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Experimenting with care and cod: On document-practices, versions of care and fish as the new experimental animal

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Abstract

A key ambition in care studies has been to study care in practice and *as* practice. By turning towards practices, care studies has rendered visible and acknowledged important work that is not captured through looking at formal procedures or official and written materials, such as policy documents and medical protocols. In this literature, document materials and the written have often been seen as unable to demonstrate and address the 'specificities of care' (Mol et al., 2010, p. 9). We challenge this view by showing how pragmatically-oriented approaches can be extended to the procedural and formalized aspects of care practices. We draw upon fieldwork in the life sciences—comparative immunology—investigated through experiments on Atlantic cod (*Gadus Morhua*). How to care for fish is a contested domain; many uncertainties exist around how to care for fish so that legal requirements are met. We ask: How are existing legal and ethical principles and procedures put to work in cod immunology and animal research? By what document-practices and document-tools is care for cod in research negotiated and settled? How does the cod stand out as an object of care in the life sciences? Our article answers these questions by empirically teasing out how scientists navigate the terrain and arguing for the importance of bringing the document-based realities of animal research into analysis. We do this by delineating three different *versions* of care: procedural care, skilled care, and dispassionate care.

Keywords

care studies, document analysis, animal research, fish, laboratory studies

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With the 2010 publication *Care in Practice: On Tinkering in Clinics, Homes and Farms*, edited by Mol, Moser, and Pols, launched a research program for care studies in science and technology studies (STS). In the introduction, the editors positioned care studies as a material-semiotic approach concerned with practices. It was pressing, they wrote, to take care seriously as a scholarly concern. One reason for this was how policy makers and the market had embraced 'care': Care, caretakers and patients were now being presented in standardized forms, and care technologies were promoted uncritically as promissory technologies that would provide health and welfare while simultaneously alleviating public costs. The editors found that, in this process, important aspects of care had gone lost: 'Words coined for the public sphere are ill suited for talking about care practices' (Mol et al., 2010, p. 9). They wrote that a key problem of care as an emerging public concern was the introduction of new terms—'public terms' like 'customer' and 'citizens'—to empower and emancipate 'patients' (p. 9). However, the editors argued, bringing care 'out of hiding' (p. 9) by way of politics and the market produced new ideals and forms of care and care relations that were not 'appropriate' to 'the specificities' of care, and thus could risk that care practices 'will be submitted to rules and regulations that are alien to them' (Mol et al., 2010, p. 7). Their contention was, amongst other things, that 'words may carry information or, like tools, help to get something done. … But words only go so far. The question, then, … is which words to use, and how, at the same time, to best respect the limits of the verbal' (Mol et al., 2010, p. 11). By studying care in practice and *as* practice, we would get a better understanding of what is at stake in care practices, how care often comes in shapes and forms that are not easily captured by the verbal, and what, at any given time and situation, is good or bad care.

In this article, we build upon the care in practice approach, but at the same time extend it by asking how pragmatically-oriented approaches can be applied to the procedural and formalized aspects of care practices. We explore this question by drawing upon fieldwork in comparative immunology, focusing on experiments on Atlantic cod (*Gadus Morhua*). Caring for fish in research and aquaculture contexts, and the challenges of doing so, is of increased concern and scientific and political attention. There is a growing body of scientific literature that considers questions of pain, cognition, and emotions in different species of fish (Message & Greenhough, 2019). Experiments that aim at a better understanding of fish health and welfare are often directly linked to the pathogen-pressured and enclosed environments of the fish farming industry, and its efforts to create a more sustainable and economically viable industry. Such experiments often involve a large number of fish. This is reflected in statistics in the aquaculture nation of Norway—the geographical context of our study. Here fish (and specifically salmon) have come to dominate the statistics of animals used in science annually (Norwegain Food Safety Authority, 2021). In the last decade, a number of guidelines, classification schemes, and protocols have been developed to manage and evaluate stress, pain, and disease in research fish and production fish (some of which we will highlight in this article). This has followed from fish being encapsulated in increasingly detailed protection measures as part of animal welfare legislation, as well the economic and sustainability concerns mentioned above. Fish have become what we term an interested object (Asdal, 2014, see also Asdal & Huse, 2023), invested with interest not just because of the opportunities it provides researchers but, as we will show, because of how this new experimental animal

responds to and engages scientists in complex and sometimes surprising ways. The latter is related to a host of uncertainties with regard to how to care for fish in ways that meet legal requirements and ethical standards. Hence, we ask: How are existing legal and ethical principles and procedures put to work in cod immunology and animal research? By what document-practices and document-tools (Asdal & Reinertsen, 2022) are good and bad care for cod in research negotiated and settled? How does the cod stand out as an object of care in the life sciences?

In our analysis, we show how scientists navigate this complex terrain and we argue for the importance of bringing the document-based tools and realities of animal research into the study of everyday practices of life scientists. We bring these document-realities into our analysis by delineating three different *versions* of care: procedural, skilled, and dispassionate care (see Mol, 1999, 2002; also Asdal, 2014, 2018). We suggest that following the more formal and formalized procedures into the lab will improve our understanding of how life scientists negotiate and handle complex situations where ethical and experimental demands and concerns are intertwined. In doing so, we also hope to contribute to extending the research agenda of care to include more empirical sites (the lab) and materials (documents and the written) through which care can be studied, and to extend such studies to include the procedural and formalized elements take part in shaping care-practices.

Experimenting with care across contexts and materials

Two intertwined analytical interventions followed from the care studies research agenda: first, attention to everyday life and routine work as important locations where the practices of politics, science, and technology meet and norms are enacted (Moser, 2005, p. 671; also Mol, 1998; Moser, 2011); and second, increased attention to how objects of care are brought into being in different knowledge practices, as well as what comes to count as good and bad care (Mol, 2002; Pols, 2006). As we summarized in the introduction, care studies scholars sought to develop ethnographic approaches that could offer empirical evidence of how identities, gender categories, and social hierarchies were inscribed in care technologies, medical ethics, and health policies. They identified an increased tendency to privatize and move health services to the market, which affected how patients were defined and the relationship between patients and health care providers (see Mol, 2008; Moser, 2005; Moser & Thygesen, 2015).

Study of the tensions between the document-oriented contexts of policy and practice, understood as embodied and often under-articulated situations, has provided a deep understanding of the work that goes into care practices and what is often not acknowledged, cared for, or easily articulated in formalized contexts and the written. A good example is Singleton's (2012) study of the implementation of the British Cattle Tracing System (BCT) in the wake of epidemic diseases, which demonstrates how a bureaucratic system clashes with situated knowledge and care practices that have developed over time and by way of embodied relations. To make her claims, Singleton worked with the material-semiotic tools of care studies—combined with Haraway's (2008) concepts of 'response-ability', 'touch', and 'looking back'—to draw attention to how responsibility and accountability were shaped in embodied relations.

In the past decade, STS has seen a rich body of studies focusing on care in animal research in the context of shifting social, legal, and ethical landscapes around this practice. The implementation of what are called the 3Rs (replacement, reduction, and refinement in animal research) and harm-benefit analysis (HBA) in European directives and national legislations has prompted social science research into how codified ethical and legal principles are in fact able to raise the quality of care in animal research. Studies have shown, for instance, how formalized and prescribed procedures of care matter for and affect care for animals (Davies, 2012; Davies et al., 2018; McLeod & Hartley, 2017).[1] These contributions have taken different forms, and focused on different aspects of the increased scrutiny from policy and science on so-called 'cultures of care' in animal research. Other scholars have focused on how codified principles and legal frameworks are often in conflict with or ignore on-the-ground care practices and their emotional costs, while reinforcing hierarchies of labour and values in animal research and the biomedical sciences more broadly. For instance, in their extensive research on animal technologists (ATs) and care in animal research, Greenhough and Roe (2011, 2018, 2019) and Roe and Greenhough (2023) have demonstrated in different ways the uneasiness that comes from having to navigate between the standards and protocols of care and the emotional investments that go into practice. ATs are professionals responsible for the care and culling of animals in research. To perform care, they must follow regulatory frameworks and guidelines. Most importantly, they must do so in ways that are consistent with the 3Rs (Greenhough & Roe, 2018, p. 703). To be consistent, as well as to manage the emotional stress that comes with suffering, caring, and killing, the AT must engage in 'ethical calculation' (Roe & Greenhough, 2023, p. 52). Like Singleton, Greenhough and Roe draw from feminist versions of care as conceptualized (differently) by Haraway (2008) and Puig de la Bellacasa (2011, 2012)—and in doing so are able to tease out the emotional and affective dimensions of animal research and how important aspects of care are recurringly silenced or rendered invisible.[2] This includes delineating clear normative stakes from the outset, such as 'the development of more care-full and response-able relations between researchers and their experimental subjects' (Greenhough & Roe, 2011, p. 47).[3]

In this article, we are also interested in the relationship between the policy-domain and practices in animal research—that is, in following formalized and codified policies into laboratory life to see how they enable care in science and the management of troublesome situations in practice. We do so differently from existing studies in that we do not focus on the ethical relationships and moral integrity that emerge or are at stake in the scientist-animal relation in the research situation. Rather, we are interested in how the written and that which is formalized in documents (such as guidelines and applications) shape care situations and the organisms subjected to care. Hence, our intervention draws on the methodological moves of practice-oriented document-analysis (Asdal, 2015; Asdal & Reinertsen, 2022) and a reading of care studies as a pragmatist tradition (which we return to in the following section). Guidelines, applications, etc., are different materials, but they have one important thing in common: they come in document-form; they are document materials. These kinds of written artifacts are not simply 'flat' or passive entities. They do things to the situations and settings of which they are made part; they are performative. More specifically, they act as tools. One of the methodological moves in

practice-oriented document analysis is precisely that of observing how documents may take on work as document-tools (Asdal & Reinertsen, 2022). A practice-oriented method, as the wording suggests, includes documents in the world of practices. Documents and the written are not made to stand in opposition to practice, but are instead made integral to the field and to studying practices. But how do documents perform? What is it that documents do in and for the practices subjected to study? To answer these questions and show how document-practices and document-tools shape and act upon care is, precisely, the objective of our study. We are interested in understanding how legal frameworks, codified ethical principles, guidelines, and score sheets intervene in practice, not only in terms of guiding what can be done or not done, but how they may *enable* practices. We demonstrate in the following that one of their important effects in and for the settings we study is the creation of an interpretative space in situations where care is required, which calls upon the scientist to mobilise the codified in practice. Concepts and value hierarchies established in documents 'around' animal research are tinkered with and put in conversation with many other elements that make up scientific practice.

In addition to introducing the document-oriented approach as an important addition to care studies, we also show how empirical studies of fish provide an occasion for understanding how document-tools are tinkered with in research contexts. Sentience and pain in fish are unsettled issues—a 'grey area' for governing, to use Valverde's (2003b) words—'whose boundaries are not clearly marked either in law or in most moral codes' (p. 15). Scientists and technicians are unsure about what constitutes pain and suffering in fish. Fish receive legislative protection equal to that of mammals; however, in practice, studies have shown that scientists struggle to interpret and respond to fish in the context of animal research (Hawkins et al., 2011; Message & Greenhough, 2019; see also Law & Lien, 2017 for choreographies of domesticating salmon). Hence, in experiments with fish, there is still wide interpretive space and learning ground between knowing fish (and differences between fish species) in the experimental context and producing good science and care. This suggests that it is even more important to understand how legal principles, ethical guidelines, and rhetorical tools work or fail to work in practice, how they are negotiated in licensing procedures, how they are tinkered with in situations, and how scientists mobilise and manage value conflicts in concrete situations.

Delineating versions of care

Key to our analysis is showing how various document-tools actively partake in formatting and shaping care-situations. We tease out and delineate these situations as different versions of care. When we refer to versions of care, we draw upon a pragmatist approach to the study of medicine, the body, and disease (Mol, 1999, 2002; see also Asdal, 2014; Mol and Law, 2004; Law, 2010). As an analytical tool, a version is useful as it allows us to approach cod as being variously *done* in different practices, and at the same time recognizing how these varieties are held together and are sometimes mutually dependent upon one another in producing the cod as a workable experimental object. We show how the various document-materials activated in our analysis can be understood as linked up with three different versions of care, and how these versions of care are shaped through interactions with the cod in the experimental setting. The versions we delineate cannot

be fully distinguished from another, but they are workable analytical categories which serve to foreground particular care-elements. We also suggest that this way of pursuing the analysis and interpreting our fieldwork and observations can be a fruitful way of contributing to the established care-studies tradition of bringing more specificity to care.

In the following, we begin by exploring what we call *procedural care* (Druglitrø, 2022). This version of care represents the legal and ethical domain of animal research that the scientists must engage with in order to do animal research. When planning, designing, and performing experiments involving animals, scientists are immersed in the legal system and must relate to laws, directives, principles, and procedures. As an analytical category, procedural care directs attention to and makes visible how formal procedures and ethical and legal tools in the public domain shape how laboratory science is designed and performed. It also demonstrates the flexibility (Valverde, 2003a, b) and tinkering (Mol et al., 2010) inscribed in formalized and moveable materials such as licenses, allowances, directives, and regulations that are meant to act upon actors, objects, and practices (Druglitrø, 2022; Valverde, 2003a, 2003b). To achieve license to do animal research, the scientists must not only have access to specific sites and expertise, but they have to provide evidence and/or good arguments for their choice of experiment, choice of animals (species, number, size, maturation, number, etc.), and show planned strategies to respond to signs of suffering which require humane endpoints (we will detail these aspects in our analysis). The formalized system establishes cod as objects of legal and ethical care, and makes scientists responsible for animal care, performing procedures, and relating research design and strategies to codified principles concerning the harms and benefits of animal research.

The second and third versions of care that we delineate are entangled with procedural care in different ways. Our second version of care, *skilled care*, is a conception of expertise coined in the then-emerging field of laboratory animal science in the late 1950s. Skilled care came to include expertise and standards of care that focused on transforming the laboratory animal into a reliable tool, which was linked to the production of good science (Druglitrø, 2018). Skilled care is here taken further as an analytical category showing how laboratory animals are encapsulated in and handled by different forms of skills closely linked to the laboratory or experimental setting. Part of this skilled care involves handling the legal frameworks and protocols for doing research, and is thus linked to procedural care, as we will show. In a later section, we move into the experimental site and analyze the material arrangements of the experiment and the experimental practices themselves. We emphasize both how the scientists tinker with knowledge from the scientific literature as well as their former training and work with cod, how they combine these with rules, principles, and regulations in their work. Relatedly, we show how skilled care is also tied to other forms of expertise besides scientific knowledge.

Our third version of care—dispassionate care (Asdal, 2014)—is also delineated from the lab and the experimental situation. Yet, in contrast to the other versions of care, dispassionate care is more about emotions in experimental work, and how these are intertwined with a *matter-of-fact* approach. Thus, dispassionate care is about the handling of emotions in a matter-of-factual way. As such, dispassionate care is not something that stands fully apart from skilled and procedural care but is rather, in the situations we study, intertwined with these versions of care. Importantly, we show how emotions

emerge in close exchanges with the experimental animal, and how dispassionate care is about handling situations that may arise quite suddenly and unexpectedly and thus cause bewilderment and affect.

To pursue experiments demands a lot of knowledge, investment, and labor around and with the cod. Thus, the cod becomes an interested object, not only in and for the economy and science in an abstract or general way, but also as an object to be cared for in science. More concretely, we show how the cod, as a non-model organism, requires the scientists to be interested, but also that the cod becomes increasingly interesting for the scientists. The interested objects emerge, we argue, in these exchanges and in practices that are made, maintained, or held together through the different versions of care.

Version I: Procedural care, and formalized negotiations of harms and benefits in a new species and a new scientific field

As part of a larger project on comparative immunology in cod and humans, scientists perform many different experiments and various forms of research—for instance, gene mapping and gene sequencing, the construction of model antigens, infection challenge experiments, and tissue transplantations. *Tissue transplantation* is one in a series of three experiments (the others being immune response to model antigens and immune organs ontogeny) where the scientists study immune reactions in cod. Tissue transplantation has for decades been a core method in immunology for studying tissue compatibility and tissue rejection, and in efforts to discover and categorize different *types* of tissue (Harboe & Natvig, 1984). Different types of transplantations can be performed: auto-transplantation (transfer of the individual's own tissue from one part of the body to another), allo-transplantation (transfer of tissue between genetically different individuals of the same species), xeno-transplantation (transfer of tissue between individuals of different species), and iso-transplantation (transfer of tissue between individuals in inbred strains, such as mice). While auto and iso-transplantations will not lead to rejection of the transplanted tissue, allo- and xeno-transplantations will, after some time. Nevertheless, rejection is a specific immunological reaction, and doing tissue transplantations on Atlantic cod is interesting to the scientists for exactly this reason. Cod lack a central part of the immune system, the MHC class II (the major histocompatibility complex class II) which is a class of molecules central to initiating immune responses (Star et al., 2011). The loss of these molecules is described in the literature as a 'deficiency' (Pilstrøm et al., 2005) and sometimes as the 'cod immune puzzle' (Guslund et al., 2020), because it is this gene class that establishes protective immunity in humans and other vertebrates. The success of the cod as a species is thus astonishing when seen from the point of view of human immunology: If humans lost this immunological pathway, it would be highly dramatic, as the immune system would not be able to fight off pathogens that could lead to disease. Tissue transplantation experiments are steps towards answering broader questions in their project: How does the cod form antigen responses? What genes and cells are active in creating immune responses? The cod group asks questions that are old or well

established in immunology, but does so while investigating and getting to know a new species and research object.

Being a new species in immunology—a non-model organism—means that there is little knowledge about the cod in experimental situations.[4] In nature, cod live in cold and deep water and cover a wide geographical area during their life cycle. Compared to the standard experimental organism in immunology—the mouse—the specificities of use, care and protection of cod are still highly unsettled. This becomes even more evident when moving into the field of fish research in Norway, where the Atlantic salmon has come to figure as the standard fish in experimental research, and thus also the species that scoring schemes and harm classifications are modeled after. This also means that many of the document-based tools for working with and experimenting on cod fish were originally developed for salmon research, and primarily domesticated salmon in aquaculture. We will return to how translations between salmon and cod are done in cod immunology.

To be able to do research on cod, the scientists must apply for a license to the Norwegian Food and Safety Agency (hereafter NFSA). It is this agency which administers the licensing system through an online platform called Laboratory Animal System for Supervision and Application (FOTS). A team of specialized officials at the NFSA administers the legal framework. They are supported by an advising committee called the National Committee for Laboratory Animals. This group gives advice to the officials on research projects. The role of the NFSA is to assess the balance between what are considered the harms and benefits of the given animal research projects. Their main site for doing this evaluation is the FOTS application, and they use different document-tools (ethical guidelines, score sheets, laws, directives, etc.). The NFSA is tasked with ensuring that possible harm to animals is considered in the design and planning of animal research and that the scientists follow established procedures for how to deal with these harms.

Scientists in the cod group submitted applications to perform tissue transplantation experiments to the NFSA in two rounds. The first application was for a pilot experiment involving 24 fish, where the scientists wanted to employ a particular method for tissue transplants which (according to the scientific literature) was very effective. The scientists wanted to transplant the fin of a fish to a so-called ‘recipient fish’. In the application, the scientists classified the project as causing ‘severe harm’ according to the national standards listed in the Animal Research Directive, appendix B.[5] This appendix contains species specific requirements and concerns. In the application, they wrote:

> Transplantation surgery will severely affect the well-being of the fish at least for the first few days. Reactions to the transplant, such as transplant rejection, may give severe local reactions. Fish will be euthanized by a quick blow to the head prior to sampling, and humane endpoints will be offered to any fish showing abnormal behaviour or signs of disease. (Application for license, 2020)

In the assessment of the application, the NFSA officials responded by requesting further information about the method for transplantation. The letter expressed concern about the choice of transplanting the fin because the structure of the fin contains bone-material, and this would potentially inflict unnecessary harm on the fish:

> **NFSA:** Why have you chosen to implant a part of a fin plus the root of the fin? It includes both bone and muscle tissue, plus mucus and possibly microorganisms on the surface. Why is it not sufficient to transplant muscle tissue …? Is it an established method in transplantation experiments?
>
> **Scientists:** Most tissue transplantations on fish are done by the transfer of shells, where shell is taken out and inserted in another fish, often from a pigmented area to a lighter area and vice versa, to observe the results easier visually. Since cod does not have hard shells, we must find other methods. The advantage of moving a significant part of the fin is that it is visually easier to evaluate reactions to the transplantation if it is visible necrotization because of rejection. We have found some old studies where this is done on other species of fish. [They refer to two different studies and add hyperlinks]. (Correspondence, November 2020)

Another point the NFSA was not satisfied with was the descriptions of *humane endpoint* strategies to be employed during the experiments. In more common terms, this refers to situations in which the animal must be killed because the pain inflicted on the animal is no longer justified from an animal welfare point of view and/or it can affect the experimental outcomes. A humane endpoint is thus a tool that is meant to encapsulate care for the animal in the experimental system, but also care for the experimental system itself and the quality of its results. There are different criteria for humane endpoints for different animals or groups of animals. In this case, the cod group was asked to provide additional information for the experiment to be licensed:

> **NFSA:** In the application, abnormal behavior and signs of disease are provided as criteria for humane endpoints. What abnormal behavior and signs of disease will be the basis of humane endpoints?
>
> **Scientists:** Signs of disease like discolored gills, wounds or abnormal behavior like fatigue, bloating, lacking or inadequate response to stimuli, disoriented swimming, partially lateral swimming, and reduced appetite when it is possible to evaluate this, will provide basis for HE [Humane endpoint].
>
> …
>
> **NFSA:** Will reactions at the area of infection mean a humane endpoint? If yes, what reactions?
>
> **Scientists:** Yes, serious local reactions to implantations or areas of injections like massive swellings, redness, bleeding, necrosis, will be used as criteria for human endpoint. (Correspondence, November 2020)

In the end, the experiment was licensed on the condition that the cod group provide a 'retrospective assessment' after the experiment ended. Performing experiments classified as causing severe harm requires retrospective assessments that include descriptions of the *actual* severity experienced by the animals during the experiment. This documentwork and its accompanying procedures serve several functions: for one, they are directed towards the public to inform and *account for* the harm and the 'relative' severity of

different types of animal research. It is also about doing critical assessments of results after they have finished and is meant to inform later experiments so that they can facilitate a better experimental design. Lastly, the retrospective assessment is about caring for the scientific enterprise to enhance the quality of animal research and the continuous work of developing 'best practice.'

The pilot failed on several accounts, particularly in the choice of method for transplanting the fin. The scientists also faced troubles securing the supply of anesthetics that were part of the experimental design due to the ongoing pandemic (we also learned that the use of anesthetics presents a welfare concern in fish research because of lack of knowledge concerning their effects). Thus, for the main transplantation experiments, several elements had to be changed. In the second application to the NFSA for the main tissue transplantation, they wrote:

> We wish to change the method of the transplantation based on our experience from the pilot. We discovered during the pilot that the transplantation of the fin did not work very well. Even though the transplanted fins in some cases were still present, they were only attached by suture, and there were no signs of tissue fusion, even after two weeks. We therefore tested out different ways of doing skin transplants, which demonstrated promising results in terms of tissue fusion. (FOTS, 2021)

In our conversations at the marine research facility during setup for the experiment, the scientists repeated this problem and added that other concerns related to the methods used in the pilot had also affected their decision to reconsider the design:

> Last year we did the same experiment. Then we did both auto and allo and thought that we could differentiate between the fish based on color identification. So white got allo and dark auto – but then it was so difficult to see them in the dark tanks and the fish were moving around all the time. So, we do not consider this method this year, there is no point. (Fieldnotes)

With the experiences of the pilot in mind and the failure of the fin method, the scientists developed an 'Updated protocol for transplantation in its entirety'[6] that they attached to the FOTS application. In the new experiment—which is also the experiment that we followed closely at the marine research facility where the experiments were conducted—they would transplant skin and muscle tissue rather than bone material.

Before we explore the experiment further, we need to conclude this section to emphasize the specificities of procedural care as they unfolded in the licensing procedure around the tissue transplantation experiments. On the one hand, what happened here is a routine follow-up procedure that the NFSA follows to have scientists clarify aspects of the application, or to ask for more descriptions and explanations. This is all about refinement of research, which is inscribed in the licensing system. These interactions always take form by way of documents (digital or analogue) and/or by phone conversations. The public officials also follow projects from the beginning to end and their afterlives (with the retrospective assessments). At the same time, we see how the interactions between the NFSA and the scientists are specified around cod fish, fish in the experimental context, and the existing knowledge in the field. Scientists are actively

involved in determining the relationship between harms, benefits, and best practice for the experimental procedures.

Furthermore, we see how integrated the formalized procedures are in the planning and design of experiments. Tracing them in detail, and in written documents and exchanges, enables us to tease out what the public officials are looking for when they evaluate research applications, the legal and ethical frameworks that they mobilize in doing this work, and how they actively link experimental practices and situations that might require acts of care to existing published literature and previously licensed projects.[7] For public officials, the documents are the main point of access to the activities in the laboratory. Previous experimental practices and previous experience with the species or the particular type of experiment are also brought into the licensing procedures, further demonstrating how document-practices and laboratory practices where care is enacted are constantly woven together.

However, the codified principles that figure in procedural care do not cover (nor do they aim to) the emotions or affective relations that might emerge in physical encounters with cod fish, as has been shown in studies of other research animals (e.g. Greenhough & Roe, 2011). For us, this emphasizes the specificity of procedural care: the practices that make up procedural care are rhetorical choreographies that relate to laboratory practices and reliable science, the ability of cod to experience harm, and the skilled formulation of controlled care responses. Hence, the formalized procedures of the licensing system structure the care of the experimental animals in ways that are intimately connected to the very detailed procedures of the scientific work. In these procedures, the specificities of care are exactly what decide the stakes for the particular research project, but also how the object of care—the cod fish—is tied to different codified principles.

Version II: Skilled care, or the material arrangements of good science and good care

The experiments our scientists are doing aim at producing new knowledge about the immune system. As part of this, the cod itself is invested with a lot of interest; in particular, the interest of the scientists to make the cod work as an experimental organism. To do this they have to know something about cod fish—their natural needs and reproducibility. They read publications and engage in seminars and conferences on topics like fish immunology, vaccinology, and biology. They follow the fish from smolt stage to reaching the appropriate weight for experiments. They nurture, care, control, manipulate, and kill the cod.

When the concept of skilled care emerged in the laboratory animal science field in the late 1950s, much emphasis was placed on the caretaker's ability to have a scientific interest in laboratory animals as well as an interest in animals. The ability to navigate concern for scientific reliability and concern for the health and welfare of animals was seen as key to ensuring good science and good care (Druglitrø, 2018). Nevertheless, skilled care was first and foremost expected to be performed in a technically skilled manner, and by following standardized protocols, guidelines, and rules. The expertise was also tied to specific sites: the laboratory and the animal house. How does skilled

care play out in cod tissue transplantations at the cold and wet workbenches of the marine research facility?

The marine research facility is perched upon a fjord about an hour drive from the university campus. The 'laboratory' at the facility is a different type of laboratory space than the typical sterile and 'dry' laboratories found at the university. It is cold (12 degrees Celsius), and tanks, pipes, and water dominate the space. Scientists must book time for themselves and their fish and pay a substantial amount of money to inhabit and use this space. The facility is certified and accredited according to scientific standards. For the transplantation experiment they have booked parts of 'Zone E – Bløtbunnlab' which is located on the ground floor of the research facility. A poster hangs on the door written in a combination of English and Norwegian: 'Entry to Bløtbunn hall. Authorized personnel only. Please keep the gate closed.' 'Bløtbunn' translates to 'wet ground' in English. The experimental fish that give and receive transplants are kept in individual aquariums. The other fish are kept in large tanks in another part of the facility. The cod the scientists are working with are bought from the national breeding program, which is based further north in the country.

Today they are doing allo-transplants on 12 fish from Group A (the 36 fish are divided into three groups: Group A, B and C). These fish have already received transplants and will now be receiving (and donating) a second round. 'Today we are doing the starboard side', the professor says, 'last time we did the larboard. I call it starboard and larboard because it makes more sense to call it that than right and left side of the fish.' The fish is placed in a purposely designed surgical cradle covered with a disposable cloth that you can buy as a five-pack at the grocery store. The cradle (with the cloth) is placed in a 'bath'. Tubes are inserted in the mouth of the fish that transports water from a tub placed on the floor. The tub contains a 'maintenance dose' of tricaine mesylate which is an anesthetic in the form of a carefully blended white powder. For the fish to stay alive, the water must be ventilated needs to with aerated seawater. This circulation system is achieved with the help of a small motor turbine that is placed in the tub.

A combination of mundane materials, such as the cloth, and specialized materials, such as the maintenance dose, stand out very clearly. Yet, while some parts may seem mundane, the surgical cradle and cloth are key to caring for the cod. Without the cloth, the cod might get unnecessary scratches, but more importantly, it could slip away in the cradle during the experiments, get injured and consequently become useless. The 'maintenance dose' is important both for the welfare of the cod and for the experiment, but also presents a risk as the use of sedation in fish research is still an unsettled issue. They also make sure to use disposable gloves when handling the fish. One of the scientists comments on this, saying that they would never use gloves in a 'natural' setting, for instance when they go recreational fishing. The use of gloves is directly linked to the fish and the scientists being situated in a scientific, experimental context, and to the fish inhabiting a status as laboratory animal.

What does this have to do with documents and document-practices? Before the experiment and as part of the pilot, they practiced on live and dead fish to develop the necessary techniques to establish a protocol for the work line. In the exchanges with the NFSA, they emphasized the importance of practicing on live fish to see if the transplant would attach itself to the fish. Practicing also gives the scientists an indication of how tissue that

is not rejected will heal (for instance, surveillance of inflammation). They had then chosen a 'mild' version of transplantation—auto-transplant—so that the procedure and the wound would not stress the fish to an 'unnecessary' degree (Application for license, 2020). The procedure involves cutting out a small sample piece from the tail region, using tweezers to place it in a cup between the two scientists, and making a pocket around the neck region to insert the tissue sample from the donor fish. All these mundane aspects are specificities of the care situations they are in, but are also closely tied to the formalized, codified, and expert-based arrangements they are part of, disciplined by, and working within. Skilled care is thus embedded in arrangements, expertise, and procedures. It is developed over time and by situated tinkering, and it links the different concerns that are folded into animal research as a scientific and societal/legal practice.

Let us return to the experimental site—the marine research facility—to see how skilled care unfolds in a situation where the scientists need to consider the legally codified principle of humane endpoints, and how skills and expertise in navigating scoresheets becomes key to managing a situation of uncertainties around the severity of the harm inflicted on the animal:

> One of the scientists has just fished out the two last fish from the aquariums to be subject to transplantation of Group A. Looking concerned, the scientist says something to the other scientist, before placing the rectangular bucket on the floor, and they both look down on the fish in the bucket. The scientist being shown the content of the bucket makes a small squeak and exclaims, 'Oh my god!' Standing a few meters behind them, I ask what it is, while stretching forward to try to catch a glimpse of the fish in the bucket. One of them looks up and says that the eye has 'popped'. The eye of the fish looks infected. The other scientist says that they have to consider *humane endpoint*. 'What do you recommend, veterinarian?' The scientist looks at the other, jokingly, but really signaling insecurity about what to do and hoping that the other scientist, who has a veterinary degree and experience from fish research, is more decisive. 'You are the expert on this. We don't kill our patients because they have an infectious eye, but you veterinarians do (laughs).' The other scientist smiles, but quickly turns serious again and is clearly contemplating what to do and how to proceed. The scientists calmly discuss if they could still do the transplantation and leave the fish in the tank for two days, when they have planned to come back to do the stiches, and then kill the fish. 'But is this humane endpoint?' It is the same scientist repeating the key question. The other says, 'It looks really bad.'

The scientists continue discussing the problem, pondering for a moment to what extent the harmed cod could qualify as a reliable research animal that can be drawn upon in the planned publications (hence another formalized, document-oriented domain emerges as relevant). They quickly turn to the question of the fish's suffering and its eye's condition. As they discuss, an employee walks by and the scientists ask if he could take a look at the fish.

> 'Have you seen this before? We are discussing humane endpoint, but we are not sure if this is it?' one of the scientists says. The employee approaches the bucket and looks at the fish for a few seconds, and exclaims: 'Oh, yeah, that's bad. It looks like there's gas in the bubble.' The employee goes off to find the guidelines that describe the three different degrees of injury and what degree the state of this fish is. After searching at a table where different information schemes are scattered, the employee returns with a scoring scheme named FISHWELL,

> pointing to the pictures and scales on the scheme, and saying that this is degree three and they would have to kill the fish. (Fieldnotes)

The local employees were used to assisting scientists in interpreting the health status of experimental fish. Being the day-to-day caretaker of the fish at the facility also meant that the employees were used to detecting infections and removing dead fish from the experimental tanks. As they were used to handling different species (and types) of fish, they had acquired comparative knowledge of fish disease and health. Furthermore, they were also well versed (moreso than our scientists) in the technical and formalized arrangements around fish research—such as the FISHWELL scoring scheme. The combination of the local employee's experience with observing dead and diseased fish and their knowledge of the scoring scheme was key to managing the situation.

There is also another interesting aspect to this situation and how document-tools do care work (and for whom). FISHWELL is part of a handbook called 'Welfare indicators for farmed Atlantic salmon' written by researchers from the Norwegian Food Research Institute (NOFIMA), the Norwegian Veterinary Institute, NORD University Norway, and the University of Stirling in the UK. The back cover blurb of the handbook reads: 'The handbook standardizes scoring for 14 different indicators to a 0-3 scoring system. Pictures are used in the system that represent examples of each scoring category.' The Norwegian Consensus Platform for the Replacement, Reduction and Refinement of animal experiments has also developed a generic set of classifications of severity that is meant to guide scientists and public officials in evaluating suffering and harms. The scoring scheme developed draws on research into welfare indicators of salmon and rainbow trout in fish farming, and not Atlantic cod in the context of comparative immunology and tissue transplantations. While the scientists are consistently emphasizing how cod are not salmon, the scoring scheme is rigged so that a fish is a fish, and not specifically cod.

What is being cared for in this version of skilled care is the research fish as part of a broader arrangement, and as a more generic figure of an experimental organism—not necessarily the cod itself. The cod does not emerge as an individual except for when it is singled out from its group due to irregularities. In the case of the cod with the popped eye, the scientists approached the situation by consulting the proper skills combined with expert-based document-tools to assist them in deciding to what extent the harms affected the reliability of the fish as an experimental organism and. in this way, they care for good science.

Version III: Dispassionate care, or how document-tools can enable matter-of-fact care and the managing of troublesome situations

The boundaries between skilled care and dispassionate care are porous. These versions are intimately entwined in terms of being oriented around managing the technical and factual with the relational and potentially affective dimensions of working with living organisms. Both versions are successfully performed by investing interest in the experimental animals. Above we discussed how the FISHWELL scoring scheme worked as a device to decide upon humane endpoints. Indeed, the situation that emerged at the marine

research facility involved passion: the scientist exclaiming 'oh my god' with a small scream and the other scientist looking very worried. The situation was managed matter-of-factually, but was invested with interest and time from the scientists and the local employee. In this section, we want to draw upon another example to tease out dispassionate care more carefully, in order to show how document-tools take part in assisting the scientists in managing troublesome situations in a matter-of-fact way and at the same time work as devices that hold scientists accountable to the cod.

The 36 fish used for the tissue transplantation experiment are taken from a tank housing up to 100 or more fish. In these tanks, it is hard for the scientists to separate individual fish from each other or detect any wounds or signs of infection. As mentioned previously, for the tissue experiment they have separated the 36 fish in three different groups with twelve fish: Group A, B and C, where group A undergoes allo-transplants, and group B and C undergo both allo- and auto-transplants. When the experiment is underway, the fish are again separated from their group in individual aquarium tanks so that the scientists can more easily control the immune process initiated in each fish and monitor the fish more closely. To keep track of which fish in is which aquarium, the fish and the aquarium are given a letter (A, B, and C) and a number (1–12). During the experiment, each fish is carefully counted and categorized, which again opens it up for care. The records would for instance tell the scientists if the fish had lost weight since the last recording, which could be an indicator of disease. The written records were always linked to photo records. After each transplant, the scientists (or the ethnographer) would take a photo of the fish that showed the transplantation wounds. The scientists would rip off a small piece of hand tissue and write the letter and number of the fish with a marker, place it on the sedated fish between the two wounds, and then take a photo. The resolution of the photo was important in order to detect small changes in the wounds, and several photos would often be taken get it right. Here is an excerpt from the fieldnotes describing the recording process from the ethnographer's perspective.

> I am put to work, given the responsibility of recording the fish on a piece of paper. As nobody has brought paper, I am using my own notebook for fieldnotes. I am told that they are doing group B today and to write 'Group B' at the top of the page. I follow the format of the recordings done with group A shown to me by one of the scientists: date is put on the same line as the group label. Under these headings, I make a table that horizontally lists the categories that are to be recorded: fish, color, weight, tank, and scientist. Vertically on the left side of the table I write B1, B2, B3 … ending with B12. I leave a line between B6 and B7 open to separate between the first six fish that are being submitted to allo-transplantations and the six remaining that are being submitted to auto-transplantation. I make an additional horizontal line inserting ALLO alongside B1-B6 and AUTO alongside B7-B12. (Fieldnotes)

While recording individual fish in order to closely monitor them during the experiment was not a legal requirement to ensure animal welfare *per se* (it was rather part of the scientific protocol for the experiment, attending to practical considerations and reliability), it had the effect of bringing out individual fish as objects of care and interest (and humor!). For instance, one of the fish—numbered B10—died and the scientists could not figure out why. The fish was taken out of the experiment and disposed of in the biowaste bucket. They could trace who had done the transplant back in the written records. This created an occasion for comparing occurrences of sudden and unexpected death, such as

when another fish from group B—an allo-fish—caused a disruption in the workflow by not waking up from the revival bath after the transplant.

> 'Is this how it happened with your fish the other day?', one of the scientists asks the other, and continues, 'This is my fish—I had the light-colored fish.' I check the records that lay on the table in front of me, and they are correct. The other scientist thinks about it and says, 'hmm I'm not sure,' while looking closer at the fish and continues to state, 'It doesn't look good how the tail curves like that. It shouldn't be like that. It's a bad sign.' One of the scientists contemplates if it is because they had forgotten to tell the staff to stop feeding them a few days before the operation (to reduce stress). Or, if it is because the tube was inserted too far into the throat of the fish. We curve over the bucket, six eyes on the fish; the fish is being pushed around by the other fish that has woken up and is swimming around. The second scientist knocks gently with a stick on the outside bucket wall to see if it helps to waken the fish. From a completely dead-like position, the fish suddenly awakes and skirts around in the small bucket as if nothing has happened. The first scientist seems relieved and jokingly comments, 'He doesn't want to be a dead fish yet.' (Fieldnotes)

When B10 died, it was recorded in the table. We had not made a row in the table for 'deaths' as they had not really expected the fish to die from this procedure—which was auto-transplantation (transplantation of its own tissue from the neck to the tail region and vice versa)—so this was resolved by drawing a small arrow from B10 to below the table where it was merely written 'died'. Hence, while the fish quite quickly moved from being an individual included in the experiment to becoming a more general category of biowaste, its death was to some extent cared for—dispassionately and matter-of-factually—by being recorded, investigated, and considered carefully.

While death was a recurring and matter-of-fact event at the facility, the scientists would retrospectively share reflections on the fact that fish died or were injured during the experiments, and how they took their responsibilities for the fish seriously, which was reinforced by the document-practices. The practices of documenting thus also acted upon the scientists, in that the scientists came out as interested in their relations to the experimental animal and vocally expressed care and concern for it. As one of the scientists expressed during one of the trips to the marine research facility and referring to B10: 'I feel bad. First of all, for the fish and that I might have caused its death because of a mistake.' However, the scientist did not only feel for the fish in this situation. Their 'attunement to' the cod, to use the words of Greenhough and Roe (2019), or 'passion for' the cod (to play upon the concept of the dispassionate) emerged in a specific context where many concerns were at play at the same time. The scientist continued: 'But [I] also [feel bad] for the experiment and future experiments in the project. Now we will have less fish for the coming experiments and will have to adjust accordingly. I feel bad for the group. I don't understand what went wrong.' Again, building on Greenhough and Roe (2019), these 'storytelling' moments of reflecting upon troublesome situations with the cod 'do a particular kind of work' (p. 376) that emphasizes how the cod affects the scientists emotionally, yet also how it is handled in the concrete experimental situation.

To sum up, in this section we have shown how document-tools are integral to experimental work and to managing situations matter-of-factually despite being emotionally challenging. Numbering the fish and keeping fish records is not primarily an act of care.

However, in situations where care for the fish is required, these records became important to retracing steps to figure out what might have gone wrong and the mistakes one might have made. The overlap between the two versions of care—skilled care and dispassionate care—lies in how they both require that the scientists combine knowledge that emerges from their encounters with the cod and the cod 'moving' them, with knowledge derived from the scientific literature, the regulatory and ethical domain, and from the licensing procedures. However, in contrast to skilled care, what is at stake in dispassionate care is the relationship to the cod in a more complex and extended manner than as an experimental organism. The relationship is also with the concrete individual cod, and in elaborating dispassionate care we underline how emotions are handled dispassionately, and how good care can take this form. Moreover, we show how document-practices, especially note-taking practices, played into and shaped the matter-of-fact handling as part of dispassionate care. What our material shows is that there is not necessarily a tension between the cod as a generic figure of fish as experimental organism, and the cod and its cod-ness.

Conclusion: Care studies and interested objects

In this article, we have discussed how formalized procedures and document-practices are made integral to 'care in action' and actively take part in shaping, interpreting, and handling experimental situations and scientists' responses to them. In doing so, we have aimed to develop concepts that are well-equipped to move the attention of care scholars to *versions of care* where document-realities and other realities are being investigated on the same terms. The versions of care we enumerate are procedural care, skilled care, and dispassionate care. We have also shown how tensions are integral to all versions of care and it is precisely these tensions that the legal (and ethical) system is built to handle. This is a distinct form of governance and governing technique—what Valverde (2003a) would call 'flexible governance'—that is required to govern moral grey areas in practice. This involves a system that provides tools and techniques so that people can govern themselves and their actions according to set moral and legal standards and rules. Obviously, tensions arise between the formal rules and written procedures and the actual scientific practices. Such tensions, however, do not imply that the formal and the informal versus the practical stand in a *given* opposition to one another. In our study, we found that scientists engaged, negotiated, and tinkered with codified principles and tools which shaped and formatted care-practices. For example, we saw this with the use of the FISHWELL scoring scheme to determine a case of humane endpoints, or how scientists engaged with the NFSA officials in redesigning their experiments. Hence, we have emphasized the problem of privileging the tacit, invisible, and unremarked as representing 'real' care in tension and conflict with the formalized, which relates to and is upheld by documents and document-practices.

Our approach then, is different from and adds to what studies in care have called 'empirical ethics' (Pols, 2012) or 'ethics in practice' (Greenhough & Roe, 2011) because we emphasize the work that documents are doing rather than how they constantly disrupt, cover over, or neglect affective and emotional aspects of working with nonhuman animals. Since the early 2000s, fish have also become increasingly protected by

regulations and ethical guidelines that are oriented around principles and practices of care. An important part of this caring is how the animal is made to stand out as an interested object, not only as an immunological object or an object to be invested in economically, but as a species to be invested in in terms of care. This happens, for instance, through the exchanges and deliberations between the scientists and the licensing authorities on how a tissue transplant procedure can best be done, in tinkering with methods and strategies to respond to the cod's assumed needs, and when the cod responds to the scientists, resisting their plans. By discussing what we call procedural, skilled, and dispassionate care, we have also aimed at extending the materials, sites, and versions of care that have, so far, captured the interest of care studies. Our angle suggests directing more attention to how document-work, such as written procedures, guidelines, and legal frameworks, becomes coupled with care work in experimental practice, and how such procedures are not only coupled with care, but also become productive in tinkering with care.

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Notes

1. See also Holmberg and Ideland (2009) for a participant observation study of how ethical committees navigate conflicting concerns in the evaluation of animal research applications.
2. Another example: Suzuki's (2021) study of how care is performed and 'improvised' in an animal research laboratory in Japan, offering an account of how ethics and care are shaped and unfold in a non-Anglo-American context. Her analysis also emphasizes the importance of studying how care for laboratory animals 'is situated and shaped by elements outside the laboratory' (p. 732). Historical studies have also demonstrated how care in animal research has been coupled with the formalized, and as a result care has taken a dispassionate (Asdal

2014) or skilled (Druglitrø 2018) form and become integral to notions of scientific reliability (Kirk 2018).

3. See also Birke et al., 2017; Sharp, 2019; Dam and Svendsen, 2018; Friese, 2013; Davies 2012; and Holmberg, 2011 for different empirical studies that tease out normative stakes in care in animal research contexts.
4. Ankeny and Leonelli (2011) conclude that model organisms are 'a specific subgroup of organisms that are standardized to fit an integrative and comparative mode of doing research' and that 'have prescriptive power'. The cod is thus a non-model organism, and it remains to be seen the extent to which it will gain such prescriptive power. However, it might be achieving this status by way of experimental practices (and care). This is not to say that the cod has not been subjected to research. To the contrary, it has been subjected to extensive research, including efforts to domesticate it (Asdal & Huse 2023).
5. This classification is in line with European standards that define severe harm accordingly: 'Procedures on animals as a result of which the animals are likely to experience severe pain, suffering or distress, or long-lasting moderate pain, suffering or distress. Procedures that are likely to cause severe impairment of the wellbeing or general condition of the animals' (EU Directive, 2010/63). What is the '63' in the citation?
6. Norwegian title: 'Oppdatert protokoll for transplantasjon i sin helhet'.
7. In the evaluation letter that approves or rejects research applications, the NFSA always list a paper trail at the bottom of the page that points to the document basis of the specific application, including previous licensing procedures or relevant scientific literature or other relevant attachments.

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