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Short communication

COVID-19 provides an opportunity to advance a sustainable UK fisheries policy in a post-Brexit brave new world

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ABSTRACT

Brexit creates a systemic shock that provides a unique opportunity for the UK to implement a new sustainable Fisheries Policy to better manage the multiple stocks on which future fishers will depend on leaving the European Union. At the same time, the global slowdown of commercial fishing as a result of COVID-19 has reduced pressure on some threatened stocks to levels not seen since the Second World War. In combination, Brexit and the COVID-19 slowdown have created a unique opportunity to facilitate the recovery of a threatened resource. Nevertheless, challenges remain as fisheries represent only 0.12% of UK economic output, presenting a risk that opportunities for more sustainable management will be lost during wider trade negotiations. Reduced fishing pressure during the COVID-19 era will enable stocks an opportunity to recover if supported by a new UK Fisheries Policy that focuses on: (a) re-establishing the role of Maximum Sustainable Yield to set limits that enable the recovery of fish populations initiated during the COVID-19 era; (b) ensuring that catch targets are set with the aim to maintain biomass at 120% of that which will achieve Maximum Sustainable Yield; (c) improving coherent resource management that also considers the expensive use of carbon associated with unsustainable fishing, and the need to protect fish throughout their life-cycle; and (d) constructing and effectively enforcing protection of a resilient network of Marine Protected Areas despite potential protests from EU member states.

With Brexit the UK is no longer required to comply with the Common Fisheries Policy (CFP), the framework for governing shared marine fisheries in European waters for nearly 50 years (since 1972). As a result, there is an opportunity to construct a new more sustainable policy that preserves populations of fish and the livelihoods of fishers who have depended on them for generations. At the same time, COVID-19 has enforced a global slowdown in the activity of many fisheries [1]. According to the Global Fishing Watch database of fishing activity based on Automatic Identification System data, some of the world's largest fishing countries based in Europe have experienced considerable reductions in fishing activity [2]. In some countries this reduction is by 50% or more compared to activity in recent years as a result of low demand, falling prices, seafood market closures, and concerns over maintaining health and safety of crews [2]. The UK, one of the nation's hardest hit by COVID-19, is particularly impacted because its fleets depend extensively on export markets and high value species [3]. Curtailed activity has reduced the pressure on many threatened stocks to levels not observed

since during the two World Wars, providing a unique opportunity to facilitate the recovery of several populations if future fishing is restricted to sustainable levels. Prior to the COVID-19 slowdown, European waters were heavily exploited and acknowledged as a global fisheries hot spot [4], with several stocks targeted by UK fishers in a degraded and precarious state with a tenuous future (Fig. 1). As long ago as 2004, the Royal Commission on Environmental Pollution advised substantial and urgent action was needed to avoid fisheries collapse. Since then, recovery has been slow, with approximately three-quarters of the assessed fish and shellfish stocks failing to meet Good Environmental Status under the EU's Marine Strategy Framework Directive [5]. Healthy and resilient marine fisheries will be critical, not only to local fishing communities, but to overall food security of a nation that in the future will increasingly suffer the vagaries of shifting trade relationships in an era of global food shortages [6]. Brexit provides an opportunity to develop policies to aid recovery, boosted by the COVID-19 slowdown; but only if substantial threats are negotiated and policy makers act quickly.

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Currently, marine fisheries are a relatively small contributor to the UK economy, representing only 0.12% of economic output in 2016 [7], leading to worries that opportunities to futureproof sustainable management may be squandered during wider trade negotiations [8]. At this historic crossroads an important question relates to whether the UK Government will grasp the opportunity reinforced by the COVID-19 slowdown to become a world leader in managing sustainable and highly profitable fisheries, continue on a “business as usual” route, or even allow increased overfishing and degradation of stocks in an effort to “compensate” for lost catches during the COVID-19 era and to satisfy calls for higher quota, e.g. by small-scale fishers.

1. “Business as usual” of ignoring science

Prior to the COVID-19 pandemic, the UK Government’s proposals for future fisheries policy after Brexit were outlined in a White Paper that was opened to public consultation in 2018 [9]. This proposed a continuation of policy for the setting of quota which pretty much reflected business as usual because there remained a lack of incentive to prevent the perennial problem of ministers disregarding the advice of scientists during negotiations [10]. As a result, quota are set at levels higher than those that would enable recovery; based on the analysis of 57 stocks of direct interest to the UK economy as of 2015, the percentage

fished at or below levels capable of producing Maximum Sustainable Yields (MSY) was only 53% [5]. In 2018, 37% of the UK stocks with available data were still subject to ongoing overfishing (Fig. 1).

Globally, quota allocations are based on calculations (or miscalculations) of MSY, defined as highest theoretical equilibrium yield (catch) that can be continuously taken from a stock under existing environmental conditions without affecting significantly the reproduction process [11]. Taking a catch-based management approach, the concept was put on a solid ecological and mathematical footing in the mid-1950s, and is estimated using surplus production models to occur when a stock is at half of its maximum population size [12]. That is, the biomass (B_{MSY}) or abundance of an exploited fish stock that generates MSY is that which has been reduced to 50% of its unfished level (B_0). Since then, the concept has been manipulated and eroded by fisheries management agencies around the world, such as those that set targets using proxies for B_{MSY} at 40% and even 25% of B_0 [13].

In recognition of several problems associated with the UN Convention on the Law of the Sea, which was enacted in 1982 and under which the concept of MSY remains an important principle, efforts have been directed at adopting more precautionary approaches and strengthening the management of shared fish stocks [14], considering fisheries from a wider ecosystem perspective (e.g. 1995 United Nations Agreement for the Conservation and Management of Straddling Fish Stocks and Highly

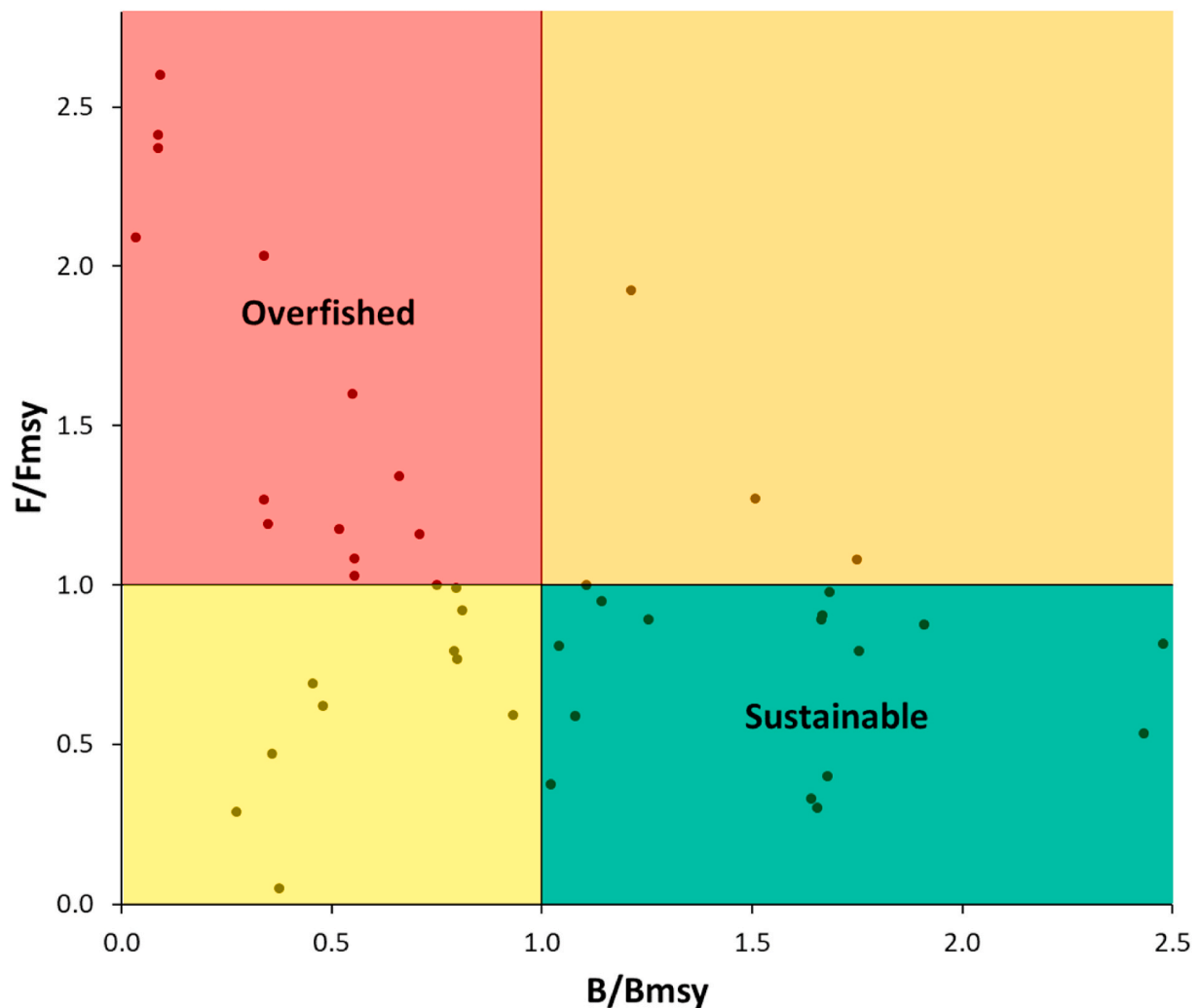


Fig. 1. Kobe plot of exploitation (F/F_{MSY}) and stock size (B/B_{MSY}) relative to sustainable levels for 43 stocks fished by UK fishers in 2018. The green quadrant ($n = 15$) illustrates stocks that were sustainably harvested and of a healthy size. In contrast, the area in red ($n = 13$) indicates stocks experiencing ongoing overfishing at a stock size too small to deliver MSY. The yellow area ($n = 11$) represents a transition towards green and the amber zone ($n = 4$) transition towards red (source data [32]). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Migratory Fish Stocks, 14; FAO's Ecosystem Approach to Fisheries, 15), cutting subsidies, restricting trade in endangered species, and installing marine protected areas [15]. Nevertheless, the concept of MSY, with and without the distortions described, persists in global multilateral fishing law, and will likely continue to play an important role in the future management of marine stocks. It is important to understand that the biomass of the majority of all stocks in Europe is much lower than B_{MSY} , including in UK waters (Fig. 1). Therefore, the shock created by the unique combination of the COVID-19 slowdown and Brexit provides an once-in-a-lifetime opportunity to kick-start the rebuilding of biomass to B_{MSY} . This would represent real progress in the conservation of stocks and progress toward healthy fisheries with close to maximum catches.

Rethinking global fisheries policies after COVID-19 and Brexit should focus on the continued evolution in developing and using catch targets and limits, such as those updated under the UN Fish Stocks Agreement and the FAO's Code of Conduct for Responsible Fisheries. This can be achieved, partially at least, by re-establishing the key role of MSY, not as a target, but as a limit, as the former, in the best of circumstances, would lead to MSY being exceeded half of the time. Focusing on UK and European fisheries, establishing a policy to rebuild fish populations to a level above (e.g. 20% as in Australia) that required to generate MSY would not only enthruse the marine conservation community, but would also increase profits for the fishing industry through maximising the economic yield [13]. Moreover, after Brexit the UK will be in a position to insist in its negotiations with the EU that the Total Allowable Catch advised by scientists not be exceeded, or better still, aim for about 95% of this amount to achieve a safety margin for biomass and maximum economic yields.

2. Embracing joined-up thinking

Moving forward, COVID-19 and Brexit provide a chance to reboot the system and move away from the siloed approach to resource management to one that is more holistic. The harvest of fish not only has implications for the management of a food, but also the use of energy. Fishing fleets are heavily reliant on fossil fuels that emit large quantities of greenhouse gases and other atmospheric pollutants, and that travel ever greater distances as they search to exploit the last remnants of a diminishing resource. Since 1950, some countries have subsidized fuel costs of their industrial fishing fleets to enable them to double the distance over which they travel to exploit fishing grounds [16]. Such fisheries, and particularly those that target high value species, expend fossil fuels that vastly exceeds the nutritional energy value of the catch harvested [17]. At a national level, superimposed on this problem are the energy costs associated with transportation due to the imbalance in what is caught and eaten, with the UK importing approximately 75% of the fish eaten while exporting up to 80% of its catch [18]. Likewise, when considering the EU as a whole, which is the world's largest trader of fishery and aquaculture products in terms of value, self-sufficiency is low, with the top five species consumed (tuna, cod, salmon, Alaska pollock and shrimps), representing 43% of the market, predominantly imported from outside of the EU (for 2016 data, [19]). Clearly, when viewed from a more holistic perspective that incorporates environmental and other concerns, such as those relating to climate change and potential shifts in supply chains [20], efforts are needed to stem illogical practices that reduce the future potential to harvest self-sustaining sources of protein and promote unsustainable utilisation of energy. Consumption of locally caught wild fish would then be a climate-conscious alternative to, e.g., consumption of beef, which has a disastrous carbon footprint.

COVID-19 and Brexit provide an opportunity to integrate wider policies that are more coherent and make sense from an ecological perspective. The Fisheries White Paper recognises the value of adopting an ecosystembased approach to management (as set out in the Department of Environment, Food and Rural Affairs' 25 Year Environment Plan), in which there is a move away from the traditional focus on single

species and greater consideration given to community interactions, bycatch, changes in ecosystem structure, and impacts of fisheries practices on habitat [21]. There is a need, however, to ensure governments do not simply pay lip service to such concepts while continuing to conduct business as usual. For example, it is insufficient to enact measures to conserve stocks of commercially important predators, such as cod, while continuing to overfish forage species, such as herring or sand eel, on which the cod depend for food [22]. Furthermore, while an ecosystem approach is important, there is also a need to consider the management of fisheries and protecting populations throughout their life-cycle. Indeed, the focus on marine fisheries appears logical in debates over the CFP, but not when considering that many species of economic value move between marine and freshwater ecosystems. Estuaries are critically important for a vast number of marine animals that reproduce there and use them as nursery habitats during the early stages of their life-cycle [23]. Adopting a holistic approach to developing policy was previously considered in relation to regulatory issues concerning inland waters (e.g. the UK Marine Bill), while the importance of connectivity between freshwater and coastal habitats was an important underpinning of the EU Water Framework Directive. Likewise, national legislation that protects some species in the freshwater environment also considers their protection in coastal waters, out to a six mile limit. Brexit in the post-COVID-19 era provides the chance to join up legislation to underpin ecologically based fisheries management and increase sustainability through modernising fisheries legislation in a coherent way.

3. Public perception and attitude shifts

Debate on how fisheries are managed after the UK leaves the EU have focused primarily on the interests of fishing communities, often within the context of how they might achieve a "fairer deal". The contentious principle of "relative stability" (e.g. [24,25]), in which the UK currently receives a fixed share of fishing opportunities based on historic fishing patterns recorded between 1973 and 1978, is suggested to be inappropriate when considering conditions that prevail today, and there is a perception that after Brexit the UK fishing industry will gain fish currently allocated to EU vessels. This not only risks conflict with EU partners, but oversimplifies a much more complex situation in which there is variation, and indeed competition, among different interests within the industry itself, e.g. between English and Scottish fleets, inshore and offshore fishing, and the owners of corporate industrial-scale fleets versus small-scale fishers. The opportunities and threats will differ among the groups, and not least between those that capture fish and those that process it. The debate, however, tends to ignore the interests of wider society, who is also a stakeholder as fish are a publicly owned asset. Wider society must be better engaged in the debate if radical shifts in attitude are to be achieved, e.g. changing eating habits and willingness to pay a premium for a more sustainable product.

4. Ways forward

After Brexit the UK must adopt an approach to fisheries management that is informed by best available science. Management systems employed around the world are diverse, and those that invest in limiting fishing pressure backed by comprehensive enforcement programmes, as opposed to enhancing fishing capacity, are more likely to experience stock recovery [26]. Recent global analysis by Costello et al. [27] indicates that management systems most commonly employed not only threaten the future of food security, but also make little economic sense. In their analysis, if stocks are managed to sustain inappropriate proxies for MSY over the long-term, then at best only a slow recovery could be expected. Alternative systems, such as those that assign quota based on Maximum Economic Yield (MEY, e.g. that aims for 1.2 B_{MSY}) to maximize long-term profits, instead of catch, perform considerably better when compared to business as usual [27]. It would be prudent to

conduct an independent scientific review to ensure the long term plan and mechanisms by which UK fisheries are managed to have the best possible chance of enhancing the future of fishing communities and national food security through recovering resilient fish populations. Nevertheless, we propose the adoption of proxies for both targets and limits of B_{MEY} ($1.2 \times B_{MSY}$) and B_{LIM} ($0.3 \times B_{MSY}$), respectively. Should the stock fall below B_{MSY} , then quota should be reduced linearly until fisheries closure is enforced once B_{LIM} is reached. This will allow stocks to recover to levels that are higher than those that can produce MSY to ensure large and diverse populations that will be better prepared for climate change, stabilize ecosystems, and at the same time maximize economic yields, i.e. fishers' profits.

A further "no brainer" for fisheries policy makers in a post-Brexit and post-COVID-19 world is the creation of a "blue belt" of Marine Protected Areas (MPAs) around the UK coast. The establishment of MPAs is one of the most cost-effective ways to restore overexploited stocks and habitats on which fish depend, to the mutual benefit of the fishing industry who experience increased catches in grounds immediately outside of MPAs [28]. Unfortunately, although the importance of establishing MPAs in UK waters is acknowledged, progress is slow, with the designation of 50 Marine Conservation Zones falling considerably short of the 127 sites proposed in an earlier consultation. More importantly, such designation is practically meaningless without sufficient enforcement of their protected status, leading to an illusion of protection when none exists [28]. Indeed, it appears that MPAs attract increased fishing pressure, with approximately 59% of the 727 MPAs designated by the EU being commercially trawled and at a higher intensity than non-protected areas [4]. The construction and enforced protection of a resilient network of MPAs must be a central pillar of future UK fisheries policy, despite the likely protests from EU members who may perceive their "historical fishing rights" to be violated. This latter point requires careful consideration if "cordiale" relationships with EU partners are to be maintained, as lessons in international relations learnt from the UK-Icelandic "Cod Wars" illustrate [29]. The Cod Wars were a series of militarised interstate "skirmishes" initiated due to UK fishing vessels entering Icelandic waters to access fish stocks that they had exploited for centuries. Eventually, the UK abandoned their perceived historic fishing rights, resulting in its acceptance of a 200 nautical mile Icelandic exclusive fishery zone. In the near future there are realistic threats of further dispute, e.g. in the English Channel and North Sea, as EU member states may attempt to defend their access to UK waters. It is likely that a policy that limits access to critical fish habitats to all, as a means to benefit the wider community through the recovery of fish stocks, will be more likely to garner international support.

Collaboration across government departments is needed to advance integrated resource management and policies that acknowledge the interactions across the energy and fisheries sectors. While the promotion of an efficient fishing industry continues, future policy should build on the opportunity presented by the COVID-19 slowdown and encourage inefficiencies within the system to reduce energy use, limit catch, and allow stocks to recover and profits to increase. Whether this is achieved by reducing the time the fleet is allowed to access fishing grounds, limiting their spatial range (e.g. reducing engine power), or increasing tax on fuel, it is an area that requires careful consideration with some cognisance of the potential for unintended consequences, e.g. of subsidy. Likewise, the hidden costs of transporting a large proportion of locally caught fish around the world while importing that which is eaten should become more transparent so that some redress might be made. This is perhaps one of the most important issues to be addressed, and greater emphasis on "partnership working" involving a range of stakeholders, including EU partners [30], is one of the areas in which the proposed policy is more progressive. This must, however, involve increased focus on engagement with the wider society, ignited through greater media attention, perhaps galvanised through celebrity campaigns [31], and cemented through state supported education programmes.

The UK finds itself in a unique situation. As for most other coastal

states globally, many stocks of fish on which its commercial marine fisheries industry depends are threatened, only gaining some temporary respite due to the enforced COVID-19 slowdown of coastal fishing activities, one that may be prolonged should a world-wide recession ensue. Unlike most other nations, however, the UK is in a position in which the status quo (CFP) has recently been unlocked, enabling a new more sustainable Fisheries Policy to be enacted that might take advantage of what is otherwise an unprecedented global challenge. In this article the problems of traditional fishing practices have been defined, the need to change direction away from business as usual articulated, and ways towards more sustainable fisheries management proposed. There is a need to act quickly, however, if this unique opportunity is not to be missed. The COVID-19 pandemic has illustrated that new laws and policies can be enacted and enforced rapidly when there is a political will to do so. Whether or not the UK decides to become a leader in advancing sustainable fisheries management is a choice that remains in the hands of the policy makers and whom wider society must hold to account.

Data availability

All data supporting this article are openly available from the University of Southampton repository at: <https://doi.org/10.5258/SOTON/D1445>.

CRediT authorship contribution statement

Paul S. Kemp: Conceptualization, Writing - original draft, Writing - review & editing, Visualization. **Rainer Froese:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - review & editing. **Daniel Pauly:** Conceptualization, Writing - review & editing.

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