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The Social Aspects of Fishing Effort

Technology and Community in Norway's Blue Whiting Fisheries

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Abstract

While economic literature inspired by the "tragedy of the commons" has emphasised people's tendency to increase fishing effort beyond desirable levels, sociologists and anthropologists who have studied the social aspects of fishing have often emphasised the capacity of these factors to restrict fishing effort. The article addresses the influence of social norms and communication on fishing effort in an empirical study of the Atlantic blue whiting fishery. The data were generated at a time when this fishery had yet to see effective quota regulations, and had been subject to a rapid growth in fishing effort, making it the largest fishery in the Atlantic. The article argues that social norms and communication patterns in the fishing fleet create a synergic effect of co-operation and competition on fishing effort. The article questions the view that social norms and communication necessarily represent a solution to the tragedy of the commons.

Key words: Competition, co-operation, fishing capacity, fishing effort, tragedy of the commons.

Introduction

While economic literature inspired by the "tragedy of the commons" (Gordon 1954; Hardin 1968) has emphasised people's tendency to increase fishing effort beyond desirable levels, sociologists and anthropologists critical of the model of agency underlying economic theory have often emphasised the capacity of social norms and communication to restrict fishing effort (Acheson 1975; Berkes 1987; Matthews 1993; Maurstad 2000). This article aims to present an alternative view based on an empirical study of the effects of social norms on fishing effort in Norway's blue whiting fisheries. The article shares the widespread scepticism of the simplistic model of agency implicit in the "tragedy of the commons" (McCay and Acheson 1987), but questions the view that people's normative and communicative capabilities necessarily represent a solution to the problem of unsustainable resource harvesting. The basic features of the study are illustrated in simplified form in Figure 1. The paper addresses the influence of social norms on competition and co-operation amongst fishermen. Subsequently, it focuses on the effects of such normatively-based competition and co-operative communication on learning and innovation, which are major generators of fishing capacity. It also addresses the influence of co-operation on the organisation of vessels on the fishing grounds, which is important for the efficiency of the fleet. Finally, it assesses the effects of competition on fishermen's utilisation of fishing capacity.

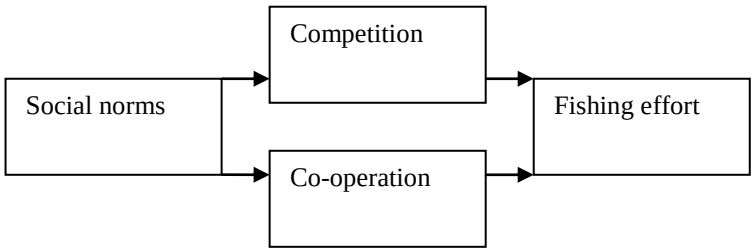

Fig. 1. The research problem

This paper forms part of an academic discourse with significant policy relevance. Technological development, expansion of the world's fishing fleets and subsequent overfishing of many wild fish stocks have made the question of fishing effort the most pressing and difficult issue for fisheries managers to deal with, and the social aspects of fishing effort have been relatively neglected in this area.

The above outline implies that fishing capacity and capacity utilisation are considered core aspects of fishing effort. These concepts need to be understood in the following analysis.

> "[Fishing capacity] is the amount of fish (or fishing effort) that can be produced over a period of time (e.g. a year or a fishing season) by a vessel or a fleet if fully utilized and for a given resource condition (FAO 2004: 119).

Fishing capacity is usually estimated on the basis of data on quantities and types of vessels and fishing gear. However, the extent to which a fisherman is able to turn his material assets into fish catch depends on his knowledge of how, when and where to use them most efficiently. Fishermen's knowledge and learning are thus natural topics in a study of fishing capacity. This paper addresses the influence of norms and communication on knowledge. It is difficult, if not impossible, to quantify the importance of knowledge in fishing, but statistical evidence from the Icelandic herring fisheries shows that catches vary systematically between skippers when boat size and time spent fishing are controlled for, which supports the hypothesis that differences in fishing capacity can to a significant extent be accounted for by differences in knowledge (Thorlindson 1988). The FAO working group on fishing capacity (2000) indeed also recognised that the long-term desired level for estimation of fishing capacity would include data on fishermen's skills.

Fishing capacity only affects fish stocks to the extent that it is actually utilised. In fisheries management, the concept of fishing capacity is consequently supplemented with the notion of "capacity utilisation", which is defined as follows:

> "Capacity utilization [is the] degree to which the vessel is utilized. From an input-based perspective, capacity utilization may be expressed as the ratio of the number of days actually fished to the number of days the boat could potentially fish under normal working conditions. From an output-based perspective, capacity utilization is the ratio of the actual catch to the potential catch (if fully utilized)" (FAO 2004: 119).

According to these definitions, catch and fishing effort emerge as the products of fishing capacity and capacity utilisation. Fishing effort can consequently be managed by controlling either fishing capacity, capacity utilisation or both.

Methodological Approach

The main data were generated through fieldwork on board four combined purse seine/pelagic trawl vessels licensed for blue whiting fisheries. These vessels belong to the same fishing community and are part of a leading milieu in Norway's blue whiting fisheries. The article thus presents a single-case study of a collectivity of fishermen and the shared norms and practices that affect their fishing effort. I spent 5-12 days on each vessel during the 2003 and 2004 seasons, covering their main fisheries: blue whiting, herring and mackerel. A total of 24 fieldwork days were spent specifically in the blue whiting fisheries.

The data were generated through a combination of observation and interviews. To the extent possible, the interviews were directly related to current observations. A typical approach would be to observe a specific incident or operation while asking for explanations, interpretations or comments on what was going on and how things were done. I spent most of my time on the bridge, which is the centre of communication, decision-making and work co-ordination onboard. The skipper and the trawl boss (or mate) – the two decision-makers on the vessels – always constituted the main informants, but data were also generated through interaction with other crew members. Data on organisation of fishing grounds were supplemented with illustrations of fleet movement patterns drawn from the map machine and radar screens. I generated additional data on shorter fieldwork trips to the community, and through interviews with owners and company administrations.

I attended the summer fisheries in the Norwegian Sea. The relatively low density of blue whiting in this area resulted in long periods – often around 20 hours – of non-stop trawling. The fishermen's activities on the bridge were thus dominated by observation of and interaction with other vessels in search of information on the whereabouts of fish, observation of the sonar screens and sounders for the same purpose, and long hours of waiting. This provided good opportunities for in-depth conversation with skippers and trawl bosses/mates, as well as observation of communication practices.

Data were recorded during observations and interviews, and written out during regular withdrawals to my personal cabin. I systematised the various topics in an index, allowing comparison of data on specific issues across situations, informants and vessels. For presenting large amounts of qualitative data in the compact form required by the article format, I gathered and compared the specific observations and abstracted them into descriptions of typical patterns. Deviations in the data are addressed in footnotes. Generally, the data are clear and consistent, and anomalies are not a significant problem. I have supplemented the general descriptions with a few examples drawn directly from field notes. These examples are only

illustrations, not complete presentations of data. Throughout the paper, I have added information on the data that underlie the generalised descriptions.

The Literature on the Social Aspects of Fishing Effort

The literature on the social aspects of fishing effort can be divided into two main bodies. First are studies of learning through information sharing. There is a significant amount of literature on information management in fisheries, but many contributions are now quite dated, and ethnographic descriptions from modern, and especially capital-intensive, fisheries are scarce. Andersen's (1972) work on Newfoundland trawler fishermen, which remains one of the most thorough empirical descriptions of information management in offshore fisheries, describes how the captain's authority on board and ability to attract skilled crew members depends on his reputation in terms of fish catching skills. This reputation is based on success relative to other vessels rather than absolute figures, which makes it rational for the individual skippers to systematically lie and conceal information about their fishing. Andersen argues that this individual rationality leads to inefficient fishing, as mutual practices of information sharing would have increased the fishing capacity of the fleet as a whole.

Orbach's (1977) study of Californian off-shore tuna seiners describes a system of limited information sharing in formalised networks that communicate internally through a set of secret codes and enforce social norms against sharing information with outsiders. Like Andersen, Orbach argues that this system leads to economic inefficiency in the fleet as a whole, compared with a system of more complete information transfer. Gatewood's (1984) study of the competitive Alaskan salmon fisheries is another one that emphasises the limited nature of co-operative practices, which are usually restricted to temporary formal arrangements within small cliques of friends and relatives, and the wide-spread use of secrecy and deception. Stuster (1978) has applied a similar perspective to information-sharing cliques in the Californian salmon fisheries (see also Orth 1987; Pollnac and Carmo 1980). Several more brief presentations of information management in fisheries have also emphasised secrecy (Acheson 1988: 102-103; Forman 1967; Peace 1996), although it has been argued that social integration among fishermen tends to reduce the element of secrecy and deceit (Palmer 1990). A series of interviews with Icelandic fishing skippers showed that secrecy and lies were used extensively in terms of catch information, while fishermen shared their knowledge on fishing technology (Thorlindson 1994). Social science studies of information management in fishing thus largely emphasise the restrictive effects of competition on fishing capacity.

The second body of literature on the social aspects of fishing effort consists of studies related to the discourse on the tragedy of the commons. Economic theory predicts that fishers increase their fishing effort up to a point where a further increase no longer appears to the individual as profitable. This thesis has given rise to the idea that individually-rational choices amount to the aggregate effect of depleting the common pool resource, leading to a sub-optimal outcome for all, unless fishing effort is restricted by the state (Gordon 1954; Hardin 1968). Anthropologists and sociologists have often emphasised the misplaced and potentially detrimental nature of state interference in communities' utilisation of common pool resources. The main argument is that people possess normative and communicative capacities that are overlooked by economic models, and that these capacities often restrict harvesting efforts, keeping them at sustainable levels (Maurstad 2000; McCay & Acheson 1987; Pinkerton 1987). An early, and now classic, example is a study of lobster fisheries in Maine where an informal system of sea tenure kept the fishing effort at a long-term profitable level in the absence of state interference (Acheson 1975). Numerous case studies conducted later have shown that people are capable of building and enforcing informal institutions that restrict fishing effort, for instance through informal systems of sea tenure (Matthews & Phyne 1988; Matthews 1993), traditional fishing practice customs (Berkes 1987), informally-enforced conservation ethics (Stoffle et al. 1994), and religious beliefs (Anderson 1994). Maurstad (2000) argues that social control mechanisms restricted capacity utilisation directly among Norwegian inshore fishermen before government restrictions became a major factor in fishing, impeding the tragedy of the commons.

In sum, studies on the social aspects of fishing have usually emphasised factors that restrict fishing effort. This literature may thus leave the somewhat paradoxical impression that fishers are capable of co-operating for the purpose of conservation, while they are less so for the purpose of efficient fishing. This article argues that normative and communicative factors have contributed significantly to the rapidly increased fishing effort in Norway's blue whiting fisheries, and that they reinforce the development towards overfishing that is predicted by the tragedy of the commons model, increasing the need for external regulation.

The Development of Fishing Effort in the Blue Whiting Fisheries

Blue whiting is a pelagic gadoid (a species belonging to the cod family) that can be found in most areas of the Northeast Atlantic. The highest concentrations can be found at depths of 300 - 600 m off the edge of the continental shelf. It is assumed that the stock consists of several components that are partly mixed on the spawning grounds. However, in terms of

scientific advice and management, the blue whiting of the Northeast Atlantic is treated as one single stock. Blue whiting matures at the age of 2 – 4 years, and then migrates to waters west of the British Isles each spring to spawn. The main catches of blue whiting are made in this area during the spawning season, but blue whiting has also been fished in the Norwegian Sea and the North Sea in recent years (ICES 2004a; ICES 2004b; Heino 2004; Skogen et al. 1999).

The blue whiting fisheries of the Northeast Atlantic began in the early 1970s, with Spain, the Soviet Union, the Faeroe Islands and Norway as the pioneer nations. Norway and the Soviet Union expanded their blue whiting fisheries throughout the 1970s. Soviet catches decreased and levelled off in the early 1980s, while Norway continued to increase its fishing and has been the leading blue whiting fisheries state since then.

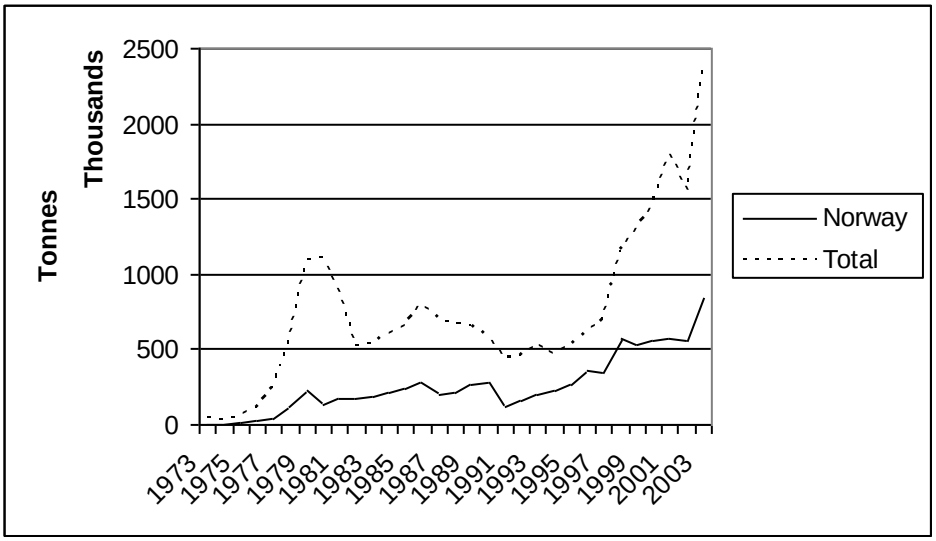

Fig. 2. Blue whiting catches in the Northeast Atlantic[1]

Figure 2 shows that catches increased dramatically from 1998 onwards, as fishermen became aware of large fishable concentrations of blue whiting in international waters. The traditional blue whiting fishing states – Norway, Russia and the Faeroe Islands – increased their efforts greatly, and Iceland also entered the fishery and quickly became one of the main blue whiting harvesting states. The fisheries also expanded into areas where there was formerly little fishing for this species, such as the North Sea (in sub-area IVa, Fig. 3) and, especially, the Norwegian Sea (in sub-area IIa). This resulted in extraction of more immature

[1] Source: ICES catch statistics database.

fish.[2] Catches of blue whiting in the Northeast Atlantic reached 2.3 million tonnes in 2003, which made it the largest fishery in the Atlantic in terms of quantities landed (Heino 2004).

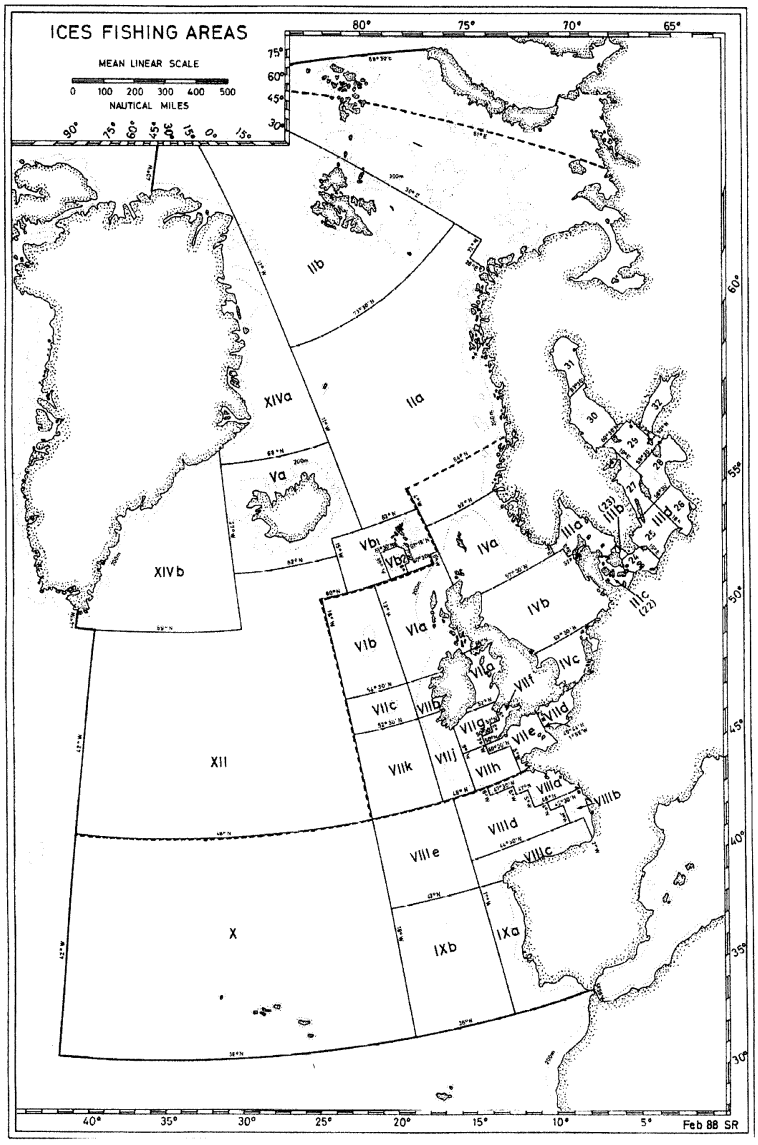

Fig. 3. Map of ICES fishing areas[3].

[2] Sources: ICES catch statistics database; ICES 2004a.
[3] Source: ICES.

Norway's blue whiting fishery has mainly been a directed pelagic trawl fishery performed with combined purse seiners / trawlers. The season starts in the spawning areas in January/February and ends in the Norwegian Sea in mid summer. However, these vessels also participate in several other fisheries during this period, such as purse seine fishing for mackerel and herring. In addition, industrial trawlers, which are a separate fleet segment, perform a mixed fishery for blue whiting and Norway pout (ICES 2004a). Figure 4 shows that the spawning grounds west of the British Isles (sub-areas VIa + b and VIIb + c) have constituted the main fishing area for Norwegian vessels, while the feeding areas in sub-area IIa of the Norwegian Sea have gained importance in recent years. The Norwegian fleet lands almost all of its blue whiting for fish meal and oil production, making it a low-value species. Profits consequently depend on a combination of good catch rates and great volumes. Norwegian blue whiting catches were 851,000 tonnes in 2003, and increased further to a record high of 958,000 tonnes in 2004[4].

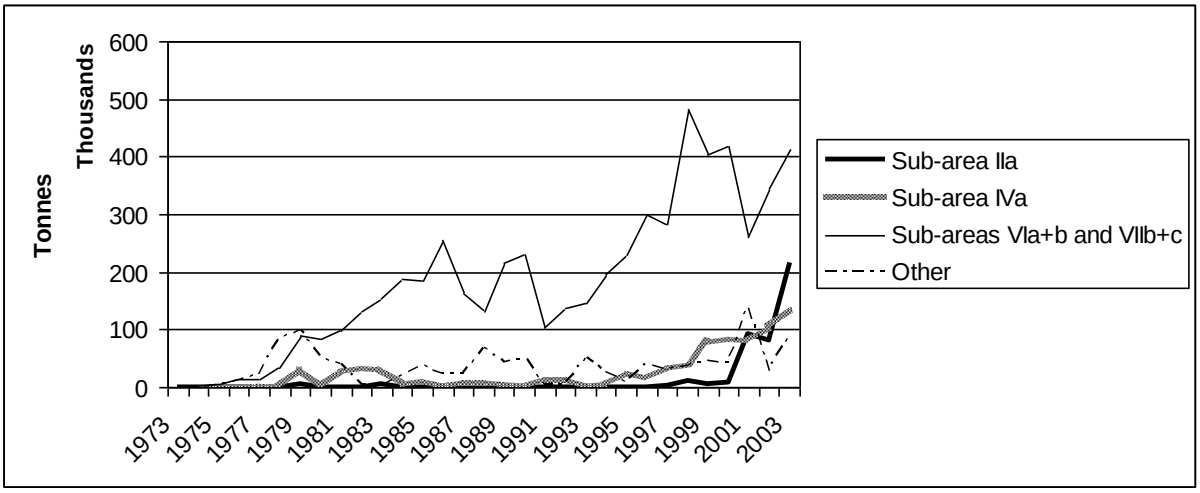

Fig. 4. Norway's blue whiting catches, by ICES fishing area and year[5].

Scientific advice suggests that the current high catch levels are based on the exceptionally high recruitment of blue whiting in recent years, and that the current fishing effort will not be sustainable when recruitment returns to normal levels (ICES 2004b).

[4] Source: Directorate of Fisheries.
[5] Source: ICES.

The Regulatory Regime

The data for this study were generated at a time when the harvesting of the blue whiting stock had never been effectively restricted by quota regulations. Blue whiting is a straddling and highly migratory fish stock – fished in international waters and the Exclusive Economic Zones (EEZs) of the EU, Norway, Iceland and the Faeroe Islands. The coastal states had not managed to agree on a quota regime when I conducted the fieldwork in 2003 and 2004. The need for a multi-lateral quota agreement was recognised when catches began to increase in 1998. The coastal states, plus Greenland and Russia, started negotiating in 1999 for the purpose of establishing a management regime, agreeing to combine management by the coastal states with a NEAFC[6] regime for the fisheries in international waters. NEAFC subsequently suggested a quota but the coastal states were unable to agree on a principle of distribution. Consequently, the NEAFC initiative was put on hold from 2002 (ICES 2004a; Government of Norway 2004). This dispute led the states into a resource-depleting "chicken game", where they increased or removed unilateral quotas in order to force their counterparts' willingness to compromise. The fieldwork was conducted while this conflict was at its peak.

Norway has exchanged fishing rights with other coastal states in the Northeast Atlantic for many years, and has thus acquired annual quotas for blue whiting in the EEZs of the EU and the Faeroe Islands. Norway also started setting blue whiting quotas for Norwegian purse seiners / trawlers in waters under Norwegian jurisdiction and on the high seas in 1999. These arrangements amounted to annual quotas of some 500,000 tonnes for Norwegian vessels during the following years. However, as the international allocation conflict intensified, Norway ceased to implement its quotas. In 2003, the Ministry of Fisheries did not stop the fishery until Norwegian vessels had taken almost twice their quota. In 2004 the Ministry granted Norwegian vessels a free fishery for blue whiting in Norwegian waters and on the high seas.[7] The fieldwork was carried out at a time when Norway's blue whiting fisheries represented a case of rapidly increased fishing effort in the absence of efficient quota regulations.

The negotiating states finally managed to reach an agreement on allocation principles in December 2005, after I had completed the fieldwork. The total allowable catch (TAC)[8] for 2006 was set to 2 million tonnes, which is approximately equal to the catches of 2005. The

[6] NEAFC (Northeast Atlantic Fisheries Commission) is an international organisation of coastal states in the Northeast Atlantic, established for the purpose of managing fisheries in international waters.
[7] Sources: Government of Norway 1999; 1996; Quota statistics from the Directorate of Fisheries.
[8] TAC is the total amount allowed to be harvested from a certain fish stock.

scientific recommendation was a TAC of 1.5 million tonnes. The current regime does not imply great reductions in fishing compared to recent years' catches, but the negotiating states are aiming to reduce the TACs gradually in the years to come (Government of Norway 2006).

Norwegian authorities regulate entrance to the fishery through licensing. Approximately 40 combined purse seiners / trawlers took part in the blue whiting fisheries in the late 1990s, while 46 participated in 2003 (ICES 2004a; Government of Norway 1999). The increased catches thus mainly stem from increased fishing effort by a stable group of participants rather than from a large number of new entrants.

The Norwegian purse seiner / trawler fleet is regulated by TACs and vessel quotas in all major fisheries, until recently except from blue whiting. The fishing capacity of these vessels is much greater than their quotas in other fisheries today. Putting surplus effort into the scarcely regulated blue whiting fisheries has thus emerged as a rational adaptation. This is particularly the case, as there has been high catchability and high recruitment to this stock in recent years. The catch per unit of effort – which indicates the abundance of fish as well as fishing technology and knowledge – increased from approximately 45 tonnes per hour in 1998 to about 55 tonnes per hour in 2003 (ICES 2004a: 213).

Normative and Communicative Aspects of Fishing Effort in the Blue Whiting Fleet of Seaborn Hills

The Setting

Seaborn Hills[9] has more than 20 offshore purse seiners / trawlers that are licensed for blue whiting fisheries, making it a leading community in this fishery. This community, which is located on the west coast of Norway, has no more than 4,500 inhabitants and is largely built on the fisheries. It has nearly 300 registered fishermen, and almost half its work force is employed in fishing-related activities. The vessels are mostly owned by local families and are also manned locally. They are operated by crews of 8-10 people, including the skipper, net/trawl boss, mate or bosun, chief with two assistants, steward and a couple of fishermen. They are all employed on a share basis. Formally, the skipper is the head of the vessel, while the net boss leads the fish searching and fish catching operations. However, in practice the skipper and the trawl boss usually make decisions by consensus. It is quite common for owners to sail as either net/trawl boss or skipper, and the administrative tasks on shore are often carried out by owners who have retired from active fishing. Some companies have

[9] I have given the fishermen's home community a fictional name, as this study also addressed fisheries crime and compliance.

replaced the traditional boss with a mate, leaving more of the fishing responsibilities to the skipper. However, this change usually has modest practical implications. Kinship and community permeates the crew and company structure, and the fisheries are intimately connected with the general social life of Seaborn Hills. Many families have relatives in fishing, and fishing news is exchanged and discussed wherever people meet. The professional reputations of owners, skippers and trawl bosses greatly affect their individual standings in the community.

Two types of social norms are crucial in terms of reputation. First are the social norms of excellence that underlie the prestige of a company, skipper and trawl boss. These norms are related to their success in fishing compared to others. During the summer fisheries in the Norwegian Sea, most vessels heaved their trawls more or less simultaneously every midnight when the fishery was at its poorest. During these hours there was intense radio activity regarding the performances of the various vessels, and skippers and trawl bosses evaluated their fishing by comparing themselves to other boats. It is common for skippers to be in daily contact with the company administration ashore, and crew members keep in contact with their families over the vessels' satellite phones. Consequently, information on the relative performances of the vessels spreads quickly in the community ashore. I witnessed the same phenomenon in seine fisheries. These observations were followed up by conversations with the skippers and trawl bosses regarding the importance of relative performance. The interview data were clear and consistent across vessels, fisheries and companies. The fishermen described performance relative to other vessels as a major motivating force. Performance was primarily measured in relative catch quantity, which was compared each day, after each trip, and in particular each year. The local newspaper prints reports of the past days' catches, and the annual ranking of the 2003 blue whiting fishery was published nationwide in the fisheries press. The vessels placements in the various rankings are a matter of genuine concern among fishermen. Relative catch is socially significant as evidence of the skill, persistence and cleverness of the skipper and the trawl boss, and the fishermen are clear that competition for catch is competition for prestige. There is significant social status associated with being a top-ranking boat in Seaborn Hills. In the largely unregulated blue whiting fisheries of 2003 and 2004, this competition was undisturbed by quota regulations.

Catch quantity is one among several indicators of professional skill relevant to social prestige. For example, there is social recognition associated with achieving high prices at the fish auctions, which indicates quality and clever timing, and by being ahead in terms of technical gear and expertise. Signs of professional skill are a topic of constant concern and

discussion among fishermen, and the relative success of a vessel is openly acknowledged among competitors. On two different vessels, I observed the leading personnel lauding major competitors for performing better on specific occasions than they did themselves.

Competition for prestige is the main non-economic factor explaining the level of fishing effort in the blue whiting fleet of Seaborn Hills. The interview data on all vessels confirm the importance of competition as a motivating force, and the fishermen always evaluated their performance in relative terms. The following comment, made by a net/trawl boss after a day of poor fishing, is illustrative: "If we had been the only ones [failing], it would have been a catastrophe." It is hardly possible, and may not even be meaningful, to quantify the relative importance of this factor compared to economic considerations, but skippers and trawl bosses describe this competition as a major source of motivation in terms of fishing effort, as stated by this skipper: "It's the competition that's driving us. We're less concerned with how much we earn than we are with getting more than the others." These vessels have constituted the most profitable part of the Norwegian fishing fleet in recent years. A regular crew member earns approximately twice the Norwegian average salary, while skippers and net bosses earn twice that of the regular crew member, and the companies currently are not under economic pressure. The absence of economic pressure arguably increases the perceived importance of the social reward for successful fishing.

Competition is multi-levelled. The descriptions of the competitive climate given by skippers and trawl bosses emphasised the competition against close relations, such as vessels from the same harbour or municipality, for the largest catch. Three of the four vessels had one specific boat that was considered their main competitor. These pairs of competitors shared the same harbours and had kinship ties at skipper/trawl boss level. As we will return to, their main competitors were also their main co-operative partners in fishing, meaning that the intensity of competition as well as co-operation increased as the social ties got stronger.[10] Such main competitors/collaborators are generally referred to as "mates" among fishermen. The fishermen also described competition against all other vessels in the national ranking. The competition among individual vessels is by far the dominating feature in these data, but the fishermen informed me that there is also an element of joint competition, where vessels from the same community, i.e. harbour or municipality, compare themselves with fishermen from elsewhere. The Norwegian purse seine/trawler fleet is mainly concentrated in two

[10] Like the other vessels, the fourth boat also had a network of close relations based on kin and company with whom it closely co-operated. However, the skipper and crew never pointed out any specific main competitor amongst these.

municipalities, one of which is Seaborn Hills, and there is a certain degree of rivalry between the two.

In order for relative success to generate prestige, it must be achieved in compliance with the second type of social norms, that is, the moral rules of acceptable behaviour. Several behavioural norms are relevant in this respect, but three are especially significant in terms of fishing capacity. First is the norm against lying. The interview data from all four vessels were clear and consistent in terms of the moral distinctions of truthfulness in this fleet. It is commonly accepted to not tell the whole truth, but a fisherman quickly loses his good reputation if he is caught telling a downright lie. The fishermen informed me that, generally, there is a high degree of compliance with this norm. They have seldom experienced being lied to during their careers. This was supported by the observational data. I never witnessed a fisherman on any of the boats I travelled with giving false information to another vessel. This is notable, as information on catch, fish findings and gear is exchanged more or less continuously.

Second is the norm of reciprocity, which ensures that favours are received with a tacit obligation to reciprocate on a later occasion. This norm was emphasised by the fishers on all the vessels I travelled with, and could be observed in relation to exchange of information as well as catch. When a vessel has caught more than it can carry, it is common practice to give the surplus to another vessel. Catch is never given as part of any explicit exchange, but the fishermen clearly describe, and express, the recipient's obligation to give catch back on a later occasion. Similarly, the fishermen explain that they provide information to others with an expectation of receiving information in return.

Third is the general norm of considerateness on the fishing ground, which prescribes that one tries to ensure one's own success without disrupting others' attempts to do the same. One of the skippers and two of the mates actually used the term "considerateness" to describe this norm but unlike the two norms described above, the fishermen did not jointly outline the meaning of this as clearly as I have done here. My description of this norm is a general interpretation of a number of more specific rules and practices that can be observed in the fleet. Several fishermen described to me the general rule that a vessel entering a trawling ground is expected to avoid disrupting the fishing operations of the other vessels. This rule is also evident in practices of information exchange on crowded trawling grounds, as I will return to later. The interview material was supported by observations of gossip regarding boats with a habit of "pushing" others on the fishing grounds. A similar rule can be observed

in the purse seine fisheries, where the finder of a school has an informal right to make the first attempt to catch it.

The data are clear that these norms are not specific to Seaborn Hills, but are general to the Norwegian purse seine/trawler fleet. Moreover, it is not reasonable to interpret these norms as specific to fisheries. They emerge as manifestations of general social norms in a specific professional setting. In sum, a good professional reputation is acquired by competitive success within a set of rules. The fishermen thus operate in a milieu hallmarked by intense competition for prestige, but where competitive success depends on compliance with a set of co-operative norms.

The Technological Means of Learning

Efficient harvesting requires long-term knowledge of fishing gear and technique, as well as short-term knowledge on the whereabouts of fish. The technology for acquiring this knowledge, by observation or learning from others, is essential to fishing capacity. There are three main types of technology for learning. First is gear for direct observations of fish. The vessels locate concentrations of fish by using sounders and sonars. Each vessel has high and low-frequency sounders that search vertically, and high and low-frequency sonars that search 360º horizontally for concentrations of fish. The sonars can spot fish at distances varying between a few hundred meters and several kilometres, depending on the species and water conditions.

Second is gear for finding fish by observing other vessels' behaviour. GPS navigation systems and radars are integrated with digital map machines, which yields data on the exact position and movement pattern of all vessels within a normal radius of 12-16 nautical miles. In 2004, the so-called Automatic Identification System (AIS) became mandatory in this fleet. The AIS provides non-stop transfer of the boat's identity and GPS data (location, course and speed) to all vessels within range of VHF radio – normally about 20 nm. The interface between the AIS and the map machine ensures that all these data are displayed directly on the electronic map of the receiving vessel. This information clearly indicates the operations and fishing patterns of the vessels displayed, suggesting the attractiveness of their current locations. The skippers and trawl bosses use this surveillance system continuously in their fish searching operations.

Third is equipment for learning through direct communication with other fishermen. The AIS ensures high transparency on the fishing ground, and makes it easy to contact the right boat. The vessels are equipped with VHF (short range) and SSB (long range) radios that are

capable of searching a wide range of channels, making them poorly suited for exclusive information sharing. When fishing along the coast, the mobile phone is the most common medium for exchange of exclusive information. Satellite phone/fax or written messages over AIS enable vessels to share exclusive information when fishing offshore.

The vessels have an Internet connection, giving the fishermen easy access to the auction data[11] of other vessels, including what, how much and where they have fished, who made the purchase and at what price. These data will generally be too old and imprecise to be useful in the daily search for fish, but it represents an opportunity to check the accuracy of information exchanged previously through personal communication on the fishing ground, allowing a certain level of social control.

The Social Dynamics of Technological Development

The purse seiners / trawlers that participate in the blue whiting fisheries are generally 60-70 m long, 8-13 m broad, and made of steel, with a loading capacity of 1,200 -1,800 tonnes. When fishing for blue whiting, they use a pelagic stern trawl that is towed over the fishing ground at a speed of around 4 knots. The cod end is capable of holding close to 600 tonnes at the most, but the fishermen try to stay well below this limit in order to avoid wrecking the gear. The trawl is equipped with sensors that indicate the amount of fish caught. The cod end floats to the surface due to a fall in pressure when the vessel heaves the trawl. The cod end is subsequently towed along the side where the catch is pumped directly into the tanks where it is cooled down by circulating water kept at the freezing point.

Blue whiting represents a relatively new fishery, and knowledge changes rapidly compared with the more traditional fisheries, such as purse seining for herring or mackerel. Consequently, fishermen display a constant concern with the technical aspects of fishing in the blue whiting fisheries, and there is much more intense interest in this issue than in traditional fisheries. Using state-of-the-art fishing methods is essential to competitiveness, and this is a major incentive for new investments and improving one's technical skills. The answer given by this skipper, when asked about the profitability of a recent investment made to improve the catching capacity of the trawl, illustrates this rationale: "It is not a question of cost, but of fishing more than your neighbour. And that is usually good business."

Skippers are frequently, and at times continuously, in touch with other vessels on the fishing ground, and the technicalities of fishing are a standard topic of discussion. A vessel

[11] All Norwegian vessels are required to land fish through a fishermen's sales organisation. The sales organisation for pelagic fish use an auction system, and members of the organisation have access to auction data.

will often share information with its close relations – i.e. vessels from the same company, community or family – whenever it has significant news on technical improvements. For example, while fishing on the high seas, one of the leading Norwegian blue whiting fishing vessels discovered how to adjust the trawl doors so as to increase the catching capacity of the trawl. It subsequently called another Seaborn Hills vessel, considered its main co-operative partner and fiercest competitor, and informed it of this discovery. The skipper recalls that they transmitted this information over the VHF radio, implying that they had many potential listeners. Fishermen generally do not put great emphasis on keeping technical knowledge exclusive to particular groups. When strangers talk on the radio to avoid gear collision for example, it is common that they also compare gear, trawl size, speed and catch (see also Thorlindson 1994).

It may seem paradoxical that technical knowledge is shared with great openness among fishermen in such a competitive setting. However, this openness becomes less of a puzzle when one considers the social recognition that is associated with having a technological edge. Knowledge cannot yield prestige unless it is displayed and it cannot be displayed without being shared. The competition for prestige thus generates a dynamic of technological development where leading vessels constantly search for technical advances, and share them with the community in exchange for social recognition once they are made.

The exchange of knowledge in the Seaborn Hills fisheries milieu extends far beyond the inter-vessel communication at sea. The skippers and trawl bosses on different Seaborn Hills vessels are often neighbours, relatives and/or friends, and sharing experiences from fishing is a significant part of their personal relationships. Mutual fisheries-related knowledge exchange is thus an integral part of the reproduction of the Seaborn Hills fisheries community.

I asked questions about these communication practices in all interview settings, and there is a joint perception among the fishermen and company administrations that there is a tradition for this exchange in Seaborn Hills. They perceive this co-operative spirit as a hallmark of their community. Sharing technical knowledge may thus not only be understood as a matter of pursuing prestige. It is also a way of displaying fellowship and tending to one's position as a member of the community. This co-operative spirit may be interpreted as an implicit norm of collective action in terms of industry development, and several informants regard it as central cause of this milieu's success in fishing. The following statement, by one of the net/trawl-bosses illustrates this: "Like in the trawl fisheries – we discuss improvements all the time... There's something about discussions and receiving help from others. It would be terribly hard for one boat to develop it all."

Technical knowledge develops and spreads quickly due to this synergy of competition and co-operation in the Seaborn Hills trawler fleet. The overall competitive climate makes the fleet receptive to innovation, and ensures that technological improvements are currently implemented in the fleet. The Norwegian blue whiting fishing fleet is thus technologically innovative, highly modernised and homogenous in terms of gear, technical solutions and working operations. The transferability of knowledge is enhanced by the homogeneity of the vessels themselves, which are by and large similarly constructed.

The experiences of the fishermen also have a direct bearing on the development of fishing gear. A single company in southern Norway – Egersund Traal – develops and delivers the blue whiting trawl gear for the entire Norwegian blue whiting fleet. The company has contact with the fishing fleet on a daily basis, and feedback from fishermen plays a significant role in the gear development process. The fishermen also ask the company for news on technical improvements on a regular basis.[12]

Knowledge on the Whereabouts of Fish

Knowledge on the whereabouts of fish is a major factor in terms of fishing capacity. Current fish finding gear greatly restricts a single vessel's capacity to find the best concentrations of fish within larger areas, and receiving reliable information from others is essential to fishing success. A network of colleagues who are willing to share information is thus one of the skipper's most valuable assets. However, the short-term relevance of this knowledge makes it less exchangeable for prestige than technical innovation, and a significant incentive for information-sharing is thus lacking. It is generally an advantage to fish alone on a good fishing ground, and the general competition for catches provides an incentive for secrecy and deception.

Information on the whereabouts of fish is generally managed more cautiously than technical knowledge, and is more often shared between closely related vessels through exclusive media, such as satellite phones. However, co-operative information sharing is significantly more wide-spread in this fleet than in the cases described in previous literature. Spending most of my time on the bridge, I observed an almost constant flow of information exchanged among vessels. During this period, I never observed fishermen give misleading advice on the whereabouts of fish. Similarly, the fishermen onboard always[13] took

[12] Pers. comm. Egersund Traal.

[13] The data contained one exception to this. This concerned a vessel rumoured to land catch illegally, which implied secrecy. This distrust thus related to factors external to the competition among vessels.

information received from other vessels on trust. The interviews on all vessels confirmed the high degree of compliance with the norm against lying.

The absence of deceptive practices can largely be accounted for by the strictly-enforced moral norm against lying and the information technology described above, which represents a significant degree of social control. When a skipper asks a colleague for information on his fishing, he can be fairly confident that the will receive an honest, if not entirely complete, answer. However, the norm against downright lies cannot adequately account for the extent of information exchange in this fleet. While fishing, skippers continuously exchange information on observations of fish and how their fishery is going, and they often give significantly richer and more specific information than required by the norm against lying. For example, when one of the skippers made an unusually good finding of blue whiting in a period of generally poor fishing, he spoke to another Seaborn Hills vessel over the satellite phone and informed that "there is a damn fine stripe here". The vessels exchanged truthful approximations of catch figures during their conversations with others, and in cases where vessels were out of radar range, they often supplemented this with exact coordinates for fishing grounds.

Such observations were followed up by interviews on all vessels, and these data confirmed and completed the picture. Calling other vessels and asking for information is the most common way of learning from others, but vessels that co-operate on a regular basis sometimes call each other for the purpose of giving information. It is also usual to call vessels on fish searching expeditions and ask them to call back if they find attractive fishing spots, which quite often results in the requested response. Vessels exchange information on the whereabouts of fish much more frequently with boats they are closely related with, e.g. through kin, company or community ties, than they do with others. The "mate" is typically the vessel that has first priority when there is a surplus of catch or a valuable hint to be shared. There is generally a higher degree of openness among Seaborn Hills vessels than there is between vessels from Seaborn Hills and boats from other communities. Both observations and interviews confirm that this pattern becomes more prominent when fish is scarce. For example, in the mackerel fisheries, which are regulated by vessel quotas that are very easy for the vessels to catch, information exchange with strangers is more extensive than in the more competitive blue whiting fisheries.

The norm of reciprocity provides incentives that largely explain information exchange beyond that required by the norm against lying. Skippers give reliable information to others based on expectations of reciprocation, and for the purpose of building their credibility among colleagues, thus strengthening their co-operative networks. Giving away information entails a

risk of losing the advantages associated with fishing alone on a good ground, but receiving hints about good fishing spots in return in the future is potentially more valuable. The rationale expressed by this trawl boss is typical: "We often discuss how much information to give, but it pays off to say things as they are. If you call a skipper and tell him that this is a good spot, and he goes there and finds fish and discovers that you helped him out, well, then he helps you next time."

The importance of trust may explain the fact that rich and detailed information is mostly exchanged among actors who are closely related. The norm of reciprocity has vaguer boundaries of conformity than the norm against lying, especially as the indebted fisher has an indefinite amount of time to fulfil his obligations. Communication based on expectations of reciprocation thus implies a high level of trust, and thus mainly involves actors who are closely related. One mate explained the logic in the following way: "When vessels we co-operate with call us, they get what they require. As for boats we don't know, it's a matter of saying as little as possible without lying. You give info for the purpose of getting info in return."

A skipper acquires prestige by performing relatively well, while conforming with the basic co-operative norms. Prestige is most rewarding when achieved among one's close relations, which is also where social control is most efficient and trust most prevalent. This explains why both co-operation and competition increases as the social relations become more intimate. The fact that a vessel's toughest competitor is usually also its closest co-operative partner is not paradoxical once the normative basis for competition is kept in mind. In addition is the element of joint competition against vessels from other harbours and municipalities, which provides an incentive for co-operation among close relations.

In the blue whiting fisheries, this normative system generates a pattern of information exchange where lies are avoided regardless of the vessel one communicates with, while information is shared beyond this point within more intimate networks of kin, company, community and friendship. The networks are not formalised and there are no norms against spreading information further to third parties. Skippers thus often receive second-hand information, and may share this information with other close relations. Information spreads within the fleet through these informal networks of co-operative relations.

The combination of information exchange and surveillance technology ensures a fairly extensive flow of information on the whereabouts of fish within the entire blue whiting fishing fleet. When a skipper receives information on a good finding from a co-operating vessel, he will often move to that spot unless he is making a good catch himself, and may also

share this information with other close relations. A small group of vessels will consequently soon gather on a good fishing ground, and this concentration signals good fishing to other vessels within radar/AIS range. This results in non-exclusive transfer of information on attractive fishing spots to the entire fleet. Boats that have yet to find promising schools will move towards the observed cluster if they think it improves their chances of a good catch. The integration of radar and AIS with the digital map machines made it easy for me to observe and record such movement patterns. This dynamic could also be observed in the purse seine fisheries. These observations were made and followed up in interviews on three of the vessels, which confirmed the significance of observing the movements of others in order to locate good fishing spots. The interviews also showed that the skipper's concern for his relative performance plays a certain role in this pattern of fleet movement. Some skippers avoid the risk of poor relative catch associated with moving too far away from their competitors, and inexperienced skippers especially will often pay attention to the moves of more experienced colleagues. A skipper's decision to approach a specific concentration of vessels on the fishing ground usually has a much broader and – in terms of ensuring a good catch – more sensible foundation than in Barth's (1966) analysis of fleet movement patterns in the Norwegian herring fisheries of the 1960s. Barth interprets cluster formation on the casting grounds as an inefficient result of the skipper's fear of having his judgement questioned by the crew, arguing that a vessel's chance of a good catch is greater if it fishes on its own. However, Barth's argument is questionable in its own right. If fishing alone obviously is the superior strategy, not only the anthropologist but also the crew, whose incomes depend on absolute catch, would likely realise this, and question the judgement of skippers who only followed the crowd. The interviews and the observational data in this study clearly suggest that the tendency of vessels to form clusters on the fishing grounds stems from a rational pursuit of skippers and trawl bosses for the best possible catch in absolute and relative terms. For example, one informant skipper who was relatively inexperienced in this fishery paid close attention to the movements of a more experienced colleague, but also made independent decisions about whether to fish with others based on explicit, critical assessment of the actual chances of improving catches.

Organising the Fishing Ground

Although cluster formation on the fishing ground reflects transfer of knowledge on the whereabouts of fish and pursuit for good catches, it entails risks of inefficiency. Pelagic trawling is space-demanding, and concentrations of fishing vessels imply a certain danger of

gear colliding. The opening of a blue whiting trawl is 10-20,000 m^2 and may be up to 200 m wide. It is kept open by trawl doors that are attached to the trawl by sweepers of some 250 m, adding more width. The doors are attached to the vessel by wires that are 800-1500 m long, implying fishing in depths of 300-500 m.[14] In addition is the length of the trawl itself, which is about 600 m. This implies that a vessel should not fish closer than approximately one nautical mile to the vessel in front of it, but may keep a somewhat shorter distance sideways. Manoeuvring is very slow when trawling. Avoiding gear collisions thus requires an overview of the movements of nearby vessels, communication and a certain degree of order on the fishing ground. An ability to organise the vessels on the fishing ground is thus essential to the fleet's fishing capacity, as this enables many vessels to exploit the best fishing spots simultaneously while avoiding gear collision and other inefficiency.

It is common for a large number of boats to be concentrated on one ground, often with no more space between them than that required to avoid gear collisions. The general pattern in cases of high concentrations of fishing vessels is that the boats spontaneously organise fishing in line, sometimes circling in order to trawl the same spot several times. On one occasion, I counted 21 trawlers fishing in a circle of no more than 9 x 1 nautical miles. Fishing grounds are generally organised fairly smoothly. Giving way sometimes implies leaving a good spot, and incidents of annoyance, gossip, and – usually polite – verbal confrontations are common, but accidents and severe conflicts are rare.

When a new vessel enters the fishing ground, the norm of considerate behaviour prescribes that it joins the end of the line or otherwise avoids pushing other vessels. It is generally not a great advantage to enter in front, as the sonar may not yield information on changes in the density of fish until it is too late to change course enough to stay on the shoal. The second vessel in the line will have time to do this provided it receives information from the boat ahead. I observed such information being requested, yielding a positive response from the vessel ahead, and addressed the issue in conversations with three of the fishermen in different settings. These fishermen confirmed that it is common to call the boat ahead and ask it to pass on information to facilitate manoeuvring for the maximum catch, and that the general practice is to comply with such requests, which implies that fishing with other vessels also offers some advantages. To sum up, the norm of considerateness on the fishing ground by and large prevents concentration of vessels from resulting in inefficiency, and ensures that the

[14] For more detailed illustrations of this fishing gear, see Karlsen 1989.

potential advantage of information exchange is utilised. The fishermen report that these rules of conduct usually also function in relations between vessels from different nations.

Capacity Utilisation

Fishing success is associated with being smarter, better informed and more persistent than one's competitors. Observations and interviews confirmed that skippers and vessel owners carefully keep track of their vessel's catch relative to others, and sometimes make plans for how to stay in the lead or catch up with their main competitors. Skippers not only compete for personal prestige, but also for that of the company. Consequently, they often experience significant psychological pressure while fishing, as expressed by this skipper after he had called the company administrator to tell him they had caught 400 tonnes that day, making them the second-best vessel of the day: "If the other boats had caught 6-700 tonnes today, it would have been terrible to call". The competitive climate generates a continuous pursuit to utilise one's assets maximally. Skippers continuously use their co-operative networks, listen in on radio conversations, and record information of interest. Skippers and trawl-bosses often push their personal limits in terms of working hours while fishing. Their presence on the bridge – in front of the communication gear and the screens of the sounders, sonars and radars – is often only interrupted by hurried meals and a few hours of highly-necessary sleep.

The fishing effort in the blue whiting fisheries is related to the capacity utilisation in other fisheries in two ways. First, the fishermen informed me that the competitive spirit becomes manifest in quota-regulated fisheries as a race to be the quickest to catch one's vessel quota. I also witnessed the competition to have the best catch of each day in all the fisheries that I attended, including herring and mackerel. There is thus a distinctly social component to capacity utilisation in quota-regulated fisheries. This competition releases excess capacity that can be used in fisheries that are not restricted by quotas, such as blue whiting. Second, having access to unregulated fish stocks provides a direct incentive to utilise fishing capacity maximally in the quota-regulated fisheries, as unregulated fisheries represent an opportunity to utilise capacity that exceeds the quotas. Norway's blue whiting fisheries is a case of such an opportunity being utilised to its fullest extent.

Towards a Socially-generated Tragedy of the Commons?

I opened this article by arguing that the sociological and anthropological literature on fishing tends to regard normative and communicative factors as constraints on fishing effort, leaving the paradoxical impression that people are less capable of co-operating for the

purpose of efficient fishing than they are for resource conservation. The case of Norway's blue whiting fisheries turns this paradox on its head. Social norms of excellence generate intense competition for prestige, which can only be successfully achieved in compliance with a set of co-operative norms. This pattern of norms and communication creates a synergic effect of co-operation and competition on fishing effort, in a fishery with limited restrictions in terms of regulation. There are no co-operative arrangements among fishermen to restrict this effort, although Seaborn Hills fishermen perceive their fleet as extremely efficient and recognise the need for regulation. Several fishers told me that they were worried about the effects of the current fishing effort on the blue whiting stocks, and expressed hope that the negotiating states would reach a quota agreement soon. The attitude expressed by this skipper is typical: "This fishing for blue whiting – it's a free fishery, no quota – is not good for the resource. If we get a full boatload, that's [approximately 1,500] tonnes. When many vessels do that, it amounts to a lot." However, the blue whiting fisheries occupy many vessels from several states, and in the absence of state regulation to ensure collective action, no one will reduce his effort individually. The normative and communicative capabilities of fishermen have added to the increase of fishing effort that is predicted by the tragedy of the commons model in the Atlantic blue whiting fisheries.

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Figures