



The impact of fisheries management on fishers' health and safety: A case study from Norway

Trine Thorvaldsen^{a,*}, Signe A. Sønvisen^b, Ingunn M. Holmen^a

^a SINTEF Ocean, Postboks 4762 Torgarden, NO-7465 Trondheim, Norway

^b Norwegian College of Fishery Science, UiT, The Arctic University of Norway, 9037 Tromsø, Norway

ARTICLE INFO

Keywords:

OHS
Safety
Health
Fisheries management
Occupational fishing
Fishers
Safety management

ABSTRACT

Since the late 1980s, Norwegian fishers have been subjected to a cohesive regulatory regime aimed at sustainable resource management. Despite high occupational injury rates and exposure to several factors that may influence health negatively, regulation of occupational health and safety (OHS) came late in fishing compared with other industries. Fisheries management and safety management are not dealt with in the same regulatory context. Administrative responsibility is often compartmentalized and improved OHS has not been included in the design of fishing regulatory regimes. This article explores the effects of fisheries management on fishers' OHS in Norway. Objectives and arguments supporting joint regulation of fish resources and fishers' safety are identified, and examples from the coastal fishing fleet are used to illustrate the effects of fisheries policy on health and safety. Reported effects are presented from the standpoint of fishers. Examples include Olympic fishing, quota activity requirements and co-fishing. Regulation of Norwegian fishers' activity at sea has been designed to protect specific values and has historically been tied to separate authorities. Case study findings are consistent with those from other jurisdictions indicating that the separation of responsibility for fisheries management and safety regulations may have unintended and potentially negative consequences for fishers OHS. More research is needed but findings indicate a more holistic regulatory approach is called for.

1. Introduction

Commercial fishing is an important export industry for Norway, making its fishers a key part of the country's value chains that serve a global market [4]. Historically, the industry was deeply rooted in Norwegian coastal societies, where seasonal fishing was commonly combined with farming or other livelihood activities. In the past, fishing activities were unregulated. Those who wanted could go fishing and were free to choose when, where and what species to fish. Since the late 1980s, however, Norwegian fishers have been subject to a cohesive regulatory regime of sustainable resource management [14]. Their safety has also gradually come under more regulation [44].

A comparative study of regulatory regimes in six countries (not including Norway) found that administrative responsibility is often compartmentalized and that attention to occupational health and safety (OHS) has not been included in fishing regulatory regimes [49]. A North-American study identified management as one of the most important potential threats to fishers' safety at sea; regulations aimed at reducing pressure on fish stocks may, for instance, increase pressure on

fishers and thereby affect their safety [15]. A report by the Food and Agriculture Organization (FAO) [16] argues that fisheries management has indirect effects on safety that cannot be ignored. More specifically, the report argues that fisheries management may affect safety by influencing fishers' options, preferences, the number of fishers and the number and design of vessels. In turn, these influences may change the probability and nature of fishers' risk-taking behavior. Compared to competitive fisheries management, fishing quotas may reduce the incentive to take risks. If the type of management does not adequately protect fish resources or limit the number of fishers and fishing efforts, fishers may need to take greater risks to secure their income. The FAO report concludes that it may be helpful to integrate safety policies into fisheries management and make improved occupational safety a direct objective of the latter. The report presents case studies from different countries, but not Norway. Hence, this article contributes to the limited but growing literature on fisheries management and fishers' safety by exploring the Norwegian context. Its objective is to analyze the relationship between fisheries management policies and fishers' safety by addressing two research questions:

* Corresponding author.

E-mail addresses: trine.thorvaldsen@sintef.no (T. Thorvaldsen), Signe.a.sonvisen@sintef.no (S.A. Sønvisen), Ingunn.marie.holmen@sintef.no (I.M. Holmen).

<https://doi.org/10.1016/j.marpol.2022.105066>

Received 23 November 2021; Received in revised form 7 March 2022; Accepted 28 March 2022

Available online 18 April 2022

0308-597X/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

1. How and why has fishers' activity been regulated in Norway?
2. How do fishers perceive the effects of fisheries management regulations on their health and safety?

2. Background: Norway's fishing fleet

The Norwegian fishing fleet consists of around 5850 vessels ranging from small coastal boats that make daily trips to sea to large factory trawlers that fish for extended periods with crews working shifts. Most of the vessels are less than 11 m in length. According to the official registry of fishers, the number of individuals who had fishing registered as their primary occupation in 2020 was 9504. A further 1476 people listed fishing as their secondary occupation. Since registration is a prerequisite of obtaining social benefits from the Norwegian Labor and Welfare Organization, most active fishers are registered. However, it is likely that many foreign fishers working on Norwegian vessels are not registered, as doing so is not mandatory [47].

Fishers experience multiple working conditions that may be harmful to their health, and studies show that they are concerned their work may negatively affect their health over time. These concerns are mainly related to strain injuries, with the most reported health complaints being musculoskeletal disorders such as pain in the neck, shoulders and arms, as well as back pain [41,54].

An occupational accident database maintained by SINTEF Ocean shows that 329 fishers lost their lives in Norway between 1990 and 2020 (SINTEF [35]). The main accident categories included vessel disasters (115), drowning after falling overboard (97) and drowning in port (62). The other categories – crush/impact, fire/explosion, falling object, accidental fall, and cut – caused 55 occupational deaths. Fishers working in the coastal fishing fleet have considerably higher fatality rates than those employed on larger vessels. In the period 1990–2011, the rates were 33.3 fatalities per 10,000 person-years in the group of vessels less than 13 m long, compared to 5.9 in the medium-to-large coastal fishing fleet and 3.5 in the deep-sea fleet (i.e., vessels above 28 m) [25,26]. The fatality risk remains alarmingly high for the smallest boats. More than half of the fatal accidents from 1990 to 2020 happened on vessels less than 10.99 m long [35]. One-hundred-and-thirty-eight of the 329 fatalities (42%) occurred while fishers were working alone. This article, therefore, places special emphasis on fishers in the coastal fleet.

3. Materials and methods

Previous publications have described the lack of connection between fisheries management and fishers' safety in Norway by examining the historical development of government regulations in the sector [44,45]. While safety regulations have been looked at, the impact of fisheries management on health and safety has not been explored previously. This article addresses this gap in the literature by discussing fishers' perceptions of the effects of fisheries management on OHS and the implications for policymakers and researchers.

The article draws on findings from a literature review of scientific publications, official reports, government documents, legal papers, newspaper articles and web pages. The review provides the basis for a description of the key actors, objectives and strategies that guide the regulation of fishers' activity at sea.

To illustrate how fishers perceive the impact of fisheries management on OHS, the article makes use of three cases [3]. In these cases, fishers express their concerns regarding the relationship between fisheries regulation and OHS. Quotes are used to describe these concerns in the fishers' own words (the quotes have been translated from Norwegian to English by the authors). The case study approach [53] gives us a detailed understanding of the relationship in question as it explores the phenomenon in its everyday context [52].

4. Results

The following sections describe the agencies responsible for fisheries management and occupational safety and how fishers' activity has been regulated through the years. Section 4.3 discusses fishers' perceptions of the impact of fisheries management on OHS in the three case studies.

4.1. The regulatory objectives of fisheries management

After World War II, Norwegian fisheries policy focused on regional development and securing coastal employment and settlement. Starting in the 1980s, economic liberalization policy led to an increased use of market mechanisms to solve fisheries issues, and the fisheries were gradually relieved of their responsibility for coastal communities' development. As a White Paper stated:

Secure jobs in the fisheries can in the long run only be achieved by the industry itself, with foundation in profitable and efficient production... It must be stressed that the fishing industry can only partly contribute to maintaining the main settlement pattern (WP No.93 [50]:8, authors translation).

Resource management and quotas to prevent overfishing became possible after the establishment of exclusive economic zones in 1977, which gave states special rights to marine resources. In the late 1980s, the northeast arctic (NEA) cod stocks collapsed, leading to the closure of NEA cod fisheries in the spring of 1989. A moratorium was put in place, and fishing rights and quotas were introduced the following year to prevent overexploitation [23,39]. To save the NEA cod, fishers' numbers were also reduced.

Another important development that greatly affected Norwegian fisheries was the removal of the Main Agreement in 1994. This was an agreement between the government and fishers about transfer payments (i.e., subsidies) that contributed to maintaining overcapacity in the fleet. As these payments conflicted with international trade agreements, the European Community demanded they be abandoned, leading to structural changes in the fleet and reduced participation in the fisheries [1, 12,37,39]. Since the mid-1990s, therefore, the focus has been on maintaining a profitable fleet.

In the past couple of decades, fisheries management policy has focused on reducing fleet capacity, conserving fish stocks, and ensuring profitability through the structural quota system (SQS). The SQS shall reduce fleet capacity and applies to vessels over 11 m (since 2006). The SQS was first introduced to the coastal fleet (boats over 15 m) in 2003 (WP No. 20 [51]). It allows two or more vessels within the same fleet category to merge quotas so long as the vessels giving up their quotas are removed from commercial fishing (St.meld. nr. 21 [36], Innl. S. nr. 271 (2002–2003)). The idea is that fewer vessels will exert less pressure on the resource and fewer fishing units will improve the profitability of the remaining ones. In turn, a more profitable fleet is thought to be more economically sustainable for coastal communities [30,40].

From this brief overview of the development of Norwegian fisheries, we see two main objectives of fisheries policy: conservation and profitability. Though they incorporate different intentions, both objectives are closely connected to the work of Gordon [7] and Hardin [10]. According to this work, it is economically rational for the fisher to fish as much as possible (WP No. 20 (2002–2003)). The outcome is excess capacity, overexploitation and the demise of the commons.

4.2. The regulatory objectives of OHS policy

While the Directorate of Fisheries is responsible for fisheries management, the responsibility for safety at sea for all vessel types lies with the Norwegian Maritime Authority. Due to its high occupational fatality and injury rates, commercial fishing is considered the most dangerous occupation in Norway [26]. To reduce the number of accidents, the Norwegian Maritime Authority has recently increased its focus on fishing safety through improved regulations, inspections and awareness

campaigns [38,44]. Historically, Norwegian fishing OHS regulations have been influenced by the International Maritime Organization (IMO) and the European Union [19,2,20]. In 1929, the first international standard for the safety of life at sea (SOLAS) was introduced. Norway then integrated the requirements of the 1977 IMO Torremolinos Convention for the Safety of Fishing Vessels into its regulations.

Mandatory safety training for Norwegian fishers was introduced in 1989. Still, the requirements for safety management systems in fishing have come late compared to other offshore and land-based industries (Fig. 1). Norway implemented regulations requiring companies to establish systems for systematic safety work (i.e., internal control) in the offshore sector in 1985 and in land-based industries in 1992. The role of the authorities was to ensure that internal control systems were documented. In 2005, systematic risk assessments¹ were introduced for workers on ships, including fishers, with the “Regulation for the work environment, safety and health of those who work on board ships”. In 2007, requirements for safety management systems (SMS) were introduced for ships, but these did not apply to fishing vessels until 2010 [45]. SMS requirements were first introduced for fishing vessels above 500 gross tonnage. In 2017, they were applied to boats below 500 gross tonnage. Fig. 2.

Following stricter OHS regulations, the focus on control and inspections has increased, leading to discussions about fishers’ behavior and safety culture [44]. Sanctions may now be used to ensure compliance. For instance, if inspections show that fishers do not comply with safety regulations, the authorities may ban them from taking part in fishing activity until the deviations (e.g., missing or broken equipment) are corrected.

Fishers’ activities and decision-making at sea are influenced by both the incentives and constraints created by fisheries management and health and safety regulations [31]. However, the objectives of fishers’ safety regulations do not match those of fisheries management. Rather than ensuring conservation and profitability, these regulations aim to reduce the risk of accidents, injuries and fatalities. In comparison, the control regime of fisheries management is much stricter, involving mandatory reporting of activity at sea through an electronic system and heavy fines for deviations.

To summarize, in Norway, as in other fishing nations, fisheries management and OHS do not have the same objectives. They are regulated by different authorities that operate largely independently even though fisheries management influences fishing activity and may thus also affect OHS on board ships.

4.3. The perceived impact on health and safety of fisheries management

This section comprises three case studies that explore the impact of fisheries management on OHS by highlighting fishers’ experiences and perceptions.

Case 1. “Olympic fishing” for Greenland halibut.

The coastal vessel “Fjordgårdbuen” went out from its homeport on the evening of the 30th of May 2010 with two men on board to fish Norwegian Greenland halibut (*Reinhardtius hippoglossoides*). Catches were good, but as the wind was picking up to a slight gale, the vessel hauled the line and secured the cargo equipment. After setting the course for shore, the vessel was hit by several large waves from the stern, capsized, and started to sink. The crew member was caught in the ropes and dragged down with the vessel; he was later found dead. The skipper

¹ The International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM-Code) (1993) is integrated in the “Ship Safety Law” and the “Regulation for the work environment, safety and health of those who work on board ships”. The International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (1995) is also integrated in Norway’s regulations for qualifications and certificates.

survived and was picked up by another vessel [34].

The Norwegian Greenland halibut fishery is regulated by an overall quota, vessel quotas, bycatch quotas and minimum size. About 60% of the total catch is caught by bottom trawl, 30% by long line, and the remaining with gill nets and other fishing gear [9]. The smaller coastal fleet mainly uses gill nets or long lines. Greenland halibut has been an important part of the income of this fleet [18]. The fishing usually takes place during the summer.

At the time of the “Fjordgårdbuen” accident, only the coastal fleet could harvest Greenland halibut. The fishery was managed through a common (total) quota of 1800 tons and was open to all coastal vessels (boats below 28 m). The fishery was also managed through vessel quotas. Boats below 14 m received 12.5 tons, those between 14 and 20 m 15 tons, and those measuring 20–28 m 17.5 tons [27]. The combination of a common quota and individual vessel quotas could be tricky. As the fishery was open, it was difficult to predict how many would participate and how fast the total quota would be harvested. When this quota was reached, the fishery would close, without considering whether all the vessels had fished their allotted quota. As fishers did not know if or when the fishing would be stopped, they tried to maximize their catches as fast as possible. This led to a race for the fish – “Olympic fishing”.

Several newspaper articles show that prior to the Greenland Halibut season of 2010, fishers questioned the Olympic fishing regulation. Coastal stakeholders argued that the rules could negatively affect income distribution and safety because the common quota forced fishers to push the limits to secure their share [48]. The Norwegian Coastal Fishermen’s Association (NCFCA) said that the management of the fishery compromised safety and led to fishers taking unnecessary risks, e.g. fishing in bad weather, which is known to increase the potential for accidents [26]. Both the NCFCA and the Fish Buyers’ Association demanded a change in the system – without elaborating what this meant. They also claimed that Olympic fishing undermined a number of issues they were working on, including safety at sea [11].

First and foremost, this will affect safety. As cod prices are low, fishers will try to maximize the quotas. In practice, you maximize the vessel quota before the fishery is stopped. As this fishing takes place offshore, it is a challenge for the smallest fleet. With the threat of a halt to the fishing, there is a danger that some will load the vessel too much or fish in poor weather conditions [11].

After the “Fjordgårdbuen” accident, several fishers pointed to the regulations as the cause of the tragedy and said they had warned something like this could happen. Some voices demanded that the authorities take responsibility, while others blamed the fisher, arguing that everyone in the sector is responsible for not compromising safety by taking reasonable precautions regardless of the regulations.

Case 2. The red king crab fishery – safety versus income.

In 2016, a red king crab (*Paralithodes camtschaticus*) fisher stated, “There is no empathy left in fisheries management” [5]. The fisher pointed to the “activity requirement”. To receive a full crab quota, fishers had to have an income of at least NOK100,000 (approx. USD12,000) from other fisheries. Those who failed to reach this level of income got a quota cut, which could amount to NOK500,000 (approx. USD60,000). Because the crab fisher had changed vessel in 2016, he and his wife had trouble fulfilling the activity requirement.

We had to go to sea between Christmas and New Year’s Eve to meet the requirement. Everyone knows how bad the weather was then. My wife was in bed throwing up. I told her she did not need to come along, but she insisted – to secure the family’s income. It was almost irresponsible. A 30-foot boat in such weather... But I am experienced and know what I can do to improve safety. Young people without experience do not have a snowball’s chance [in hell] to handle something like this [5].

The same year, a 26-year-old fisher had his life turned upside down by a car accident that left him paralyzed from the waist down. He owned

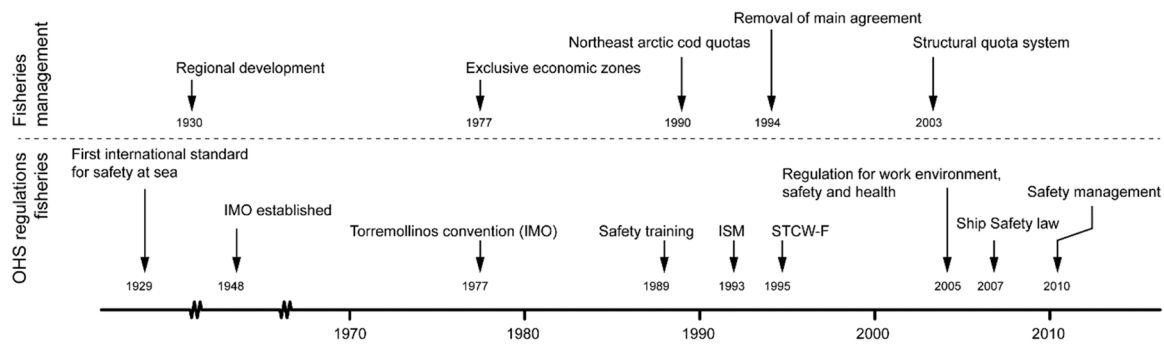


Fig. 1. Fisheries management, ohs regulations and fisheries historical development.



Fig. 2. Fishing for the red king crab [32].

two fishing vessels and normally participated in the king crab fishery [17]. At the time, regulations required vessel owners to be on board during the fishing [28]. If the fisher did not participate, therefore, he would not meet this requirement and would have his quota cut. Despite getting better, six months after the accident he was still in a wheelchair. When he applied for an exemption, his application was denied. According to the regulations, the only exemption to the participation rule was for vessel owners who were representatives in a labor union or another public organization. A month after the case made headlines in the fisheries press, the Minister of Fisheries changed the regulations. According to the Minister, this was not how the system was meant to work to secure active fishers [29].

I doubt he is the only one in a situation like this. I am sure that others before him who were sick forced themselves to go fishing with small vessels even though they had an injury that made it impossible. This could be very dangerous. It demonstrates how unreasonable the regulations have been on this point. I am glad that we have sorted this out [22].

This change in the regulations means that vessel owners with injuries or an illness from which they need time to recover do not have to sell their vessels or risk quota cuts; others can now fish for them until they are able to return.

Case 3. Co-fishing for safety.

Fishers fishing alone are particularly prone to fatal accidents. Analyses of occupational accidental deaths show that 62% of fatalities in the smallest coastal fleet (boats under 15 m) happen among fishers working alone (SINTEF [35]). As one fisher said,

It should be forbidden to be alone at sea. Accidents happen because the fisher is on board alone. Fatal accidents are often caused by being alone. If there had been two men on board, more lives could have been spared [21].

According to fisheries stakeholders, a solution to this problem could be what has been termed “co-fishing”. Co-fishing allows one vessel to fish all or part of the quota of another vessel. Thus, one vessel can be used to fish two quotas, and fishers can fish together.

Coastal vessels under 11 m in vessel quota-regulated fisheries may co-fish (the so-called closed group). To ensure that fishing is carried out by *bone fide* fishers, the vessel owner must stay on board during fishing [29]. Some have claimed that the co-fishing arrangement is a restructuring of fleets by stealth, which leads to fewer active boats and negatively affects coastal communities [6]. According to the Office of the Auditor General, the co-fishing arrangement has removed 250 of the 1100 vessels under 11 m, which no longer land catches [42]. Stratification of active and passive vessels is thus taking place.

The co-fishing arrangement, however, does not include the most vulnerable fleet segment – the “open group”. As the name implies, the open group is an open fishery in which “anyone” can participate, and the group is regulated by a common quota. Vessels are small coastal boats usually manned by one person. The main argument against opening the scheme to this group was that it could increase the fishing effort, as non-active vessels are brought into active fishing, which would increase the pressure on the quota. However, although it may make economic sense to fish alone, regulations do not hinder vessel owners from cooperating, for example by first fishing the quota on one vessel and then on the other [21]. Still, several stakeholders have called many times for co-fishing also in this fleet segment. One fisher explained how, despite being excluded from co-fishing, he chose to cooperate with another skipper. “We fished some [quota] on my vessel, and then we fished on his vessel, which is smaller and less safe”. He added,

Those who have the largest quotas [the closed group] get to co-fish, but we in the open group don’t. I cannot see that the authorities have done anything to solve the safety challenges in the coastal fleet [21].

5. Discussion

This article demonstrates that the regulation of Norwegian fishers’ activity has been designed to meet objectives that are separate from those of fisheries management and its authorities. Thus, there has been little overlap in the design of rules and regulations in the two domains. Furthermore, safety is not a direct objective of fisheries management, as suggested by Knapp [16].

While the regulations aimed at conserving fish stocks and ensuring a profitable fleet have been in place for years, safety regulations have come late, especially compared to other sectors, despite high accident and fatality rates [38,44]. The safety authorities have been concerned with non-compliance with the rules, linking this to a weak safety culture; many fishers do not agree with this view [44].

Knapp [16] notes the common perception that links the degree of danger for fishers to the choices they make on risk. These choices relate to the use of safety gear, getting sufficient rest, the type of boats they use and the kind of weather in which they choose to fish.

This perception places the responsibility for safety primarily on

fishers. However, as this and other articles show [15,16,49], the choices fishers make and the risks they experience are influenced by many factors, including fisheries management requirements. The three cases presented here demonstrate that fishers believe that certain fisheries management regulations negatively influence their working environment and OHS.

Harsh weather conditions are a major hazard for fishers' safety, but the decision of whether or not to go fishing in a given type of weather is left to individual harvesters [33,43]. Studies have shown that catch shares, or quotas, can increase safety as they reduce the race for fish and the incentive to sacrifice safety for speed, which can make fishers feel pressured to go out in harsh weather conditions, thus compromising vessel stability and crew safety (Hughes and Woodley 2007). Pfeiffer et al. [31] found that the decision to fish in poor weather generally decreases under individual fishing quota programmes thanks to more flexible decision-making. A previous study found that the frequency of search and rescue (SAR) missions in the Alaskan halibut and sablefish fisheries decreased from 33 per year to fewer than 10 per year after the introduction of catch shares [8]. Similarly, Knapp [16] showed that SAR missions in the Argentinian hake fishery stabilized after the introduction of quota-based management. Moreover, in Iceland, the Individual Transferable Quota (ITQ) system has been linked to the modernization of vessels, resulting in safer boats and a reduction in SAR missions.

Even when common quotas are accompanied by vessel quotas, as described in **Case 1: "Olympic fishing" for Greenland Halibut**, fishers feel that regulations increase the pressure to go to sea, including in weather conditions that compromise safety. In the decision to go to sea, safety is weighed against financial income. The same dilemma is found in **Case 2: The red king crab fishery – safety versus income**. The pressure to go fishing, even in poor weather, counteracts fishers' everyday safety precautions, where evaluating weather conditions is important, particularly for coastal fishers in smaller vessels. This case shows how requirements regarding the right to participate end up compromising the occupational health of fishers who become ill or injured. Until the rules were changed in 2016, fishers who were unable to go fishing due to injuries or illness faced the dilemma of securing their health versus maintaining their livelihood. **Cases 1 and 2** are both the result of fragmented regulations that do not account for unintended risks and diverse regulatory demands.

Furthermore, **Case 3: Co-fishing for safety** demonstrates that fishers' preference not to work alone for safety reasons was incompatible with fisheries management policies in the open group of the red king crab fishery. Analyses of occupational accidents have shown that many fishers who lost their lives were working alone [46]. Some fishers may enjoy fishing alone, or they might do so for economic reasons. There are no minimum crewing requirements in fishing vessel safety regulations. Still, practices such as sailing together to and from the fishing grounds, keeping in touch via radio or phone during fishing, and co-fishing are all examples of what many Norwegian fishers do to stay safe [43]. A similar practice, where vessels stay close and in contact during fishing for safety reasons, described as the "buddy system", has also been found among North-American coastal fishers [24].

6. Conclusion

In Norway, fishers' activity is regulated down to the level of the individual fisher. Fisheries management and fishing safety regulations have been designed to meet different objectives and are historically tied to separate authorities. The findings of this study support previous claims that the responsibility for fisheries management and safety regulations are compartmentalized. The three cases presented above also show that some fishers believe that management regulations aimed at protecting stocks and limiting capacity have had a negative effect on their working environment and safety. While the case study approach applied here is useful to illustrate certain harmful consequences of fisheries management on OHS, this phenomenon should be studied more

broadly and systematically, e.g. through interviews, observations and surveys aimed at both fishers and regulators. This work will provide valuable knowledge for policymakers, who should develop more holistic regulatory regimes that safeguard both stocks and fishers without compromising one or the other.

CRedit authorship contribution statement

Trine Thorvaldsen: Conceptualization, Methodology, Investigation, Project administration, Writing – original draft, Writing review & editing, Funding acquisition, **Signe Sønvisen:** Conceptualization, Methodology, Investigation, Writing - original draft, Writing review & editing, Funding acquisition, **Ingunn Holmen:** Conceptualization, Methodology, Investigation, Writing review & editing, Funding acquisition.

Acknowledgments

We would like to thank the reviewers of this article for their valuable comments. SINTEF Ocean, Norway (Grant number 302006793-5), funded the writing of this article.

References

- [1] P. Arbo, B. Hersoug, The globalization of the fishing industry and the case of Finnmark, *Mar. Policy* 21 (2) (1997) 121–142.
- [2] D. J. Bakka, Hundre år for sikkerhet til sjøs Sjøfartsdirektoratet 1903–2003. Bergen, Molvik grafiske as, 2004.
- [3] S. Crowe, K. Cresswell, A. Robertson, G. Huby, A. Avery, A. Sheikh, The case study approach, *Med. Res. Methodol.* 11 (100) (2011) 1471–2288.
- [4] FAO, The state of world fisheries and aquaculture – Meeting the sustainable development goals, 2018. Rome, FAO.
- [5] A. Fenstad, "Spydde seg gjennom jula for å nå kongekrabbekravet.", 2016. Retrieved 2020, from <https://www.fiskeribladet.no/nyheter/spydder-seg-gjennom-jula-for-ana-kongekrabbekrav/8-1-45138>.
- [6] Fiskeribladet, Politikerne bør holde på samfiske, 2020. Bergen, Fiskeribladet.
- [7] H.S. Gordon, The economic theory of a common-property resource: the fishery, *J. Polit. Econ.* 62 (2) (1954) 124–142.
- [8] D. Grimm, I. Barkhorn, D. Festa, K. Bonzon, J. Boomhower, V. Hovland, J. Blau, Assessing catch shares' effects evidence from Federal United States and associated British Columbian fisheries, *Mar. Policy* 36 (3) (2012) 644–657.
- [9] E. Hallfredsson, "Tema: Nordøstarktisk blåkkeite.", 2021. Retrieved 11.11., 2021, from <https://www.hi.no/hi/temasider/arter/nordostarktisk-blakkeite>.
- [10] G. Hardin, The tragedy of the commons, *Science* 162 (3859) (1968) 1243–1248.
- [11] T. Hatlem, "Ønsker unngå kappfiske etter blåkkeite.", 2010. Retrieved 11.11., 2021, from <https://fisk.no/fiskeri/2879-onsker-ungga-kappfiske-etter-blakkeite>.
- [12] P. Holm, The dynamics of institutionalization: transformation processes in Norwegian Fisheries, *Adm. Sci. Q.* 40 (3) (1995) 398–422.
- [14] J.P. Johnsen, Is fisheries governance possible? *Fish Fish.* 15 (3) (2014) 428–444.
- [15] I.M. Kaplan, H.L. Kite-Powell, Safety at sea and fisheries management: Fishermen's attitudes and the need for co-management, *Mar. Policy* 24 (6) (2000) 493–497.
- [16] G. Knapp, International Commercial Fishing Management Regime Safety Study: Synthesis of Case Reports, FAO, Rome, 2016.
- [17] Kyst og fjord, Kristian får bruke leieskipper, 2016. Kjøllefjord, Kyst og fjord.
- [18] Kyst.no, "Om påstått norsk overfiske av blåkkeite.", 2005 Retrieved 11.11. 2021, from <https://www.kyst.no/article/om-paastaatt-norsk-overfiske-av-blaakkeite/>.
- [19] P.H. Lindøe, Safe offshore workers and unsafe fishermen – a system failure? *Policy Pract. Health Saf.* 5 (2) (2007) 26–39.
- [20] P.H. Lindøe, O.A. Engen, O.E. Olsen, Responses to accidents in different industrial sectors, *Saf. Sci.* 49 (1) (2011) 90–97.
- [21] T.M. Martinussen, "Det skulle vært forbudt å være alene på havet.", 2013. Retrieved 11.11. 2021, from <https://www.fiskeribladet.no/nyheter/-det-skulle-vart-forbudt-a-vare-alene-pa-havet/8-1-31722>.
- [22] T.M. Martinussen, "Fisker Kristian (26) fikk Sandberg til å endre deltakerforskriften.", 2016, Retrieved 11.11. 2021, from <https://www.fiskeribladet.no/nyheter/fisker-kristian-26-fikk-sandberg-til-a-endre-deltakerforskriften/8-1-48828>.
- [23] A. Maurstad, To fish or not to fish: small-scale fishing and changing regulations of the cod fishery in Northern Norway, *Hum. Organ.* 59 (1) (2000) 37–47.
- [24] M.A. McDonald, K.L. Kucera, Understanding non-industrialized workers' approaches to safety: how do commercial fishermen "stay safe"? *J. Saf. Res.* 38 (3) (2007) 289–297.
- [25] E. McGuinness, H.L. Aasjord, I.B. Utne, I.M. Holmen, Fatalities in the Norwegian fishing fleet 1990–2011, *Saf. Sci.* 57 (2013) 335–351.
- [26] E. McGuinness, H.L. Aasjord, I.B. Utne, I.M. Holmen, Injuries in the commercial fishing fleet of Norway 2000–2011, *Saf. Sci.* 57 (2013) 82–99.
- [27] Ministry of fisheries, Forskrift om regulering av fisket etter blåkkeite nord for 62° N i 2010, MoF, Oslo, Lovadata, 2009, p. 2009.

- [28] Nærings- og fiskeridepartementet, Forskrift om adgang til å delta i kystfiskefartøygruppens fiske for 2016 (deltakerforskriften), 2015. NFD. Oslo, Regjeringen.no.
- [29] Nærings- og fiskeridepartementet, Forskrift om regulering av fisket etter torsk, hyse og sei nord for 62° N i 2021. FOR-2020-12-22-3152, 2021. Oslo, Regjeringen.no.
- [30] Participation Act, The Participation Act (Lov om retten til å delta i fiske og fangst) of 1999 no. 15 (updated 2008 no. 10, §1), 2008. Oslo, Ministry of Fisheries and Coastal Affairs. Participation Act of 26th of March 1999 no. 15, updated 18th of April 2008 no. 10, § 1.
- [31] L. Pfeiffer, T. Petesch, T. Vasan, A safer catch? The role of Fisheries Management in Fishing Safety, *Mar. Resour. Econ.* 37 (1) (2022), 000-000.
- [32] Redningselskapet, Kongekrabbe fiske i Varanger i 2005, 2005. NA, www.flickr.com: Creative Commons-license.
- [33] E. Reid-Musson, J. Finnis, B. Neis, Bridging fragmented knowledge between forecasting and fishing communities: co-managed decisions on weather delays in Nova Scotia's lobster season openings, *Appl. Geogr.* 133 (2021), 102478.
- [34] T. Sandnes, Ble senket av brottsjø, 2010. Folkebladet. Finnsnes, Folkebladet.
- [35] SINTEF Ocean, Occupational injuries and fatalities in the Norwegian fisheries and aquaculture industry, 2020. Trondheim, SINTEF Ocean.
- [36] St.meld. nr. 21 (2006–2007) Strukturpolitikk for fiskeriflåten, Ministry of Fisheries and Coastal Affairs. White paper nr. 21 (2006–2007): 180.
- [37] D. Standal, B. Aarset, The tragedy of soft choices: capacity accumulation and lopsided allocation in the Norwegian coastal cod fishery, *Mar. Policy* 26 (3) (2002) 221–230.
- [38] K.V. Størkersen, T. Thorvaldsen, Traps and tricks of safety management at sea, *Saf. Sci.* 134 (2021), 105081.
- [39] S.A. Sønvisen, The recruitment paradox: Recruitment to the Norwegian fishing fleet, 2010. Fishing people of the north: Cultures, economies, and management responding to change. Alaska Sea Grant, University of Alaska Fairbanks, Fairbanks, Alaska.
- [40] S.A. Sønvisen, Recruitment to the Norwegian fishing fleet: storylines, paradoxes, and pragmatism in Norwegian fisheries and recruitment policy, *MAST* 12 (8) (2013) 26.
- [41] S.A. Sønvisen, T. Thorvaldsen, I.M. Holmen, A. Øren, Work environment and health in the fishing fleet: results from a survey amongst Norwegian fishers, *Int. Marit. Health* 68 (4) (2017) 203–210.
- [42] The Auditor General, Undersøkelse av kvotesystemet i kyst-og havfisket, 2020. Oslo, Riksrevisjonen. Dokument 3:6 (2019–2020).
- [43] T. Thorvaldsen, The importance of common sense: how Norwegian coastal fishermen deal with occupational risk, *Mar. Policy* 42 (2013) 85–90.
- [44] T. Thorvaldsen, Managing risk in the Norwegian fishing fleet, *Policy Pract. Health Saf.* 13 (1) (2015) 17–30.
- [45] T. Thorvaldsen, Fra frie menn til trygge arbeidere En antropologisk studie av sikkerhet, regulering og yrkesfiskeres arbeidspraksis, 2017. PhD Thesis, NTNU.
- [46] T. Thorvaldsen, K.O. Kaustell, T.E.A. Mattila, A. å Høvdanum, J.M. Christiansen, S. Hovmand, H. Snorrason, K. Tomasson, I.M. Holmen, What works? Results of a Nordic survey on fishers' perceptions of safety measures, *Mar. Policy* 95 (2018) 95–101.
- [47] T. Thorvaldsen, S.A. Sønvisen, Multilingual crews on Norwegian fishing vessels: implications for communication and safety on board, *Mar. Policy* 43 (2014) 301–306.
- [48] Vesterålen online, "Undergraver næringen.", 2010. Retrieved 30.04., 2014, from <http://www.vol.no/nyheter/article360737.ece>.
- [49] M.J.S. Windle, B. Neis, S. Bornstein, M. Binkley, P. Navarro, Fishing occupational health and safety: a comparison of regulatory regimes and safety outcomes in six countries, *Mar. Policy* 32 (4) (2008) 701–710.
- [50] WP No. 93 (1982-83), Om retningslinjer for fiskeripolitikken. Ministry of Fisheries and Coastal Affairs, White Paper nr.93 (1982–83).
- [51] WP No. 20 (2002–2003), S. m. Strukturiltak i kystfiskeflåten, Ministry of Fisheries and Coastal Affairs. White Paper nr. 20 (2002–2003).
- [52] R.K. Yin. Case Study Research: Design and Methods, 4th ed., SAGE, Los Angeles, 2009.
- [53] R.K. Yin, Case study methods. APA handbook of research methods in psychology, 2012. H. Cooper, P. M. Camic, D. L. Long et al., American Psychological Association. Vol 2 Research designs: Quantitative, qualitative, neuropsychological and biological: 141–155.
- [54] A. Øren, T. Thorvaldsen, M. Sandsund, I.M. Holmen, Sickness absence and hospitalization among workers on board Norwegian fishing vessels, *J. Agromed.* 24 (4) (2019) 357–363.