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Fisheries: Hope or despair?

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ABSTRACT

Recent work suggesting that fisheries depletions have turned the corner is misplaced because analysis was based largely on fisheries from better-managed developed-world fisheries. Some indicators of status show improvements in the minority of fisheries subjected to formal assessment. Other indicators, such as trophic level and catch time series, have been controversial. Nevertheless, several deeper analyses of the status of the majority of world fisheries confirm the previous dismal picture: serious depletions are the norm world-wide, management quality is poor, catch per effort is still declining. The performance of stock assessment itself may stand challenged by random environmental shifts and by the need to accommodate ecosystem-level effects. The global picture for further fisheries species extinctions, the degradation of ecosystem food webs and seafood security is indeed alarming. Moreover, marine ecosystems and their embedded fisheries are challenged in parallel by climate change, acidification, metabolic disruptors and other pollutants. Attempts to remedy the situation need to be urgent, focused, innovative and global.

1. Introduction

Humans have exploited fish populations for food and profit for thousands of years (Sahrhage and Lundbeck, 1992), but the last 150 years have seen huge increases in geographic reach and depth range, an unprecedented fishing intensity through new technology, and a global commoditization of fishery products (Lam and Pitcher, 2012a; Watson et al., 2012). For the past 10 years, fisheries worldwide have been generally reported as being in an extremely poor state, with almost no improvement in sight (e.g., Pitcher, 2001; Pauly et al., 2002). Marine fisheries catches have not increased since the 1980s (FAO, 2012) and there is evidence of episodes of serial depletion by location and depth (e.g., Morato et al., 2006; Swartz et al., 2010). At the same time, marine organisms are challenged by warming, acidifying seas (Sumaila et al., 2011; Doney et al., 2012) and by an increasing spectrum of pollutants, raising questions as to whether we face major reductions in ocean production and biodiversity: one such question is, "We have drawn heavily from our oceans to feed millions but have we done irreversible harm to the biodiversity of our seas?" (Dulvy, Simon Fraser University, Canada, pers. commun.). Indeed, these trends have led some to forecast the collapse of ocean fisheries as we know them (Worm et al., 2006; Pauly, 2009). Recently, however, some (including Worm) have raised a voice that things are improving in fisheries, indeed may be better than we thought, and that previous analyses were too pessimistic and biased (Branch, 2008; Worm et al., 2009; Worm and Branch, 2012). Which of these perspectives is nearer the truth? Based on IPSO workshops in 2011 and 2012 (see acknowledgments), this paper examines the status of world marine fisheries in the light of these issues and makes suggestions as to what may be done to improve things.

2. Management quality

The quality of fishery management is one key issue that tests any claim that things have improved. Management quality has been recently assessed in some detail as being depressingly poor. For example, since its adoption in 1995, Article 7 (Fishery Management) of the FAO (UN) Code of Conduct for Responsible Fisheries has provided well-regarded, synoptic guidelines for the management of sustainable fisheries. As a voluntary code, its efficacy is critically dependent on compliance, but its parent body has failed to monitor effectively despite being mandated to do so by the Code itself (Article 4.2). Recently, compliance with the Code has been estimated for 53 countries landing 95% of the world fish catch using scores for 44 questions and validated by teams of experts (Pitcher et al., 2008a, 2009). Overall, compliance is low, over 60% of countries getting fail grades and no countries being awarded an overall 'good' grade. Even the top scoring countries barely reached a 60% compliance rating. Other recent analyses of the quality of fishery management have come to similar conclusions (e.g., Mora et al., 2009).

Analysis of Code of compliance scores shows that poorly-addressed management issues world-wide (Fig. 1A) could be tackled reasonably easily. For example, catch issues that have fail scores for Code of Conduct compliance in all ocean basins are the use of environmentally damaging fishing gear such as bottom

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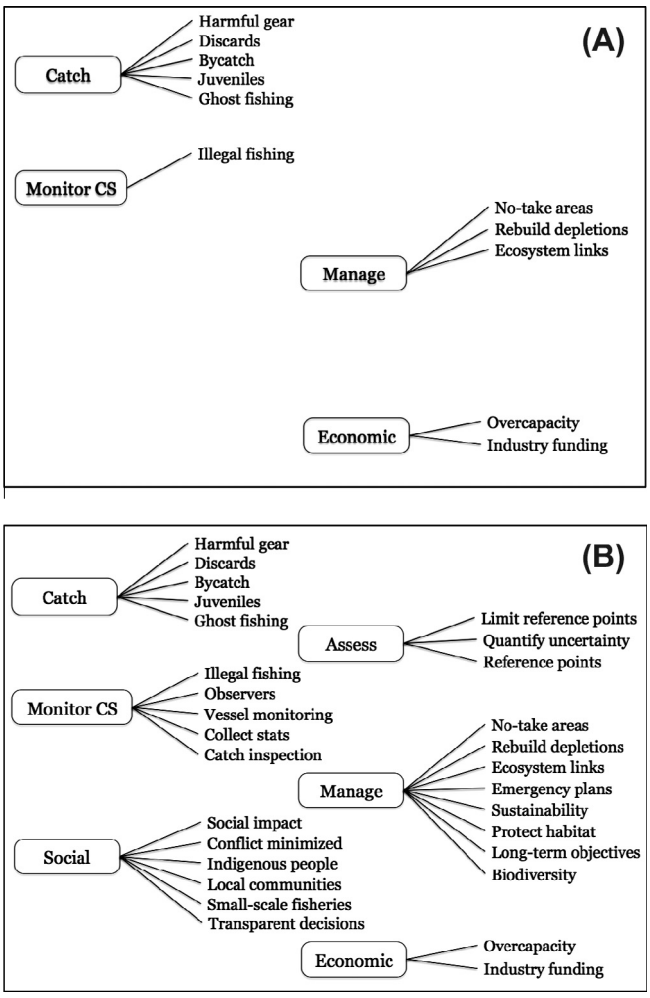

Fig. 1. Fishery management issues that were awarded fail scores in compliance with the FAO (UN) Code of Conduct for Responsible Fisheries. Issues are grouped into six topic areas: catch and fishing gear, assessment, management, monitoring control and surveillance, economic and social. (A) compliance issues with fail scores world-wide; (B) compliance issues with fail scores in the worst scoring ocean basins (Indian Ocean and Mediterranean).

trawls, high bycatch and discards, and 'ghost fishing' – lost fishing gear that continues to kill fish. Dealing with these well-known conservation issues using cleaner fishing gear is relatively straightforward and can create more profitable fisheries in the long run as depleted stocks are restored: another Code of Conduct issue that failed in every ocean basin world-wide. Arranging for the retrieval of lost fishing gear is more expensive, but this, and other costs of moving towards compliance with Code, could legitimately be recouped from the industry that caused the problem. Economic issues that get fail scores world-wide are the failure of the fishing industry to pay for its own management costs, a hidden form of subsidy, and a failure to reduce the vast overcapacity of the fishing fleets (Sumaila et al., 2012; World Bank FAO, 2009). The good news is that addressing both of these economic issues could recoup money currently lost in these subsidies.

In ocean basins other than the North Atlantic, the list of fail scores for Code of Conduct compliance grows much longer (Fig. 1B). The Indian Ocean scored worst, closely followed by Mediterranean: the North and South Pacific were intermediate. Additional key management issues are a failure to implement marine protected areas, to set limits beyond which emergency measures are adopted, and to address conflict among fishery and other ocean user sectors. Two important social issues are to recognize the special needs of indigenous peoples and to foster co-management of marine resources with fishing communities and small-scale fisheries, both features that are known to lead to more sustainable and responsible fisheries (Gutierrez et al., 2011; Pomeroy and Andrew, 2011).

3. Are things improving?

A recent review of the main types of fishery management suggests that most of the 'silver bullet' approaches of a single type of management system (such as 'property rights', 'MPAs' or 'co-management') will not work well, and only combined management approaches (ecosystem and restoration-based) perform best (Pitcher and Lam, 2010). However, despite many calls for its implementation (e.g., Hall and Mainprize, 2005), there has been a widespread failure among the principal fishing countries to adopt the key features of ecosystem-based fishery management (Pitcher et al., 2008a,b). Nevertheless, there are some signs that the management of some fisheries in the developed world is improving. For example, countries with higher Code compliance scores showed improvement in status between 1995 and 2005, according to an ecosystem health index (Coll et al., 2012). Unfortunately, countries with poor Code compliance had not changed, or had got slightly worse. Poor governance in managing fisheries in developing countries is a hard problem to tackle: for many small-scale fisheries in developing countries it is impractical to collect any data. In such situations, it has been suggested that basic elements of 'primary fisheries management' represent a practical solution (Cochrane et al., 2011).

Is the current status in sustainability of fisheries better than had previously been thought? Analysis of stock assessment data from over 350 stocks by Worm et al. (2009) suggested that improved management had led to increased biomass and that fishery stocks were recovering. However, the analysis was based on fish populations that have conventional stock assessment procedures held in a public database (the "Ram Myers legacy database": Ricard et al., 2012). These fish stocks, however, comprise only 16% of the annual world fish catch (only about 8% without just one stock, the US North Pacific pollock), and moreover, most of them are from North America and Europe (Worm and Branch, 2012). As one might expect for fisheries where costly modern stock assessment is carried out, these fisheries are largely in countries of the developed world with the top 15% of fishery management quality scores (Mora et al., 2009). They all have a relatively high UN Human Development Index and are at the upper end of the range of compliance with the UN Code of Conduct for Responsible Fisheries (see Fig. 2: Pitcher et al., 2009). In these assessed fisheries, biomass lies at about 32% of estimated unfished biomass, or about 90% of the MSY level (Worm and Branch, 2012). Moreover, Froese et al. (2012) argue that these assessed stocks are a fundamentally biased subset of all fished stocks in that they represent high value, resilient stocks that have survived fishing for decades, or centuries of fishing in the case of some European ecosystems.

While there is indeed some evidence of small improvements to fisheries management in the developed world (Coll et al., 2012), over 80% of the world's fish are caught elsewhere (Pomeroy and Andrew, 2011) and so this does not support a message of confidence. In fact, a statistical analysis of the status of the majority of world fisheries (Costello et al., 2012) using a multiple regression model to predict status (B/Bmsy) for unassessed fisheries, confirms that, although fisheries for which stock assessment is available are mostly in a reasonable shape, serious depletions are the norm world-wide. This argues against Worm and Branch's (2012) suggestion that unassessed fisheries may "probably harbor higher