Challenges and issues in the DHC *Anchoveta* sector

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The Peruvian anchoveta industry for Direct Human Consumption (DHC) has grown almost 10-fold during the last decade, with reported annual landings of about 130,000 metric tons (MT) in 2012 (PRODUCE 2013). However, the total catch from the DHC fleet has been argued to be much higher (Caillaux et al. 2013), with evidence pointing to a large share of their catch being illegally diverted to fishmeal production (Freon et al. 2013). Below, there is a recount of the most pressing issues and challenges affecting the *anchoveta* industry in relation to management, regulatory frameworks, institutions and markets.

Overcapacity and Incentives to Illegal Fishing

Under current conditions, the DHC processing industry would be providing incentives to illegal fishing, misdirecting DHC anchoveta catch to fishmeal production plants over the limits allowed by the law. First, the overcapacity of the DHC fleet at many locations along the Peruvian coast (Caillaux et al. 2013) would impose an unaccounted high pressure over the stock, and potentially jeopardize its sustainability. While a program to reduce overcapacity in the Indirect Human Consumption (IHC) sector has been implemented in recent years, policy makers have found great opposition to regulate overcapacity in the DHC sector and to provide exit alternatives to fishermen (Risi Mussio pers. comm.).

Second, higher per-unit profits of fishmeal relative to DHC products (Freon et al. 2013) are a strong incentive for the industry to prefer indirect rather than direct consumption markets. Processing companies pay significantly higher prices for anchoveta to produce fishmeal at residual plants (Avadi et al. 2014), which are justified by the increasing value of fishmeal and fish oil in the international markets. Uneven buying prices condition DHC fishermen to sell their catch to residual plants, and thus incurring in illegal behavior. Additionally, the presence of residual plants inside or next to DHC processing plants, and the rule allowing allocating up to a 40% of the anchoveta landed by DHC vessels to fishmeal would promote IHC over DHC production. Higher costs associated with the preservation of DHC catch (Avadi et al. 2014b) further discourage fishing and processing anchoveta for human consumption. Finally, a lack of infrastructure for DHC unloading and processing at many Peruvian ports would make it even more difficult to check compliance with the DHC normative (Caillaux et al. 2013).

Complex Institutional Framework

The IHC and DHC fleets are managed under different systems and are regulated by separate government entities at the Vice-Ministry of Fisheries (VMP). Moreover, the VMP is responsible for both policy design and developing regulations, and of the surveillance of fishing and processing activities through their different control agencies (Paredes & Gutierrez 2008). A recent regulation that gives administrative responsibilities of fisheries management to regional governments could create issues with the limitation of access to DHC fishermen. Reducing management redundancy and increasing inter-agency cooperation could help facilitate a more comprehensive management scheme.

Regulatory framework inconsistencies

DHC fleet vessels operate outside of the TAC limit set for the anchoveta stock, and thus are not accounted for the estimation of the total quota, remaining unmonitored. In fact, the DHC fleet would be capturing the target escapement biomass, which is supposed to be the portion of the stock left in the water that reduces the risks of collapse (Arias Schreiber and Halliday 2013). Although there would be many difficulties with assigning a quota to DHC fleets, a recent study found that large-scale and small-scale fleets could benefit by applying a TAC to the DHC fleet and effectively raising target escapement (Caillaux et al. 2013).

The coastal zones assigned to anchoveta DHC fleets, occurring up to the 5 and 10-mile fishing boundaries, as well as SISESAT monitoring ensure exclusive fishing areas for DHC fishermen. However, the natural consequence of this zoning is the concentration of DHC fishing effort in a relatively narrow coastal band. Considering that anchoveta aggregations are often distributed closer to nearshore areas (Gutierrez et al. 2007), these rules might be causing an unintended detrimental effect by increasing availability to DHC fleets operating in open access.

DHC market limitations

Low local demand for anchoveta food products has been an issue that has prevented the growth of the DHC industry. The preference for other available fish, the relatively low variety of DHC products in the market, and the lack of a gastronomic culture around anchoveta in Peru would be some of the main limiting factors for increasing demand (Freon et al. 2013). However, the Peruvian government has made efforts to increase consumption of canned anchoveta to help reduce malnutrition in low-income and rural sectors (Sanchez & Gallo 2009, Freon et al. 2010). Up until 2012, the government had a program that bought and distributed free canned anchoveta products to low-income citizens (Arias Schreiber and Halliday 2013). Even with the incorporation of *anchoveta* food products to the public school lunch program, *Qali warma*, it seems that local demand for anchoveta food will remain to be an issue.

The lower competitive capacity DHC *anchoveta* products in international markets, such as cured and frozen, relative to other producing countries is another factor limiting DHC industry (Freon et al. 2013). Tools that have been successful in similar fisheries in making production, marketing and exporting processes more efficient should be considered.

Industry Efficiency and Environmental impacts

Experts agree that for the last couple of decades there have not been any issues with the sustainability of the anchoveta stock (Sanchez and Gallo 2009, Freon et al. 2013, Arias Schreiber and Halliday 2013). However, there are concerns about the impacts of anchoveta fishing on species that depend trophically on this stock, in the Humboldt Current Ecosystem (Freon et al. 2010). These impacts can be accentuated by continuing to allow the DHC fleet to fish over the TAC limit.

In addition, there are worries about the efficiency of the fleets and processing plants, and its associated environmental impacts. According to a recent Life Cycle Assessment of the DHC processing industry, high-energy consumption while processing some DHC products (i.e. cured and canned) might be limiting productivity in the sector (Avadi et al. 2014b). Particularly, fuel use was found to be the main determinant in efficiency and environmental impacts of the whole *anchoveta* supply chain, where DHC vessels were found to be the most energy inefficient. Interestingly, improvements in the efficiency of the IHC fleet would attain the greatest reduction in overall energy consumption and the industry's associated impacts on the environment (Avadi et al. 2014). Finally, the same authors find that DHC products have higher environmental impacts, mainly associated with discarding and processing inefficiencies. Such problems should be addressed in order to make anchoveta food production both economically and environmentally attractive for investments.

Surveillance system

The program in charge of the surveillance and compliance, also known as PVCPD, controls the IHC fleet fishing and processing, and more recently, the DHC sector activities as well. Control services are provided by specialized private firms, which are fully funded by anchoveta fishing companies. However, there are not any records of audits being made to certify the capabilities of surveillance companies (Arias Schreiber 2012). Thus, the potential conflict of interests - between

monitoring and monitored companies – and the possibility for cheating the system could jeopardize the proper control of fishing activities made by private companies as well as the health and sustainability of the anchoveta stock.

Fishing taxes

Failing to collect fishing taxes mandated by law can affect the funding of surveillance and management activities and the programs that promote reductions in overcapacity in the industry, as well as the overall compliance of both fishing sectors. A recent study found that the collection of fishing taxes from the IHC sector has been incomplete and inefficient (Galarza & Collado 2014). Additionally, the misuse or underuse of collected fishing rights by local and regional governments in Peru (Contraloria 2012), could be affecting their administrative capacities and preventing their optimal performance (Vela et al. 2014). In this sense, Galarza and Collado (2014) recommend modifying the collection system of fishing taxes by using a rent charge that contains a fixed and a variable part. Since rent depends on the natural variability of catch and price, then rent collection should adjust to this condition.

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