

Pausing for reflection to make progress: An assessment framework for ethical discussions on innovations in fisheries

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INTRODUCTION

The research and development of technology in the field of fisheries aims to address the issues and concerns with which the industry is currently confronted. A recent example is a research project that aimed to develop specific technology to take account of product quality and fish welfare. The step to include welfare as a motivation for developing specific technology in this field is relatively novel and this theme has received little attention in research and development thus far (Huntingford *et al.*, 2006; Lambooi *et al.*, 2012; Metcalfe, 2009). One reason for this lack of attention may relate to the diversity of views surrounding the moral position of fish and our duties towards them that follow, which links to the scientific discussion on the capacity for pain perception in fish (Bovenkerk & Meijboom, 2020). Nevertheless, despite this debate there are significant motivations, from both a moral and practical perspective, to explore the impacts of commercial fisheries processes on fish and their welfare (Evans, 2009; Kaiser & Huntingford, 2009; Metcalfe, 2009) and to address these issues and concerns through technological development, *i.e.*, developing new and improving on existing methods.

A CASE STUDY OF TECHNOLOGICAL INNOVATION IN FISHERIES

The mentioned research project refers to the demersal trawl fishery operation for whitefish species in Norway as a case study and focused

on proposing concepts for the capture and slaughter phases of this fishery operation. More specifically, the proposal for the first concept was to develop a gentler capture method by altering the design of the trawl cod-end. The idea was that this modified design would allow the captured fish more space and exposure to calmer flow conditions inside the cod-end, potentially reducing stress, exhaustion and mechanical damage (Gjøsund *et al.*, 2011). The proposal for the second concept was to develop a more humane slaughter method by assessing the application of electrical stunning in water while pumping the fish onboard the vessel (Erikson and van de Vis, personal communication, 2018).

THE LINK BETWEEN ETHICS AND INNOVATION

Given that innovations, in any context, strive for change and often for improvement, they include ideas about what is desirable and should be promoted, and what is undesirable and should be prevented. As such, the process of technological innovation is not morally neutral (de Kreuk *et al.*, 2009; Fontrodona, 2013) and is linked to all kinds of values (Wright, 2011). This normative characteristic of innovation has the potential to raise ethical questions and requires those professionals involved in the research and development of technology to make decisions on moral matters.

In the context of the case study, these questions are about whether and how ethical and societal issues ought to be included in

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FIGURE 1 Presentation of the proposed ethical assessment framework. The table represents the first component of the framework and the box below represents the second component

		Evaluation							
Interest group	Values & Principles	Operationalization	What is the impact of the innovation on [examples]?	Score			Would modifying the innovation make a difference to the score? Yes or No	Are there any general or public concerns related to this item?	
				Positive	Neutral	Negative			
Fish	Animal welfare	Humane / 'good' treatment of the individual animal – attention to natural living, the biological functioning, health and affective state of the animal	<ul style="list-style-type: none"> The pain and stress experienced by the individual Oxygen deficiency experienced by the individual 						
	Animals' intrinsic value	Respect for the individual animal as 'an end in themselves'	<ul style="list-style-type: none"> The problem of animal instrumentalization – value as a natural resource only, rather than a living being in itself 						
	Animal integrity	Respect for the 'wholeness' of an individual animal, resulting in it flourishing in its own characteristic way	<ul style="list-style-type: none"> The injuries and (tissue) damage sustained by the animal 						
	Relational value	Human-animal bond resulting in (a-specific) care	<ul style="list-style-type: none"> The human-animal relationship 						
	Value of life	Respect for the rights of the animal to continue its life	<ul style="list-style-type: none"> The mortality of target individuals and escapees 						
Human	Cultural value	Attention to the habits and opinions of people based on their cultural background and traditions	<ul style="list-style-type: none"> The traditional fishing methods and practices 						
	Economic value	Analysing the costs and benefits	<ul style="list-style-type: none"> The quality and value of the product – resulting in a higher price in a competitive market The efficiency of the fisheries operation The costs associated with investment, implementation and maintenance 						
	Health and Safety	Attention to the physical and mental well-being of employees	<ul style="list-style-type: none"> The physical workload and safety associated with implementation and maintenance The time and energy used on implementation and maintenance 						
	Inter-generational justice	Responsible harvesting in a non-wasteful manner	<ul style="list-style-type: none"> The livelihoods of future generations Food security for future generations 						
	Professional autonomy	Providing room for independent decision-making	<ul style="list-style-type: none"> The freedom to make decisions about fishing methods and practices – choice whether to adopt (new) technology 						
	Professional integrity	Acting virtuously leading to care for the well-being of animals and ecosystem	<ul style="list-style-type: none"> The practice of being a 'good' professional in the fisheries industry 						
	Social responsibility	Acting for the benefit of society (and environment) as a whole	<ul style="list-style-type: none"> Contributing to the local community – creating fulfilling employment Providing food security 						
	Food quality	Providing the quality characteristics that are acceptable to consumers	<ul style="list-style-type: none"> The nutritional composition, visual appearance and taste of the product 						
	Food safety & security	Providing a sufficient amount of healthy food for human consumption	<ul style="list-style-type: none"> The health risks associated with the product The quantity of the product 						
	Respect for public opinion	Taking account of the views and perceptions of (the majority of) society – citizens, consumers, researchers, NGO's, etc.	<ul style="list-style-type: none"> The opinions of society on the problem of animal instrumentalization The opinions of society on the humanity of fishing methods and practices The concerns of society for the environment Consumers concerns for their own health 						
	Ecosystem	Ecosystem integrity	The 'intactness' and 'completeness' of the ecosystem	<ul style="list-style-type: none"> The diversity of species, habitats and environments – biodiversity 					
		Ecological value	The role of each species as part of the ecosystem	<ul style="list-style-type: none"> The health and productivity of populations of different species 					
Natures' intrinsic value		Respect for nature for its own sake	<ul style="list-style-type: none"> The problem of the instrumentalization of nature as a resource 						
Relational value		Emotional bond of humans with the ecosystem, resulting in respect and care for nature	<ul style="list-style-type: none"> The relationship between humans and the ecosystem 						
Self-realization of nature		Allowing nature to unfold and flourish in its own way	<ul style="list-style-type: none"> Human interference and exploitation of natural resources 						

Outcome

1. Dilemmas:
Are there any dilemmas that result from the discussion?
What are the elements of this dilemma?

2. Legal framework:
Are there any concerns about the current laws and regulations?
Are there any concerns with regard to practical feasibility?

3. Modifications:
Does the assessment result in any reasons to modify the innovation?
If so, what points are in need of further improvement?
Is it feasible to make these modifications?

4. Conclusion:
Is it possible to come to a final conclusion (overall positive or overall negative) from the discussion?
If not, why not?

5. Relevance:
Is the innovation in line with current developments in the fisheries industry?
Does it contribute to the sustainability and social responsibility of the sector?

the proposed technologies, especially those related to fish and the ecosystem. Despite a certain degree of (public) consensus towards taking such issues into account, there are still questions about how to consider the interests of fish and the ecosystem in relation to those of humans (Lam, 2019). This calls for a careful and explicit assessment of the moral dimensions. However, this assessment process may not be self-evident and can be time-consuming, especially in this context where professionals are confronted with novel and complex issues. Therefore, it can be helpful to structure and support this process by using an ethical assessment framework.

WHY IS IT NECESSARY TO DEVELOP AN ETHICAL ASSESSMENT FRAMEWORK?

Assessment frameworks are characterized as practical methods that can assist in facilitating and structuring the ethical assessment process. They can help those involved reach an informed judgement by capturing the broad range of ethically relevant considerations of an issue (Beekman *et al.*, 2006; Beekman & Brom, 2007). Ethical assessment frameworks can have a range of different functions (Moula & Sandin, 2015). At one end of the spectrum they can function as decision-support tools that can provide guidance about what one should do. At the other end of the spectrum they can be used as heuristic tools that can broaden the ethical discussion by identifying issues that require reflection and attention.

Various methods have already been proposed, developed and discussed for different fields and contexts (Kaiser, 2006; Millar, 2018; Stafleu *et al.*, 1999). However, frameworks devised for application to cases of technological innovation in fisheries are still lacking. Furthermore, as the discussion in the context of the case study is about the extent to which ethical and societal issues ought to be included in the proposed technologies, it was necessary to design a framework tailored to this specific purpose.

THE PROPOSED ASSESSMENT FRAMEWORK

The assessment framework that was developed for the described purpose is composed of two components (Figure 1). The first component is constructed as a table made up of several rows and columns, where each row presents a theme for discussion and each column represents a step in the process of discussion. The second component of the framework presents a set of concluding questions.

The aim of the first component is to encourage those involved to systematically discuss the issues and concerns that ought to be considered from the perspective of animals, humans and the ecosystem. These are at the level of broadly shared values and principles. The first column lists a set of predetermined and widely recognized values and principles that are at stake and reflect different dimensions of the ethical debate. They are differentiated according to three groups that represent for whom values and principles are considered: fish (animal), humans and the ecosystem. These values and principles are

characterized in the following two columns, first by defining how they are made operational and, second, by presenting examples of how the technologies may have an impact on them in practice. A subsequent column provides the opportunity to score whether a given innovation has a positive, negative or neutral impact on each of the considerations at stake. In instances of uncertainty about the level of impact, it is possible to indicate whether or not making modifications to an innovation may alter the score. Finally, any general or public concerns related to a certain value or principle can be discussed in the last column of the table.

The second component of the framework completes the discussion by determining whether or not it is possible to reach a conclusion about the desirability or undesirability of the proposed technology.

APPLICATION TO THE CASE STUDY

The main objective of the framework is to structure the assessment of the technological concepts proposed in the research project in a number of steps. An explanation of how the assessment framework works is given with a presentation of how the item on animal welfare can be discussed and evaluated.

The first step in discussing this item is ensuring a shared understanding about how it is defined in the context of the case study. The framework provides an operational definition for this item as the “humane or good treatment of the individual animal”. This is followed by establishing what impact the proposed concepts can have on animal welfare in practice. The framework suggests that a gentler cod-end or electrical stunning may have an impact on, for example, the pain and stress experienced by individuals. However, this point is open for discussion and participants are free to present additional or alternative examples. Based on the first step, each of the participants can then evaluate *how* the proposed concepts have an impact on animal welfare. This next step involves scoring whether they have either a positive, negative or neutral impact on, for example, the pain and stress experienced by individuals. For instance, the proposed concept for electrical stunning could be evaluated as having a positive impact on animal welfare. A line of reasoning could be that this method renders the fish unconscious before the slaughter process, thereby reducing stress, pain and exposure to anoxic conditions. At this stage, it is worth emphasizing that the evaluation of any of the values and principles is in comparison to the state-of-the-art in fisheries rather than to moral ideals. For example, the proposed concepts are evaluated relative to the standards for animal welfare that are currently accepted and used (Norwegian standards in this case study). Therefore, scoring positive, negative or neutral is in terms of whether there is an improvement or worsening of animal welfare by the proposed concepts, rather than whether they are “good” or “bad” for this value. Nonetheless, the framework provides room for more general concerns about animal welfare, or any of the other values, in the context of fisheries to be raised. Once a

consensus has been reached or the dissensus has been clarified regarding the evaluation of animal welfare, the next item on the list is examined following the same steps.

Eventually each item will have been examined, the result of which will be a checklist of scores. However, the aim is not about ending up with a list of scores. The aim of the framework is to enable a discussion and to identify at which points there may be consensus and where there may be a differentiation of opinion. Therefore, the arguments for consensus and dissensus will be important elements to take into consideration in reaching a final conclusion regarding the proposed concepts.

The assessment process of the proposed concepts is concluded by answering the closing questions. The first question is about the possibility to adapt the technological concepts in such a way that they better address the concerns that have been discussed. For instance, suppose that the positive impact of the innovations on animal welfare comes with potential safety risks for crew members handling such equipment. In that case, the framework stimulates an exploration about whether there are possibilities to reduce the safety risks or whether there is a genuine moral problem at stake. The following question refers to the wider context in which the proposed technological concepts are being developed. Even if they may have a generally positive impact on the values and principles at stake, it is important to discuss the potential practical and legal restrictions, and more general (public) opinions about the practice of fisheries. Furthermore, the assessment process may reveal reasons to make modifications to the proposed concepts. This may be relevant for those points at which there is uncertainty or where making modifications may improve the potential of the proposed concepts for having a positive impact on the values and principles at stake. Lastly, even if it is possible to come to a conclusion about the desirability or undesirability of the proposed concepts from an ethical perspective, it is still relevant to consider their position in a wider context. This includes questions related to the current sustainable development goals and the societal and political debates about the future of fisheries.

CONCLUSIONS AND FUTURE PERSPECTIVES

In conclusion, the function and focus of the assessment framework are defined:

- The function is to enable professionals to include ethical and societal concerns in the technologies proposed in the case study by discussing them in a systematic way.
- The focus is on structuring the discussion and broadening the debate about the moral considerations at stake in this context and supporting the professionals involved to make sense of the complexity surrounding that discussion.

As a result, the framework has the potential to raise awareness and encourage discussion about novel themes, especially with regards to those linked to animals and the ecosystem. Therefore, it can

increase inclusiveness by making these themes more explicit in the process of research and development. Although using this assessment framework will be time-consuming, it is asserted that it is important to pause for ethical reflection in the process of technological innovation. This does not hold only for the case study discussed here. Ethical reflection in fisheries, which this framework aims to enable and structure, is important for a wider context of technological innovations. It is essential to deal with the complexity at stake, include the perspectives of stakeholders in the innovation process and improve acceptance of a technological innovation.

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REFERENCES

- Beekman, V., de Bakker, E., Baranzke, H., Baune, O., Deblonde, M., Forsberg, E. M., ... Nielsen, A. P. (2006). *Ethical bio-technology assessment tools for agriculture and food production: Final report ethical bio-TA tools* (QLG6-CT-2002-02594). The Hague: LEI.
- Beekman, V., & Brom, F. W. (2007). Ethical tools to support systematic public deliberations about the ethical aspects of agricultural biotechnologies. *Journal of Agricultural and Environmental Ethics*, 20(1), 3–12.
- Bovenkerk, B., & Meijboom, F. (2020). Ethics and the welfare of fish. In *The welfare of fish* (pp. 19–42). Cham: Springer.
- Evans, J. C. (2009). The ethics of fish welfare. *Journal of Fish Biology*, 75(10), 2872–2874.
- Fontrudona, J. (2013). The relation between ethics and innovation. In *Social innovation* (pp. 23–33). Berlin: Springer.
- Huntingford, F. A., Adams, C., Braithwaite, V. A., Kadri, S., Pottinger, T. G., Sandøe, P., & Turnbull, J. F. (2006). Current issues in fish welfare. *Journal of Fish Biology*, 68(2), 332–372.
- Gjøsund, S. H., Hansen, K., Enerhaug, B., Grimaldo, E. & Sistiaga, M. (2011). Ny skånsom pose for trål og snurrevad (New gentle cod end for trawl and seine): SINTEF A22865 (SFH80 A103068)
- Kaiser, M. (2006). Practical ethics in search of a toolbox: Ethics of science and technology at the crossroads. *Ethics, Law and Society*, 2, 35–44.
- Kaiser, M. J., & Huntingford, F. A. (2009). Introduction to papers on fish welfare in commercial fisheries. *Journal of Fish Biology*, 75, 2852–2854.
- de Kreuk, M., van de Poel, I., Zwart, S. D., & van Loosdrecht, M. C. (2009). Ethics in innovation: Cooperation and tension. In *Philosophy and engineering* (pp. 215–226). Dordrecht: Springer.
- Lam, M. E. (2019). Seafood ethics: Reconciling human well-being with fish welfare. In B. Fischer (Ed.), *The Routledge handbook of animal ethics*. Abingdon: Routledge.
- Lambooi, E., Digre, H., Reimert, H. G. M., Aursand, I. G., Grimsmo, L., & van de Vis, J. W. (2012). Effects of on-board storage and electrical stunning of wild cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) on brain and heart activity. *Fisheries Research*, 127, 1–8.
- Metcalfe, J. D. (2009). Welfare in wild-capture marine fisheries. *Journal of Fish Biology*, 75, 2855–2861.
- Millar, K. (2018). Let's talk about veterinary ethics: Developing tools, finding spaces and recognising institutional responsibilities. *Veterinary Record*, 182, 662–663.
- Moula, P., & Sandin, P. (2015). Evaluating ethical tools. *Metaphilosophy*, 46(2), 263–279.

- Stafleu, F. R., Tramper, R., Vorstenbosch, J., & Joles, J. A. (1999). The ethical acceptability of animal experiments: A proposal for a system to support decision-making. *Laboratory Animals*, 33(3), 295–303.
- Wright, D. (2011). A framework for the ethical impact assessment of information technology. *Ethics and Information Technology*, 13(3), 199–226.

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