

Identifying social practices to inform fisheries management—the case of bycatch practices of marine mammals and seabirds of German gillnet fishers

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Gillnets are one of the most common fishing gears globally and provide a fundamental contribution towards the income of millions of people as well as to the supply of protein. At the same time, bycatch from gillnet fisheries is one of the biggest threats to seabirds and marine mammals worldwide, because their habitats coincide spatially and temporally with gillnet fisheries. There has been research on technical solutions to unwanted bycatch, yet the social-science perspective is rather understudied. Little is known about fishers' bycatch behaviour, which can be researched as a social practice. Against the background of Anthony Giddens' structuration theory, this study used social sciences methods to analyse the bycatch practices of gillnet fishers in the German Baltic Sea. The results show that fishers normalize bycatch of seabirds as part of their fishing routine, while bycatch of marine mammals is experienced as a crisis. Underlying mechanisms for different bycatch practices are identified, and their meaning for management as well as further research questions are discussed. The perspective of normalizing and non-normalizing bycatch practices as well as fishers' own mitigation strategies should be considered by fisheries management when addressing bycatch mitigation measures as they could be designed more effectively.

Keywords: bycatch mitigation, bycatch practice, documentary method, fisheries management, structuration theory.

Introduction

“It doesn't help to hide it all and to lie. That's why I say, I catch whales with gillnets. I don't like it, I don't want it. I will do everything to mitigate it. That's for sure.”

(Fisher no. 18, SH)

Gillnets are one of the most common fishing gears globally (He, 2006) and provide a fundamental contribution towards the income and protein supply of millions of people around the world (Waugh *et al.*, 2011). At the same time, commercial fisheries, such as gillnet and other fisheries, are one of the biggest threats to seabirds and marine mammals globally (Reeves *et al.*, 2013; Dias *et al.*, 2019). Marine mammals and seabirds are at high risk of becoming unwanted bycatch by gillnet fishers because their habitats coincide spatially and temporally with gillnet fisheries. There are several agreements protecting seabirds and marine mammals, such as the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish, and North Seas (ASCOBANS) (ASCOBANS, 2012) and the Flora-Fauna-Habitat Directive (Council of the European Communities, 1992). These agreements identify the protection of these species as a supranational norm. At the national level, several attempts have been made to create management measures that are in accordance with these norms and agreements, e.g. by developing technical or tactical measures to avoid bycatch (Eayrs and Pol, 2019). The importance of bycatch mitigation in all kinds of fishing methods, out of ethical, as well as ecological, and even economic reasons, has been emphasized in research globally for many years. For example, there have been >200 studies on by-

catch from trawling (Kennelly and Broadhurst, 2021), as well as a large body of literature composed of over 600 studies on bycatch in gillnet fisheries (Northridge *et al.*, 2017). Despite the manifold research, approaches to bycatch mitigation have only been successful to a limited extent, e.g. due to a limited uptake of newly developed gear by fishers (Eayrs and Pol, 2019).

For a long time, authors argued that there needs to be a deeper understanding of fishers, their operations and responses to regulations, or incentives to design management instruments, and that most of fisheries problems arise from the lack of such (e.g. Hilborn, 1985; Wilen *et al.*, 2002; Salas and Gaertner, 2004; Naranjo-Madrigal *et al.*, 2015; Torres-Guevara *et al.*, 2016). Since the human use of nature is socially and culturally influenced, this relationship needs to be studied in order to develop effective resource and conservation management (Leenhardt *et al.*, 2015). Social and political science research is therefore needed to identify the barriers and opportunities for using new models that incorporate fisher behaviour in developing, implementing, and evaluating fisheries policies (Andrews *et al.*, 2021).

Therefore, developing effective management for bycatch reduction first requires an understanding of fishers' bycatch practices. To this end, this study focuses on the following research question: How are the bycatch practices of the gillnet fishers in the German Baltic Sea constituted? Additionally, I want to briefly discuss what this knowledge can imply for current bycatch-mitigation management.

This study adopted a sociological perspective, looking at fishers' bycatch actions, which allows approaching the individual agency of fishers. Agency refers to their capability to

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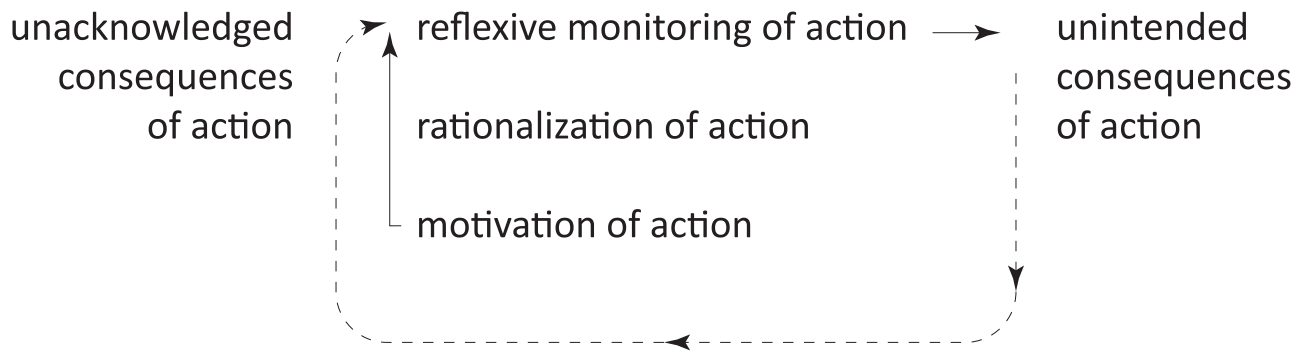


Figure 1. Model of stratification (Giddens, 1984).

act and also to consider their embeddedness in political structures. The paper first provides some theoretical background that guided the research and then follows with an overview of the methods applied. The study followed structuration theory and applied the documentary method to process the results. The results were derived from interviews with fishers, which provided insights into their bycatch practices.

Theoretical background

In sociology, there are different social science theories that focus on different parts of the social world. To answer a research question, it is important to reflect on which part of the social world the research question is to be located in. Much like how academic knowledge about certain fish species is updated regularly, theories about our social world also grow regularly with new findings. To understand fishermen's actions, they are considered a social practices. Social practices are the doings, speaking, feelings, and thinking that actors necessarily share with each other, which is a precondition for understanding and acting in the social world (Schäfer, 2016). For example, fishermen share the understanding that only the owners and crew of a vessel are allowed to use the vessel. There is no discussion in the morning at the harbour to decide which vessel to get onto because of the social practice of ownership. One of the guiding ideas of practice theory is the importance of implicit, practical knowledge in the form of know-how knowledge and routinizations that guide actions (Reckwitz, 2007). Although fishers don't discuss ownership, they use this implicit rule and knowledge every day and form their fishing routine around it. This might seem trivial, but by making these implicit rules and practices visible, we are able to think about alternative practices when current practices do not align with management goals or shared values.

Structuration theory (Giddens, 1984) provides an insightful framework for looking at social practices. In structuration theory, social practices lie at the interplay of structure (such as formal and informal rules as well as resources) and human actions (such as fishing). Social practices are enabled as well as limited by structures, while at the same time they are reproduced and modified by actions (ibid.). One example can be fishing within quota limits: quotas enable fishers to go fishing sustainably and therefore secure fish stocks for future generations, but at the same time, fishing quotas limit the actual fishing activities in the present. Fishing quotas as such only work, if fishers abide by them. If all fishers would decide to not adhere to the quotas anymore, this technical regulation (quotas) would not work and therefore the rules would be modified by the fishers. In the same manner, adhering to the

quota system reproduces the social practice of fishing within the quota limits.

To understand social practices in more depth, Giddens developed a stratification model (Figure 1), which elaborates on how practices, i.e. fishing practices, come to be through various forms of consciousness and motivation of the actor. As a result, unintended consequences can arise, such as the unwanted bycatch of marine mammals and seabirds.

The stratification model of the acting self describes motivation of action, rationalization of action, as well as reflexive monitoring of action as embedded sets of processes. Motivation for action is understood as wants that prompt actions and provide overall plans. A general motivation in fisheries can simply be the wish to continue fishing or the aspiration to make a living from fishing—which also shows that motivations can be different for different fishers. Rationalization of action means that actors routinely maintain a theoretical understanding of their actions, although this does not mean that they can elaborate on it discursively. For fishing, this means that fishermen know their motivations for going fishing but, when asked directly, don't necessarily reflect on them. Rationalizations of actions can be especially well accessed through reconstructive social science methods. Reflexive monitoring of action describes the continuous monitoring of actors' actions and of their social and physical contexts by themselves. In fishing, this can mean the monitoring (by the fishers themselves) of fishing according to a quota. It is also important that competent actors expect other actors to do the same and act under that understanding—which is how social practices can be reproduced. Actions can have both intended and unintended consequences, which may be unacknowledged. In ecological terms, fishing-induced evolution is an example of an unintended consequence of fishing (e.g. Guerra *et al.*, 2020). Another example of an unintended consequence in fisheries management is found in the closure to protect red king crab. It led to an increase in halibut bycatch, due to direct displacement effects and also due to indirect effects caused by adaptations in fishers' fishing behaviour (Abbott *et al.*, 2012).

This study uses the model of stratification to understand different bycatch practices, as well as their consequences, for German gillnet fishers. Since this study is focusing on different taxa of bycatch, I expected to find differing motivations, modes of rationalization, and modes of reflexive monitoring.

Material and methods

The selection of relevant fishers was based on an upstream study that separated the German Baltic gillnet fleet into groups



Figure 2. Map of the German Baltic Sea, locating the research sites (© Nakula Plantener, Annemarie Schütz, Thünen Institute of Baltic Sea Fisheries) (Barz *et al.*, 2020).

of vessels with distinct annual landing sequences (Meyer and Krumme, 2021). Consequently, the groups with the highest fishing efforts were selected based on the hypothesis that high fishing effort would lead to a potentially high probability of encountering unwanted bycatch events (Barz *et al.*, 2020). A second criterion was whether the landings occurred near Natura 2000 sites (that protect marine mammals and sea-bird habitats). These harbours were identified around the island of Fehmarn (Schleswig-Holstein—SH) and around Greifswald Bay (Mecklenburg-Western Pomerania—MWP) (Figure 2) (Meyer and Krumme, 2021).

All in all, 22 interviews were conducted, resulting in >50 h of audio recordings that were then transcribed. The interviewed fishers were all self-employed skippers, which is the most common form of fishing enterprise in the German Baltic Sea, and they were on average 50 years old, with eight fishers coming from MWP and 14 from SH (Barz *et al.*, 2020).

The selected fishermen were interviewed using semi-structured, problem-centred interviews (PCIs) (Witzel, 2000) (see supplementary for the interview guideline and complementary questionnaire). The interviewees gave written consent to their interviews being recorded and, afterward, transcribed verbatim, anonymized, and analysed.

Qualitative interviews such as PCIs allow access to tacit and explicit knowledge as well as the interpretative schemes used in social practices. PCIs allow for openness towards the fishers' self-setting of relevancies during the interviews, which are stimulated by narrative questions (Witzel, 2000). This could be seen in the interviews, for example, when fishermen were asked about their professional biographies. In their narrative answer, most fishers focused on the relationship to their fathers, although the question itself did not mention the word "father" or was expecting a narrative on a patrilineal occupa-

tional heritage. However, this was clearly very relevant to the fishers (Barz *et al.*, 2020).

The analysis of the interviews was conducted using a reconstructive social science method: the documentary method (Nohl, 2010), which is a well-suited methodology for understanding social practices (Barz, 2021). The method aims at reconstructing the implicit regularity of experiences documented in the data (Nohl, 2010). In this case, the data material is the transcribed interviews. As a result of the open yet focused questions, fishermen were encouraged to first and foremost narrate their experiences in addition to describing situations or giving opinions. Especially in narrative passages, the method enables the tracing of recurring patterns of action. However, these patterns are implicit, and fishers (just like other people) are not necessarily able to reflect on them. Here lie the capabilities and strengths of this reconstructive method because it focuses on *how* something is narrated just as much as on *what* is narrated (Nohl, 2010).

I conducted 11 interpretation workshops in varying group compositions of 3–9 (on average 5) researchers with different professional backgrounds, consisting of colleagues and other graduate students. These groups discussed the interpretations of the anonymized transcripts to ensure that the interpretation was exhaustive and verified, modified, or falsified. This group process, which supplemented my individual interpretations, served to ensure transparency and intersubjectivity within the analysis (Barz, 2020).

The documentary method works in distinctive steps (Nohl, 2012). The first step is (i) a formulating interpretation, where the transcript of the interview is reformulated to gain another perspective on it and move away from the wording used by the interviewee. This step analyses *what* was said by the interviewee and describes the intentional expressive meaning

of the narrative. It is followed by (ii) a reflective interpretation, which is about generating orientation frames and making them explicit. Orientation frames are the interpretive schemes of action in which a topic is discussed or a problem is handled. This step analyses *how* the answers are narrated, moving away from the intentional expressive meaning to the documentary meaning. Here, the researcher gains access to the practice of action and its underlying process structure, which is outside the perspective of the actors (Bohnsack *et al.*, 2013). We encounter this in daily life in situations where we identify an action as an expression or evidence of a certain attitude (Nohl, 2012). The orientation frame can be consolidated if the same orientation frame can be reconstructed in other sequences of the text from the same interview. Different orientation frames can be made more explicit when the same thematic sequences of different cases are interpreted next to each other comparatively. During the next step, the orientation frames are abstracted from the individual cases and grouped with relatable orientation frames into (iii) a first typology (a sense-genetic typology). Another dimension of socio-cultural factors is added to the typologies, resulting in (iv) a socio-genetic typology (Nohl, 2010). Although this process is described as a linear process, the reconstruction of orientation frames and subsequently types is an iterative and reflexive process that is executed several times before the results are consolidated.

The data analysis resulted in two different typologies: a typology of the general social fishing practice of German gillnet fishers—corresponding to different types of agency (elaborated on in Barz *et al.*, 2020)—as well as a typology of bycatch practices. This study is limited to the second typology, which is outlined using citations from the interviews (translated from German into English). The bycatch typology was consolidated when the interview analysis reached theoretical saturation, meaning that new cases did not add new findings but confirmed the reconstructed typology (Wiedemann, 2014).

Case study: gillnet fishing in the German Baltic Sea

The Baltic Sea is one of the largest brackish ecosystems in the world, with different levels of water salinity and stratified water bodies. This affects species distribution and allows fishers to catch marine and freshwater species (Meyer and Krumme, 2021). Gillnet fishing has a long history in the German Baltic Sea (Steusloff, 2006). At the time this study was conducted (in 2018), western Baltic cod and western Baltic spring spawning herring played a dominant role in fishing; nowadays, these stocks are radically declining, and the economic importance of them is replaced, *inter alia*, by plaice, which can also be caught with gillnets. In 2016, there were 650 German vessels operated by 486 owners practicing gillnet fishing (Barz, 2021), which means ~80% of the German vessels were using gillnets as first or secondary gear, with 98% of them being <12 m (Meyer and Krumme, 2021). Marine mammals and seabirds living in coastal waters are particularly vulnerable to bycatch because their habitat may overlap spatially and temporally with gillnet fisheries (Kindt-Larsen *et al.*, 2016). In the Baltic Sea, diving ducks, sea ducks, and cormorants are particularly affected by bycatch (Bellebaum, 2011). As the Baltic Sea is an important wintering area for many seabirds, there is an increased risk of bycatch for them at this time of year (Sonntag *et al.*, 2012). The Baltic Sea is also home to harbour porpoises, the only cetaceans in the Baltic Sea, to whom gill-

nets are considered to be one of the greatest threats (Kratzer *et al.*, 2020).

For these reasons (widespread use of gillnets and habitat overlap of seabirds and harbour porpoises with fishing areas), this study focuses on small-scale fishers.

Although the fishing sector in Germany is highly regulated, unwanted behaviour, such as bycatch of marine birds and mammals, is not yet part of a national legal regulation (Barz, 2021). However, two local German laws touch upon the topic of bycatch: in Schleswig-Holstein, fishers are obligated to report bycatch of harbour porpoises to the fisheries authority (Schleswig-Holstein, 2018). There is also a regulation stating that vessels >12 m, operating east from Rostock (see Figure 2), need to apply pingers to their gillnets, which are harbour porpoise deterring devices. Another management instrument, but no legal regulation, in Schleswig-Holstein is a voluntary agreement between gillnet fishers, their representatives, a bridging organization, and the local Ministry of Environment. Bridging organizations are institutions, NGOs, or organizations that link external or governmental institutions to local initiatives in a supportive role (Whitty, 2015). In the case of the voluntary agreement, the *Baltic Sea Information Centre Eckernförde*, a small environmental educational centre, helped build up the agreement, keeps in contact with fishers, and monitors compliance with the voluntary agreement randomly. According to the agreement, fishers apply mitigating measures such as avoiding feeding places of seabirds during wintertime, reducing the number of nets during the summer, and using harbour porpoise alert devices (PALs). Furthermore, fishers should actively participate in the monitoring of seabirds and harbour porpoises and in the development of bycatch mitigating gear, as well as hand over bycaught and dead harbour porpoises for further scientific studies (Landesfischereiverband Schleswig-Holstein *et al.*, 2015; Barz, 2021). However, informal interviews with experts from the bridging institution suggested that there were more bycatch incidents than cadavers actually collected. At the same time, there is no official scientific study to confirm their observations. The agreement was signed by the two state fishing associations, the Baltic Sea information centre, and the states' Ministry for Environment.

Results

The analysis of bycatch-related text from the interviews resulted in the reconstruction of a typology of bycatch practices composed of two types: (i) normalizing bycatch of seabirds and (ii) non-normalizing bycatch practices of marine mammals. The typology of bycatch practices highlights different perspectives and mechanisms, which will be embedded in Giddens' stratification model in the discussion (Figure 3).

Bycatch typology:

(i) Normalization of bycatch

Bycatch of marine mammals and seabirds is seen as normal by fishers. There are different practices to produce, reproduce, and legitimize this normalization. The study identified three different practices for constructing bycatch: (a) *Widerfahrnis*, (b) relativization, and (c) routinization.

(a) *Widerfahrnis*

Widerfahrnis can be explained as something out of an actor's control: "It (*Widerfahrnis*, FB) refers to events and facts that cannot be eliminated, defeated or avoided by any countermeasures, not to mention

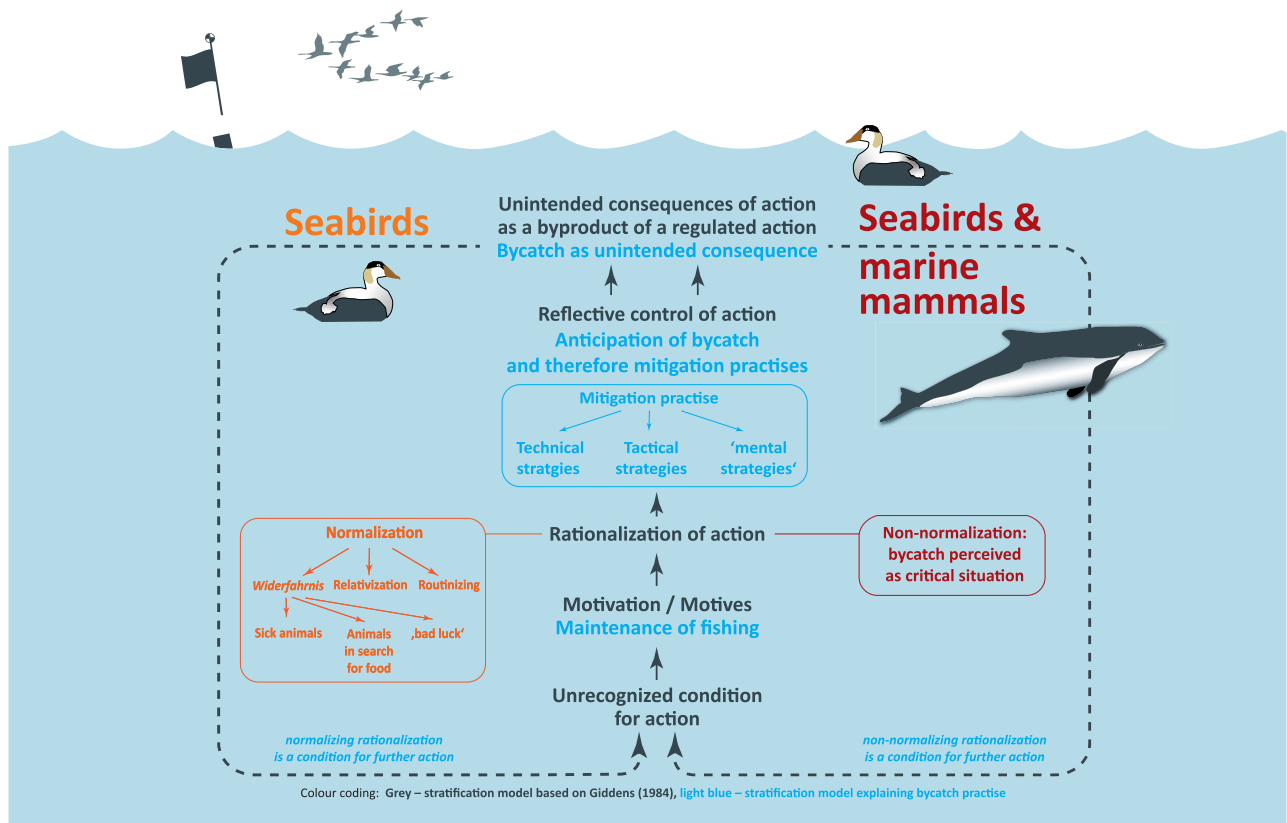


Figure 3. Stratification model of bycatch practice.

that they could have been averted and prevented from the outset by foresight and preventive action.” (Straub, 1999). During parts of the interviews when fishers talked about bycatch, they developed a narrative plausibility of bycatch events based on causal conditions. This study understands plausibility to mean processes that are logically comprehensible from the perspective of the actors. At the same time, the causal conditions for these processes are also important in this context. There were different forms of causal conditions, all of which placed reasons for bycatch on the side of the bycaught animals: sick animals, animals having bad luck, and animals in search of food (Figure 3). These plausibilities are all beyond the reach of fishers. Thus, they describe bycatch as something that happens to them and not as an active action.

The experience of *Widerfahrnis*, and with it the rejection of active involvement in bycatch, is illustrated in the following citation:

“Yes, you sometimes have a bird in it [the net-FB], that’s true. I agree with you there. That can’t be mitigated in fishing. But I just don’t know how to manage it differently.”

(Fisher no. 6, MWP)

Bycaught animals, which are affected by a disease, get caught in gillnets, which they wouldn’t if they were healthy. The explanation of the active be-

haviour of the animals caught in the nets is located in the ecology of the animals.

“I was somehow told—I don’t know off the top of my head if this is true—at fishing school we were somehow told this by a biologist. The cormorant is actually smart, should also somehow work with sonar. That’s what I got told. And so, the cormorant that we then have in the net—he should actually be sick. He wouldn’t actually go into the net at all [otherwise-FB].” (Fisher no.7, SH)

Furthermore, bycaught animals were said to get unlucky, because they entangle in nets.

“It often happens that a cormorant or something like that dives in and at this length, kilometres long, it finds a net and then it has bad luck. That’s just the way it is.”

(Fisher no. 20, SH)

“You can have bad luck. Imagine that you really have bad luck, that you really have your nets full of birds, right. [...] How will you-? You can have bad luck sometimes. You can really put your nets in such a flock that so many get caught there. Or you can have bad luck sometimes, that more are stuck on it. Could also be sometimes [the case], I do not know.” (Fisher no. 6, MWP).

In addition, there is a narrative that focuses on the human aspect of bad luck: fishers are in bad luck if

they have bycatch. Bycatch can influence the yield in a negative way, and the narrative also indicates that bycatch is reconstructed as socially undesirable behaviour by the fishers themselves. Although *Widerfahrnis* leads to a delimitation of responsibility, at the same time there are indications that own mitigation strategies have been developed based on bycatch experiences, which will be discussed in more detail later.

(b) Relativization

Another mechanism for normalizing bycatch is putting it into perspective and therefore relativizing it. This often goes along with references to the past. More birds were caught in the past, and therefore the quantity of today's bycatch is seen differently by fishers who experienced how seabirds were caught in the past or who have been told about it by their older family members. Furthermore, in the past, the (by)catch of seabirds used to be legitimate as birds were considered livestock, caught intentionally by fishers, and sold as food. Nowadays, consumer discourses are different. Much like shifting baselines, it is not common anymore to buy and consume wild birds, and sales of birds for food only take place unofficially and have no place in the public sphere.

“I will never forget that. There were so few cod—it must have been in like the 70s—that my father said—Don't write that in the newspaper now—[...] I mean that is, he is yes, he is time-barred. That he said: then we had, then we had a hundred ducks. In the nets. And people still ate the ducks back then. And then he said: four boxes of cod—that's not great. But we still had a hundred ducks. A piece goes for one German mark. And then, ducks and cod, that was another day's pay. Yes. Tell that today. Then all hell breaks loose.” (Fisher no.5, SH)

This historical justification of seabirds as a commodity influences the current dominant discourse around seabirds on the fishers' side. When animals are classified as livestock, it determines what behaviour toward them is considered legitimate by society (Buschka *et al.*, 2012). Therefore, the lower degree of empathy shown towards the bycatch of seabirds can be due to their classification as a commodity in earlier times. The last citation *then all hell will break loose* from fisher no.5, again shows where fishers locate today's discourse on bycatch of seabirds and their use as a possible commodity. He uses dramatic words to describe the possible consequences of bringing normalized bycatch of seabirds back into the public sphere. This suggests that the visible results of bycatch events and bycatch practices are socially undesirable and therefore deviant behaviour.

(c) Routinization

Where fishers show a routinization of bycatch, having bycatch is narrated as a regular part of everyday fishing life. Although fishers hardly ever talked about a specific quantity of bycatch, it became clear that bycatch of seabirds, and handling it, is a part of their professional routine. Routine is characterized

by the repetitive character of practices and is seen as opposed to critical situations (Giddens, 1984). During the interviews, routinization can be reconstructed in passages where fishers do not narrate a singular event nor do they narrate a critical situation, or where they generalize their own experiences and transfer them to other fishers.

“Nobody can tell me that they didn't have a duck once with them, that's nonsense.”

(Fisher no.3, SH)

“It happens, right? Seabirds, harbour porpoises, everything just happens, right? That's just the way it is. Sure, it happens—that always sounds stupid.” (Fisher no. 16, SH)

Fishers illustrate that they have developed strategies on how to handle bycaught seabirds, like throwing the birds back into the sea or taking them home to eat. The social practices of handling bycatch are not located in the public sphere. On the contrary, it remains hidden and tied to the workspace of the vessel or the private home.

Fisher no. 20, SH: “That's, that's quite normal, he swam in there, is dead and...”

Interviewer: “What do you do with it then?”

Fisher no. 20, SH: “Yes, throw it away again. What should I do with it?”

Fishers go on with their daily work after they have taken the bycatch out of their nets. This habitual character of, e.g. throwing the animals overboard helps to produce and reproduce bycatch as part of a routine and therefore normalize it.

The different variations of plausibility reflect assumed ecological knowledge (captured animals are sick or follow their urge for food) and reflect the assumption that bad luck or chance are responsible for bycatch events. They show at the same time a distancing and powerlessness towards the bycatch event and its avoidance. This may be due to the awareness that bycatch is socially undesirable. Fishers shared explanations, justifications, and rationales for bycatch events, while at the same time emphasizing that it is a matter of *Widerfahrnis*.

(ii) Non-normalization

While bycatch of mostly seabirds can be integrated into a routine and fishers have developed habitualized strategies for it, bycatch events of harbour porpoises are usually narrated as a critical situation. Critical situations are events characterized by a radical, unpredictable rupture that threatens or destroys the certainty of institutionalized routines (Giddens, 1984).

Even if bycatch events of harbour porpoises might occur more than once for a fisher, they are narrated as singular events, and fishers' routines are particularly ruptured when they have a calve as unwanted bycatch.

“I can remember other years and then one has also really, yes. You had one more often. Also, a small one with it, and that...Yes. It's not nice at all. No,

when the mother's milk runs out of its mouth, it's—you don't want to see it. You don't want to. But yes, what do you do. Right, and... I also see a problem, I have no idea if a mother with her...toddler, with her little one following, actually swims around and there is a net, if the little one then actually passes by. Right, I don't know, or [if it-FB] evades." (Fisher no. 18, SH)

The event is approached with empathy, and captive animals are humanized using terms that are usually only used for humans in everyday language (*mother's milk, toddler*). Harbour porpoises are more likely seen as charismatic animals (Campbell and Cornwell, 2008), whose bycatch triggers a critical situation, which could not be shown in the case of seabirds.

Bycatch mitigation practices

During the interviews, fishers presented different strategies that they apply actively to avoid bycatch (for an overview, also see Barz *et al.*, 2020). The following section elaborates on these mitigation strategies.

The main reasoning behind bycatch mitigating practices in connection with seabirds is placed in the economic sphere, in terms of labour efficiency and lost revenue. If birds are entangled in gillnets, the nets break and are unusable for fishing. The goal of bycatch mitigation can thus be reconstructed as a by-product of economic orientation.

"If you have a bird with you, then you take it with you. It sucks—your net is broken and everything...because nobody wants to—we don't kill a bird on purpose. Right? But I don't burst into tears—but that is not nice because the net is broken, right?"

(Fisher no. 3, SH)

The economically disadvantageous nature of bycatch of seabirds becomes clear and the plausibility of bycatch-mitigation behaviour is narrated. From an economic perspective, it is logical for fishers to avoid bycatch in order not to have their nets destroyed and their catchability reduced, as well as to avoid the labour-intensive untangling of birds. This reasoning results in fishers developing their own mitigation strategies to avoid bycatch.

In general, these strategies were diverse. They are part of their professional knowledge and result from experience, in parts even from intergenerational experiences. They pursue tactical and technical strategies as well as mental strategies (Figure 3), some of which have their origin in the voluntary agreement of Schleswig-Holstein, such as avoiding certain areas or times and reducing the soaking time of the nets. The agreement also includes protected areas for seabirds where fishing is prohibited.

"And as I said, [where there are] seabirds—nobody goes there anymore. There are bird protecting areas everywhere now from this voluntary agreement that we are not allowed to fish there at certain times." (Fisher no. 17, SH)

In addition to the tactical measures in the agreement, fishers also avoid areas with a high risk of seabird bycatch as well as conduct visual checks for seabird gatherings before fishing.

Furthermore, based on restrictions, their own experiences, and ecological knowledge, fishers know which seasons are at high risk for bycatch.

"The area [...] and the time. Now, during summer, I can fish on the mussel banks. And in the fall, the early fall, nothing happens there. There is no one, right. But, as soon as it becomes winter here and the water gets colder, and that. Then they [seabirds-FB] just come. And then I have to avoid such areas. [That's-FB] quite clear. And every fisher does so." (Fisher no. 4, SH)

The use of technical measures is also rooted in the voluntary agreement of Schleswig-Holstein, where fishers commit, *inter alia*, to apply harbour PALs to their nets to alert harbour porpoises of an obstacle and ideally to redirect them.

"What I also said before, that the fisher voluntarily already reduces his number of nets, and we also—with these pingers that we use extra against harbour porpoises."

(Fisher no. 7, SH)

Hope is also expressed as a strategy to mitigate bycatch and is hereby classified as a "mental" strategy. However, I would rather refer to it as a "non-mitigation" strategy. Hoping for no bycatch does not result in a particular social practice but results in a bycatch practice that is characterized by the absence of active mitigation practices. Hope implies a "confrontation with the limitations of one's agency [agency meaning one's capability to act-FB]" (Miceli and Castelfranchi, 2010). Hope is characterized by the mixture of a goal and a wish and the possibility that they will be fulfilled, as well as by the belief that there are underlying powers that cannot be controlled. It does not ignore or reject the belief in probability but merely holds on to the belief in possibility (*ibid.*).

Interviewer: "How do you manage to have fewer ducks in it?" [...]

Fisher no. 5, SH: "Yes, you can't manage that at all. That, that, that's not possible. You can only hope every day that they're not in there."

While fishers hope that there will be no bycatch events during their fishing practices, there seems to be no mitigation strategy within their power to reach that goal. In this sense, the concept of hope stands in one line with the plausibility of *Widerfahrnis* of bycatch.

In the following section, these results are embedded into Giddens' stratification model. Furthermore, bycatch as an unintended consequence of fishing and the relevance of these findings for management are discussed.

Discussion

Stratification model of bycatch practice

Giddens presents routine as a mechanism to avoid anxiety and guilt (Loyal, 2003). In this manner, the normalizing process of bycatch is interpreted as a mechanism to avoid guilt and therefore assumes that fishers act under the influence of the normative concept that bycatch is an unwanted practice. In this way, it can be shown that even though a normalization process takes place, which seems to suggest an indifference about bycatch of particularly seabirds, this is not necessarily the case. Bycatch events of marine mammals, on the other hand, have

been reconstructed as a critical situation—an event characterized by a radical, unpredictable interruption threatening the certainty of routines (Giddens, 1984).

Referring to structuration theories' stratification model (Giddens, 1997), it can be said that different bycatch practices lead to different actions with different outcomes. Nevertheless, it could not be shown from the interviews that non-normalizing practices necessarily leads to more precautionary actions. In Figure 3, adapted from Giddens (1984), the stratification of bycatch practices is illustrated (Figure 3).

Following Giddens' structuration theory, a rationalization of action takes place that allows actors to develop a theoretical understanding of the reasons for their actions. This does not mean that these reasons can be discursively negotiated, but they can be reconstructed by describing the action when addressed (Giddens, 1984). This was done documentarily in this case. For the German gillnet fishers in this case study, the motivation for action was to continue fishing. The different rationalizations for actions identified in the interviews can be related to the species being bycaught (Figure 3). Thus, although harbour porpoise bycatch is perceived as critical, fishers take the risk of bycatching harbour porpoise by continuing their fishing practices. Related to bycatch, rationalization occurs by practicing various avoidance strategies as well as hoping that no animals will be caught. The bycatch of seabirds is mostly rationalized through three mechanisms: by narrating it as *Widerfahrnis*, by relativizing it, and by routinizing it. The normalization of bycatch practice was shown to be hegemonic: the existing conditions are accepted and thus consolidated.

In the phase of reflexive control of action (Figure 3), bycatch is also accepted on a discursive level, and gillnet fishing is practiced in a routine manner. Bycatch events can be accepted based on different action rationalizations. This in turn can then lead to bycatch as an unintended consequence of action and is thus a by-product of regulated and directed action. Unintended consequences mean that the consequences are inconsistent with the beliefs of the actors and were not pursued by them (Giddens, 1984). The analysis showed that bycatch might be an unintended but not an unanticipated consequence. It is therefore a form of permitted outcome (Zwart, 2015). When fishers narrate how bycatch cannot be avoided and how it is part of everyday fishing activity, this means it is an accepted social practice that is primarily based on the motive of maintaining the fishery. Fishers might not share the perspective of bycatch being problematic, as supranational regulations or regional protection agreements suggest, respectively; they seem to not put this concern above fishing in general. This unproblematic perspective towards bycatch can be emphasized if these concerns are not shared internationally. In Germany, Eider ducks are a protected species, and their bycatch needs to be mitigated in German territorial waters, whereas hunters in Danish territorial waters are allowed to shoot them (Bird Life International and Dansk Ornitologisk Forening, 2016). Such contradictory regulations can also lead fishers to resent efforts spent on mitigation and conservation practices (Santora, 2003).

When it comes to bycatch mitigating measures, the role of fishers is often communicated as the role of active actors who need to change their behaviour. It is important—especially in the natural science-dominated fields of resource management—to recognize that resource managers and resource users do not necessarily share the same perspective on

certain issues, and therefore a common understanding might be hard to reach. Change should be addressed from the perspective of those whose behaviour one seeks to influence, considering the heterogeneity of fishers and their practices (Suuronen, 2022). The study's findings in the field of bycatch practices show that science and fisheries view the problem of bycatch from different perspectives. On the one hand, policy and scientific approaches, such as the development of mitigating gears, assume that the development of new gear will solve the problem of bycatch if they are applied by fishers, and therefore an expectation of bycatch as controllable prevails in science and research projects (Lempe, 2016). On the other hand, the mechanism of *Widerfahrnis* shows that fishers can perceive bycatch as incidents that cannot be changed. At the same time, the normalization of seabird bycatch suggests fishers don't share the problematic perspective and therefore also do not share the need for adopting a solution (e.g. an alternative fishing gear) either. Similar but different discourses about government policies and, inter alia, fishers, have also been found in Dutch contexts (De Koning *et al.*, 2020). Uncovering these diverging perspectives and contradictions is one of the strengths of qualitative social science (Bercht, 2021). If fishers' reasoning is not known and discussed in relation to the reasoning of policymakers, this can lead to misunderstanding and misinterpretation (Kraan and Verweij, 2020), and the probably diverging perceptions of seabird bycatch need to be kept in mind when trying to form a common ground for mitigation measures in the German gillnet fishery.

Fishers have shown that they have developed different mitigation strategies, which can also be part of a common understanding between fishers and managers. The experiential knowledge of fishers should be acknowledged and could be integrated into management, allowing for co-construction (Stephenson *et al.*, 2016). This study also showed that not all forms of bycatch are perceived the same, and bycatch practices can differ according to the bycaught species.

Several research questions derived from these results. First, due to the qualitative nature of the analysis, the correlation between bycatch practices and the frequency of bycatch events could not be determined. This could be the case if, particularly seabird bycatch is normalized because these incidents tend to happen more often than bycatch of marine mammals. Moreover, bycatch could be normalized because in fishers' work there are many other issues that are perceived as problems, which are directly threatening their businesses and fishing operations. This was not thematized during the interviews, but becomes apparent now as the fishery in the German Baltic Sea is currently experiencing a strong structural change due to the recent collapse of the western Baltic cod and western spring spawning herring stocks, resulting in very low quotas (ICES, 2020, 2021a, b). Second, it would be interesting to explore how the (seemingly) contradiction of *Widerfahrnis* on the one hand and active bycatch mitigation strategies by fishers on the other hand, can be reconciled. Third, further analysis of policy documents about current mitigation measures might reveal a mismatch between underlying assumptions about fishers' behaviour in these documents and fishers' actual bycatch practices. Informal discussions with scientists and eNGOs already point in that direction, but this specific case could be investigated further. Although fishers in SH and MWP are regulated differently, with a voluntary agreement active in SH and no agreement in MWP, bycatch practices did not differ across this line. For future research and management, it

would be of interest to evaluate the voluntary agreement and look specifically for its effects on bycatch practices or social norms.

In order to promote new practices and promote bycatch as a (solvable) problem, measures to enhance environmental literacy and general awareness can be implemented. This could mean adapting curriculums in fishery training schools, but it could also mean forming a closer relationship between scientists and fishers. Furthermore, social capital and peers who address bycatch as problematic can be important to catalyst change in fishers' behaviour. This suggests that community outreach programmes and local social networks could be used for this purpose. Whilst for effective management these proposals suggest that fishers need to "learn" the understanding of bycatch as a problem, this also needs to be addressed by other stakeholders, such as NGOs, politicians or scientists, who will need to "learn" to understand fishers' perspective and be open to creating deliberate action in order to find common ground and legitimacy for mitigation measures (De Konig *et al.*, 2020).

Conclusion

Giddens' theory of structuration, combined with the documentary method, allowed insights into the meanings assigned to bycatch of seabirds and marine mammals by German gillnet fishers and different bycatch practices, which can be understood as an unintended consequence of fishing.

The case study offers insight into the different ways in which bycatch of seabirds and harbour porpoises is conceptualized and can contribute to a better understanding of fishing practices in the context of unwanted bycatch. The results can be considered as a starting point for the joint development of mitigation management between fishers and managers, tying to the strategies that fishers already apply and thus increase compliance. The study made the social practices of unwanted bycatch more explicit, therefore allowing for this knowledge to be used in co-production processes of mitigation research, technology, or management and facilitating their effective development. It can also contribute to a common understanding between the involved actors.

Declaration

This research is part of my PhD project, which has been published as a monograph: Barz, Fanny (2021): "Boat's don't fish, people do"—a sociological contribution towards holistic bycatch management. Dissertation. Institute of Sociology and Demography, University of Rostock, Rostock https://doi.org/10.18453/rosdok_id00003726.

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Supplementary data

[Supplementary material](#) is available at the *ICESJMS* online version of the manuscript.

Conflict of interest

I have no conflicts of interest to disclose.

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Data availability statement

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly.

Author contributions statement

Fanny Barz: conceptualization, methodology, investigation, formal analysis, writing-original draft preparation, and reviewing.

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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