Modes of Naturing: or stories of salmon[1]

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Introduction

[2]

Figure 1: The Norwegian Blacklist

Times change, natures change, and what is natural changes too. Figure 1 is the front cover of the 2007 Norwegian Blacklist, a list of species alien to Norway. The Iberian snail on the front cover is indeed originally Iberian. And the red king crab, another alien species comes from the Kamchatka Peninsula. But the Blacklist adds that:

> 'Some indigenous species are domesticated and have had their genes altered by artificial selection. If such species escape or run wild, domesticated individuals may hybridise with individuals in the wild populations. The wild forms may thereby be supplied with genes that are poorly adapted to the natural conditions. Such hybrids can result in decreased survival of offspring and a generally poorer adaptation to natural conditions.'[3]

The blue fox (Alopex lagopus) and the farmed Atlantic salmon (Salmo salar) fall into this category. Bred from wild Norwegian predecessors, the Blacklist tells us that their genes are now so different that they have become alien. But if we move forward five years things are different. The successor to the 2007 Blacklist is the Fremmede Arter i Norge – med Norsk Svarteliste 2012, the Alien Species in Norway – with the Norwegian Blacklist.[4] Here the blue fox and the farmed Atlantic salmon have disappeared. There is a backstory[5], but the larger point is that the division between what is wild and what is not changes across time and place.

The mobility of this Norwegian list is a little misleading. Alien or not, Norway makes pretty strenuous efforts to keep its domesticated and wild salmon apart. So too do authorities in the Columbia River basin in the US Pacific Northwest. Here, however, the division does not work in the same way. As in Norway, there are salmon hatcheries, but salmon are reared precisely so that they can be put into

[2] Gederaas, Salvesen and Viken (2007).
[3] Gederaas, Salvesen and Viken (2007, 38)
[4] Gederaas et al. (2012).
[5] When the first black list was published in 2007, the inclusion of escaped Atlantic Salmon in the list of 'alien species' turned out to be rather controversial. Biologists at the Norwegian Institute of Marine Research, for example, claimed that Atlantic Salmon could not be an alien species in its own rivers of origin. For details, see Lien and Law (2011).

the rivers.[6] Released in the spring when they become smolts, they pass down to the sea and some return two, three, or four years on. Indeed, around 80% of the salmon coming up the Columbia River are hatchery-reared.[7] Some are trapped and used to breed the next generation of hatchery salmon. Others are caught by anglers. The contrast with Norway needs to be nuanced. Faced with dwindling wild salmon stocks the Norwegians are experimenting with a carefully controlled and river-specific version of this system.[8] Nevertheless, in general what happens in Oregon is unimaginable in Norway. Blacklisted or not, at least in theory in Norway domesticated farmed salmon and wild salmon are kept rigorously apart. The idea of deliberately mixing (most) reared salmon with those that are not is unthinkable.

Perhaps, then, on the Columbia River they do not care about nature or 'natural salmon'? But no, this is not the case. The division between stream- and hatchery-reared salmon is important in Oregon too, but it emerges in other ways. For instance, before hatchery salmon are released their adipose fins are clipped.[9] Anglers are allowed to keep the hatchery-reared fish that they catch – which is part of the reason for the hatcheries in the first place. By contrast, depending on location and season, they often are required to return their stream-spawned cousins to the river. (The fine for not doing so in 2016 was $435.[10]) Here, then, the adipose fin has become a marker for wildness. Legally.

These two stories from Norway and the US Pacific Northwest frame the concerns of this chapter. Our object is to explore divisions between 'nature' and 'culture' by looking at the different histories of 'salmon and their humans' in these two locations.[11] We do this by focusing on practices. Thus our interest is in how salmon-relevant practices work in mundane, down-to-earth, daily procedures, and with how cuts between nature and culture arise from and are reproduced in those practices. That this nature-culture distinction – often understood as a binary – is central to many, perhaps most, Euro-American worldviews is widely recognised.[12] The fact that it is not inevitable – that there are cultures in which this same divide makes little or no sense – is also quite generally understood.[13] However, the ways in which divisions such as this may be understood as growing out of a multiplicity of partially overlapping and entirely down-to-earth practices is perhaps less obvious. And it is these that we explore in this chapter.

So what does this mean in practice? Our answer draws on the disciplines of science, technology and society (STS) and cultural anthropology. Both focus on how relations and divisions are embedded in day-to-day routines.[14] So in this way of thinking 'salmon and their people' are caught up in – and

[6] Although their general appearance resembles Atlantic salmon, Pacific salmon (Oncorhynchus spp.) are members of a different genus from those found in the Atlantic. The most common species of salmon in the Columbia River are chinook (Oncorhynchus tshawytscha), coho (Oncorhynchus kisutch), and sockeye (Oncorhynchus nerka), although smaller numbers of chum (Oncorhynchus keta) and steelhead (anadromous form of Oncorhynchus mykiss) are also present.
[7] Bonneville Power Administration (n.d.).
[8] See Dalheim (2012) and (Lien: 2015, 153-158).
[9] The very small number of hatchery-reared salmon that are released in Norway (see (Lien: 2015)) also have their adipose fins clipped.
[10] This is the standard fine for "a violation absent a culpable mental state." With clear evidence of intent, however, one can also be charged with a class A misdemeanor with maximum potential fine of $6250, or one year in prison. Personal communication, Oregon State Police, Fish and Wildlife Division (12 January, 2016).
[11] Haraway (2008).
[12] The literatures are very large, but see, for instance: Williams (1988), Cronon (1995), Latour (2004)
[13] Again the literatures are large, but see, for instance: Strathern (1992), Escobar (2008) and Farquhar and Zhang (2012).
[14] For case studies that treat human-animal attributes as practical, material-semiotic relational effects see Callon (1986) and Haraway (2008).

given shape by – more or less mundane practices. An absent adipose fin? Then, for the fisherperson on the Columbia River, the fish originally came from a hatchery. The presence of an adipose fin? Then it did not. The practices of removing this fin, and of landing a salmon and looking to see whether or not it is there thus weave people and salmon together in particular sets of relations that are simultaneously material – they include bodies and water and technologies such as anaesthesia and landing nets – and meaningful because they signify an important distinction between river- and hatchery-raised salmon. To use the language of STS and cultural anthropology this is a 'material-semiotic' cut because it is simultaneously materially heterogeneous and meaningful or significant.[15] So the relations in the relevant practices distinguish two classes of salmon. Importantly, and as a part of this, they reproduce that distinction. To put it differently, these practices are 'performative'[16] because they enact people and salmon in a particular way by giving them a specific relational shape or form. Indeed, as we have just noted, at least by implication they also enact a division between the worlds of nature and culture, again in a particular way. Emphasis on the particular.

In this chapter, we explore what we will call modes of naturing as these are done in the practices of distinguishing natural or wild salmon from those that are not in Norway and the US Pacific Northwest. As we have implied above, these practices are very different. Necessarily, and as a part of this, we consider how the natural salmon shifts with changes in the practices and their social, economic, political and environmental – including global – contexts. We then ask how to think about 'the natural' if it is indeed generated in practices, and about possibilities for doing some modes of naturing otherwise.

Norwegian Histories

Salmon farming is important in Norway: in 2014 there were 380 million farmed salmon.[17] Oil aside, it recently became Norway's largest export industry, surpassing fisheries. And it has grown very quickly. Fifty years ago, artificial cultivation of Atlantic Salmon in saltwater was highly experimental, and hardly profitable at all. But in the late 1960s, the combination of successful marine cultivation and efficient hatchery smolt production laid the basis for industrial expansion. The process was one of trial and error. In the beginning, the captive fish were fed fish waste ground up in cement mixers. If sea lice became a problem garlic might be added to the mix. Many of these experiments worked, but the industry only began to grow on a large scale with the invention of the open-sided sea-borne netted pen, and the extension application of other technologies, previously used in terrestrial husbandry, to farmed fish. The most important were: the creation of dried pelleted fish feed; the use of selective breeding programs to enhance growth; and later, the development of vaccines that could largely replace the rampant use of antibiotics common in the industry during the first decade[18].

With the growth of this industrialised marine aquaculture came environmental, and economic problems, and the gradual growth of concern about fish welfare. Necessarily politics got stirred into the mix. The industry started locally, buoyed by national policies that favoured rural enterprise and

[15] The term 'material-semiotics' comes from Haraway (1988). For a recent survey see Law (2008).
[16] The term 'performativity' comes from philosophy (Austin: 1965), where it is argued that sometimes words are actions – that they perform consequences. (Think of the words 'I do' in a marriage ceremony.)
[17] This figure comes from http://www.fiskeridir.no/content/download/7620/95513/version/6/file/sta-laks-mat-07-utgbeh.xlsx (accessed 20 November 2015.) It refers to salmon in saltwater grow out sites only, and does not include the cohorts raised in tanks that have not yet reached the transformation (called smolitification) that adapts them to salt water.
[18] For details on the history of salmon farming in Norway, see Lien (2015) pp.33-37, for a discussion of feed pellets and scalability, see pp 119-122.

local ownership, though over time that was to change. Most important in the present context were environmental issues. As it grew, the industry started to become controversial. There were arguments about polluting excrement from the pens, and the loss of unused feed. There was concern that the fish farms were acting as incubators for disease which spread to undomesticated salmon. Some of these diseases were mitigated by effective vaccines, but not all. As we write in early 2016, parasites such as salmon sea-lice (lepeophtheirus salmonis) have become a major problem, one that has led to tighter regulation and a temporary ban on further expansion of aquaculture. Sea-lice have always been a companion of Atlantic salmon, but the density of salmon pens in the Norwegian fjords has offered provided an optimal habitat, and allowed them to proliferate to unprecedented levels. From the pens they pass into the fjord and onto the wild salmon, for which they are now an important threat. In response to this, farmed salmon are treated with a range of medications and insecticides that are a further source of controversy, due to the risk of environmental side effects. And then, a further issue, sometimes the salmon escape. The percentage of escapees is small – between 1998 to 2015 less than one fish in a thousand. But cumulatively, as the industry expands, the figure became very large: around six million in that period.[19]

Since the industry started to grow in Norway it has been tightly regulated for environmental reasons. Locations for fish farms are specified and total biomass is limited. The calendar is controlled too. For instance, all the farms in a fjord may be cleared of fish as the river salmon pass out to the sea in order to reduce the likelihood of sea lice infestation. Again, welfare regulations and inspections by vets are important. The industry claims, not without reason, that the regulatory burden is considerable. But it cuts both ways. So, for instance, the firms have to keep tabs on salmon biomass, but this is also economically important for farmers who need to know whether they are feeding their fish efficiently. In addition, biomass statistics also tell them whether the salmon are unwell (sick salmon eat less). All this means that the mechanics of measuring biomass are important both to the state and to the industry. And their interests overlap in other ways too. Diseased fish are unproductive fish. Sea lice can inhibit growth. And if escaped fish are an environmental problem, then they also count as lost revenue for the industry.

So what is the difference between the fish that breed in the rivers and swim in the fjords in the North Atlantic, and those being reared in fish farms? Any answer to this question needs to span the general and the specific. The general is easily articulated. Farmed salmon are not the same as river and fjord salmon in a variety of ways. Indeed, somewhere along the way, Norwegians started talking about 'oppdrettslaks'. 'Oppdrett' means breeding or rearing, so oppdrettslaks are reared salmon, bred salmon. At some point they also started to talk of 'villaks' or wild salmon. Though neither category existed fifty years ago (then there were just 'laks' or salmon), this distinction is now embedded in the Norwegian language.

To a first approximation oppdrettslaks belong to (aqua)culture while villaks belong to nature. That is the general answer. This means that we are looking at a further articulation of the EuroAmerican binary mentioned in the Introduction. But this cut only comes to mean anything if it is also worked out in practices, and this is where we move from the general to the specific. The devil indeed lies in the practical detail. It lies in a whole lot of practices for keeping oppdrettslaks apart from villaks, or for separating them out if they get mixed together. There are many such practices, and they work in different and sometimes conflicting ways. They are also location- or site-specific. In addition, they are context-specific in the sense that they reflect and reproduce social, political, environmental and

[19] Norsk Fiskedirektoratet, the Norwegian Directorate of Fisheries, at http://www.fiskeridir.no/content/download/7621/95518/version/5/file/sta-laks-mat-08-tap.xlsx. (Accessed 20 November, 2015).

scientific agendas. It also turns out that in some cases these are less about nature-culture binaries than nature-culture gradations. We move, in short, into the complexities of different modes of separating salmon.

Modes of Separating Salmon

Any list of the specificities for distinguishing salmon is often going to sound mundane. But if the devil lies in the detail we have to deal with the mundane details and attend to their performativity, to what it is that very ordinary practices do, and the nature-culture realities that they help to bring into being.

 [20]

Figure 2: Nets at a salmon farm, culture on the right, nature on the left

So, for instance, the Norwegian villaks-oppdrettslaks division depends on pens and nets. The practices of netting, of putting nets in place, of repairing them, respecting them, and maintaining them, help to enact the Norwegian nature/culture salmon binary. Unsurprisingly, the practices of netting are a continuing preoccupation on the fish farms. It takes time, patience, and considerable physical effort to keep the nets in physical good shape as a barrier. Algae have to be removed. Nets have to be aired. They have to be inspected. Crucially it is important not to drag a vessel's propeller into the netting. All this both protects the profits of the farmers, and keeps the villaks wild.

 [21]

Figure 3: the skirt which goes round the pen for chemical sea lice treatment

Another set of practices has to do with sea-lice. While sea lice control is partly about what goes on inside the nets (fish welfare and profit), it is also in part about protecting wild salmon from infestation, and so reducing the attrition of villaks populations. Since nets don't stop sea-lice, and since sea-lice can hardly be controlled as they float with the current, the sea-lice have to be controlled in the pen. Here nature is conserved by controlling culture. How does this work? As we

[20] Photo ref DSC01769 June 2012
[21] Photo ref DSC008725 June 2010.

mentioned, various medications are added in rotation to the water in the pens[22]. This takes heavy handling because the netting has first to be hung around with an impermeable skirt (see Figure 3). We also mentioned that entire farms – indeed fjords – may be cleared at the time of the spring outmigration of the young villaks, something that takes the power and co-ordination of a strong state and its regional regulatory apparatus. And then over the last decade a third form of biological control has been created in the form of wrasse or 'rensefisk' (cleaning fish).[23] These are introduced into the pens, and under suitable conditions and in the right numbers these eat the sea lice on the salmon. All of these regulatory practices are put in place primarily to protect villaks. To keep the side-effects of culture from diminishing nature.

 [24]

Figure 4: Mixing milt (sperm) with eggs at the breeding station

Then there are practices of breeding. 'Some indigenous species are domesticated and have had their genes altered by artificial selection', those were the words of the 2007 Blacklist. Again, the breeding is its own set of technologies and practices involving (inter alia) milt (sperm) and eggs and buckets and incubators at its own set of specialist sites. Fish are being bred for the qualities stipulated by farmers, the qualities that we touched on above. The result may or may not qualify for inclusion in the Blacklist, but our point here is that oppdrettslaks are here being further distinguished from villaks, through mundane hatchery practices. To put it differently, not only does nature need to be separated from culture, but (aqua-)culture needs to be artfully cultivated in ways that tend to remove it from nature.

But then, if we shift sites again, we discover other practices of separation. How do fisherpeople in Norway know the difference between a villaks and an escaped oppdrettslaks? The first answer is visually, for sometimes an escaped fish looks different, though you also need to know what you are looking for:

> 'Rounded and often split fins, shortened gill covers and deformed fins and jaws are common characteristics of escaped farmed salmon. More stippling below their median line makes them easy to confuse with sea trout. Vaccination marks and abdominal adhesions may also be detected when the fish is cleaned.'[25]

These words are translated from the Norwegian Salmon River Association field guide. Figure 5 shows a poster from the Norwegian National Veterinary Institute:

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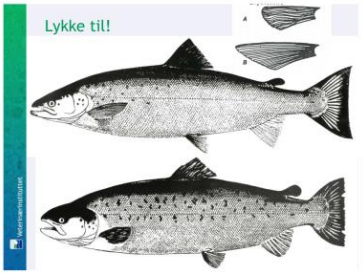
[22] Increased sea lice control leads to increased medication, which breeds resistance in the sea lice. Hence, to minimise resistance issues, different forms of medication are used in rotation, based on preliminary tests on the susceptibility of specific populations of sea lice in each pen.
[23] Lien (2016).
[24] DSC07549, November 2009
[25] English translation of text sourced at http://prohd.no/Bilder/Laks%20Oselva%202010/Villaks%20gjenkjenning/Villaks%20gjenkjenning.pdf. (Last accessed 20 November 2015.)

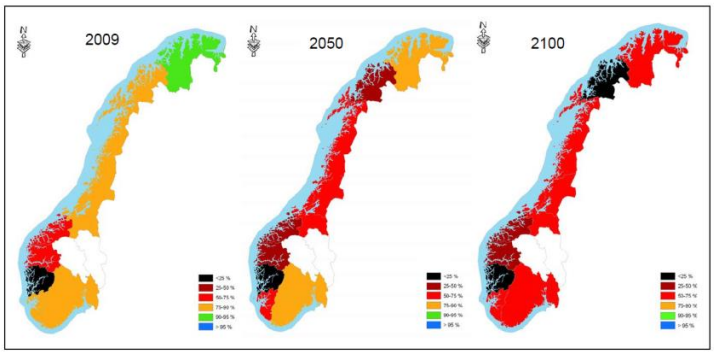


[26]

Figure 5: Distinguishing wild and domesticated escaped salmon in Norway

Here we are also in the realm of the visual. The nature-culture divide is horizontal, lying between the first and the second picture. It's the first kind of fish that you are after – look at its clean lines and its elegant fins and gills – and it's disappointing to catch the one on the bottom.[27] Sometimes the fisherperson may not recognise the difference, but his or her local guide usually does. But other times visual practice doesn't work at all. For instance, if the fish in question escaped when it was young there may be no obvious visual markers. If you are curious you may be able to send a scale sample off for analysis to the Norwegian Institute for Nature Research (the Norsk Institutt for Naturforskning), and indeed that is what fisherpersons are advised to do. Here the cut is made with genetic technologies. And in due course the answer comes back, again as a binary: wild or domesticated.

So finally there are the practices of genetics – and of population biology. Look at Figure 6:



[28]

Figure 6: Estimated and projected percentages of salmon spawning stock with a wild background

The map on the left shows a 2009 estimate for the genetic ancestry of spawning salmon by region in Norway. Black means danger. Here the figure for that genetic ancestry is less than 25%, red means 50-75%, and green means between 90% and 95%. As the colours indicate, the projections for the rest of the 21st century look pretty grim. The message fits with the reasoning of the 2007 Blacklist. This is like an ecological version of Gresham's Law. Even though they reproduce less successfully, bad domesticated salmon will drive out good genetically wild salmon by sheer weight of year-by-year escaping numbers (assuming that the farming of salmon continues). Which means that bad genes (meaning ill-adapted genetic uniformity) drive out good (and diverse) genes and so decrease

[26] This is published by the National Veterinary Institute, the Veterinærinstituttet, sourced at http://www.tofa.no/tofa/vedlegg/Hvordan-skille-villfisk-og-oppdrettsfisk-revidert%5B1%5D.pdf. (Last accessed 20 November 2015).

[27] See, for instance, http://www.granbo-flyfishing.no/_english-edition/fiskedagbok.php?start_from=5&ucat=&archive=&subaction=&id=&. (Last accessed 20 November 2015).

[28] Diserud, Fiske and Hindar (2010, 33).

river specific adaptability.[29] But note this complication. Here the division between nature and culture is not binary. Instead we are looking at a mode of separation that is quantitative, not qualitative. It is a gradation. And it is distributed, too, geographically. In this set of practices Finnmark in the North is 'more natural' than Hordaland in the West.

So in Norway there many modes of separating; many practices for dividing oppdrettslaks from villaks. We have listed netting, sea lice control, visual markers, gene identification and mapping, and population biology – and each of these is in turn its own complex of different practices. And the list is not itself complete. We have not considered how the legal regulation works in Norway, or administrative practice (though as we saw with the Blacklist, this is contentious.) We have hardly considered how the different practices have changed over time.[30] Neither have we entered into the controversies that surround some of the complexities. So, for instance, if the idea that villaks populations are natural implies the absence of human intervention, then this is misleading. In order to enhance stocks available for fishing, but also to mitigate the effects of hydroelectric dam projects, salmon fry have been caught, transported and released in 'the wrong' rivers at least since the middle of the 19th century.[31]

All this said, the broad lines of the story are clear. In Norwegian practices oppdrettslaks may be distinguished from villaks visually, reproductively, genetically, and ecologically. The modes of separating are mostly, though not entirely, binary. They tend, though never perfectly, to align with one another. And these modes of separation for salmon map onto the idea that that which is natural is pristine and untouched, whilst that what is cultured is touched and improved – or for the critics, touched, disturbed and polluted. The specificities, then, lead back to that which is general: the endless enactment of a foundational division between nature and culture in many different overlapping ways. A divide, let us note, that makes no sense to Norway's Sámi indigenous people even if they are no more keen on fish farming than Norwegian environmentalists.[32]

Histories from the Pacific Northwest

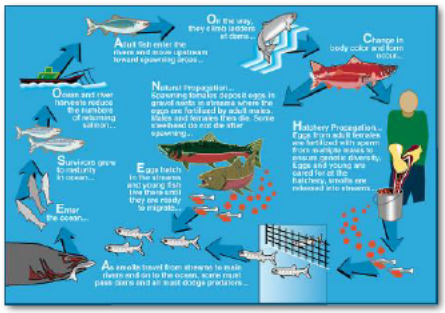
But this can be done differently. In the Columbia River in the US Pacific Northwest as in Norway, classificatory distinctions among salmon have a long history. Native and Euro-American fisherpeople have both used sophisticated categorizations, differentiating salmon for instance by size, shape, colour, location, and seasonal run timing. Distinctions related to wildness, however, are relatively recent, and have developed in tandem with particular fish hatchery practices.

In the second half of the 19th century, the invention of the tin can spurred the construction of fish canneries along the lower Columbia River and set off a salmon fishing bonanza. The weight of salmon harvested by non-native fisherpeople jumped from 272,000 pounds in 1866 to over 42 million pounds in 1884[33]. Worries about salmon declines accompanied the increased harvests. In 1877, a major regional newspaper wrote that 'unless some scheme for replenishing the stock of fish is carried to successful completion . . .the hope for future generations of salmon in the waters of the

[29] 'Our results indicate that such annual invasions have the potential for impacting on population productivity, disrupting local adaptations and reducing the genetic diversity of wild salmon populations.' Fleming et al. (2000, 1173).
[30] For more on the history see Lien (2015, 33ff) and Treimo (2007).
[31] Osland (1990), Treimo (2007), Lien (2015, 150).
[32] See Ween and Colombi (2013) and Joks and Law (2016, submitted).
[33] Taylor (1999, 63).

Columbia will indeed be very thin.'[34]. Fish hatcheries became the primary strategy for addressing this issue.

Beginning in the late 1890s, government-funded hatcheries hatched salmon eggs in trays, reared young fish in tanks, then released them into the streams and rivers to augment existing fish runs. But unlike Norwegian salmon farming, the issue was not to keep hatchery fish apart from others. Rather, and to the contrary, the hope was that hatchery fish would mingle with stream-born fish to boost overall numbers of harvestable salmon. In theory, once released, hatchery fish would migrate to the ocean, alongside their stream-born brethren, feed for up to three years, then return to fresh water. In practice, most of the young salmon that early hatcheries produced were severely malnourished and died very quickly after release[35]. As in Norway, feed pellets mattered. It was not until the late 1960s, when a biochemist developed the first nutritionally effective salmon feed, that significant numbers of hatchery salmon survived to adulthood[36]. Today, as we mentioned earlier, approximately 80% of the fish returning to spawn in the Columbia River Basin begin their lives in hatcheries. Hatchery production has become so commonplace that the practice is now integrated into many Pacific salmon life cycle diagrams (see Figure 7).



[37]

Figure 7: Life cycle diagram (Public domain from US Army Corps of Engineers)

One reason fish biologists knew that more hatchery fish were surviving to adulthood was that they had started marking and tagging them. Why? This was in part to demonstrate that state and federal taxes were not being wasted. Beginning in the 1970s, hatcheries removed adipose fins from some fish and inserted a tiny coded wire tag in their snouts. Fisherpeople were encouraged to note the absence of the fin and to hand over the heads of tagged fish to the authorities. Officials would retrieve the tag and enter its number in a fish-monitoring database. Since only hatchery salmon were so tagged, the fin-clip became associated with hatchery origin.

Even so, hatchery salmon were not seen as fundamentally different from stream-born fish until the 1990s, when the Endangered Species Act, rising concerns about biodiversity, and genetic analysis came together to produce new practices of salmon categorization.[38] In that decade, due in part to increasing habitat degradation, changing ocean conditions, and river damming, most salmon populations in western Oregon and Washington – whether hatchery raised our not – began to shrink. Although salmon declined throughout the Columbia River Basin, certain charismatic stocks – including one that turns bright red and migrates more than 900 miles upstream to spawn – were

[34] Taylor (1999, xvi).
[35] Taylor (1999, 91-92).
[36] Netboy (1973, 336).
[37] https://en.wikipedia.org/wiki/Salmon#/media/File:Life_cycle_of_Pacific_salmon.jpg (last accessed 12 January 2016)
[38] See Levin and Schiewe (2001) on the rise of genetic concerns in the 1990s.

particularly hard hit.[39] Disturbed by the impending extinction of such populations, environmental advocacy groups set out to 'save the salmon'. In 1990, the National Marine Fisheries Service[40] received a series of petitions from nonprofit groups asking the agency to consider protecting several salmon populations under the auspices of the 1973 Endangered Species Act (ESA). But such demands raised a new question: what would count as a 'species'? There are Linnaean definitions, but these shift, and the ESA is a small player in this moving landscape.[41] It defines a legal species as 'any subspecies of fish or wildlife or plants and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.'[42] If salmon were to be eligible for ESA protection, then they needed to be grouped into 'distinct population segments' (our italics).

These ESA policies drew on research that showed remarkable genetic differences among salmon of the same species from different tributary streams. They also argued that hatchery salmon lacked such specificity because few hatchery-cultivated fish were direct descendants of fish from the stream on which their hatcheries were located.[43] In an attempt to relieve egg shortages and increase the geographic ranges of salmon with desirable traits, hatcheries across Oregon, Washington, California, British Columbia, and Alaska had long swapped fertilized eggs, mingling salmon genes from distant regions.[44] In addition to such stock transfers, hatcheries also exerted their own inadvertent selective pressures on salmon[45]. The consequence? The National Marine Fisheries Service concluded that hatchery salmon were not protected under the Endangered Species Act because, 'the key is the link between a "species" and its native habitat, and this link is broken when fish are moved from one ecosystem to another'.[46] Stream-spawning fish were properly natural while hatchery fish were not.

But how to distinguish them in practice? The answer was to return to fin-clipping. No longer confining clipping to fish with an internal tag, hatcheries began to fin clip virtually all their fish to make visible the split between what came to be popularly known as 'wild' and 'hatchery' salmon.

[39] In 1992, only a single fish from this population returned to Idaho's Redfish Lake, once known for its swarms of spawning salmon.The fish, which became a media icon, was given the name "Lonesome Larry" and mourned as the last of its kind (White: 1995, 104).
[40] This agency is now known as NOAA Fisheries.
[41] Marris (2007)
[42] Nehlsen et al (1991, 4-5).
[43] Waples (1991), Taylor (1999).
[44] Taylor (1999, 97), Kostow (1995).
[45] Worried that they might not fill their quotas of eggs if they waited until late in the season, hatchery workers consistently used the earliest returning fish as brood stock. As a result, the genes of early returning fish are nearly always overrepresented, and over the course of several decades, the timing of hatchery salmon runs has crept earlier (Quinn and others: 2002).
[46] Waples (1991, 18-19).

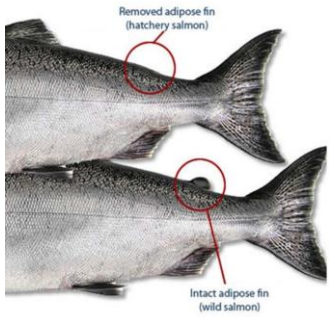


Figure 8: Clipped and Unclipped salmon [47]

More modes of separating salmon

Earlier, we listed a series of techniques used in Norway to distinguish villaks from oppdrettslaks. These included: nets, sea-louse control, breeding, genetics, visual inspection, and population biology. Some though not all of these reappear in the Pacific Northwest rivers. The issue of sea lice is not relevant (these are marine parasites), but many practices of genetics and population biology are common to both, albeit in variants, as are concerns over how breeding practices may render fish less 'natural.'

Such visual distinctions are important in the Columbia River because, and unlike Norway, nets do not hold different kinds of fish apart. Instead nets belong to commercial fisherpeople and indiscriminately scoop up all salmon, hatchery or wild. For more than a century, fisherpeople have used boat-based gill-nets, snaring the fish by the gills and often killing them before they are hauled on-board. But since the Endangered Species Act listing of a subset of the river's salmon, such a method has proven problematic because it captures these fish, legally required protected from harvest, along with the still abundant hatchery fish, made to be caught. For certain fisheries, the fisherpeople have now switched to smaller mesh tangle nets that hook salmon by the teeth or head, rather than the gills. Alive when they reach the boat, and the fisherpeople can then check whether or not the fish have fin clips. The fin-clipped fish go into the boat's hold, while those without are placed in a water-filled 'live box', where they recover for a few minutes before being returned to the river. Another mode of inspection and separation.[48]

[47] Drawn from Weitkamp (2013, 8) http://www.dfw.state.or.us/fish/OHRC/docs/2013/Hatchery%20and%20Wild%20Fish%20in%20the%20Columbia%20River%20Estuary.pdf

[48] See video of tangle net fishing and 'live box' at http://www.salmonforall.org/tanglenet/. There are also other sorting techniques. See http://www.hcn.org/issues/43.21/tribes-try-selective-fishing-to-boost-catch-without-harming-wild-salmon.

Figure 9 Live box, or recovery box [49]

In a region without pens, there are other spatial practices for keeping wild and hatchery salmon apart. Scientists tracking the upriver migration of wild salmon have found that these usually travel up the main shipping channel, a deep-water area created by decades of dredging. So fishing has been curtailed in this channel, and the fisherpeople have been moved to bays and side channels where such fish rarely swim – so called 'select areas' (see Figure 10). And this spatial separation has been further reinforced by releasing hatchery salmon in locations close to those select areas, in order to encourage them to swim into these off-channel areas when they to return from the sea[50].

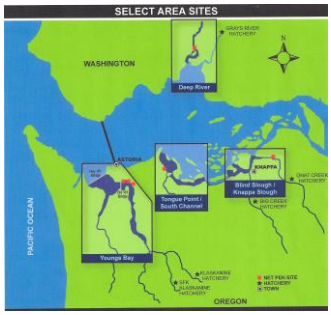


Figure 10: Select Area Fisheries Map [51]

So what is happening in the Columbia River is both like and unlike what happens in Norway. Many of the same techniques are at work but not all, and some work differently. The Columbia River practices distinguish 'hatchery' from 'wild' salmon', not 'wild' (villaks) from 'farmed' (oppdrettslaks). Even more than in Norway the divisions are tenuous, fragile – and contested too. So some insist that salmon should be done through more distinctions, some fewer, and others that the cuts should be done along different lines.

Most fisheries biologists argue for more distinctions. Uncomfortable referring to fish that spawn in streams as unequivocally wild, they prefer a tripartite distinction between 'hatchery', 'naturally produced', and 'genetically wild' fish. Most though not all salmon return to the waterway from

[49] Washington Department of Fish and Wildlife (n.d.)

[50] Although fisherpeople in these fisheries are allowed to keep salmon whether or not they have a fin clip, clipping, other forms of tagging, and sometimes even genetic analysis are used to monitor that those fisheries are indeed capturing predominately hatchery fish.

[51] http://www.co.clatsop.or.us/sites/default/files/fileattachments/fisheries/page/521/select_area_fishery_enhancement_project_fiscal_year_2010-12_report.pdf

which they came, though hatchery-reared salmon wander more than stream-reared fish.[52] Many US biologists are reluctant to consider offspring of stream-hatchery matings 'wild' since they are no longer completely genetically linked to their specific rivers. They also argue that such 'mixed' fish produce fewer offspring than those are purely wild, so impeding the reproduction of wild salmon.[53] Born in a stream, these crosses have intact adipose fins, but genetic analysis finds them less than fully wild. For many biologists the hatchery/wild binary is too simple; we need more categories.[54]

Others, however, argued just the opposite: for fewer distinctions. Native American groups, for example, argue that rigid hatchery/wild distinctions slow down salmon restoration. When bred and reared with care, hatchery fish can be used to restore natural runs. Their fisheries disproportionately impacted by dams, Columbia River tribal groups have a strong interest in boosting severely diminished salmon populations, as well as in how to bring fish back to rivers far from the sea where they have disappeared. For such tasks, they see hatcheries as an invaluable tool. Investing in their own genetics laboratory, fish culture experiments, and stream ecology research, tribal groups have found ways to make hatchery salmon that are more like wild fish – so similar, they say, that their fish should be exempted from fin clipping and allowed to spawn in rivers.[55] When their fish are marked with a fin-clip, they are disproportionately caught by recreational and commercial fisherpeople in the lower river, and do not make it back to the upper river tributaries to spawn in streams and once again evolve a special link to their own waters.

Distinctions, though, are not simply made in the course of different management debates. They are also cut along entirely different lines in quite other settings. Step up to a fish counter in the US, particularly in a salmon producing region like the Columbia River, and one is likely to see salmon labelled as 'wild'. This is not the 'wild' of the fin-clip, which aims to separate naturally spawning fish from hatchery produced ones. Indeed, many of these fillets and steaks are likely to have come from hatchery fish. Here, the category of 'wild' relates to marketing. On the fishmonger's counter fin-clips and genes are not important. All salmon captured by fisherpeople are marketed as 'wild' or 'wild-caught' fish. The cut is economic rather than scientific, and the context is interesting.

When farm-raised salmon from Norway began to flood international salmon markets in the 1990s, non-farmed salmon fell in price.[56] Consumers did not distinguish the fish lying before them on the fishmonger's slab except by price, and farmed fish were cheaper. US and Canadian fisherpeople countered by marketing non-farmed fish as premium products and processors adopted the 'wild' as their central motif[57]. As a strategy it worked: being marked as wild in this context can now more than double the sale price of salmon. At the same time, it has also added to complexity – perhaps it would be better to say confusion – in a location where people routinely encounter non-commensurable distinctions between hatchery/wild and farmed/wild salmon. By contrast, in Norway, buying wild salmon over the counter is rarely an option. Most wild salmon that is caught is either released, or consumed by the fishermen's family, friends and kin, or bartered to the same groups of people. With practically no hatchery production to boost the wild salmon stocks the numbers caught are much lower than in the US and only rarely make their way into the market.

[52] Quinn (1993) and Pascual (1995).
[53] Araki (2008)
[54] Similar multiplication happens in the small scale Norwegian experiments in hatchery-based
[55] See the Colombia River Inter-Tribal Fish Commission website at http://www.critfc.org
newspaper article at http://www.eenews.net/stories/1060023973. See also Ween and Colombi (2013).
[56] Eagle et al. (2004)
[57] Hébert (2010)

Note that all of these salmon distinctions are contingent. They reflect and reproduce international and intertwined biological, commercial, cultural (social) and leisure-related interests. And indigeneity also gets stirred into the mix in both countries, albeit again in very different ways. But what do these divisions tell us about 'nature' and its distinction from 'culture'?

Conclusion

Across the social sciences and humanities, we often talk about the Euro-American nature-culture binary as if it were a single, foundational division lying at the heart of Western thought. But as this chapter has shown, though they endlessly reappear, nature-culture distinctions are far from single or unified. And they emerge not from an ahistorical cultural logic, but from countless, shifting, everyday practices. There are many modes of naturing. Such is the lesson that we draw from the stories we have told about 'villaks' and 'oppdrettslaks', and the alternative classifications and practices for distinguishing salmon on the Columbia River.

Crucially, these different practices for enacting salmon intersect both within and across these regions. At times modes of naturing arrive at different conclusions, though sometimes they do not, and perhaps most often they work in ways that are partially consistent.[58] Sometimes, to be sure, they travel. Similar routines of population biology – its statistical modelling, its genetic sequencing, its sampling techniques and its field-based observations – crop up in Norway and the Columbia River, though how they are used may vary. But ways of doing biology are themselves also varied and often subject to dispute. As we have seen, what counts as a 'species' depends on context, and the history of taxonomy reveals fish classification to be a substantially moveable feast.[59] Furthermore, biology has no monopoly over classificatory practices. Marketing draws its own quite different lines through the worlds of fish, though again it may trade on the idea of the 'wild'. And then there are further ways of making divisions that grow out of quite other kinds of practices – for instance among those who fish – that may or may not align with those of biology or marketing. Indeed, some such practices – for instance among native American groups, and Sámi people – work in ways that may have little or nothing to do with nature-culture divisions. The world does not have to be cut in this Western-inflected binary mode.[60]

But what does this plethora of naturings imply? There are various possible responses. The multiplicity of the practices for dividing nature from culture may work to increase the strength of the binary divide. The reason for this is that the fate of the division does not depend exclusively on the fortune of any single set of practices. If one such practice does not work – for instance in genetics, or marketing, or in recreational fishing, or on a Norwegian fish farm as when a net is breached – then its failure does not undermine the principle of the binary divide. It just shows that the particular way of making that division was flawed. An obvious response is then to redouble efforts for finding better ways of separating nature from culture – which is perhaps one way of understanding what is

[58] For this argument about partial connections between objects that are both the same and different see Mol (2002).

[59] Salmon belong somewhere in the animal kingdom and are grouped and classed in a number of ways. These may be linked to morphology. This is how Linnaeus worked. Subsequently this they were related to the geological record, the practices of stratigraphy and the various technologies of geological dating, and then to the theory of evolution. More recently classifications came to reflect the practices of DNA sequencing, and also a practical concerns including those of conservation. See Marris (2007).

[60] Many ways of knowing the world avoid nature-culture divisions. These include (for instance) Sámi ways of knowing salmon (Joks and Law (2016, submitted)). And there are many more ways of making the binary divide that we have not touched upon in this piece including, for instance, Romanticism. See Law and Lien (2016, forthcoming).

happening with the entire clearance of farms on Norwegian fjords in the face of concerns about the effects of sea lice on villaks.[61]

Another possibility is that this practical multiplicity – or perhaps the awareness of it – can undermine the great nature-culture divide. To say it quickly, nature no longer seems quite so 'natural' if it is visibly generated in practices. Some might say, for instance, that if the truth about nature is being 'constructed' then we do not really need to take the nature that results from those constructions so seriously. Or, alternatively, that if the experts cannot agree among themselves about what is natural and what is not, then this suggests that there is no particular need to worry about what any of them are saying about nature.

Both these possibilities have been played out in real life, but our concern is different again. It is with the conceptual and political possibilities that arise if we start to think through multiple naturings. In particular, this implies the need to think simultaneously about the human and the non-human as we ask about what might be desirable in the worlds of salmon and their people. Our argument, therefore, is that it is important to explore what Annemarie Mol calls a 'politics of what' in addition to the more obvious 'politics of who'.[62] The latter comes in many variants, but is familiar and easily imagined for those raised in Western democracies. It is about people and social collectivities: about 'who' has certain rights and access to resources. This way of thinking is deeply embedded in both professional and lay political thinking in Western cultures, and it is easy to see it at work in the present context. To take just one example, salmon politics – both in the Columbia River system and in parts of Norway – are often framed as questions of allocation, of fair distribution. Such politics take the form of conflicts and competition between different interests and interest-groups, including indigenous communities and fisheries managers, or salmon farmers and river anglers.

This is the 'politics of who', but the practices that we have explored in this chapter are not restricted to people, identities, communities and interest groups. They are also about the nature of salmon, of villaks and of oppdrettslaks, and, to be sure, about nature and culture. And as with human politics, the story has been one of change. So, for instance, in Norway, what counts as a 'villaks' has been a constantly moving political and ecological knot. Indeed, as we have seen, fifty years ago the category of 'villaks' was not available. Neither (to take another example that we also mentioned earlier) was there any well-developed concern about the river-specificity of salmon stocks, and historically that restocking was not river-specific. Again, twenty years ago, no one imagined that 'wild' salmon might be hatchery reared, an experiment now being actively pursued on the Vosso River.[63] In this flux, the bodies of salmon and their relations to other beings have themselves changed. And so it is in all the stories that we have told. The nature of salmon, of domestication, of the wild, along with the binary division between nature and culture – all of these have been subject to practical intervention, they have changed, and often they have become matters for discussion and debate. Our argument, then, is that a 'politics of what' is almost always implied in a 'politics of who'; that, indeed, the two cannot be disentangled.

What might this mean in practice? The answer depends on what kind of a difference one hopes to make.[64] So, for instance, if the concern is with social inequality, then some parts of a 'politics of who' quickly suggest themselves. The citizens of Indian first nations, and Sámi fishermen are multiply

[61] See Latour (1988, 201-203), where he argues that colonisation was robust precisely because it was not coherent.
[62] See Mol (2012).
[63] Barlaup (2013), Lien (2015).
[64] Haraway (1994).

disadvantaged: they deserve support. But since a politics of who also implies a politics of what, additional and much less conventionally political questions also become important. Which kinds of salmon are better and which are worse? What are good ways for salmon to relate to other species and to the environment in particular circumstances? In the contexts of salmon worlds, what would make good modes of naturing, and where? Are there circumstances in which it would be appropriate to abandon the division between nature and culture, and others where it might be useful to temporarily hold on to it? Any response to these kinds of questions will be contingent and situation-specific. There may well be moments when the most obvious politics to protect salmon spawning beds might also be to insist on the need to protect nature. This, then, is a moment when the divide is reinforced – and for good reason. But then there will equally be moments when a 'politics of what' looks quite different. For instance, as we noted above, many Sámi people, though just as concerned about spawning beds as the biologists, neither necessarily treat nor want to treat the world through the lenses of a nature-culture binary.[65]

So political tactics are likely to be contingent. And so too are salmon classifications and nature-culture divisions. But we want to conclude with one final thought. The worlds of salmon and the practices out of which they grow are rather large-scale, often robust, and as a part of this are bound up with many well-established institutional forms. They certainly cannot be wished away. On the other hand, they are also on the move. As we have seen, salmon practices have been shifting for more than a century in both Norway and the Columbia River, and dramatically so more recently with the growth of farmed and hatchery-reared salmon. And this history of change continues. Indeed, in certain respects the divisions and classifications that it makes are also surprisingly fragile. For instance, in the Columbia River, fin-clipping – a seemingly solid and established mode of separating salmon – is threatened by federal government budget cuts, and hatcheries are uncertain how best to respond. Should they reduce the production of juvenile fish so that they could afford to clip them all? Commercial and recreational fisherpeople would resist the resulting dearth of fish. But if they release significant numbers of unmarked fish then fisherpeople will no longer be able to distinguish river fish from those that have been hatchery bred. The knock-on effect is that severe catch restrictions will be needed to protect Endangered Species Act fish, since they can no longer be visually distinguished from hatchery salmon. And this is our final thought. The contingency and fragility of practices such as fin clipping is important because it reminds us that the world is less fixed we often take it to be. It reminds us that there is ample space – and need – for a 'politics of what' as well as a 'politics of who'. To put it more generally, it reminds us that naturing could be otherwise.

[65] Ween (2012) and Joks and Law (2016, submitted).

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