

## What you need to know to be a fish farmer in West Norway

Marianne Elisabeth Lien and John Law

In the dark the car drives itself. Three minutes, down the hill, carefully because the road's icy. The car park is brilliantly lit. I pull on my woolly cap and step out of the car. A chill wind is cutting round the corner of the warehouse as I bang the door shut behind me, and walk into the workshop. They're there already, three of them. Sitting. Standing. No one is talking. It's too early. Too dark. Now the manager arrives. There are brief greetings. '*God morgen*'. It's all very informal. It's quiet. It's Norway. It's rural West-Coast Norway.

Everyone knows, or is related to everyone else. You know where they come from, and you have to get along. But you don't need to talk much. Especially not in the morning.

So what's on the menu for today? Well, says the foreman, the vet's visiting. She will lead a workshop on fish welfare, and some of us will need to sign up for that. It's mandatory now. And then the nets need to be rotated. We need to do that today. As we do endlessly. Net rotating. '*Tromling*'. And then there is a new apprentice this week. Vidar. A lean young man, shy among his new workmates, barely 18. He is assigned to me. Otherwise, well, nothing special. Just the usual things. I'll come out, says the foreman, around lunchtime.

Okay, it's time to move. I pick up one of the lights, a big hefty underwater lamp, and we walk out into the dark in procession. It's fifty meters down the quay to the motor boat, it's bitterly cold and still dark out. The boy, Vidar, undoes the mooring ropes while I lift the engine canopy and put the fuel on. Thank goodness, he knows how to pilot boats in the dark and he needs only minimal instructions. I dive into the cabin, fumble the key into the ignition, and start the motor. After a couple of seconds the engine coughs and bursts into life. Vidar releases the last of the ropes as I put the boat into reverse. Now we're both in the cabin with

the door shut. I back the boat away from its mooring, turn the rudder, put the engine into forward gear and we're off. Round the end of the jetty I take us, slowly, and then I head directly for the farm. Barely visible, it's out there in the middle of the fjord, but the boat knows the way. I push the throttle forwards and sit down on the swivel chair. We're banging along now, moving against the waves in the choppy water. And dawn is just beginning to break, a distant blue beyond the mountains to the east.

It doesn't take long, five or seven minutes, and the farm looms up. Ten square pens, five on each side of a narrow platform walkway. And then, at the far end, the raft with the warehouse and the control room. Like a two-storey house in the middle of the fjord. I slow the boat as we pass the pens. There are half a million salmon out here, and there is no reason to scare them. Then I slow it more as we get to the raft. The water is choppy, the boat bounces up and down. Vidar reaches for a mooring rope. On his second try he grabs it and he's cleating it down while I turn off the engine. Vidar climbs up onto the raft deck – it's three metres above the water. I wait for a moment while he's disinfecting his boots – biosecurity is important, though the birds don't sterilise their feet, that's for sure – and then I pass him the light. Now I climb up, fish the key from its hiding place and open the door to the lobby. In we go, shutting the door behind us. I drop my bag near the computer. I'll tog up properly in a bit. But first I need to get the generator running. Nothing will happen until we've got power. And then we can make a cup of coffee. That's pretty urgent too.

I turn into the warehouse. In the half dark there are ghostly bags of fish feed on my right, that reach all the way to the ceiling. In the far corner there's the new generator. Like the boat it takes a moment to kick in. And then there is a roar. It's rumbling. And it's going to go on rumbling for the next eight or ten hours. The lights blink on in the warehouse. The fish farm is coming to life. I return to the lounge and sit down at the desk. There are two computers, but I'm interested in the one that controls the feeding. Now that there's power, I

can boot it up. Waiting, watching as it goes through its impenetrable routines, and then I move the mouse. I hear the familiar ‘click’ as the screen lights up with a graphic image of our four feed silos, underneath the warehouse. Hmm. There’s enough feed in the silos for now. Then I start the blowers to get the feed moving. Three more clicks. There we are. The programme is running. The blowers are on. And the pellets are starting to rattle down the pipes and rain down on the heads of the salmon. Out there in the breaking dawn salmon are starting to feed. Hopefully, at least. That is the idea. But we won’t know that for sure quite yet.

It is time for coffee. Vidar has got the coffee-maker going. That’s a good sign. I reach for my mug and fill it up. While I blow the hot surface, I think about what to tell him. I need to give him some idea of the jobs that are waiting for us. He’s a newcomer to this city of fish. I am an old-timer. But where do I begin?

What do I need to know to be a fish farmer? I need to be able to drive a car. I need to be able to pilot a small boat in the icy pre-dawn waters of a fjord in West Norway. I need to be able to tie that boat up safely. All this goes without saying. Like most boys from around here, Vidar knows all this already. I need to know about engines – small ones like the motor in the boat, and large ones like the massive generator set that powers the farm. I need to know something about computers too. I need to know a little about the software that does the feeding. I need to know how to make a cup of coffee. I need to know when to work and when to rest, when to relax, and when to be worried. I need to know what signs to look for, to pick up on the signals coming from deep down where the salmon swim. But how can I explain all this to this young man who knows hardly anything about salmon? It needs to be learning by doing. So I finish my coffee, and tell him that today he will collect *daufisk* – dead fish.

## Daufisk

Here is what you need: a wheelbarrow, a clipboard, a sheet of waterproof paper, and a pencil on a string. He carries the inscription devices, while I push the wheelbarrow. We walk single file, about sixty meters along the walkway between the pens to the far end. We can hear the rattling sound of feed flowing through pipes, and the splash of a salmon breaking the surface. Good. The fish are feeding. It's soon light and it's going to be a beautiful day, crisp and clear. Then I open the stop-valve on the air pipe. I tell Vidar to watch out. The hissing starts. Then there's a rumble and a fat blue pipe bobs to the surface in the pen. It's pointing at the deck close to where I'm standing. For a moment it lies still, and then it starts thrashing around like a demented sea-serpent. I'm hoping that it hasn't got blocked. If this happens it will mean trouble, we'll have to haul it up and clear it, and that can take several hours. Vidar asks: *How does it work?* Over the hissing sound of the water I shout that the air is driving a pump, way down at the bottom of the pen. And the pump is sucking water from the bottom of the pipe to the top, close to where we're standing. Suddenly there's a torrent of water pouring out. Vidar gets showered before he jumps to one side. And then they come: dead salmon sucked from the bottom of the pen. Bang, bang, bang, they spurt out of the end of the pipe and hit the blue plastic container, slithering around before they come to rest. Three four, five of them, and then a couple of lively wrasse, *leppefisk*, placed in the pen to eat the sea-lice, accidentally sucked up the tube. I throw them back into the water.

'*Why do they die?*' It is Vidar again. But who knows why they die? There are 50,000 fish in this pen. A few of them will die each day. It is inevitable. And we need to take them out. We're the undertakers here. And the caretakers too. The two jobs go together. And that's what the pipe is for. So that the dead can be removed, and the rest stay healthy. I watch the

torrent of water, there's six, seven, eight and nine dead fish, and then they stop coming. I turn the stop-valve and the flow starts to tail off. I ask Vidar to get the clipboard and I make a note in the right column. Pen number ten. '9'. That's okay. Not too many. No need to worry. A sign that the batch as a whole is doing OK. Next pen. But first we need to pick up the nine corpses and put them in the wheelbarrow.

How do you pick up a salmon? Even more to the point, how do you do this efficiently? You're going to pick up dozens each day. So how do you do minimise the effort you need to put in? I give Vidar a demonstration. You do it one-handed. You grab them very firmly by the tail. Wrap your fingers round them. And then you just lift them up, all four or five kilos. And then you can toss them into the wheelbarrow. That's it. Simple. All in one movement. So long as you know how to do it. He watches while I do a few, and then I leave him to do the rest. And then we move on to pen number nine. By the time we have finished pen number seven, Vidar is doing OK. I leave him to do the rest of the pens, and go back to the control-room to do some paperwork.

What do I need to know to be a fish farmer? I need to be able to push a wheelbarrow. I need to know what all the pipework is on the farm. Big pipes and small, for water, feed, pressurised air and electrics. I need to know how the *daufisk* routine works. I need to know how to pick up fish that are heavy and slippery. I need to keep out of the way of torrents of water. I need to remember to take a note of the number of fish that flop down at my feet, and then to enter the numbers into our computer. I need to be able to diagnose what's happening when things start to go wrong, or when too many fish are starting to die. I need to know what counts as 'too many'. But I don't need to know why each single fish dies. I need to know fish as a collective, as a group or a batch or a pen. That is how I need to know the fish. Not as single individuals.

### **Ingenuity: engineering a crate**

Stupidity makes for more work. If you're at the far end of the farm and you've forgotten to bring the box cutter or the pair of pliers, then it's a long walk back to the workshop to get them. But then again, some of the things that we do – some of the ways that we work – also make for extra work. Quite unnecessarily. Collecting the dead fish in the wheelbarrow? Vidar found it easy today. No wonder. If you're only getting ten or twelve out of each pen then you only need to make two or three journeys with the wheelbarrow. That's not so bad. But from time to time the fish start dying in larger numbers. Epidemics occasionally sweep through a fish farm. If things are going badly there may be thirty or forty dead fish coming out of each pen every morning. Then it's a different matter. You're sorry for the fish, yes, but you're sorry for yourself too. It's hard work, carting off all those fish in the wheelbarrow, and emptying them into the tank filled with formic acid. So then there's the question: isn't there a better way of doing things? That is what I ask myself. Time and again. And the answer is usually: yes.

For instance, there's the forklift truck. And then there are large oblong polyurethane containers. Two meters by one-plus metre by one-plus meters. They're made to be lifted and stacked by forklifts. So I started to think. Could I adapt one of these containers? Was there any way we could avoid the business of manhandling all those fish? And the answer was: yes there was. It took a while, and it was a bit of a hodgepodge, but it worked just fine. First I cut out one of the walls of the container, most of the way up to the corner. Then I got a piece of pipework which would serve as a hinge and ran it along the top of the side I'd just cut out. From corner to corner. Then I attached the missing side to the pipe so it hung down to cover

the space I'd just cut it from. And then I made a catch – this took several tries – to keep this flap shut. Because we didn't want the fish flopping out. Except, that is, when we actually wanted to deposit them in the formic acid tank. And there, that was it. A new kind of device.

If you're interested you can see it, over there. Ready for the next lot of *daufisk*.

One forklift, one container, the germ of an idea, and quite a bit of fiddling around with whatever the materials to hand, that is what it took. Yes, it's not a thing of beauty, and you sometimes need to work on the hinge or the catch. But it works. It's made life easier. And Vidar? He listens politely. Perhaps, one day, he'll understand why it's worthwhile, this kind of lash-up.

What do I need to know to be a fish farmer? I need to be able to solve practical puzzles. Puzzles that, if I can solve them, will simply make the job easier. So puzzle-solving, that's the first thing. Though, no, I correct myself, it isn't the first. First I need to be able to see that there's even a puzzle there to solve. I need to ask myself the question: is this a good way of working? Or is there something about it that could be made easier? So that's number one and number two. Here's number three: It helps if I am a little bit lazy. Not really lazy. It's not a question of shirking. But it helps to be lazy enough to want to make the work a bit less back-breaking; a little bit quicker. Perhaps it helps, too, that I'm not the young man that I was. Some things get more obvious in middle age. There's quite a lot of heavy handling, and it's nice to find ways of cutting this down. And then, here's number four, I need to be able to think about the puzzles mechanically. This isn't anything to do with theory. This isn't even design, if by design you mean doing something with a pencil and paper. It's in my head and it's three dimensional. The question is: what kind of a device, what kind of a physical object, might I engineer up to solve the puzzle? With the bits and pieces to hand on the fish farm, this is important. Because we don't have a machine shop – that's back on the shore. And then, number five: I actually need to be able to *do* the job. I need to be able cut through

polyurethane, to make workable hinges out of pieces of pipe and jubilee clamps with their worm threads. I need to be able to do things with my hands. And then finally, I need the time. I've no complaints about the firm. It's fine. But the fact is that if everything's going okay and you're doing what has to be done, nobody is looking over your shoulder and barking orders. So and this is number six, I need to know how to get other tasks out of the way so that I can spend a bit of my time on a project like this. These are some things I need to know if I want to solve practical problems on the fish farm.

## **Feeding**

My stomach is rumbling. Sure enough, it is time for lunch already. In the damp changing room I step out of my clogs and pull off my red coveralls. Hands under the warm water. That feels nice. I peek into the kitchen and see that Vidar has set the table for three. Kristoffer, the foreman, must be on his way out. Everything seems to be there, bread, butter, salami, tinned mackerel in tomato sauce, smoked salmon, smoked mackerel, and *seilaks* – the canned pollock dyed red so that it looks like salmon, a throwback to the 1960's when salmon was still expensive. And there are cheeses too, goat cheese and gouda. Lunch is heavily subsidised by the firm. We pay a small sum each month – it's deducted from our salaries. But it's a great deal, one of the fringe benefits of working for the company. Vidar has even emptied the dishwasher. Good boy. That is one of the things we need to know how to do too. We need to know how to take care of ourselves, which includes keeping the kitchen tidy. Or tidy enough. No one else is going to do this for us.

Kristoffer arrives. We sit down to eat, and he wants to know how things are going. Are they, the salmon, feeding properly? Are we giving them enough to eat? Or are we feeding them too much? The managers constantly worry about these questions. They know



the figures, they know our profit margins. Feeding, they say, counts for 60% of the cost of raising salmon. If you over-feed them, then you're throwing money into the ocean. And if you're not giving them enough, then they won't be growing as quickly as they should. And that will impact on the margins too. When you get down to it, it's all about money, of course. The salmon put the food on our tables, while we drop feed on their heads.

But then again, there is more to feeding than cost. Because feeding is also a way of knowing how well they're doing. If they're eating less than they should it could be a sign that there's something wrong. You start to ask yourself: did I get the numbers right? (It's easy to miscount). Or has disease got into the pen? We've got estimates for the total weight of salmon in each pen, and we know how much they are likely to eat. But, of course, we could be wrong. On the other hand, if we've got the weights right, then perhaps there's something wrong with the salmon. And then you start to worry. So how do you know that you're giving them the right amount to eat? It is actually quite complicated. How can I give Vidar a sense of this?

While we're clearing the table I ask him to follow me up onto the gantry when we're through. 'We're going to check the feeding', I explain. '*Sjekke foringa*'. 'It won't take long'. 'But aren't they feeding already?' Vidar asks. Of course they are. We can hear when the feed lines come to life. There's a shrill ringing as the feed pellets blow down the line to the pens. And then, equally suddenly, there's a deafening silence when the quota has been reached, and the feed pump automatically turns itself off. But right now they're all on. But this doesn't stop us hand feeding, to check their appetite.

I grab a scoop and a bucket, fill it with pellets. Then we climb the steep steps. Up here on the gantry, it's windy, and noisy too. Not a place for conversation. But we get a good overview of the pens. Now we're above pen number six. I fill the scoop, and with a casual movement of the wrist I flick the pellets at the surface of the water. The response is

instantaneous. Suddenly the water is simmering with life. It's almost as if it is boiling. We can see the salmon jumping, we can hear their tails flapping as they break the surface. Good! They *are* hungry! Or at least some of them are. Some of them? Yes, because from up above we can only see what's happening near the surface. Even so it's looking good. We decide that pen six is in good shape.

There are other ways of checking the feeding. You can watch your computer screen. Because you can lower a camera into the pen, and see the fish swim past. You can see the pellets of feed falling through the water, and how the fish react. You can sip your coffee at the same time, and follow Facebook on the corner of your screen, like some of the younger farmhands. You can stay out of the wind. Surveying them from the computer sounds easier. But I tell them it is not the same. You need to have a *sense* of the fish. You need to be *near* them.

'What are you looking for?' Vidar shouts through the wind. 'This', I reply. 'This is good. They are feeding. No disease. No waste.'

'But what if nothing happens? What if they don't react when you drop feed on them?' It is Vidar again. He's good at asking questions. 'Well, then something is probably wrong', I shout back. Though only probably. Because it's sometimes hard to tell what's going on. If the surface of the water is choppy, or the light is wrong, you really can't see very much at all. And even if it's all perfect, how far can you see down into the pen? A couple of meters? Perhaps three? Not very far. But it's enough to get a sense of what's happening. So we do it every day. We do it lots of times each day. *Sjekke foringa*. It's important. It's constantly on our minds. And it's an art, not a science. You get a feel for it. Hopefully. It is learning by doing.

What do I need to know to be a fish farmer? I need to know how to 'sense' the fish. I need to know what it looks like when things are okay in the pen, and when they're not. I need to

watch them. A lot. And I need to be able to see things that I can't see, deep down there in the pen. There's science here too, and numbers. Fish nutrition. 'Feed conversion ratios' – how much feed it takes to make a kilo of fish. The number of fish in the pen, their average weight, the biomass swimming round beneath my feet. But then it's also more than scientific measurements. The art of sensing when something is wrong. That educated sixth sense that things are going well. Or not. Is this knowing? Well, perhaps it is. But it's a kind of knowing that is corporal, a knowing that rests on vision and sensory skills, and draws on experience. On all those other moments that were similar. The cues that something might be wrong are subtle. A sign of disease may come in just a hint of a change. It's not easily put into words. Regardless of the noise up here on the gantry. Vidar will just need to watch as I do this. One day he will get it. Or he won't. There's not a whole lot that I can say about it.

### **Domestication and care**

It's late afternoon. Vidar, Kristoffer and I have been moving the nets, *tromling*, since lunchtime. Why? What's the need? The answer is that after a while the nets get heavy with algae. You need to stop the algae growing. You need to kill it. And how to do this? The answer is – you leave the nets to dry. It sounds simple enough. Indeed it is. But there's a snag. The nets are doing a job. They're there setting boundaries. They're there to stop all your expensive fish from swimming off into the wide blue yonder. No nets, no fish, no income flow. And, by the way, the nets are also there to stop your precious salmon from reproducing with their distant cousins which are still swimming in rivers nearby. So what do you do? Well, the answer is pretty straightforward. The net is far longer than it needs to be. Only half of it is in the water at any given time. The other is wound round a huge cylinder. So when it's time to clean the net you start to unwind it. You turn the cylinder and let the net

drop into the water. And then you go to the other end of the pen and start to pull in the part of the net that's been underwater. You pull it in and wind it round the other cylinder. None of which is much fun. It's heavy work. Lines need to be disentangled. At the same time it is a pretty smart invention. Like so many things out here.

But now we're done and we're having another cup of coffee. And eating chocolate too, another of the company fringe benefits. Soon we'll get back to work. We need to catch a few fish for Anna. She's the young community vet, and she's on her way out. It's time for her scheduled inspection. Though that makes it sound very formal. Which it isn't. Yes it's serious and she comes regularly. But her inspections are welcome too. Every time she comes I learn something from her. There is always something that we didn't know about. It's forty years after the first successful attempts to raise salmon in saltwater pens, and the fish are still 'newcomers to the farm'. And we, their caretakers, are mere beginners. At least, that is often how it feels. Because it is hard to know whether you are doing things right. I mean, how can you know fish that live in shoals of 50,000 to the pen when you don't go in the water yourself?

One way, as Anna keeps telling us, is by taking samples. Today is the day for the fortnightly sea-lice count. Sea-lice are nasty little parasites that have always been attracted to salmon. And we've got so many salmon that our pens give them plenty to feed on. Sea-lice are flourishing in the Western fjords. And they're becoming a threat to the salmon outside the pens as well. The wild salmon, the smolt that hatched out in the river last year, come down the river. And on their way to the Atlantic they swim pass the farms. And then they catch sea-lice. Or at least, that's what we are told by the authorities. And the authorities know because they add up our lice-counts and publish their aggregated statistics. At any rate the result is now an almost zero-tolerance policy for sea-lice in the pens. The threshold for treatment has never been so low. Good for the wild salmon, but more work for us.

There is a slight drizzle as Vidar and I head back out to the pens. He's carrying the dip-net, and the metal clip board with its water proof paper, while I'm carrying the bucket. There's water in the bucket, and liquid anesthetic. Again, the hissing sounds of pellets being blown through plastic pipes stop us from talking. But Vidar is a keen observer and doesn't need much instruction. Soon, he's holding on firmly while four or five kilos of lively fish desperately thrashes about inside the net. He lifts the net, edges it over the handrail, and empties its contents into the bucket. The fish is still splashing and flapping like crazy, but within seconds it calms down. It 'goes to sleep', as they say in medicine. Then I lift it up to examine it for lice. Squatting, I lie the salmon across my thighs and start looking. Sea lice are tiny creatures and they come in different categories, or that is how we report them: 'young', 'mobile', and 'female'. If they're female then they've taken up residence on the salmon's scales and they're about to reproduce. Most salmon have none. But occasionally, we spot one, or two. Slowly, we fill the slots on the paper grid. We need to check 20 salmon from each pen. A random sample of the 50,000 in the pen.

What do I need to know to be a fish farmer? I need to be able to lift and hold heavy lively fish, at a difficult angle. I need strong upper arms. I need to recognize a sea louse, and to distinguish females from young ones that are still crawling around. I need to know how to write the right numbers in the right boxes on the chart, and how to enter them into the computer. And I need to be able to work quickly because we don't want to keep the fish in the bucket for too long. I need to throw them back in the water before they have become too drowsy. In other words, I need to know how to inflict some (not much) discomfort on a few fish, in order to care for the population as a whole. And sometimes – this happens when the sea louse count gets too high – I also need to know how to medicate our salmon because we need to keep their wild cousins healthy and happy.

## Welfare

Are the fish happy? Who knows? Anna has joined us now. And while she helps us to finish the sea lice count, she asks me: 'have you signed up for the fish welfare workshop?' She reminds me: it's mandatory. And it's next week. And then, as she speaks, I remember that since 2010 salmon have been subject to Norwegian animal welfare legislation. They have rights now, pretty much like cows and pigs. Like farm animals they're even stunned before they're slaughtered. Much of the slaughterhouse was rebuilt as a result. No more suffocating with CO<sup>2</sup>. Things are changing.

But, I'm thinking, next week I have a million better things to do. I dread the thought of spending two whole days inside a classroom, looking at PowerPoints and listening to people talking about legal regulations. I've been working with salmon for twenty years! Do I *really* have to do this? 'Yes', she says. She looks at me kindly but sternly. The look in blue eyes leaves no room for doubt. 'Precisely because you have worked with us for so long', she insists. 'Your experience is crucial. It's really important'. I look at her and I raise my eyebrows. 'You see', she continues, 'it's not only us teaching you. It's you teaching us as well. You'll be asked about practical routines. About how to do things differently, and better. You will talk about salmon as sentient beings. Because they probably are. It is just we don't know them yet. Or rather, we are all learning.' Anna takes her knife from her belt, and picks a dozy anaesthetised salmon from the bucket by its tail. With a swift move, she cuts its throat. Soon she will take it to the laboratory room, next to our kitchen, and check its inner organs. Her specialty. I wouldn't have a clue, but she sure does, and sometimes she sends samples to a proper lab for further analysis.

What do I need to know to be a fish farmer? I need to know the difference between what I need to know and what I don't need to know. I need to know when to ask for advice. I need
--

to be able to judge the many by examining the few, and vice versa. I need to know the limits of what anyone can know in this business, but sometimes, just sometimes, I need to press those limits, to push a bit further. Because, in the end, life is a journey and we are all in this together, salmon, people, sea lice, wrasse and whatever else. Sometimes our lives intersect, like here, on the platform. And then, all we can do is do our best, and perhaps, now and then, find ways of making life a little better, for everyone. Except, I guess, the sea lice.

This is what I think about as I steer the boat towards the shore. Reflecting, too, that a day's work is a day's work. That there are other things to do in life as well. Which is something else I need to know if I want to be a fish farmer.

### **Acknowledgments**

We are grateful to the anonymised 'Sjølaks AS' for their kind agreement to let us locate our study within the firm, and for its generous practical support, including lunches. We would like to thank all those who work for Sjølaks (they too are anonymised) for their warm welcome, their help, and their willingness to let us watch them at work and participate when possible. In many cases their kindness has vastly exceeded any reasonable expectation or need. The project, 'Newcomers to the Farm', was funded by the Norwegian Research Council (project number 183352/S30), with additional research leave and financial support from Lancaster University, the Open University and the University of Oslo and we are grateful to all of these institutions.

### **Suggested reading**

On ontology, see John Law and Marianne E. Lien (2012) 'Slippery: Field Notes on Empirical Ontology'. *Social Studies of Science*. 43(3): 363–378.

On the materiality of salmon farming, see John Law and Marianne E. Lien (2013) 'Animal Architectures', in Penny Harvey et.al. *Routledge Companion to Objects & Materials*.

London: Routledge.

On the interface of farmed and wild, see Marianne E. Lien and John Law (2011) Emergent Aliens: On Salmon, Nature and their Enactment. *Ethnos* 76 (1): 65-87.