1. Introduction

This chapter provides a future-oriented perspective on marine small-scale fisheries (SSF), with a focus on new directions for management. The discussion is based on lessons from successes in such fisheries, as well as experiences with less successful conventional approaches. As will be discussed, there is a high diversity among small-scale fisheries worldwide, and accordingly the chapter does not attempt to consider all the many forms of SSF or all the relevant issues. Instead, we seek to present a set of themes and approaches that relate broadly to success and failure in SSF management.

In doing so, we recognize that extracting lessons from such a diverse array of fishery types and SSF situations necessarily simplifies complex circumstances and interactions. It is important to appreciate, even if not fully understand, the complexity of these fisheries – and to recognize that “blueprint solutions” are not available to resolve complex problems. Furthermore, management options for SSF must bring about changes in attitudes and behaviours in order to succeed. For this, empirical lessons learned in SSF must be sufficiently simple to be shared, learned and institutionalised by a wide variety of stakeholders. These themes thread their way throughout the chapter and mainly concern the incorporation of human dimensions into SSF management (also see DeYoung et al. 2008). Our analysis here takes a ‘people-centred perspective’ based on new ideas about how emerging management approaches can improve the sustainability and resilience of SSF.

First, we describe the nature of SSF. Then trends in the management of SSF are discussed with emphasis on recent approaches and perspectives that form the context for the remaining sections – which focus on promising directions for the future in managing SSF. These sections examine overarching policy, establishment of effective management systems, and key considerations for management. The chapter closes with some conclusions on the way forward.

2. Characterising small-scale fisheries

There is no one ‘model’ of a small-scale marine fishery, but rather they can be seen as fisheries possessing many of the following characteristics:

- fishers operate close to shore and are dependent on local resources,
- fishers use vessels that are relatively small and individually-owned,
- the fishery constitutes an integral part of the coastal communities where fishers live,
• there is a greater reliance on labour than on capital in the fishery, and correspondingly the capital cost per fishery job is relatively low as is the fuel used per unit of catch,
• the participants do not identify themselves as being part of an offshore or industrial fishery.

The term “small-scale” describes a spectrum of fishing operations that share the common feature that they are not of an industrial scale. While “small-scale” is sometimes used interchangeably with “artisanal”, “subsistence” and “inshore”, the latter terms may take on specific, overlapping meaning within the umbrella of being small-scale. Indeed, Panayotou (1985, p.11) points out that “although there is no standard definition of small-scale fisheries, various classifications of fisheries do exist: small-scale versus large-scale, subsistence versus commercial, artisanal versus industrial, inshore (or municipal) versus offshore...”. Almost all SSF have commercial aspects, generally due to the value of fish as food. Exceptions include (1) subsistence fisheries, ones in which “cash transactions are minimal, but fish tend to be traded or shared extensively among kinship and social networks”, and (2) sport or tournament fisheries where high income is derived from fishing services rather than the sale of fish (Berkes et al., 2001).

There are small-scale fisheries in all parts of the world. The term ‘small-scale’ is widely used in developing regions, but even though it is less commonly found in a developed-country context, many fisheries in the latter areas are small-scale. Indeed, the idea of “small-scale” is relative to the location being considered. As Panayotou (1985: p.11) notes, “it is not unusual to find that what is considered a small-scale fishery in one country would be classed as a large-scale fishery in another”. For example, tuna long-lining is done at an artisanal level in Caribbean small islands where ‘small-scale’ ranges from outboard-powered open vessels making day-trips to 12 metre decked and inboard-powered multi-day boats. However, in North America the latter vessels would be at the lower limit of the small-scale range, and 15-20 metre vessels comprise the bulk of the inshore fleet – vessels that would be considered industrial in the insular Caribbean. Similar differences occur in other parts of the world in comparing developing to developed countries.

Berkes et al. (2001) observe that while small-scale commercial fisheries exploit many of the same stocks as are exploited by the large-scale commercial fisheries, they also exploit a large number of smaller stocks, the fisheries for which may be highly modernised and technologically sophisticated. Such fisheries target groups of species such as:
• Deep demersal fishes of tropical shelf slopes, typically using nets, lines and traps;
• Coastal large pelagic fishes, typically trolling or with small-scale longlines;
• Coastal demersal fishes of temperate shelves and bays, using traps, nets, and longlines, often exploiting the same stocks as large-scale trawl fisheries operating further offshore, but frequently targeting different life history stages.

In situations of minimal commercial activity, or subsistence, SSF tend to exploit an even greater variety of very small stocks distributed over numerous management units (Berkes et al. 2001). These fisheries typically use traditional fishing gears such as small nets, traps, lines, spears and hand collection methods. Although biodiversity of the catch is often highest in these fisheries, partly because of the low selectivity of gears used, there tend to be few discards as everything is utilised. Full utilisation is one of the characteristics of areas in which poverty is high (Béné 2003). This category of fishery, common in Africa, Asia and the Pacific, targets the following:
• Fishes and invertebrates of coral reefs, typically with traps, spears, lines and by hand;
• Fishes and invertebrates of coastal lagoon and estuaries, typically using nets;
• Fisheries for marine aquarium species in all habitats.

The above discussion reveals an important pattern of commonality amongst SSF worldwide that may allow them to be distinguished from other scales of fishery. This pattern is important as it allows us to share experiences, lessons and policy or management interventions across diverse settings. Although SSF are more deeply embedded in distinct socio-cultural conditions than are larger scale fisheries, ones based more in international business and the marketplace, there is no reason to consider them so unique as to be intractable for governance and management.

In Table 1 below we build on the analysis of Berkes et al. (2001) to illustrate some useful categories and characteristics relevant to the discussion of SSF that follows in this chapter.

INSERT HERE --- Table 1. Categories and characteristics of fisheries

3. Changing perspectives

3.1 A brief history

Fisheries management must balance conservation and development to achieve improvements in quality of life that are sustainable and equitable inter-generationally. However, in the aftermath of World War II, both in developing countries and along the rural coasts of developed countries, attention paid to SSF focused on fisheries investment. This was aimed at economic development via technological change in order to increase harvest and products for commodity markets. It was decades later that the pendulum swung away from development towards science and increased regulatory conservation (Degnbol 2004) – after it became clear that SSF could suffer overexploitation, through a combination of poor management and overcapitalisation, as had been the experience in many industrialised fisheries.

Over the course of the 20th century, the dominant position of conventional fisheries management led to an erosion of opportunities for more people-centred approaches to managing SSF. The latter approaches range from civil society participation in so-called “modern” societies, to culturally embedded customary tenure and other systems in “traditional” societies. Fisheries of all scales, in developed and developing countries, are typically still subject to some elements of the command-and-control approach of conventional fisheries management – despite this having been proven to be flawed in many instances (Berkes et al. 2001, Charles 2001). A few well documented deficiencies of conventional approaches include:

• Assessments often data intense
• Narrowly single-species, often single gear
• Strong biology and economics bias
• Ecosystem approaches still new
• Often underestimates uncertainty
• Assumes rational decision-makers
• Top-down, command and control
• Control not flexible for adaptation
• Undervalues the human dimensions
• Local knowledge often second class
• Co-management as a last resort only
• Poor compliance as lacks legitimacy
• Ignores other economic sectors
• Separated from social, cultural contexts
• Ignores politics of decision-making
• Overlooks the importance of scale
Recent perspectives on SSF have sought to rectify these shortcomings, being oriented more towards human dimensions, as illustrated for example in the attention being paid to the social, cultural, political and institutional aspects of SSF. This treats humans as agents able to self-organise within complex adaptive systems – linking social systems to ecological systems within the fishery, and linking to each other through social networks (Mahon et al. 2008). In this new perspective, there is a focus on good governance, aiming toward more resilient fishery systems (Chakalall et al. 2007; Charles 2007). We present some of these perspectives below.

3.2 Complex adaptive systems (CAS)

It is useful to view fisheries as systems – with a fishery system one of interacting components (species, fleets, communities, institutions, etc.) dynamically changing over time (Charles 2001). Then a complex system is one that exhibits particular characteristics stemming from patterns of interaction internally within the system. When systems also exhibit the capacity to self-organize, learn and adapt they are referred to as complex adaptive systems (CAS). Typically, SSF exhibit the characteristics of such systems, within which the desirable quality of self-organization can be enhanced through appropriate policy inputs (Mahon et al. 2008). This contrasts with conventional fisheries management which has often been thwarted by self-organization, when attempts to control one part of the system result in unpredicted adaptive responses in other parts. For example, fishers in SSF devise innovative ways to collectively and individually circumvent management regulations, as Hauck (2008) discusses in the case of South Africa.

Since SSF are complex and adaptive, coping with complexity should be of particular interest to fisheries managers. Recent approaches to dealing with complexity in human-in-nature systems recognize them as unpredictable and uncontrollable. Treating SSF as complex adaptive systems leads to very different management approaches, ones with the potential to address SSF management problems where conventional approaches have failed. The emphasis shifts from ‘command and control’ to a focus on enabling of self-organization, learning, adaptive capacity and resilience (Mahon et al. 2008). New frameworks and models that a SSF manager can use to implement enabling policy are needed if stakeholders are expected to improve SSF systems. An initial challenge is to communicate CAS concepts to stakeholders, including policy-makers.

3.3 Social-ecological systems (SES)

Parallel to the idea of SSF as complex adaptive systems, it is also helpful to management to view SSF as social-ecological systems (SES). Berkes et al. (2001) note: “We use the term social-ecological system (SES) to emphasize the point that social systems and ecological systems are in fact linked. The delineation between social and ecological (and between nature and culture) is artificial and arbitrary...” Indeed, interdisciplinary social-ecological management of fisheries is not a luxury but a necessity when dealing with CAS.

Managing fisheries with an eye to both the biophysical environment and the socio-economic environment makes the task of the manager both easier and more difficult. It is easier because such an approach brings the task of management closer to the reality of fisheries and fishers. It is more difficult, because such an approach requires a working knowledge of concepts and fields not covered in the conventional education of the average SSF manager – essentially a shift in emphasis from technical to ‘people’ skills (Mahon and McConney 2004). This shift means that
current best practices (good governance, integrated coastal management, adaptive co-management, livelihood approaches, etc.) need to be situated within the conceptual frameworks of CAS and SES. They also need to be transboundary, as McConney and others (2007) have argued for the fisheries in the Caribbean.

3.4 Governance and adaptive co-management

Governance is a wide-ranging idea that includes the entirety of public and private interactions taken to solve societal problems and create societal opportunities. This includes the formulation and application of principles guiding those interactions, and care for institutions that enable them (Bavinck et al., 2005). In the context of CAS and SES, governance involves dynamic institutions and processes that permit key management interventions at the appropriate scales and times.

SSF governance issues occur at international, national and local levels partly because many governmental and non-governmental stakeholder organisations in SSF are weak in capacity. Power, or at least a legal mandate, is usually centralised in a government authority and meaningful participation in management by informed civil society is uncommon (Mahon and McConney 2004). Yet, many governments have indicated, often in the context of public sector reform and good governance, their intention to share information, power and responsibility with civil society through decentralisation, delegation or devolution.

Governance is increasingly being connected to CAS and SES approaches, with such perspectives referred to, for example, as ‘interactive governance’ or ‘adaptive co-management’. The former (Bavinck et al. 2005; Kooiman et al. 2005) sees models of CAS and SES as a means to improve institutional arrangements and practices in SSF, while the latter argues that if fisheries are to be managed sustainably within uncertain environments, it is crucial to employ more adaptive and participatory methods of management (Armitage et al. 2008; Charles, 2007). These methods are ones based on institutionalising learning and designed to function successfully even given unexpected changes in SES, or an ignorance of SES structures and processes. Adaptive co-management in SSF is of particular interest given its links to resilience (Armitage et al. 2007).

3.5 Resilience of fishery systems

The aim of management in fisheries and other natural resources, as well as place-based (area) management, is increasingly oriented toward enhancing the resilience of the system. The concept of ‘resilience’ describes the capability of SES – the ecosystem, human and management systems – to ‘bounce back’ from unexpected shocks and perturbations such that the integrity of the system as a whole is sustained, without collapsing, self-destructing or otherwise entering an intrinsically undesirable state (Berkes and Folke 1998). Thus in SSF, we can envision a resilient ecosystem, resilient management institutions and a resilient social system. Conventional management approaches, focusing on control and stability, can be detrimental to resilience, and lead to critical system problems. On the other hand, both the precautionary and the ecosystem approaches – to be discussed below – are examples of new thrusts to enhance the resilience of fishery systems at policy and other levels (Charles 2001).
4. Policy scene and context
We turn now to a set of over-arching policy themes and contextual aspects that affect and seek to improve SSF management, applying modern perspectives to move beyond what has not worked in conventional fisheries management approaches.

4.1 Precautionary approach and international instruments
Non-precautionary management has led to the overexploitation and unsustainability of many fisheries (Swan and Gréboval 2005). There is a need for precaution to be explicitly built into policy for SSF, given that within these complex social-ecological systems, the best available (scientific) information is always likely to be deficient. This is especially the case when SSF are development-oriented and constraints on short-term harvest or post-harvest opportunities may not be readily accepted.

The precautionary approach is enshrined in recent multi-lateral environmental agreements (MEAs). Early MEAs ignored SSF, but recent ones acknowledge and address the special circumstances of developing countries, where SSF are prevalent. MEAs and other international instruments (e.g. CBD, UNFSA, MDG, WSSD, UNFCC) provide both rights and obligations, but the impacts upon SSF have often been unknown or uncertain at the time countries sign MEAs. Countries with SSF are now moving to forecast and monitor policy implications partly by informing and involving civil society. This is mainly because NGOs are often more in touch with SSF stakeholders than are state agencies, as is the case in many Asia-Pacific regions (Pomeroy and Berkes 1997). In addition, the multi-stakeholder approach to communication facilitates self-organisation within governance arrangements such as co-management (Armitage et al. 2007).

4.2 Integration into national policy and goal-setting
Even where SSF are very visible, such as in small island developing states, their contribution to national economies as measured by standard indices is often so low compared to tourism, the service sector, etc. that they are not integrated into national policy in ways that reflect their true socio-economic value. Recent increased use of resource valuations and studies of value-added provide more realistic estimates of the worth of SSF to multiple sectors and policy decisions, as in the case of Barbados (Mahon et al. 2007). This is a promising trend that should involve more stakeholders in goal-setting, using participatory research and widely disseminating the results. These approaches can be both informative and empowering to SSF stakeholders.

4.3 Decentralisation and devolution
Typical regulatory legal-institutional arrangements tend to constrain options and concentrate real power and jurisdiction in the hands of a few at the top. However, top-down governance of SSF has proven difficult due to many of their characteristics described previously. Decentralised and devolved governance holds potential for greater success in SSF (Pomeroy and Berkes 1997), but only if there are adaptive policy environments that enable self-organisation – e.g., through adoption of a subsidiarity approach that places decision making at the lowest, most local level feasible. Schmidt (2005) provides lessons from Cambodia and the Philippines in this vein.
4.4 Markets, trade and subsidies
In many cases, SSF no longer serve purely domestic markets, so although fisheries authorities typically do not have responsibility for trade, fisheries policy must now take into account global trade rules and requirements, price trends, etc. Ignoring the impacts of global trade and subsidies on SSF is no longer an option, as developed consumer markets are demanding more products derived from SSF. This in turn is changing their market orientation and the nature of the fish chain. Furthermore, subsidies continue to impact fisheries in both positive and negative ways. There is a real need to better understand how global trends to restrict subsidies, even “good” ones, are impacting on incentives both to harvest and to conserve, as well as impacting on post-harvest activities (e.g. affecting entrepreneurial incentives). Leadbitter et al. (2006) consider the situation and private sector roles in East Asia.

4.5 Food security, food sovereignty and poverty
There has been a tendency globally to focus on industrialised, larger-scale fisheries involved in commodity production and trade, which led to an ignoring of the important role SSF play in supplying food fish, especially to those in poverty (Béné 2003). However, recent trends to pay more attention to matters of food supply and distribution have increased the significance of SSF in international policy (Béné et al. 2007). Notably, the harvesting of fish in SSF is done with significantly less energy input on a per unit production basis. In the context of poverty alleviation, Béné et al. (2007) note that systems are being put in place to facilitate what are often traditional self-organised production and marketing chains, in order to benefit from these lower supply costs that contribute to food security and food sovereignty.

5. Setting management systems in place

5.1 Fishery systems, the fish chain, and cross-scale linkages
Coastal, small-scale and/or tropical fisheries are typically multi-species, focused more on an ecosystem and on a community of people trying to make a living, rather than an isolated set of fishers exploiting a specific stock. Thus the narrow view of a fishery reflected in the conventional approach to management – that of a specific fish stock and the ‘fleet’ (or set of fishers) exploiting it – is no longer considered acceptable, especially in SSF. Instead, as noted earlier, management approaches need to pay attention to the broader fishery system, recognizing the pervasive interactions between the core of the fishery (fish and fishers) and all the other elements of the ecosystem and the human system. There is a need for reasonable comprehension of the interactions among relevant components of the fishery system, but in a cost-effective way (Garcia and Charles, 2007).

In particular, a key part of broadening the perspective on SSF lies in seeing beyond the harvest sector, paying more attention to post-harvest processing, marketing and distribution (Charles, 2001). First, attention to the processing sector within the context of fishery management can help improve livelihoods of fishing households without increasing catches (e.g., with better processing into more manageable forms leading to easier distribution and reduced spoilage). Second, it is increasingly important to examine the various patterns of consumptive or non-consumptive use, as consumer impacts become better appreciated (e.g. in the live food fish and aquarium trade). Third, a broader view helps highlight the role of women as active participants in
many fishery systems – in fishing itself, in post-harvest components, in fishing households and in the community.

Aspects of scale are also crucial to consider, since SSF are typically ‘embedded’ within larger-scale systems. (For example, community-level fishing in the Annapolis Basin of Nova Scotia, Canada, forms part of a larger fishery in the Bay of Fundy, which in turn lies within the trans-boundary fishery of the Gulf of Maine, a component of the broader Northwest Atlantic.) Local solutions may be most effective, in the spirit of the subsidiarity approach (managing at the most local level possible), but need to be connected with these larger scales, often through ‘cross-scale linkages’, whether these link communities, governments, nongovernmental organizations, etc. In particular, if decentralized and/or local approaches to management are needed to account for local conditions, but the fish stocks range over larger geographical areas, coordination across boundaries is needed. For example, decisions concerning a community-based fishery, harvesting a local stock, can be linked through policy and practice to those at a broader geographical scale, whether provincial, national or even international as in the case of Caribbean tuna fisheries (McConney et al. 2007).

5.2 Fisheries institutions, participation and empowerment

A dysfunctional and ineffective fishery management institution will be unable to shape the fishery so as to meet societal objectives. The legal-institutional systems in many SSF have proven to be too rigid to deal with the changing nature of fishery management, and especially the shocks and disturbances that appear to be impacting all fisheries more frequently.

To address such concerns, the principles and concepts of CAS and SES – such as institutional linkages and nested institutions – may offer opportunities to better design SSF arrangements that promote flexibility and the freedom to adapt, within societal norms (Mahon et al. 2008). This involves the creation and nurturing of institutions that can effectively and sustainably self-regulate the use of fishery resources. Desirable institutions: (a) are structured properly, with wide-spread support, (b) are seen as fair and just, (c) serve to create social incentives for responsible behaviour in fishing, and (d) have inherent resilience. That being said, the ‘best’ institutional arrangement will vary with the context - dependent not only on natural and human realities, but also on society’s objectives and the priorities attached to each as in the case of introducing the ecosystem approach to fisheries (DeYoung et al. 2008).

A key trend in institutional design lies in acknowledging the value of participation by all fisheries stakeholders, and some level of empowerment of those stakeholders. This move, one that is crucial in supporting self-organization, leads to forms of co-management (described later in this chapter). It contrasts sharply with conventional management in SSF, which tends to be top-down with minimal stakeholder participation (except that occurring in a consultative or advisory capacity, where power remains vested in a state management authority). Indeed, the perceived lack of legitimacy resulting from a lack of participation and empowerment is among the various reasons why the conventional approach has often not worked (Jentoft 2000).

5.3 Learning and adaptive capacity

Within any form of fisheries management, processes of learning and adaptation will be present to some extent – but in conventional management, these may not be prominent or conceived of in a
social context beyond their fairly narrow scientific basis. This has led to learning and evolution relating to only some aspects of fisheries, typically concentrated on natural systems. What works better for SSF is a broader view in which social and institutional learning is pursued, and adaptation is seen as both a collective and an individual response – on several levels across a number of scales (Armitage 2008). For example, faced with changing conditions in the fishery, adaptation is needed on the part of individual fishers, fishery organizations, other components of the fishery system, and management agencies, from local to international scales as appropriate.

While learning processes can lead to a building of capacity over time, there may nevertheless be a lack of capacity at any particular point in time to undertake all aspects of fishery management, from assessments and policy development through to operational management and enforcement. In particular, the capacity of fishers, communities and other stakeholders within a SSF to engage in management is likely limited. Given these limitations, the tendency to pattern management authorities and arrangements in SSF on those in place for larger-scale industrial fisheries has not worked well. Furthermore, the scaling-down of larger-scale organizations to ‘fit’ SSF has not been necessarily appropriate, if what is really required are different elements of capacity and organizational orientation. Thus the recurring theme of this chapter applies again: management of SSF may benefit from paying less attention to conventional approaches and more attention to people-centred approaches – ones that correspond more closely to existing capabilities for data and information management, to the availability of local knowledge, and to sustainable levels of technical and scientific expertise and funding (Lebel et al. 2006).

5.4 Uncertainty and adaptive management

There is often an “illusion of certainty” in fisheries management (Charles 2001, 2007), in which we underestimate the level of uncertainty in the fishery. The desired response to this in SSF lies not so much in increasing the sophistication of fishery models, but in ‘living with uncertainty’ by acknowledging the sheer gaps in human knowledge and understanding of these systems, and by including a wider range of stakeholders who may utilize different knowledge systems and be at very different levels of comprehension of fisheries. Charles (2007) illustrates how a lack of this thinking led to past problems for the sustainability and resilience of SSF in Atlantic Canada.

We see now that dealing with uncertainty in fisheries is not just a scientific matter, but one that recognizes how people in SSF have often developed strategies to cope with uncertainties ranging from surprises to absolute ignorance (Berkes et al. 2001). At the organisational level, this approach to uncertainty is called ‘adaptive management’ – which provides a mechanism to follow the precautionary approach and improve the overall resilience of fisheries, through initiatives to overcome unsustainability (Swan and Gréboval 2005). In particular, adaptive management includes the recognition that in fishing, operating plans must be flexible, to allow for the highly uncertain nature of the fish. Adaptive management (or adaptive co-management) implies suitable processes for continuous learning (through monitoring) and for maintaining the capability and willingness to make appropriate adjustments to management actions as needed (e.g., within a given fishing season) in order to meet conservation and socioeconomic goals. Adaptation is mainly about learning, as Garaway and Arthur (2004) point out in their analysis of situations in South and Southeast Asia.
Within SSF management, there is also a need for regular evaluation (whether participatory or not) often via research, so that policies and plans are subject to analytical scrutiny and redirection (Satia and Staples 2004). Without this, SSF management has gone off course with little or no corrective action taken; this has been wasteful of resources. By acknowledging and using feedback loops and processes, through CAS and SES perspectives, there is more opportunity to incorporate effective monitoring and evaluation into management of SSF (Mahon et al. 2008).

5.5 Livelihoods, households and diversification

Relating to the above discussion of fishery systems, there is a need to deal with inherent linkages between fisheries and other human activities, especially in coastal and marine sectors such as aquaculture and tourism, as well as coastal communities and fishing households. A “livelihoods approach” (e.g., Allison and Ellis, 2001) broadens fishery discussions to emphasize the entirety of individual, household or community sources of wellbeing and livelihood (income), and in particular how individuals, households and communities develop ‘portfolios’ of livelihood sources. The notions of livelihoods and household scale decision-making offer more realistic models of how SSF operate, and are linked to improving quality of life (Béné 2003), which is central to much human endeavour and development policy.

In particular, since each fishery participant, their household and their community must generate a livelihood one way or another, risks are reduced, and resilience enhanced, if those livelihoods can be achieved from a diversity of sources. For example, SSF that involve multiple species and types of fisheries give fishers a diversified ‘portfolio’ of options, and give management greater capability to reduce harvesting of vulnerable stocks (Charles 2001). Similarly, ‘occupational pluralism’, arising when fishers and their households engage in both fishing and non-fishing activities, reduces risks by reducing reliance on fishing (Allison and Ellis 2001). Finally, measures to diversify the economy in fishery-dependent areas, by creating new, sustainable economic activity outside the fishery sector, can enhance the range of available livelihood choices (Béné et al. 2007).

5.6 Linking to the ecosystem approach and integrated management

In the past, conventional approaches to fisheries management took a rather narrow view of the fishery; this was often focused just on a single species (or a few species) and with a narrow view of economic interactions and human-in-nature connections. It is now recognized that such approaches have proven relatively unhelpful in managing SSF. This recognition has led to a move toward the Ecosystem Approach to Fisheries (EAF, also referred to as ecosystem-based management) which ensures that interactions with the ecosystem are taken into account in managing fisheries, while also considering relevant human dimensions and participatory processes [e.g., FAO (2003), De Young et al. (2008)].

Within the context of the complexity of SSF, the EAF can be viewed more broadly as a ‘systems approach’, one based on CAS and SES perspectives, and with a broader view of governance. This draws on what we already know works better for SSF, relative to experiences with conventional approaches. In particular, by recognizing that a fishery can be only imperfectly controlled, and that there are limitations on what can be achieved through management, the EAF helps us to avoid a “fallacy of controllability” (Charles 2001), a sense that more can be known, and more controlled, than can be realistically expected.
The EAF, in paying attention both to the ecosystem around the fishery, and the relevant human dimensions, can be seen also as a fisheries-specific form of integrated management. Indeed, combining into fishery management both an ecosystem approach and a livelihoods approach (as described above) leads us to draw linkages with integrated ocean and coastal management. This is a natural connection, especially in the context of SSF, since integrated approaches are characterized by a multiplicity of resources and habitats, a range of environmental variables, and a balancing of attention to both natural and human systems and dynamics (Mahon et al. 2008).

6. Key considerations for management

6.1 Goals, objectives, directions

Thinking of SSF as simple or under-developed systems has not worked in practice because they are in reality quite complex and sophisticated. In the past, the policy environment was one in which small-scale fisheries were deemed able to take care of themselves, not because their adaptive capabilities and ability to self-organise were recognized (as in CAS), but because they were treated as economically insignificant, and the impacts upon them as a result of policy and planning in other sectors were ignored (Berkes et al. 2001).

However, SSF involve a multiplicity of social, cultural, political, economic and ecological objectives. Some common objectives in SSF include: production of fish, economic efficiency, employment, export promotion and foreign exchange generation, industry diversification, socio-political stability, decreasing rural-urban drift, and/or maintaining a regional balance of development.

The real challenge, however, lies not in listing all the objectives but rather in prioritizing the list, and in determining the right balance among them – to determine a suitable balance or blend of objectives that contribute to an overall direction for the fisheries in keeping with societal policy decisions. Indeed, the complexity inherent in SSF requires that attention be paid to the trade-offs among SSF options and opportunities, in order to optimise their contribution to societal goals. This has also resulted in greater interest in decision-making and involving fishery stakeholders as part of interactive governance processes (McConney et al. 2007).

Overall, an understanding of the objectives at all levels, from fisher through to government, is important in order that fishery policy can help to enable some level of self-organisation – since a clear and shared direction helps to orient that collective action, so as to determine the essential level and nature of management intervention (DeYoung et al. 2008).

6.2 Conflict management and power dynamics

Conflict management has not played a major role in conventional management approaches, but with the many stakeholders in socially and culturally embedded social-ecological SSF systems, it is important to manage conflict (Graham et al. 2006). Given the diversity of SSF, one must be careful not to rely on prescriptions, and to be aware of power disparities in setting up conflict management arrangements, which may work better informally.
In dealing with conflict and the interactions within the SSF, power dynamics need to be considered. This aspect has been largely ignored in conventional approaches, which may have led to unnecessary failures, especially in cases of conflict. It is clear that power dynamics play a large role in governance and may be especially important in SSF due to inequity among actors. It is necessary to take power into account and to appreciate how embedded it is in culture and society. These features vary by location, as Bennett et al. (2001) discuss for cases in Ghana, Bangladesh and the Caribbean.

6.3 **Data, information and communication**

Conventional fisheries management is typically intense in scientific data demands and only a small portion of data is converted into information that is communicated and used in public or private decision-making. The new approach in SSF is to pay more attention to converting data from several sources into information for decision-making and communicating the information to all stakeholders – to facilitate the transparency and accountability needed for good governance. However, multi-stakeholder communication is not without its challenges, as Pomeroy and others (2001) point out for cases of co-management in Asia.

Typically there is information that already exists in fishery systems, but has been under-utilised in fishery management to date. This usually lies beyond the standard scientific apparatus, in the realms of local knowledge, “fishermen’s knowledge” and traditional ecological knowledge (TEK) (Berkes et al. 2001). These sources of knowledge incorporate accumulated information that has built up over time by fishers and coastal communities through regular interaction with their environment. Such knowledge may relate to aspects of the natural world around them, or to what type of resource management arrangements function best within the specific cultural and belief systems, or to which fishing techniques are most effective, or most conservationist, within the local context. A key challenge lies in integrating this knowledge with modern fishery science and management – this requires developing both the sense of trust and the means of communication between scientists, managers and knowledge holders. The challenge is aided by moves toward more multidisciplinary fishery research, such as has been advocated for SSF (Satia and Staples 2004).

In most small-scale fisheries, there has been little effort to involve fishers in determining research priorities and in the research activity itself. This is changing, however, with the increasing recognition that the support of fishers for management is enhanced if they are involved in dealing with the information available. There are significant moves toward participatory research involving fishers, with some partnerships now being institutionalised – e.g., community-based fishery management in some SSF often has a built-in participatory research component as one of the ways of overcoming unsustainability (Swan and Gréboval 2005).

6.4 **Fishery planning and management**

Planning processes in SSF have tended to be fairly centralized, dominated by state authorities, with an early emphasis on economic development plans, then turning more to a focus on conservation and management plans. This is now seen as inefficient and ineffective. Planning processes have become more inclusive and their products more diverse, with emphasis on their active uptake in order to improve legitimacy, compliance and success (Berkes et al. 2001).
The planning process in SSF needs to produce a suitable “portfolio” of management measures –
drawing on management tools that may include (1) input/effort controls, regulating what fishers
bring into the fishing process, (2) output/catch controls, regulating what comes out of the fishing
process, (3) technical measures, to regulate the technology, gear, space and timing used, and (4)
ecologically-based management, such as marine protected areas and multi-species approaches.
Selection of the measures must consider such factors as: overall strategic fishery goals and policy
directions, biological aspects of the resource, and the level of uncertainty and complexity in the
fishery. Further, a variety of human aspects must be taken into account, such as (a) existing,
historical and/or traditional management approaches, (b) cultural and community preferences for
management, (c) the current knowledge base and human/technological capacity for management,
and (d) the monitoring and enforcement capability (Charles 2001).

Notably, some conventional management tools, ones that may be common in highly-regulated
and/or industrialized fisheries, may not be suitable (whether less applicable or more difficult to
implement) in SSF. A broad-based fishery assessment (not only a stock assessment) is needed to
determine what is or is not appropriate. Success may have as much to do with the context and
process of management implementation as with the specific measures.

A major subject of discussion in fishery planning and management is that of over-capacity. A
particular approach to this is needed for SSF, one that recognizes their multiple objectives and
overall complexity. Thus if there is seen to be a need for capacity reduction, actions must be
designed to consider impacts on multiple factors, such as conservation, ecological balance, rent
generation and income distribution, fishing community welfare, and institutional stability. Thus
capacity reduction decisions are likely best considered through targeted and selective approaches
that aim toward achieving a desired overall fishery state. One must take into account such factors
as the differential capacity and flexibility of gear types and fleet sectors, conservation impacts of
harvesting technologies, and the use of local-level approaches to explicitly meet local objectives,
as Pascoe and Gréboval (2005) illustrate using international experiences.

6.5 Co-management and community-based management
Governance arrangements that implement decentralisation and devolution are receiving
increasing attention as a result of the failure of centralised approaches (Schmidt 2005). There is
an entire spectrum of arrangements for sharing authority and responsibility, and multiple phases
that they proceed through, from introduction to maturity.

Co-management – the development, implementation and enforcement of management measures
by a suitable combination of government, fishers, communities and the public – is rapidly
expanding and evolving in small-scale fisheries (Pomeroy and Rivera-Guieb 2006). Typically,
this involves increasing the role of fishers, their organisations and their communities in
managing local resources – e.g., through community-based management (Graham et al. 2006).
Such approaches, based on sharing decision-making power and the responsibility to ensure
fishery sustainability, serve to lessen the conflict between fishers and managers that has tended
to lead to failure in top-down management regimes. Furthermore, where fish in the sea are
publicly owned, as in most national fisheries, co-management can logically include a role for the
public in developing policy concerning the overall use of those resources, if authorities are people-centred (Mahon and McConney 2004).

6.6 Fishing rights
Fishing rights, when present in the context of effective management institutions, help to clarify the roles and responsibilities of the various players in the fishery, and thereby to steer incentives in desired directions. An appropriate rights system, one that fits well into human realities and management institutions, can enhance a fishery and its sustainability (Charles 2001, 2002). On the other hand, imposition of inappropriate rights systems can lead to undesired consequences, such as a loss of resilience in communities or institutions. Thus it is crucial to emphasise that it is not just a rights system, but an appropriate rights system that must be sought (Berkes et al. 2001, Charles 2002).

In particular, among the options for rights-based management, many (such as market-driven individual quotas) do not work well in the complex SSF world of multi-species, multi-gear, multi-fleet situations. On the other hand, rights of access such as territorial use rights (TURFs) and community-based collective rights may have greater chance of success in SSF. These may well be culturally embedded in tenure systems and customary practices that have existed historically, making them conducive to being revived or adapted within a socio-cultural setting (DeYoung et al. 2008) – such situations have been well documented in SSF of the South Pacific, for example (Ruddle and Johannes 1989).

6.7 Marine protected areas (MPAs)
MPAs are examples of ecologically-based management, in that they do not focus on individual species but instead limit human activity throughout a designated area of the ocean. Indeed, they involve more than the fishery sector itself, with implications for a range of ocean use sectors, and the need for conflict resolution between such sectors. This is especially so in SSF where they coexist in, or compete for, the marine space occupied by the fisheries. This often leads to coastal conflicts, implying the need for consultation, design, implementation and monitoring of the MPA to occur using participatory processes (McConney et al. 2003).

MPAs, like other management approaches, have a mixed record of success in fisheries. They seem to have worked for SSF when combined closely with traditional tenure systems – e.g., in some parts of Asia-Pacific such as the Philippines, which have suitable local or community-level government involvement (Pomeroy et al. 2001). However, if or how they assist in managing conflict, replenishing nearby fisheries or conserving biodiversity depends greatly upon technical design and governance. Conceiving of MPAs as social-ecological systems (as has been done in this chapter for fishery systems) may improve their fit in SSF.

7. Conclusions
Most of the world’s fisheries, and the vast majority of fishers, are ‘small-scale’. However, most fishery funding, most research and most writing on fisheries has been from the perspective of large-scale, industrial contexts. This fundamental mis-match has been the source of abundant problems. Furthermore, a key concern is that what attention has been paid to SSF has often been in the form of efforts to apply conventional management approaches, ones developed with large-scale fisheries in mind.
This chapter has sought to outline new thinking, new perspectives, that can help overcome this critical barrier to progress in small-scale fisheries. While conventional management tended to focus narrowly on single species and single fishing fleets, without incorporating aspects of marine ecosystems or human dimensions, new perspectives broaden the picture.

In particular, approaching SSF from the perspectives of complex adaptive systems and social-ecological systems provides a suitable framework to more fully address fishery management challenges. These two perspectives are complemented by a shift from a narrow view of fishery management into concepts of governance and adaptive co-management, which can guide policy development and management practices toward increased resilience of fishery systems.

The implications of these over-arching perspectives have been discussed in three principal settings:

1. The policy scene and the fishery’s context: Key elements include the role of international instruments and the precautionary approach; integration of fisheries into national policy; decentralisation and devolution; markets, trade and subsidies; and considerations of food security and food sovereignty.

2. Structures, processes and approaches involved in setting management in place: Adopting a broad view of the fishery system, the fish chain, and cross-scale linkages, it is crucial to address the role of fishery institutions, participation and empowerment, adaptive management, processes of learning, and adaptive capacity among fishers, managers and other stakeholders. In looking ‘beyond the fishery’, SSF management needs to consider the role of livelihoods and of livelihood diversification, as well as the value of connecting with the ecosystem approach and integrated management.

3. The management system: Practical management of SSF requires an understanding of goals, objectives and directions, notably the multi-objective nature of SSF, and the need for conflict management and attention to power dynamics. The availability of data and information, as well as its communication, are key factors, as is selection of a portfolio of management tools. Some management measures common in large-scale fisheries may be quite inappropriate in a small-scale setting, whereas positive choices may include co-management and community-based management, recognition or implementation of appropriate locally-based fishing rights, and the use of marine protected areas.

As noted at the outset of the chapter, small-scale fisheries have a value to their society that goes well beyond simplistic economic indicators. Thus, while they are certainly challenging to manage, successful management will have a considerable payoff. To this end, the perspectives highlighted in this chapter should provide a suitable framework in which to pursue the shift from conventional management toward more effective approaches and better outcomes for small-scale fisheries worldwide.
8. References


Table 1. Categories and characteristics of fisheries
(Adapted from Berkes et al. 2001)

<table>
<thead>
<tr>
<th>Fisheries-related Characteristics</th>
<th>Categories</th>
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<tbody>
<tr>
<td></td>
<td>Large-scale Industrial</td>
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<tr>
<td>Fishing unit</td>
<td>Stable, with division of labour and career prospect</td>
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<tr>
<td>Ownership</td>
<td>Concentrated in few hands, often non-operators</td>
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<tr>
<td>Time commitment</td>
<td>Usually full-time</td>
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<tr>
<td>Boat</td>
<td>Powered, much equipment</td>
</tr>
<tr>
<td>Equipment types</td>
<td>Machine-made, assembled by others</td>
</tr>
<tr>
<td>Gear sophistication</td>
<td>Electronics, automation</td>
</tr>
<tr>
<td>Investment</td>
<td>High; large proportion other than by operator</td>
</tr>
<tr>
<td>Catches (per fishing unit)</td>
<td>Large</td>
</tr>
<tr>
<td>Disposal of catch</td>
<td>Sale to organised markets</td>
</tr>
<tr>
<td>Processing of catch</td>
<td>Much for fishmeal and non-human consumption</td>
</tr>
<tr>
<td>Operator’s income level</td>
<td>Often high</td>
</tr>
<tr>
<td>Integration into economy</td>
<td>Formal; fully integrated</td>
</tr>
<tr>
<td>Occupationality</td>
<td>Full-time or seasonal</td>
</tr>
<tr>
<td>Extent of marketing</td>
<td>Products found worldwide</td>
</tr>
<tr>
<td>Management capacity of fisheries authority</td>
<td>Considerable with many scientists and managers</td>
</tr>
<tr>
<td>Management units</td>
<td>One or few large units</td>
</tr>
<tr>
<td>Fisheries data collection</td>
<td>Not too difficult given the authority’s capacity</td>
</tr>
<tr>
<td>Governance situation as business enterprises</td>
<td>Corporate private sector often with State backing</td>
</tr>
<tr>
<td>Strategies for coping with uncertainty in the fishery</td>
<td>Based on formal business planning, risk assessment</td>
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