymouth area which is subject to multiple protective designations, providing a clear example of the issues.[5]

Part 1 – The Theory

1.1 Marine Policy in the UK

In 2002 the UK Government and Devolved Administrations declared their vision for 'clean, healthy, safe, productive and biologically diverse oceans and seas'.[6] From the basking shark to the jewel anemone,[7] UK marine waters host significant biodiversity: proper protection and management requires a holistic approach.

[4] Text to n 40 in pt 1, s 1.2
[5] Text to n 52 and n 68 in pt 1, s 1.3
[6] Department for Environment, Food and Rural Affairs, *Safeguarding Our Seas* (2002)
[7] 'Ten surprising species found living in UK waters, in pictures' (*The Telegraph*) <www.telegraph.co.uk/news/earth/wildlife/11768107/Ten-surprising-species-found-living-in-UK-waters-in-pictures.html?frame=3389993> accessed 27 January 2019

The Marine Strategy Framework Directive (MSFD),[8] adopted by the European Union (EU) in July 2008, requires Member States (MS) to formulate a marine strategy in order to achieve 'good environmental status' (GES) in their marine environments by 2020.[9] The MSFD defines GES as:

> …the environmental status of marine waters where these provide ecologically diverse and dynamic oceans…thus safeguarding the potential for uses and activities by current and future generations…[10]

The MSFD takes an 'ecosystem-based approach' to the management of human activities and incorporates the precautionary principle. The aim of a MS' marine strategy should be to:

> (a) protect and preserve the marine environment, prevent its deterioration…
>
> (b) prevent and reduce inputs in the marine environment, with a view to phasing out pollution….[11]

The UK Government, in conjunction with the Devolved Administrations, published their programme of measures in 2015.[12] Scotland enjoys considerable devolved powers: including legislating on matters relating to the environment and fisheries.[13]

The Marine and Coastal Access Act 2009 (MCAA) - in Scotland the Marine (Scotland) Act 2010 - introduced a new system of marine management. The MCAA created the Marine Management Organisation (MMO) to 'licence, regulate and plan marine activities' in and around England.[14] Additionally, the MCAA created ten IFCAs in England focussing on regional management.[15] The MMO and IFCAs align to achieve the aforementioned overall vision for UK marine waters.[16]

[8] Council Directive 2008/56/EC of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) [2008] OJ L 164/19
[9] ibid art 1(1).
[10] ibid art 3(5).
[11] Council Directive 2008/56/EC (n 8) art 1 (2).
[12] Department for Environment, Food and Rural Affairs, *Marine Strategy Part Three: UK programme of measures* (December 2015)
[13] 'Devolved and Reserved Matters' (*The Scottish Parliament*) <www.parliament.scot/visitandlearn/Education/18642.aspx> accessed 27 January 2019
[14] 'About us' (*Marine Management Organisation*) <www.gov.uk/government/organisations/marine-management-organisation/about> accessed 27 January 2019
[15] Inshore fisheries and Conservation Authorities – see for example, 'DEFRA guidance to the IFCAs' (*Association of IFCAs*) <www.association-ifca.org.uk/about-us/defra-guidance-to-the-ifcas> accessed 27 January 2019
[16] ibid.

Section 44 MCAA requires the UK Government and Devolved Administrations to create a Marine Policy Statement (MPS). Its purpose is to provide 'a framework for preparing marine plans' and to 'contribute to the achievement of sustainable development' in the UK marine area.[17] The MPS was published in March 2011 and adopted by all UK Administrations.

Underpinning the statement are the UK High Level Marine Objectives (HLMO). Published in April 2009, the HLMO define a 'comprehensive set of outcomes' to aid all UK Administrations in achieving sustainability and socioeconomic prosperity.[18] There are 21 HLMO, the most relevant of which are:

- Biodiversity is protected…
- Healthy marine and coastal habitats occur across their natural range and are able to support strong, biodiverse biological communities…
- Marine businesses are taking long-term strategic decisions…
- Marine businesses are acting in a way which respects environmental limits…[19]

1.2 The Sea Lice Plague and the Wrasse Panacea

In 1971 the first ever Scottish farmed salmon was removed from a pen in Lochailort.[20] Scotland is now the largest producer of farmed Atlantic salmon in the EU and one of the top three producers globally.[21] It is Scotland's largest food export: producing 162,817 tonnes in 2016.[22] The industry is expected to grow. The Scottish Government is supporting the industry to reach a growth target of 210,000 tonnes annually by 2020[23]. If this target is met, the Scottish aquaculture industry will have an estimated annual turnover in excess of £2 billion and will support well over 10,000 jobs directly and indirectly.[24]

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[17] HM Government, *UK Marine Policy Statement* (March 2011)
[18] HM Government, Our Seas – a shared resource High level marine objectives (April 2009) 9
[19] ibid 6-7
[20] Sir Iain Anderson, 'Marine Harvest: 1977-1979' *Fish Farmer* (Edinburgh, 15 July 2015) 16
[21] 'Environmental impacts of salmon farming' (*The Scottish Parliament*) <www.parliament.scot/parliamentarybusiness/CurrentCommittees/107588.aspx> accessed 27 January 2019
[22] ibid.
[23] North Atlantic Salmon Conservation Organization, *Supporting sustainable aquaculture growth alongside a thriving recreational fisheries sector Reducing the impacts from sea lice and escapes on wild fish in Scotland in parallel with NASCO's international goals (Tabled By EU – UK (Scotland))* (June 2016)
[24] ibid.

All livestock industries face problems with parasites. Sea lice are marine ectoparasites, which attach themselves to salmon and feed on their blood and epidermal tissue.[25] Sea lice, found mostly in the first few metres of surface water, can cause major damage to the health of the salmon and to the commercial viability of the farm. This occurs mainly by:

> …reducing fish growth, loss of scales which leaves the fish open to secondary infections…and damaging of fish which reduces marketability, but also by increased levels of morbidity and mortality…[26]

The effect of sea lice on the salmon farming industry is considerable. In 2017, the estimated cost of the sea lice issue to the global industry totalled £400 million.[27] The worldwide supply of salmon fell by an estimated 7% in 2016, forcing consumer prices up.[28] While all countries that farm salmon face problems, Scotland appears worst affected. Farm-specific data for Scotland is sparse, although a 2016 survey showed that the percentage of affected sites in Scotland went from 28% in 2014 to 49% in 2015, compared to the Norwegian level which remained at 5% and the Irish level which rose from 8% to 18%.[29]

A side effect of this is the impact on wild salmonid populations. Salmonidae are a family of ray-finned fish, including salmon, trout, char and other species, known collectively as salmonids. Lice migrate from farmed to wild creatures, thus increasing the threat level to the wild populations.[30] In 2015, fisheries scientists from Scotland, Norway and Ireland reviewed over 300 scientific publications on the damaging effects of sea lice on wild salmon in salmon farming areas, and concluded that there can be a potential 12-29% fewer wild salmon spawning in salmon farming areas.[31]

A biological – natural and painless - method of delousing which has grown in popularity in recent years, involves deploying live cleaner fish, such as wrasse, into the salmon farm pens to feed on the lice and remove them from the surface of the salmon.[32]

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[25] Emily Osterloff, 'The problem of sea lice in salmon farms' (*Natural History Museum*, 27 April 2018) <www.nhm.ac.uk/discover/the-problem-of-sea-lice-in-salmon-farms.html> accessed 27 January 2019
[26] Dave Jackson and others, 'The drivers of sea lice management policies and how best to integrate them into a risk management strategy: An ecosystem approach to sea lice management' (2017) 41(6) Journal of Fish Diseases 927
[27] Douglas Fraser, 'Scottish salmon farming's sea lice 'crisis'' *BBC News* (14 February 2017) <www.bbc.co.uk/news/uk-scotland-38966188> accessed 27 January 2019
[28] ibid.
[29] ibid.
[30] Norwegian Institute for Nature Research, *Impacts of salmon lice emanating from salmon farms on wild Atlantic salmon and sea trout* (January 2018)
[31] Eva Thorstad and others, 'Effects of salmon lice *Lepeophtheirus salmonis* on wild sea trout *Salmo trutta*—a literature review' (2015) 7 Aquaculture Environment Interactions 93
[32] Ainsley Riley and others, 'Northern European Wrasse - Summary of commercial use, fisheries and implications for management' (*The Scottish Government,* February 2017)

The method was first developed by the Norwegian Institute of Marine Biology in 1988,[33] prior to which wrasse had no commercial value. Subsequently, the use of wrasse has been successfully marketed as a natural, low-cost, environmentally friendly, effective method of delousing, increasing the value of wrasse.[34] Salmon farms worldwide now use cleaner fish.[35]

Live wrasse fishing in Scotland began in the 1990s, but over time wrasse stocks have depleted in line with demand.[36] There is a relationship then with stocking densities of wrasse, with a suggested ratio of one wrasse to 25 salmon (4%)[37] although Wester Ross Fisheries used a 2.5% density in 2016 and achieved positive results.[38] In 2018, the industry estimated that 1.2 million wrasse would be required to service all Scottish fish farms.[39]

In response, Scottish salmon farms are sourcing live wrasse from the south coast of England. The fisheries emerged around the coasts of Cornwall, Devon, Dorset, Hampshire and Sussex around 2015.[40] Higher populations and warmer sea temperatures, compared to Scottish waters, permit a longer fishing season.[41] In these south coast fisheries, the species of wrasse captured are Corkwing, Goldsinny, Rock Cook, and Ballan, Baillon's wrasse are also targeted, although in smaller numbers.[42] These fisheries appear fruitful. In 2015, during one 18-week period, 57,000 wrasse were fished from the Dorset area,[43] and it is estimated that more than 1 million wrasse were removed from in the English Channel that year.[44]

<www.gov.scot/binaries/content/documents/govscot/publications/foi-eir-release/2018/03/foi-18-00461/documents/55e0082f-2c07-4fda-b7e2-ec26b757e000/55e0082f-2c07-4fda-b7e2-ec26b757e000/govscot:document/> accessed 27 January 2019

[33] Anne Berit Skiftesvik and others, 'Wrasse (Labridae) as cleaner fish in salmonid aquaculture – The Hardangerfjord as a case study' (2013) 10(3) Marine Biology Research 289

[34] 'WHY CLEANER FISH?' (*BioMar*) <www.biomar.com/en/uk/articles/products/cleaner-fish/why-cleaner-fish/> accessed 27 January 2019

[35] Jim Treasurer (ed), *Cleaner Fish Biology and Aquaculture Applications* (5M Publishing Ltd, 2018) vi

[36] Ainsley Riley (n 32) para 11.

[37] Scottish Aquaculture Research Forum, *Use of Wrasse in Sea Lice Control* (July 2013) 3ff, 24

[38] Jim Treasurer (ed) (n 35) Jim Treasurer and others, 'Cleaner fish rearing and development in the UK' 382

[39] Kevin Keane, 'Sea lice 'breakthrough' for salmon farmers' *BBC News* (9 August 2018) <www.bbc.co.uk/news/uk-scotland-45110143> accessed 27 January 2019

[40] Department for Environment, Food and Rural Affairs, *Inshore Fisheries and Conservation Authorities Conduct and Operation 2014-2018* (2018) 13ff, 20, 62

[41] Martin Sayer, 'Hypometabolism in torpid goldsinny wrasse subjected to rapid reductions in seawater temperature' (1996) 49(1) Journal of Fish Biology 64

[42] Katerina Kousoulaki and others, 'Fisheries for cleaner fish species in Europe' in Jim Treasurer (ed), *Cleaner Fish Biology and Aquaculture Applications* (5M Publishing Ltd, 2018) 349

[43] 'Devon fish under threat for the benefit of Scottish salmon farms' *South Hams Gazette* (27 June 2017) <www.southhams-today.co.uk/article.cfm?id=109582&headline=Devon%20fish%20under%20threat%20for%20the%20benefit%20of%20Scottish%20salmon%20farms&sectionIs=news&searchyear=201> accessed 27 January 2019

[44] Katerina Kousoulaki and others (n 42).

1.3 Protecting the Wrasse Ecosystem

The UK is committed to establishing a coherent network of Marine Protected Areas (MPA) throughout its waters.[45] MPAs are designated globally to halt marine ecosystem decline and promote system resilience.[46] As of March 2018, 24% of UK waters were within an MPA.[47] MPA is an umbrella term which is defined by the International Union for Conservation of Nature as, 'any area of intertidal or subtidal terrain…which has been reserved by law or other effective means to protect part or all of the enclosed environment'. [48]

Two of the numerous categories of MPA are discussed here, given their relevance to live wrasse fishing in the south of England.[49] The Habitats Directive,[50] requires MS to propose SACs with a view to conserving 'rare, threatened or endemic' organisms or habitats.[51] Annex 1 specifies the habitats to be protected (189), while Annex 2 specifies the species (788).

The Plymouth marine area is covered by two SACs. The Plymouth Sound and Estuaries SAC covers an area of 63.9km², and hosts five primary habitats and one primary species. [52] The Start Point to Plymouth Sound & Eddystone SAC covers an area of 340.9km², and hosts one primary habitat.[53] These two SACs straddle the Devon-Cornwall border, and are jointly managed by the Devon and Severn (DSIFCA) and Cornwall IFCAs (CIFCA).[54] In August 2018 it was confirmed that live wrasse fishing is undertaken in both of these Plymouth SACs.[55]

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[45] 'About Marine Protected Areas' (*The UK Marine Protected Areas Centre*) <www.ukmpas.org/about.html> accessed 27 January 2019
[46] ibid.
[47] 'Contributing to a Marine Protected Area Network' (*Joint Nature Conservation Committee*) <http://jncc.defra.gov.uk/page-4549> accessed 27 January 2019
[48] International Union for Conservation of Nature*, Guidelines for Marine Protected Areas* (1999)
[49] Contributing to Marine Protected Area Network (n 47).
[50] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora [1992] OJ L 206/7
[51] 'The Habitats Directive' (*European Commission*) <http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm> accessed 27 January 2019
[52] 'Plymouth Sound and Estuaries' (*Joint Nature Conservation Committee*) <http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0013111> accessed 27 January 2019
[53] 'Start Point to Plymouth Sound & Eddystone' (*Joint Nature Conservation Committee*) <http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030373> accessed 27 January 2019
[54] Cornwall Inshore Fisheries and Conservation Authority, *Plymouth Sound and Estuaries SAC (Special Area of Conservation)*; Cornwall Inshore Fisheries and Conservation Authority, *Start Point to Plymouth Sound and Eddystone SAC (Special Area of Conservation)*
[55] Devon and Severn Inshore Fisheries and Conservation Authority, *Potting Permit Byelaw Policy Statement & Potting Permit Conditions for the Live Wrasse Fishery* (1 August 2018) 3

Member state obligations related to SACs are established in Article 6 HD. Article 6(1) instructs MS to establish the necessary conservation measures and 'appropriate management plans' for the sites. Article 6(2) requires MS to avoid general deterioration and disturbance of the habitats or species for which the site is designated. Article 6(3) instructs MS that any plan or project likely to have a significant effect on the site must be subject to an assessment of its implications; and the MS must only agree the plan or project upon determining that it will not adversely affect 'the integrity of the site'. Article 6(4) states that if it is necessary for a plan or project to go ahead despite a negative assessment (for overriding reasons of public importance), the MS must take 'all compensatory measures necessary' to maintain site consistency.

The interpretation of Article 6(3) has been problematic for MS. The ECJ's judgement in *Wadenzee* (2004), is the leading authority.[56] This case concerned mechanical cockle fishing in the Wadden Sea. On the meaning of 'plan or project', the court noted that the HD does not provide a definition, however the Environmental Impact Assessment Directive (EIAD) [57] does offer a definition of 'project' which includes:

- the execution of construction works or of other installations or schemes

- other interventions in the natural surroundings…[58] [59]

As both Directives promote analogous general objectives, the ECJ applied the EIAD definition to the HD, and considered when an assessment of the effects of a plan or project is required.[60] It determined that an assessment is required when there is a 'probability or a *risk*' of significant effects on the site: a *risk* exists when one cannot be excluded on the basis of objective information.[61] The ECJ stated that 'in case of doubt as to the absence of significant effects such an assessment must be carried out'.[62] The Court then discussed the concept of an 'appropriate assessment', holding that it must precede the approval of the plan or project; and must identify all aspects of the plan or project which could affect the conservation objectives for the site in light of the 'best scientific knowledge in the field'.[63] Regarding approval of the

[56] Case C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels* v *Staatssecretaris van Landbouw, Natuurbeheer en Visserij* (2004) ECR I-07405
[57] Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment [1985] OJ L 175
[58] ibid art 1(2).
[59] Case C-127/02 (n 56) para 24.
[60] ibid para 26.
[61] ibid para 43ff, 45.
[62] ibid para 44.
[63] ibid paras 53-54.

plan or project, the ECJ stated that 'where doubt remains…the competent authority will have to refuse authorisation'.[64]

National legislation has also created a class of MPA in the UK. Section 116 MCAA provides a power for the Department for Environment, Food and Rural Affairs (DEFRA) to designate Marine Conservation Zones (MCZs). The grounds for designating a MCZ are essentially to conserve flora, fauna, habitat, geological and geomorphological features.[65] Explicitly, conservation includes conservation of diversity, regardless of whether the thing being conserved is rare or threatened.[66]

As well as being a SAC, the Plymouth marine environment includes an MCZ designation. The Tamar Estuary MCZ, created in December 2013, comprises two distinct geographical areas, the Lynher estuary and the Tamar and Tavy estuaries: together covering an area of 15km².[67] This site has five protected features.[68] The conservation objective for this zone is to maintain the protected features in a 'favourable condition'.[69] This site straddles the Devon-Cornwall border and is consequently managed by the two IFCAs.[70]

1.4 Local Regulation

Live wrasse fishing in the south of England is a cross-county practice. Three IFCAs cover this area: DSIFCA, CIFCA, and Southern (SIFCA). Although the IFCAs try to work collaboratively, especially at their borders, they are distinct regulatory bodies.

The DSIFCA is proactive in relation to live wrasse fishing. Section 155 and 156 MCAA bestows upon IFCAs the power to make byelaws, enforceable quasi-legislation. In 2015, the DSIFCA bought a Potting Permit Byelaw into force, requiring anyone fishing with pots to have a relevant permit.[71] Most live wrasse fishing occurring in the south of England is conducted using lightweight pots or traps on or near rocky reefs.[72] The byelaw contemplates two types of permit: a Category One Permit for commercial vessels; and a Category Two Permit for

[64] ibid para 57.
[65] Marine and Coastal Access Act 2009, s 117(1)
[66] ibid s 117(5).
[67] Cornwall Inshore Fisheries and Conservation Authority, *Tamar Estuaries Sites MCZ (Marine Conservation Zone)*
[68] ibid.
[69] The Tamar Estuary Marine Conservation Zones Designation Order 2013, SI 2013/23, s 5(1)
[70] Department for Environment, Food and Rural Affairs, *Tamar Estuary Marine Conservation Zones* (November 2013) 4
[71] Devon and Severn Inshore Fisheries and Conservation Authority, *Potting Permit Byelaw* (18th September 2014)
[72] Devon and Severn Inshore Fisheries and Conservation Authority, *Potting Permit Byelaw Development and Management of the Live Wrasse Pot Fishery* (1 July 2018) 3

recreational fishers.[73] As of 1 June 2018, DSIFCA had issued 531 potting permits, including 200 commercial permits, each lasting up to 24 months.[74] There are four commercial vessels currently fishing for live wrasse in the Plymouth Sound and surrounding estuaries.[75]

The byelaw includes conditions, and also establishes flexible permit conditions.[76] Flexible permit conditions allow DSIFCA to 'introduce, remove or vary' conditions relating to restrictions on catch, gear, area or time.[77]

In June 2017, the DSIFCA Byelaw & Permitting Sub-Committee (B&PSC) considered making five changes to the potting permit conditions. These changes were:

1. To implement a fully documented fishery
2. To implement a 120 pot limit per permit holder
3. To require the marking of wrasse gear with 'WRA' and Vessel's PLN[78]
4. To establish a closed season - 1st April to 30th June - for the Live Wrasse Pot Fishery
5. To introduce minimum and maximum conservation reference sizes for five species of wrasse. [79]

Following agreement, all potting permits were amended in July 2017 to reflect this.[80] DSIFCA also introduced a chart of voluntary closed areas for live wrasse fishing. The implementation of a fully documented fishery facilitated DSIFCA capturing landings data and potting figures for each vessel.[81] The establishment of the fully documented fishery led to DSIFCA publishing a Data Analysis Research Report regarding live wrasse fishing in November 2017.[82] This report analysed data recorded by the four vessels in the Plymouth Sound area between April-October 2017 and 20 on-board surveys carried out by the DSIFCA Environment Officers.

[73] Potting Permit Byelaw (n 71) paras 4-5
[74] Devon and Severn Inshore Fisheries and Conservation Authority, *Enforcement and Compliance Strategy 2018-2019* (May 2018) 5
[75] Devon and Severn Inshore Fisheries and Conservation Authority, *Live Wrasse Fishery in Devon and Severn IFCA District Research Report* (November 2018) 6
[76] Potting Permit Byelaw (n 71) paras 23-26.
[77] ibid paras 24-25.
[78] A vessel's PLN is its Port Letter and Number. It identifies the port and the individual vessel to aid in identification.
[79] Development and Management (n 72) 6.
[80] ibid 6-7.
[81] Development and Management (n 72) 6.
[82] Devon and Severn Inshore Fisheries and Conservation Authority, *Live Wrasse Fishery in Devon & Severn IFCA District Data Analysis Research Report (*November 2017)

Following this research, a formal review of the permit conditions relating to the live wrasse fishery began in November 2017.[83] On 12 April 2018, after a six-week consultation with stakeholders, the B&PSC decided on two amendments to the conditions:

1. …the closed season for the Live Wrasse Pot Fishery to start on 1st May and end on 15th July;
2. …the slot size for corkwing wrasse to be 140mm to 180mm.[84]

A revised chart of voluntary closed areas was also published. These permit condition changes and voluntary guideline changes were circulated to permit holders in August 2018.[85]

Similarly, the CIFCA enacted the Live Wrasse Fishing (Limited Permit) Byelaw 2018[86] to manage live wrasse fishing in the district, in conjunction with voluntary measures.[87] In contrast, the SIFCA has not created any byelaws relating to wrasse: regulation is based solely on voluntary guidance documents.[88]

Inshore Fisheries and Conservation Officers (IFCOs) hold common enforcement powers under sections 245-261 MCAA and fisheries enforcement powers under sections 264, 268, 269 and 284 of the Act. The role of IFCOs is to enforce byelaws and other provisions, therefore enforcement will be most relevant in the DSIFCA and CIFCA districts.[89]

All three IFCAs use a risk-based approach to enforcement, reflecting the recommendations of the Hampton Review.[90] Each IFCA has a slightly different means of implementation. Generally, fishing methods/fisheries are scored (1-4 or 1-5) against a range of factors, including Conservation Impact, Infringement Risk and others.[91] The combined score is then plotted on a 'risk matrix' which follows a traffic light system: green (low risk, monitor), orange (medium risk, review), or red (high risk, act).[92] The DSIFCA risk matrix for 2018-19 made no mention of wrasse removal.[93] The CIFCA risk matrix covers potting and generally designates

[83] Development and Management (n 72) 10.
[84] ibid 21.
[85] Potting Permit Byelaw Policy (n 55).
[86] Cornwall Inshore Fisheries and Conservation Authority, *Live Wrasse Fishing (Limited Permit) Byelaw 2018* (11 February 2019). This byelaw is brand new and will not be discussed further in this thesis.
[87] Cornwall Inshore Fisheries and Conservation Authority, *Live Wrasse Fishery Guidance 2017-18*
[88] Southern Inshore Fisheries and Conservation Authority, *Wrasse Fishery Guidance*
[89] Enforcement and Compliance (n 74) 7.
[90] The Hampton Review is a UK report, published in 2005, on the subject of effective inspection and enforcement by regulators
[91] For example, Enforcement and Compliance (n 74) annex 2.
[92] ibid.
[93] ibid 16.

it as green or orange.[94] The SIFCA risk matrix covers potting and specifically covers wrasse fishing, designating it as mostly a red practice.[95]

While IFCAs will try to achieve compliance through engagement, education and advice, there are a number of enforcement measures that can be utilised including Financial Administrative Penalties and criminal prosecution.

Part 2 – The Practice

2.1 Murky Waters

Prior to the 1980s, wrasse held little interest for aquaculturists and biologists.[96] Over the last three decades global research has boomed, although research into English wrasse appears scarce. Populations in English waters, including the southern areas, have not been systematically assessed or recorded, resulting in a worrying lack of contemporary data.[97] A 2017 report stated that 'there are no stock assessments for any species of wrasse in British waters, with biological data limited...'.[98]

Without robust data, it is difficult to track both changes over time and the impacts of fishing activities. Uncertainty also surrounds the scale of live wrasse fishing in the south of England, caused by incomplete or undefined landings data.[99] A report by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) concluded that:

> 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.[100]

[94] Cornwall Inshore Fisheries and Conservation Authority*, Enforcement Plan 2018 – 2019* (May 2018) app 1
[95] Southern Inshore Fisheries and Conservation Authority, *Compliance Risk Register* (February 2018) app A
[96] Jenny Hjul, 'Call to halt wild wrasse 'gold rush'' (*FISHupdate*, 20 April 2017) <www.fishupdate.com/call-halt-wild-wrasse-gold-rush/> accessed 12 February 2019
[97] Ainsley Riley (n 32) para 22.
[98] ibid paras 21-22.
[99] NB, fish landed are those brought to the shore, as distinct from the catch which takes into account discards, see here, Devon and Severn Inshore Fisheries and Conservation Authority, *Management of the "Live" Wrasse Pot Fishery* (3 August 2017) 13-14
[100] ibid 13. Unable to source original report.

A clear example is observable in Weymouth, Dorset. During 2016 live wrasse fishers in Weymouth recorded a large amount of their landed fish as 'assorted', providing no species information.[101]

The DSIFCA has attempted to collect data on the Plymouth Sound live wrasse fishery using observer surveys and landings data. The first set of findings, published in November 2017,[102] led to potting-permit condition changes.[103] However, this research study was limited. Of the four vessels actively fishing for live wrasse in the Plymouth Sound, on-board observer surveys were only carried out for three of the vessels.[104] No observer surveys took place in May.[105] Overall, this study had observer coverage of 5.5% of the entire fleet.[106] This level of observation may pose limitations such as an inability to provide 'robust estimates of fleet-wide parameters' and a risk of bias.[107] In addition, a month's landings data was missing for two vessels.[108] Devon Wildlife Trust (DWT) were critical of the study particularly in respect of the data relating to Catch Per Unit Effort or Landings Per Unit Effort, as fresh areas were constantly being fished.[109]

DSIFCA conducted further data collection during 2018, with results published in November of that year.[110] This research had similar limitations to the 2017 research, although achieving 12% observer coverage.[111] It may seem insufficient, however, in concluding the 2018 results report, the DSIFCA explained that more even coverage of the vessels would allow for more powerful research, but 'this is often hampered by logistical circumstances and realistically…would not be possible at the current level of resource'.[112]

The CIFCA also attempted to conduct research into live wrasse fishing in its district, but the data sets are small-scale, seemingly unanalysed, and unreplicable.[113] Information is thus incomplete when it comes to wrasse populations in English waters, necessitating

[101] Katerina Kousoulaki and others (n 42).
[102] Data Analysis Research Report (n 82).
[103] Potting Permit Byelaw Policy (n 55).
[104] Data Analysis Research Report (n 82) 9.
[105] ibid.
[106] ibid.
[107] World Wildlife Fund for Nature, *Observer Programmes Best Practice Funding Options and North Sea Case Study* (2008)
[108] Data Analysis Research Report (n 82) 6.
[109] Development and Management (n 72) 16.
[110] Research Report (n 85).
[111] ibid 49.
[112] ibid 50.
[113] Cornwall Inshore Fisheries and Conservation Authority, *Wrasse fishery independent report 2017*; Cornwall Inshore Fisheries and Conservation Authority, *Fishery Independent Wrasse Sampling Survey Field Report 2016*

consideration of other, applicable, research in order to make judgements about the effects of fishing activities.

Wrasse are a sensitive species and therefore 'vulnerable to over-exploitation and possibly localised depletion'.[114] They are sensitive for several reasons. First, wrasse are territorial fish, exhibiting high site fidelity, making local populations easily targetable.[115] Second, wrasse reproduce slowly.[116] Third, many species have large males as nest-guarders: removing males may therefore impact on the number of successful egg hatches.[117] Finally, some species of wrasse are protogynous hermaphrodites, this means that the sex-ratio, and therefore reproductive success rate, can be impacted by size-based exploitation.[118]

Research from elsewhere has documented the effects of live wrasse fishing. In 2017 scientists in Norway compared wrasse populations in four sites where fishing occurs, with wrasse populations in four sites where it is banned.[119] Their findings showed that goldsinny wrasse were up to 65% less abundant in the fishing sites, and corkwing wrasse were up to 92% less abundant.[120] In 1992, a study considered the impact of the first two years of a live wrasse fishery in Ireland.[121] CPUE was found to be significantly lower in the second year (showing decreased wrasse abundancy).

Wrasse play a vital role in their ecosystems, so it seems logical that their removal would unsettle the whole system. Wrasse often eat small invertebrates, and there is anecdotal evidence of invertebrate increase in areas where there has been heavy wrasse fishing.[122] Wrasse also eat sea urchins which can destroy seafloor kelp forests.[123] A 2011 study looked at the effects of removing all wrasse from a patch reef habitat (a small, isolated reef area) and

[114] Ainsley Riley (n 32) para 20.
[115] David Villegas-Ríos and others, 'Home range and diel behavior of the ballan wrasse, *Labrus bergylta*, determined by acoustic telemetry' (2013) 80 Journal of Sea Research 61
[116] 'Devon Wildlife Trust wants strong controls on Wrasse being captured by salmon farming industry' (*Marinet*, 18 July 2017) <www.marinet.org.uk/devon-wildlife-trust-wants-strong-controls-on-wrasse-being-captured-by-salmon-farming-industry.html> accessed 12 February 2019
[117] Ainsley Riley (n 32) para 20.
[118] ibid.
[119] Kim Tallaksen Halvorsen and others, 'Impact of harvesting cleaner fish for salmonid aquaculture assessed from replicated coastal marine protected areas' (2017) 13(4) Marine Biology Research 359
[120] ibid.
[121] William Darwall and others, 'Implications of light-history strategies for a new wrasse fishery' (1992) 41 Journal of Fish Biology 111
[122] ibid 1.
[123] Andy Coghlan, 'Cleaner fish that keep farmed salmon healthy at risk of wipe-out' *New Scientist* (24 March 2017)

keeping the reef wrasse-free for 8.5 years.[124] The study found that resident fish were 37% less abundant and there was a 23% decrease in the number of species present.[125]

Information surrounding wrasse populations in Southern England is limited. This knowledge-gap combined with known wrasse behaviours and research from other countries, suggests that caution should be taken when allowing commercial fishing of live wrasse. Accordingly, the precautionary principle should be routinely applied in these circumstances.

2.2 Ambiguous Assessments

The HD requires that any plan or project taking place in a SAC and likely to have a significant effect on the site must be subject to an appropriate assessment.[126] The HD has been transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (CHSR): appropriate assessment takes the form of a Habitats Regulations Assessment (HRA) under regulation 63 CHSR. There is a compelling argument that live wrasse fishing in the two Plymouth SACs should have been appropriately assessed from the start.

Kraaijeveld (2006) saw the ECJ adopt a broad definition of 'project' as applied to the phrase 'plan or project'. [127] The ECJ extended the meaning of 'extraction of mineral resources' within the EIAD to include other interventions in the natural environment and the use of natural resources.[128] Fish are obviously a natural resource, thus their extraction falls within the scope of a 'project' under the HD. To support this view further in *Waddenzee* the ECJ recognised fishing activities as 'projects' under the HD.[129] The issue, then, is whether live wrasse fishing in the Plymouth SACs is likely to have a significant effect on the sites.

The term 'likely' does not denote certainty, rather it implies feasibility or potentiality.[130] Commission advice states that 'it is unacceptable to fail to undertake an assessment on the basis that significant effects are not certain'.[131] In *People Over Wind* (2018) the CJEU held

[124] Peter Waldie and others, 'Long-Term Effects of the Cleaner Fish *Labroides dimidiatus* on Coral Reef Fish Communities' (2011) 6(6) PLOS ONE
[125] ibid.
[126] Council Directive 92/43/EEC (n 50) art 6(3).
[127] Case C-72/95 *Aannemersbedrijf P.K. Kraaijeveld BV and Others v Gedeputeerde Staten van Zuid-Holland* (1996) ECR I-5431
[128] ibid para 30-31.
[129] Case C-127/02 (n 56).
[130] European Commission, *Commission notice: Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (21 November 2018) 40
[131] ibid.

that the likelihood that a project will have significant effects on a site cannot be downplayed by taking into account any intended mitigation or protection mechanisms.[132]

The Commission's advice explains that significant effects should be determined by 'taking particular account of the site's conservation objectives and ecological characteristics'.[133]

For both Plymouth SACs the conservation objectives are determined by Natural England (NE), a DEFRA-sponsored non-governmental public body to be consulted on any HRA in England.

While there is no mention of wrasse specifically in the designation of the SACs and wrasse are not a HD protected species, research has demonstrated how vital wrasse are to relevant habitats. Using the example of reef habitats - reefs were a selection criteria for both Plymouth SACs - it is clear why fishing for wrasse will have a significant effect on the conservation objects of the SACs. NE determine 'attributes' relating to each protected habitat type within the SAC which must be maintained in order to meet the conservation objectives for the site.[134] For both Plymouth SACs, one attribute which must be maintained in relation to reefs is the 'presence and spatial distribution of biological communities'.[135] For both Plymouth SACs, kelp forests are included within the list of notable biological communities.[136] Wrasse are known to inhabit reefs found within the Plymouth SACs,[137] so remove them and kelp-grazers such as sea urchins are allowed to destroy the kelp forests. Thus, the conservation objects for the sites will not be met and the ecological characteristics of the sites will be compromised. This suggests that an HRA should have been carried out prior to the commencement of the fishery in the Plymouth SACs in 2015. This did not happen.

Several HRAs have been carried out by the DSIFCA/CIFCA relating to the Plymouth SACs.[138] However, all are post May 2016, and relate to specific fishing gears: the removal of wrasse

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[132] Case C-323/17 *People Over Wind and Peter Sweetman v Coillte Teoranta* (2018) ECR I-244
[133] European Commission (n 130) 42.
[134] For example, 'Start Point to Plymouth Sound and Eddystone SAC Supplementary Advice (*Natural England*, 16 May 2016) 9<https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK0030373&SiteName=plymouth&SiteNameDisplay=Start+Point+to+Plymouth+Sound+and+Eddystone+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=> accessed 14 February 2019
[135] ibid; 'Plymouth Sound and Estuaries SAC Supplementary Advice' (*Natural England*, 20 March 2017) <https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK0013111&SiteName=plymouth&SiteNameDisplay=Plymouth+Sound+and+Estuaries+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=> accessed 14 February 2019
[136] ibid.
[137] 'CUCKOO WRASSE' (*Plymouth City Council*) <https://webarchive.nationalarchives.gov.uk/20110927060948/http://www.plymouth.gov.uk/cuckoowrasse> accessed 14 February 2019
[138] For example, Devon and Severn Inshore Fisheries and Conservation Authority, *Fisheries in EMS Habitats Regulations Assessment for Amber and Green risk categories* (December 2017). Eight Habitat Regulations Assessment documents have been seen, five created by the Devon and Severn

has been a secondary issue. From these HRAs, the IFCAs and NE assert that the fishery is not having a significant effect on the sites, despite stating that further research is required and funding a PhD to investigate. [139]

Arguably, the Government has not fulfilled its HD obligations and the IFCAs have not fulfilled their CHSR obligations by failing to carry out appropriate HRAs. With wrasse being specifically targeted in SACs, in significant quantities, and taking account of the importance of wrasse to the habitats, it would be reassuring to see a specific HRA, not on the general gear used, but on the particular topic of live wrasse fishing in the Plymouth SACs. With the benefit of hindsight, this would have been preferable pre-2015.

2.3 Limited District Management

All of the IFCAs under consideration appear to have functional regulatory systems concerning the wrasse fishery in their districts, although arguably appearances are not meeting the actual need for protection of wrasse in the fisheries.

The DSIFCA is able to modify the permit conditions for every Potting Permit holder in its district. The holder must abide by the conditions on pain of enforcement. The latest amendment (August 2018) changed closed season dates and the size for corkwing wrasse.[140] The basis of these conditions is worthy of examination.

For example, the change to the closed season dates was reportedly made to protect the majority of spawning wrasse to avoid population collapse.[141] The change was informed by the DSIFCA's 2017 data collection study. However, the study only observed one ballan wrasse (the most fished species).[142] DWT informed the DSIFCA that in the 2017 study, 'over 80% of wrasse were not assessed for spawning during April and over 70% not assessed during May'.[143] The decision to extend the closed season to mid-July may be valid, but there seems to be no evidence base for moving its start from April to May. Further concern was raised by NE regarding the lack of evidence.[144] The DSIFCA have attempted to use spawning data from

Inshore Fisheries and Conservation Authority and three created by the Cornwall Inshore Fisheries and Conservation Authority, only one of these documents will be referenced here.

[139] Sarah Gall, Evaluating the Impacts of Integrated Fisheries and Conservation Management (PhD thesis, University of Plymouth 2016)

[140] Potting Permit Byelaw Policy (n 55).

[141] Research Report (n 85) 48.

[142] Data Analysis Research Report (n 82) 24.

[143] Development and Management (n 72) 17.

[144] ibid 15.

other countries as an aid, but DWT have criticised this approach on the basis that latitude effects spawning.[145]

Arguably the DSIFCA lacks information to inform permit conditions to protect wrasse populations. The permit conditions will likely change again in 2019 on the basis of the DSIFCA 2018 data collection study.[146] Although this appears to be a 'suck it and see' approach, it is, at least, an attempt to collate data. Regardless of the permit conditions, success will always require implementation and enforcement.

One permit condition supports the operation of a fully documented fishery.[147] Permit holders are required to complete and submit weekly landings forms.[148] Evidence suggests, however, that the enforcement of this condition is inconsistent. The 2017 study identified that forms were often only submitted following repeated requests from a DSIFCA officer; while some forms were incorrectly completed affecting data quality.[149] The 2018 study painted a similarly mediocre picture of officers having to chase fishers to submit; and fishers being inconsistent in their submissions.[150]

All three IFCAs employ voluntary measures as a management tool: for the SIFCA it is the sole method of regulating the fishery. The CIFCA and SIFCA offer no information in respect of fishers' compliance with the voluntary measures. The DSIFCA, however, has explored this issue in its research. In the 2017 study, two out of the four commercial fishing vessels fished in the voluntary closed areas suggested by the DSIFCA,[151] and five out of the 12 voluntary closed area grid squares were fished.[152] Voluntary compliance reportedly improved dramatically in the 2018 study with no fishers using the closed areas.[153] However, full compliance across the districts seems unlikely: a BBC documentary in October 2018 camera filmed a vessel fishing for wrasse in a voluntary closed area in the SIFCA.[154]

The actions of the IFCAs to date suggest a group of organisations that does not have sufficient knowledge to take appropriate action in respect of the wrasse fishery, thus adopting ineffectual measures. Considering that the IFCAs' top priority, is the 'conservation of marine ecosystems

[145] ibid 17.
[146] Devon and Severn Inshore Fisheries and Conservation Authority, *Potting Permit Byelaw Formal review of the Live Wrasse Pot Fishery* (30 October 2018)
[147] Potting Permit Byelaw Policy (n 55) 1-2.
[148] ibid 2.
[149] ibid 28-29.
[150] Research Report (n 85) 50.
[151] Data Analysis Research Report (n 82) 12.
[152] Development and Management (n 72) 16.
[153] Research Report (n 85) 49.
[154] Inside Out South West (BBC, 29 October 2018)

for (direct) economic purposes',[155] arguably they are more focused on how the management measures work for the fishers rather than the environment. Perhaps there is scope to change.

Part 3 – The Future

3.1 Working with What We Have

Having explored the legal and regulatory issues surrounding the fishery in Southern England, it appears that there is room for improvement. Taking full advantage of the current legal tools may be an effective way to improve the wrasse's long-term prognosis.

The HD, governing the SACs where live wrasse fishing is occurring, could be better utilised. A HRA should be completed by the DSIFCA and the CIFCA for the two Plymouth marine SACs, with live wrasse fishing/reef health as the focus. A HRA should be completed for each SAC where live wrasse fishing is occurring, for example around the Studland to Portland SAC in Dorset.[156]

MCZs could also be useful. MCZs protect Features of Conservation Importance (FOCI).[157] In 2018, DEFRA consulted on adding 12 new FOCI to existing MCZs, demonstrating that MCZs and their conservation focus may be changed.[158] The current list of MCZ features is not fixed, and any species or habitat can be added where 'there is a strong case for protecting them'.[159] If wrasse species were included on the list of species FOCI for the Plymouth MCZ, it would afford them more protection by obligating the relevant IFCAs to seek to maintain their populations at sustainable levels.[160]

The IFCAs have taken steps to manage the fishery in their districts, and the DSIFCA stated that it has 'introduced stringent statutory management to try to ensure the fishery is sustainable'.[161] However, there remain issues relating to compliance with the byelaws and

[155] Lynda Rodwell and others, 'Fisheries co-management in a new era of marine policy in the UK: A preliminary assessment of stakeholder perspectives' (2013) 45 Marine Policy 279
[156] 'Chesil and the Fleet' (*Joint Nature Conservation Committee*) <http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0017076> accessed 5 March 2019
[157] 'Marine Conservation Zone Features' (*Joint Nature Conservation Committee)* <http://jncc.defra.gov.uk/PAGE-4527> accessed 6 March 2019
[158] Department for Environment, Food and Rural Affairs, *Marine Conservation Zones: Consultation on proposals for designation in 2019 Annex C – Additional features proposed for inclusion in existing Marine Conservation Zones* (June 2018)
[159] Marine Conservation Zone Features (n 157).
[160] Designation Order (n 69) s 5(2).
[161] Email from Devon and Severn Inshore Fisheries and Conservation Authority to author (4 March 2019)

adherence to voluntary measures. Solutions may prove difficult, due to a lack of resources, but it could be asserted that the answer is education.[162] Live wrasse fishers should be fully aware of the ecological importance of the relevant species. A focus on education could increase the 'likelihood of cooperation and [fishers] adhering to management objectives while reducing objection or conflict'.[163] Optimistically, this might develop concepts such as 'voluntary stewardship' and 'pride of ownership' amongst the fishers.[164] Perhaps the IFCAs could create educational conservation resources to accompany the purchase of a potting permit. While such ideas would require an investment from already cash strapped IFCAs, education-based compliance is known to improve awareness and aid conservation in the long-term.[165]

Another logical development – seemingly feasible - is for the SIFCA to create a wrasse fishery byelaw. The more significant the impacts of the activity, and the more frequently the activity occurs, the more likely it is that the creation of a byelaw is necessary.[166] DEFRA applies the precautionary principle in situations where conclusive evidence as to the risks of the activity is unavailable, meaning that IFCAs should not avoid taking regulatory action in times of uncertainty.[167]

There are a number of improvements that could occur within the existing legal and regulatory framework. Some of these improvements would likely require investment, while others appear easily accessible. Improvements within the existing fabric sound progressive, but there is also scope for some more ambitious changes.

3.2 Suggestions for Change

When considering future options, the extreme reaction may be to suggest a total ban on the fishery. The island of Sark, a separate jurisdiction within the Channel Island of Guernsey which is a British Crown Dependency, has banned the export of live wrasse from its waters.[168] Sark is the first location in the British Isles to take this action.[169] A blanket ban may be feasible on an island with a population of about 500, but in relation to the UK this would not be practical.[170]

[162] Conduct and Operation (n 40) 11.
[163] Charlotte Witney and others, 'Imprecise and weakly assessed: Evaluating voluntary measures for management of marine protected areas' (2016) 69 Marine Policy 92 5
[164] ibid.
[165] ibid.
[166] ibid.
[167] ibid 13.
[168] BBC News, 'Export of live wrasse banned by Sark's government' BBC News (8 May 2019) <www.bbc.co.uk/news/world-europe-guernsey-48160700> accessed 11 September 2019
[169] ibid.
[170] Rob Byrne, 'Sark: Ten years of democracy, but is it working?' *BBC News* (18 December 2018) <www.bbc.co.uk/news/world-europe-guernsey-46540202> accessed 18 April 2019

Therefore, two main legal changes appear to be potentially applicable to live wrasse fishing in the UK.

3.2.1 Quotas

Defined as 'a limited quantity or number of goods or other items that are permitted by a state or body to be imported, exported, or manufactured'.[171] Applied to fisheries, quotas are used globally to preserve fish stocks and ensure fishing proceeds at a sustainable level for each particular species.

EU fisheries are managed by the Commission via the Common Fisheries Policy (CFP).[172] Created in 1970, the CFP allows the Commission to work with MS and non-MS (such as Norway, Iceland and Morocco which share fisheries and stocks with MS) to set quotas.[173] Quotas are set by the EU Agriculture and Fisheries Council **(**AGRIFISH**)** under the CFP in the form of total allowable catches (TACs) in tonnes or numbers.[174] TACs are set annually for most species, and biennially for deep-sea species.[175] AGRIFISH devises the TACs according to scientific advice provided by the International Council for the Exploration of the Sea (ICES) and the Commission body, the Scientific, Technical and Economic Committee for Fisheries (STECF).[176] The TAC for each species is shared out between MS in fixed percentages, known as 'relative stability' shares.[177]

Currently no species of wrasse is included in the CFP TACs.[178] If wrasse species were included, the CFP rules would apply to live wrasse fishing in the UK. It is unclear whether new species may be added to the CFP, but it may be possible, as the 2019 TACs included new by-catch quotas for five species, showing that important, although unrelated, changes can be

[171] Jonathan Law, *Oxford Dictionary of Law* (8th edn, Oxford University Press 2015) 506
[172] Council Regulation (EU) 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) 1954/2003 and (EC) 1224/2009 and repealing Council Regulations (EC) 2371/2002 and (EC) 639/2004 and Council Decision 2004/585/EC [2013] OJ L 354/22
[173] European Commission, *The International Dimension of the EU Common Fisheries Policy* (2015)
[174] 'Agriculture and Fisheries Council configuration (AGRIFISH)' (*European Council*) <www.consilium.europa.eu/en/council-eu/configurations/agrifish/> accessed 9 March 2019
[175] The Common Fisheries Policy (CFP)' (*European Commission*) <https://ec.europa.eu/fisheries/cfp_en> accessed 9 March 2019
[176] 'Scientific advice on managing fish stocks' (*European Commission*) <https://ec.europa.eu/fisheries/cfp/fishing_rules/scientific_advice_en> accessed 9 March 2019
[177] 'Fishing quotas' (*European Commission*) <https://ec.europa.eu/fisheries/cfp/fishing_rules/tacs_en> accessed 9 March 2019
[178] Council Regulation (EU) 2019/124 of 30 January 2019 fixing for 2019 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters [2019] OJ L 29/1

made.[179] For this to happen, the ICES or the STECF would need to make a recommendation. Where there is sufficient data, the ICES uses a maximum sustainable yield (MSY) measurement to formulate recommendations on fish stocks.[180] Calculating MSY is difficult due to 'uncertainties in the relationship between stock size and recruitment' (recruitment is the stock's growth rate), and variability in environmental conditions.[181] With wrasse, the challenge may be greater considering the general lack of population data. Where there is a data deficiency, the scientific bodies use the precautionary principle to inform recommendations.[182] However, these scientific recommendations are 'essentially dependent on data', therefore it is unlikely that a CFP TAC could be set for wrasse without better data on wrasse populations.[183]

With the transboundary and political complexities that characterise the CFP, it may be more appropriate to turn to the local bodies to establish a wrasse quota. When asked about the possibility of creating a quota for live wrasse, the DSIFCA stated that:

> A more local catch limit could (in theory) be set if deemed appropriate but it is likely that the IFCA would manage effort via the number of pots set, rather than the number of fish to be landed.[184]

The DSIFCA has set a 120-pot limit for each potting permit holder,[185] but the CIFCA and SIFCA have not set pot limits. Nonetheless, a pot limit is not the same as a wrasse quota, and a quota would provide more focused protection. IFCAs are permitted to make byelaws 'limiting the amount of sea fisheries resources a person or vessel may take in a specified period', therefore a wrasse quota byelaw appears possible.[186] However, this might be made easier with the help of Governmental legislation. The Wash Fishery Order 1992 was created to aid the local protection of mussels, cockles, clams, scallops and queens in the Wash estuary. This Order allows the Eastern IFCA to impose quotas.[187] With the backing of an Order made by the national Government, the IFCAs would find themselves in a more comfortable position to impose wrasse quotas.

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[179] European Commission, *Press Release Commission proposes fishing opportunities in the Atlantic and North Sea for 2019* (7 November 2018)
[180] European Commission, 'Proposal for a Council Regulation fixing for 2019 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters' COM (2018) 732 final, 2
[181] Jill Wakefield, *Reforming the Common Fisheries Policy* (Edward Elgar Publishing Ltd 2016) 178
[182] COM (2018) 732 final (n 180).
[183] ibid.
[184] Email to author (n 161).
[185] Potting Permit Byelaw (n 71).
[186] Department for Environment, Food and Rural Affairs, *IFCA Byelaw Guidance Guidance on the byelaw making powers and general offence under Part 6, Chapter 1, Sections 155 to 164 of the Marine and Coastal Access Act* (March 2011) 9
[187] Conduct and Operation (n 40) 2.

3.2.2 Taxes

Regulation is often the default response for Governments when facing an environmental challenge, but alternatives may be more suitable. The Organisation for Economic Co-operation and Development (OECD), which has 36 member countries including the UK, encourages the consideration of alternative measures such as 'market-based instruments'.[188] These instruments can include taxes and subsides, which may influence behaviour by imposing economic incentives or deterrents.[189] Instruments such as these offer more flexibility and can reflect the changing patterns of a sector, however they require close monitoring.[190]

Taxes on wrasse might reduce the quantity of cleaner fish that Scottish salmon farms are willing to use, thereby reducing fishing levels. These financial changes would need to apply to all cleaner fish species (such as lumpfish) or there is a risk that companies would simply offset wrasse usage with lumpfish: transferring the issue rather than solving it.

In the UK, value added tax (VAT) is a consumption tax placed on the sale of goods and services,[191] is the third largest source of tax revenue.[192] There are three rates of VAT that businesses can charge: standard rate of 20%, reduced rate of 5%, and zero rate of 0%.[193] There is also a fourth category of VAT exemption.[194] The correct rate of VAT depends upon what goods or services are being sold.

Under schedule 8, part II of the Value Added Tax Act 1994, 'live animals of a kind generally used as, or yielding or producing, food for human consumption' are zero-rated goods. Note (2) found in the same location states that ''Animals' includes bird, fish, crustacean and mollusc'. Live wrasse, and other cleaner fish, fall into this category. A zero rate level of VAT means that the seller must record all sales in their accounts and report them in their returns, but the rate charged to buyers is actually 0%.[195]

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[188] Organisation for Economic Co-operation and Development, *OECD REPORT ALTERNATIVES TO TRADITIONAL REGULATION* 4
[189] ibid 5-6.
[190] ibid 6.
[191] Julia Kagan, 'Value-Added Tax - VAT Definition' (*Investopedia*, 7 February 2019) <www.investopedia.com/terms/v/valueaddedtax.asp> accessed 10 March 2019
[192] HM Treasury, *Value added tax: routes to simplification* (November 2017) 3
[193] 'Businesses and charging VAT' (*GOV.UK*) <www.gov.uk/vat-businesses/vat-rates> accessed 10 March 2019
[194] 'VAT rates on different goods and services' (*GOV.UK*, 12 May 2017) <www.gov.uk/guidance/rates-of-vat-on-different-goods-and-services> accessed 10 March 2019
[195] Businesses (n 193).

It could have a positive effect if VAT on live cleaner fish were to be raised to the reduced rate or even the standard rate. This would require a legislative and policy change. Even if VAT on cleaner fish was increased, sellers only have to register for VAT once they have an annual turnover of £85,000.[196] This is the highest VAT threshold in the EU and the highest general threshold in the OECD.[197] However, it is likely that live wrasse sellers will need to register as wrasse sell for around £17 per fish so fishers' turnovers are likely very high.[198] All sales count towards this threshold, including zero-rated sales.[199]

In April 2018 the Ministry of Finance in Norway announced their consideration of a tax on salmon farms relative to their use of the country's natural resources.[200] A committee was appointed in October 2018 to assess the new system's design.[201] It is early days, but it will likely be recommended for commencement in 2020 and experts predict it will mean a 2-5% tax increase for Norwegian salmon farms.[202] Soon after the announcement, market valuation for the main industry players decreased; Mowi by 3.9% and Salmar by 7.1%.[203] . If Scottish salmon farms were similarly taxed for using natural resources (including live cleaner fish), it might operate to deter them from doing so and encourage them to find other solutions to the sea lice problem.

3.3 Scientific Advancements

Successful, scalable, and safe breeding of wrasse would likely mitigate the live fishing issue, but the barriers to breeding make it unfeasible at present. Globally, scientists are working to perfect breeding, hatching, and rearing processes, as well as improvements to the welfare of

[196] HM Revenue and Customs, *VAT: maintain thresholds for 2 years from 1 April 2018* (22 November 2017)
[197] HM Treasury (n 192) 6.
[198] Figures on price of wrasse vary greatly. This figure has been used as it is an average of a few sources: Inside Out (n 206); BBC News, 'Why the wrasse is the UK's most expensive fish' <www.bbc.co.uk/news/av/world-europe-guernsey-46196189/why-the-wrasse-is-the-uk-s-most-expensive-fish> accessed 10 March 2019; a 2017 report by the Centre for Environment, Fisheries and Aquaculture that has been referenced by multiple sources but the original report was not found
[199] Andrew Needham, 'When to register for VAT and issues regarding registration' (2013) 27(11) Tolley's Practical VAT Newsletter 73
[200] 'Norway considering natural resource tax on fish farms' (*Thomson Reuters*, 30 April 2018) <www.reuters.com/article/us-norway-tax-fishfarming/norway-considering-natural-resource-tax-on-fish-farms-idUSKBN1I10GI> accessed 10 March 2019
[201] Jenny Hjul, 'Norway salmon tax probe underway' (*FISHupdate*, 10 October 2018) <www.fishupdate.com/norway-salmon-tax-probe-underway/> accessed 10 March 2019
[202] 'Norway ponders new aquaculture tax; farmers' share prices drop' *Undercurrent News* (1 May 2018) <www.undercurrentnews.com/2018/05/01/norway-ponders-new-aquaculture-tax-farmers-share-prices-drop/> accessed 10 March 2019
[203] 'NORWEGIAN STOCKS-Fish farmers sink as government considers resource tax' (*Thomson Reuters*, 30 April 2018) <www.reuters.com/article/norway-stocks/norwegian-stocks-fish-farmers-sink-as-government-considers-resource-tax-idUSL8N1S72LY> accessed 10 March 2019

cleaner fish. Advances might occur in relation to the use of cleaner fish, but it may make sense to look at other, new, less environmentally damaging methods to combat the sea lice problem.

In May 2017, Scottish Sea Farms (SSF) introduced new 'sea lice skirts' at their salmon farm in Ronas Voe, Shetland.[204] These skirts encase the salmon pen down to six metres, allowing water and oxygen to move through normally, while preventing lice from entering.[205] As sea lice live in the first few metres of water, the skirt should cover their natural depth range. After nine months of use, SSF reported positive results with sea lice presence below the Scottish legal threshold.[206] SSF have now invested £800,000 in rolling out the skirts to 11 other salmon farms.[207] The Norwegian aquaculture supplier Botngaard has developed the 'Lice skirt V-2018': a slimmer, more durable, cost-effective 'perma skirt' purported to reduce infestation by 50-80%.[208] These skirts are tailor-made for specific farms, taking account of factors such as pen size and weather conditions.[209]

Another salmon pen modification which could combat sea lice is 'snorkel' technology.[210] Pens with the snorkel modification have a net barrier which keeps the salmon at depths of around 10-16 metres, and because salmon require access to air to fill their swim bladders, they have a cylinder or 'snorkel' leading through the barrier to the surface.[211] The salmon are kept at low depths away from the lice, and when they need to access surface waters, they are protected from lice by the snorkel barrier. This technology was developed and tested at the Norwegian Institute of Marine Research.[212] Tests in 2016 found that snorkel pens reduced sea lice abundance by a maximum of 65%,[213] but 2017 tests reached a figure of 84% in a spring-summer period.[214] Snorkel technology could improve the sea lice situation without diminishing

[204] 'SSF rolls out lice skirts after Shetland success' (*FishFarmingExpert*, 20 February 2018) <www.fishfarmingexpert.com/article/ssf-rolls-out-lice-skirts-after-shetland-success/> accessed 12 March 2019
[205] 'SALMON THRIVING THANKS TO NEW ANTI-SEA LICE SHIELDS' (*Scottish Sea Farms*, 19 February 2018) <www.scottishseafarms.com/news/2018/february/salmon-thriving-thanks-to-new-anti-sea-lice-shields/> accessed 12 March 2019
[206] ibid.
[207] ibid.
[208] 'Perma skirt' (*Botngaard*) <www.botngaard.no/en/products+and+services/perma+skirt> accessed 12 March 2019
[209] ibid.
[210] ''Snorkel' cage cuts lice numbers by 80% in trials' (*FishFarmingExpert*, 11 April 2018) <www.fishfarmingexpert.com/article/snorkel-cage-cuts-lice-numbers-by-80-in-trials/> accessed 12 March 2019
[211] ibid.
[212] ibid.
[213] Lars Helge Stien and others, ''Snorkel' sea lice barrier technology reduces sea lice loads on harvest-sized Atlantic salmon with minimal welfare impacts' (2016) 458 Aquaculture 29
[214] Daniel Wright and others, ''Snorkel' lice barrier technology reduced two co- occurring parasites, the salmon louse (*Lepeophtheirus salmonis*) and the amoebic gill disease causing agent (*Neoparamoeba perurans*), in commercial salmon sea-cages' (2017) 140 Preventative Veterinary Medicine 97

fish welfare or production: 'using a depth-based barrier is a powerful management tool for salmon farming'.[215] The technology is not currently in use in the UK.

In 2018, a Canadian company developed a viable Thermolicer.[216] Originally a Norwegian invention, now commercially available,[217] , the machine moves fish, at high volume, through a system containing warm water which kills the sea lice.[218] Now approved by the Norwegian Veterinary Institute, thermal delousing is on the rise.[219] However, there have been numerous mass mortality incidents related to thermal delousing, and warnings that it can cause head injury, brain bleeds and stress.[220] Similarly, Cooke Aquiculture in Scotland own a Hydrolicer, which has been in operation since 2017.[221] It works by moving fish through a system which uses low pressure water jets to create turbulence and dislodge the sea lice.[222]

Diet may also be important. In 2016, Chile became the first country to allow in-feed treatment.[223] This inhibits the formation of chitin (a fibrous substance which is a component of the lice exoskeleton) in sea lice thus preventing the lice from growing.[224] In addition, an American company, has developed a type of salmon feed based on previous research into a specific mannan-rich cell wall fraction (MRF) and terrestrial animals.[225] MRF is a carbohydrate found in the outer cells of a specific strain of yeast, and has been shown to improve the gastrointestinal morphology of terrestrial animals while interacting with the immune system and altering enzymes.[226] MRF resulted in 'better performance, livability [*sic*] and optimum immune response' in the animals.[227] Alltech is now supplying Norwegian salmon farms with

[215] Frode Oppedal and others, 'Sea lice infestation levels decrease with deeper 'snorkel' barriers in Atlantic salmon sea-cages' (2017) 73(9) Pest Management Science 1935
[216] 'Salmon farmer set to use Norway's 'Thermolicer' technology' *Portland Press Herald* (Portland, 11 May 2018)
[217] THERMOLICER' (*Steinsvik*) <www.steinsvik.no/en/products/e/seaculture/fish-health/thermolicer> accessed 12 March 2019
[218] ibid.
[219] ibid.
[220] 'Campaign group to file legal challenge against Scottish salmon farms' use of Thermolicer' *Undercurrent News* (London, 10 July 2018)
[221] 'TECHNOLOGY FOCUS: HYDROLICER – NON-MEDICINAL SEA LICE MANAGEMENT' (*Scottish Aquaculture Innovation Centre*, 23 October 2018) <www.scottishaquaculture.com/news-events/technology-focus-hydrolicer-non-medicinal-sea-lice-management/> accessed 12 March 2019
[222] ibid.
[223] Colleen Parr Dekker, 'Chile first country to approve Elanco's novel sea lice treatment for salmon' (*Elanco*, 4 November 2016) <www.elanco.com/news/press-releases/imvixa> accessed 12 March 2019
[224] ibid.
[225] 'For salmon's sake: Seeking solutions to sea lice' (*Alltech*) <http://ag.alltech.com/en/blog/salmon-sake-seeking-solutions-sea-lice> accessed 12 March 2019
[226] ibid.
[227] ibid. Unable to source original study.

MRF based feed products, which increase the natural external mucous production of the fish and therefore increase natural resistance to diseases and parasites, including sea lice.[228]

When science is moving quickly, the precautionary principle is paramount. Perhaps a model such as that suggested by Andy Stirling in 2016 on the precautionary principle and emerging technologies, could be useful in this regard.[229]

Conclusion

Live wrasse fishing has been occurring in southern England for around four years.[230] The economic motives are clear; the fishers make money selling wrasse, and the salmon farms save money by using wrasse to maintain healthy stocks. There are multiple layers of regulation which attempt to protect wrasse populations and surrounding environments by providing regulation, restriction and structure.

This article has explored the validity, efficacy, and implementation of these legal mechanisms. The conclusions are uncomfortable. A SAC is a powerful tool for environmental protection, but HRAs are not being carried out properly, so the HD and the SACs cannot fully function.[231] The UK Government's obligations relating to the HD are not being fulfilled optimally. The creation of MCZs by the MCAA is positive, but the relevant MCZs in Southern England do not specifically cover any wrasse or connected species amongst the FOCI.[232] Byelaws created by two of the IFCAs shows progress, but compliance and enforcement remain areas for concern. The voluntary measures created by the IFCAs appear weak and are likely ineffective.[233]

There are numerous examples of human activity causing a species to rapidly decline in numbers with action not being taken until it is too late. Whaling is a prime example of this, and whilst, clearly, whales are different from wrasse the point remains - wrasse populations should not be permitted to be decimated beyond recovery before serious action is undertaken.

The question then arises as to what action can or should be taken in the future to reduce or prevent any ecological damage caused by live wrasse fishing. This article has submitted that the pre-existing legal mechanisms, if implemented sufficiently and comprehensively, could be

[228] ibid. Unable to source original study.
[229] University of Sussex, Science Policy Research Unit Working Paper Series, Andy Stirling, *Precaution in the Governance of Technology* (July 2016-14) 16.
[230] Text to n 40 in pt 1, s 1.2
[231] Text to n 139 in pt 2, s 2.2
[232] Text to n 160 in pt 3, s 3.1
[233] Text to n 154 in pt 2, s 2.3

effective. Proper HRAs should be carried out for each SAC in specific relation to live wrasse fishing, and wrasse species should be added to the list of FOCI for each MCZ. The SIFCA should exercise its powers and create a relevant byelaw, while the current IFCA byelaws could be made more effective if combined with a fisher education programme: this could be in the form of educational materials sent to each permit holder. This article has also suggested alternatives to existing legal tools, which could be used in this situation, namely, quotas or taxes.

Some have suggested a moratorium be placed on the growth and development of the Scottish salmon farming industry until it can fully mitigate and control its main environmental impacts, including sea lice.[234] While potentially draconian and economically significant - arguably, its growth should be paused until better solutions to the sea lice problem are discovered. A solution would be optimal but in the meantime it is necessary to ensure that the live fishing of wrasse is suitably recorded, monitored, evaluated and, if necessary, restricted, before it is too late.

[234] 'Salmon aquaculture in Scotland: is it coming to the end of the line?' (*Scottish Aquaculture Reform Network Scotland,* 21 September 2018) <https://salmonaquaculturescotland.wordpress.com/2018/09/21/salmon-aquaculture-in-scotland-is-it-coming-to-the-end-of-the-line/> accessed 28 March 2019