



Struggling towards co-existence of the Baltic Sea coastal fisheries and the grey seal

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Abstract

Commercial small-scale fisheries along the Baltic Sea coasts have declined over the years although these fisheries are viewed as important for coastal development and food security at the local, national, and EU levels. The viability and future of small-scale fisheries are severely challenged by problems caused by grey seals. The conflict, occurring between Baltic Sea coastal fisheries and conservation of the grey seals, has been severe since the mid-1990s and continues despite attempts to find a more balanced situation. Resting on reviews of multiple material, this paper explores the state-of-the-art opportunities for mitigating the seal-fisheries conflict and asks how these are related to social struggles and social justice. Our paper concludes that co-existence of coastal fisheries and the grey seal is possible but necessitates political will and co-designed seal management plans that help implement context-specific measures. Seal deterrents, for instance, give hope as a supplementary conflict mitigation measure – along with seal-proof fishing gear – but provide only partial relief. From the fisheries sector's position, influencing the size of the seal population is a logical solution. The lifting of the EU trade ban of seal products as a regional derogation would allow sustainable management of seal populations so that they be used as renewable natural resource. Monitoring changes in the seal population is crucial for maintaining a balanced population. Reaching co-existence is timely, because – unlike the seal – the diverse Baltic coastal fishing culture is increasingly endangered.

Keywords Coastal fisheries · Grey seal · Conflict · Governance instruments · Baltic Sea · Social struggle

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Introduction

Since the mid-1980's, after being threatened by hunting and environmental toxins, the grey seal (*Halichoerus grypus*) population in the central Baltic Sea increased rapidly and recently the population has expanded also in the southern Baltic Sea (Suuronen et al. 2023). The increase of the grey seal population is a result of successful conservation actions. Conflict between Baltic Sea coastal fisheries and conservation of the grey seals has been severe since the mid-1990s (Bruckmeier and Høj Larsen 2008; Varjopuro 2011; Bruckmeier et al. 2013; Suuronen et al. 2023), leading to polarization between stakeholder groups. Nature conservation organizations defend the continued level of protection of the species and coastal fishers struggle with the consequences of strict seal conservation policies leading to increased number of seals near the fishing grounds. Despite numerous attempts during the last 25 years to mitigate the seal-induced losses, neither the adaptability nor profitability of the Baltic Sea small-scale

coastal fisheries has turned for the better (Svels et al. 2019).

Commercial small-scale fisheries along the Baltic Sea coasts have substantially declined over the years although these fisheries are viewed as important for coastal development at both the local, national, and EU level (Waldo et al. 2020). In the northern parts of the Baltic Sea, the viability and future of coastal small-scale fisheries are severely challenged by problems caused by fish-eating animals, mainly grey seals, and cormorants (Salmi et al. 2023). The seals are considered by fishers to constitute the biggest threat for the continuation of fishers' livelihood (Svels et al. 2019; Vetemaa et al. 2021). The direct consequences faced by the coastal fishers include loss of catch (removal of fish or damaged fish) and physical damage on nets and extra work necessary, for example, to repair damaged gear (Bruckmeier et al. 2013). Hidden losses, losses not visible such as catch taken without a trace or scared away from the fishing grounds also constitute a large part of the loss (Königson et al. 2007, 2009).

A core tension is related to balancing conservation and management of the grey seal population with sustaining the opportunities for coastal fisheries. All seal species in the Baltic Sea are strictly protected (HELCOM 2006) and there is a strong public empathy associated with these species (Butler et al. 2008). At the same time, commercial fisheries in the Baltic Sea region support well-being and employment of people in coastal areas and in addition provide healthy and highly appreciated locally produced food. The management approach applied by authorities has mandated the protection of seals but has failed to adequately consider the social and economic impacts of that policy (Svels et al. 2022; Suuronen et al. 2023). Coastal fisheries have become a vulnerable group of professionals and sector related conflicts in many cases impact fishers' social and emotional needs for respect, identity, belonging, and status (Arias Schreiber and Gillette 2023).

In the face of the endangered coastal capture fisheries in the Baltic Sea, there is an urgent need to find effective long-term solutions for securing the co-existence of fishing livelihood and the grey seal population. Although it may seem that the struggle for mitigating this conflict is a never-ending story, opportunities exist for finding new terms of coexistence between human interests and wildlife. This necessitates more profound understanding of the constraints that hamper finding a balanced situation and acknowledging the importance of political action. For this purpose, our paper, by exploring the state-of-the-art opportunities and constraints for mitigating the seal impact on fisheries poses the following overarching research question: *How is seal conflict mitigation related to social struggles and social justice along the coasts of the Baltic Sea?*

In the following section we describe the conceptual framework followed by a methodological discussion in the third section. In the fourth section, we depict the Baltic Sea coastal fisheries, and fishers' constraints and struggles with the seal impacts. Thereafter, in the fifth section, we present the background of seal impact mitigation, explore the recent best practices, variations and combinations of measures that aim at moving forward in mitigating the seal-fisheries contradiction. On this basis, in the sixth section, we discuss the challenges in balancing the social struggles and social justice issues and enabling better adaptability of the Baltic Sea coastal fishers without endangering the protection of the grey seal, and what can be done for moving towards co-existence of the Baltic Sea coastal fisheries and the grey seal. Finally, in the seventh section, we draw conclusions on how to move towards long-term sustainable co-existence of coastal fisheries and the Baltic grey seal population.

Conceptual framework

Environmental conflicts involving humans and wildlife species are commonly referred to as "human-wildlife conflicts", defined by International Union for Conservation of Nature as "struggles that emerge when the presence or behaviour of wildlife poses actual or perceived, direct and recurring threats to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife" (IUCN 2023, p.3). In the conceptual framework and the overall discussion of this paper we add on and emphasize the concept of "social struggle" that brings social justice concerns to conflict studies (Bavinck et al. 2018). Social struggle rises in situations that are felt as unjust, underlining the importance of social justice. Especially in small-scale fisheries, like the Baltic Sea coastal fisheries, social justice must permeate ongoing interactions between the fishers and other stakeholders, including governments (Jentoft and Chuenpagdee 2022).

A major reason for intensification of social struggles in fisheries is due to the increasing involvement by governments in what used to be mainly fisher affairs (Bavinck et al. 2018). Shifts in power from local to national and international decision-making levels are significant in this case study. For example, the human-wildlife conflict highlights the struggle for coexistence between Baltic Sea coastal fishing (Salmi et al. 2023) and grey seal protection. Bavinck et al. (2018) hold that the choice of using the term social struggle highlights three features. "*The first is that social struggle is a collective, not an individual effort. Second, it is not momentary, but prolonged, stretching out over longer time periods. Finally, it is a serious and not a frivolous matter, involving substantial investment of resources, such as human and social capital, and having objectives that are*

important to people." (Bavinck et al. 2018 p. 47). One can also speak of social struggle in the absence of visible agitation, as such direct action may be suppressed, co-opted, or diluted.

In the context of fisheries, social struggle can be divided in three dimensions: (1) fishers' material deprivation, (2) perceived injustices and (3) collective responses (Bavinck et al. 2018). This paper focuses on the opportunities and constraints in using measures that aim at mitigating the seal impact on fisheries. These typically aim at reducing fishers' material deprivation, like economic losses induced by seals visiting the fishing gear. The other dimensions are, however, also pivotal: the feeling of injustice, that is typically triggered when fishers are unable to act for improving their situation, and collective action that struggles for a better future. In the seal-induced social struggle of the Baltic Sea coastal fisheries, many types of measures have already, without a breakthrough been used for mitigating the problems. Fishers have also tried to respond collectively to influence the policies behind the management measures they hold as socially unjust, with poor outcome.

Methodology

To describe the research field analysed in this article, we use secondary material like EU directives, marine protection strategies and programs, HELCOM manuals and guidelines, national seal management plans, scientific literature and reports, but also experiences and knowledge¹ obtained from international conferences, seminars and workshops the consortium members have taken part in. Our data originates mainly from research in three Baltic Sea seal projects; (1) the Baltic Sea seal and cormorant TNC² project, with empirical data from 219 interviews with small-scale commercial Baltic Sea fishers in six countries (Svels et al. 2019). The transnational co-operation project can be regarded as a rare effort of social struggle and social justice aiming to secure a better future for the Baltic Sea coastal fishery not only by addressing the severity of the problems, but also by making their voices heard and spreading information about the economic and social impacts of increasing seal and cormorant

¹ Previous, the conflicts between grey seal protection and small-scale coastal fisheries in the Baltic Sea was studied e.g., in the Framework for biodiversity Reconciliation Action Plans (FRAP) project, 2013–2016, funded by EU 5th framework program (Rauschmayer et al. 2008).

² Transnational cooperation, 2018–2019, funded by European Maritime and Fisheries Fund (EMFF) and the Natural Resources Institute Finland (Luke).

populations; (2) the RESOCO³ project, an academic collaboration across the Baltic sea countries founding an trans-disciplinary synthesis of up-to-date Nordic knowledge and best practices in collaboration and exchange with small-scale fishers, seal hunters and public administration (Svels et al. 2022). Interdisciplinary and international discussions during the RESOCO project in 2022 initiated and set the stage for analyses in this article; and (3) the RECOFI project, a synthesis of research findings of grey seal and cormorant mitigation governance tools in a Finnish context (Salmi et al. 2022).

Baltic Sea coastal fisheries and the seal situation

Small-scale coastal fishing in the Baltic Sea

The Baltic fisheries governance is a complex, multi-level case where different actors and interest groups from a variety of sectors interact (Salmi et al. 2023). The international and national regulation and monitoring of coastal fishing has increased, most notably since the implementation of the EU common fisheries policy (CFP). At the same time environmental degradation, in particular eutrophication, has become a serious problem in the Baltic Sea (Tynkynen 2017), reducing coastal fishing opportunities. On top of multiple challenges, the future of the Baltic Sea coastal fisheries largely depends on what can be done to mitigate the seal induced problems. Larger scale open sea trawling is less vulnerable to these problems, because seals tend to visit passive gear, like gill nets and trap nets that are used in coastal areas.

The use of local natural resources by fishing, has been of vital importance for the economy of the inhabitants of the Baltic Sea coasts since millennia (Salmi et al. 2023). The number of coastal fishers started to decline after the mid-20th century and this trend has continued. In 2017, the coastal fleet in the Baltic Sea was estimated 5,418 vessels and equivalent to 92% of the total Baltic Sea fleet and around 9% of the total EU small-scale fishing fleet (Lloret et al. 2018; STECF 2019). Nearly 6,500 fishers are estimated to be involved in the Baltic Sea coastal fisheries (Salmi et al. 2023).

The Baltic Sea coastal fishers have developed diverse strategies to fit with the specific settings (Salmi et al. 2023). History shows the ability to adapt to changing

³ Regional solutions for mitigating seal-fishery conflict in the Baltic Sea – Interdisciplinary synthesis, 2021–2022, funded by the Nordic Council of Ministers, the Nordic working-group for fisheries co-operation (AG-Fish).

circumstances, for example, through adoption of self-reliant life mode and exploitation of new income sources for the pluriactive household economy (Salmi 2015). Flexibility and adaptation have been possible also by applying local and regional variations in fishing practices and livelihood strategies. Typically, Baltic Sea fishers employ a variety of fishing gears and target several fish species on a seasonal basis.

Along with the increased seal-induced losses and assumption of new stakeholder groups and decision-making powers, fishers often find their various adaptation strategies inoperative. Consequently, options for continuation of the livelihood have become increasingly narrow and a substantial part of the Baltic Sea fishers have left their occupation. For instance, many Swedish coastal fishers explain that they have used all their skills and made all possible modifications in their fishing techniques to cope with the situation, but now they see no more coping possibilities (Johansson and Waldo 2020). The majority of the fishers, however, have attempted to change the circumstances – especially the institutional framework described below.

Struggle with seal impacts and action

The seal-fisheries conflict can be called a social struggle. Although the seal is naturally an important agent in the play, embedded in the whole ecosystem (Olin et al. 2024), the tensions are fundamentally arising between groups of people and their contrasting views, interests, and values. A specific wildlife situation will be appraised differently depending on individual goals and the perceived relevance and implication of conservation and wildlife impact (Eklund et al. 2023; Scherer 2009). For example, people whose livelihood does not depend on the existence of wildlife will probably support stricter protection than those whose livelihoods are threatened. Perspectives on seal politics in the Baltic are steeply divided between fisheries and hunting organizations on one hand, and nature conservationists and environmental administrators on the other (Salmi et al. 2023). This polarization is most visible in views towards hunting where e.g. coastal fishers want to restrict the size of the seal population, and the conservationists like to restrict hunting and enhance conservation. There is also a divergence between seal-population-oriented research and fisheries-oriented research, with differing focuses and appreciation of the need for conflict mitigation measures.

In the late 1990s a rapid growth of the Baltic Sea grey seal population contributed to creating the conflicting situation as the seals gradually started to cause serious damage for small-scale fishers (Harding and Härkönen 1999; Kauppinen et al. 2005; Jounela et al. 2006; Königson et al. 2009; Härkönen et al. 2013; Kindt-Larsen et al. 2023). It is theorized that the conflict has intensified since 2000, not only because of the rising overall number of seals (Suuronen

et al. 2023; HELCOM 2023) but also due to seals increasingly entering the inner archipelago areas that they did not previously inhabit, as well as exhibiting bolder behaviour (Suuronen et al. 2024). Many fishermen also report having close encounters with seals which was not common in the past.

The persistent struggle between Baltic Sea coastal fisheries and the grey seals has made fishers' situation increasingly dire (Bruckmeier and Høj Larsen 2008; Varjopuro 2011; Svells et al. 2022). Various damages and economic losses have grown (Königson et al. 2015; Svells et al. 2019; Vetemaa et al. 2021) despite substantial efforts especially for developing seal-proof fishing gear. The problematic situation is expected to continue and increase the risk of more fishers abandoning fishing as livelihood.

Frustrated by the difficult situation fishers from 15 Fisheries Local Action groups (FLAGs) across the Baltic Sea supported their fight for the survival of the coastal fishing livelihood and initiated the *The Baltic Sea seal and cormorant TNC project*. The findings (Svells et al. 2019) confirm that the impacts of seals are often serious obstacles for the continuation of the fishing livelihood. Furthermore, seals are considered to hamper coastal fishing usually more compared to the cormorant – particularly in Sweden and Finland (Fig. 1). In line with the fishers' opinion, seals typically cause direct effects such as reduction of catch, and damages to gear and the fish. Svells et al. (2019) note that steps forward necessitate a wide collaboration across sectors both regionally and internationally. Moreover, the project concluded that mitigation of the seal induced problems should be designed in collaboration with fishers and other stakeholder groups.

Transformation of conflict mitigation to current measures for mitigating the controversy

Changing measures for conflict mitigation

Measures for seal-fisheries conflict mitigation in the Baltic Sea have been developed and studied actively as the increase of the seal population has been intense, and the seal damages have been most severe in the Baltic Sea countries. However, the increase of the grey seal population in the southern Baltic Sea (Fig. 2) has raised a need also in Denmark to consider measures for mitigating the seal-induced damages (Kindt-Larsen et al. 2023).

In early 2000s, the main governance measures aiming at conflict mitigation were fishing technology development, financial support for seal-safe gear investments, compensation payments for seal-induced damage, protective hunting, and seal management plans (Varjopuro 2011; Bruckmeier

Fig. 1 The average gravity of the seal and cormorant-induced impacts on six indicators estimated by the fishers in 15 coastal areas in Estonia, Finland, Sweden, Denmark, Germany and Poland (Svels et al. 2019)

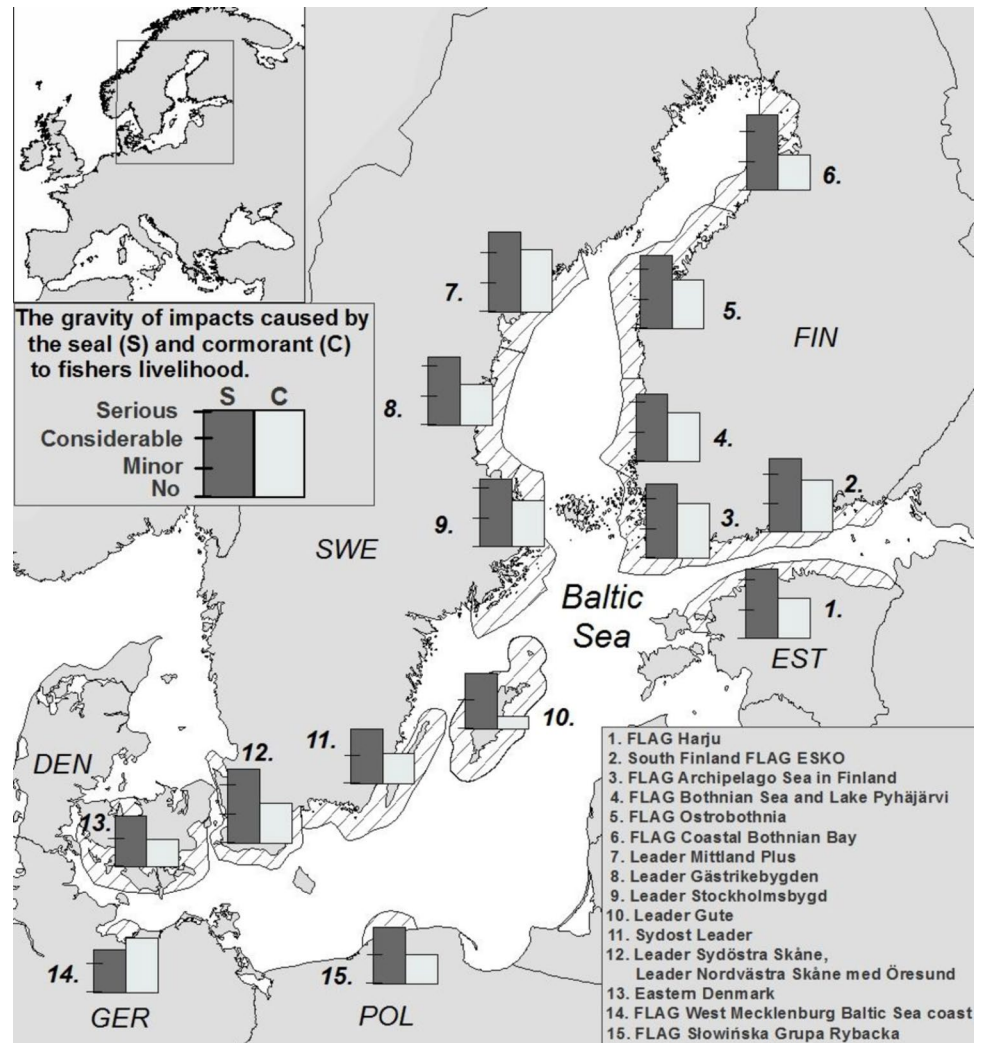
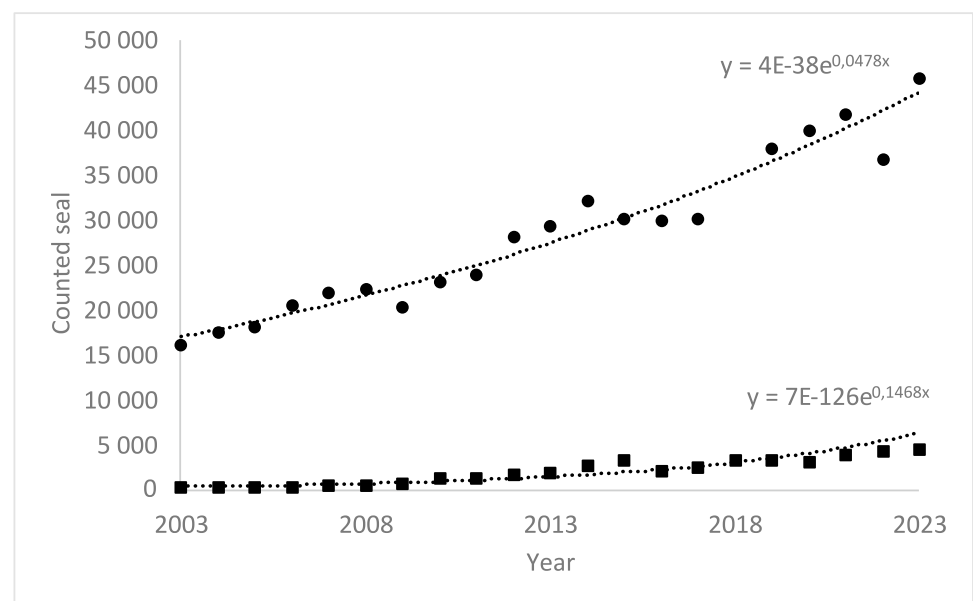


Fig. 2 Number of grey seals counted in joint inventories in 2003–2023 in the entire Baltic Sea (dots) and in southern Baltic only (squares). The dotted lines show the exponential regression (built on Suuronen et al. 2023 with additionally data from 2022 and 2023)



et al. 2013). These governance measures are still in use. In the past, local opportunities to manage animal populations were typically wider than today. In Finland seal hunting was still encouraged by the state in the early 1970s through a bounty system, but since the mid-1970s seal protection has progressed rapidly as environmentalism took a stronger hold over society (Varjopuro 2011). In Sweden grey seal hunting was banned from 1975 onwards in the Baltic, apart from culling for the protection of fishing gear, which was completely stopped in 1988 (Bruckmeier et al. 2013). Grey seal hunting that aims at protecting the fisheries was reintroduced in Finland 1997, in Sweden 2001 and in Estonia 2015 (Suuronen et al. 2012).

In early 2000s, one of the strategies in place for mitigating the seal-fishery conflict consisted of revitalizing the traditions of grey seal hunting and utilization of the hunted seals. Seals were considered as challenging the future of the fishing livelihood, but they were also regaining their value as a natural resource. Projects were arranged in Finland and Sweden to educate hunters to make protective hunting efficient and ethical, and on how to utilize the hunted seal as a resource. Moreover, a transboundary project between Finland and Sweden, managed by the Kvarken Council, initiated collaboration between authorities from fishery, hunting and nature conservation sectors, regional fishers', and hunters' organizations (Bruckmeier et al. 2013).

However, the most important development has taken place not at the local level but at the regional and international level. Surrounding the Baltic Sea all coastal states, except Russia, are part of the European Union (EU) binding them to law that is made outside of the remit of their national legislative bodies, albeit still through a democratic representative process. It was at the level of European institutions that a piece of legislation came to ban the trade of commercial seal products within the territory of EU member states (European Parliament and Council 2009). This legislation was developed in response to longstanding concerns about the welfare of seals in commercial hunts (Sellheim 2016). These concerns had already led to the adoption of legislation at the same level of governance which restricted imports of products derived from newborn harp seals and hooded seals (Council of European Communities 1983). The legislation enacted in 2009 was thus introduced as a more comprehensive measure following the resurgence of Canada's seal hunt in the 1990s, which was driven by efforts to address declines in fish stocks (Livernois 2010).

Very importantly, the 2009 ban was not enacted just as a natural resource management strategy, but also on the basis of moral grounds, as the species was seen as having a special standing among others. Despite challenges from Canada and Norway, the World Trade Organization upheld the EU's right to maintain the ban on such moral grounds in 2014, recognizing animal welfare as a legitimate basis for trade

restrictions (World Trade Organization 2014). However, critical voices were lifted on the lack of emphasis on the degree of recognition of commercial sealing as a livelihood and also on the role of anti-sealing groups that may have contributed to a pre-determined stance on the commercial seal hunt during the policymaking process (Sellheim 2013). Burke (2023) views anti-sealing groups as having played a significant role in shaping public and political opposition to sealing, often through the use of sensationalized narratives and misinformation and criticizes these groups for failing to consider the cultural, economic, and environmental realities of Indigenous and coastal communities. Since the ban's implementation, the scale of the seal hunt in Europe has decreased. The legislation remains a key tool in the EU's approach to animal welfare and trade, balancing the protection of seal populations with considerations of public morality.

The final part of this section studies the possibilities and obstacles in utilizing the currently available measures for seal-fisheries conflict mitigation. For this purpose, the measures are divided into four groups: technical solutions for reducing seal-induced catch and gear damages; hunting and other human activities that affect the behaviour and abundance of seals; economic measures used to support fishers' capability to cope with seal induced challenges; and institutional and policy measures in mitigating the seal-fishery conflicts.

Technological development

Local cooperation between fishers, researchers and technical experts has created practical context-dependent innovations (Salmi 2009) and developed *seal-proof fishing equipment* to minimize the seal-induced problems in coastal fishing. In particular, they have innovated the pontoon trap (Suuronen et al. 2006; Hemmingsson et al. 2008), which is presently a common trap net design utilized in many coastal areas along the northern Baltic Sea. The gear has a seal-proof fish chamber made of a double wall of firmly stretched netting of extra-strong polyethylene material. The structure of the pontoon-trap prevents seals entering the chamber but allows fish to enter.

Due to the diversity of Baltic Sea fisheries and their circumstances, a gear design may be successful in conflict mitigation in one coastal setting, but inefficient in another. The pontoon trap has become successful on coastal fisheries targeting especially salmon and European whitefish. However, damages caused by seals cannot be completely avoided. Although the fish chamber of a pontoon trap is seal-proof, seals catch fish and disturb the capture process in the other parts of the trap net and in the vicinity of the gear (Lunneryd et al. 2003; Fjälling et al. 2006). There is necessary no adaptive learning involved in this behaviour pattern. Seals are

after the fish that are in the trap-net. Because their access to the eventual fish chamber of a pontoon trap is prevented by various types of technical solutions, it is natural that seals try to catch the fish that are swimming towards the fish chamber. There can be plenty of fish inside the wings of a trap-net aiming towards chamber and these parts of a trap-net cannot be made seal-proof. Seals are intelligent animals when it comes to obtaining food. It has been shown that it is the same seals that have learnt to return to the fishing gear to depredate on the catch (Königson et al. 2013). There is a constant race between gear developers and the seal as new trap net designs are being developed.

Even though technological development has been successful in some fisheries, e.g. the salmon fisheries with pontoon-trap, new alternative gears are needed for multiple fisheries targeting multiple species as the conflict between seals and fisheries affect nearly all types of passive gears used in small-scale fisheries in the Baltic. Gillnets which are vulnerable for seal-induced damages and widely used for many target species in the Baltic due to its low cost and flexibility. In the southern Baltic Sea, there has been a development concerning the use of pots, a cage-like device, as a potential alternative to gillnets for targeting cod, with the aim of reducing depredation on cod by seals and pots have been shown to provide a seal-safe alternative (Königson et al. 2015; Ljungberg et al. 2022). Pots can be made seal-safe because the catch is kept in a closed compartment framed by a solid construction and in materials withstanding seal damage. Additionally, pots are considered to be environmentally friendly compared to for example trawl fisheries as they are considered a fuel-efficient type of gear that minimally impacts the bottom substrate (Suuronen et al. 2012). Furthermore, pots can be tailored to be species and size selective, thereby reducing bycatch of non-target species or undersized target species. However, the collapse of the cod stock has impeded the implementation of pot fishing since the cod fisheries is forbidden or only allowed as bycatch.

Because modifying fishing gear has turned out to be insufficient for minimizing the seal-induced problems, lately the technological development activities have focused on *seal deterrents*, providing a promising new type of technological solution (Lehtonen et al. 2023). Acoustic deterrent devices (ADDs) produce sounds of high enough intensity to cause discomfort in the seals that enter the vicinity of the gear where an ADD is mounted (e.g., Götz and Janik 2013). Hence, ADD offers a potential way to discourage seals from entering the vicinity of the gear. Deterrent devices can be used in the vicinity of a fishing gear (Vetemaa et al. 2021), or the equipment may help preventing the seals enter a *seal-free fishing area* in archipelagos, inshore bay areas and river mouths. Lehtonen et al. (2023) have tested creating these areas by “closing” straits to shallow inshore areas from seals by using seabed-mounted acoustic seal deterrent devices.

This measure requires specific settings and can therefore be implemented only in limited locations of the coastal areas. The experiments suggest that seabed-mounting would be a technically feasible method to discourage seals from entering through straits into inshore bay areas.

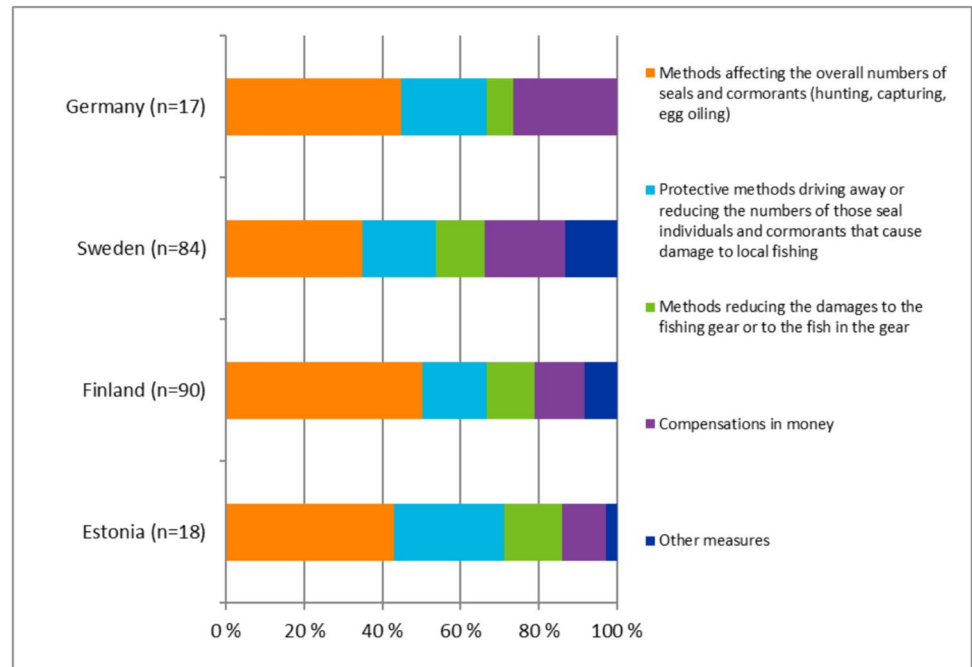
The development of using seal deterrents in the vicinity of a fishing gear gives promises for alleviating the seal-induced losses in trap net fisheries. Lehtonen et al. (2022) have observed markedly improved salmon catches in pontoon traps that were equipped with seal deterrent. On the other hand, in Estonia the yearly costs related to the use of seal deterrents are considered too high, as at the same time revenues of coastal fisheries are declining (Svels et al. 2022). Thus, even if the use of deterrents can be a technical solution, this is not economically viable in the long run. In parallel with the growing seal population nearly every trap net would soon need a seal deterrent. Implementing ADD systems for every fishing trap would drastically increase operational costs, making the fishing industry unsustainable without significant financial support from subsidies.

However, trap net fishing is still possible for many fishers thanks to the development of both gear modifications and seal deterrents - and subsidies for fishers to invest in these technologies. But these measures have helped the fishers' situation only partially. A potential alternative strategy to avoid seal damage is to use *active fishing gear*, such as seine nets or trawls, instead of passive gear such as gill nets or trap nets. Active gear seldom suffers from serious seal damage, but the profitability of new fishing strategies is insecure and may require investments that are unreachable for small-scale fishers. At the same time, in most coastal areas of the Estonia trawling and seining is not possible due to the shallowness and stony bottom.

Seal hunting and utilization

In the TNC project (2018–2019) the Estonian, Finnish, Swedish and German coastal fishers regarded methods affecting the overall numbers of seals and cormorants as the most functional measure to tackle with the problems (Fig. 3). Many fishers deemed protective measures that deter or reduce the numbers of seals and cormorants causing damage to local fishing as crucial. In contrast, methods designed to minimize damage to fishing gear or the fish within it were generally less favoured, despite significant efforts to create more durable seal-safe gear. A clear result was that fishers consider *seal hunting* as the most effective conflict mitigation measure (Svels et al. 2019). However, hunting of the grey seal is either prohibited or restricted in many ways along the Baltic Sea coastal areas. The alternative ‘Protective methods driving away or reducing the numbers of those seal individuals and cormorants that cause damage to local fishing’ was also found important by many. Usually, the

Fig. 3 Distribution of the most popular measures for mitigating seal and cormorant induced problems among German, Swedish, Finnish, and Estonian coastal fishers in the studied Fisheries Local Action Groups (Svels et al. 2019)



‘Methods reducing the damages to the fishing gear or to the fish in the gear’ were least popular, although much effort has been put in developing stronger seal-safe fishing gears. Additionally, Estonian fishers considered financial compensation the least effective solution for addressing problems caused by seals and cormorants.

Seal-induced catch loss and gear damages have increased also in the southern parts of the Baltic Sea with a growing number of seals. In the southern Baltic Sea countries, the seals are usually protected and for instance in Denmark derogation permits for hunting are difficult to implement due to time-consuming bureaucratic procedures (Svels et al. 2022). In Estonia, the existing large protection areas and hunting rules for seal hunting make it difficult to hunt seals, which has resulted in only approximately 20 animals being shot annually (Suuronen et al. 2023).

Citizens in many parts of the Arctic and Baltic Sea region resist seal hunting and NGOs have campaigned against the use of products processed from marine mammals (Burke 2021; Svels et al. 2022). This has affected seal policies and opportunities in many countries. Launching of the EU directive that banned the trade of seal products in 2009, provided a major weakening of opportunities to reconcile the seal-fisheries problems in the Baltic Sea. This is because the seals’ value as a natural resource and motivation for hunting was reduced, which in turn decreased the potential of hunting as a management measure (Svels et al. 2022).

The adoption of laws and policies at the supranational level further constrains the realm of possibilities for Baltic coastal states who are members of the European Union. Field-based data collected during the research project

RESOCO (2020–2022) suggests that perceptions about wildlife vary greatly between different Member States; anecdotal evidence was the estranged reaction of German tourists to the Danish policy of culling sick seals causing public nuisance instead of providing them with veterinary treatment. This goes to illustrate how there is a problem of scale in the governance of the seal conservation–fishery conflict. Certain cultures who are not familiar with seals have an idealized fondness of their existence while cultures where they abound are more realistic about the inconvenience of their numbers. The same can be said about wildlife hunting in general, which means that attitudes towards the activity itself varies greatly from nation to nation, and especially from urban to rural areas and if it is done for subsistence or for economic gain. However, as the current arrangement is set up by legislative bodies representing all citizens, an averaging of the sensibilities takes place, meaning in practice that there is in practice a great distance between who sets the rule and who experiences it. One may be led to believe that the current rule is a fair balance, since hunting is not prohibited but economically unviable due to the trade ban. However, the literature suggests that the seals’ value as a natural resource and motivation for hunting was reduced, which in turn decreased the potential of hunting as a management measure. Thus, one may instead conclude that regulating this matter at the level of the EU limits the diversity of methods and strategies for stakeholders and lawmakers in the context of the Baltic Sea to manage this natural resource and thus to adequately govern this conflict of interest (Svels et al. 2022).

Although the EU trade ban on seal products has effectively taken most of the economic value away from seals, the

seal can still be a valuable part of the hunter's own household and the catch considered a valued resource (Svels et al. 2022). In the autonomous region of Åland, this is mainly fostered by NGOs and supported by the local government. Consequently, interest in seal hunting and the utilization of seals as a resource has increased and especially among young people there is growing interest in seal hunting as part of their cultural heritage. In the law regulating hunting in the Åland Islands, it is also stated that all edible game must be utilized (Ålex 1985, § 53). The parts of seals that are utilized include blubber for oil, the skin, and the meat for food. Seal meat is considered a delicacy if handled correctly and can be prepared in many ways (Ziegler et al. 2021; Svels et al. 2022).

According to Svels et al. (2022) public acceptability of *protective hunting*, targeted hunting which occurs near the fishing gear, is higher than hunting that controls the overall seal population. Fishers often claim that restoring seals' timid behaviour, caused by hunting, would keep seals in distance from human activities and reduce seal-induced damage to fisheries. On the one hand, protective hunting is viewed by fishers as time consuming, complicated and a temporary measure (Salmi et al. 2022) and this is why fishers prefer measures affecting overall seal population. According to fishers, a new seal arrives in a few days to continue emptying the fishing gear after elimination of the previous one (Salmi et al. 2022).

Economic measures

Economic support helps coastal fishers invest in new technologies that aim at reducing seals' effects on livelihoods. Indeed, due to the low profitability and fishers' limited funds available for investments, public economic support is a prerequisite for developing the technologies and putting the new expensive innovations to use (Svels et al. 2022). Without sufficient *investment support*, expensive technical tools can rarely be adopted by the fishers (Salmi et al. 2022). In Finland and Estonia, EU funds have been channelled towards supporting fishers' investments in seal-proof fishing gear and recently also seal deterrent devices. This compensation covers 50–80% of the total sum and requires co-operation with the Natural Resources Institute Finland (Luke) in monitoring and development. In Estonia, fishers receive 80% reimbursement for investments in seal deterrents (Svels et al. 2022). In Sweden also fishers receive 80% reimbursement but 2024 the funds were overdrawn, and no new funding will appear before 2027 (Swedish Board of Agriculture 2024). In Denmark, the possibility for a compensation fund for Bornholm fishermen's seal-induced damage to catch and gear was rejected by the Government after a request which explicitly mentioned the example of Swedish state practice (Ministeriet for Fødevarer, Landbrug og Fiskeri 2021).

Economic compensations and so-called *tolerance payments* function as measures for helping fishers continue their livelihood, although fishers would prefer a solution that does not compromise their ability to deliver fish to consumers or function only as a short-term solution (Waldo et al. 2020; Svels et al. 2022). The tolerance payment refers to payments that helps fishers to tolerate the situation where the seals decrease their profitability. In Finland, the sum is defined in relation to fisher's fishing income, because accurate calculations of the actual economic losses are nearly impossible to make (Salmi et al. 2022). Economic compensation for calculated seal-induced losses is difficult to implement in capture fisheries because of the hidden damages and heavy additional work involved when each fisher should monitor and estimate the multiple economic losses. The tolerance payment system being based on the value of the catch makes it easier to implement.

At present, due to the trade ban of seal products, most of the seal carcasses cannot be utilized, a compensation system for *appropriate removal of seal individuals* has been developed. In Finland this system has been applied to compensate the fishers for costs of the proper handling of male seals removed from trap nets, gill nets or fish farming facilities (Svels et al. 2022). This payment can be used only to support handling and transportation of removed seals and have been paid annually for more than one hundred grey seals (Ministry of Agriculture and Forestry 2023). The aim in the long run is to decrease seal visits to gear and support fishers' opportunities to remove the most problematic seals. A similar system is under development in Sweden with a fee to transport seal carcasses to destruction sites or bioenergy use (Swedish Board of Agriculture 2024).

Policy measures

As the core tensions in human-wildlife conflict situations are societal, the use of institutional and policy measures is critical. These instruments are typically national or international and often aim at protection of the seal rather than at mitigating the struggle. *Seal conservation areas* can be regarded a result of spatial planning merely designed for seal protection purposes, without due consideration for the social aspects of seal management. For example, along the Swedish coast, a majority of the most important haul-out or resting islands for seals are protected areas, especially in the southern Baltic; in Finland, there are eight seal conservation areas, established from the beginning of 1998 when seal populations were still relatively small (Ministry of Agriculture and Forestry 2007).

The international framework for governing the management of grey seal population is hierarchic, ambiguous and lacks consideration of coastal communities and fisheries aspects (Suuronen et al. 2023). According to Suuronen et al. (2023) the management criteria for seals established

by HELCOM and the EU diverge from the goals of the EU CFP that seek to ensure a reasonable standard of living for those dependent on the fishing industry. While motivated by moral considerations, namely the welfare of seal hunting, the EU ban on trade in seal products is today a very impactful institutional barrier for mitigating the seal-fishery conflict taking place in the Baltic Sea. The ban restricts the economic use of hunted seals as a resource and decrease opportunities for local management of problematic seal individuals near fishing gear, and thus the management of the wider seal population.

Measures based on communication and collaboration between authorities and locals are commonly used to mitigate conflict in human-wildlife issues (Johansson et al. 2017). However, to be successful, these measures require stakeholder trust in the managing authorities (Waldo et al. 2020), and long-term commitment of stakeholders (Butler et al. 2015). Balanced research efforts (e.g., social science, biological and economic studies) and the spread of information could benefit the situation. *Partnerships and collaboration* between fishers, researchers and developers produce knowledge about seal-induced effects on livelihoods and create new innovations for mitigating the seal problems of fishers. In Finland for instance, successful co-production projects have already been carried out when developing technological measures such as seal-proof trap nets or seal deterrent devices. Coastal fishers and researchers have not only co-produced useful solutions, but the collaborative process has also strengthened fishers' trust in the researchers' roles in supporting fishers' livelihoods (Setälä and Salmi 2022).

In addition to collaboration in knowledge creation, measures fostering the use of local involvement and knowledge are central. National participatory *seal management plans* can improve the situation by reconciliation and triggering practical application of the above-described variety of measures; in general, the plans are developed with the involvement by governmental agencies, scientists, hunting and fisheries organizations, conservation organizations, and local communities. Planning processes may help in understanding the positions of interest groups and in finding a common view of the struggle and justice perspectives, and co-designing measures for its management, but also in involving local expertise for implementation. Seal management plans for the Baltic Sea have been published in Finland, Åland Islands, Sweden and Denmark (Svels et al. 2022). Estonia also has a management plan for grey seals but according to the fisheries sector it has shown limited potential to solve seal-related conflicts. However, several Baltic Sea countries lack seal management plans or have such plans under development (e.g. Germany, Poland, Russia, Latvia and Lithuania).

As mentioned above ([Struggle with seal impacts and action](#) section) the Baltic Sea coastal fishers and FLAGs

have also taken their fate in their own hands and aimed at improving their *social struggle and social justice* by increasing wider understanding of fishers' dire situation and influencing the EU commission. The representatives of the project gave presentations in several international meetings and in 2019 the project sent an open letter to the fisheries ministers of EU member states in the Baltic Sea Region and to the MP candidates for election in 2019. A seminar "*The future of Baltic Sea small-scale fisheries: tackling the increasing impact of seals' and cormorants' predation - Conclusions and recommendations of the Baltic Sea Seal and Cormorant TNC project*" was arranged in May 2021 (Baltic Sea fisheries 2023) discussing the seal- and cormorant-induced socio-economic impacts, possible conflict mitigation measures, and necessary actions that needed to be taken by different decision-making levels to protect the Baltic small-scale coastal fisheries sector and to preserve opportunities for inhabitants to buy and eat locally caught fresh fish.

Discussion

In 20 years, opportunities, and constraints for mitigating the Baltic Sea wide contradictions and struggle between coastal fisheries and grey seal protection have partly changed, but no breakthrough has been made. Measures to protect the seal population were secured (Suuronen et al. 2023) while, in spite of manifold actions, the applied measures to mitigate the seal-induced problems and revitalize the Baltic Sea coastal fisheries have been insufficient.

Numerous measures have been taken especially to overcome the seal-induced pragmatic problems and material deprivation faced by the coastal fishers. Since technology development chiefly represents a less aggressive attitude towards the grey seal, compared with hunting, it is unsurprising that nature conservation stakeholder groups have strongly favoured this type of mitigation measure (Varjopuro 2011; Salmi et al. 2022). Consequently, development of *new gear technology* has become a popular measure that aims at enabling both seal and fisher to co-exist in some degree of harmony. Indeed, the development of gear technology has helped many, but the seal's ability to learn has become an obstacle for achieving an effective solution in trap net fisheries (Königson et al. 2013). New gear modifications require public support because investments are high. Moreover, the popular gill net fisheries continue to suffer from the seal-induced problems as they do not benefit from the gear development.

Seal deterrents form a novel opportunity that may become part of the solution towards better co-existence of the seal and the Baltic Sea coastal fisheries. Channelling public economic support for using seal deterrents is important, because deterrents may be the core technological conflict mitigation

measure in the years to come. The deterrent devices have developed quickly, which helps spread these innovations (Salmi et al. 2022). To enable continuation, fishers are also to some extent financially compensated for the consequences of seal conservation policies. In providing technological solutions for the conflict, the development costs and investment subsidies are essential, but economic compensation for losses, or the tolerance payment system, can be seen as a temporary measure to be used until more efficient measures that help prevent seal-induced losses become available.

Along the years many coastal fishers have *left the fisheries occupation* and Blomquist and Waldo (2021) show that seal interaction is an important explanatory factor. The remaining ones have adopted various coping strategies, e.g. searching for new fishing areas, including more shallow waters, and changing timing and increased frequency of fishing activities, changing gear and target species (Salmi et al. 2022; Johansson and Waldo 2020). Moreover, as the landings have become smaller, fishers have *added the value of the landings by self-processing* of fish and selling the products directly to consumers. Many fishers have increased their yearly income by working in other jobs outside the fishing season. On one hand, the room for adaptation has been modest because of the serious consequences of the seal-induced losses. On the other hand, without fishers' own reactions and *publicly funded technological measures and compensation payments* executed in many the Baltic Sea regions so far, the number of coastal fishers would undoubtedly be smaller.

Despite fishers' and local communities' attempts to cope with the seal-induced challenges, things have often gone worse, and fishers' frustration has increased. Fishers and their supporters have shown signs of *collective activism* grown out of their social struggle and an appeal for social justice as they joined forces for making a change with the TNC project. This network enhanced wider awareness of small-scale fishers' circumstances by inserting lobbying actions in the EU. However, it did not lead to major steps forward in balancing the contradictions, nor reflecting the commercial fishers' marginalized power position (e.g., Salmi and Mellanoura 2020), yet has spread like ripples, years later, with several local follow-up projects.

The decision to govern natural resources at the international level, namely by recourse to European Union legislation, limits the possibility for state and local authorities to address human struggles resulting from seal *conservation goals*. The increased non-local pressures, namely institutional and regulatory constraints, have diminished the local ability in taking action to improve coastal communities' and fishers' situation; namely, it is submitted that there is a struggle with the consequences of the EU trade ban on seals that should not be overlooked when considering the objectives of wildlife conservation. Fishers call for wider opportunities for hunting seals as the primary method for mitigating

their losses. They also hold that killed animals should be seen as a resource instead of just a harm, but the EU legislation prevents that from happening. The EU has thus reduced hunting motivation at the local level and prevented the use of hunting as a measure to mitigate the seal-fishery conflict; that notwithstanding, in Åland and Sweden hunted seals are utilized locally (Svels et al. 2022).

Resolving conflicting situations between humans and wildlife requires multilateral interaction and stakeholder participation (Saarikoski et al. 2024; Rauschmayer 2013). To mitigate the seal-induced conflict, planning processes, especially *national management plans*, should focus on approaches that facilitate local and regional solutions and a set of measures that catalyse a shift towards an *improved balance between the fisheries sector and environmental protection interests*. Management plans should be able to identify features that increase the sensitivity to power asymmetries in planning situations (Peltola et al. 2022). Participatory methods are essential not only for conflict mitigation but also as a democratic value in itself.

The main challenge found to resolve the social struggles and injustice and bring it to a good coexistence status is *governance*. The rules applicable to the conflict were designed for a different ecological and socioeconomic situation. This is leading to contestation from certain actors, who are coalescing around research projects to challenge dominant discourses, namely those around the fragility of seals. One key hurdle in this multilayered governance arrangement is the overarching restrictive norm-setting of the EU, which reflects discourses that are not exclusively inspired from the Baltic Sea context. This paper submits that a bottom-up approach to change in this governance arrangement can already be seen by the multiple research initiatives that have a clear dissemination element, whereby policymakers become aware of the changing ecological reality.

Another major challenge is the disconnection between environmental management and resource exploitation at sea, namely fisheries. At present, the *two policy arrangements* are kept separate and little *dialogue* exists between them both at EU and national levels. One proposed solution for this challenge is the continued co-production of knowledge, whereby actors at the local level may be involved and provide data, in the shape of experiences and perceptions. This paper demonstrates how such projects have had a positive effect in creating coalitions and building trust between parties with a view of mitigating existing contradictions and attenuating the effects of the struggle and injustice human-wildlife situations have created. There is already an argument for the success with relation to the development and funding of new technologies, but as seen from the sheer fact that seals learn faster than new technology is implemented, further remains to be done to structurally resolve the conflict at the policymaking level. Moreover, as circumstances,

fishing strategies and the seal-induced problems vary, the mix of conflict mitigation measures (Bruckmeier et al. 2013) should be applied to the regional context in question.

Conclusions

Today, despite various technological solutions and support-mechanisms developed and applied, the seal-fisheries situation remain increasingly serious. The long-lasting contradictory situation has resulted in deep frustrations among fishery folks and is contesting the legitimacy of public administration and research. Ways forward entail finding a better balance in applying combinations of several types of measures for mitigation. Seal deterrents give hope as an additional measure along with seal-proof gear but can provide only partial relief. Moreover, technological developments require different types of funding from the society. In order to relieve the studied social struggle, more emphasis should be given to relieving the problems related to social justice and locally based collective action. It necessitates a change of governance ideals and arrangements towards more balanced empowerment of coastal fisheries and localities, parallel with encouragement of local activism. There is a need to reconsider the policies and institutional structures that set the frame for enabling future co-existence.

We conclude that co-existence of coastal fisheries and the grey seal in the Baltic Sea is possible, but it necessitates political will, international planning, and further development of the measures. Reaching co-existence is timely, because – unlike the seal – the diverse coastal fishing culture in the Baltic Sea is increasingly endangered. There is a need to initiate and emphasise local participation at various levels of stakeholders to catalyse a change that relieves the fishers' feelings of injustice. Moreover, to facilitate the design of regional and local measures, and their planning and operationalization, Baltic Sea states and regional authorities should promote Baltic Sea wide dialogue and research. This could lead to undertaking a seal management plan covering the Baltic Sea. From the fisheries sector's point of view, influencing the size of the seal population is a logical solution, yet future supervision of changes in the seal population is crucial for maintaining a balanced seal population in the Baltic Sea.

More recently, however, there seems to be a potential change in the governance of this conflict. In a response to a Member of the European Parliament's inquiry in early 2024 regarding the adverse effects of the ban on trade in seal products on Sweden's fishing industry, and when asked to reconsider the possibility of lifting the seal trade ban, the European Commission indicated that it would undertake a comprehensive fitness check of the regulation on Trade in Seal Products, as well as the Seal Pups Directive (European

Parliament 2024). This review process is expected to encompass a broad spectrum of consultations, including a call for evidence and a public consultation, along with targeted discussions involving key stakeholders such as selected Member States, recognized bodies in Canada and Greenland, relevant public authorities in Norway, and various organizations representing fishermen, seal hunters, conservationists, and animal welfare advocates. The findings from this fitness check will guide the Commission in determining whether any additional measures or adjustments to the existing regulatory framework are warranted.

The lifting of the EU trade ban as a regional derogation would allow seal products to be made available as a resource on a small scale across the Baltic Sea coastal areas. It would allow the management of seal populations in such a way that they can be used in a versatile and sustainable way as a renewable natural resource. Such an approach would have a highly positive impact on the problem, as the trade ban is a major obstacle to increase the sustainable exploitation of seal populations. Thus, it should be a common goal for the Baltic Sea states in the near future to, at least, have regional exemptions to allow for hunting as a species management tool, without removing the economic incentives associated with the exploitation of such resources.

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Declarations

Competing interests The authors have no competing interests to declare that are relevant to the content of this article. The views and opinions expressed herein are those of the authors and do not necessarily reflect those of their affiliations.

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