Scenarios as Radical Alternatives: The Case of Aquaculture in the Finnish Archipelago Sea

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Abstract: The method of constructing scenarios is neither straightforward nor unproblematic. We propose first of all the term epistemic closure for representing the necessary methodological limitations of scenario construction. Whenever a particular kind of epistemic closure becomes a habit within some field of scenario-making, we use the term conventional scenarios. The problem with conventional scenario-making is that its analysis of the future is restricted – it can only register the events and trends that its particular approach allows it to see. There is a risk of highly contingent developments, for which there is no preparation in society. Therefore, we want to emphasize the importance of constructing unconventional scenarios, that is, scenarios that are not based on conventional epistemic closure. Our second argument concerns the wide range of variance in future development. Social evolution includes events and developmental trajectories that are impossible to discern with any approach that represents development in a linear fashion. Most scenarios consider the past to be a model for the future, in which existing trends are projected into the future. We call these scenarios trend-based. Other scenarios – called Event-based scenarios – acknowledge that the future is contingent in relation to our knowledge, and focus more on the fact that the pattern of change can change. To illustrate our methodological arguments, a small case study on the future of aquaculture in the archipelago of southwestern Finland is included in the text.

Keywords: scenario methodology, contingency, aquaculture, Finland

1. INTRODUCTION

Thirty-five years ago most experts within the Finnish fishing industry shook their heads at the crazy idea of farming rainbow trout at sea (Eklund 1987a, Peltoniemi 1984). Independently of this, other experts projected catastrophic futures of depopulation for the Finnish archipelago areas (Hustich 1974, Jaatinen 1968). Both groups of experts proved wrong. In 1991 Finland's annual production of sea-farmed rainbow trout was over 15 million kg, at a value of FIM 385 million (Finnish 1993). These figures qualified the country as a major producer of the product. At the same time the depopulation trend started to level out in the archipelago areas. Fish farming at sea had turned out to be an important part of the solution to the depopulation problem (Eklund 1988, 104, Mattsson 1995). Unanticipated developments like this should make us reflect on the ways in which we represent the future in planning and management.

Constructing scenarios of possible future development has become a popular way of dealing with uncertain developments. Scenarios are constructed concerning climate change, biodiversity, business development, national economy, global futures, etc. In this article, we treat scenarios as descriptions of possible pathways of future development, articulated for the purpose of facilitating informed decisions about the future. In accordance with many current overviews of future studies methodology, we place scenarios clearly in the field of planning sciences, which fuse together prescriptions about how to proceed optimally from the present state to some preferred future state, with descriptions of the present circumstances and the historical trends that led to them (Godet 1993, Mannermaa 1991, Niiniluoto 1993).

Yet the method of constructing scenarios is neither straightforward nor unproblematic. We argue first of all that scenarios require particular lenses to be chosen for looking into the future. More technically, we propose the term epistemic closure for representing the necessary methodological limitations of scenario construction. In modelling, for instance, one must make decisions on what kinds of data to collect and how to relate different kinds of data in the model. Whenever a particular kind of epistemic closure becomes a habit within some field of scenario-making (for instance, futures for the Finnish fisheries sector), we use the term conventional scenarios. The problem with the culture of conventional scenario-making is that its analysis of the future is restricted – it can only register the events and trends that its particular approach allows it to see. There is a risk of highly contingent developments, for which there is no preparation in society. Therefore, we want to emphasize the importance of constructing unconventional scenarios, that is, scenarios that are not based on conventional epistemic closure.

Our second argument concerns the wide range of variance in future development. In 1965 Finnish fisheries experts projected that rainbow trout farming would continue to be a fresh water activity and thus of little significance for the Finnish fishing industry (Peltoniemi 1984). Why were they so wrong? One answer could be that the approach they applied in the projection was unable to identify the trends. Another plausible answer is that many unconventional scenarios of Finnish fishery would have had just as big problems in identifying the significance of aquaculture for archipelago development. The reason is that social evolution includes events and developmental trajectories that are impossible to discern with any approach that represents development in a linear fashion. Most scenarios consider the past to be a model for the future: existing trends are projected into the future, generally with a high and a low extreme value, and one or a few middle values. We call these scenarios trend-based. Other scenarios – called Event-based scenarios – acknowledge that the future is contingent in relation to our knowledge, and focus more on the fact that the pattern of change can change.

Contingency is a key concept in our analysis of scenario construction. By contingency we refer to the problem of not knowing what developmental trajectories in the present will turn out to determine future events. Contingent events are events that surprise us because we lacked the instruments for seeing them coming. While unpredictable, contingent developments are not random ones. As Stephen J. Gould puts it when describing the history of evolution in nature, a historical explanation of the unfolding of events does not emerge from deductions from laws of nature, but from sequences of preceding states, where major changes in any step of the sequence would have altered the final outcome (Gould 1990/1989). In retrospective, outcomes can be explained in causal terms, because they are dependent upon what happened before. But when approached as a future process, evolution is highly unpredictable and final outcomes must be considered to be contingent.

The unexpectedness of contingent events can be explained in at least two ways. First, events can be contingent because of restrictions in the epistemic lenses with which we approach social change. This is what happens when, for instance, development follows trends that conventional scenarios do not identify. Second, events can be contingent because they fall outside any detectable trend. The occurrence of such Events (the capital is used to distinguish this category of events) can be explained in different ways – for instance as a result of the freedom of agents or of the characteristics of complex systems. Common for all explanations is the claim that Events are unpredictable for all epistemic approaches. The task of Event-based scenarios is, therefore, not to eliminate the contingent character of future events, but rather to make us realize that contingency is something we have to learn to live with.

In what follows, we will provide an analysis of the distinctions presented above: a) conventional vs. unconventional scenarios, and b) trend-based vs. Event-based scenarios. We defend the view that unconventional and Event-based scenarios are important in planning for the future, because they can a) reduce contingency and/or b) help us to be better prepared for contingent events. To give our methodological bones some flesh, a small case study on the future of aquaculture in the archipelago of southwestern Finland is embedded in the text. The case is used for demonstrating what the notions of unconventional and Event-based scenarios mean for the praxis of projecting futures.

2. SCENARIO-CONSTRUCTION AS A METHOD

Before tackling in detail the issue of how to deal with contingencies in scenario construction, we will discuss a few of the general characteristics of scenarios in order to clarify what scenarios can and cannot do. Our first remark will refer to something scenarios cannot do. They cannot function as objective road marks on our march to the future. Scenarios are not transparent in relation to the future: their representations of the future can affect people's perceptions, decisions, etc., and thus either enforce or inhibit the content of the scenario. In short, scenarios not only represent the future in some sense, but also participate in creating it.

The potential of scenarios to affect the reality that they describe derives from the fact that they are central elements of future-related discourses. As such they constitute means through which different social actors can articulate their views of the future. Articulations of this kind both reflect and construct social interests, drawing on available cultural resources – like historical or mythical analogies; plots from novels, dramas, or films; metaphors in present linguistic practices, and so on. Thus, scenarios are both socially and culturally embedded: they project the future in terms of the social interests and cultural resources that have dominated their making.

The social and cultural embeddedness of future projections can be exemplified by highway construction on the U.S. West Coast after World War I and subsequent freeway construction from the mid-1950s to 1980s. These developments were made possible by widespread popular and political support, which materialized in public subsidies for road projects (Wollenberg 1985). It is difficult to imagine that anybody criticizing the car-and-a-suburban-home ethos would have gained credibility at that time. Wisdom tends to come in retrospect. In 1970, the retired planning director of the by-then suburbanized Santa Clara County in the San Francisco region wrote an article for a conservation journal in which he acknowledged professional and political failure, because the valley's growth from 1950 to 1965 had been guided by anything but sound planning principles (Wollenberg 1985:257).

Social interests and cultural resources provide general epistemic lenses for the construction of scenarios. However, as we get down to the technical specifics of scenario construction we must also take into account methodological issues. Like all descriptions of the world, scenarios are based on particular, more or less articulated, methodological assumptions. These assumptions involve, for instance, the concepts through which the past, present, future and the path(s) between the three are described, the causal relationships between different phenomena, the way in which concepts should be operationalised (for instance, qualitatively or quantitatively?), the status of the scenario in relation to the 'real' future (if there is any such), and so on. General theories about such conceptualisations, causal relations, operationalisations, etc. are called methodologies (for instance, positivism, hermeneutics, social constructivism, and systems theory). In the making of scenarios, methodologies have to be applied to the case the future of which interests us (for instance, the future of Finnish aquaculture). The process of application modifies the methodology so as to make it appropriate for the case in question (Bruun 2000b). This modification can involve the invention of new concepts, more particular hypotheses about causal relations, more particular ideas about operationalisation and so on. In our terminology, an applied methodology is called an <u>epistemic approach</u> (Bruun 2000a, Bruun 2000b, Bruun & Hukkinen Submitted). Scenarios are based on at least one such approach. Principally, however, they can also be constructed by using several approches through a process that we have elsewhere called <u>epistemic encounter</u> (Bruun & Hukkinen Submitted).

Whatever the original number of epistemic approaches involved, the condition for articulating a scenario is that one scenario-making approach is decided upon. This implies that a boundary is drawn between the epistemic inside and outside of the scenario. We call this process of boundary work <u>epistemic closure</u> (see alsoBruun 2000a). Sometimes the process of epistemic closure can be quite uncontroversal, with no competing approaches left aside. In other cases, closure leads to controversy and social conflict. For social scientists an interesting question concerns the social and cultural mechanisms behind epistemic closures. Generally, cultures of planning and management have developed their typical ways of relating to the future through, for instance, models for economic or social prognoses that are used regularly. This implies that a particular epistemic closure has become <u>conventional</u> and that projections of the future, or scenarios, that are made in this way can be qualified as conventional.

We can gain some insight into the process of epistemic closure through Maarten Hajer's (1995, 1996) notions of <u>story-line</u> and <u>discourse coalitions</u>. Story lines are narratives that frame our understanding of particular phenomena. They provide us with thought models and a language to articulate the phenomenon in question. In doing this they distribute roles and moral positions to different actors and define the risks and challenges facing them. Story-lines tell us about the history, present, and future of the phenomenon, and are therefore crucial for mobilising responses among social actors. In politics (in a wide sense), story-lines are potentially powerful because they can engage heterogeneous actors in relatively homogeneous policymaking processes. This possibility derives from the general and ambiguous language ('modernisation,' 'globalisation,' 'sustainable development') used in many influential story-lines. The term discourse coalition refers to discursive convergence in the way in which heterogeneous social actors represent their identities, interests, and ambitions. Modern discourse coalitions have been found in, for instance, the area of environmental policies, where various actors position themselves around notions like ecological modernisation and sustainable development. Successful story-lines generate unified policy processes. At the same time, however, they limit the scope of policies by marginalising perspectives that do not fit within their framework (see, for example,Böhler 1999, Frändberg 1998).

Epistemic closure in scenario-making can be seen as a particular case of story-line formation. It defines the methodological lens through which the future is depicted and, at least implicitly, performs many of the framing functions of story lines. Scenarios are often constructed through a process of negotiation between 'relevant' social actors – national and local authorities, business, interest groups, universities, etc. Thus in scenario-making we see the emergence of <u>epistemic coalitions</u>, a subcategory of discourse coalitions. Epistemic coalitions are heterogeneous and should not be mixed with what Peter

Haas (1997/1992) has called epistemic communities. The latter term refers to networks of professionals ”with expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area” (Haas 1997/1992, 3). In distinction from epistemic coalitions, epistemic communities are homogeneous, consisting of members that share normative and causal beliefs, notions of validity, and who feel involved in a common policy enterprise. While the term ’epistemic coalition’ refers to agreement among different actors about the approch to be applied in scenario-making, ’epistemic community’ refers to one of the actors that might be involved. According to Haas, however, the epistemic community might be a very influential actor, because as society becomes increasingly complex and the future feels more and more uncertain, the need for expertise increases. In scenario-making, this would imply that experts or epistemic communities are gaining, or have gained, significant influence in determining the epistemic approach to be applied.

3. A TWO-DIMENSIONAL CATEGORISATION OF SCENARIOS

In this article, we are interested first of all in the epistemic approaches, that is, the analytical lenses with which the future can be understood. Our second concern is the degree of variance in future development when compared to present trends. How we understand the future and what actually happens in the future are both key elements of the indeterminacy, or contingency, of future development. We divide the epistemic approaches to the future into conventional and unconventional scenarios, and the degree of variance in future development into trend-based and Event-based scenarios. On the basis of these divisions, a two-dimensional categorisation of scenarios can be constructed.

3.1 Conventional versus Unconventional Scenarios

Considering the epistemic restrictions of scenarios, we suggest that a high degree of homogeneity in the practices of constructing scenarios is problematic. It is quite natural that there is some norm acquiring the status of ‘conventional’, because it is important to develop standards to make decision-making efficient in terms of time and money. Standards do not necessarily have to be static, but can change as the flow of time reveals flaws in assumptions or errors in predictions. Yet, it seems crucial that resources are allocated also to the construction of unconventional scenarios that make it possible to identify other developmental trends and reflect on their implications for the future of whatever happens to be the focus of analysis.

3.2 Trend-Based versus Event-Based Scenarios

A particularly significant methodological consideration in scenario-making concerns the degree of variance in the elements that constitute the scenario. Our introductory section stressed that the world sometimes changes in completely unpredictable ways. Yet, such knowledge is rarely integrated in scenario-making – be it conventional or unconventional. Normally, change is seen as a scenaric invariant within some idea of gradual evolution. Scenarios that are built on such assumptions can be called trend-based scenarios. In trend-based scenarios, change is often graphically illustrated as continuous lines extending from a single point in the present to several alternative points in the future. Yet in light of historical evidence, this is an inept way of describing socio-economic development (for instance, Dyke 1988). What is more, recent paleoclimatological studies indicate that past climates have been characterized by events caused by dramatic and rapid temperature fluctuations. Not surprisingly, events such as floods, landslides, and avalanches are the focus of recent climate scenarios (Heal 1999).

This is not to say that there is no stability in the world and that trend-based scenarios are doomed to fail. Our claim is rather that surprising changes do happen and that trend-based scenarios are unable to deal with this possibility. They should therefore be complemented with Event-based scenarios, that is, scenarios which attempt to describe the future in less linear terms. Events (with a capital E) are, as was mentioned in the introduction, not predictable as expressions of trends. In Event-based scenarios, we are interested in Events that affect the future of whatever it is that interests us. To the extent that social change is understood in terms of trends, Events bring change into social change itself. Or, in other words, social change becomes a variant rather than an invariant in the scenario.

Event-based scenarios can be constructed on quantitative basis, applying, for instance, the mathematics of chaos and complexity (Clark et al. 1995). Such scenarios should, however, be complemented by narrative scenarios, and this is what we want to focus on in the rest of this section. The point of narrative Event-based scenarios is not to predict a particular future, but rather to demonstrate the type of future that can be envisioned on the basis of an informed (quantitative or qualitative) analysis of the present day society. This is done by exemplification: the type of future is exemplified by narrating a particular future. Why?

Narrative, Event-based scenarios should not only describe what could happen, considering what we know about our situation today, but also the kinds of challenges and opportunities that could arise in a future of contingent events. Put in another way, Event-based scenarios should give us an impression of what it would be like to live in conditions determined by Event-based variations in the parameters of change. In trend-based scenarios, which operate according to the principle of gradual evolution, such analysis is often considered superfluous, since the challenges and opportunities are already known. In fact, the conceived challenges and opportunities generally function as the motivation for making trend-based scenarios, as, for example, when demographic prognoses are made to help decision makers design social security systems. Narrative, Event-based scenarios are different. Their task is not to specify already known kinds of opportunities and challenges, but rather to introduce new ones.

3.3 Combining the Perspectives

The trend-based versus Event-based distinction is clearly different from the conventional versus unconventional distinction. The first distinction refers to the extent to which unpredictable events dominate the plot of the scenario, while the second is related to the epistemic approach that dominates scenario-making within a particular field. We are therefore in a position to formulate a four-field based on the two dimensions of scenario construction, as shown in Table 1.

Table 1: Categories of Scenarios Based on Epistemic Approach and Variance in Development

VARIANCE IN DEVELOP-MENT	EPISTEMIC APPROACH	
	Conventional	Unconventional
Trend-based	Foreseeable trends in domains known to have an influence on the activity of interest	*Foreseeable trends in domains not expected to have an influence on the activity of interest*
Event-based	*Surprising events in domains known to have an influence on the activity of interest*	Surprising events in domains not expected to have an influence on the activity of interest

Table 1 outlines four categories of scenarios: conventional trend-based, unconventional trend-based, conventional Event-based, and unconventional Event-based scenarios. In the following, we are most interested in the unconventional trend-based and the conventional Event-based scenarios (italicized in Table 1), because in our assessment they constitute the less-charted territory of scenario construction. The unconventional trend-based scenarios attempt to outline foreseeable developments in domains of change not ordinarily perceived as having an influence on the activity of interest. In the case of aquaculture in the Archipelago Sea (to be described the next section), we think such unconventional trends might be Russian energy policy, Norway's decision to join the EU, Baltic algae blooms, and the reinvention of archipelago communities. The conventional Event-based scenarios focus on surprising events in domains of change that are empirically known to have an influence on the activity of interest. In the case of Finnish aquaculture, such surprising events might be dramatic fluctuations in VAT, the disappearance of HELCOM, and unexpected trends in fish consumption.

We are less concerned with the two remaining diagonal cells in Table 1. By conventional trend-based scenarios we mean projections into the future of foreseeable trends known to have an influence on the activity of interest. We are not implying that these scenarios are irrelevant, only that they provide a rather narrow view of the future and that much research has already been done on the predictive and extrapolative methodologies that they rely on. For the sake of clarity, we are also omitting the unconventional Event-based scenarios – although we do mention some parameters around which such a scenario could be constructed.

4. THE CASE: AQUACULTURE IN THE ARCHIPELAGO SEA, FINLAND

To illustrate what we mean in practice by the unconventional trend-based and conventional Event-based scenarios, we will applie these notions to the particular case of aquaculture in the Finnish baltic Sea archipelago. This is an area that we know fairly well (1998a, 1998b, Bruun 1998c, 1999, Eklund 1984, 1987a, 1987b, 1989, 1996, 1987). To understand the scenarios, one has to know something about the history of Finnish aquaculture and its present situation. This section will be devoted to such background information.

In Finland, aquaculture constitutes the major branch within the fisheries sector. It consists of food fish and fry production in cages, tanks, and artificial and natural ponds. A distinction can be made between inland and sea farming. While inland farming uses fresh water, sea farming is performed in the brackish water of the Baltic Sea. From the perspectives of aggregated quantity and economic value, sea farming is significantly more important than inland farming. Yet, it should be remembered that sea farming is dependent on the juveniles produced by inland farmers. Finnish aquaculture at sea is extremely homogeneous with a complete domination of one species, rainbow trout (Finnish 1993).

Rainbow trout farming at sea was introduced at the end of the 1960s (Eklund 1987b, Peltoniemi 1984). The fish is raised to the size of 1-3 kg in net cages. After a careful start, the amount of establishments increased exponentially during the 1980s, first in the Turku archipelago and a few years later in the Åland archipelago. The dramatic development is clearly illustrated by the increase of fish produced at sea farms from less than 1 million kg in 1978 to more than 15 million kg in 1991. During the same time span, the value of sea-farmed rainbow trout increased from FIM 55 million to FIM 385 million (1992 prices). These numbers can be compared with the decrease of the value of Finnish professional fishery at sea between 1980 and 1991, from FIM 241 million to FIM 153 million (Finnish 1993). In the 1990s, the developmental trajectory of fish farming changed direction, mainly as a result of environmentally motivated restriction introduced by the authorities. In 1998, Finnish sea farmers produced approximately 13 million kg rainbow trout at a value of less than FIM 200 million (1997 prices) (Finnish 1999).

Sea farming is located in the archipelago areas along the Finnish coast, the southwestern archipelago between Hanko and Åland being the most significant area (Finnish 1999). To simplify, we call this archipelago area the Archipelago Sea according to common practice, although there is no strict geographical definition for that name. The introduction of rainbow trout farming coincided with a period (1950-75) of strong depopulation in the Finnish archipelago areas, and the trade became an important factor behind levelling out the negative trend (Eklund 1987a, 1988). Today, aquaculture is an important source of employment in several municipalities (Mattsson 1995). Although being a relatively new business in the archipelago, it has been argued that fish farming has functioned as a way of preserving and developing the fishery traditions in the area at times of decline in ‘normal’ fishery (Eklund 1986, Eklund 1989).

The economics of aquaculture is complex. The greatest expenditure for fish farmers is represented by feed, which is produced by Finnish fodder industry using imported fish. Salaries, interest-levels, and taxes are also significant expenses (Mattsson 1995). On the income side, the market prices of rainbow trout is the major determinant. Here the major competition comes from Norwegian farmed salmon and mass produced cheap meat like pork and poultry (Ministry 1996). Unlike the rest of the Finnish fisheries sector, aquaculture never got any direct price subsidies. Fish farmers are therefore used to the risks of free markets (Ministry 1991). The Finnish membership in the European Union (from 1.1.1995) implied changes in the form of market dependency. The general liberalisation of the food markets affected the Finnish fish prices negatively. Finland is part of the Common Organisation of the markets (COM) within the European Union. As the Union adjusts the COM to the World Trade Organisation (WTO), the mechanisms affecting Finnish food and feed prices are not only internationalised, but also globalised (European 1996).

Since the early 1970s, Finnish aquaculture has been surrounded by conflicts concerning the environmental effects of the industry (Ministry 1982, Peltoniemi 1984). Fish farmers have been accused for being responsible for ecological problems like mass growth of algae, silting of shores, pollution of fishing equipment, etc. – problems that have serious aesthetic, ecological, and potentially also economic consequences in the archipelago. Mass media have been instrumental for putting the aquaculture controversy on the public agenda, enveloping the pollution problem in a rich context of political and cultural symbolics (Andersson 1998a, Bruun 1998c).

The aquaculture controversy has often been framed within a larger discourse on the ecology of the Baltic Sea. This was achieved, for instance, by the inclusion of aquaculture in HELCOM’s (Helsinki Commission, the major instrument for international co-operation for improving the environmental state of the Baltic Sea) hotspot list over sources of serious pollution into the Baltic Sea (HELCOM 1992). The poor environmental condition of the Baltic Sea has resulted in a situation in which any eutrophication-related bad news about the sea can lead to significant public and political pressure on the business – independently of the extent to which fish farming can be proved to have causal responsibility. Advocates of fish farming have tried to counter these negative attitudes by emphasising that the environmental problems of aquaculture are primarily a local or regional matter, and that the contribution to Baltic Sea pollution is very small (1,2% of the phosphorous release and 0,4% of nitrogen-release into the Baltic Sea in 1990 according to Karttunen and Vielma (1994). According to HELCOM the numbers were 1,5% and 0,4% respectively (Eklund 1996)). There have also been considerable improvements in fish farming practices to decrease pollution: for instance, better composition of the feed and better feeding practices (Karttunen & Vielma 1994). New cage technologies are being developed at the moment (Eklund, interview May 1999 in Dragsfjärd). Some ecologists have also proposed an integration of cage farming of salmonids with mussle-rearing in order to 're-cycle' the surplus nutrients coming from cage fish farming (Folke & Kautsky 1989, 234-243).

During the 1990s the amount of rainbow trout farmed in Finland has slowly decreased (Finnish 1993). This reduction is apparently due to two factors. On the one hand authorities have been more restrictive in giving permits, since the public has been alarmed by the algae problem in the Baltic Sea and since aquaculture in the Archipelago Sea has remained on the HELCOM hot spot list. On the other hand the enormous expansion of and export of farmed Atlantic salmon in Norway has caused price pressure on rainbow trout farmed in Finland. Large farms cannot easily get permits to expand and some small farms have closed down due to the low price level. However, some large farms have continued to export rainbow trout to Japan.

In the Archipelago Sea Region the importance of the primary sector has continued to decrease during the 1990^{th}, while the importance of tourism and service production as well as of the welfare sector has increased (Andersson 1998b, Andersson & Eklund 1998). Fish farming is still of crucial importance in some municipalities, while tourism and leisure related services are gaining in importance in other municipalities.

Finally, a few words will be written about the conventional way of discussing the future of Finnish aquaculture. The conventional scenarios focus on economic, technological, practice-related, environmental, biological and medical issues. Economic concerns are domestic market developments, exports, interest rates, taxes, competition with other products, product development and refining, and exploration of opportunities for a more diversified aquaculture. The economic frame also involves monitoring Finnish fish consumption and consumer attitudes to fish. In the area of technological development, attention has been directed towards new feeds, new instruments for feeding, refining technology, cage technology, and removal of pollution. Practice-related work aims at improving hygiene and quality in all parts of the chain from production to consumption. Education and information are important parts of this work. Environmental scenarios focus on the reduction of pollution according to policy targets and investigations of how ecological changes in the sea can affect the health and growth of farmed fish. Biological research aims at speeding up growth, controlling reproduction and improving disease resistance in the fish, both by traditional breeding methods and, more recently, by using modern biotechnology. Medical concerns, finally, cover disease prevention practices like vaccination programs, development of drugs, and strategies for dealing with epidemics.

It should also be pointed out that scenarios in the sense of focused narratives about plausible or possible futures of Finnish fish farming are rare. The future is rather projected through particular targets, general goals, articulated challenges, acknowledged risks, and, most commonly, through more or less implicit assumptions about how markets, environmental policies, technologies, consumption patterns etc. will change in the future. Claims about the future tend to be either prescriptive or implicit (or at least not discussed critically).

5. SEVEN SCENARIOS

We can now return to the discussion about unconventional and Event-based scenarios. To illustrate the way in which unconventional scenarios change our perspectives on the future, we will in outline a set of potential trajectories of development that are likely to have an influence on Finnish acquaculture, yet cannot be identified through the epistemic approaches presently adopted by the Finnish fisheries authorities and the fish farmer organisations.

Our scenarios are constructed as stories about the future – even if narrated in past tense – and thus introduce the topic of the future in a clearly articulated (in distinction to an implicit and hidden) way. The point, however, is not to narrate entire scenarios, but merely to demonstrate the way in which unconventional approaches can introduce novelty into discourses about the future.

We want to stress that the issue with the unconventional trend-based scenarios does not concern the plausibility of the trajectories, as long as they are not seen as completely improbable. The point is that conventional scenario-approaches within the Finnish fisheries sector lack the means for projecting such futures. The problem is not that there are no signs of these developments. It is rather that they are considered to be external to the future of aquaculture when it comes to systematic projections.

(1) Russian energy policy. When the Primorsk oil port project at the eastern end of the Finnish Gulf was officially launched with little certainty over

financing in 2000, skeptics thought the idea would gradually wither away. Yet the consistent increase in oil price since 2000 speeded up the extraction of oil and gas resources in Northwest Russia. The EU's Northern Dimension programme, presented by Finland as a policy initiative to the EU in 1996 and solidified as an EU programme in 2000, ensured financial and political support for the activity. The Primorsk oil port all of a sudden became the obvious gateway for transporting oil from the remote regions of Siberia to Central Europe and the rest of the world. Despite much-publicized environmental concerns expressed by Finland, Estonia, and Sweden in particular, port construction began with urgency in 2012 and full-scale oil transport in 2015. Oil tanker traffic increased dramatically in the Baltic. Confidence in the future of aquaculture in the Baltic Sea began to erode. That confidence received the definitive hit in 2017, when two oil tankers collided in bad weather in the Finnish Gulf outside the Archipelago Sea, spilling most of their cargo to sea. Aquaculture as a livelihood along the Finnish coast and Åland began to lose its significance.

(2) Norway joins the EU. Norway, the Euro-skeptic of the late 1990s, decided to join the EU by popular vote in 2005. With strong support from aquaculture interests in Finland and Sweden, Norway successfully lobbied for significant subsidies for aquaculture and fishing, citing the need to preserve traditional European cultures in Arctic coastal and archipelago regions. A special support scheme was established under the auspices of the EU's Northern Dimension programme, which ensured significant funds from the EU to research, development, and entrepreneurship in aquaculture. By 2010, Norwegian fish farmers diversified their economies by buying almost 40% of the Finnish sea-farms. Aquaculture in the Archipelago Sea became more industrialized, with a marked increase in production unit size and the level of fish product development. As part of this development, Finnish aquaculture lost its local character, and complex conflicts arose between Norwegian aquaculture interests and Finnish tourist interests.

(3) Baltic algae blooms. The occasional Baltic algae blooms of the 1990s had become a recurring event by the second decade of the new millennium. The most pronounced impact of the algae blooms on aquaculture was an indirect one. Aquaculture was more and more perceived as one of the hottest spots of nutrient loads into the Baltic, and thus a major contributor to the algae problem. The political pressure on Finnish and Åland authorities to increase their restrictions on fish farming at sea led to much tougher conditions for renewed and new allowances. At the same time, a dramatic change occurred in the attitudes of the archipelago people themselves. European and domestic tourism, which had become a major economic factor in these areas, was negatively affected by the poor image of aquaculture. German newspapers wrote influentially about the health risks connected with bathing in the Baltic Sea archipelago and illustrated their articles with maps of the locations of fish farms. International environmental organisations urged tourists to boycott the Finnish archipelago. In this situation local opinion in the archipelago municipalities turned, for the first time in the short history of aquaculture, against the trade.

(4) Reinvention of archipelago communities. During the first decade of 2000 it became clear that two new groups of inhabitants were beginning to ensure the continued existence of archipelago communities in Southwestern Finland. There were the permanent inhabitants, many of which relied on novel rural livelihoods such as ecological farming, tourism and IT-mediated distal service work. Then there were the semi-permanent dwellers who worked in the urban and suburban regions but lived in the archipelago for at least six months of the year. The new archipelagoans had an immediate negative effect on aquaculture. As the activity became more industrialized and high tech –oriented through innovations in biotechnology and environmental protection, the new local population grew increasingly skeptical of its impact on the image of a clean and environmentally friendly archipelago life. At first there were intensive conflicts within archipelago communities over the status of aquaculture between the older generation, who were generally positive towards the potential of aquaculture, and the younger generation, who wanted to get rid of it. By 2020 the generation shift in archipelago communities had turned aquaculture into a minor livelihood for only those few entrepreneurs who were willing to experiment with small-scale and environmentally sound fish farming practices.

We will now turn to three conventional Event-based scenarios for Archipelago Sea aquaculture, which focus on surprising events in parameters known to have an influence on aquaculture. In contrast to the trend-based scenarios, the Event-based scenarios do outline trajectories that may seem unpredictable and therefore speculative from the perspective of existing models. The issue here is how the models are structured, or more precisely, the extent to which the models account for non-linear developments. The Event-based scenarios thus discuss not the trends in, say, VAT and fish consumption, but rather their extreme fluctuations.

(5) Dramatic fluctuations in VAT. The level of value-added tax always had major implications for the profitability of aquaculture. By 2010, the first common EU tax policy had been developed with considerable emphasis on environmental issues. After a lengthy debate within the EU over whether indirect taxes should reflect specific policy aims such as environmental protection, the EU decided on considerable VAT breaks for renewable natural resource extraction, such as fishing and aquaculture. The Finnish Archipelago Sea experienced a revitalization of aquaculture when confident entrepreneurs began to invest in new aquaculture plants. The entrepreneurs were also able to attract research and development funds from the EU for increasing plant size and production efficiency. In 2015, however, the newly appointed Commission gave contrary signals and made explicit political motions to 'neutralize' VAT with respect to specific policies. The markets reacted immediately and aquaculture business suffered considerably.

(6) HELCOM vanishes. During the first decade of 2000, the EU began to show increasing interest in Baltic environmental policy. The HELCOM organization, which used to provide a platform for environmental protection and crisis management in the Baltic Sea, was dismantled in 2007 to minimize overlap with the EU-based environmental mechanisms on the Baltic Sea region. In contrast to HELCOM, the EU took an extremely stringent and implementation-oriented view of environmental matters in the Baltic. Although it was widely accepted that long-time increases in background nutrient loads from nonpoint sources in the Baltic countries contribute significantly to algae growth, an integrated pollution control model that the EU officials liked to rely on indicated that the blooms themselves were triggered by localized point sources of nutrients. One such point source were the rainbow trout farms. As a result, the EU environmental officials imposed stringent environmental requirements on aquaculture. By 2015, aquaculture had turned into a marginal economic activity in the Archipelago Sea.

(7) Unexpected trends in fish consumption. Today's consumption of rainbow troutis dependent on two counteracting trends: consumer demand for healthier foods, which speaks for the fish; and consumer demand for environmentally sound food production, which factors against rainbow trout. The successful rainbow trout farming practice can find the right balance between these demands. The unsuccessful one put fish farmers in the worst of possible worlds, as many could testify from their experiences since the 1980s, when rainbow trout farming became subject to several criticisms concerning water pollution effects and the potential health effects of fish fodder additives. By 2010 these issues turned out to be the main constituents of fluctuation in rainbow trout demand. In fact, market fluctuations appeared to have become the norm of the enterprise. During serious algae blooms in the Baltic, the water pollution and food additive issues became prominent and pulled down the demand. Demand was pushed up again when the arguments for the healthiness of fish took hold. Market fluctuations turned aquaculture into a relatively minor part-time enterprise, since plant sizes were kept small to allow for rapid adjustments to marked demand.

A third category of scenarios to be presented could have been that of unconventional Event-based scenarios. We decided to omit this category, in order to avoid confusion between the notions of 'unconventional' and 'Event-based'. There are, however, no principal obstacles to constructing such scenarios. Any of the unconventional trend-based scenarios in the previous section could, for instance, be varied so as to admit strong fluctuations in development (for instance, in the Norway-EU relations in scenario 2), so as to make the scenario more Event-oriented and less trend-oriented.

6. CONCLUSION

The main implication of this case study is a plea for plurality in strategic efforts to outline future options for Finnish aquaculture policy. In our assessment, Finnish fish farmers and officials responsible for fisheries management constitute an epistemic coalition that has grown accustomed to mapping out its future options with conventional methodological approaches that assume more or less linear development. This makes the core group of fisheries experts ill prepared for future contingencies. We harbor no illusions about creating alternative epistemic coalition over night. What we do see a need for, however, is self-reflection by fisheries experts. In the long run, it would serve the fisheries community well to facilitate the emergence of novel epistemic coalitions based on unconventional approaches to aquaculture management and to promote tolerance toward revising the conventional models to account for surprising futures.

Our argument for heterogeneous scenario-making practices is not only epistemological. There is also a moral reason for promoting plurality. All scenarios have a normative aspect concerning the optimality of measures taken to achieve desired ends. In scenario-making, epistemic closure is paralleled by a normative closure. This is not always realised, because the prescriptive elements of scenarios are rarely brought under critical scrutiny. Even the most ’objective’ assessments about the future are laden with normative positions. Scenarios concerning Finnish aquaculture are no exception. Early scenarios projected a growth of the trade despite opposition from environmentally oriented actors. The public criticism was seen as a problem, but not as a factor that could endanger the whole business. It was seen as an external challenge that had to be faced – mainly by improved information about the realities of aquaculture and the people depending on it – rather than as an internal element of the aquaculture system. The inability to even project the subsequent greening of Finnish aquaculture policies as a relevant possibility can be interpreted as the result of a normative opposition to any development of such kind.

The plea for pluralism is made with full acknowledgement of its vulnerability to criticism: either the scenarios are seen as containing irrelevant parameters of change, or the variability of the parameters is criticized as being improbable. We can only defend ourselves with an epilogue on contingency.

Our motivation for writing this article was a long-standing professional interest in scenario methodologies (Hukkinen 1994, 1995a, 1995b, 1998, 1999a, 1999b, 1999c). At the height of the writing of the first draft in the spring of 2000, we were also rewarded with the best possible gratification a researcher can get: reality spoke to us the way we expected. On 27 May 2000, an aquaculture plant in Kumlinge, Åland was reported to have full contamination of the VHS-virus (viral hemorhagic septicemia virus). The entire stock at the plant was exterminated (Vesala 2000b). A few days later the disease was found at the Pyhtää plant on the coast of mainland Finland, with similar results (Vesala 2000c). To make matters worse for Finnish aquaculture business, a long-time critic of Norwegian aquaculture decided to open his mouth at the height of the fish kills in Finland, claiming that medication delivered to fish at aquaculture was cancer-causing (Width 2000). By the summer of 2000, the VHS virus scare was already having an impact on rainbow trout demand (Vesala 2000d) and the precarious future of Finnish aquaculture had once again become one of the main media topics, both in news and opinion pages (Forsström 2000, Vesala 2000a). This time, however, eutrophication was not the problem.

Who would have thought of it?

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