

Links in the Fish Chain

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As the preceding chapters of this section have demonstrated, resource regulation has not been the strong suit of fisheries. Each chapter has identified serious problems of, or challenges to, governance in the world's fisheries: over-fishing, human-induced ecosystem shifts, threats to livelihoods, pollution, over-dependence on marine sources of fish feed, and quality control. These are well-known problems that have in recent years prompted increasing recognition that fisheries governance has been inadequate to the challenge of maintaining sustainability and livelihoods in maritime areas.

While not to excuse governance failures, the preceding chapters have provided a major reason for them: the diversity, complexity, and dynamics of the main segments of the fish chain that we identify militate against the establishment of straightforward, effective governance mechanisms. This task is rendered even more complex when the attempt is made to incorporate all of the segments of the chain into a whole. The intent of this chapter is to reflect on the constitution of the fish chain or, really, the multiple intertwined fish chains that extend from the world's fisheries, and then to assess the governance challenges specific to governing the interactions within entire fish chains. Both of these tasks have been anticipated in the introductory chapters to this volume and in this section of the book. We begin this chapter with a short reflection on the representation of the chain.

How Should the Fish Chain Be Viewed?

Two explicit approaches and one implicit approach to representing the fish chain have been taken thus far. The first of these, most consistent with the metaphorical image of the chain, is the notion of a vertical, interlinked sequence of interactions that brings an aquatic organism from its ecosystem to the consumer's dining table (fig. 1 in the introduction to Part II). The second is the more complex, multi-layered image of the chain represented in the diagram in fig. 2 (in the introduction to Part II). For now, we will content ourselves with the descriptions of approaches one and two as presented in the introductory chapter to this section. Later in this chapter, we will return to their importance as images for understanding the chain.

The third, implicit, approach is that, in order to grasp the complexity of the chain one has to break it into constituent segments in order to view each more closely. Two aspects of the breaking up of the chain merit particular attention: how it is divided and the lessons that become apparent

from its division. The logic by which the chain was divided is clear from the chapter breakdown and from the affiliation of the authors. We divided the chain largely according to disciplinary expertise. A biologist thus wrote on ecology, sociologists and anthropologists on the organisation of fish capture, another biologist led the chapter on aquaculture, and a team led by an economist produced the chapter on post-extraction processes. Such a division matches the typical arrangement of studies of fisheries and fish chains. The implication of dividing the chain disciplinarily gets less attention in fisheries studies. Each of the disciplines involved in the study of fisheries has particular perspectives and emphases associated with it. These are evident to a degree in the four contributions to this part of the book. Beyond highlighting these disciplinary tendencies below, but also showing their limitations, we wish to emphasise the comparative advantages of so closely juxtaposing the disciplinary approaches for understanding the fish chain.

Decoupling the Fish Chain

The task of breaking and reassembling the chain was anticipated in the assignment to the chapter authors who were instructed to incorporate a concern with diversity, complexity, and dynamics. How individual authors responded to that challenge is a good indication of disciplinary predilections and overlaps.

Kulbicki (see chap. 3) focuses on diversity— at either the spatial or species level – and how this impacts on the stability, resistance, and resilience of aquatic ecosystems. Yet, as the authors note, ecosystems are not static and the diversity ‘mix’ can change either naturally, through migration and speciation, or through human intervention, with species loss just as, if not more, important to diversity and ecosystem functioning as species gain. The complexity and dynamics of such ecosystems inhibit the development of effective governance, more so when the full range of parameters are unknown – these include the presence of presently *undescribed* species within the system, particularly in the tropics, and how widely or narrowly concentrated are their habitats.

Yet species diversity is inextricably linked to habitat diversity – and so the promotion of the latter will also benefit the former. The implications, in terms of governance with an ecosystem health objective in mind, will range from the ban or regulatory restriction of certain gears that reduce habitat diversity such as bottom trawling, dynamite fishing, use of poisons, and mangrove destruction, to the promotion of habitat enhancement through the construction of artificial reefs, the restoration of degraded areas of coastal wetlands, the delineation of marine protected areas, effluent controls, etc. Equally, ecosystem health-oriented governance could address the direct promotion of resource diversity through such measures as enhancing juvenile survival of fish, reducing the fishing pressure on spawning

aggregations, and limiting the use of gears that are not selective in terms of size or species catch composition.

Evidently Kulbicki's main points of reference are biological and physical parameters of the ecosystem: fish species and ecosystem boundaries and interactions respectively. Human interventions are seen from the perspective of the fish, with the most immediate threats, fishing and other direct anthropogenic pressures, looming largest. Markets and other factors conditioning human effort are in the distant background. Following from this orientation, the chapter's governance recommendations are directed at measures to ensure the basic conditions for maintaining ecosystems and the species diversity they contain.

As Johnson et al. (see chap. 4) notes, from the *capture* point of view, the most important dimensions of diversity are the social organisation of production, technological intensity, and the space and time involved in the extraction process. The capital intensity of production will grow as the spatial sphere of operations is extended – with subsistence fishers who fish inshore coastal waters tending to use local knowledge and locally produced, low-cost gear while the distant water fleets of multinational companies make recourse to global positioning devices, monofilament nets, and state-of-the-art fishing vessels. The overall historical dynamic of capture fishing has been in the direction of technological intensification, the increasing importance of large-scale industrial production, and changes in the space and time of fish capture.

Yet, even within small-scale and large-scale fisheries, there is a rich complexity of extraction strategies that reflect local livelihood conditions and institutional priorities. In inshore coastal fisheries, for example, if fishers target a single species they generally use a limited range of gears – adapted according to fish size and/or fish behaviour. Most fishers in these single species fisheries tend to adopt one specific gear as this reduces costs and may optimise efficiency. However, in a coastal fishery with several commercial species, the fisher has to decide which species to target, in the belief that (if everything goes according to plan) he or she will get a mixed catch, albeit dominated by the target species. Moreover, depending on the dynamics of the underlying ecosystem, he or she may well have to – or choose to – shift from one target species to another depending on the season, the market or other factors; so it is probable that he or she retains a portfolio of gears, or at least has gears that can either adapt to different situations or deliver a broad spectrum of catch. In very diverse coastal fisheries, in which the catch is necessarily varied, the choice is explicit: either have many different gears selected according to target species or invest in the minimum of gear giving the maximum spectra of catch. The first choice implies either having enough capital to buy and maintain several gear types and, perhaps, the corresponding vessels, or splitting the investment between various members of a fishing community. The second is usually the 'poor person's choice' insofar as it reduces both the investment and the returns, since broad-spectrum gears do not necessarily catch the most commercial species.

The nature of the capture process has a number of implications in terms of governance then, particularly with regard to the objectives of social justice and livelihoods/ employment. If a capturing 'free-for-all' is permitted, inequities in the stocks of fishing capital will likely be translated into inequities in catch levels. If governance mechanisms are sought instead to regulate resource access, more latitude is available to pursue social equity and ecosystem health objectives. If the regulatory approach is chosen, a decision has to be taken about whether to apportion stocks between competing fishers, or to control effort through gear restrictions and the like. Variations on these alternatives have different implications for social equity and the maintenance of diversity in fish capture.

At the centre of the sociological approach to fish capture are the social relations and institutions that organise the extraction of fish. Ecosystem variables are seen as one factor among many which influence how fish are captured. To the degree to which the market is viewed as a collection of social actors, it may be internalised into the organisation of fish extraction. Johnson et al. deliberately left an implicit external influence, as the authors were aware that discussion of the market would be left for exclusive treatment by Thorpe et al. (see chapter 6). Following from Johnson et al.'s social focus, key governance priorities for fisheries sociology are the degree to which fisheries interventions and governance influence livelihoods, employment, and the quality of social relations.

Pullin and Sumaila's chapter on aquaculture (see chap. 5) diverges from the model of the other chapters in the fish chain section because it was written by a biologist, with significant input from an economist. This cross-disciplinary collaboration matches the anomalous status of the topic of aquaculture in terms of the disciplinary division of the fish chain we have made here; aquaculture includes interactions among a range of ecological, social, organisational, and marketing segments of the entire chain. And, while it would be quite feasible to devote disciplinary chapters to each of those elements in another context, the single chapter devoted to aquaculture in this volume meant their integration. In the context of the exponential growth of aquaculture, Pullin and Sumaila here emphasise the cross-sector impacts of aquaculture development. A central concern of the chapter is the [over] reliance of aquaculture on fish-meal and fish-oil as feed inputs – diverting a substantive proportion of the global fisheries catch – around thirty percent according to recent figures – into the mouths of captive fish rather than humankind (Tuominen and Esmark 2003). The governance challenges facing aquaculture relate to the complexity of its ecological and social interactions and its market links, which have generated a dynamic of rapid growth. Aquaculture also involves a highly diverse set of operations ranging from a fisher-farmer using a local water resource to raise fish so as to supplement household consumption and, often, income, to large, capital-intensive, foreign-owned salmon farms in Chile and shrimp farms in India (Barrett et al. 2002; TED 1996).

Governance strategies for aquaculture have to reflect these conditions. The land-based activities of some aquaculture operations, for example, ne-

cessitate mediating mechanisms to reconcile relevant objectives like ecosystem health and social justice with those of coastal and/or riverine zone management. The cross-sector linkages in aquaculture governance include its impact on local ecosystems, whether through the introduction of alien species, the generation of effluents and eutrophication, the destruction of local habitats, or the influence of vested interests and power structures, which can often override the establishment and enforcement of environmental safeguards. Governance strategies for aquaculture also need to arbitrate on issues of social justice; how, for example, should access to water bodies and/or coastal regions suitable for aquaculture activities be governed? Equally, as the genetic aquatic treadmill of selective breeding, hybridisation, and gene transfer gathers pace, multiple issues of ‘justice’ arise – from the sovereign rights of states over all their native genetic resources (Eberlee 2003), to private intellectual property rights on genetically enhanced aquatic resources.

Governance in the extraction process, as in post-extraction activities – whether capture or aquaculture – is not solely confined to the processes themselves, but has a far wider remit in terms of the fundamental concerns identified in chapter 1. The markedly higher occupational incidence of mortality in the fishing industry, for example, offers a compelling reason for the implementation of exigent and ongoing safeguards to protect lives, and not just livelihoods, in the sector (cf. US Bureau of Labor Statistics). Equally, governance arrangements such as formal and informal share arrangements among crewmembers, or community mechanisms to support disabled mariners and the families of drowned or disappeared seamen, can contribute significantly towards norms of social justice.

The final chapter on the fish chain details the nature and organisation of historic and contemporary *supply* chains, using African cases for illustration. They comment on the extent to which such chains are both competitive and participatory, and illustrate how quality considerations are becoming a major driving force underpinning the chain. While they recognise the diversity within, and complexity of, fish supply chains, they also contend that such variations do not invalidate the Folkerts-Koehorst thesis of consumer-driven supply chains (see chap. 6).

Consumer-driven supply chains in a plainly unequal world (UC Atlas 2003) have profound implications in terms of the objectives of food security and safety, social justice, and livelihoods, as Northern agendas orient fish chains that originate in the developing world to the market and quality edicts of the global fish trade. The Nile perch trade, like that of the South African demersal trade, bypasses local markets and, with ecosystems capable of delivering finite fish resources, impacts adversely upon local consumption levels. Food insecurity is compounded by the limited local employment opportunities offered in such global food chains, as the drive for efficiency in processing and capturing and the need to meet exacting quality standards merely serves to aid the concentration and integration of fishing capital, to the detriment of other stakeholders. Small-scale fishers face reduced stocks of fish; paid labour loses employment on increasingly capi-

tal-intensive and often foreign-owned fleets; and market traders have reduced stocks available for sale.

Governance in the post-extraction sector can take many forms; from a laissez-faire market approach that allows market participants to determine the structure of the resulting chain, to an approach where the state directs the chain strategy, controls participation, and determines the competition therein. Furthermore, a plethora of potential governance tools exist. These include, among others: the imposition of tariffs and quotas to protect domestic markets from cheap imports or to guarantee domestic consumption levels; restrictions on foreign investment to prevent excessive foreign intervention; measures to forestall restrictive practices, particularly closed auctions; and the derivation and enforcement of chain quality standards, whether on food safety or other grounds.

Thorpe et al.'s starting point (see chap. 6) is the nature of post-extraction supply chains. These vary enormously, reflecting their length and the number of stakeholders involved. Thorpe et al. make clear the very direct impact that market chains have on local populations and on local environmental conditions. It argues that markets are increasingly consumer driven, and that consumers in the North have undue power to influence the priorities of the supply chain, which have deleterious impacts on the South. Chains are becoming longer and more complex, with a corresponding loss of local control over them. While the focus of the chapter is on changing flows of supply and demand, and the institutions that structure fish chains, it also deals explicitly, like Johnson et al. (see chap. 4) with topics such as equity and social organisation.

This last point illustrates that the division of the fish chain into disciplinary components for ease of presentation cannot avoid overlap between them. Areas of linkage are most pronounced in the chapters by Johnson et al., Pullin and Sumaila, and Thorpe et al. (see chaps. 4, 5, and 6), while the difference is greatest between them and Kulbicki (see chap. 3). This reflects the relative inter-disciplinary distances between the chapters, with that between the natural and social science showing the largest gulf. The difference between Kulbicki and the other authors can also be demonstrated by the different emphases given to diversity, complexity, and dynamics. Diversity comes across most strongly in Kulbicki's chapter, while the other authors pay as much if not more attention to complexity and dynamics. Even between chapter 3 and the other chapters in the section, however, the connections are sufficiently important to point to ways of reconstituting the chain.

Reassembling the Fish Chain

The advantage of disassembling the chain, besides allowing for a more detailed examination of its components, is that doing so gives a better sense of how the chain looks from the perspectives of different places within it. When coming back to view the chain as a whole, the visits to each part of

the chain bring an altered perspective. This process of immersion in the parts and then return to the whole is the scales approach advocated in chapter 4. The contention of this approach is that a perfect, complete view of the fish chain is impossible. Any view of the fish chain represents choices and loss of detail in certain areas. But, at the same time, the movement between different perspectives and scales within the chain can allow for a more appropriate approximation of the diversity, complexity, and dynamics of the global fish chain and its constituent fish chains. Such an adaptive approach to understanding the chain mirrors the dynamics of the interactive approach advocated in this book. It also furnishes the basis for a reflexive interdisciplinary approach that recognises the advantages of the understandings available from each disciplinary position without trying to synthesise them.

These rather abstract comments will be better understood by bringing them back to the content of this section's chapters and how each anticipates the work of reassembling the whole of the chain while preserving its own particular emphasis. Kulbicki (see chap. 3) draws the connection between the ecological and human spheres primarily in terms of human fishing pressure on ecosystems. The view of the chapter from the fish's perspective is an interesting place to put oneself as a social scientist. Social scientists are used to seeing the ecosystem as a mysterious other, at best defined through the indigenous classifications of the people with whom they work and visible through the landed species on the beach. The impression from Kulbicki's chapter is quite the opposite; the ecosystem is the rich subject and the motivations and behaviour of fishers the mysterious other. While the market is much more clearly conceivable as a human creation than the human-influenced ecosystem, it too can take an agency of its own when viewed in abstract terms. Yet, while Thorpe et al.'s emphasis is on the market and participants in the supply chain, the latter could equally be viewed from a biological, species-based, perspective. Indeed, doing so serves to reinforce the notion of chain connectedness between the living resource in its aquatic environment and the extracted resource in the human environment.

Pullin and Sumaila (see chap. 5) covers aquaculture and provides a useful point of reference on the section as a whole. First, it was written from a more synthetic approach, in that it comes closest among the discussed chapters to covering an entire fish chain. Yet, in the limited space of the chapter, that synthesis emphasised the inter-sector effects of growth in aquaculture, particularly in terms of ecological impact. It would be just as reasonable to imagine a chapter on aquaculture that prioritised social impacts and equity concerns in terms of changing market control. Second, aquaculture has a great deal of overlap with and influence on capture fisheries and the ecosystems and markets within which they are embedded, yet is nonetheless subject to very different market and production logics. Given the connections of aquaculture to capture fisheries, its importance for the future of aquatic foods, and its partial resemblance to capture fisheries

chains, the combination of similarities and differences of aquaculture comprise a stimulating alternative vantage point.

In the foregoing paragraphs, we have shown how a scales approach provides a way of viewing the relationship among the different segments of the fish chain in an interactive, dynamic way. The advantage of such an approach is that it offers a flexibility useful for its recognition of the value of the positions and inputs of different stakeholders. The approach could well provide epistemological support to the argument for, and methodology of, co-management. At the same time, this book argues that governance is more than just getting the methodology right, although that is fundamental. Governance, as Bavinck et al. (see chap. 15) will emphasise, is also about having to make choices according to normative frameworks. In the governance of the fish chain, these are choices of inclusion and exclusion and of allocation. One of the important choices with normative implications in discussing the fish chain is what holds it together. In the next section we show that the assessment of the drivers of interconnection and change in the fish chain varies, again to some degree according to discipline. After summarising some of the key theoretical models of the glue that holds the chain together, we return to the argument presented by Kooiman and Bavinck (see chap. 1): that globalisation encapsulates the most useful set of forces for understanding the interactions of the chain as a whole.

What Drives the Fish Chain?

Propositions about what binds the chain together are an essential part of knowing what the chain is because they explain how the fish chain can be internally diverse, complex, dynamic, and yet can still be considered a distinct whole. The degrees to which different propositions about the chain's drivers can account for diversity, complexity, and dynamics also provide a measure of their explanatory power.

The basic candidates for the dynamics of the chain that emerge from the discussion of the fish chain in this part of the book are natural forces, the individual, or social constructions. Each has an important influence on the chain and its specific manifestations. We argue, however, that the determinative factor is the social.

As Kulbicki's comprehensive treatment of the ecology of fisheries in a North-South perspective demonstrates, ecosystems are highly complex and subject to a wide range of factors, the effects and interactions of which are very imperfectly understood. Nonetheless, prior to intensive human intervention, permanent ecosystem shifts generally were gradual, occurring over long time scales. As the chapter notes, historical ecosystems even tended to be able to incorporate catastrophic events. It seems probable that for small-scale fishing for local consumption that developed over long time periods, the ecosystem was determinant in terms of influencing fishing gear and fishing strategies, which were diverse and complex in reflection of the ecosystems they depended on. Small-scale fishing for which the time

depth is great, however, is the only case in which natural factors can be said to be primary in shaping the fish chain.

Kulbicki (see chap. 3) clearly acknowledges the current unprecedented power of direct and indirect human effects on marine ecosystems, with marine ecosystems changing in ways that biologists are unable to predict and that are having permanent effects. The weight of causality within the fish chain can be said to have reversed, with the anthropogenic now ascendant over the natural in the dynamic of the fish chain. While the primary force for change is now human, this does not imply increased predictability of ecosystem change. On the contrary, there is considerable evidence that human interventions are creating greater instability and more dramatic shifts within ecosystems. In all modern fisheries, human agency and institutions are far more important in shaping the character of the fish chain, although such remove from the environmental context has implications for the long-term sustainability of the modern fish chain in that it is less receptive to ecosystem feedback.

If we accept that human agency has come to assume the dominant position in the fish chain, we need to define what drives that agency. One option is to invest the source of agency in individual self-interest, as does neo-classical economics. In the case of fisheries, individuals are free agents who seek to maximise their shares of the rent available for the given resources. Under the assumptions of a perfect market, ecosystem health will be maintained because cost of effort equals price at the point of maximum sustainable yield (MSY). Hardin's *Tragedy of the Commons* hypothesis is grounded equally in individuals seeking to maximise their shares of a common-pool resource. Unlike the neo-classical view, however, he did not hold that the market would restrain over-exploitation of available resources. Rather, he argued that exploitation of the resource would continue to the point of exhaustion as resource extractors devote ever-more effort into trying to maximise their resource share unless mutually agreed upon coercive measures could be adopted (Hardin 1968).

Critics of these approaches – us among them – argue that it is erroneous to look strictly to the individual as the source of agency. Individual action has to be considered in its social-cultural-political – and ecological – context, which informs action even as it is influenced by it. On the one hand, political-economic imperatives may skew incentives such that MSY may be overshoot. On the other hand, tragedies of the commons may not arise despite considerable population pressure when collective institutions restrain individual interest. We do not deny the importance of individual agency as a key source of dynamics within fisheries. Our point is rather that individual agency is strongly conditioned by collective incentives and restraints, which have a determinative role in guiding change. The dynamics of the fish chain comes thus not from a single source, but from a complex series of interactions which at present may best be summarised as globalisation, as a way of describing the general shift in the scale of the context shaping coastal and fisheries populations.

Over the past several centuries, globalisation has meant that the sources of influence on individual decision-making have become increasingly distant from local experience. The dynamic of change in fisheries is due to an increasingly complex interaction of events, many of which occur in far-removed regions of the world. Perhaps the most critical force is the evolution of the global economy itself in terms of the development of new or intensified demand, growing market linkages, and the global spread of technological innovations. Growing importance also has to be attributed to the attractions of modernity through media and interaction with members of one's own kin or cultural group who have made good abroad. The pressures of globalisation on local environments are felt through such forces as more efficient vessels and capturing/processing technologies, fleet subsidies driven by international models of fisheries development, in-migration to seaboard regions including the expansion of coastal-based tourism, and requirements imposed by organisations tracing and regulating the international fish trade.

These and other impacts of globalisation are felt and translated into local experience and the actions of individuals in diverse and complex ways, reflecting particular local contexts. Nonetheless, they put the sources of change at a distant and largely unreachable remove from local perception. While the idea of governance has advanced by recognising the socially situated nature of individual agency, and the need thus for collective institutions to manage individual action and harness collective power, it also has to face the new global reality that much of the sphere of locally-important decision-making capacity lies outside of the local realm.

Images of the Fish Chain Re-examined

While fig. 1 is useful as a simplification of the market process that links consumers worldwide with ecosystems and producers in specific fisheries, it gives a misleading sense of the verticality and unity of international fish production chains. As the decomposition of the chain in this section of the book has demonstrated, fig. 3.1 conceals an enormous depth of variation and complexity of the chain. That depth cannot be appreciated except through immersion in each of the segments of the chain, an effort that alters the perception of the chain as a whole.

Fig. 3.2 conveys more effectively the interactive dynamic of the chain. It illustrates how market valuation influences the resources targeted for extraction from the natural environment. Innovation provides constant stimulus to means by which resources are extracted and to the kinds of resources targeted. Human extraction of a series of target living resources is the primary, among many, disruptions of the natural environment emanating from the human environment. The ecological processes by which valued species are created in the natural environment are indirectly influenced by human disruptions. An indication that these processes occur across different scales is evident from the lower part of the diagram.

Each of these figures thus captures only aspects of the forces driving the chain. Fig. 1 (in the introduction to Part II) shows that the chain is now global while fig. 2 (in the introduction to Part II) gives a sense of the complexity of the interactions propelling it. Yet, neither of the figures captures fully what drives the chain. Fig. 2 does provide a source for the chain's dynamics in the innovation box. Yet innovation is itself dependent on the deeper incentives provided by the international economy and the attractions of modern life, the inclusion of which would necessitate adding another dimension to the diagram. Additionally, neither of the chains acknowledged the diversity and complexity of local conditions nor the ongoing change to them that globalisation brings.

Governance Implications of the Foregoing Discussion of the Fish Chain

The main challenge of the governance of the entire chain is that its diversity, complexity, and dynamics inhibit the construction of universally applicable models of governance. Rather, governance solutions need to be multiple and need be able to work at different spatial, institutional, and disciplinary scales. This is all the more urgent with globalisation, which is causing fish chains to lengthen, diversify, and become more complex. Thus, there is a need to work on governance approaches that are consciously interactive in the sense of involving multiple disciplines and stakeholders and in the sense of being able to adapt to rapidly changing situations. This is not new ground; there are longstanding disciplinary and cross-disciplinary attempts to meet these challenges.

Johnson et al. (see chap. 4), for example, connects to a large literature that tries to link social and ecological systems (Berkes and Folke 1998). This reflects the acceptance among natural scientists of the importance of human activities on natural systems, which has led to increasing attempts to incorporate humans into ecosystem models. Granted, some proposals from biological scientists simply advocate the exclusion of humans from ecological zones, but others recognise the importance of involving local people and communities in the management of natural refugia. From the social sciences, there are many initiatives that address the difficulties of human organisation for natural resource management, such as collective action theory, institutional economics, cultural materialism, and legal pluralism.

The consideration of diversity, dynamics, and complexity of the fish chain in this part of the book has raised the importance of choice as a key issue for governance. Governance of the fish chain requires making hard choices between alternatives that will result in potentially negative consequences for individuals, groups, or the natural environment. Such choices are embedded in the social, political, and economic dynamics of fisheries and are constrained by the uncertainty of knowledge of the fish chain, and thus the associated unpredictability of intervention in it. The social nature

of choice and the contingency of knowledge mean that fish chain governance necessarily has to engage with its epistemological and normative foundations. We have made an important start in that direction in this chapter with the discussion of the images of the fish chain. The methodological outcome of that discussion, the advantages of decomposing and re-composing the fish chain with multi-disciplinary input, reaffirms the importance of multi-stakeholder involvement in fish chain governance. It also reaffirms the importance of precaution in decision-making, for the sake of the natural environment, and the importance of social equity considerations as a normative guide.

It is apparent from the preceding chapters that the context in which governance occurs – what we choose to term the ‘fish-chain’, is diverse, complex, and changing rapidly. Equally clear is that a multitude of governance tools/instruments can be deployed to resolve the fundamental concerns identified by Chuenpagdee et al. (see chap. 2). The task is to identify the most appropriate governance tools given particular local conditions. It falls to state, market, and civil society institutions, as the following part of this volume shows, to determine and implement the most effective instruments and resources for the resolution or remediation of concerns and thence to oversee their operation. We have suggested in this chapter, however, that those approaches which are flexible, interdisciplinary, multi-sector, and self-aware will most likely be able to adapt to the demands of globalisation on the fish chain while achieving key objectives of resource and livelihood sustainability, food safety, and food security.

FISH FOR LIFE

Interactive Governance for Fisheries

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