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# Social harvest control rules for sustainable fisheries

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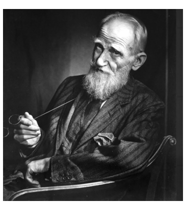
## Abstract

Fisheries are supposed to be for the benefit of society, producing food, providing livelihoods and enabling cultural continuity. Biological productivity goals for fish stocks operationalised through Harvest Control Rules (HCRs) are central to contemporary fisheries management. While fisheries policies often state socio-economic objectives, such as enhancing the livelihoods of coastal communities, those are rarely, if ever, incorporated into operationalised management procedures. The lack of articulation of social objectives and lack of monitoring of social outcomes around HCRs amounts to poor public policy. In this article, we explore the potential for social HCRs (sHCRs) with reference points and agreed predefined actions to make the social dimensions of fisheries explicit. sHCRs cannot cover all social dimensions, so should be considered as one tool within a broader framework of fisheries governance. Moreover, successful sHCRs would require sound deliberative and participatory processes to generate legitimate social objectives, and monitoring and evaluation of fisheries management performance against those objectives. We introduce two potential types of sHCRs, one based on allocation of catch within biological limit reference points, and one for when fishing exceeds biological limit reference points. The application of sHCRs, we argue, can foster accountability and help avoid non-transparent negotiations on size and distribution of the catch. Our proposal is a call to action for policy makers and fisheries managers to properly integrate social criteria into fisheries governance, and for both biophysical fisheries scientists and social scientists to do better in practical collaboration for methods and knowledge development to support this integration.



**Ghoti papers**

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**Etymology of Ghoti**

George Bernard Shaw (1856–1950), polymath, playwright, Nobel prize winner, and the most prolific letter writer in history, was an advocate of English spelling reform. He was reportedly fond of pointing out its absurdities by proving that 'fish' could be spelt 'ghoti'. That is: 'gh' as in 'rough', 'o' as in 'women' and 'ti' as in palatial.

**KEYWORDS**
accountability, integrated management strategy evaluation, social monitoring and evaluation, social objectives, transparency, triple bottom line harvest strategy

## 1 | INTRODUCTION

Harvest control rules (HCRs) are pre-agreed guidelines on how much fishing is allowed relative to the status of target fish stocks (Punt, 2010). HCRs take different forms in different settings, depending on the fishing fleets they aim to control, the biological attributes and geographical extent of fish stocks, and the definition of historical rights of different groups of fishers (Kvamsdal et al., 2016). They can be relatively simple, such as setting a single allowable catch that does not change, or more complex, by triggering limits on allowable catch or fishing effort when target or limit reference points are reached (Breen et al., 2003; Froese et al., 2011; Smith et al., 2008). While the exact content of HCRs varies, they are aligned to the pre-defined objectives set out in management plans aimed at regulating fishing effort to maintain or rebuild target fish stocks, and sometimes to protect wider ecosystem structures and processes. This alignment between management objectives and HCRs is generally evaluated in management strategy evaluation (MSE) (Kaplan et al., 2021).

By pre-defining HCRs in management plans, objectives and strategies of fishery management are made transparent, meaning that stakeholders know a priori what action will be taken should the status of fish stocks change. Such transparency is also presumed to help avoid polarised negotiations over reducing allowable catch due to, for instance, lowered spawning stock biomass (Fletcher et al., 2016). In practice, however, HCRs are not always fully implemented when fisheries overshoot predefined biological reference points, and management decisions aiming to support social outcomes set allowable catch above the levels advised by fisheries scientists (Carpenter et al., 2016; Kvamsdal et al., 2016; Punt, 2010). This demonstrates that conventional biological reference points, related to fishing mortality, spawning stock biomass or ecosystem productivity (Bentley et al., 2021; Geromont & Butterworth, 2014), have social and economic consequences for fishing activities that are not always made explicit (see e.g., Voyer et al., 2017). Yet, 'strategic' social goals, such as fisher income, employment and livelihoods, quality of life, preserving communities and cultural traditions, maintaining recreational fishing access, ensuring food supply and managing resource use conflict (Symes & Phillipson, 2009) are not integrated as operational objectives in management strategies and their evaluation. Consequently, management decisions implicitly designed to support social outcomes may be deemed illegitimate or be undermined by poor implementation.

Conventionally, social factors are left downstream in the policy process—the idea being that the catch should be determined on biological grounds first, and then social and economic considerations addressed. Our reasons for suggesting social issues should be brought into HCRs are twofold. First, fisheries policy objectives are usually a combination of biological objectives (such as healthy marine ecosystems) and socio-economic objectives (such as fleet profitability, sustaining coastal communities). Even simple socio-economic objectives, such as fleet profitability, may be used to determine optimal fisheries policy (Richter et al., 2018). Currently, the most of the effort and skills of fisheries scientists and managers goes into determining total allowable catch (TAC) in relation to biological criteria. Putting one or more quantifiable and relevant social considerations centrally into the analysis for decisions about catch will lead to better alignment with socio-economic objectives. Second, by making socio-economic objectives implicit rather than explicit the legitimacy of policy and management risks being undermined. Social HCRs (sHCRs) could enable trade-offs between social and biological objectives to be made explicit and feed into pre-defined mechanisms, including compensation or allowing continued fishing in recognition of social benefits, or phased approaches to fisheries reform (Eikeset et al., 2013). Over the long term, the introduction of sHCRs could be part of moving management beyond assumptions that biologically sustainable fisheries will inevitably lead to generalised societal benefits, and instead make explicit social benefits and losses for particular groups within society on the basis of specific management strategies.

In this article, we argue that sHCRs can complement the use of biological HCRs (bHCRs) for determining socially beneficial harvest strategies for fisheries. We argue that sHCRs, within a broader set of approaches supported by transparent monitoring, evaluation and learning, can enable social objectives to be operationalised in fisheries management by integration of social and biological objectives that feed into harvest strategies. sHCRs alone cannot address all of the relevant social objectives that should be considered in fisheries management, but they are one potentially useful tool that could be used for quantifiable indicators. The following section asserts the importance of a deliberative, evidence-based approach to setting social objectives for fisheries, some of which can be translated into meaningful sHCRs. We then outline two potential families of sHCRs—'doughnut' and 'bank and borrow' sHCRs—that illustrate how social objectives can be translated into reference points and rules for management. Finally, we discuss the importance of embedding the sHCR within a socially informed MSE process.

## 2 | GOVERNANCE PRECONDITIONS FOR sHCRs

sHCRs would require a sound framework of broader fisheries governance. We have conceptualised this in Figure 1 by showing the sHCRs process (dark blue) within other elements of fisheries management

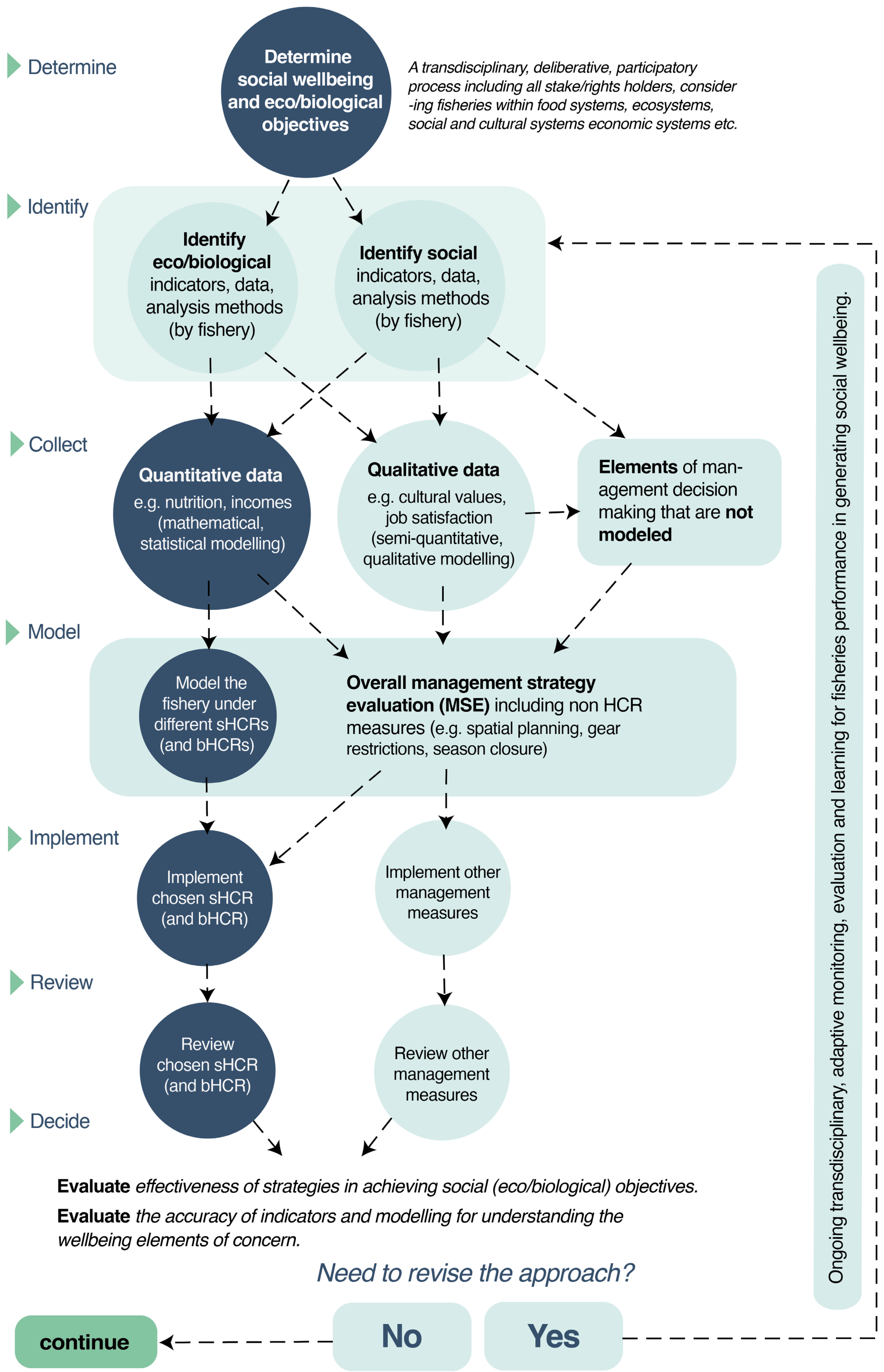


**FIGURE 1** sHCR in fisheries management for social wellbeing with management strategy evaluation (MSE) and monitoring evaluation and learning (MEL).

(light blue). Many articles over recent decades have discussed ways fisheries managers could better address social impacts of fishing (see Data S2—Fisheries Social Objectives), particularly around the access to fisheries resources given to different groups. sHCRs are not intended to replace those efforts, but could add to the specific mix of practices to address social impacts adopted in each context. The foundation of good fisheries governance means (co-)management systems that engage both representation and multi-disciplinary expertise to set well-accepted social, cultural, economic and biological fishery objectives. It also means monitoring relevant indicators for those objectives, including the social ones, evaluating outcomes of HCRs and other strategies, and adjusting the strategies if necessary.

Importantly, sHCRs should interrelate with other governance activities to address social elements that cannot be captured in sHCRs because, for example, they are not meaningfully quantifiable (Figure 1). Accurately understanding the social context of fisheries, setting appropriate targets, collecting reliable data and evaluating change will require a great deal more social science expertise and deliberative participation by all groups involved in or affected by the fishery in question than is currently normal in fisheries science and management.

We propose that MSE is a suitable vehicle for encompassing much of the broader deliberation on management strategies that is necessary in addition to HCRs. MSE is an approach for deciding between management strategies aided by computer simulation. In some cases MSE is done narrowly, with automated tactical decision rules, but it can include qualitative and quantitative forms of data, and different kinds of social, cultural, economic and ecological objectives (see Plagányi et al., 2013). The broader form of MSE could enable meaningful sHCRs.

## 3 | WHAT MIGHT AN sHCR LOOK LIKE?

Reflecting their biological counterparts, sHCRs can be defined as rules that provide a basis for tactical decisions in managing a fishery in relation to explicit or perceived management objectives and available data (see Punt, 2010). Theoretically, sHCRs could be separate from bHCRs. However, given that the biological limits of a stock shape the possibilities for social benefits from a fishery, it is logical that sHCRs be connected to bHCRs. By explicitly linking social aims to biological aims, we argue, the fundamentally social goals of fishing could be integrated in fisheries management—rather than divorcing social benefits from the biological management of fish stocks. With this in mind, we identify two families we label 'doughnut' sHCRs and 'bank and borrow' sHCRs.

### 3.1 | 'Doughnut' sHCRs

'Doughnut' sHCRs focus on the social allocation of catch within an HCR based on biological limit reference points (Figure 2). Following Raworth's (2017) circular 'doughnut' representation of a 'safe and just operating space', the harvest strategy sits between the social goals of equitably meeting human needs (the inner circle) and the predicted biological limits of fish stocks (the outer circle). Doughnut-type sHCRs are based on an a priori goal of social allocation determining the level of harvesting control between different groups, such as industrial and artisanal fishers, or indigenous and non-indigenous fishers.

There are precedents for socially driven allocation of fishery resources. For example, a recent cooperative governance arrangement between the Haida Nation and the Government of Canada will privilege Haida Pacific herring (*Clupea pallasii*, Clupeidae) fisheries over non-indigenous fisheries as part of their stock rebuilding plan (Russ Jones, personal communication). The 'Trawl Ladder' introduced to the Northeast Arctic Atlantic cod (*Gadus morhua*, Gadidae) fishery in 1990 allocated TAC between smaller coastal vessels and the larger trawler fleets conditional on the size of the TAC. In bad years with a low TAC, the coastal vessels are treated preferentially, while in good years the trawlers get a larger fraction of the TAC than in bad years (Armstrong et al., 2014). In Australia, fisheries resources are allocated between commercial, recreational and cultural (indigenous) fishing based on underlying social objectives of fairness and equity, optimising economic and social benefits, and meeting indigenous needs (Mazur et al., 2020). In many examples of socially driven allocation, however, social objectives are either not made explicit or not articulated into measurable indicators. There may also be minimal or no evaluation of outcomes (Armstrong et al., 2014; Mazur et al., 2020). And because allocations are made periodically or ad hoc, rather than being pre-agreed, discontent and even conflict undermine the legitimacy of these otherwise socially progressive approaches to management (ibid.).

We argue that formalising a socially driven allocation of TAC through a doughnut-type sHCR would in contrast ensure that rules about how the allocation will proceed if stock levels change are decided a priori. It would require social objectives to be defined from a participatory deliberative process and clearly articulated, outcomes evaluated and management practices adapted as necessary to effectively achieve the objectives (for an overview of social objectives that have been identified in the literature for different fisheries worldwide see Data S2—Fisheries Social Objectives). We propose two sub-type doughnut sHCRs based on the different approaches for allocating TACs based on available stock biomass.

The first sub-type maintains a *proportionally constant* social allocation between different groups of fishers with the objective of distributing or allocating benefits from a fishery (Bailey et al., 2013; see Figure 2a,d). This kind of sHCR goes beyond setting catch quota alone by making the social objectives for the allocation explicit and predetermining that specified groups will retain equal proportions of the catch if the catch is reduced, in order to avoid negative social impacts. For example, in cases where a reduced TAC favours larger vessels that can fish further offshore, a proportionally constant allocation can protect a small-scale coastal fleet from disproportionate damage.

The second sub-type enables a *preferential social allocation* to one group of fishers over another (Figure 2b,c,e,f). For example, the sHCR could determine that if catches have to decrease for biological reasons, some groups of fishers (e.g., artisanal, subsistence or indigenous) take a larger share of catches for specified social reasons (e.g., vulnerability to poverty or enabling cultural continuity). For instance, catch or effort may be intentionally reserved for smaller coastal vessels in order to maintain social benefits related to supporting livelihoods and food security within Indigenous, family- or community-based fisheries. Harvest could be allocated first to small-scale or indigenous fishers until a specific tonnage after which the surplus could be fished by other groups of (industrial) fishers (Figure 2e,f) (see, e.g., NTI 2009). Expressed in terms of fishing mortality, a decrease in biomass would mean allocating a decreasing share of the fishing mortality to relatively more privileged groups of fishers, because the social needs (food and nutrition security, staying above the poverty line, cultural survival) of privileged groups are less vulnerable to reductions in catch. This form of preferential allocation temporarily supports social objectives for small-scale fisheries over industrial development to balance out the skewed impact. Here, monitoring the social performance of fisheries is crucial for understanding the outcomes of allocation decisions, because industrial fisheries can also be important for preventing social disadvantage. For instance, industrial fisheries can provide many jobs in processing, and shelf-stable food that is also useful for food and nutrition security, including for disadvantaged people.

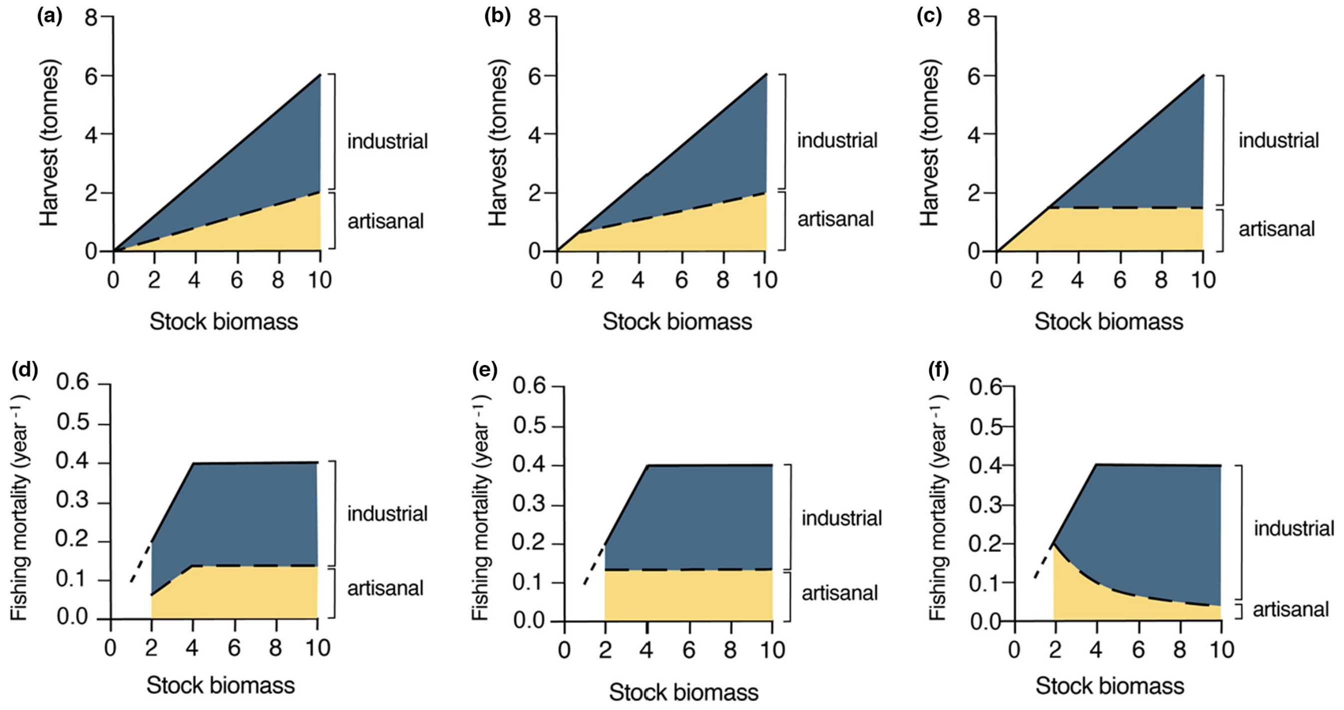


FIGURE 2 Examples of doughnut-type sHCRs proportionally constant (a) and (d) and preferential (b, c, e) and (f).

Indicators for monitoring performance against social objectives can include employment, work satisfaction, proportion of new entrants, reduced dependence on remittances, social connectivity among communities, equitable distribution of catch value, extent and nature of fisheries-related cultural and spiritual practices, (mal) nutrition and measures of overcoming vulnerability related to co-morbid health conditions under conditions of structural and political adversity (Biedenweg et al., 2016; Durgun et al., 2021; Kourantidou et al., 2021; Kronen et al., 2010; Plagányi et al., 2013; Slagboom et al., 2020; see also Data S2—Fisheries Social Objectives).

Preferential treatment may also reflect differences in adaptive capacity between fleets to catch other species in different fisheries, which depends on range, gear and also regulations. When it is biologically feasible to increase the catch, allocating additional catch to the industrial fleet rather than the artisanal fleet (as at Figure 2c–e) could be implemented in an sHCR where artisanal fisheries do not have the capacity to expand their spatial fishing range at large stock sizes, when, for instance, range expansion occurs. This kind of preferential allocation to the industrial fleet could also be appropriate if artisanal fleets are supplying local fresh markets that cannot absorb greater landings, and if the industrial fleet can process the catch (extending shelf life) and/or export the catch to other markets.

## 3.2 | 'Bank and borrow' sHCRs

'Bank and borrow' sHCRs maintain an allocation of fish to certain groups for social reasons even, in extreme cases, when temporarily going beyond biological reference points (e.g., $F_{MSY}$. For a definition of reference points see Data S1—Biological Reference Points for Fishing). By setting an a priori social reference point for temporarily exceeding biological reference points, a bank and borrow sHCR provides vulnerable groups an opportunity to cope with external shocks related, for example, to natural disasters, conflict or pandemics over short and defined time scales (e.g., Bennett et al., 2020; Lam et al., 2020). Setting social goals in contradiction of stock status need clear limits on fishing pressure to be biologically feasible over the long term. In other words, 'bank' the ecological system during 'good times' so that it can be 'borrowed' from during 'bad times', for example, through setting fishing mortality above the $F_{MSY}$ limit. Such an sHCR introduces risk into a fishery—especially in light of the stochastic nature of stock recruitment giving no guarantee of recovery between shock events (Hsieh et al., 2006, although see Hilborn et al., 2020 for resilience of stocks). In many cases, the trade-off is best characterised in terms of current social objectives prioritized over future social objectives; rather than as social objectives pursued at the expense of biological objectives. Indeed, past overfishing in Europe has undermined current and future catch potential of many stocks; representing costs that must be borne and ultimately be paid back by future generations of fishers (Quaas et al., 2012, see also Data S1—Biological Reference Points for Fishing). A bank and borrow sHCR would at least make explicit that 'banking' is necessary, countering common inclinations to 'borrow and keep borrowing' under political pressure.

Bank and borrow sHCRs may relate directly to social concerns for fishers as well as other people who rely on fish for food or the economic activities in fish value chains, to prevent vulnerable groups from falling into extreme poverty, malnutrition or famine. Here, we propose, the HCR would have a set of biological target reference points for re-building that become limits during 'banking' periods, and social reference points related to basic social well-being indicators such as poverty lines (e.g., income below X proportion of median income for Y location). Nutritional security could also be used, using indicators such as deficiencies of vitamin A, calcium and iron and omega-3 long-chain polyunsaturated fatty acids that can lead to foetal and childhood developmental problems and chronic disease (Golden et al., 2021). Allowing catches to temporarily exceed biological reference points could be triggered by shocks from outside the fishery (Béné et al., 2010), such as drought (Figure 3a). Social limit reference points could trigger an ongoing allowance to keep fishing for a pre-defined period of time in spite of impacts on desired stock status (Figure 3b). Careful monitoring of the social indicators as well as the biological ones is important, to ensure that the increased fishing is indeed alleviating poverty or improving nutritional security.

Some may object to bank and borrow sHCRs as legitimizing overfishing. In some species, especially those designated 'endangered, threatened and protected', it is highly problematic to maintain stocks or rebound from overfishing because of low fecundity or other life history characteristics. Yet, there is abundant evidence that many fisheries can survive long periods of overfishing (Hilborn et al., 2020, see also Data S1—Biological Reference Points for Fishing). Moreover, most fisheries legislation worldwide specifies that fisheries are to be for the benefit of society, so if fisheries managers protect only fish stocks and not communities or cultures relying on those fisheries, they are not fulfilling their governance duty. By a priori agreeing upon the social conditions under which biological reference points are exceeded, and under which circumstances catches will be reduced to allow stocks to rebuild when human needs are adequately met, fisheries can positively contribute to urgent temporary human needs such as malnutrition or extreme poverty, explicitly shifting fisheries management from generating wealth (i.e., economic revenue) to welfare (i.e., human needs) (Béné et al., 2010). Fluctuations in fishing effort already happen in unmanaged fisheries (see, e.g., Allison & Ellis, 2001), and in periods of crisis such as during the COVID-19 pandemic, in places where non-fishing employment disappeared (Lucas, 2022). We argue that bank and borrow sHCRs could mitigate crisis-driven overfishing that already happens if the social objectives behind allocations are made explicit and legitimized, and the point of returning to lower mortality agreed upon, rather than further burdening people already at risk of dire poverty by framing their practices as illegal, unregulated or unreported (IUU) fishing (see, e.g., Song et al., 2020).

Fishing above biological reference levels also happens when there is no humanitarian crisis as such. For example, in Northeast Arctic Atlantic cod fisheries stability of catches have often been preferred by the fishing sector over more volatile annual catch levels even if the biological reference level prescribes otherwise (ICES, 2016). Similarly, decisions are made in EU fisheries to limit shifts in quotas from year to year for stocks with a multi-annual plan, such as common sole (*Solea solea*, Soleidae) and European plaice (*Pleuronectes platessa*, Pleuronectidae), by a certain percentage to minimise economic impact and maintain stability to fishing communities and industrial fleets alike (see, e.g., Condie et al., 2014). EU TACs have sometimes been set higher than the biological advice from the International Council for the Exploration of the Sea (ICES), in order to maintain access for the fishing industry, implicitly to

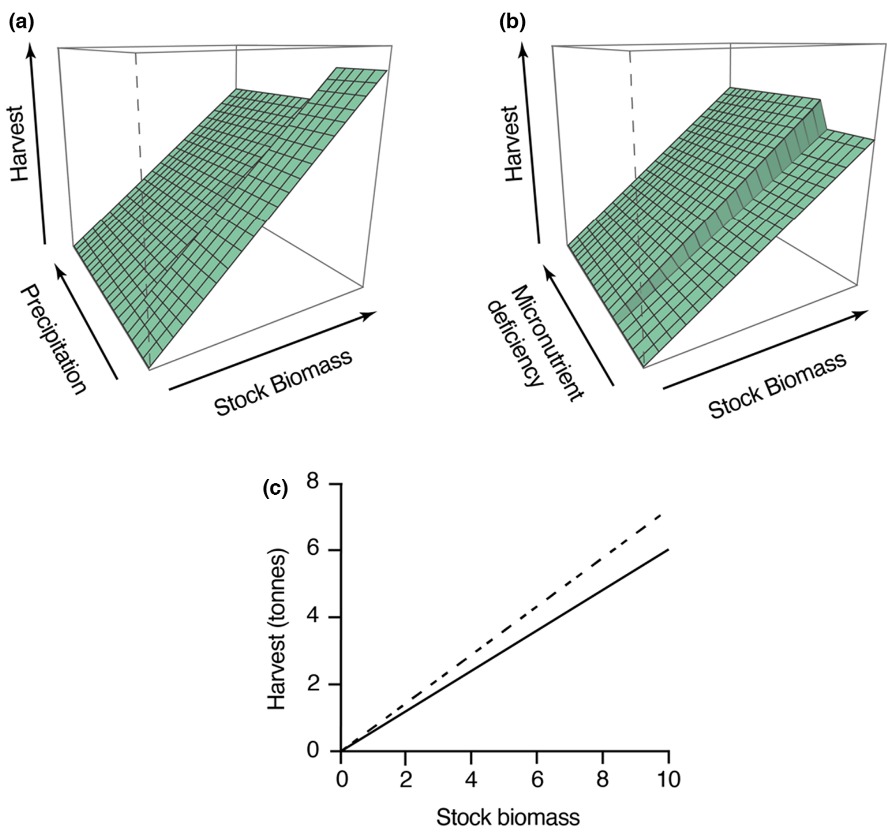


FIGURE 3 Example of a bank and borrow-type sHCR.

sustain fishing communities and their ways of life, skills and knowledge for working at sea (Da Rocha et al., 2012). Is there a use for bank and borrow sHCRs in these circumstances?

Even for readers who believe overfishing should not be allowed in situations such as in Europe, the fact is that it happens, and we argue that bank and borrow sHCRs could make such management decisions more transparent and accountable. The social goals in European fisheries are not made explicit in TAC discussions, nor is performance towards these goals evaluated. Introducing sHCRs in the manner we propose would require decision-makers to articulate the reasons for allowing increased fishing mortality, define the intended benefits and beneficiary groups, and evaluate whether overfishing has been justified against social outcomes achieved.

In sum, despite the undoubted downsides of overfishing, we argue that where it does occur, bank and borrow sHCRs can improve the situation by: (i) avoiding implicit and non-transparent decisions during periods of duress, (ii) introducing evaluation of social outcomes from increased fishing mortality and (iii) encouraging managers to specify how temporary overfishing will relate to rebuilding efforts (Figure 3).

## 4 | sHCRs WITHIN MSES

As noted at the start of the article, HCRs do not work alone, but within a broader framework of fisheries management that should encompass the multidimensional objectives and different temporal and spatial scales relevant for good governance of fisheries resources (Figure 1). MSEs can be a key part of that broader framework. Other approaches such as ecosystem-based management or marine spatial planning can also address social objectives, but MSE works particularly well for HCRs because it explicitly evaluates which management strategy will best achieve the specified objectives. MSE can be a deliberative and collaborative process between scientists, decision makers, stakeholders and other relevant social groups and can include social, economic and cultural objectives (Plagányi et al., 2013). MSEs require monitoring frameworks for assessing whether strategies worked as intended (Punt et al., 2016; Rademeyer et al., 2007; Smith, 1994). Here, it is useful to distinguish between the different elements of a harvest strategy: (1) the objectives of the fishery, with associated performance indicators that are contrasted to reference levels and (2) HCRs, which are the agreed rules setting a path from the current level to the desired reference level, and directing action when a reference level is reached or overshot.

Integrating sHCRs into MSEs requires the explicit evaluation of key uncertainties—including the parameters used, model type and data errors and implementation—for achieving different management objectives (Butterworth, 2007). Including these uncertainties in the data and models on which the management strategies are based is crucial to: (1) help predict *ex ante* whether management strategies will lead to desired objectives, (2) assess *ex post* whether the implemented management strategy achieved the desired objectives and (3) adjust HCRs in response (following Punt et al., 2016). MSEs are especially important when developing sHCRs, given uncertainties in the data and with respect to causal links between social and biological phenomena in the fisheries system. As outlined in Figure 1, the early steps of an integrated social and biological MSE would involve the identification and representation of quantifiable performance indicators to assess an sHCR, which includes identifying uncertainties. This would then be followed by the development of a set of models of the fisheries system, using those indicators to represent whether different social objectives are likely to be achieved under different management strategies, including candidate sHCRs. These models help to assess likely performance against social objectives in light of structural uncertainties.

For elements of the fishery system that cannot be quantified, MSE may also involve semi-quantitative and qualitative modelling (e.g., Geary et al., 2020). Designing sHRCs should therefore involve socially informed, reflexive choices about what kinds of social data can be meaningfully quantified and working out how qualitative data can be incorporated into decision making (e.g., by putting constraints on the shape of an HCR).

Integration of sHCRs into fisheries stock status instruments could be central to MSEs. For instance, once developed through an MSE, the sHCRs could have Kobe plots designed to visually articulate where the fishery is operating in relation to social objectives—in addition to the usual kind of Kobe plots using biological objectives like fishing mortality at MSY—and make explicit the likely outcomes of various trade-offs between different reference levels/objectives (see Plagányi et al., 2013). A range of potential indicators to measure performance against social objectives were listed in the previous section for sHCRs (see also Data S2—Fisheries Social Objectives). Key indicators of social performance and reference points could also be developed from the Human Development Index, or the Sustainable Development Goals, for example. See Figure 4 for a general example of what such plots could look like.

As noted at the start of the article, successful implementation of sHCRs within an integrated MSE framework will require as a

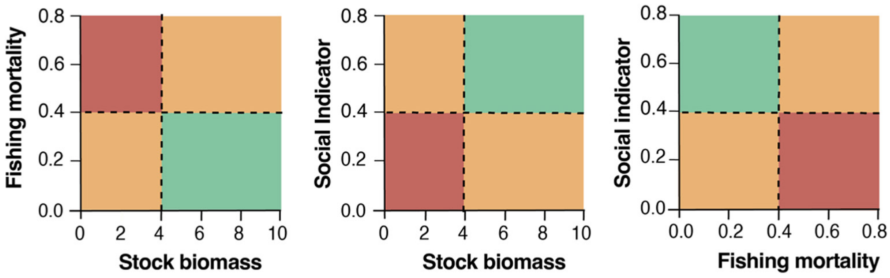


**FIGURE 4** bHCR and sHCR related Kobe plots.

foundation effective public participation processes and social scientific expertise. These are a necessary, but not sufficient, condition for sHCRs to 'work'. Deliberative and participatory processes are needed to generate social objectives for fisheries that are accepted as legitimate in their contexts. Both qualitative and quantitative social science skills are needed for designing data collection schemes to ensure the indicators used in modelling reliably represent progress towards objectives, and for monitoring and evaluating the social performance of fisheries both for sHCRs and for other elements of fisheries management outside the sHCR. New data collection may be necessary for indicators for social objectives. In some cases, existing non-fisheries data, including household income and expenditure, nutrition, employment and trade, may be combined with empirical data and modelling outputs. In contexts without resources to collect new data or adapt existing data it is also possible to use models of intermediate complexity (MICE) or other models with lower data requirements (Geary et al., 2020). Furthermore, not all elements of decision-making must be mathematically modelled (Figure 1). Qualitative assessment of assumptions and values can also be used to make decisions in data poor cases—and, as argued by Basurto et al. (2023), when done in a rigorous and transparent manner can improve the inclusion of otherwise 'illegible' and excluded fishers.

## 5 | CONCLUSION

Our call for sHCRs does not replace bHCRs. Instead, building on systems already established for biological management, we argue that sHCRs can be one element in improving fisheries management by making social objectives and impacts explicit and requiring fishery managers, fishers and politicians alike to openly deliberate them in a socially inclusive, equitable and evidence-based manner. Implementing sHCRs would require identifying and prioritising social objectives, then building datasets and monitoring systems for evaluating progress towards those objectives. Scientific evaluation of the social performance of fisheries will be a significant step forward over the current situation where, if social objectives are included at all in fisheries management (such as 'stability' through the EU common fisheries policy, see Condie et al., 2014), these benefits are assumed, rather than assessed. Such a process would also make explicit and assessable claims that social goals are achieved through good environmental stewardship. sHCRs can be used to make a subset of the social objectives of fishing operational and measurable in management. In doing so, sHCRs can contribute to addressing the enduring challenge of ensuring that the social dimensions of sustainability are central to fisheries policy.

We hope this article generates debate amongst biologists and social scientists alike to recognize that setting HCRs is by definition an interdisciplinary undertaking. Social objectives are implicitly included in the operation of bHCRs and bHCRs inherently have social effects. Developing sHCRs is one way of marrying biological and social objectives in fisheries. By making a priori decisions on who gets how much fish under specified conditions sHCRs could provide a framework for a politics of distributional justice informed by scientific evidence. We also propose that sHCRs could improve the policy process in situations where fishing occurs beyond what is biologically recommended. While it may be unpalatable to allow for overfishing in fisheries management, even temporarily, the reality is that overfishing is already often allowed for social reasons and that the policy process around such decisions is poor. sHCRs can provide a transparent framework for assessing and holding fisheries agencies accountable for achieving social objectives. Where temporary overfishing is deemed socially necessary, sHCRs provide a means of setting justification for it, evaluating the outcomes and pre-decided plans for rebuilding stocks afterwards. Making more explicit which social objectives are pursued through sHCRs may also enhance the legitimacy of HCRs by providing clarity on the social relevance of setting biological references and limits. sHCRs may even open up debate around the wider role of HCRs in fisheries where stakeholders have struggled to see the relevance of, or lacked willingness to set bHCRs.

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### CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest regarding the content of this article.

### DATA AVAILABILITY STATEMENT

The data used for this paper is published materials, listed as references.

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