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The Political Ecology of Salmon Aquaculture in Chile

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Introduction

Statistically seen, of the 15.2kg fish every German consumes per year, 15% is salmon, which is the third most popular fish in Germany after Alaska-Seelachs and Hering (Keller/Kress 2013: 9). But where does the salmon that ends up on our plates every 6th time we eat fish come from? There's no obligation for producers to declare the origin of their fish products, but if they do so, the latin name of the fish, catching method and catch area should be declared. Salmon, of which about 40% are captured in the wild and the rest brought up in aquacultures, could then be declared as follows: Salmon (salmo salar), aquaculture from Chile. Without any doubt, this makes consumption more transparent, but the standards of production – both, social and ecological ones –and the ecological impacts are still kept in the dark. Looking at agricultural farming as it takes place in Chile's 9th and 10th region is even possible from the home office: Fishing nets and cages can be seen from above with the help of online map services. Still invisible are, of course, ecological and social impacts of this way of food production. Indeed, salmon aquacultures are responsible for severe damages to the local fjord ecosystem. Food residues and faeces drop down from the cages, fish are fed with antibiotics and mass escapes due to holes in the cages are a serious challenge for the fjord environment that has never been a home for salmon until humans brought it there. But problems continue on land: a high risk potential for divers and low wages in general are the price for an employment in the structurally weak area.

This report deals with the consequences of aquaculture in Southern Chile being viewed in the context of political ecology. Originally being developed by geographers, the projection of political ecology (PE) unites analysis of natural as well as social sciences. It is based on the assumption that recent environmental problems cannot be analysed from one side only, as reasons and solutions for problems are usually multidimensional. Regarding salmon aquaculture in Patagonia/Chile, I have two theses:

a) There is an imbalance of power between the salmon industries, local population and environmental associations towards the local population which is expressed in the conflict of salmon aquacultures in Southern Chile.

b) Earnings of the salmon aquacultural business are internationalized while the negative environmental impacts remain on a local level.

First, I will give an overview of the field of PE and then the problem analyzed in this paper will be described clearly. Afterwards, I'll give a description of the environmental changes due to salmon farming in Chile and the actors involved (salmon industry, local population and environmental associations). The last part contains a discussion of the theses and short future prospects of possible developments in the field.

Literature

A short, detailed overview of the wide field of PE is delivered by Krings (2008), while a more detailed and methodologically more precise is given by Robbins (2004). Bryant (2001) clusters different mentors of PE which helps to understand better the evolution of the field. Concerning salmon aquacultures, scientifically proved material comes from environmental organisations. Doren/Gabella (2001) wrote a very detailed and elaborate report on the issue for Fundación Terram which treats both the ecological and social costs of the problem. Same goes for García Moreno (2005), who worked for Veterinarios Sin Fronteras (VSF). A newer research paper from Ecoceanos is written by Igor Melillanca/Díaz Medina (2007). Fortt Z./Buschmann (2007) published a report focusing on the (mis)use of antibiotics. More important facts and numbers about aquacultural salmon farming

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in Chile come from an interview done by Morgenthaler (2011) with the German filmmaker Wilfried Huisman. Regular statistics about fish consumption in general are compiled by the Food and Agriculture Organization (FAO), especially in their statitic year book by Gennari/Keita/Schmidhuber (2013: 123-199).

Political Ecology

PE is not a self-contained theory, but a theoretical-conceptional frame, in which various approaches can be summed up. They all have in commonthat they "denaturalize certain social and environmental conditions, showing them to be the contingent outcomes of power, and not inevitable". (Robbins 2004: 13) Bryant (2001) distinguishes neo-Marxist, post-Marxist, feminist and post- structuralist schools within PE. All of them focus on analysing social environmental conditions which means that environmental issues are seen as (re)allocation issues between different social actors such as minority groups, corporations and politicians. Due to the variety of the approaches there is no consistent methodological framework. PE constantly tries to do two things at once: critically explaining what is wrong with dominant accounts of environmental change, while at the same time exploring alternatives, adaptations, and reactive human action in the face of mismanagement and exploitation." (Robbings 2004: 12)

Piers Blaikie and Harold Brookfield, the two geographers who founded PE in the 1980s, understand their field of research as a "geography-based research field that nonetheless maintains strong links to anthropology and sociology." (Blaikie/Brookfield 1987: 17) Links to political science are given by the fact that the social construction of natural spaces is an expression of potentials of power and spheres of influence, which is a genuine field of study for political scientists. Blaikie and Brookfield published empirical studies and worked mainly on Development Studies, which is also a topic that involves various disciplines, therefore PE has a high potential for interdisciplinary work. The reason for the increasing significance of PE obtained in the 1990s lay in the fact that it – in contrast to former approaches – put environmental problems in the context of unequal power distributions and economic constraints In Germany, social ecology has become popular. Social ecology has a lot of intersections with PE, but was founded explicitly with reference to critical theory (see also Becker/Jahn 2006).

Salmon aquacultures in Chile – the environmental conflict

Atlantic salmon (Salmo salar), was originally not at home at the Chilean costs and is therefore an invasive species. It was brought to the country only about 100 years ago in order to make financial profit out of it and cover the demand for protein in the local population. (Doren/Gabella 2001: 7) In the 1990s, after the end of the military dictatorship under General Pinochet, salmon breeds experienced an enormous boom in Chile and the country is now the second biggest producer of salmon behind Norway. About two thirds of salmon aquacultures worldwide are located in Norway and Chile. (FAO 2009: 75) Within Chile the centre of salmon farming is based in the 10th region around Reloncaví. (Doren/Gabella 2001: 7) Most of salmon cages are located there a down south in structurally weak areas with a low population density, but partly untouched fjord landscapes. Today, in Chile 98% of the farmed salmon are for export. (García Moreno 2005: 8)

The conflict arising from this practice is the endangering of the fjord ecosystems by various factors which has consequences for local fishermen depending on good environmental conditions. Furthermore, social conflict can be found between people depending on jobs in the salmon industry, but in the same time being exploited in their job. The problem gets even bigger if future perspectives are involved: a growing income sector can be the (eco-) tourism branch, which depends on the attractiveness and ecological intactness of the region, which will be progressively destroyed if salmon industry continues to work the way they do at the moment.

The massive amounts of production and the exposure of the fjords to the invasive animal has of course an influence on the landscape and the local ecosystem. To measure the degradation of landscapes due to human interference, Robbins (2004: 91-96) suggests four indicators: loss of natural productivity, loss of biodiversity, loss of usefulness and creation or rise of environmental risks. In the following, I will give a detailed description of the negative impacts of salmon farming on the environment.

Atlantic salmon – not a domestic species in Chile

Salmon in agricultures is kept and raised in under-water cages, which should prevent the animals from escaping, but doesn't isolate them from their environment. Big amounts of faeces (containing Phosphor and Nitrogen), feed residuals (containing medicine, especially antibiotics) and residues of dead fish fall down on the sea floor underneath the salmon cages. (García Moreno 2005: 27) Sediments that stay there change bacterial flora on the ground and, as a consequence, have an influence on the food chain. (Fortt Z./Buschmann 2007: 9) As mentioned

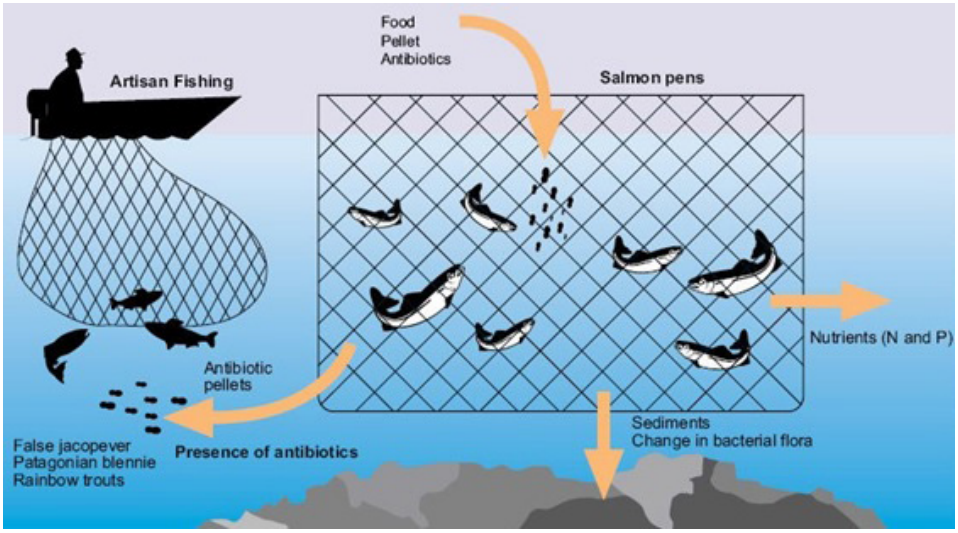

Figure 1: (Source: Fortt/Buschmann 2007:p.9)

above, salmon is an invasive species, therefore its implementation into Patagonian ecosystems means an enormous risk for the latter. What makes it particularly even more risky is the problem that sea lions on their search for food damage the salmon cages, so that salmons escape, spread and spawn. Given the fact that there are no other massively polluting industries where salmon aquacultures are located, the consequences of this intervention in the natural space are clearly visible.

The risk of escaping salmons

It happens regularly that sea lions looking for food or thunderstorms cause grave damages to the salmon cages so that fish can get outside and spawn freely in the fjords. Escapes are "one of the most serious environmental problems resulting from open-water aquaculture operations"(Oceana 2012), because salmons have a high demand of food and therefore threaten or even erase other species. In Chile, the number of escaped salmon out of aquacultures is up to 1 million.[1] The social component of the problem is that it is forbidden and punishable to capture or angle the escaped fish, because they are officially private property of the salmon corporations. Fishermen, whose basis for work and nutrition is already endangered by the industrial competition, find themselves in the middle of a dilemma.

Epidemics and antibiotics

Because salmon are kept with only little space in the cages, there is a potentially higher risk that the whole stock falls ill. One of the most serious illnesses is the ISA virus (Infectious Salmon Anaemia). In 2012, scientists of the University of Bergen could prove that the virus was introduced to Chile from Norway. As there are already existed experiences with the dangers of contagion in Norway earlier, it can be said that the handling of a possible outbreak in Chile was negligent. The biggest ISA epidemics in Chile happened in 2007 and 2009 (FAO 2009: 75), in 2013 ISA spread again. (Trovall 2013)

In order to lower the risk of illness and epidemics, the feed of the salmon already contains antibiotics. Chilenean law allows a much higher amount of antibiotics in foodstuff than in Norway. (Fortt/Buschmann 2007: 6). Residuals of the antibiotics can also get into the human body via the food chain and so cause possible resistances towards antibiotics. Moreover, wild fish are also affected because they eat foodstuff remains that aren't eaten by the salmon and then fall out of the cages. (Fortt/Buschmann 2007: p.6).

Follow-up problem: exploitation of other fish species for feeding the salmon

When they grow up (and grow fat), salmon needs more animal proteins than they deliver when they grown-up. The data on the exact amounts varies: Marine Harvest, worldwide leader in the market for salmon aquacultures, states on their homepage that the amount is 3kg wildly fished fish and some biologists say it can be up to 8kg (Morgenthaler 2011). How much the amount of fish that is fed to other fish is, becomes clearer when looking at the numbers of the FAO: out of 148 tonnes of recovered fish, 128 tonnes are directly for human consumption. (FAO Statistic Year Book 2013, Part 3: 146) Independently from the exact amount of fish meal that is fed to salmon in the breeding locations to make them grow, it becomes clear that a sustainable salmon production is not possible, because it is based on the exploitation of other fish species.

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Another ecological follow-up problem of the massive salmon farming is the endangering of the protected species of the sea lion (Otaria flavescens). Sea lions are often killed, because they damage the salmon cages looking for the fresh food inside. (Igor Melillanca/Díaz Medina: 34)

The social dimension: bad working conditions and dependencies in the salmon industry

Beyond the ecological point of view, the environmental conflict around salmon aquacultures also shows a social dimension that is not to be neglected, especially not while doing PE. The region of Los Lagos with the highest density of salmon aquacultures is among the poorest regions in Chile and has the lowest educational level. (García Moreno 2005: 15ff) Agriculture, including fishing industry, is still the most important economic sector, even though tourism is becoming more and more important. The surrounding nature attracts tourists looking for adventure sports as well as hobby anglers. In 2004, about 45,000 people in Los Lagos region were directly or indirectly employed in the salmon industry (SalmonChile 2013), but not even 7000 – that means less than 10% - were organized in labour unions. (Igor Melillanca/Díaz Medina 2007: 7-21) Especially for the divers working at the salmon cages, their job bears a high risk of accidents. Diving lower than officially permitted, pressure to go diving during bad weather conditions, bad equipment and an insufficient training and control make their job one of the most dangerous. In Chile, on average every month a diver working in the salmon industry dies, while in Europe this happens every three years (Igor Melillanca/Díaz Medina 2007: 14).

Regarding the landscape degradation indicators by Robbins (2004), what can be said about the human impacts on Patagonian landscape?

Loss of natural productivity: Due to regularly happening salmon escapes out of their damaged cages, the coastal ecosystem suffers, because salmon's enormous hunger diminishes the domestic fish stocks.

Loss of biodiversity: To provide feed for aquacultures, fish is recovered along the whole Chilean coast, which is leading to a major overfishing problem, which industrial salmon farming is also responsible for. Furthermore, escaped salmon threaten and endanger the local ecosystem while looking for the massive amounts of food they need. Unfortunately, exact data on how the ecosystems change under influence of escaped salmons has not (yet) been provided, but what is already obvious is the perilous situation of sea lions who are already protected, but still killed because they can do harm to the salmon cages.

Loss of usefulness: At least two branches of economy depend on the intact Patagonian fjord landscape, local (artisan) fishery and tourism. Fishermen are highly affected by the salmon industry, because of escaped salmon diminishing the populations of the domestic fish species. On top, they can get juridical problems if they fish a salmon which is property of a company, even when swimming around freely. How much tourism is harmed actually can't be stated in this paper, but there's the potential danger that the regions affected by salmon industry loose attractiveness, especially for angler tourists looking for domestic species.

Creation or rise of environmental risks: In my opinion, so far there is no definitive correlation between salmon breeding and new/rising risks that can be proved, but some are probable regarding the endangered status of sea lions as a key species in the local ecosystem or some effects connected to the massive use of antibiotics.

Actors in the conflict: Salmon industry

Salmon is one of the most important export products of Chile and more than half of the total amount of exported fish products is salmon (SalmonChile 2013), even 98% of all salmon farmed in Chile is intended for export, especially going to Japan and the United States (García Moreno 2005: 9). In 2005, three of the biggest salmon exporters were transnational corporations; still the market leader is Marine Harvest (ibid). Marine Harvest, the global market leader for salmon aquacultures and based in Norway, has been heavily criticized for their destructive way to farm salmon as well as the dangerous working conditions. (See also the movie "Lachsfieber"by Wilfried Huismann) Since 1986, all salmon producing companies are united in the association SalmonChile, which has 54 members at the moment and its goal is to represent the common interests of salmon industry to the state and investors. Given only the large number and importance of its members, SalmonChile is a largely influential actor, which enables salmon industry to speak with a common voice.

In Chile, environmental standards are lower than for example in Norway and growing rates in the salmon branch account more than 10%, which makes the country a paradise for investors and internationally operating companies. (Morgenthaler 2011) Good preconditions are not only to be found in Chile's natural resources, but also in the economic conditions: Since the 1980s the country follows a highly neoliberal course, strictly sticking

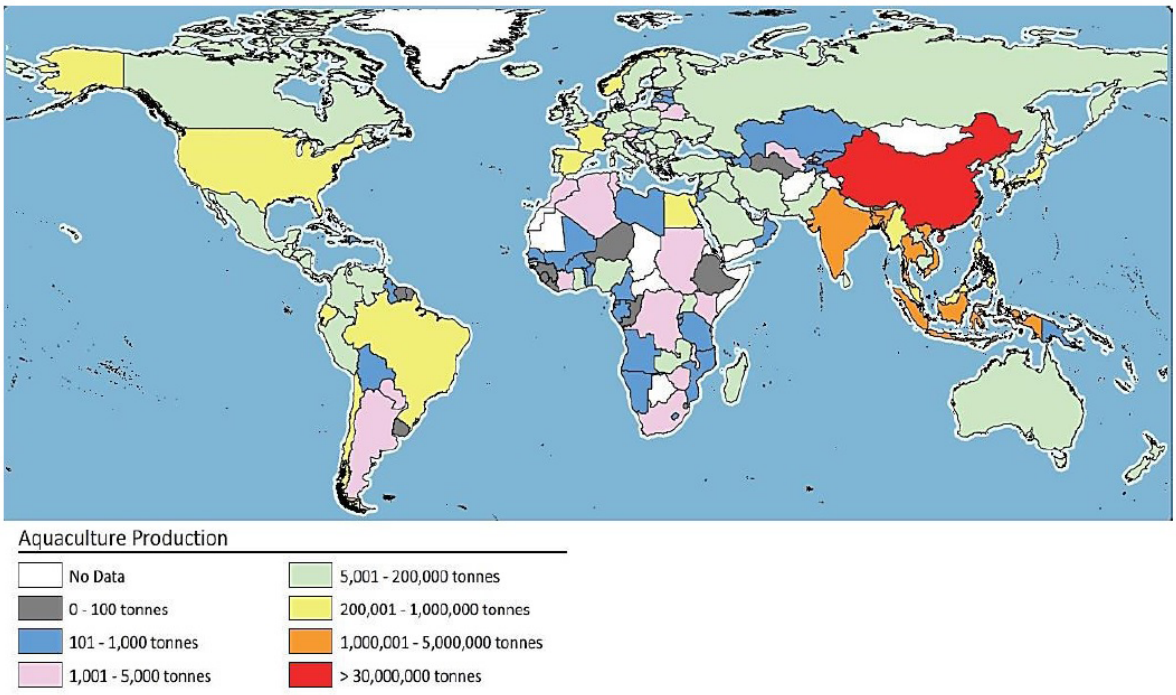

Figure 2: Aquaculture production of aquatic animals for human consumption (tonnes) in 2009
Source: - NASO aquaculture maps collection , Food and Agriculture Organization of the United Nations (FAO), 2014 Accessed 10 June 2014
http://www.fao.org/fishery/naso-maps/naso-maps/en/)
Please find the fishery statistical time series at:
http://www.fao.org/fishery/statistics/software/fishstat)

to the principle „grow first, then regulate" (García Moreno 2005: 6) and also within the society, major concerns about environmental issues are hard to find. Despite the very low regulative environmental framework, Salmon-Chile point out that in Chile no other sector would have to bear that much regulation regarding the environment like the salmon industry.[2] Not only being committed to "big business interests", the association stresses the local commitment of its members, e.g. donations to school, libraries and other public places in the salmon producing regions. All in all, the capital that is generated in Chile by salmon breeding only partly stays there. Big amounts of money leave the country and the political and economic framework favours this situation (Igor Melillanca/Díaz Medina 2007: 5), which attracts even more investors.

Local population and employees in the salmon industry

Obviously it is not possible to summarize the whole population of aquaculture-hosting regions as a collective actor with homogeneous norms and ideas, but those employed in the salmon industry bear more or less similar working conditions. As already described above, working conditions in the salmon sector are precarious in the sense that there are no labour unions, there's a certain dependence on the few jobs offered and there were even court cases against some employers. (Igor Melillanca/Díaz Medina 2007: 7-21) There are scattered acts of protests and strikes, but so far they are not connected or collective to an extent that allows the creation of a strong and contained actor – even though there would be a basis for common demands such as secure contracts, better employment protection, proper safety measures and the right to organize in labour unions. Ecoceanos states: "50% of the members of labour unions belong to superior organisations, which means they are connected through federations, which shows an actor that is fragmented, shattered and has no capacity to negotiate." (Igor Melillanca/Díaz Medina 2007: 16). The same sentiment goes for tourism. There is no association of interest that could criticize the practices of the salmon industry. Although the loss of biodiversity and destruction of coastal ecosystem will have an impact on the development of tourism, because they promote the untouched and intact natural landscape which is strongly connected to Patagonia as you might know it.[3]

Environmental organizations

Eco-social problems around salmon aquacultures in Southern Chile belong to the very core issues of the country's relatively young environmental movement. One of the organizations running a campaign on salm-

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on farming is Ecoceanos, founded in 1998. They advocate for the protection and the sustainable treatment of marine/coastal ecosystems and resources, but also want to strengthen civil society and promote the active participation of small organizations in the political process. In order to achieve these goals, their methods are environmental education, capacity building, research and trying to encourage broader public discussion through publicity. Ecoceanos is also part of Red Puentes Chile, a nation-wide association of eleven organizations working on social and ecological issues and who have committed themselves to sustainable development. Red Puentes itself is an international NGO containing seven national branches.

Another NGO dealing with ocean issues in Chile is Oceana, the biggest international organization working only on the protection of oceans and their ecosystems, founded in 2001. In addition to offices in the USA, Europe and Central America, they also have an office in Santiago de Chile. Their campaign on salmon aquacultures is only one of many, but showed a visible success when Chilean Congress tightened the regulations on the prevention of salmon escapes and restriction of antibiotics in feeding. in 2010 (Oceana 2013). Fundación Terram, a Chilean environmental NGO founded in 1991, mainly focusses on research and provides studies and articles delivering concrete advice on how to achieve sustainable development. Additionally, they want to support social engagement and cooperate with different social and ecological NGOs.

Last but not least, there is the association Veterinarios Sin Fronteras (Vets Without Borders) who struggle for worldwide food justice and against the reasons for hunger in the world. They aim to change the economic system in a fair and equal way. They have no office in Chile, but substantial material on a scientific basis about salmon is provided by the Spanish section (see Cabrera 2003).

Conclusion

Without any doubt, the development and expansion of the salmon industry in Southern Chile have led to a considerable change, especially in respect to the degradation of the landscape. According to the criteria developed by Robbins (2004), we can clearly speak of a loss of natural productivity, biodiversity and usefulness in the centres of salmon production. Even though Robbins' fourth criteria, creation or increase of environmental risks could not be asserted, the other points clearly indicate a major intervention in the existing coastal ecosystem. The outcome is an environmental conflict that reflects different power potentials of the distinct conflicting parties.

First, according to the definition from the beginning, power can be seen as room to manoeuvre in the natural sphere. In the salmon industry, it is the salmon producing corporations who are the responsible for the destructive changes that take place in Patagonia, because they can maximize their profits treating nature like they do. In Chile, there is currently no mechanism that allocates (monetary) costs of environmental destruction to the originators, so, inevitably, these costs have to be borne those who suffer directly from the destruction itself. This proves the first point of my thesis.

Second, power can also be seen as room to manoeuvre in the political sphere that is guiding the policies. The analysis of the three actors presented above – salmon industry, local population and environmental associations – indicates the different state of organisation between them. While the industry has a powerful and professional representative of their interests in SalmonChile, their employees and the neighbourhood of affected regions are only marginally organized. That there's hardly any opposition against the practice of salmon industry, can be explained plausibly by the lack of jobs in the structurally weak area. People depend on jobs in order to earn their living at least on the short and medium term and it is the salmon industry that provides these jobs in Patagonia. Furthermore, it seems that the salmon industry even represses trade unions, which would stabilize the advance they already have concerning representation of own interests towards change agents. The third group I analysed, the environmental associations, is partly working internationally, but until now there have been neither collective campaigns nor demands to improve of aquacultural standards. This doesn't mean that their engagement is completely without consequences: the tightening in the regulation concerning salmon escapes in 2010 was achieved decisively under pressure from NGOs.

What is remarkable about the environmental associations is also that they don't only focus on the negative environmental consequences of salmon production, but also consider social factors. I interpret their social engagement as an expression of a broader understanding of sustainability, which can bring them sympathy within the population, but also connects, to a comprehensive criticism of the whole capitalist economic system. The higher degree of organisation the salmon industry has achieved, allows the corporations to assert they even vis-à-vis the state. Chile has implemented a strongly neoliberal policy since the 1980s which advantages transnational corporations, but makes it even more difficult

for those who want to implement regulative rule. So, in conclusion, even the second thesis is supported: earnings of the salmon business are internationalized, while negative environmental impacts remain on a local level.

Beyond the problem analysis, political ecology always seeks potential for change. Where can we find change towards a sustainable, ecologically friendly world in the example presented in this analysis? In my opinion, the developments in the Chilean environmental movement since the 1990s give good reasons for hope. The associations I have presented – Fundación Terram, Ecoceanos, Oceana and VSF – do great scientific work. Furthermore, they work strategically reasonably in international networks/an international context. It is important to integrate local initiatives, because the protection of the environment starts on a local level and the people only act when they see and understand the benefits they get from engagement for their environment. I see the environmental organisations as pioneers when it comes to social/societal change towards a (more) sustainable world. Especially in Patagonia also the (eco-) tourism branch has great potential to gain influence on political decision makers, because they are a growing industry, depending on an intact, natural environment and spectacular landscapes.

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1. A list of major salmon escapes in the 10. and 11. region between 2004 and 2005 can be found in Igor Melillanca/Díaz Medina 2007: 27-28.
2. Indeed a good overview of the different legal frameworks regulating salmon farming can be found on the homepage of SalmonChile: *www.salmonchile.cl//frontend/seccion.asp?-contid= 473&secid=6&secoldid=6&subsecid=141&pag=1,* last accessed February 10, 2014
3. See *http://www.turismochile.com/guia/sur/.*