
Seafood Supply Chain Management: Methods to Prevent Illegally-Caught Product Entry into the Marketplace

I. Introduction

It has been broadly recognized that illegal, unreported and unregulated (IUU) fishing is a significant problem globally, with the estimated value of IUU catches between US\$ 4-9 billion per year (HSTF, 2006).¹ IUU fishing is prevalent on the high seas, but the bulk of the value of IUU catch is from within Exclusive Economic Zones (EEZs) of coastal states. Developing countries are particularly impacted, such as sub-Saharan Africa which loses about US\$ 1 billion in catches yearly to illegal fishing, or 19% of current landed value (HSTF, 2006).

There are many factors which facilitate the pervasive nature of IUU fishing. There are often inadequate national laws, or insufficient funds for implementation. Regional governance is only as effective as the collective will of individual governments. Surveillance and enforcement in fisheries is costly. There may be a need to rely on technology, which may be inadequate, tampered with, or costly. In many cases, there are weak port state controls and weak trade measures.

Bribery and corruption is also found within some IUU fisheries or in the supply chain for IUU fish. Corruption, as defined by Campos and Bhargava (2007) is 'the use of public office for private gain' (p.9). Inspectors have been known to endorse catch documentation data that is clearly false (HSTF, 2006). Paper copies of customs-related forms can also be obtained from government officials to be forged or altered in order to allow entry of illegally-caught product as legally-caught product at ports of entry. Illegally-caught seafood products without proper documents may be smuggled into countries by bribing government officials to look the other way.

There are concerted efforts being put forth by many organizations to curb IUU fishing activities directly, with several recommendations for further improvements in those efforts put forward recently by the High Seas Task Force (HSTF) of the OECD (HSTF, 2006). The goal is to eradicate IUU fishing activities, as these activities cause not only damage to the fish stocks via over-fishing, but also cause significant losses to society through economic and other losses to communities. Focusing on greater and more effective enforcement is one approach, which continues to be explored.

Another avenue to pursue is supply chain management – in other words, preventing IUU fish from reaching the marketplace, thus effectively removing the economic incentive to

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II. Background

A. *The Global Seafood Supply Chain*

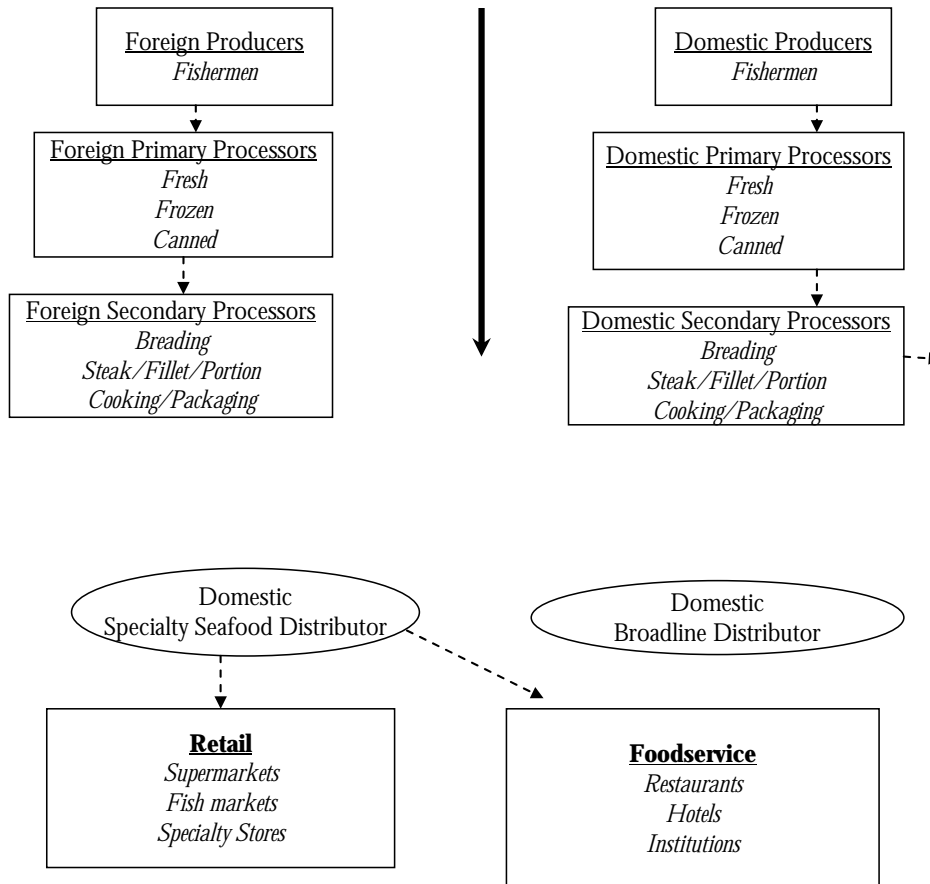
The supply chain for seafood can involve a large number of intermediaries between the fisherman and the consumer, as depicted in the stylized example in Figure 1, loosely based on Knapp, Roheim and Anderson (2007). Most seafood is traded internationally, particularly the high-valued species most commonly associated with IUU fishing (e.g. tuna, toothfish, cod, abalone).

In the simplified supply chain presented in Figure 1, there are four possible routes fish caught by a foreign fleet may make its way to the consuming nation: 1) it may be exported directly after harvest; 2) it may be exported after only primary processing occurs within the foreign harvesting nation; 3) it may be exported after both primary and secondary processing occur within the foreign harvesting nation; or, 4) it may be exported after harvest to a third country processor which will then re-export the product to the consuming nation.

A relatively new feature of the global supply chain is the emergence of a third country processor – a country to which nations export unprocessed products simply to become processed, only to have those products re-exported. The primary nation serving this role is China. A growing and significant amount of fish is exported to China post-harvest, processed, then re-exported around the globe. This has significant implications for IUU fish, in particular, as if one is successful in getting illegal fish into China, the product is essentially laundered, as it re-emerges as legal ‘product of China,’ if it does not remain in the domestic market for consumption there.

The supply chain presented in Figure 1 masks the presence of middlemen (brokers, chain pflowa i

Figure 1. A Simplified Global Finfish Supply Chain



trace the history, applications, or location of that which is under consideration. When considering a product, traceability can relate to the: origin of material and parts; processing history, and distribution and location of the product after delivery.' ISO recently re-defined traceability specifically having to do with feed and the food chain (ISO 22005:2007) as the same as the Codex definition.²

Traceability in limited form has been in place in the seafood industry largely as a means to reduce the impacts of food-borne illnesses by fast and precise product recalls (Petersen and Green, 2006). Legislation such as that in the U.S., EU and other nations requiring country-of-origin labeling, which generally also requires information on production method -- caught at sea or farmed -- requires traceability. The increasing use of voluntary labels, including geographic designation, organic certification, or environmental attributes such as ecolabeling, also require traceability.

Traceability is broadly a record-keeping system that identifies and tracks products, transportation of products, and ingredients into products from origin to consumption, while providing the ability to quickly trace back products at any point in along the supply chain (Thompson, Sylvia and Morrissey, 2005). Internal traceability refers to tracking the movement and changes made to a product within a company, while external traceability refers to tracking a product as it moves through the supply chain (Petersen and Green, 2006). Traceability systems used may be either paper-based, electronically-based (bar-codes and/or radio frequency identification systems) or a combination of both (Petersen and Green, 2006). A traceability system must cover the entire supply chain, such as that depicted in Figure 1, including the transportation and middlemen involved.

There are 3 issues that are critical to the success of any traceability system: 1) compatibility; 2) data standardization; and 3) the definition of a traceable resource unit (Kim, Fox and Gruninger, 1995). The first requires that all entities within the chain are able to communicate and transmit data efficiently. Standardization requires identifying the aspects of handling, processing and storage that are important to preserve the identity of the product and its attributes. A traceable resource unit is defined as a whole fish or a batch of fish at the initial stage, however, this will change during processing. Thus, new traceable resource units are assigned at each step along the chain, although the initial unit must follow each fish or lot through all steps of processing and distribution (Thompson, Sylvia and Morrissey, 2005).

Database systems must be developed to handle all the collected data (Derrick and Dillon, 2004). Computer software providers have developed software packages capable of tracking seafood (Thompson, Sylvia and Morrissey, 2005; Petersen and Green, 2006).

III. Catch and Trade Documentation Schemes

The FAO lists 17 regional fisheries management bodies, in other words, bodies with a management mandate. Among those, only a few have in place schemes to document

² <http://www.iso.org/iso/pressrelease.htm?refid=Ref1063> (last accessed November 27, 2007).

catch and trade, or subsequent movements of fish through the supply chain. A catch documentation scheme is one which uses certifications at the point of harvesting and applies to all fish which are caught, landed and/or trans-shipped (FAO, 2002). A trade documentation scheme requires documentation to accompany particular fish and fish products when traded (Upton and Vitalis, 2003).

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has the most comprehensive program, which seeks to provide independent verification of retained catches of members, to estimate legal catch and to deter the entry of IUU-caught product into ports and onto the market, as well as cover transshipments, exports and imports (Lack, 2007). The first to adopt a trade documentation scheme was the International Commission for the Conservation of Atlantic Tunas (ICCAT) to address IUU fishing for bluefin tuna; a certified document must accompany the fish when it is traded on the international market (Upton and Vitalis, 2003). The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the Indian Ocean Tuna Commission (IOTC) have adopted similar measures (Upton and Vitalis, 2003).

In general, consensus appears to be that the documentation schemes have failed to prevent IUU fishing. NET (2004) and others provide additional reasons, a rather lengthy list, of why catch and trade documentation schemes tend to fail. A subset of those, related specifically to supply chain management, is compiled here.

Documentation schemes monitor only subsets of the catch and of the supply chain (NET, 2004; Lack, 2007). For example, some schemes apply only to a subset of products that enter the supply chain (Lack, 2007). For example, depending upon RFMO, perhaps only a) frozen but not fresh products, b) catch taken by a particular method, or c) product that enters into trade but not product remaining in domestic markets, are documented. Under scenario (a) or (b), if products that are close substitutes, this increases the possibility of laundering, or mislabeling, when one product requires documentation and another does not. In scenario (c), if a large enough share remains in the domestic market – or makes its way circuitously to the international market, it undermines the effectiveness of documentation schemes as fisheries management tools.

Specific to the case of Patagonian toothfish, there are a number of well-documented means by which the CCAMLR catch documentation scheme can be circumvented, leading to a total catch which is often 100% greater than the set quota. For example, NET (2004) describes how IUU fish importers can evade restrictions by falsifying the name and shipping codes to incorrectly describe the product being imported on the shipping manifests for imported fish (e.g., species, form, weight). The mislabeling can be quite simple. For example, the manifests for shipments of Patagonian toothfish frequently use only the term ‘seabass,’ which also can include common seabass (*Dicentrarchus labrax* and *Dicentrarchus punctatus*). The shipping codes are not very dissimilar, and are not carefully scrutinized by customs agents. In addition, importers can more easily evade restrictions by importing frozen fillets instead of whole fish. It is easier to disguise Patagonian toothfish (and most IUU species) as another species in the fillet form. More specific labeling of species would limit this mislabeling.

the standard. The certification bodies in turn hire a team of scientific experts to assist in the assessment process. Certification is voluntary and accessible to all wild capture fisheries.

Certification lasts five years and is subject to annual audits to confirm improved required improvements are being made. No product from the fishery can bear the MSC eco-label identifying it as being from a well-managed source until chain-of-custody/traceability

The issuing, initially, of a fishery only certificate, rather than a joint certificate was a first for any fishery certified by the MSC since its inception, and directly a result of the significant problems with IUU fish. A joint fishery/chain of custody certificate was to be issued when the certification body responsible for issuing the associated fishery management certificate was satisfied that the system of tracking and tracing implemented by the fishery was sufficient to provide a guarantee that all fish and fish products invoiced by the fishery originate from the evaluated fishery. Until this joint fishery/chain of custody certificate was issued, fish and fish products from the fishery were not allowed to enter into further chains of custody, and be eligible to carry the MSC Logo. The joint fishery/chain of custody certificate was issued in May 2005.

Chain of Custody Certification for MSC-certified South Georgia Toothfish⁴

What we discuss next is the chain of custody certification that has taken place from vessel to landing, and the elaborate program undertaken by the GSGSSI to ensure no IUU fish enters into that chain that allowed them to obtain that certification. Equally important, a detailed discussion of chain of custody and its certification stands in contrast to catch documentation schemes. This highlights why chain of custody is a more rigorous and effective method of prevention of IUU fish entering the marketplace than catch documentation scheme, at least as the catch documentation scheme currently operates.

- Inspection of vessels, at designated ports, prior to commencing fishing operations
- Automated labeling of all boxes of toothfish product to a pre-set specification, detailing all relevant aspects of capture and box contents
- Daily uploading of product data onto a central database
- Inspection on cessation of fishing operations, including weighing of total catch and sampling of box labels and contents

This scheme meets the requirements of the MSC chain of custody standard, i.e.

- These is a clearly documented control system specifying procedures and responsibilities
- Inspections, VMS and recording of catches prevents any mixing of certified and non-certified product
- Catches are clearly and securely labeled
- Appropriate records are maintained

The group scheme is responsible for the accurate labeling and tracing of toothfish product to the point at which the product has been inspected on cessation of fishing activities, at either KEP, South Georgia or Port Stanley, Falkland Islands. After inspection, chain of custody will be the responsibility of the individual Group Members and will be subject to a further chain of custody. This will be subject to future separate certification assessments along the chain of custody.

The central database of product label information provides the bases for further verification of chain of custody integrity at later points in the chain of custody. This will be subject to future separate certification assessments along the chain of custody.

In a personal conversation with Harriet Hall, Director of Fisheries for GSGSSI, several more specifics of the program were laid out. Any vessel operator who expresses interest in joining the SG Group Entity receives a letter. Once the vessel has joined the SG Group Entity, beginning in 2004, it is required to undergo a beginning of the season and end of season inspection, which was extended beyond the previous inspection to include verification that the vessel has no toothfish stored.

At the end of the season, or if the vessel has left SG waters mid-season, a declaration of the amount of toothfish on board must be made to the Government Officer and checked against the daily catch reports to ensure accuracy. Immediately upon exiting SG waters the vessels must proceed to Stanley, Falkland Islands for catch weighing. Once in Stanley the trunks of toothfish are taken off the vessels and weighed. The trunks are then stored in cold storage/reefer containers until the holds are empty of all product (Headed and gutted trunks). Sub-products, i.e. collars and cheeks are not weighed as they are not used in calculating the amount of quota taken by a vessel.

Once all the products have been offloaded and weighed, the vessels are searched, random checks being carried out on bait and sub-products stored on board to ensure that all products have been offloaded.

license.⁵ This is equally true with South Georgia toothfish certification. Subsequent handlers of MSC toothfish must undergo MSC chain of custody certification. Before any MSC toothfish will be seen by a consumer, chain of custody will not just have to be established from the vessel to the ports, but from the ports further along the supply chain through the wholesale and up to the retail sector. IUU fish must not be able to make its way into the supply chain at any point. This makes the computerized documentation and database maintained by the GSGSSI extraordinarily important. Firms further up the supply chain and their ability to access the central database to verify product label information to provide the basis for further verification of chain of custody integrity at later points in the chain of custody is critical.

The MSC chain of custody standard follows a traceability scheme as outlined earlier in the paper. Each business in the chain of custody is certified to have a system and set of procedures in place to ensure that MSC fish are kept separate from other non-MSC certified fish in their business, and able to trace a product back to its original source. The key is record keeping; for goods in, processing and packaging, and goods out. Once certification is awarded, annual audits are required, and re-certification is required every 3 years.

The full Standard is available on the MSC website.⁶

Applicability of MSC Certification in Removing IUU Fish from the Supply Chain

To date, the South Georgia toothfish fishery is the only fishery certified by the MSC which significantly tests the ability of this approach to preventing the most egregious cases of IUU fish from reaching the supply chain, although the Ross Sea Antarctic toothfish fishery announced November 20, 2007 it is entering the assessment process. However, all certified fisheries have shown that even the least egregious cases of IUU fishing can be prevented for those fisheries; thus the traceability created in the entire supply chain from MSC-certified fishery to consumer by the MSC chain of custody certification ensures such product does not enter the marketplace. For the purposes of this paper, the focus will be on the egregious cases.

While the system has been in place for toothfish for 3 years, there are no documented cases of IUU fish reaching the marketplace. In other words, there are no documented cases of anyone being able to circumvent the various control measures, such as the electronic bar coding or computerized systems, put in place and inter-mingle IUU fish with the MSC-certified fish from South Georgia. Surveillance reports by Moody Marine, available on the MSC website, give no indications of any breakdown in the chain of custody system.

Interviews with industry members along the supply chain who have chain of custody similarly indicate a positive view of MSC certification. Greg Johnsson of Sanford

⁵http://www.msc.org/assets/docs/The_MSC's_Logo_Licensing_Sys

Company Limited in New Zealand states “t

Barents Sea was approximately 101,000 tons of cod in 2005, or approximately 20% of the total allowable catch (TAC).⁹

Recently, the European Seafood Processors Association, or AIPCE, has created measures to safeguard against the entrance of IUU cod from the Barents Sea into the European supply chain, and is working on similar measures for Baltic Sea cod (Morrison 2007a; 2007b). It is envisaged that similar measures could be created for tuna, other whitefish and salmon (Morrison, 2007b). Interestingly, even though the same species is coming from both the Barents Sea and the Baltic Sea (cod), Morrison points out that different document control procedures must be developed since different product forms come from each – frozen cod from the Barents Sea and fresh cod from the Baltic. This is another example of why the supply chain is complex (see Figure 1).

The measures include working closely with the Northeast Atlantic Fisheries Commission (NEAFC), the RFMO in charge of cod from the Barents Sea. To that end, all fish destined from third countries must first be landed at a NEAFC designated port (of which there are only 100 as of September 17, 2007- www.neafc.org). No transshipment at sea to flags of convenience vessels is allowed. A strengthened system of black-listing IUU vessels and port control took effect as of May 1, 2007 (NEAFC 2007).

The control procedures are new as of only months ago, thus difficult to assess as to their effectiveness. What is unique about them is that the approach is common to the purchase of fish *by all European processors*, including 13 member states and Norway as an associate member. Thus, all seafood processors in these 14 countries will be demanding common control procedures with respect to the vessels from whom they purchase fish. Ocean Trawlers, the firm whose vessels came under scrutiny for selling IUU fish to several European processors as mentioned above, has posted these procedures on their website, and a copy of which may be found in Appendix A.

VI. Summary and Recommendations

The above discussion has provided a brief discussion and analysis of catch and trade documentation schemes, the application of the MSC chain of custody certification to the South Georgia toothfish fishery, and the newly created AIPCE Barents Sea cod control document procedures. All these approaches prevent IUU fish from reaching the marketplace.

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risk reduction and public relations, among others. No matter what the reasons, the economic incentives created by the demand for such seafood by the retailers and processors at the top of the supply chain is transmitted down the chain to all those who supply to them, forcing changes in business practices with respect to IUU fish. To the extent that the traceability system remains verifiable, and it is in the interest of the AIPCE and MSC, as well as the retailers and processors, that it does so, this creates a more effective system than the current systems in place by RFMOs.

The problem, of course, is that these systems are currently only in place for very limited number of fisheries, and may not be easily expandable to all the fisheries in which significant IUU issues exist. Given that a prerequisite for MSC chain of custody certification is certification of the fishery, if a fishery is poorly managed it is not likely to be MSC certified until significant changes occur within the fishery. It must reform its management system to become a well-managed fishery before it may become certified. This is of course the point of market-based incentives for better environmental stewardship, but the likelihood that the occurrence of this in some fisheries with significant IUU fishing may not be large. However, those fisheries might take on board some aspects of chain of custody programs onto their catch documentation schemes.

The MSC is actively engaged in increasing the number of developing country fisheries within its program. The European processors appear to similarly be planning to expand the traceability schemes to Africa, at least under the UK Department for International Development program “Grand Theft Oceans” program (DEFRA, 2007). Progress will be on a fishery by fishery basis, similar to that in the developed fisheries.

To conclude, this paper has raised several points which lead naturally to the several recommendations. Some of recommendations are not new, although the arguments of this paper may strengthen the case for those recommendations. All are

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Appendix A

To achieve this a full product traceability system is required so products can be traced from their suppliers and tracked to their buyers.

This standard is designed to provide a high level of confidence that products carrying the MSC Logo originate from an MSC Certified Fishery while not imposing unreasonable compliance costs on the industry.

The scope of this standard is the requirement for maintaining the chain of custody for products from fisheries certified to the MSC Standard. It does not



