

Sámi Salmon, State Salmon: LEK, Technoscience and Care¹

Solveig Joks^a and John Law^b

^a Sámi Allaskuvla, Sámi University of Applied Science
Hánnoluohkká 45, NO-9520 Guovdageaidnu, Norway
solveig.joks@samiskhs.no

^b Department of Sociology, The Open University, Walton Hall,
Milton Keynes MK7 6AA, UK, John.law@open.ac.uk
and
Centre for Science Studies, Department of Sociology,
Lancaster University, Bailrigg, Lancaster LA1 4YN

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‘Nowadays there are so many people fishing. And of course they will catch fish if they fish day and night. The problem is that the fish never get any peace, not even for an hour.’ (The words of Petter Somby, Tana River fisherman)

‘An overview of threat factors in the Tana show that overexploitation of salmon in the different parts of the salmon migratory system is the major threat factor for Tana salmon.’ (A view from the biologists)²

Introduction

In Sámi ‘Deatnu’ means ‘the big river’. It is also the Sámi name for a major river in Sápmi in north Norway and Finland.³ Deatnu is one of the most important salmon rivers of Europe. This paper is about that river. It is about salmon, people, administration, international frontiers, conflict and conservation on the Deatnu. This means that the paper is also about two different worlds. On the one hand there are civil servants and politicians and biologists, and conservationists. On the other hand, there are local people, often though not always Sámi, who fish for salmon in the Deatnu and its tributaries. In one of these worlds, the world of politics and science, the Deatnu is in crisis. The number of salmon returning and spawning has fallen. In some places that decline has been extremely serious. Something needs to be done, and it needs to be done urgently. So policies that drastically limit fishing and the ability of local people to fish in their own ways are being imposed. In the other world lived by many local and Sámi people salmon numbers go up and down, but if there is a crisis then this is not necessarily obvious. And if there are problems about salmon and their numbers then the origins of that problem are not necessarily those identified by the scientists and administrators.⁴

At the same time this paper is also about care.⁵ In part it is a story about *what* or *whom* to care for. The numbers of salmon? Their genetic diversity? The birds and animals that fish for salmon, the predators? The people who live by and with the Deatnu? Sámi practices and Sámi ways of relating to salmon? The tourist industry and the revenues that it brings to the northernmost counties of Norway and Finland? Perhaps these overlap, but sometimes, perhaps often, they do not. It is also, to be sure, a story about *how* to care. That is, it also pits models for caring against one another. Centered modes of knowing about the environment as against distributed understandings of how the world works. Textual versions of knowledge versus contextually-related stories. Calculations as opposed to narratives that resist quantification. The idea that knowing is something to be made transportable and drawn together in a single location, as against the idea that knowing is located and essentially context and occasion-linked.

In what follows we draw on Joks’ PhD research (Joks 2015). We first briefly spell out the entangled history of the Deatnu and its fishing. Second we describe some of the Sámi ways of knowing and thinking about salmon, *luossa*. We show that these are ways of knowing that can be disentangled only with difficulty from embedded and located practices of fishing or not fishing, practices that also have to do with relating to the river. Third we turn to the practices of the biologists and describe

² Working Group on Salmon Monitoring and Research in the Tana River System, see Erkinaro, J., Falkegård, M., Niemelä, E., and Heggberget, T. G. (2012:5).

³ ‘Sápmi’ is the Sámi name for the areas that Sámi people traditionally lived in and in which they continue to live. These are in north and mid Norway, Finland, Sweden and the Kola peninsula in the Russian Federation. Note that the Norwegians call the Deatnu the ‘Tana’ river and the Finns the ‘Teno’, and that in Sápmi ‘Deatnu’ is nominative, and that in the accusative and genitive it is ‘Deanu’.

⁴ For an attractive overview of the Deatnu river LEK-science differences and their context, see Ween (2012a).

⁵ For introductions to the literatures on care see Mol (2008), Mol *et al.* (2010) and Singleton (2010).

their modelling and the policies that follow from those models. With these contexts in place we focus on the conflict between the conservation biology on the one hand, and particular Sámi versions of local ecological knowledge (LEK) on the other. We show how conservation biology, which is supposed – and indeed legally required – to consult with LEK fails to do so satisfactorily. Indeed, it turns out that it *cannot* really do so because the stories that make up LEK do not count – and we literally mean count – as evidence in the world of quantitative population modelling used in conservation biology. So a version of science adjudicates the existence and the character of the problem. Backed by administration, its problematisations dominate, and its solutions rather than those of LEK are put into practice. Finally, we ask what might be done. How might these different modes of caring be worked together? What would it take in terms of changes in practices – Sámi, scientific, and administrative – to work carefully together across difference? How might the power asymmetries be worked around to produce more satisfactory solutions?

Histories

The geographers tell us that the Deatnu is located on the Finnish–Norwegian border in Sápmi. They add that it runs for 348 kilometers, and for around 256 kilometers it marks the border between Finland and Norway. The historians tell long and complex geopolitical stories about empires, nations, boundaries, state-building, racism, and ownership (Pedersen 2008). Until 1751 there were no fixed national boundaries, and even when the boundaries were defined, the so-called ‘Lapp Codicil’ in the same year allowed Sámi people and their reindeer free movement across those borders. Geopolitics continued to unfold as the borders between Norway, Sweden, Finland and Russia shifted in ways that were at best arbitrary from the point of view of Sámi people, and sometimes disastrous.⁶ And new settlers moved into areas that had previously been Sámi. And all this around a century of gradual extension of state-building by Norway, and against a backdrop that was colonial at best and often straightforwardly racist. In this world the Sámi were inferior.

As a part of this, legal scholars tell equally complex stories about ownership. This took different forms at different times and places, but overall it worked to re-context collective ownership of fishing rights. The Land Resolution in Norway in 1775 made it possible for individuals to own private property (Pedersen 1991), and from 1800 the authorities started to connect fishing rights with property. As the process of nation-building continued, in 1871 (Solbakk 2011a) and despite resistance, new fishing rules were imposed which marked the beginning of the end of Sámi self-government. The ‘Royal Resolution’ (1871) took state control of fishing on the Deatnu, and a law in 1888 determined that net fishing in Deatnu⁷ was only allowed by local householders who owned or leased fields, and excluded other members of the household, though fishing with a rod was still permitted. In 1911 the rights of householders were further restricted in a regulation resisted by many upriver Sámi who were not consulted about these changes⁸. Fishing with nets was confined to those who produced 2000 kilos of hay a year. The overall trend was one that favoured settlement – settled agriculturalists – against those who lived by herding, hunting and gathering. It also, albeit incrementally, made space for outsiders to fish for a fee,⁹ a space that was progressively occupied by

⁶ As with the 1852 closure of the border between Norway and Finland for reindeer herding, which catastrophically interfered with annual patterns of long-distance movement (Solbakk 2011 a).

⁷ In weir fishing a permeable barrier is built which guides the fish into a net. In drift net fishing a net held up at one end by a float is drawn slowly downstream by a boat.

⁸ Two main Sámi municipalities as Kárášjohka and Buolbmát were not consulted. It was only down the river where Norwegians also lived that people were consulted (Pedersen 2013).

⁹ The Deatnu became known to English aristocrats in the 1830s and the number of ‘outsiders’ fishing gradually increased (Solbakk 2011b.)

sports fishing, and gradually impacted on net fishing. Such that, to bring the story up to date, in 2012 rod fishing, partly local and partly by outsiders, took around 60% of the total catch of the Deatnu and its tributaries (Erkinaro et.al, 2012:4).

That is the law. But administration and international politics adds their own further complexities. So, for instance, since 2011, the part of the Deatnu in Norway has been managed by a local administrative body, the Deatnu River Fish Management Board (Deanučázádaga Guolástushálddahuš/Tanavassdragets Fiskeforvaltning – DG/TF). Locally appointed, most members represent net fishermen, and there are additional representatives from the Deatnu and Kárašjohka municipalities. The main tasks for DG/TF are to regulate fishing, organize river policing, and manage fishing license revenues. On the Finnish side it is all a little different. Fishing rights generally belong to the owner of the land, a so-called ‘water area’ (Burgess 1996). Land ownership includes membership of the Fishing Cooperative, which is a register of all landowners with fishing rights. The main difference with respect to net fishing between Norway and Finland is therefore that hay production is crucial in Norway, while fishing rights in Finland are connected to land ownership. And this is crucially important because many new households were created in Finland in the 1970s in the Ohcejohka/Usjoki municipality (Burgess 1996). Anglers and companies have come from south Finland in large numbers, have bought property from locals, and many have built cottages. As a result, large numbers of people have become members of one of the fishing cooperatives, and now have the right to fish with a rod (though not nets) within their cooperative area even though they are outsiders. Indeed, the locals talk of them as ‘tourists’.

Knowing salmon

Quiet

Ethnography. It is 2.00 pm on 1st July 2011. Petter and Solveig are meeting at Petter’s house. They have chosen that time because the Finnish tourists are not allowed to fish from boats between two and eight pm. *Fiertu ja beaivvadat*: ‘it is a quiet sunny day’. They walk down to the river. No tourists. It is indeed really quiet. Solveig’s notes:

‘We do not use the boat’s outboard. Instead, Petter starts to row from Moskki to Mákkidsavvoniid. Anglers are not allowed to fish from boats, not at this time. On the Finnish side Solveig can see five people fishing from the bank with rods. She can also see two boats. People are repairing their outboards. Solveig is sitting in the stern. She is letting out the lines, an arm’s length at a time. For both the rods. By now Petter is rowing in the *savvon*¹⁰. There are no weirs in sight. And no boats either. Not at Mákkidsavvoniid.’

It must seem very quiet for the salmon. It must be good for them, since only Petter and Solveig are there with their flies. For a moment the clamour of tourist fishing has been stilled. We want to say that this is about *care*. So caring for the river and the fish in the river is partly about being quiet. Partly, too, it is about flies. Petter makes his own flies. This means that each is a little different. If the salmon see the same kind of fly again and again – if, in other words, they see manufactured flies – then, says Petter, they no longer find these attractive and they hide in quieter places like *guoikkat* (rapids) or *coahki* (low water).¹¹ But care or its absence is also about the sheer number of fishermen.

¹⁰ A smoothly flowing stretch of water in a big river.

¹¹ For more detail see (Joks 2015:146).

‘With all the tourists the river has turned into a motorway. And they are screaming, the fish. Tourists buy a 24-hour card. They don’t have time to take a coffee break. And the tourists want to fish at the best places during their 24 hours.’ (Petter)

Jusse (another of Solveig’s interviewees) says that there are hundreds of tourists on the Finnish side of the river. The river is black, he says, filled (*čáhppadin*) with tourists, and that much of the time there are dozens of boats on the Finnish side, queuing and waiting to fish. Petter says that the problem is that you cannot rest if you are a tourist. You cannot put off fishing if the weather is not right. You cannot avoid fishing if the state of the river is not right. If the water level is too high (*dulvi*), or too low (*coahki*). You have to make full use of your 24 hours even if local fishermen would not dream of fishing in those conditions.

Respect, Bivdit, and ‘what is meant’

Back to Solveig’s notes:

‘We take a break. Petter rows to the bank, and we drink coffee. And then, while we are sitting on the bank, we see a boat. They are fishing. We watch as they catch a salmon. Solveig calls out. ‘Can you see? If we had been on the river that fish could have been ours.’ ‘No,’ says Petter. ‘That’s not right. Because that fish was not meant for us’ (*Diet guolli ii lean munnuide oidnojuvvon*). He adds: ‘We can’t catch the fish that are already caught.’ (*Ean moai sáhte goitotge goddit daid guliid mat leat juo goddojuvvon*).’

Another thread from this ethnographic story. The word *oidnojuvvon*. Above we have translated this as ‘meant’. But we might just as well have written ‘it was not fated’, ‘it was not intended’, or ‘it was not given to us’. For there is indeed something about *being given* here, something that is *outside the power of people*. It has to do with Petter and Solveig and the salmon in question, but it is also bigger than people and fish alone. We are in a particular kind of relational world. So, for instance, salmon may *smell* people. For instance Petter tells Solveig to hold the fly for a while before she releases it into the water. Solveig interprets this to mean that she needs to create a contact between herself and the salmon. But Petter is also implying something more general about salmon, people, and a wider context. In what way?

One answer is that salmon are not easy prey. They can make a choice. If a fisherman shows appropriate respect then a salmon may give itself to that fisherman. The Sámi word *bivdit* indexes what is at stake. On the one hand, it means to hunt and to fish. On the other hand, however, it also means to plead or to ask – for instance, to ask someone to do something.¹² Fishing, then, is partly about asking, and asking respectfully. The salmon may accept the request, or it may not. In a certain way it has autonomy. It may choose to sacrifice itself to a particular person, or not.¹³ At this particular place, and at this particular time.¹⁴ This also suggests that personal humility is important, a further expression of respect (‘Because that fish was not meant for us’).

‘Bragging about a salmon catch would put you above it as something you had conquered due to your own cleverness. If part of the reason behind the catch had to do with the salmon’s willingness to be caught or the wilderness’s willingness to share something with you, then expressing it as a private success would threaten the contractual nature of the catch. The result might well be that the next time you fished at the same spot you would catch nothing.’ Schanche (2004, 3)

¹² *Mun bivddán du dahkat juoiddá*: ‘I ask you to do something for me’.

¹³ See Oskal (1995) on the related topic of reindeer luck.

¹⁴ For further details see Joks (2015:139). See also Willerslev (2007).

So respect is important before, during, and also after fishing. And, as we suggested a moment ago, the context extends to larger patterns of intention (Schanche's term 'contractual' is too probably too restricted.) And sometimes – not always – that context includes God:

'Gosa bat dat Ipmilláhji lea šaddan? Ozai čuimmiid ja luŋkkáid vuolde. - Vai johkii dat láhji njuikii?' (H. A. Guttorm, 1982, p. 31). 'What's become of "God's gift". He searched for it under the pillars and doors. – Or did the 'gift' jump into the river?'

In this quote from a Sámi novel the protagonist is trying to count the number of salmon that he has caught, but the reference to God is seriously intended. Care, then, is about respect. It is about knowing limits. It is about entering into a relation with the river and its salmon, and not exceeding oneself.

Plenty or not?

But let us return to Solveig's ethnography.

'Petter and Solveig fish at the first spot for an hour. No bites. No fish. They take the lines in, start the outboard and set off downstream to Uvllásavvoniid. Fifteen or twenty minutes later Petter cuts the outboard. He starts rowing, and Solveig puts out the rods and lets out the line again. It's the same again. No fish.

Petter says: 'This has happened to me many times. Going fishing but not catching anything. The fish that are swimming now aren't easy to catch. They are very fat, and very hard, and they are short too. But some years ago I didn't catch many fish either. It was before 13th July. I remember the date because that's when they had the fishing competition in Sirbmá.'¹⁵

So fish vary in appearance ('very fat, and very hard'), and good fishing comes and goes, for there are good years and bad years. The same story turns up in the newspapers and on the web pages of the Norwegian Broadcaster, NRK. For instance, 2014 is a good year. 'Tidenes beste laksommer' ('The best salmon summer for ages'¹⁶). Here is Andreas Njárga, again quoted by NRK:

'I have personally never experienced a better salmon summer than this year. I've been fishing for two weeks, and during this time I have caught all the salmon that I need. I've caught enough for myself, my wife and the whole family.' (NRK Sápmi (2014), our translation.)

Something similar is happening in another fjord, the Skillefjord. Here is Torbjørn Olsen quoted in the same NRK report:

'I have never experienced anything so extraordinary as this year. Here we have even had to increase the capacity of our freezers to keep up with all the fish.' (NRK Sápmi (2014), our translation.)

Though people – if they are not respectful – may also bring down trouble on their heads.

'Petter and Solveig are talking about the Sámi television news. Solveig says that she has heard a man from Kárášjohka. He said that drift net fishing catches the salmon that were meant to go upriver to the Kárášjohka river. Petter disagrees. He says that the fish which belong to the area where they are fishing never go to the Kárášjohka river. It was the people there who destroyed the river, themselves, because they used Seine nets (*nuhtton*), and the breeding salmon that were meant to go there (*stámmaguolli*) have disappeared.'

¹⁵ More than 100 people live in the area where Solveig did her fieldwork.

¹⁶ NRK Sápmi (2014). The same report also quotes biologists saying that Tana salmon is a threatened species.

Though Seine nets are not necessarily to be avoided. Elsewhere, for instance in the lakes in Sápmi, they may also become important tools for caring.¹⁷ But not in the river, at least according to Petter.

Science

People like Petter care about fishing. As a part of this they care for fish in the Deatnu, and how to relate to those fish. This is a part of the context that we need to understand the deeply felt dispute we mentioned in the introduction about fishing and its regulation. The NRK news item we have just quoted also tells us that:

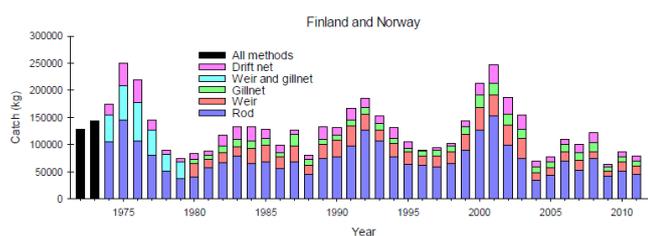
‘Over the past few years, a number of scientists have come up with warnings that there are few salmon in the Tana River. The Tana salmon has been described as an endangered species, liable to disappear entirely unless fishing is restricted immediately. Against this, Andreas Njárga reports that there have been good catches in the weirs for the last two years. Therefore, he doubts the scientists.

‘Researchers seem to have decided that there are few salmon in the Tana River. That the salmon here are about to disappear. But if this is so, then I have to ask where the fish are coming from. Are they falling from the sky into the Tana River? How does this all hang together?’ (NRK Sápmi (2014), our translation.)

A good question. So what are the scientists saying?

The Working Group on Salmon Monitoring and Research in the Tana River System (the ‘Group’) is a Norwegian-Finnish government-level initiative established in 2010. It reports annually on the status and trends of salmon stocks (Erkinaro et al., 2012, 10), evaluates stock management with reference to NASCO guidelines, assesses gaps in knowledge, offers research guidance, and scientific advice to managers. The Group’s four members come from the Finnish Game and Fisheries Research Institute and the Norwegian Institute for Nature Research (NINA). Three have ‘experience and detailed knowledge’ of the Tana (Erkinaro et al., 2012, 10). The fourth, representing NINA, links the Group to the institute’s scientific expertise.

The Group’s first report appeared in 2012 and it is gloomy. It argues that despite fluctuations, catches have been in long-term decline.



(Erkinaro et al., 2012, 19)

Then it asks: are salmon stocks optimally reproducing themselves? In response, it calculates stock-specific spawning targets that will permit sustainable yields, and then estimates the actual numbers of returning female spawning salmon to determine whether these targets are being met. Like all such models it rests on a series of assumptions that may be debated (Erkinaro et al., 2012, 60-64), and the statistics on which it is based are often also uncertain. It is best, notes the report (Erkinaro et al., 2012, 65) if spawning fish can be directly counted by divers. Failing this, videos of acoustic

¹⁷ ‘The most important fishing gear for settled Sámi in Kautokeino has been the Seine net. The Seine net fishes but it simultaneously cleans the bottom of the lake. The net catches both fish, and twigs and leaves that have accumulated at the bottom of the lake’. (Østmo 2013, 53), our translation. Here Seine netting is an important form of care.

counts of fish moving up the river may be combined with catch statistics. Least good, catch statistics can be combined with an estimate of the proportion of fish being caught (the 'exploitation rate', a figure derived from comparison with other river systems, to which we will return below.) In practice it is this third method that is most widely used in the 2012 report, which then uses these statistics to run simulations and probability distributions, and arrives at the conclusion that:

'... target attainment is currently very bad in the Tana river system. ... in the period 2004-2010, and in most years the spawning stocks were far below the targets.' (Erkinaro et al., 2012, 5-6)¹⁸

Indeed, some places there was no sustainable surplus at all. The Group's policy conclusion is similarly clear:

'An overview of threat factors in the Tana show that overexploitation of salmon in the different parts of the salmon migratory system is the major threat factor for Tana salmon.' (Erkinaro et al., 2012, 5)

Much tighter regulation of fishing, and especially of returning female salmon, is urgently needed – a policy that is controversial as we have noted above. But so too are the causes of any decline, so the report crosses swords with local experts about the significance of predators and different forms of fishing, an issue to which we return below.

Procedurally, the Group is also required:

'To identify integrate local and traditional knowledge of the stocks in their evaluations' and '[t]o collect information from local communities and organizations and cooperate with such bodies in the dissemination of scientific results to the public.' (Erkinaro et al., 2012, 10)

In a section on traditional and local ecological knowledge (TEK and LEK) the Report notes that there is much encouraging 'contact and cooperation between locals, researchers, and managers', and it looks forward to the further development of this. Then it offers its account of TEK/LEK. This, it says, 'is tied to a place ... and is knowledge acquired through experience and observation' (Erkinaro et al., 2012, 29). It cites Berkes to say that it 'can broaden the information base needed for decision-making' (though it adds that this is less useful for well-studied species such as salmon). Then it turns to questions of epistemology.

'LEK and TEK is largely oral and visual, intuitive, experience based, subjective and highly qualitative, while science is based on systematic data within a model- or hypothesis-based framework which, though the use of a strict sampling design, are largely objective and quantitative. The usefulness and relevance of LEK/TEK therefore becomes highly limited.' (Erkinaro et al., 2012, 29-30)

Picking up a theme from the previous page it continues:

'The attempts at segregating LEK/TEK from science also contain a strong element of misunderstanding about what science really is. Science is described as strictly hypothesis-based, linear, oversimplified and reductionistic, and this description is used to illustrate how far removed science is from the realities of nature. This is, of course, a fundamentally wrong description of science, and the attempts at establishing LEK/TEK as an equal alternative to science becomes (sic) flawed.' (Erkinaro et al., 2012, 30)

Then it offers its own empiricist theory of science:

¹⁸ Figures ranged from 60% to 20% and were lowest in the upper tributaries.

‘Every bit of information is exactly that, information. And all bits of information have their place within natural science and can be included. This is equally true within applied scientific studies of salmon. So when fishermen, which are the contributors of LEK/TEK, complain that their knowledge is not being taken into account when scientific results and evaluations are presented, they do so largely because they fundamentally misunderstand at which level and how TEK/LEK are included and used.’ (Erkinaro et al., 2012, 30)

In practice TEK/LEK can do one of two things for scientific inquiry. It can either be a source of observations which lead to new scientific hypotheses. Alternatively, it may provide important observations to test and interpret scientific results. At this point the Report includes an additional paragraph by one of its members, Tor G. Heggeberget, who presses the need for additional and formalized processes of dialogue between local communities and the Group in order, in part, to scope and prioritise problems. He adds:

‘Through a dialogue process, a platform for acceptance of future sustainable management of Tana salmon can be established. In situations where acceptance of important knowledge is lacking, it is extremely challenging to establish effective regulations.’ (Erkinaro et al., 2012, 31)

So, and to summarise, the biologists have their view. They have their findings. They have articulated unusually explicit approach to epistemology. So there is no question that they care. They care about and for salmon stocks. They care about the long-term preservation of those stocks in all their genetic diversity. They care about doing their science well. They care about getting the right answers. We might even add that in their own particular way they care about LEK and TEK (for as we have seen, information from these can be included in science), and also about the concerns of local people. But how does this look to those local people?

Creating local ecological knowledge

Though the scientists sometimes disagree, in practice for people who live with the river those scientists mostly speak with a single voice. Claims about salmon stocks are made. Regulations appear. And then those regulations are imposed. So what of the local people? The answer is that though they have their own disagreements, as we mentioned above often the findings of the biologists and the regulations seem arbitrary or irrelevant. Importantly, they frequently cut across ways of fishing central to the lives of many continuing a process of erosion that has been going on since Norway and its neighbours set out on the process of nation-building. We cannot explore the complexities here, but we want to give the sense a particular Sámi position by returning to Petter Somby, the fisherman whom we met above, and drawing too on interview material with Áslat Varsi. Our concern is to extend what we have already said about Petter’s LEK. And as a part of this, it is to understand what this implies for care – for caring for fish, the river, people, and the relations in which they are embedded.

First let us briefly note that people like Petter study their part of the river very carefully indeed. So, for instance, they distinguish between *čázis*, *coahki*, and *dulvi*. *Dulvi* means ‘high water’ and *coahki* ‘low water’. As with some of the terms that we discussed above, for Petter and his fellow fishermen these terms are practical – they have to do with where to fish, including where to place fishing weirs. In the past, when Sámi people managed the river themselves, they would always fish in *čázis* locations. These were places where the water level was optimal. In a *čázis* area fishing is excellent. But often such fishing is not possible now. This is because the river is zoned, and its driftnet fishing permits are restricted to individual zones for a three-week period between May and June. Since some zones are not in *čázis* at the right time this means that no drift net fishing takes place.

As the biologists who wrote the Tana River Report note, this kind of local knowledge generates ways of thinking unlike their own. '[O]ral and visual, intuitive, experience based, subjective and highly qualitative,' those were their words. We do buy into the whole list ('subjective'?) but categories such as *čázis*, *coahki*, and *dulvi* are certainly experience-based and qualitative. And then there are fish in Petter's world that do not appear in biology. These include *orru guolli*, *vuoggaguolli* and *čáhppes guolli*. *Guolli* means 'fish'. But these are not biologically taxonomic. For Petter an *orru guolli* is a salmon that stays in the same place. The significance of this is that it is a fish that needs a particular kind of fly. Áslat, who lives in Petter's area, describes a visit by one of the best Deatnu fishermen who usually fished a long way down stream. But when he came to visit he caught nothing – because he used his own different flies. Obviously the *orru guolli* is not a category of fish relevant to – perhaps we would be better to say noticed by – the biologists, but it illustrates the fine grain of LEK.

Then there are *vuoggaguolli*. These are fish of no particular appearance. *Vuogga* is Sámi for fly, so a *vuoggaguolli* is a 'fly fish'. It is, Petter explains, difficult – even impossible – to catch salmon with a rod unless there are *vuoggaguolli* swimming in the river. But a fisherman will never say that he has caught a *vuoggaguolli*. He might, instead, say that he has caught a *diddi*, a small salmon weighing between one and three kilos. A *vuoggaguolli* is a relationally behavioural category to do with fishing with a rod and line. It is a way of talking about the likelihood of catching salmon: whether it is worthwhile going out with a rod at all. So it describes the behaviour of fish. Again it is not taxonomic, but reflects detailed and fine-grained knowledge of the behaviour of salmon.

Finally there are *čáhppes guolli* or 'black fish'. These are the fish that are getting ready to spawn. Solveig's notes.

'Petter says that first of all we have to protect *čáhppes guolli*. 'From the beginning of August we should not be fishing at all. But it's not worthwhile throwing them back if it's only me and a few others who are doing so. Because the Finnish tourists will keep on fishing them anyway. And *čáhppes guolli* have to spawn and therefore it's important that they are able to get peace and quiet.'

These stories tell us three things. First that Petter's form of fishing is under continuing pressure. Second, that Petter and people like him know a great deal about the river, the fish in the river, and the relations between people, fish, and the larger forces at work. Third, that their ways of knowing and managing the river also have to do with caring. They want – and they need – the salmon to return, and they have thought carefully about what this might imply. So as we have just seen, Petter has strong views about *čáhppes guolli* or black fish. These should be protected. In August they should not be caught at all. And if Petter ever caught a black fish he would return it to the river – at least until he observes the antics of the Finnish tourists. He has equally strong views about over-fishing. Remember that he and Solveig went out to fish at the only moment during the day when the river was not being overrun by Finnish tourists in boats. The two of them needed space to fish. But as a part of this, Petter is also implying that, overall, too many salmon were being caught. Perhaps as importantly, the wrong kind of salmon were being taken (black fish) or disturbed, for the river was never quiet – bad for the fishing, bad for the fish, bad for black fish, and therefore for spawning, fish fry and fish stocks in general.

He makes a further point also made by many others: that predators make serious inroads into the numbers of salmon

'Sharp-billed' birds eat salmon fry, such as *gáhkkor*, that is red-throated diver. *Čeavrrit* (otters) have increased.'

Many along Deatnu talk about birds of prey, predators and carnivores (Ween 2012a, 155ff). Here the difficulty is that the predators are protected. Áslat describes the seabirds that turn up on small islands close to where he lives on the Deatnu

‘It is full of birds here, and this leads to problems because they eat salmon fry that are growing.’

The scientists know the argument well and they disagree:

‘Predation is a factor that is widely pointed to locally as a threat for salmon. There is very little biological basis for arguing that naturally occurring predators are a threat to salmon, and predation must rather be viewed as an integral and natural part of the ecosystems that salmon live in and it is rarely possible to measure any negative impacts from predation. The best way of counteracting any potential effects of predation is to make sure that management targets for the stocks are met so that stocks are full-recruited on an annual basis. Other local arguments that are discussed include natural variation, increased tourist angling and decreased number of gillnets.’ (Erkinaro et al., 2012, p5)

Here the scientists and local people are living in two different worlds. So, for instance, at a 2012 seminar on the future management of Deatnu, the need for tighter rules on fishing was discussed by the regulators. For obvious reasons this was controversial, and local people returned to the issue of predators and said they in the past they protected fish fry from those predators. For instance, they set *sáibma*, small-mesh nets, to catch sea trout, but these nets also caught predators such as pike. (Pedersen 2011, 5) *Sáibma* were banned from 1990, and many believe that pike stocks have increased as a result. Neither were there any restrictions on shooting birds such as goosanders, and in the past there were springtime hunts for mergansers. (Pedersen 2011, 23) Along with many others, Áslat is frustrated because the scientists ignore these kinds of observations. People are no longer allowed to control predators. And overall, if salmon are under pressure then there are many reasons for this. And some, perhaps most, of those reasons are being refused by the scientists. As in this kind of argument.

‘The fact that animals eat each other, is an essential and natural mechanism in all ecosystems and one that salmon are well adapted to living with. Tana salmon have lived with predators such as goosanders, pike and seals for thousands of years, and there have never been any problems’ (Falkegård 2014, 60, our translation)

As if obvious, the implication is that animals are natural whereas people are not. The biologists are distinguishing, as in so many conservation efforts, between ‘nature’ on the one hand, and ‘culture’ on the other. (West et al. 2006, Hölzl 2010). People are being written out of their worlds in ways that not only prevent them from fishing in ways that they have for generations, but also makes little sense in the relational world of Sámi experience (Oskal 1995). But there is a further additional difficulty, and this has to do with care. Yes, we have no doubt that the scientists care for nature and nature conservation, though, as we have been trying to show, that caring extends only ambivalently to people. However, the efforts of the scientists, and the regulations that flow from those efforts, degrade the attempts of local people to care for their river and their fish. Why? Because when the fishing is restricted, as it is, people are driven from the river to seek other forms of livelihood. And, no longer watching over and relating to the river, neither are they any longer in a position to care for it. We are, in other words, watching a long term process of deskilling. The capacity to care locally is under threat. Indeed, Sámi practices and ways of being are being carelessly eroded.

So what is to be done?

Let us step back. At present in Norway the Deatnu is managed in part by the Deanu čázádaga guolástanhálddahus (DG)/Tanavassdragets fiskeforvaltning (TF). Above the DG/TF there is a hierarchy that includes the Norwegian Miljødirektoratet (Environment Agency) and a series of bilateral arrangements between Norway and Finland that trickle down to produce their own administrative arrangements on the Finnish side. We have explored some but only some of these structures and their effects above. As we have seen, from the point of view of local people many of these arrangements and the policies that they produce make little or no sense. Scientific knowledge, statistically informed, is decanted into administrative regulations that undermine local ways of living and fishing whilst ignoring local knowledge of the river and its salmon. As again we have seen above, the scientists are mandated to attend to local ecological knowledge, but fail to do so. The question, then, is what is to be done?

There are many complexities here. As many have noted, there is a web of overlapping and conflicting interests at work (Burgess (1996), Ween (2012a, 2012b)). Thus local people frequently disagree, and if the international differences in ownership and regulation between Norway and Finland are layered in, this complexity is further exaggerated. Ween's (2012a, 155) description of the consequent regulation as 'cumbersome' is apt. If, however, we confine ourselves to the Norwegian management and its scientists on the one hand, and the kind of Sámi expertise represented by Petter on the other, some points of overlap nevertheless emerge. They share for instance, a common concern to protect spawning and salmon populations. Albeit in different ways, they are both concerned with overfishing. Very differently, they are also in some measure caught up in the same material administrative practices because the rules and regulations are common to both groups even if they manifest themselves in quite different ways. There are also occasional meetings in which representatives of the scientists and the locals meet together, though this happens very rarely. Finally, we should not forget that the scientist are legally to required to attend to local ecological knowledge, though as we have seen this works poorly for the locals.

Despite these overlaps it is clear that things are not working well. Indeed, quite to contrary. Nevertheless, it is on this rather slender common base that we want to build our conclusion. The argument we draw on comes from STS. To put it simply, this discipline suggests that large differences, political, administrative, epistemological, and ontological all grow out and imply mundane material practices. The latter include meetings, discussions, texts of all sorts, visual depictions, bodies, and networks of supporting infrastructure.¹⁹

Let us start, then, with local ecological knowledge. The STS-inspired question is: where does this appear, and in what material forms? The first and perhaps the most obvious answer is that it makes itself manifest as embodied skills. People like Petter simply *see* things that are invisible to outsiders. They know their section of the river in ways that visitors and scientists do not. As a part of this they live and work on it too. And therein lies both the beauty of this kind of expertise but also its disadvantage. We do not need to have recourse to the distinction between 'objective' and 'subjective' used in the 2012 Working Group Report. STS suggests instead, that situated expertise is a way of knowing that is relatively untransportable (Latour 1990). If it is spoken at all (and often this never arises) then this is probably to share that knowledge with other local people, or perhaps to particular individual outsiders. It is unlikely to be in order to make claims about the river or its salmon in distant places such as scientific meetings or the offices of administrators. Neither, to be

¹⁹ See, for instance, Asdal (2008), Callon et al. (2009), Knorr-Cetina (1981), Latour and Woolgar (1986), Law (2004), Moser (2008) and Verran (1998, 1999 and 2002).

sure, is this kind of knowledge quantitative in form. Indeed, if it gets translated into textual form at all then the case of the Deatnu suggests that this is likely to be in the form of reaction to outside events. Yes, we may learn from the pages of the press that there are a lot of salmon this year, but this claim is already in substantial measure a response to the claims of the scientists and managers that salmon populations are falling. It is reactive.

We are not only saying then, that this kind of local ecological knowledge is quantitative, but also that it is not intrinsically textual in form. Furthermore, an important associated point, it is also *distributed*. There are dozens, probably hundreds, of people like Petter who have knowledges about the Deanu river. But their knowledges are not being drawn together. This suggests that whatever one thinks of the outsider knowledge of the biologists, they also deserve a quantum of sympathy. The local ecological knowledges that they are running up against and pushing aside are distributed and largely verbal. There is, as it were, nothing for them to push against. There is no fixed place either literally or metaphorically to which they can go and to which they can react. This suggests that the innovation that the locals need is the creation of procedural and material ways for gathering knowledge, perhaps textual, that are also transportable, which can then be presented to outside experts in ways that allow and require the latter to attend to it systematically.

We have an example in mind to do with quantification.

‘[S]cience is based on systematic data within a model- or hypothesis-based framework which, though the use of a strict sampling design, are//largely objective and quantitative.’

We quoted this already. It comes from the 2012 Report. As we also noted above, the scientists are admirably frank about the limits of many of their statistics. So what might local experts add? The answer (and it will come as no surprise to a social science audience) is that just like Tana river salmon, statistics do not fall from the sky. They are generated in practical material arrangements. And local people know a great deal about some of those arrangements. For instance about numbering catches. Look back to the bar chart above. Taken from the same report, this sums catch statistics, and breaks these down by categories of fishing, rod fishing, weir fishing, and so on. But how are these statistics assembled? As Ween (2012a, 166) notes, the self-evident answer is that people are involved. Fishermen. But each time they fill in a form and submit it to the authorities, first those people stop and ask themselves: what are the authorities expecting? How will they *react* to the figures that they receive? Will they worry about overfishing if the figures are large? Will they worry that there has been overfishing if the figures are low? And (this is another question that the local experts on the Norwegian side of the board also ask) do the tourist fishermen from Finland have any reason to fill in the forms properly at all?

As we have just said, this is scarcely news for social scientists (Cicourel 1964, Garfinkel 1967). But it in the present context it has several implications. One is that even if the biologists and managers prefer to distinguish nature and culture, statistics about the former arise in ways that are not binary. And, two, this is a place where local ecological knowledge might indeed be mobilised in ways that would make a difference to the biology, *if only that knowledge could be assembled and made transportable*. How to do this? In general we cannot know. This question needs to be handled experimentally and case by case. Perhaps, however, it would be wise to start by assembling local expertise for the Management Board. This, after all, includes local representatives. If this were achieved, it might then be possible to local ecological accounts into dialogue with those of the biologists – as indeed the biologists say that they wish²⁰.

²⁰ For attempts to work in this way see Waterton and Tsouvalis (2015), and Callon et al. (2009).

But if this implies substantial changes for local people in the ways in which they mobilize their expertise, then correspondingly radical alterations will be required of the outside experts and the administrators and politicians with whom they work. A part of what is needed is already clear. Local ecological knowledge is not quantitative. As is obvious, outsiders will need to find ways of taking qualitative evidence seriously. To be clear, we are not necessarily arguing that biologists should abandon their quantitative models, and it may be that some of the realities pointed to by the local experts can be rendered into statistical form. But a second innovation will also be required of the scientists and their administrative allies. The story here is one that is well recognized in the literatures of environmental humanities. Indeed, we have touched on it above, and it has to do with the distinction between the human and the non-human. In the way that the models, or perhaps more particularly the politics, are implemented there is a binary divide between nature and culture. As we saw above, 'predators' are natural. They are to be protected. But human 'predators' are quite different. In important ways they do not belong to the natural ecosystem at all. And if they happen to be present then they need to be urgently regulated. As we have just observed, this is a classic expression of the Western divide between that which is human and that which is not. Its expression in conservation policies since the 19th century has been well documented, and what we have described in this paper shows that it is at work again in Sápmi.

Scientists care. The biologists that we have describe care for the Deanu river and in particular for its salmon stocks. But the local experts care as well. They care for the river, for the fishing, but also for local social relations. Despite the manifest difference in power relations we do not want to say that one mode of caring should displace the other but we do want to argue, following Verran, that it would be good to find ways of allowing them to go on together despite – and indeed because of – their manifest differences. With emphases on *both* 'together' and 'difference'. The literatures in STS remind us that caring implies heterogeneity. They also tell us that caring is iterative. The innovations that we have proposed above are therefore entirely provisional. But somehow, or so we have argued, the expertise of the locals needs to be hardened, whilst that of the scientists and the administrators needs to be softened.

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