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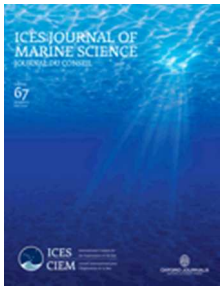

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Practical steps toward integrating economic, social and institutional elements in fisheries policy and management

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Abstract

While many international agreements and legislation in most jurisdictions call for incorporation of four pillars of sustainability, the social (including cultural), economic and institutional aspects (the 'human dimension') have been relatively neglected to date within the practice of fishery assessment and management. As a result, nations are failing to achieve the aspirations of ecosystem-based and integrated management. Recent research publications and discussions have focused on three key impediments: a relative lack of explicit social, economic and institutional objectives; a general lack of process (frameworks, governance) for routine integration of all four pillars of sustainability; and assessment and management processes that are biased towards biological considerations. The practical integration of ecological, economic, social and institutional aspects requires a 'systems' approach with explicit consideration of strategic and operational aspects of management: multidisciplinary or transdisciplinary evaluations; practical objectives for the four pillars of sustainability; appropriate participation; and a governance system that is able to integrate these diverse considerations in management. We challenge all involved in fisheries to immediately take five practical steps toward integrating ecological, economic, social and institutional aspects: 1) Adopt the perspective of the fishery as a 'system' with interacting natural, human and management elements; 2) Be aware of both strategic and operational aspects of fisheries assessment and management; 3) Articulate overarching objectives that incorporate all four pillars of sustainability; 4) Encourage appropriate (and diverse) disciplinary participation in all aspects of research, evaluation and management; and 5) Encourage development of (or emulate) a participatory governance system.

Key Words: Fisheries sustainability, ecosystem approach, integrated management, integrating social and economic aspects, social-ecological system

Introduction

There has been substantial movement towards implementation of objective-based management in fisheries, including an increasing prevalence of specific objectives and performance indicators used in both fisheries assessment and management decision-making (e.g. Punt, 2015; Rindorf et al, 2016a). There is also widespread recognition of the need for increased attention to the four pillars of sustainability (ecological, economic, social (including cultural) and institutional) in fishery management advice and decision-making (Garcia et al, 2014; Rindorf et al, 2016b). Although international agreements and legislation in most jurisdictions call for incorporation of all four pillars, the social, economic and institutional aspects (the 'human dimensions') have been relatively neglected to date within the practice of fishery assessment and management in most countries. Current stock assessment methods and established assessment review and management processes in most nations, including those in Canada, Europe (e.g. ICES) and Australia, remain heavily dominated by, and biased towards, biological perspectives and have been unable to adequately embrace economic, social and institutional aspects (e.g. Bond and Morrison-Saunders, 2011).

The failure to fully embrace economic, social and institutional considerations has resulted in a failure to achieve the aspirational objectives of sustainable development and ocean-related policies of many countries (Begg et al, 2015). This, in turn, has produced major negative consequences. Many of these have been unintended, or at least untracked, such as the direct social and economic costs of lost or foregone community benefits resulting from changes in the distribution of benefits from fisheries (Pinkerton, 2013; Pinkerton and Davis, 2015; Wiber, 2000). There has also been dissatisfaction with management; from both the public and the fishing industry. Public dissatisfaction is commonly expressed through a lack of societal acceptance or 'social license' (as seen, for example, in negative public reaction to the "supertrawler" Magiris/Abel Tasman in Australia (Hayward et al 2013); or the

approval of new 'pulse' fishing gear in the Netherlands (Haasnoot et al 2016)). Industry may perceive management directions as flawed or a threat to continued existence (as seen for example in the concern about concentration of lobster fishing rights in Canada (Barnett et al, 2016), or of the introduction of the landing obligation in Europe (Kraan and Verweij, 2016)). These have contributed to increased management complexity and costs including considerable additional re-evaluation and meetings and to a lack of compliance, further reducing the efficiency of management and worsening the overall results.

Practical integration of ecological, economic, social and institutional objectives and indicators in fisheries was the focus of the recent (November 2015) international ICES/Myfish symposium on targets and limits for long-term fisheries management (summarized in Rindorf et al, 2016b). The set of papers arising from that meeting (see ICES Journal of Marine Science Volume XXX) demonstrates that, while there have been some efforts made to modify existing approaches, these have not yet been able to adequately combine the full suite of economic, social and institutional considerations required of management. More recently (June, 2016) another ICES symposium was devoted to 'Understanding marine social-ecological systems: including the human dimension in integrated ecosystem assessments' (see ICES Journal of Marine Science Volume YYY; Thébaud et al, 2017). Both symposia have pointed to a dilemma: the incorporation of economic, social and institutional aspects is necessary, but current biologically-based assessment and management systems seem unable to do it. This paper explores why the aspirations to include economic, social/cultural and institutional objectives have been so difficult to convert into real outcomes. We argue that there is need for substantial modification of the approaches to and processes of fisheries assessment and management, and that implementation of five practical steps could have widespread benefits to fishers, managers, the public, and decision makers.

The Problem - failure to attend to the four pillars of sustainable fisheries

Three major problems or characteristics have been identified in recent literature and meetings (for example Rindorf et al, 2016b; Begg et al, 2015) with respect to the failure to attend to the four pillars of sustainable fisheries.

First, there is a relative lack of explicit social, economic and institutional objectives (Symes and Phillipson, 2009; Spangenberg et al, 2002). These 'human dimensions' are generally undefined, or poorly specified relative to the biological aspects of fisheries. For example, international agreements and the legislation of many nations contain only high-level, aspirational objectives related to economic, social and institutional considerations (FAO, 1999). Human dimensions are commonly assumed to be included within overarching concepts (for example as part of 'sustainable yield') or adequately covered by proxies (e.g. catch per unit effort - CPUE) for economic return and lifestyle aspects of social dimensions (Brooks, 2010). The tendency to deal in broad terms means that few fisheries have specific operational objectives and appropriate indicators to monitor economic, social and institutional performance of fisheries.

Secondly, there is a general lack of process (frameworks, governance) for routine integration of ecological, economic, social and institutional considerations (Begg et al., 2015; Bond and Morrison-Saunders, 2011). Many jurisdictions have legislation and policies calling for integration, but lack empowered governance structures that enable practical implementation. Historically, social and economic aspects have been typically included as longstanding political imperatives (e.g. implementation of ITQs to overcome perceived problems of competitive fisheries; "modernization" versus "social welfare" objectives - Charles, 1992; Barnett et al., 2016), or as short term political choices during the decision making process (e.g. perceived impact on employment in processing plants; Paterson et al 2013), rather than proactive explicit social and economic objectives. Where they have been included in routine decision-making, social and economic aspects are often added after ecological

consideration, in an inconsistent or ad hoc manner according to the political pressure applied, and often without the benefit of analyses or appropriate methods (e.g., Clay et al, 2014; Lane and Stephenson, 1998, Beeton et al., 2012).

Thirdly, fisheries assessment and management processes are biased towards biological considerations (Begg et al, 2015; Brooks et al, 2015; Pascoe et al, 2013). Scientific study, data collection and advice are almost exclusively on biological aspects, which are considered to be the primary mandate of traditional assessment and management. Most nations have structured fisheries institutions around assessments with elaborate processes for production of peer reviewed biological advice, but have no process for development of comparable economic, social and institutional evaluations (for a recent discussion see Constanza et al, 2016). Advisory processes are generally not asked to provide, and are not ready to provide, more comprehensive advice. The issue is complicated by the predominant institutional views and histories of participants. Some argue that advice related to economic, social and institutional aspects of fisheries is beyond the scope of expertise of traditional fisheries assessment bodies (it's 'not our job', or 'we don't have the expertise'), and indeed fisheries agencies lack such expertise because they have prioritized building expertise in biological sciences. In other cases, scientists appear hesitant to ask for financial information from fisheries participants, or mistrust between agencies and fishers limit sharing of data and information that may be perceived as private, even though catch and effort information is routinely collected. Most scientific staff who are accustomed to conventional fisheries assessment and management processes have backgrounds in biology and ecology, and lack the training or experience to integrate other aspects. Where economists have been involved in assessment processes, there is usually a dearth of information to provide anything more than qualitative advice. Other social scientists, who may have the relevant backgrounds, have generally been relatively unconnected with traditional assessment and management processes, and are therefore unable to easily contribute to the conventional system (see Urquhart et al, 2011). Furthermore, participants who

are entrenched in established processes or in academic disciplines may also be simply unmotivated (unwilling or unable) to 'take up the torch' to include diverse aspects of the four pillars, perhaps due to the lack of agreed methodologies and common terminologies.

The combined effect is an imbalance in the four pillars. There is continued dominance of biological aspects of assessment and management, considerably less consideration of economic aspects, and very little incorporation of social and institutional factors (Charles et al., 2014; Paul and Stephenson, in review). Fisheries governance systems either do not include economic, social and institutional aspects, or include only a small subset of these considerations. Where they have been included, it tends to be around biological analyses, without appropriate evaluation, late in the decision-making process (as with political considerations), and in a system that is difficult to change (see Parlee and Wiber, 2014).

This situation is not new. Calls for *consideration* of economic and social aspects extends to the first half of the 20th century (e.g. Sinclair, 1988; Gordon, 1954; Anderson, 1983 translation of Warming 1911), and published critiques and calls for greater *integration* date back more than two decades (e.g. Stephenson and Lane, 1995; 2010; Garcia, 1996). ICES, for example, established a 'Fisheries Management Committee' in 1997 to include considerations of 'economics, sociology and management science' (Rozwadowski, 2002). It has been increasingly popular to establish working groups and initiatives related to the 'human dimension' e.g. Fisheries System and Maritime Systems working groups of ICES (ICES 2000, 2013; 2015); the Strategic Initiative on the Human Dimension (http://www.ices.dk/community/groups/Pages/SIHD.aspx); the Human Dimension initiative of PICES (a Study Group on Human Dimensions was replaced by the Section on Human Dimensions of Marine Systems (http://meetings.pices.int/members/sections/S-HD) then, in November 2016, replaced by a PICES Science Board standing committee, the Human Dimensions of Marine Systems Committee) and IMBER (http://www.imber.info/Science/Working-Groups/Human-Dimensions). However, in spite of such

initiatives, movement to full integration of ecological, economic, social and institutional aspects has been very slow. Many previous proposals for frameworks with diverse indicators remain unimplemented (e.g., Boyd and Charles, 2006; Charles et al., 2002), and there remains a profound inertia in fisheries assessment and management that is preventing integrated attention to the four pillars of sustainability.

Priorities for integrating ecological, social, economic and institutional aspects of fisheries

We suggest there are five key elements for the practical integration of ecological, economic, social and institutional aspects of assessment and management:

1. Adopt a systems approach, recognizing interacting natural, human and management elements

There is a longstanding recognition of the need to assess and manage fisheries as integrated systems, including consideration of the ecosystem, society and management (e.g., Charles, 1995). To this end, there have been a variety of attempts to describe or conceptualize the fishery as a social-ecological system (see for example Kooiman et al, 2005; Ommer et al., 2011; 2012; Kittinger et al., 2013; Begg et al., 2015). We suggest there is a need to adopt the perspective of interacting natural, human and management systems (Cochrane, 2000; Charles, 2001) requiring explicit consideration of ecological, economic, social and institutional aspects of both assessment and management.

2. Be aware of both strategic and operational aspects of fisheries management

Further, we emphasize that management of fisheries has both operational and strategic aspects (conceptualized in Fig 1) that operate on very different time scales, utilize different types of information, and require different participation. The familiar, management planning cycle (operational cycle of Fig 1) is a routine (e.g. annual) approach to evaluating and updating tactical aspects of management decision-

making. It tends to involve a subset of the interested parties (especially industry and government), and only the biological subset of management objectives. This is quite distinct from a strategic cycle (outer cycle of Fig 1) that should occur from time to time to modify policies or strategies, and should involve broader participation (industry, government, NGO's and even the public) and a more comprehensive set of considerations. It is especially in relation to this strategic cycle that economic, social and institutional objectives and indicators may be identified and monitored in relation to medium or long term goals of fisheries management. Much of the complication in integrating ecological, economic, social and institutional considerations stems from the fact that these aspects cannot be included directly in the annual tactical management planning (except perhaps as political imperatives), and most current processes do not include an explicit strategic planning cycle that would allow such consideration. There is need for greater appreciation of which aspects of management are operational and which are strategic, and to include processes for both operational and strategic aspects in assessment and management planning. A systems approach to fisheries, as outlined in Fig 1, should provide a mechanism for incorporating and integrating both strategic and operational aspects of ecological, economic, social and institutional objectives, within an appropriate framework or governance process (discussed later).

3. Define practical objectives for the four pillars of sustainability

Modern, objective-based (or performance-based) fisheries management decision-making requires articulation of specific objectives, which will drive relevant performance indicators and reference points that can be used in applied decision-making. The imperative to include the four sustainability pillars, and in particular social, economic and institutional objectives is well articulated in international agreements (albeit in high-level aspirational terms as in the UN Sustainable Development Goals (UN, 2012)) and increasingly in national policies. The challenge is twofold, first requiring political articulation

or at least direction, and then implementation. Contrary to common belief, the scope of economic, social and institutional objectives can be anticipated. Indeed, several initiatives have recently articulated candidate operational objectives with relevant performance indicators related to ecological (e.g. productivity, trophic structure, biodiversity and ecosystem integrity), economic (e.g. viability and prosperity, distribution of benefits), social (e.g. health and well-being, sustainable communities, ethical fisheries) and institutional (e.g. legal obligations, good governance, effective decision-making) aspects of management (e.g. Canadian Fisheries Research Network (http://www.cfrn-rcrp.ca/Public-Products-EN), Australia (Triantafillos et al , 2014; Begg et al, 2014; Brooks et al, 2105), and the USA: NOAA (http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/).

Practical implementation of economic and social objectives continues, however, to be confounded by major issues. Economic and social priorities (or values, or objectives) differ among interest groups, and are less easily agreed upon than are biological objectives. While biological objectives of maximum sustainable yields can be and often are debated, decisions focusing on economic and social objectives (such as fishery access and allocation) are much more controversial as the impact is more direct and explicit, there are clear "winners" and "losers". In addition, even when a set of objectives can be agreed on, the priorities given to these objectives can also vary substantially between different interest groups (Pascoe et al. 2009; Pascoe et al. 2013). Consequently, while there may be internationally agreed objectives regarding the biological aspects of the stock, nations with different development needs and/or diverse participants will have different priorities in terms of specific social and economic objectives. For this reason, the diversity of interests cannot generally be distilled into a single specific fishery objective. Identifying and recognising these differences in objective priorities is as important as identifying the objectives themselves, if buy-in from all stakeholders is to be achieved. The disciplinary considerations differ in scale and in use (strategic vs operational; Fig 1) (Benson and Stephenson, in review; Punt et al., 2015), so that the processes as well as methodologies of attempting to identify

uniform objectives and performance measures pose barriers. Further, systems that are accustomed to defined and immutable objectives and measures have difficulty accommodating the fluidity in economic and social considerations. The bottom line is that there are structural and institutional reasons for the failure to integrate economic and social aspects. This points to the need for improved governance processes, starting with an analysis of these structural and institutional reasons in order to allow appropriate flexibility in the consideration of the four pillars.

4. Undertake multidisciplinary or transdisciplinary research, evaluation and management

Fisheries assessment and management must broaden its focus beyond biological considerations to become interdisciplinary (integrating disciplines) or transdisciplinary (spanning disciplines in a joint approach) (Phillipson and Symes, 2013; Lang et al, 2012; Begg et al, 2014 & 2015). Economic, social and institutional aspects require focused analyses and devoted expertise. The 'silos' of disciplinarity are both a strength and a weakness in comprehensive fishery evaluation. There is a need for, and value in, disciplinary-specific methods and analyses, coupled with an imperative to overcome differences and work together to provide integrated assessments and practical management advice. Comprehensive evaluation has been hampered by the fact that prime contributors to assessment and management tend to be from government institutions that have predominantly biological and other natural science expertise. The natural science apparatus within government has not typically provided structure or incentives for staff to social science expertise. As a result, social scientists, affiliated primarily with academic institutions, have been often excluded from (typically government-driven) applied assessment and management processes. There may also be a lack of interest among some in both natural sciences and social sciences to develop better relationships and greater integration. This may be due in part to the practical challenges of engaging with biologically-dominated institutions, which do not understand

or recognize the relevance of the economic and social sciences to the biological/ecological part of the system, and which feel fully subscribed with existing programs and considerations.

Regardless, there is a need to overcome issues and to link disciplinary silos in effective processes. The need to provide agreed (i.e. consensus) and peer-reviewed advice has become an important feature in assessment and fishery evaluation. Social science relates to diverse aspects of the human dimension including features such as employment, ownership, business prosperity, understanding and knowledge; perceptions of legitimacy and social empowerment, human behaviour, culture, values, norms and worldview, as well as governance and institutional frameworks. Social context is the essential component of social analysis. Social evaluation requires diverse methodologies, the outcomes of which are not always easily linked to an analytic framework defined on the basis of a single (previously biological) subject matter. As a result, there is a mismatch between the richness of social context and the reduction or simplification required in traditional quantitative assessments. Institutionally, there is also need for evolution in management approaches from separate consideration of disciplines (where each discipline is competing for primacy in consideration) to new transdisciplinary approaches in which all can contribute to informing and meeting the over-arching objectives which span all the disciplines.

5. Include appropriate participation

Fisheries stakeholders are not a single group and therefore flexible approaches and attitudes need to be adopted in management frameworks. Fisheries governance systems have tended to privilege one set of participants (those in the harvesting and processing sectors of the fishery, and increasingly the conservation sector) rather than consumers and others who also gain indirect benefits (such as non-use and aesthetic values) from fish resources, as well as broader societal considerations. There has been a widespread call for more transparency in decision-making and for greater participation in governance. Without downplaying the very real challenges around appropriate stakeholder participation (Hurlbert

and Gupta, 2015) we suggest insufficient attention is currently paid to determining and developing appropriate forms of participatory decision-making in fisheries management. This implies the need to recognize the diversity of objectives, the structure of governance (Raakjaer et al 2014), and raises issues of the diversity of considerations at the governance table (whose concerns are evident there?) (Mikalsen and Jentoft 2001), and of power dynamics (whose objectives are paramount?) (Van Leeuwen et al 2014; Pascoe et al, 2013 & 2014).

Revising governance to address diverse objectives in strategic and operational fishery management

The governance, or management process is key to all aspects of fisheries assessment and management. Governance links the participants and the processes. At present, fisheries management planning is focused on operational aspects (tactical management plan, informed by an annual stock assessment). Effective governance of fishery systems requires explicit attention to both the strategic and operational aspects, (which will be on different time and space scales) as well as consideration of the spectrum of participation (Fig 1) at appropriate stages. The question remains as to how to construct a governance system with processes that allows for meaningful integration of the four elements of sustainability across different temporal and spatial scales.

The current operational management situation is a sequential process in most places (conceptualized in scenario 'a' of Fig 2), in which explicit biological aspects are considered first (as objectives and then interpreted as targets and performance measures), usually with analysis including peer review. The economic, and perhaps social and institutional, aspects are added later, most often without clearly articulated objectives and usually without formal analysis or assessment as to the effects of the management options being considered. This status quo has been criticized for lacking an institutional process for formal evaluation of social/cultural and economic aspects and for including those aspects in

a manner that is largely opaque and political. As food for thought, we ask if there are alternative conceptual options that might allow an improved integration of economic, social, and institutional aspects? One might imagine at least four other scenarios.

Scenario 'b' (Fig 2) anticipates a sequential set of separate processes in which ecological aspects are still considered first, but social, economic and institutional aspects are added subsequently after being subjected individually to expert analyses, and perhaps to peer review. This has the obvious advantage of more thorough and formal treatment of social, economic and institutional aspects, but raises the questions of how they will be integrated with other considerations, and is therefore rather a more nuanced description of the status quo. Scenario 'c' represents a possibility of analyses by separate teams (ecological, social, economic and institutional) linked in a process which requires formal integration or consideration of interaction and trade-offs among these aspects. Scenario 'd' anticipates that these diverse elements can be linked in a single, integrated process. Scenario 'e' represents the possibility of starting with assessment of the human dimensions of the fishery system, and then restricting/modifying those according to ecological considerations or constraints. This would ensure the early articulation of social and economic objectives, and would fit with the reality that fisheries are rooted in diverse societal goals of providing food supply, social and cultural aspects of livelihoods and economic value. All of scenarios, 'b' through 'e', anticipate a more formal treatment of social, economic and institutional aspects, and scenarios 'c' through 'e' introduce those considerations earlier.

Scenario 'c' would be classified by most definitions (e.g. Paterson et al 2010) as an interdisciplinary approach. Scenario 'd' could represent either an interdisciplinary approach or, if the treatment of the disciplines was comprehensive and from the beginning of the process, could be a transdisciplinary approach according to the definitions of Aboelela et al 2007 ('research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical,

methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem') or Paterson et al 2010 ('research that starts from real-world problems to develop solutions in partnership with multiple stakeholders').

Several methods have been proposed in the literature as being able to combine social, economic and institutional aspects (see Benson and Stephenson, in review), including Ecological Risk Assessment for Fisheries (Fletcher, 2009; Hobday et al, 2011), Management Strategy Evaluation (Cox and Kronlund, 2008; Dichmont et al, 2008, Punt et al, 2014; Fulton et al., 2014), Ecosystem models (Link et al 2002; Curtin and Prellezo, 2010), multi-objective modelling (Pascoe et al. 2016), multi-criteria decision analysis approaches (Dichmont *et al.* 2013) and Bayesian Belief Networks (Kuikka et al, 1999; Duespohl et al, 2012). Further, there is the possibility of using (combining) several methods, as was done for example, in integrating the biological, economic and cultural outcomes in the analysis of alternative management systems for the Torres Straits lobster fishery; Plagányi *et al.* 2012; Plagányi *et al.* 2013). Although integration of ecological, economic, social and institutional aspects has often been articulated as an aspiration, practical implementation has to date generally been confounded by the historical dominance of biological approaches and a lack of clarity as to the spectrum of non-biological objectives. As discussed above, ecological, economic, social and institutional considerations differ in application (operational vs strategic) and scale (e.g., spatial or jurisdictional) – of the fishery itself, and through to society as a whole. They therefore require different types of advice (prescriptive, descriptive or insight) (Benson and Stephenson, in review). A single process for integrating all of these aspects is naïve, but it is critical that the processes work together to integrate ecological, economic, social and institutional aspects across strategic and operational considerations. While we recognize that governance processes and power structures are unlikely to change unless there is major influence (such as judicial directive or widespread public outrage), we suggest there is need for modification of governance processes to

include explicit consideration of both strategic vs operational cycles of management (as described in Fig 1), and the full suite of ecological, economic, social and institutional aspects of management (Fig 2).

Overcoming inertia to integrate social, economic and institutional objectives

The literature provides a litany of criticisms of conventional fisheries management (Charles, 2013; Hilborn, 2007; Symes & Phillipson, 2009; Pinkerton and Edwards, 2009; Wiber, 2000). In spite of elaborate fisheries management processes, there has been an inability to achieve the aspirations of international agreements and national legislation related to sustainability, and a failure to prevent unintended consequences including stock collapse, overcapacity and collapsed coastal communities. There is need for an integrated approach to fisheries (and to other marine activities) in relation to a more diverse set of objectives that include the higher standards of ecological integrity and diverse social, economic and institutional aspects of sustainability, and that can account for and manage societal expectations in relation to ecosystem constraints in a context of change (Stephenson, 2012). Failure to adopt a more comprehensive integrated approach will perpetuate the focus on a subset of primarily ecological objectives and the neglect of many social, economic and institutional objectives. This will result in further unintended (or at least untracked) consequences, failure to achieve the diverse spectrum of objectives in legislation, and further loss of confidence in management systems. In contrast, a successfully integrated approach promises better success at meeting objectives, fewer unintended consequences, better appreciation and support of management and increased management credibility. We have illustrated several examples where such integration has been undertaken successfully. This demonstrates that such approaches are possible even if not broadly adopted.

An appropriate governance process is key to resolving the challenges of integration. The governance system establishes the participation and disciplinary scope, allows the emergence of objectives and puts

in place the processes for transdisciplinary consideration. Ideally, these processes would be institutionalized, but we suggest there is scope within most existing fisheries assessment and management systems to make immediate progress and to overcome the inertia that has been prevalent to date.

We call on all participants in fishery assessment and management to challenge themselves and each other to work within their sphere of existing influence to improve the integration of ecological, economic, social and institutional aspects in evaluation and management of fisheries and to promote the articulation of overarching transdisciplinary objectives. We suggest the following practical steps would be useful to undertake immediately, by individual participants and collectively:

1. View the fishery as a 'system' with interacting natural, human and management elements
2. Be aware of both strategic and operational aspects of fisheries management
3. Articulate overarching objectives that incorporate all four pillars of sustainability
4. Encourage appropriate (and diverse) disciplinary participation in all aspects of research, assessment and management
5. Encourage development of (or emulate if there are institutional impediments) a participatory governance system.

Although difficult, greater (and more effective) attention to social, economic and institutional aspects of assessment and management is critical to the sustainability of fishery systems, and the benefits they provide for fishery participants, management decision-makers, and society. There is a need for both leadership to articulate a strategy for integration of the four pillars in assessment and management. and collective creativity, in modifying governance regimes to incorporate those aspects effectively.

An increased emphasis on the consideration of social, ecological and economic aspects of fisheries resources is fundamental to producing better political and public outcomes. Measures to achieve this

include: clearly identifying the social and economic objectives sought in accessing and harvesting resources; distinguishing between the strategic and operational aspects of assessment and management; and addressing – at least in part – the complications traditionally cited with the use of objectives and indicators. Clarity in objectives for all domains (ecological, economic, social and institutional) must underlie the governance changes that will facilitate integration of the four pillars of sustainable resource management. Articulation of social and economic aspirations, even in a strategic "visioning" process, would engage a broad range of stakeholders, and provide policy makers with a broader and more solid platform from which to speak in future planning processes. This would improve transparency of the process, provide a stronger basis for decision-making, and reduce unintended (or unacknowledged) consequences of management actions. Importantly, it will also improve credibility and societal acceptance in the management process. Establishing that management policy reflects societal priorities, and that management is perceived to be achieving desired outcomes, are key elements to achieving and maintaining a social license for fisheries.

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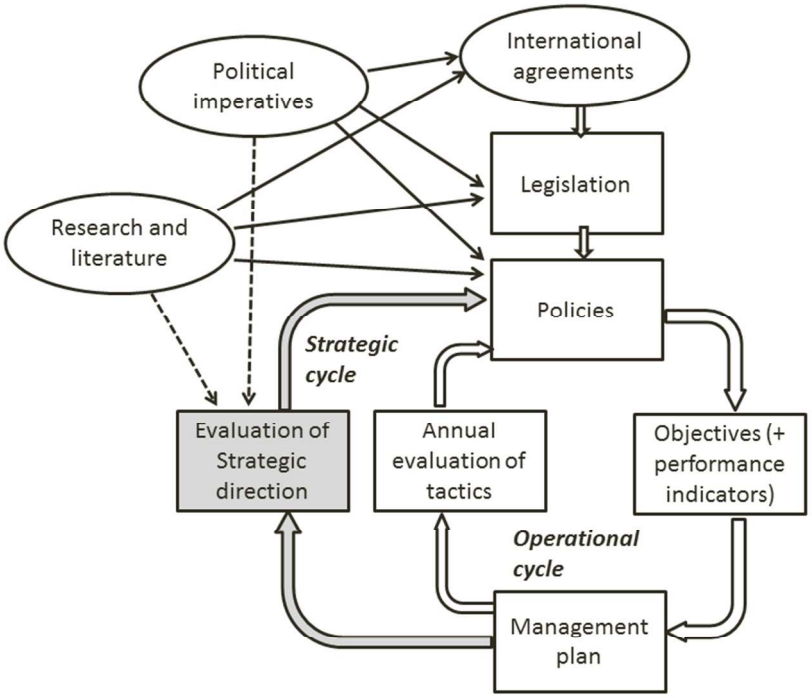
Figure Captions:

Fig 1. Conceptual representation of a comprehensive fishery system in which there is explicit recognition of both the common operational cycle and a strategic cycle, currently missing in most situations.

Fig. 2. Conceptual tactical or process options for integrating ecological, economic, social and institutional considerations in fisheries evaluation and management. Spheres represent distinct processes. The white ellipse indicates a lack of formal process.



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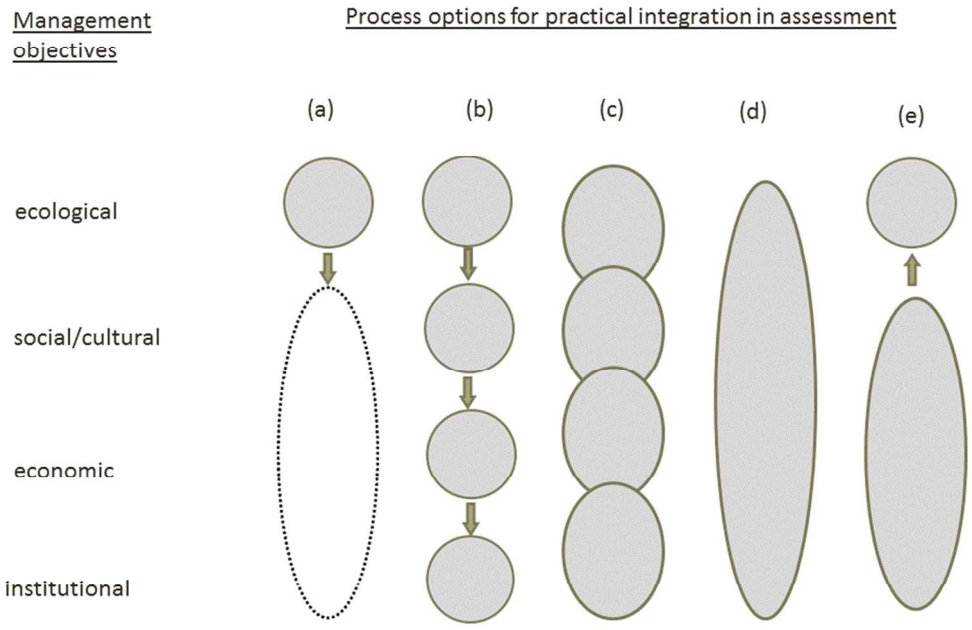
338x254mm (72 x 72 DPI)



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