Appropriate management for small-scale tropical fisheries

Yasuhisa Kato[1]

Abstract

Overinvestment in fishing capacity, followed by an inevitable decline in global capture fish catches, is widely interpreted as having demonstrated the need for international fisheries management instruments. These instruments began to be developed in the early 1990s, initially within the framework for addressing environmental concerns, and later directly from the drive toward the Food and Agriculture Organization of the United Nations' Code of Conduct for Responsible Fisheries (FAO 1995), its related international plans of action, and other conventions. In general, however, the resultant flood of legislation has not been implemented in tropical countries, partly because the number of instruments overwhelmed the capacity of national fisheries administrations, but also because of "implementation fatigue", priority being given to other sectors, and a lack of political will. Further, these international instruments have failed to adequately address tropical, small-scale fisheries because they were formulated based on Western scientific methodologies.

Introduction

A major characteristic of global fisheries management since the mid-1990s has been the move toward international governance of fisheries, mainly under various United Nations (UN) initiatives. At first glance it would seem reasonable to conclude that international governance would likely comprise a major change that national fisheries administrations would have to contend with. But so far, at least, this has not occurred, largely because most such international fisheries initiatives have not been implemented and probably will not be. As such, these initiatives remain largely theoretical statements, long on lofty principles but short on practical guidance for a huge range of tropical fisheries realities.

This article examines the principal elements of the fisheries management systems that the international community has attempted to enact. These are not likely to become a major element of change that will have to be considered for management and adaptation in tropical small-scale fisheries in the foreseeable future.

Origins of globalized fisheries management

Overinvestment in fishing capacity during the 1950s and 1960s in many industrialized nations caused world fisheries to change from being about 60% underexploited in the early 1950s to 60% overexploited 40 years later. As a result, most marine capture fisheries began to decline (FAO 1997, 2007b), destroying the illusion that aquatic resources are infinite, and making it apparent that changes within the fishing industry would eventually demand significant adaptation and management. This recognition stimulated research regarding sustainable fisheries, and eventually resulted in international agreements on a "precautionary approach" (FAO 1996).

Preambles to the UN Convention on the Law of the Sea (1982) and the Convention on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995) demonstrate that concern over fisheries resources and the need for their sustainable management increased greatly during the intervening 13 years; the latter convention was based specifically on international concerns over highly migratory fish stocks, as highlighted in Agenda 21 of the UN Conference on Environment and Development (UNCED 1992). Driven by increasing concern over the deterioration of the global environment, Agenda 21 identified actions to reconcile human activities affecting the environment with the presumed requirements of sustainable development. Protection of marine and coastal areas, together with the conservation and rational use and development of the living resources of these areas, was included in Chapter 17 of Agenda 21.

Although not highlighted in 1982, the importance of fisheries management was gradually recognized, and in 1984 the UN Food and Agriculture Organization (FAO) organized the World Conference on Fisheries Management and Development, which was the first such international conference. In general,

[1] Professor, Center for International Planning, Kagoshima University, 1-21-24 Korimoto, Kagoshima, Japan 890-8580.
Email: kato@ms.kagoshima-u.ac.jp

however, recognition of global fisheries problems was masked by the rapid development of the industry and the economic benefits being derived from it. As a consequence, until relatively recently, fisheries management was promoted only gradually, and in an *ad hoc* manner. The globalization of fisheries administrations has developed in particular since 1992, when the UN Conference on Environment and Development (UNCED) addressed increasing concerns about the state of the global environment.

The reference point for all subsequent international fisheries instruments is the UN Convention on the Law of the Sea (UNCLOS) 1982. This convention entered into force in 1994, and is the fundamental legal framework governing the use of marine areas. This was specified in the UNCED's Programme of Action for Sustainable Development, which adopted Agenda 21. Chapter 17 of Agenda 21 specifies that implementation of UNCLOS must involve integrated approaches and a "precautionary approach". The UN Framework Convention on Climate Change and the Convention on Biological Diversity (CBD) were also adopted in 1992. State control in high-seas fisheries was enhanced by FAO's Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, which stipulates that it is the special responsibility of flag States to enable more effective management and contribute to reducing illegal, unreported and unregulated (IUU) fishing activities, and ensure a good exchange of information.

A turning point for the global promotion of sustainable fisheries occurred in 1992, when the Cancun Declaration was adopted at the International Conference on Responsible Fisheries. The declaration captured the spirit of FAO's Code of Conduct for Responsible Fisheries (CCRF), reflecting concern over the urgent need to establish a sustainable global fisheries management system. The declaration was followed by Agenda 21, which drove development of CCRF initiatives during 1992–1995. Based mainly on UNCLOS, Agenda 21 and the Cancun Declaration, CCRF deals comprehensively with six thematic areas: Fisheries Management, Fishing Operations, Aquaculture Development, Integration of Fisheries into Integrated Coastal Area Management, Post-harvest Practices and Trade, and Fisheries Research.

Together with its four related International Plans of Action[1] (IPOA), the comprehensive but voluntary CCRF, adopted in 1995, covered the principal aspects of fisheries. Other important instruments followed (FAO 1999, 2001c). The UN Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stock Agreement) entered into force in November 2001. Its main objective is the long-term conservation of straddling and migratory fish stocks, and it includes provisions to avoid adverse environmental impacts, preserve marine biodiversity, and maintain the integrity of marine ecosystems. The 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem focused on the ecosystem approach to fisheries management (EAF) (FAO 2001a), and mandated FAO to prepare technical guidelines for EAF within the context of the 1995 CCRF (FAO 2003a). The 2002 Plan of Implementation of the World Summit of Sustainable Development consolidated and reinforced the implementation of existing fisheries-related instruments by setting a 2010 deadline for the application of EAF and the maintenance or restoration of stocks to levels that can produce maximum sustainable yield (MSY).

In addition, the moratorium on the use of large-scale drifting gill nets became UN General Assembly Resolution 44/225 (1989). This was the first time a fisheries issue was discussed in a non-fisheries arena such as the UN General Assembly, bypassing FAO, the UN agency that specializes in fisheries. This approach demonstrated that fisheries issues were becoming increasingly regarded as an integral part of environmental issues. The Convention for the Prohibition of Fishing with Long Drift Nets in the South Pacific, agreed at the UN General Assembly in 1989, together with the start of negotiations on the UN Fish Stock Agreement in 1993, were indicators of a new era focusing on high-seas fisheries. Various binding or voluntary international and regional agreements relate to the fishery sector, either specifically or indirectly through biodiversity, environment, labor or other issues. Because binding agreements usually pertain to the global level, most are deposited in a UN organization.

Consequences of "globalized fisheries management"

Efforts undertaken by international fisheries institutions since the early 1990s have resulted in ongoing international momentum regarding sustainable management of global fisheries. However, those global instruments, including CCRF, have slanted the focus toward large-scale commercial fisheries, specifically those operating on the high seas. This occurred because management issues relating to

[2] These four plans are: 1) Conservation and Management of Sharks (2000), 2) Reducing Incidental Catch of Seabirds in Longline Fisheries (2000), 3) Management of Fishing Capacity (2000), and 4) Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fisheries (2001).

high-seas fisheries required urgent clarification, and the preparation of two important instruments — CCRF (1992–1995) and the UN Fish Stock Agreement (1993–1995) — was conducted simultaneously by FAO (CCRF) and the UN (the Fish Stock Agreement). Further, in the mid-1990s, FAO responded to decreased funding (resulting from donor policy changes) by drastically reorienting its focus on global food security and the sustainable development of primary industries. Thus, FAO shifted from supporting developing countries to promoting globalization, a direction that followed the interests of developed nations. The focus of the Committee on Fisheries (COFI) also changed after work had begun on CCRF in 1992. COFI payed particular attention to the global agenda, and downplayed small-scale fisheries, and henceforth focused mainly on achieving sustainability in developed-country, high-seas industrial fisheries (FAO 2007a).

This reorientation of priorities by FAO undercut national management initiatives by withdrawing guidance on rationale and methodology from agencies struggling to develop an appropriate management system, and then implementing it on national fishing industries that were concurrently expanding. In addition, many simply underestimated the effort required, and when it became apparent that designing and implementing a fisheries management system would require massive amounts of work and investment, in addition to structural adjustments, many governments gave up and took no action.

That situation has been compounded since the 1990s by an enormous flood of global and regional instruments dealing with environmental and renewable resource issues that have either been related directly to or have had an impact on fisheries. In poorer tropical countries this has put fisheries administrations under severe and often overwhelming pressure, commonly resulting in "implementation fatigue". Further, implementation of the many ambitious instruments prepared by the international community is generally beyond the technical, financial and institutional capacity of economically poor countries, such that little progress has been made in using them. The poor status of world fish stocks is widely acknowledged (e.g. Christensen et al. 2003; FAO 1994, 2007b), and the number of stocks ranked as overexploited, depleted and recovering has increased in recent decades (FAO 2002). Other major problems include the lack of sound national statistical data (FAO 2001b), and the absence of money and trained manpower to rectify the situation (FAO 2001b). Much is still needed, especially in economically poorer countries, to implement CCRF, which is hampered by a lack of capacity (FAO 2003). Cochrane and Doulman (2005) also demonstrated that little had been done to implement IPOAs; only the IPOA to prevent, deter and eliminate IUU fishing has been substantially implemented nationally, but even then implementation remains inadequate (FAO 2003b).

The lack of progress has been widely examined, with Cochrane (2000) suggesting that poor implementation has resulted from: 1) poor or inappropriate management decisions resulting from biological and ecological uncertainty; 2) priority being given to short-term economic and social objectives and not to longer-term sustainability objectives; 3) poorly defined fisheries policy and management objectives, resulting in poor decisions based on immediate problems; and 4) institutional weaknesses stemming from top-down management, a lack of user rights and stakeholder participation. Doulman (2003) identified the following principal problems: open-access; politicians' avoidance of unpopular decisions; social and economic issues being downplayed, with priority given to fisheries science in management; low national management capacity; conflicting objectives, and inadequate penalties.

The problems associated with developing sustainable and responsible fisheries are reflected in the factors constraining implementation of the 1995 FAO CCRF (FAO 2003d, 2003e). Constraints are generally identifiable as:

- a lack of capacity or political will;
- a lack of resources and general management capacity, funding limitations, and scientific knowledge;
- low formal education levels;
- limited stakeholder and public participation
- inadequate policy and legal framework;
- open access fisheries;
- political interference; and
- short-term focus.

Fisheries policy-makers everywhere lack the resources needed to provide alternative livelihoods when reductions in fishing effort result in fishers becoming unemployed, and this fact could undermine efforts to implement EAF (FAO 2003a). The lack of capacity and financial resources has been recognized in some international fisheries instruments, such as CCRF (FAO 1995); IPOAs on IUU, seabirds and fishing, and sharks (FAO 1999, 2001c); the UN Fish Stocks Agreement; the CBD; and the WSSD Declaration on Sustainable Development and the Plan of Implementation (WSSD 2002). Unfortunately, these documents have not been supported by action, and assistance falls far short of meeting needs (FAO 2003c; UNDP 2003). As Cochrane and Doulman (2010:87) observed, "... it seems evident that society as a whole is unable

or unwilling to pay the costs required". Further, Cochrane (2000) pointed out that a key underlying constraint is that social and economic pressures favor short-term benefits, with long-term costs.

Cochrane and Doulman (2005) favor a scientific and technological solution to this situation, in tandem with "good governance".

> Undoubtedly, much can be achieved by addressing the important constraints in improving the biological and ecological aspects of fisheries management. Overcoming some of the scientific problems facing fisheries would, in conjunction with good governance, contribute to improved management. The establishment of better systems of data collection and monitoring, improving the biological and ecological knowledge relevant to fisheries management, improved methods of stock assessment that take better account of uncertainties, especially in multispecies and data-poor fisheries, the development of fishing methods and gear that reduce or eliminate unwanted by-catch (SEAFDEC 2000) and damage to the substrate will all contribute within an appropriate governance environment to more responsible and productive fisheries. Ultimately, such improvements will be essential for effective management for sustainable use of fishery resources.

The authors (Cochrane and Doulman 2005) further note that none of that will happen unless:

> ...the attitudes of society can be changed to place appropriate value on sustained ecosystem goods and services, leading to changes in political will and governance, the benefits of such scientific and technological improvements will be swept aside as society and the practices and policies of the governments that serve society continue to focus on the short-term.

Nothing will be realized in the absence of political will and a willingness to endure short-term sacrifice in favor of potential — but not assured — long-term gains. More affluent (but still small) segments of populations are in a position to make such a decision, but the poor are not. Regardless of the Western emphasis on ecosystems and a neoliberal philosophy (Davis and Ruddle 2012), eradicating poverty remains the greatest global challenge (WSSD 2002), and each nation is primarily responsible for making political decisions regarding its own sustainable development and poverty eradication.

Drawbacks of the globalization process

Considering that an estimated 80.5% of total fisheries production is harvested by tropical developing countries (FAO 2003f: 9; FAO 2010), most of which are characterized by small-scale and coastal fisheries with little or no involvement in high-seas fisheries, more attention should be given to formulating policies that include appropriate methodologies to achieve sustainable coastal fisheries production. However, international development assistance for fisheries has decreased drastically. Unless that situation is reversed, particularly for projects that seek to establish appropriate fisheries management, the momentum and accomplishments of international global sustainable fisheries efforts over the last two decades could be dissipated.

Efforts since the early-1990s have raised global awareness and driven consensus-building to achieve sustainable fisheries. However, the globalization of fisheries governance demands that issues promoted by internationally recognized authorities and the various activities implemented to popularize them be verified technically. The concept of a "resource management system" has also been disseminated globally. For example, the use of the MSY model has been promoted via Article 7.2.1 of CCRF. It is generally understood that the MSY model can be applied in principle for the management of target species where a long-lived single species dominates in a specific fishing ground and ecosystem. It is also widely understood that the ecological structure of the world's fisheries resources varies greatly, ranging from a large population of a dominant single species in temperate waters to the multi-species composition with varying productivity characteristic of diversified tropical ecosystems. It has become common knowledge that fish catches in temperate areas have a very simple species composition compared with multi-species composition of catches from tropical waters. In other words, the MSY model has been widely popularized based on an erroneous assumption: that the ecological structure of fisheries resources worldwide is similar to that found in temperate waters, where the MSY model and resource management system were initiated and developed.

Under a conventional or Western system, three main elements are required for management actions: 1) determination of the total allowable catch (TAC), or more particularly the individual transferable quota (ITQ) used for estimating fisheries stock sizes; 2) allocation of the estimated available resource to an appropriate number of users; and 3) monitoring of compliance by resource users with the rules. However, such a system was developed in accordance with the characteristics of temperate zone fisheries resources, where the catch is composed primarily of a single or a few commercial species. As a

consequence, temperate zone fisheries are commonly defined by the species caught (e.g. cod, crab, herring, salmon or halibut fisheries). In contrast, tropical fisheries are commonly denoted by the gear used, such as trawl or purse-seine fisheries, rather than by the predominant species caught, reflecting the multi-species composition of most tropical catches. In a similar manner, the TAC concept has been promoted by Article 61.1 of UNCLOS, which relates to the conservation of living resources.

The sustainability of nearshore fisheries in tropical developing countries is handicapped by two principal interlocking factors. The first is the large number and general poverty of fishing households. Second is the ineffectiveness of conventional or Western models of fisheries administrations. Poverty combined with a lack of alternative sources of income is the principal reason that small-scale fishermen are forced to operate in ways not conducive to the sustainability of fisheries. For this reason, the subsector must be addressed in comprehensive rural programmes that include fisheries administrations within the broad framework of regional and local economic development and management.

Tropical countries fisheries context

Fisheries management and development assistance programmes in tropical countries are usually bureaucratic, centralized, top-down, and science-based. However, such management has been roundly criticized, and is now usually seen as a failure (Satria et al. 2002). Limited financial resources and low professional capacity typically constrain development of resource and environmental policies and their implementation throughout tropical developing countries, where national fisheries administrations are small and have little operational capacity, unlike those for agriculture. In fact, national fisheries administrations in most tropical developing countries are small and were established during 1950–1970 as technical institutions to support the rapidly modernizing commercial fishing sector. National fisheries administrations have been dominated by biologists and engineers, and while most staff are capable as scientific advisors supporting modern fishing industries, they are less suited to the fisheries management tasks recently mandated in response to global initiatives.

Although fisheries management in tropical developing countries has been promoted gradually over the last 30 years, it has generally proven difficult to provide the technical and financial inputs required to restructure fisheries agencies to meet international dictates. Management activities in most countries focus on solving local resource conflicts, with government intervention akin to little more that fire fighting. Preventive management to avoid overcapacity or overexploitation has not developed.

Recent approaches to fisheries management recognize that fisheries management problems have social and economic roots, and it is widely understood that government intervention is most effective if initiated at the local level. But under their current structure, national fisheries administrations in tropical developing countries are poorly positioned to perform local management, and therefore have attempted to delegate management authority through decentralization.

However, decentralization has not been conspicuously successful, mainly because of a lack of clear policy directives to support attempted innovation, possibly because centralized resource management systems continue to predominate, while newer approaches have yet to gain wide acceptance by fisheries bureaucrats. This is demonstrated by a lack of confidence in national management formulations and the continual seeking of approval from the international community and Western sources that have promoted newer approaches. Although some countries attempted to accommodate MSY-based resource management into their national systems, it has not been well accepted locally.

Unfortunately, the illusion of "resource management" remains too influential for tropical developing nations to commit to establishing their own system. Most senior scientists and researchers at government institutions in tropical countries received their tertiary education in fisheries-related institutes or universities in temperate zone nations, where resource management has been promoted. The model-based, stock assessment-driven resource management concept reflects their educational background, and this constitutes an important source of inertia.

Although the concept of and the areas under "open access" for aquatic resources have been modified according to the understanding of ocean governance, in principle aquatic resources are still considered to be open access resources. Further, although the current regime is dysfunctional, it may not be feasible to convert to a limited access regime because open access developed historically within wider civil society, and it may be difficult to modify as a convenience for fisheries.

The term "co-management" has been increasingly adopted, in part because the theoretical ideas have been widely popularized, but mainly because the term's simple image has been accepted by national fisheries administrations staff responsible for management issues (Ruddle and Hickey 2008). The term co-management can now be used more readily by government officers who feared losing their administrative powers based on their control of rights and authority when co-management was first promoted, even if they understand the need for change

only hazily and just at a technical level. When the term co-management is used, government officers may retain the belief that they can still wield management authority, even though some responsibilities have already been transferred to the local level (Davis and Ruddle 2012).

Appropriate small-scale fisheries management systems in tropical developing countries

Why small-scale coastal fisheries have to be managed

Although Cochrane (2000) suggested four reasons for weak implementation of the international approach to fisheries management, other reasons can be considered in the context of small-scale tropical fisheries. There is debate over the need to manage small-scale coastal fisheries, based in part on the assumption that top-down management is burdensome, and thus should not be imposed on already powerless and financially weak small-scale fishers. It is also argued that catches by small-scale fishermen are negligible compared with those of commercial fisheries. That may be correct for a single fishing unit, but an estimated 80.5% of total fisheries production is harvested in tropical developing countries, where a large portion of the catch is harvested by small-scale fishermen operating a huge number of units. The impact of small-scale fishermen is by no means negligible in terms of achieving global sustainable fisheries.

Large-scale commercial fisheries have a built-in "profitability mechanism" that halts their operation when operational costs exceed income because of declining resources. Compared with commercial fisheries, small-scale fisheries apparently lack such a mechanism, owing to their low operating costs, and so continue fisheries beyond the levels where commercial fishermen cease operations. However, many small-scale fishermen in Southeast Asia use illegal fishing techniques that include small net mesh size and dynamite fishing, because they try desperately to improve their income as resources decline. The impact of such activities can be tremendous when conducted in spawning and nursing areas for commercially important species.

Western fisheries management methodologies are narrowly focused on fisheries resources, while the social welfare of fishing communities and other social problems have been relatively neglected (see below). Under the compartmentalized structure of government, issues relating to the social welfare of fishing communities do not fall squarely under the mandate of either national fisheries administrations or ministries of welfare. If national fisheries administrations stop seeking to improve fisheries management and stop contacting small-scale fishermen owing to various difficulties, support for the social welfare of fishing communities will be completely disregarded. In the meantime, it is unlikely that social welfare support by other agencies will increase. Poor fishing communities could eventually be abandoned by the national welfare system.

Despite international concerns about sustainable fisheries — which began in the early 1990s — most governments have never given a high priority to implementing innovative approaches to fisheries management. In fact, fisheries management issues have only been actively discussed at either regional or national levels since 2006.[3] Instead, countries have continued to focus on increasing their participation in expanded international markets for fish and fishery products, based mainly on aquaculture development. In contrast, the most valuable species from their commercial marine fisheries have been declining.

In addition, so-called market-driven measures for sustainable fisheries developed in accordance with global concerns about aquatic environments have become increasingly burdensome external pressures in countries where fish and fishery products are major export commodities. Fisheries officials became concerned about the impacts of market-driven measures such as "traceability" — especially related to the increased activities on sustainability such as eco-labeling — on their increasing international fish trade, and began to show renewed interest in sustainable fisheries through the implementation of management systems.

Despite widespread criticism of the resource management system and promotion of ecosystem-based management, policy-makers are still greatly influenced by the former. Thus, it must be ascertained if management measures and actions can be successfully implemented without knowing the size of the resource, and whether non-technical or scientific people can successfully implement the management actions (see below). No scientific approach or models correctly assess fisheries resources with multi-species composition, meaning that fisheries management systems must be designed so as not to rely on stock size. One way to do this may be to use practical indicators instead of stock size, which would enable the monitoring of trends in resource status and income level of the fisheries (Kato 2004a; SEAFDEC 2006).

[3] For example, in Southeast Asian countries (SEAFDEC: Establishment of Regional Scientific Advisory Committee on Fisheries Management in Southeast Asian Region. ASEAN/SEAFDEC: Regional Investigation on the Establishment of ASEAN Mechanism on Fisheries Management).

Most tropical developing countries wish to strengthen their research capacity, especially to conduct resource surveys aimed at identifying data and information to improve fisheries management, and this may be justified as scientific work that seeks to understand resource status and related factors. Although most scientists now understand that temperate zone models are inappropriate for tropical ecosystems, such models and the concept of MSY are frequently referred to in national and regional fisheries management planning exercises. However, obtaining an absolute value for resource status, such as MSY, is difficult considering the multi-species composition of the resources, and although research results contribute to scientific findings, most have not been put to direct practical use as management inputs. Instead of an absolute resource value, relative evaluation — using catch per unit of effort (CPUE), change of species composition, and catch length-frequency data — can provide useful indicators that could be used in an input control system for fisheries management in multi-species tropical fisheries. Government fisheries agencies need clear policies on the type of fisheries management system to be developed and the type of data and information required from scientific research. In the absence of such polices, and compromising with familiar output control systems, scarce government funds are wasted, and do not serve to increase the sustainability of fisheries.

Designing appropriate systems

A serious constraint to good governance is the lack of appropriate fisheries management systems for coastal and small-scale fisheries. An alternative fisheries management system is urgently needed, based on the practical prerequisites discussed below.

Fisheries management systems are usually designed as a compromise with existing systems and international instruments. This may simplify the design, but the resultant system is not closely adapted to the many varied local social and economic conditions, as this process requires careful analysis. Accommodating various internationally agreed upon instruments into an alternate system can ensure consistency with global management, and may imbue a sense of international political security, but it must be recalled that some global instruments fail to accommodate local cultural, social and economic conditions, as well as the ecosystem characteristics of developing countries. Some internationally developed texts and guidelines (FAO 2007a) are too generic and ambitious, and commonly overlook local factors, such that there no internationally recognized system that is particularly applicable to tropical coastal, small-scale fisheries exists. This makes it difficult for scientists to recommend a system to evaluate when developing countries and their policy-makers are seeking options for planning innovative fisheries management systems. If several theoretical ideas are recommended the common result is implementation of various uncoordinated pilot projects by different donors and government agencies, in an effort to verify different ideas and identify a "best practice". This time-consuming and unsystematic approach is unlikely to reveal the best alternate fisheries management system. It is important to begin with a clear policy regarding the promotion of alternate fisheries management systems; this allows governments to create an enabling environment before implementing pilot projects and testing methodologies in a coordinated manner.

Further, the ill-defined use of different terms such as "co-management", "community-based fisheries management", or "integrated fisheries management", to denote alternate systems, is an unwarranted complication and source of confusion (Davis and Ruddle 2012), mainly because of the lack of policy directives on fisheries management. Unfortunately, efforts to develop an alternate system have never been coordinated at the national level, because the approach has been to promote individual pilot projects. Work undertaken directly with communities — particularly by non-governmental organizations in an effort to sidestep the unconstructive involvement of central governments and their often distracting interventions — also complicates coordination among projects. Fisheries management should be a national issue, supported by and consistent with national policies. It should not be implemented in a fragmented manner at the community level, particularly under the direction of foreign organizations.

Developing a long-term policy for sustainable fisheries

A backlash sometimes occurs when governments attempt to implement *ad hoc* management measures without elaborating long-term policies. Such measures are most often implemented in response to increasing pressure, including foreign pressure, and are normally intended to have visible effects. However, in most cases the envisaged positive effects are not realized, and sometimes the results are negative. For example, in response to overcapacity, some countries encouraged their fishing fleets to move offshore in order to alleviate fishing pressure in coastal waters. However, the unintended result was that most boats returned to coastal waters when the offshore resources proved to be less abundant than expected, and the operation not financially viable. Such results should have been anticipated, given the absence of appropriate legislative arrangements and feasibility studies for each fishery.

Buy-back (subsidy) schemes have sometimes been initiated to tackle overcapacity, but such subsidies proved ineffective in the absence of alternative livelihoods, and a system to support a fixed number of vessels. To alleviate poverty and overcapacity in fishing communities, some countries initiated an exit plan and non-systematic poverty alleviation programmes. However, national fisheries administrations are generally not technically competent to implement such social programmes, and "off-the-shelf packages" launched without modification to fit the circumstances of specific communities did not minimize competition in fisheries; instead, when people failed to receive financial benefits they returned to fishing. The programmes have not fulfilled the envisaged objectives because they have not addressed the overriding problem: the lack of alternate livelihood opportunities in rural communities.

Although monitoring, control and surveillance systems, including such sophisticated equipment as a vessel tracking system, have been introduced to improve enforcement, success has been limited because many patrol boats are not fully operational owing to the absence of management regulations, a basis for law enforcement, and the lack of government funds for operations. Further, lacking clear management objectives, most monitoring, control and surveillance activities in tropical developing countries focus on illegal fishing. A further problem is that there is no unambiguous definition of "illegal fishing".

Alternative management system for tropical coastal and small-scale fisheries

Compared with agriculture, the need to manage fisheries has only recently been recognized. Further, MSY-based resource management is the only widely recognized fisheries management method. However, the short history and uncertain nature of aquatic resources and ecosystems have inhibited the understanding of the status of fisheries and fishereies resources. The understanding is gradually building that stock assessment-driven "resource management" may not be appropriate for small-scale and coastal tropical fisheries.

Global sustainable fisheries have been promoted according to a single scenario applied for fisheries worldwide. However, the applicability of such a single approach, especially for highly diverse small-scale and coastal tropical fisheries, is debatable. The specific characteristics of tropical fisheries, in addition to ecological differences such as multi-species composition, are important factors when considering appropriate scenarios for sustainable fisheries. One issue concerns the size of fishing units. The majority of tropical fisheries are small in scale. In Southeast Asia, for example, 95% of fishing boats are less than 5 gross registered tons. When Western management approaches are discussed, fishing units targeting particular dominant species to be managed may number in the hundreds at most. However, in Southeast Asia, fishing units targeting dominant species barely exist. Instead, management must focus on a multi-species resource situation. Further, in small-scale coastal fisheries, the numbers of fishermen can be huge, ranging from several hundred thousand in Malaysia, Myanmar, the Philippines, Thailand and Vietnam to a few million in Indonesia. Further, small-scale tropical fisheries are conducted mainly as daily operations, using fishing communities as their base. Thus, their social linkages and reliance on fishing communities is high. This may be one reason why the Western system refers to "resource management" and not to "fisheries management, as the latter focuses on fisheries resources and not fishing communities. For these reasons, it can be an almost impossible challenge for national fisheries administrations in tropical countries to follow a Western methodology. Although fisheries management systems can be designed as a compromise between existing systems and international instruments, it may be impossible to modify existing systems and apply them to such totally different fisheries.

Southeast Asian countries struggled to develop appropriate fisheries management methodologies and concluded their regional fisheries policy under the Association of Southeast Asian Nations (ASEAN) umbrella in a Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN region. Regional fisheries policy documents were adopted by fisheries-related ministers of ASEAN countries at the ASEAN-Southeast Asian Fisheries Development Center (SEAFDEC) Conference on Sustainable Fisheries for Food Security in the New Millennium, "Fish for the People," in November 2001. It was later endorsed by ASEAN's Ministers of Agriculture and Forestry. Article 5 of the resolution concluded that it was necessary to "....[e]ncourage effective management of fisheries through delegation of selected management functions to the local level". And Article 6 concluded that it was necessary to "[r]ecognize the need to progressively replace 'open access' to fisheries resources with 'limited access regime' through the introduction of rights-based fisheries that also may facilitate the management of fishing capacity and promote the use of responsible fishing gears and practices" (ASEAN and SEAFDEC 2001).

Institution building: Community level organizations

Resource management focuses more on stock assessments than social factors; is normally conducted between government agencies acting as managers of individual fishing units; and focuses

mostly on decentralization and management linkages with a relatively small number of individual resource users. Little attention has been paid to the role of local institutions such as fishermen's organizations, although some systems refer to roles unrelated to fisheries management

Given the large number of scattered small-scale fishing settlements, focusing government intervention on individual fishing units would be impractical. Thus, the establishment of appropriate institutions in each fishing community is a key to the success of any alternative management system, with an appropriate group of fishermen in each fishing community serving as a local partner. Creating an appropriate interface institution with a user-rights group in each fishing community is the most important policy consideration. Under such an arrangement, the obligation to conduct responsible and sustainable fisheries would become the responsibility of these local institutions.

Implicit in a fisheries legislative framework is an educational component that addresses the allocation of common resources. The general perception is that fisheries regulations lack strict legal definitions because infringement impacts only on common resources, rather than seriously violating the rights of others. To counter this, one option would be to clarify resource ownership by providing fishing rights. However, if a fishing right provided only to resource users fails to convince them to act as custodians of common resources, their compliance with rules imposed by a government agency is unlikely to improve. It is therefore important to delegate some fisheries management rights as obligations that accompany fishing rights.

While general rules would be based on national fisheries regulations, detailed rules of conduct should be developed by the fishermen themselves. With assistance from government agencies, the fishers' organizations could formulate such regulations as by-laws. Considering the current poor compliance with government rules and regulations, there is nothing to lose by such an arrangement. On the contrary, if resource users are involved in making rules and regulations the compliance level could improve substantially (SEAFDEC 2006).

Based mainly on rural development objectives and the improvement of the national market for agricultural products, some Southeast Asian governments attempted to establish community organizations, including for fisheries, but most such attempts quickly failed. Several reasons account for this. First, most organizations were established by government agencies, and the continuous need for financial support became burdensome, because their financial independence was not well conceived. Second, modernization of markets based on a public auction system initiated by fishermen's organizations (but not strongly supported by the government) was either not accepted or was sabotaged by middlemen. Third, fisheries management was not considered important and the objectives of fisheries institutions were poorly defined. Combined with other constraints, this led to the collapse of the nascent institutions.

Marketing fish and fishery products

Enhancing the economic capability of community institutions such as fishermen's organizations may require an additional right in adition to those related to fishing and management: that of being involved in the marketing of products via community public auctions. This would require further clarification of the legal status of fishermen's organizations, including their exact legal status as non-profit organizations, including privileges regarding taxation.

It is often asserted that coastal small-scale fisheries remain financially weak because their incomes are retarded by an informal market structure, and particularly by "middlemen", who are conventionally characterized as a "social problem". But this cannot be so easily assumed without prior and thorough investigation of the various aspects of each particular case of informal credit and finance (Ruddle 2011). However, informal marketing makes it difficult for the small-scale fishermen to set the price of their products, which they may be obliged to market with no involvement in value added owing to their relationship with middlemen. Because fish and fishery products are increasingly destined for the international market, modernization of local fish marketing systems is an immediate need to establish transparency. Without an enhanced financial status to provide a strong incentive for fishermen, it is unlikely that small-scale fisheries management systems can be improved. An improved local marketing system can be critical to ensuring better local fisheries management and fishermen's livelihoods.

Alternative fisheries management designs must include major changes at the local level. Local institutions such as fishermen's organizations can be financially independent through their involvement in fish marketing, particularly via community-level public auctions. However, strong government support is required (to provide an enabling environment, and especially a legal framework) if the current and long-established marketing systems, which are based on a relationship between individual fishermen and middlemen, are to be modifed

Functions of government agencies and fishermen's organizations

One difficulty in delegating management authority could be the general perceptions that individuals

in charge hold regarding fishermen. "Resource management" is conventionally regarded as highly technical and science-based, making it difficult to convince national fisheries administration staff and policymakers that fishing community members are capable of conducting management tasks. Effective promotion of an alternative fisheries management system requires changing the mindset of decision-makers wedded to existing approaches.

Potential additional benefits of an appropriate fisheries management system

Promotion of responsible fishing

Promoting responsible fisheries is difficult in a context of declining resources and increasing user competition under an open access regime. The lack of clear ownership of fisheries resources is commonly but erroneously considered to be the main cause of the problem (Davis and Ruddle 2012), leading to the assumption that once fishing rights and partial delegation of management responsibility have been established, conditions could improve drastically. In Ban Saphan Bay, Thailand, although fishermen had minimal rights, they demonstrated an interest in using resources sustainably by complying with a voluntary moratorium on such illegal fishing gear as the push net, and upgrading their gear to a larger mesh size. The Ban Saphan Bay project was supported by Thailand's Department of Fisheries, but no national legal support was provided. However, provincial regulations supported the system (Anuchiracheeva 2005; Anuchiracheeva et al. 2003). Fishermen gradually became more sensitive regarding implementation of sustainable resource use to the extent of monitoring the misconduct of outsiders fishing in the designated exclusive rights areas of others. Based on mutual agreement, they regulated their activities and informed on the irresponsible behavior of outside fishermen.

It is well understood that any system based on government regulations cannot be effectively implemented and enforced in myriads of fishing settlements scattered along vast coastlines, especially considering the current low management capacity of governments in developing countries. A different and appropriate system is required to regulate fisheries. There is no overriding reason why any government enforcement is required to regulate small-scale fisheries. This is well demonstrated by the case of Japan, where there is almost no government intervention at the local level, as all coastal fisheries activities are confined in their respective designated areas, and compliance with rules developed by resource users (with guidance by the government) is normally high (Kato 2004b; Makino and Matsuda 2005; Ruddle and Akimichi 1989; Yamamoto and Short 1991).

Provision of fishing rights together with management rights to resource users may greatly enhance their compliance with fishing rules, especially when the critical rules are developed by themselves as one of the most important functions of the fishermen's organizations. Such an arrangement would promote responsible fisheries as well substantially reduce the costs of government enforcement. Although enforcement of the rules for small-scale and coastal fisheries might be improved through an internal mechanism under an appropriate system as described here, the resolution of conflict between small-scale operators and large commercial boats that frequently encroach into coastal areas would remain an external problem requiring solution through government intervention, including an improved licensing system for commercial fisheries.

Overcapacity

Although overcapacity is recognized as a serious problem facing small-scale fisheries in Southeast Asia, no effective solution has emerged, and the number of fishermen is increasing continuously. Entrance to small-scale fisheries is presently unregulated, and new entrants are not discouraged mainly because of the widespread rural poverty and lack of alternative livelihood opportunities. It is doubtful that any top-down approach by government agencies would be effective, although a primary objective of introducing fishing rights is limiting the number of small-scale fishing units. On the other hand, a solution could be promoted through fishermen's organizations, because introduction of a user-rights group via a fishermen's organization could also function to limit membership, as they develop their own regulations to either reduce or not increase membership so as to secure larger shares for existing members. Transparent and logical selection criteria and a stringent evaluation of applicants could freeze membership size and even lead to an eventual decrease.

Data collection

Although government agencies normally collect fisheries data either directly or using contracted enumerators at fishing ports, markets and other sites where fish are aggregated, the geographically scattered pattern of small-scale coastal fisheries and the small size of marketing points ensures that most transactions between fishermen and market intermediaries ("middlemen") are conducted privately, so that the volume of fish transacted is not visible to outside enumerators. This makes reliable collection difficult (Kato: 2003b). In contrast, data collection in cooperation with fishermen has been considered, but has never been successfully implemented, owing to a lack of mutual trust between national fisheries administrations and fishermen. Agencies

claim disappointment with the quality of data, and fishermen are reluctant to provide data without knowing how it will be used. However, that could change if the right to manage fisheries is delegated to fishermen's organizations, because they would require basic operational data that fisheries agencies could then access and compile.

Collection of statistical data and information is also problematic because the current systems were introduced long before fisheries management data needs were identified. Current fishery statistical systems are focused on the collection of production data and not on the data required for fisheries community management, such as the number of fishermen and the number and type of fishing boats and gear. Such basic data have not been emphasized or systematically collected, even after fisheries management became a priority issue. This may have also resulted from the narrow Western fisheries management focus on resources. Data required for fishermen's involvement could be easily collected by resource users or local institutions if management functions are delegated appropriately to the community level.

Scientific indicators such as MSY are inherently too uncertain and hypothetical to be of value in the management of tropical small-scale fisheries, and will not be understood by resource users, who can more easily understand management indicators such as CPUE that are more appropriate to assessing fishermen's activities than resources. Based on such an understanding, regional guidelines for indicators were developed by SEAFDEC (2006). Fisheries management for small-scale tropical fisheries should focus on the management of fishermen's activities rather than on resources, and both managers (local institutions that collaborate with national fisheries administrations) and resource users (fishermen) must use mutually understandable indicators and communication tools.

Conclusion

One assumption of globalization is that internationally agreed upon issues should be applicable worldwide. However, in many cases that may not reflect reality, especially in developing countries. Further, because the globalization of fisheries administrations is a relatively recent phenomenon (having begun after 1990), most developing country representatives attending international meetings are not yet accustomed to the format and rules that govern the meetings. For example, although some countries may consider a specific proposal unacceptable, the meeting could consider that issue as unanimously accepted if dissenting opinions and concerns are not expressed. There is a large gap in the way different countries participate in meetings organized to address issues relating to the promotion of the globalization of fisheries administrations.

Concerns have been expressed (Kato 2003a) that methodologies, such as the resource management system developed in temperate areas, have been overwhelmingly promoted and widely accepted as the ,means of attaining sustainable fisheries, without carefully investigating the applicability of the system in different and diversified ecosystems around the world (particularly in the tropics), and without recognizing the longstanding existence of viable, successful alternative systems (Kato 2008; Ruddle and Hickey 2008).

Acknowledgements

I am grateful to Kenneth Ruddle for his guidance and suggestions regarding content. Nevertheless, the opinions expressed herein are entirely my own. I am also grateful to the Southeast Asian Fisheries Development Center (SEAFDEC). The context for this article was developed through a series of SEAFDEC activities on the regionalization of the Code of Conduct, and related activities.

References

Anuchiracheeva S. 2005. Towards right-based fisheries: Case of Bang Saphan Bay. Fish for the People 3(2):22–36.

Anuchiracheeva S., Demaine H., Shivakoti G.P. and Ruddle K. 2003. Systematizing local knowledge using GIS: Fisheries management in Bang Saphan Bay, Thailand. Ocean and Coastal Management 46(11–12):1049–1068.

ASEAN and SEAFDEC (Association of Southeast Asian Nations and Southeast Asian Fisheries Development Center). 2001. Resolution and plan of action on sustainable fisheries for food security for the ASEAN region, main outcome of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium, "Fish for the People". Bangkok: SEAFDEC.

CBD (Convention on Biological Diversity). 2000. Decision 6 of the Fifth Conference of the Parties to the Convention on Biological Diversity, Nairobi, Kenya, May 2000.

Christensen V., Guénette S., Heymans J.J., Walters C.J., Watson R., Zeller D. and Pauly D. 2003. Hundred-year decline of North Atlantic predatory fishes. Fish and Fisheries 4:1–24.

Cochrane K.L. 2000. Reconciling sustainability, economic efficiency and equity in fisheries: The one that got away? Fish and Fisheries 1:3–21.

Cochrane K.L. and Doulman D.J. 2005. The rising tide of fisheries instruments and the struggle to keep afloat. Philosophical Transactions of the Royal Society B 360:77–94.

Davis A. and Ruddle K. 2012. Massaging the misery: Recent approaches to fisheries governance and the betrayal of small-scale fisheries. Human Organization 71(3):244–254.

Doulman D.J. 2003. Some observations on developments in world fisheries. US State Department electronic journal "overfishing". Washington, DC: US State Department.

FAO. 1994. Review of the state of world marine fishery resources. FAO Fisheries Technical Paper 335. Rome: FAO.

FAO. 1995. Code of conduct for responsible fisheries. Rome: FAO.

FAO. 1996. FAO technical guidelines for responsible fisheries, no.2, Precautionary Approach to Capture Fisheries and Species Introduction. Rome: FAO.

FAO. 1997. The state of world fisheries and aquaculture. Rome: FAO.

FAO. 1999. International plan of action for reducing incidental catch of seabirds in longline fisheries, international plan of action for the conservation and management of sharks, international plan of action for the management of fishing capacity. Rome: FAO.

FAO. 2001a. Report of the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem. Reykjavik, Iceland, 1–4 October 2001. FAO Fisheries Report 658.

FAO. 2001b. Report of the Twenty-fourth Session of the Committee on Fisheries, Rome, 26 February–2 March 2003. FAO Fisheries Report 655.

FAO. 2001c. International plan of action to prevent, deter and eliminate illegal, unreported and unregulated fishing. Rome: FAO.

FAO. 2002. The state of world fisheries and aquaculture. Rome: FAO.

FAO. 2003a. The ecosystem approach to fisheries. In: FAO technical guidelines for responsible fisheries. vol. 4, suppl. 2. Rome: FAO.

FAO. 2003b. Progress in the implementation of the Code of Conduct for Responsible Fisheries and related plans of action. COFI/2003/3Rev.1. Unpublished document. Rome: FAO.

FAO. 2003c. Report of the Twenty-fifth Session of the Committee on Fisheries. Rome, 24–28 February 2003. FAO Fisheries Report 702.

FAO. 2003d. Progress report on the implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing. Document C2003/21 presented at the Thirty-second Session of the FAO Conference, 29 November–10 December. Rome: FAO.

FAO. 2003e. Case studies on the implementation of the provisions of the Code of Conduct for Responsible Fisheries and its related international plans of action. Unpublished report made available to the Twenty-fifth Session of the Committee on Fisheries, Rome, 24–28 February 2003.

FAO. 2003f. Yearbook, Fishery Statistics. Rome: FAO.

FAO. 2007a. Report on the Twenty-seventh session of the Committee on Fisheries. FAO Fisheries and Aquaculture Report No. 830. Rome: FAO.

FAO. 2007b. The State of World Fisheries and Aquaculture (2006). Fisheries and Aquaculture Department. Rome: FAO.

FAO. 2010. Status and potential of fisheries and aquaculture in Asia and the Pacific 2010. Bangkok: Asia-Pacific Fishery Commission, FAO Regional Office for Asia and the Pacific.

Kato Y. 2003a. Globalization vs national implementation: The role of regionalization. Fish for the People 1(1):13–16.

Kato Y. 2003b. Collection of fisheries data and information. Fish for the People 1(2):20–25.

Kato Y. 2004a. Fisheries management in Southeast Asia: Where indicators come in. Fish for the People 2(1):2–7.

Kato Y. 2004b. Learning from the Japanese right-based fisheries system. Fish for the People 2(3)2–12.

Kato Y. 2008. Steering the small-scale fisheries of Southeast Asia towards responsible development. Fish for the People 2(8):3–9.

Makino M. and Matsuda H. 2005. Co-management in Japanese coastal fisheries: Institutional features and transaction costs. Marine Policy 29(5):441–450.

Ruddle K. 2011. "Informal" credit systems in fishing communities: Issues and examples from Vietnam. Human Organization 70(3):224–232.

Ruddle K. and Akimichi T. 1989. Sea tenure in Japan and the Southwestern Ryukyus. p. 337–370 In: Cordell J.C. (ed.) A sea of small boats. Cambridge, MA: Cultural Survival.

Ruddle K. and Hickey F.R. 2008. Accounting for the mismanagement of tropical nearshore fisheries. Environment, Development and Sustainability 10(5):565–589.

Satria A., Umbari A., Fauzi A., Purbayanto A., Sutarto E., Muchsin I. 2002. Menuju desentralisasi kelautan. Cidesindo: Jakarta (in Indonesian).

SEAFDEC (Southeast Asian Fisheries Development Center). 2000. Regional guidelines for responsible fisheries in Southeast Asia: Responsible fishing operations. SEAFDEC, TD/SP/21, November 2000.

SEAFDEC. 2006. Regional guidelines for responsible fisheries in Southeast Asia: Supplementary guidelines on co-management using group user rights, fishery statistics, indicators and fisheries refugia. SEAFDEC, SEC/SP/76, March 2006.

UNCED (United Nations Conference on Environment and Development). 1992. Report of the United Nations Conference on Environment and Development. Rio de Janeiro: United Nations.

UNDP (United Nations Development Program). 2003. Human development report 2003. Millennium goals: A compact among nations to end human poverty. New York: Oxford University Press.

WSSD (World Summit on Sustainable Development). 2002. Plan of implementation. World Summit on Sustainable Development. Johannesburg: United Nations.

Yamamoto T. and Short K. (eds). 1991. International perspectives on fisheries management with special emphasis on community-based management systems developed in Japan. Proceedings of the JIFRS/IIFET/Zengyoren Symposium on Fisheries Management, August –September 1991, Tokyo.