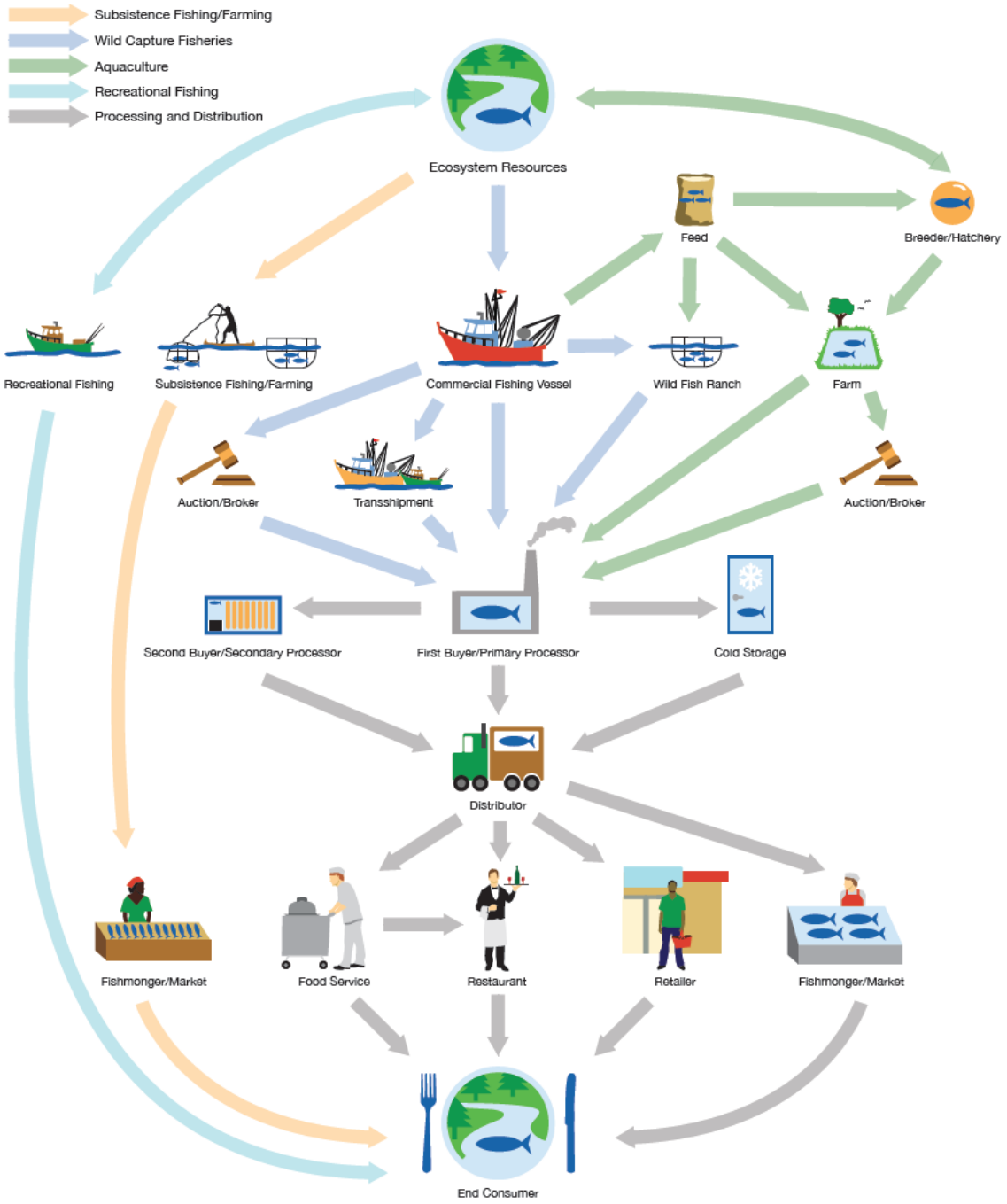
Traceability of Fisheries Products



A comparative study of 10 country cases under the framework of the programme GCP/INT/253/JPN "Fisheries Management and Marine Conservation within a Changing Ecosystem Context"

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Glossary of abbreviations

ABNJ	Area Beyond National Jurisdiction Program
BIP	Border Inspection Post (EU)
BO	Bilateral Organization
CA	Competent Authority
CARICOM	Caribbean Community and Common Market
CC	Catch Certificate
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCS	Catch Certification Scheme
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDS	Catch Documentation Scheme
COFI	Committee of Fisheries (FAO)
CPUE	Catch-Per-Unit-Effort
CTE	Critical Tracking Event
EC	European Community
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FBO	Food Business Operator
FT	Sub-Committee on Fish Trade (COFI)
FVO	Food and Veterinary Office (EU)
HACCP	Hazard Analysis and Critical Control Points
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOs	International Organizations
IPOA	International Plan of Action
ISO	International Organization for Standardization
IUU	Illegal, Unreported and Unregulated (Fishing)
KDEs	Key Data Elements
MCS	Monitoring, Control and Surveillance
MS	Member States (of the EU)
OECD	Organisation for Economic Co-operation and Development
OLDEPESCA	Latin American Organization for Fisheries Development
PSMA	Port State Measures Agreement
RASFF	Rapid Alert System for Food and Feed
RFBs	Regional Fishery Bodies
RFMOs	Regional Fisheries Management Organizations
ROs	Regional Organizations
SPS	Sanitary and Phytosanitary Measures
ToRs	Terms of reference
VMS	Vessel Monitoring System

1 Executive summary

The Food and Agriculture Organisation of the United Nations (FAO) is the implementing agency for the "Fisheries Management and Marine Conservation within a Changing Ecosystem Context" project. Funded by the Government of Japan, the project aims to strengthen global capacity for implementation of the FAO Code of Conduct for Responsible Fisheries.

As a preliminary step of this project, the taskforce of the "Traceability of Fisheries Products" sub-component commissioned a series of country studies in order to examine common practices in the implementation of traceability in 10 countries.

The main objectives of this present study are "to review the 10 national traceability case studies, taking into account their relevance for combatting IUU fishing" and "to provide recommendations on ways to improve their traceability practices, especially to combat IUU fishing".

Furthermore, it was requested that the authors include the food safety component associated to traceability. Hence, and due to the limitations of the analysis, the study focuses only on *sanitary eligibility* involving the traceability system associated to the unique identification in terms of control of sanitary and operational conditions that the production chain of seafood in a country is required to comply with, and is therefore controlled and verified by a suitable Competent Authority (CA).

The authors' activities took place under the following strategy, agreed with the project coordinators.

Based on the provided secondary sources (i.e. the 10 reports), the authors assessed the following aspects:

1) if the state has a functional traceability system;

2) if this system is suitable for fish products traceability;

3) if this traceability system is designed as to optimize combatting IUU fishing, under two components:

> 3.a) if the data captured by the system are relevant for identification of IUU fishing;
>
> 3.b) if the traceability system covers all the points in the distribution chain relevant for IUU fishing.

4) if this traceability system is designed as to optimize official sanitary eligibility of all the value chain from harvest onwards.

For Point 1, recommendations found in scientific literature for assessment of effective traceability systems were followed.

For Point 2, the recommendations of the ISO standard 12875:2011 Traceability of finfish products - Specification on the information to be recorded in captured finfish distribution chains were followed. As the name indicates, this one refers only to finfish, so shellfish are not included, but it is assumed that the results can be extrapolated to shellfish as well.

For Point 3, there is no standard addressing this issue yet and only one scholarly article could be found on the topic (Borit & Olsen, 2012). Thus, the argument in this article for both point's 3.a and 3.b. were followed by making a simplified version of the referenced decision matrix.

Based on this analysis, the authors evaluated the country reports traceability systems in terms of there:

a. Inclusivity - the extent to which the system is designed to provide guarantees for all legally-caught and sanitary controlled fish in the value chain of the species/fishery in question;
b. Impermeability - the extent to which the system is designed to exclude illegal catches, and potential non-controlled processing practices; and
c. Verifiability- the extent to which the system is audited by an independent body or person (i.e. by those other than the parties directly responsible for following the requirements).

Prior to the country analysis, the authors considered important to standardize the understanding of traceability and other concepts relevant to the present study based on the relevant bibliography known to them, as this would be the only way to evaluate all the country studies, under the same

methodology.

After the analysis of the individual reports, it was found that none of the sources provided enough information to assess whether the principles of effective traceability were met by the traceability systems of the 10 respective countries.

Common issues identified throughout some of the reports were in regards the expectations of ToR's; the relevance for combating IUU Fishing, ensuring Food Safety and Sanitary Eligibility, reducing vulnerability to threats and crisis (especially for small scale sector), and the importance of the role's held by RFMO's and other organizations

Consideration of the results for each country analysis, the authors discussed the need for standardization in the methodology and tools required to assess traceability systems, the need for coordination in between the different authorities, the roles of external and internal traceability, the incorporation of information management systems and the need of standardization in the domain language of traceability.

The study concludes that the systematic review of the 10 country reports shows that there is a lot of confusion and inconsistencies in the meaning, scope, legal status, implementation capacity and control of traceability systems.

The authors believe that FAO, as in other aspects of fisheries and seafood production, it is in a unique position to lead this efforts, by expanding on the work initiated by the "Best Practice Guidelines on Traceability" (COFI:FT, 2014) , as requested by the thirteenth session of the Sub-Committee on Fish Trade (COFI:FT) in Bergen, Norway, 24–28 February 2014.

The authors support the proposition that FAO should convene an expert consultation, which would benefit from the findings of this present study, and include international experts on traceability from all geographical regions, as well as representatives of the various stakeholders along the seafood supply chain, to provide not only a set of guidelines on how to implement traceability systems, but equally importantly, how to evaluate them.

The report concludes with a set of overarching recommendations to FAO, and to the group of countries whose reports were evaluated.

2 Background of the consultancy

The Food and Agriculture Organisation of the United Nations (FAO) is the implementing agency for the "Fisheries Management and Marine Conservation within a Changing Ecosystem Context" project. Funded by the Government of Japan, the project aims to strengthen global capacity for implementation of the FAO Code of Conduct for Responsible Fisheries. As a preliminary step of this project, the taskforce of the "Traceability of Fisheries Products" sub-component commissioned a series of country studies in order to examine common practices in the implementation of traceability in 10 countries: Argentina, Barbados, Morocco, Peru, Senegal, Sri-Lanka, Tanzania, Turkey, Uganda and Vietnam. The studies on national traceability practices (including regulations and implementation) in these 10 countries are to conform the backbone of this report.

The terms of reference (ToRs) for the present study included:

1. The consultant will undertake the following actions in relation to 10 national case studies on traceability practices: Argentina, Barbados, Morocco, Peru, Senegal, Sri-Lanka, Tanzania, Turkey, Uganda and Vietnam (GCP/INT/253/JPN).
2. Review the national traceability case studies in function of their:
    a. Inclusivity - the extent to which the system is designed to provide guarantees for all legally-caught fish in the value chain of the species/fishery in question;
    b. Impermeability - the extent to which the system is designed to exclude illegal catches, and potential non-controlled processing practices; and
    c. Verifiability- the extent to which the system is audited by those other than the parties directly responsible for following the requirements.
3. Take into account relevance for combatting IUU fishing, insuring food safety, and reducing vulnerability to threats and crises especially for small scale sector and legal fisheries.
4. Perform a comparison of the different case studies identifying best practices, including a SWOT analysis.
5. Include a brief status report on the role of regional bodies (RFMOs) in development and implementation of traceability practices in the above countries, whenever relevant.
6. Prepare a Final Summary Report with conclusions on common national practices/best practices identified in the case studies. Note any regional differences/similarities, implications for small-scale sector versus commercial operations, and major challenges to improve seafood sustainability in the 10 case studies.
7. Provide concrete expert recommendations to national policymakers on improved national/regional policies. Provide FAO with recommendations on ways to assist national governments to improve their traceability practices, especially to combat IUU fishing and improve resilience along the seafood value chain to support sustainable livelihoods.

3 Strategy

3.1 Authors' approach

The authors' activities took place under the following strategy, agreed *a priori* with the project coordinators.

The main objectives of this study are "to review the national traceability case studies, taking into account their relevance for combatting IUU fishing" and "to provide recommendations on ways to improve their traceability practices, especially to combat IUU fishing".

Furthermore, it was requested that the authors include the food safety component associated to traceability. Hence, and due to the limitations of the analysis, the study focuses only on *sanitary*

eligibility involving the traceability system associated to the unique identification in terms of control of sanitary and operational conditions that the production chain of seafood in a country is required to comply with, and is therefore controlled and verified by a suitable Competent Authority.

Therefore, having as data source the countries reports this study assessed the following aspects:

1) if the respective state has implemented a functional traceability system;

2) if this system is suitable for fish products traceability;

3) if this traceability system is designed as to optimize combatting IUU fishing, under two components:

3.a) if the data captured by the system are relevant for identification of IUU fishing;

3.b) if the traceability system covers all the points in the distribution chain relevant for IUU fishing.

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For Point 1, recommendations found in scientific literature for assessment of effective traceability systems were followed.

For Point 2, the recommendations of the ISO standard 12875:2011 Traceability of finfish products - Specification on the information to be recorded in captured finfish distribution chains were followed. As the name indicates, this one refers only to finfish, so shellfish are not included, but it is assumed that the results can be extrapolated to shellfish as well.

For Point 3, no standard addressing this issue was found. Thus, this study follows the argumentation of the only one scholarly article identified on the topic (Borit & Olsen, 2012) for both point's 3.a and 3.b. and using a simplified version of the referenced decision matrix.

Based on this analysis, the study provide recommendations for improvement of the respective traceability systems in terms of their:

a. Inclusivity - the extent to which the system is designed to provide guarantees for all legally-caught and sanitary controlled fish in the value chain of the species/fishery in question;
b. Impermeability - the extent to which the system is designed to exclude illegal catches, and potential non-controlled processing practices; and
c. Verifiability- the extent to which the system is audited by an independent body or person (i.e. by those other than the parties directly responsible for following the requirements).

The authors' opinion was that due to the lack of standardization and uniformed quality of the SWOT analysis provided in the 10 reports their utility was limited, as to use to perform an extra SWOT analysis of all the reports, furthermore is believed that the SWOT methodology itself is of limited use in these cases. While the process of elaborating a SWOT may enrich the knowledge of the authors of the original reports, in the case of this study it does not help in the context of a comparative analysis, hence the authors did not pursue that element of the ToR.

3.2 The source reports

The source reports were prepared as part of national consultancies for the FAO, under the project "Fisheries management and marine conservation within a changing ecosystem context" (GCP/INT/253/JPN).

The information of each report was compiled in order to describe national traceability practices (including regulations and implementation) in the different countries with respect to their key fisheries and identify faced challenges. The main focus of these reports was on prevention of IUU and critical points in the production chain from point of capture to final destination and integration of practices for IUU prevention and food safety.

While the terms of references where standardized, the resulting reports were far from that. While some reports did address the issue, most of them read like a disjointed document that collected information

that did not fully addressed the issue at hand and quoted various pieces of legislation, not always relevant.

Most of the countries are authorized to trade with the European Union (EU), hence the traceability systems has been developed through the sanitary or the fisheries side, but in most cases only for the EU destined production chain.

This initiative is the first of its kind. In principle, it is consider to have been a very ambitious undertaking, as the project hoped to find a standardization on views on studies analysing different fishing universes in terms of magnitude, such as Peru in one end and Barbados in the other, or regulatory frameworks, such as Turkey (a EU accession country) and Uganda (a landlocked African republic). The complexity of comparing such a diverse range of countries made it difficult to find a quantitative basis already available, hence the authors had to develop their own.

3.3 Traceability as a EU market access requirement

3.3.1 Health certification

In 1993, concerns relating to consumer health and safety led to the establishment of hygiene regulations across the EU. These were complemented in 2004 with regulations concerning the importation of food and feed, including fisheries and aquaculture products. These rules comprised the "hygiene package" that has evolved over time, involving designated Competent Authorities (CAs) in EU Member States (MS) and in third countries, a network of Border Inspection Posts (BIPs), a system of sanitary certification and of rapid alerts (i.e. RASFF).

Traceability (defined by the EU in Regulation (EC) no. 178/2002) is intrinsically part of the regulatory framework, as under the health certification, third countries have to guarantee that the exported product accomplishes what is established by the so-called EU "hygiene package".

The core of this package is formed by Regulations (EC) no. 852/2004, (EC) no. 853/2004 and (EC) no. 854/2004, which are supplemented by other regulations and directives. Third country CAs have to guarantee that all the participants in the production chain, from the producers (fishermen boats, aquaculture plants etc.) to the exporting establishments, passing by cool stores, processing establishments etc. comply with the EU rules. Thus, it is expected that all the components of this production chain be identified with an identification code. In other words, this identification code assures that the components of the production chain having such a code could operate in the EU.

The exporting country CA needs to assure compliance with three types of obligations:

a) Obligations of resources: i.e. instruments of production, Hazard Analysis Critical Control Points and prerequisites programme, traceability etc.

b) Obligations of results: i.e. safety levels of the product (e.g. histamine, contaminants) etc.

c) Obligations of control: i.e. regulatory verification, data storage and management, legal support etc.

Once the equivalence is established, the country can export to the EU market as long as the products exported come along with a health certificate emitted by the CA of the country of origin.

The EU, through its Food and Veterinary Office (FVO), reviews, checks and makes sure that exporting country's seafood safety regime is equivalent to that of the EU itself. FVO makes inspection missions to third countries, and evaluates the CAs performance, as to determine the status of compliance with the EU rules. After the inspection, FVO missions will publish a public report containing what they have found, references and, if necessary, recommendations to facilitate compliance.

Regulation (EC) no. 854/2004 states what kind of official controls third countries CAs have to make in order to assure, via traceability, that all production chain components are respecting EU rules. This regulation establishes that the CA without prior warning, on a regular basis, can carry out official controls with a frequency based on risk. These controls can also be done at any stage of production, processing, distribution, exporting, etc.

In other words, establishments have to be prepared to be object of an official control by the CA at any moment, putting them at risk of being suspended or removed from the list of official approved establishments if they are not able to prove that are complying with the EU hygiene package, losing the possibility to export to EU market and/or to provide their product to other establishments officially approved by the CA.

Besides the FVO, the EU has other tools to verify the compliance with its rules by third countries. All products entering the EU coming from third countries must entre via an EC approved Border Inspection Post (BIP), under the authority of an official veterinary. On arrival, third country products are subject to three types of checks:

a) a documentary check: done systematically;

b) an identity check: done systematically;

c) a physical check: done appropriately to the risk profiling of the consignment.

If any non-compliance with the EU legislation is found, the BIP notifies it to the EU member countries through the RASSF, facilitating its detection on the European Market thanks to the traceability system that they has to be implemented as a result of compliance with the hygiene package. If the product represents a danger to consumers' health (e.g. exceeding any regulatory level or containing non-authorized substances), then the exporter may decide if it wants to recover it or let it be destroyed.

The EU permits then only imports from authorised countries and under each country then there are approved establishments.

3.3.2 IUU catch certification

Considering that the EU consumers were concerned with the fact that *"illegal, unreported and unregulated (IUU) fishing constitutes one of the most serious threats to the sustainable exploitation of living aquatic resources and jeopardises the very foundation of the common fisheries policy and international efforts to promote better ocean governance*" (preamble of the EU IUU Regulation), the EU adopted the Regulation (EC) No. 1005/2008 establishing a Community system to prevent, deter and eliminate IUU fishing (EU IUU Regulation). This Regulation is accompanied by its respective implementing regulation and other legislative tools.

The EU IUU Regulation prohibits trade with the Community in fishery products stemming from IUU fishing, and states, in its preamble: "…*to make this prohibition effective and ensure that all traded fishery products imported into or exported from the Community have been harvested in compliance with international conservation and management measures and, where appropriate, other relevant rules applying to the fishing vessel concerned, a certification scheme applying to all trade in fishery products with the Community shall be put in place*."

The Catch Certification Scheme (CCS) was introduced on the 1st January 2010, whereby fisheries products[1] must be accompanied by Catch Certificate (CC) declaring that the catch was made in accordance with applicable laws, regulations and international conservation and management measures.

The IUU regulation applies to all trade of marine fishery products, processed or not, originating from third country fishing vessels and exported to the EU by any means of transportation. It also applies to any catches originating from EU fishing vessels to be exported to third countries. Transhipments and processing operations are also within the scope of the IUU CCS.

One of the key aspects of this Regulation is the requirement of traceability of marine products. In theory, the legal system aims to record the origin of all the marine products arriving to the EU market: this means knowing who captured the fish, where was it caught, how much was caught, when it was

[1] Article 2.8 of the EU IUU Regulation defines the concept "fisheries products". This concept has evolved over the years and currently most of the bivalves, molluscs and aquaculture products are excluded from the scope of the EU IUU Regulation.

caught and how it was caught, and that all these activities took place in compliance with a verifiable regulatory framework.

The objectives of the CCS are threefold:

a) ensuring product traceability at all production stages, from catch to marketing, including processing and transport;

b) enabling flag States to better monitor the fishing activities carried out by its vessels and so support compliance with conservation and management rules; and

c) providing a legal basis for cooperation between flag States, countries of processing and of marketing and improving the dissemination of information.

As all the products entering the EU market have to be accompanied by this certificate, the EU importer must ensure that the consignment to be imported has a validated certificate provided by the exporter prior to the importation to the EU. Normally the responsible for emitting the catch certificate is the Fisheries Authority of the flag country of the vessel. As well as with the health certificate, IUU regulation is based on the responsibility and commitments of third countries.

While the effectiveness of the IUU Regulation and the CCS has been heavily criticised by various parties including the EU Parliament itself[2], the requirements implicit in the official validation of the certificate by authorities of the flag state, could not be substantiated without an effective traceability system.

4 Methodology

Following the strategy detailed in Section 3.3, the activities took place under the following methodology, agreed with the project coordinators.

4.1 Concepts harmonization

The authors considered important to standardize the understanding of traceability and other concepts relevant to the present study based on the relevant bibliography known to them, as this would be the only way to evaluate all the country studies, under the same methodology.

4.1.1 Definitions of traceability

In the last two decades, traceability has become a popular concept in industrial logistics (Opara, 2003), regardless of the production regime and type of product (Flapper, Fransoo, Broekmeulen, & Inderfurth, 2002; Jansen-Vullers, van Dorp, & Beulens, 2003). Nevertheless, tackling the theoretical aspects of traceability seems to be difficult.

In some supply chains; such as those in the food industry, the disputes begin with the definition of traceability. Different branches of the food industry have different perceptions about the meaning of traceability, despite common requirements and drivers that generally extend across industries (Jansen-Vullers et al., 2003). Thus, many researchers simply do not mention any definition of traceability in their articles, refer to at least two meanings of it or make up their own definition (Olsen & Borit, 2013).

A typical misconception of laypeople and many authors (for examples, see Olsen and Borit, 2013) is that traceability is only a numeric code attached to products, that it actually means place of origin, or that it is a method to ensure that information about the product is true.

The professional controversy continues with the granularity and the depth of traceability – how small should the identified unit be (e.g., a crate of shrimps or "a season of skipjack tuna harvest"). This subject is followed by whether the entire supply chain (e.g., from field/farm/hook to plate) or only parts of the supply chain should be covered by traceability requirements, and whether this coverage should be based on risk assessment (e.g., steps in production in which pathogens are inactivated).

[2] Compliance of imports of fishery and aquaculture products with EU legislation
http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513968/IPOL-PECH_ET(2013)513968_EN.pdf

Other points of disagreement include the breadth of traceability, i.e., the amount of information the system records (McEntire et al., 2010), and the body that should be responsible for implementing traceability, i.e., the legislature or the industry. In conclusion, traceability has been both a politically and strategically controversial issue and has acted as a major deterrent for multi-disciplinary cooperation and understanding (Vorst, 2004). On a deeper level, the multiple perceptions about the meaning and applicability of traceability held by different people may be related to idiosyncratic cultural backgrounds and, therefore, to their basic notions of trust and transparency requirements (Hofstede, 2004). Following this suggestion, it has been noted that transparency does not equate to traceability (Egels-Zandén, Hulthén, & Wulff, 2014) because the latter only sets the framework for the former.

The present work uses the definition of traceability from ISO 8402:1994, as this incorporates all the critical properties of a traceability system as described in the scientific literature (Olsen & Borit, 2013). Thus, traceability of any given product refers to *"the ability to trace the history, application or location of an entity by means of recorded identifications."*

In a product sense, it may relate to: the origin of materials and parts; the product processing history; and the distribution and location of the product after delivery. This definition clearly states what should be traced (history, application and location) and how the tracing should be done (by means of recorded identifications).

There are several principles (or requirements) that must be followed for the traceability system to be effective. It is critical that these recordings are interconnected and in a format that allows the product to be tracked along the entire supply chain. Thus, units that are traced (traceable resource units (TRUs), e.g. a box of mackerel) and identification/numbering schemes that provide codes/numbers used for the unique identification of TRUs (e.g., GS1 barcodes) are parts of a traceability system (Borit & Olsen, 2012).

For this system to be effective, it is essential that the codes of a TRU (either as a raw material or semi-finished product) entering a link in the supply chain are associated uniquely with those of the same item (semi-finished or end product) leaving the link. This ability to identify products individually is the basis of product traceability (Jansen-Vullers et al., 2003; Kelepouris, Pramatari, & G. Doukidis, 2007; Moe, 1998; Poli, 2004; Porter, Baker, & Agrawal, 2011). Equally critical is maintaining accurate records of the transformations (e.g., splitting, joining) that the TRU undergoes and sharing the TRU identification code with partners in the supply chain (Kelepouris et al., 2007; Nachay, 2011). This approach is consistent with the FAO guidelines on traceability (COFI:FT, 2014).

Based on these arguments, this study maintains that traceability is an infrastructure that can be used by control agencies for two purposes. The first purpose is to retrieve different data for various reasons (such as environmental sustainability documentation or contamination concerns). The second purpose is to verify these data with their specific means; e.g. genetic identification of species such as in the seafood mislabelling cases identified by studies such as those reported in Helyar et al. 2014 (haddock labelled as cod; tilapia sushi labelled as white tuna sushi). Mislabelling in this cases "presents substantial challenges for the sustainable management of the respective fisheries" (Helyar et al., 2014).

As discussed in the literature, "a traceability system is quite similar to a filing cabinet in that they both deal with systematic storing and retrieving of data. Importantly, neither a traceability system nor a filing cabinet care about what types of data are being stored" (Olsen & Borit, 2013). This notion has several important consequences.

For instance, there is no guarantee that the recordings are true or complete, as both error and fraud can lead to false claims about the properties of the food product, including its origin. There is a clear need to verify these claims, and in this area, analytical methods and instruments play a crucial role. Similarly, documenting traceability and documenting eco-label type chain of custody are two different concepts. Although traceability can be used as a tool in the certification process, traceability and certification are nonetheless different process (Borit & Olsen, 2012).

There are solutions simpler than traceability for partial product tracking, such as when the regulator only requires operators to identify their suppliers or customers. This process is less efficient and more inaccurate because tracing product sources can only be attempted by means of a formal, and often lengthy, examination of each link in the chain. To clarify, it is appropriate to employ terms such as step-by-step (one-step-forward-one-step-backward) or chain traceability instead of the comprehensive name of traceability. The principle of the correct denomination of traceability systems should also be complied with by certification and documentation schemes, which are also becoming increasingly common among private actors (Nilsson, Tunçer, & Thidell, 2004). These requirements for correct denomination of procedures also involve the responsibility to inform producers and consumers of the concepts applied and their limitations.

4.1.2 Catch documentation schemes

Catch documentation schemes designed to address IUU fishing from a Monitoring, Control and Surveillance (MCS) point of view or from a trade documentation perspective are important tools in the IUU fishing fight, however they *per se* are not equivalent to traceability systems (Borit & Olsen, 2012).

Hence is important to define the authors' perspective in terms of the domain language used, in complementarity to other FAO initiatives[3].

A Catch Documentation Scheme (CDS) for the certification of legal provenance is referred to as Catch Certification Scheme (CCS); the central document should be referred to as a Catch Certificate (CC) – as opposed to a Catch *Document* or a Catch *Form*. Logbooks and landing records also are *catch documentation schemes*.

The primary objective of a CCS is to ascertain and assure the legal provenance of fisheries products through government certification of landed catches, providing for their traceability throughout the supply chain, and restricting domestic and international trade of a species (or group of species) to batches of products which are accompanied by the relevant certificates. In doing so, the CDS scheme will obstruct market access to non-certified and/or non-certifiable products of IUU origin, thus directly contributing as a market measure to combatting IUU fishing.

As a secondary objective, a CCS can also achieve other purposes. One such secondary objective, which requires no modification, is the near-real time monitoring of landed quantities of fish, making the CCS a prime candidate to monitor the filling of quotas in TAC managed fisheries. However, it important to assure that achieving the secondary objectives does not imply the modification or complexification of the CCS, because of the risks of undermining the effectiveness of the scheme in achieving its primary objective.

Other fisheries-related information, such as Catch-Per-Unit-Effort (CPUE) data, is better handled through alternative tools, such as logbook and/or observer programs. CCS (CDS) systems should not overlap with, or be used to duplicate, replicate or validate data collected through other means – they should be singularly focused.

4.1.3 Health / Sanitary export certification

Export certificates are documents that confirm the safety and suitability of food products being exported from a country. These are issued as a matter of cause as a market access requirement, but can be as well a national requirement of the export country. While not all destination countries require them, they can help facilitate border clearance.

When food products are accompanied by an export certificate it means that they meet all applicable national and/or specific market access standards.

The information registered by a certificate depends on the food product and the destination market. It may carry information such as:

[3] FAO Areas Beyond National Jurisdiction Program (ABNJ) - Activity on Tuna CDS Best Practice.

- the country of origin of the product and its ingredients;
- the heat treatment or other processes used when manufacturing the product;
- the microbiological status of the product;
- the product's health status – for example, whether or not a certain animal disease is present in the country of origin.

There are several different kinds of export certificates:

Health or sanitary certificates

Health or sanitary certificates are government-to-government certificates that include information about the product, its health status and the consignor.

Official assurances

An official assurance is a government-to-government assurance confirming that the products meet both domestic and the destination country's requirements. Official assurances are only issued for countries where the national CA has negotiated an agreement with the destination market as part of an official assurance programme.

Free sale certificates (FSCs)

FSCs are consignment-based documents provided to facilitate trade in markets that require a statement about the safety and suitability of the food and food-related products that are exported.

Free sale advice statements (FSASs)

FSASs are registration documents used to facilitate trade in markets that require food products be registered. FSASs exclude wine and most animal products.

While traceability may have a role in in the different type of certifications, these certification schemes *per se* are not equivalent to traceability systems.

In this study food safety is understood as the *conditions and practices that preserve the quality of food to prevent contamination and foodborne illnesses*.

However, due to the limitations of the analysis, the study focused only on *sanitary eligibility* involving the traceability system associated to the unique identification in terms of control of sanitary and operational conditions that the production chain of seafood in a country is required to comply with, and is therefore controlled and verified by a suitable CA

4.1.4 Chain of custody

In agreement with (Borit & Olsen, 2012), the authors of this study understand that in the fish industry, the term ''chain of custody'' has taken on a more specific meaning. Documentation of chain of custody is part of what is required for certification, especially certification related to use of eco-labels.

The exact chain of custody requirements vary, but in two important areas there is in practice a difference between documenting traceability and documenting eco-label type chain of custody:

(1) ''Traceability'' is a purely descriptive term, and one can split and join (fish) products as much as one likes and still have traceability, as long as one documents the fact that the units (for instance the boxes of fish) have been split up or joined together. There are very specific rules for what one is allowed to do in order to maintain the chain of custody as defined by the eco-label certification standards. A typical rule might be ''you are not allowed to mix together fish from two different suppliers''. In this respect, eco-label type chain of custody requirements (''do not mix'') is stricter than the traceability requirements (''mix as much as you like as long as you document it'').

2) Beyond the rules about not mixing, eco-label type chains of custody requirements contain no provision for keeping separate units and associated recordings. If the rule is ''you are not allowed to mix together fish from two different suppliers'' there is (from an eco-label type chain of custody view) no difference between two boxes of fish that come from that same certified supplier, even if the fish is caught by different vessels or on different days. In a good traceability system, this is regarded as

essential information and the boxes should have separate unique identifiers and separate sets of properties. In this respect, traceability requirements (''if units are physically separated, they should be documented separately'') are stricter than the eco-label type chain of custody requirements (''as long as you do not mix in violation of the eco-label rules, you do not need to differentiate between units that are of the same category'').

4.1.5 Regional Fisheries Management Organizations

FAO defines[4] Regional Fisheries Management Organizations (RFMOs) as Regional Fishery Bodies (RFBs) with a management mandate. These bodies adopt fisheries conservation and management measures that are binding to their members. RFMOs can define Conservation and Management Measures that are binding to its members (*hence defining legality of practices and catches*) as well a CDS or more general documentation schemes.

RFBs are mechanisms through which states or organizations that are parties to an international fishery agreement or ("agreement" is fundamental, and different from arrangement) arrangement work together towards the conservation, management and/or development of fisheries. (Some RFBs, especially those with an ecosystem mandate, work with seabirds etc. that are connected with fisheries but are not fish stocks *per se*.)

The mandates of RFBs vary. Some RFBs have an advisory mandate, and provide advice, decisions or coordinating mechanisms that are not binding for their members. The functions of RFBs also vary. They can include the collection, analysis and dissemination of information and data, coordinating fisheries management through joint schemes and mechanisms, serving as a technical and policy forum, and taking decisions relating to the conservation, management, development and responsible use of the resources.

The difference between a "regional fishery body" and a "regional fishery arrangement" is that the former has established a secretariat that operates under a governing body of member states and the latter does not have.

Regional Organizations (ROs), International Organizations (IOs) and Bilateral Organizations (BOs) on their side have a more limited role in terms of compliance, however are freer as to provide institutional strengthening and capacity building in fisheries and traceability related issues to its member countries.

4.2 Evaluation frameworks

The study divided the analysis in two complementary areas: analysis of the information provided by the reports (text analysis) and the coding of that information in the matrix analysis.

Gaps found under each of the evaluation components will then provide for the recommendations at country level. The most common issues found will support the rationale behind the general recommendations of the study.

4.2.1 Matrix development and analysis

As indicated in Section 3.3, to analyse the content of the 10 country reports and evaluate to what degree the existing or proposed traceability scheme enable the identification of IUU fish and sanitary eligibility, this study utilised a coding scheme based on a simplified and adapted version of the evaluation framework for requirements related to data recording and effective traceability designed to prevent IUU fishing described by (Borit & Olsen, 2012). As to standardize all the comparison (and simplify the matrix), the authors referred to IUU fishing operations according to (OECD, 2004, 2005) and the definition of IUU fishing and IUU fishing vessel from EU Regulation No. 1005/2008. Thus, the evaluation matrix comprises descriptors necessary to identify IUU fishing activity, IUU fish, IUU fishing vessels, IUU fishing ports, IUU fishing operators.

[4] http://www.fao.org/fishery/topic/16800/en

This Regulation includes tacitly FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA) and FAO Port State Measures Agreement (PSMA), as its provisions are built on these documents. We adapted the matrix to the purpose of this study by adding the descriptors relevant for food safety. Therefore, the final matrix contained descriptors for: illegal (and party unreported) fishing data; food safety data; efficient traceability systems data. In addition, the matrix covered all the points in the production chain that are vulnerable for infiltration of IUU fish, from sea to export.

The same template matrix was used for each of the 10 reports, thus in the end 10 matrices were filled in. The text of the reports were read thoroughly and coded in the respective cells of the evaluation matrix by one rater. At this step, the rater looked for specific text referring to each descriptor, rather than general and imprecise text. For example, if the report text reads: "all fish products are traceable from catch to final consumer", these words cannot in themselves be analysed, but the specific ones, which refer to concrete measures, taken to enable the traceability of fish products can be.

The scoring of individual entries in the matrices – as well as the logical operations performed with these scores – can be explained in terms of three-valued logic (Breuer, 1972). An individual entry in the matrix could only take one of three possible values, {false, equivocal, true}, depending, respectively on whether the requirement was absent (false proposition), equivocal (fuzzy proposition) or clearly defined and addressed (true proposition). At a further analysis, the equivocal category was split in two: not clear/fuzzy and partially true (i.e. true only for some species, fisheries, vessels). Thus, the coding set contained the following values: {false: 0, equivocal: 1, 2, true: 3}.

In addition, colour codes were used to indicate if the reports mentioned any authority monitoring and verifying the data recording process devised the respective traceability system: the report clearly indicates a third party, the report clearly indicates a government agency, the report is not clear about this, the report clearly indicates that there is no monitoring and verifying of the data recording process".

Logical operations occur when calculating the final value of production chain coverage or traceability (e.g., requirement C) from two or more requirements (e.g. A and B). In this qualitative characterisation, the value of the requirement C for the production chain (horizontal analysis) and traceability/IUU fishing/food safety (vertical analysis) was the result of the logical conjunction operation, i.e. A ^ B.

Thus, in the final assessment, the results of this logical operation can only take three values: true (3) if present in all requirements, false (0) if absent in any requirement, and equivocal (?) in all other cases. To further distinguish partly effective traceability (i.e. traceability that allows for a system that would function to a limited extent) from the non-effective, the majority function was chosen to be used in all the false cases. Thus, traceability was set to false only when n/2 arguments or more were false, where n is the number of traceability conditions (Valiant, 1984), and to partly effective in all other cases.

When performing the vertical analysis, it happened that not all the IUU fishing/food safety data were captured by the reports, and in this case the authors had to interpret in what degree the recorded data is helpful in IUU fishing deterrence/food safety assurance.

The matrixes *per se* are not part of the report, as a measure to protect the confidentiality of the information there contained, the matrixes can be provided on request by the authorities of the concerned country.

4.2.2 Report analysis

Due to the varied nature of the reports, it was realized that a fully objective approach to their evaluation, based on the matrixes discussed in Section 4.2.1, while very useful in some countries, would render very limited information on others.

Hence, a more holistic analysis would be required to complement the matrixes. Furthermore, the

authors' opinion was that due to the lack of standardization and uniform quality of the SWOT analysis provided in the 10 reports their utility was limited. In many studies, the information gathered was oversimplified and some information fitted into more than one category or was slotted into an inappropriate category. Moreover, in the end, such an analysis invariably relied on subjective judgments. Objective measures of all the components simply do not exist.

In order to standardize the analysis, the authors proposed adapting the methodology presented by (MRAG Asia Pacific, 2010) as a framework to evaluate the traceability mechanisms in each country and then elucidate gaps and current best practices.

Thus, each country's study is briefly presented in this report and the traceability system described in the country study is evaluated against three components: inclusivity, impermeability and verifiability.

4.2.2.1 Inclusivity

Inclusivity evaluates the extent to which the system is designed to provide traceability for all legally-caught fish of the country in question. If the sole objective of the scheme is to prevent the products of IUU fishing and those originated from non-sanitary approved operators from reaching the market, inclusivity is not particularly important as long as all fish that do enter the market are properly documented.

If there are legally caught fish that are not incorporated into the traceability scheme, this greatly compromises the usefulness of the scheme for monitoring compliance. In particular, under such circumstances, it would not be expected that the number of fish documented would match the number of fish caught. In addition, the potentially wrongful exclusion of otherwise legal fish on the grounds that they lack documentation could be a problem for fair trade. Inclusivity should therefore be as high as possible for maximum effectiveness and defensibility.

4.2.2.2 Impermeability

Impermeability evaluates the extent to which the scheme is designed to exclude non-traceable fish. The traceability scheme's impermeability directly determines its effectiveness for both combating IUU fishing and for monitoring sanitary compliance. It should be noted that a scheme may be highly impermeable, but not very inclusive.

It is worth to note that while high impermeability is desirable, marginal improvements in schemes that are already highly impermeable may incur high costs and diminishing returns.

4.2.2.3 Verifiability

Verifiability evaluates the extent to which those other than the parties directly responsible for filling out and validating the documentation audit the traceability scheme.

The existence of penalties or sanctions for improper documentation is also taken into account. A third issue is the extent to which any audit result is used not only to accept or reject individual shipments, but also to identify patterns in IUU fish trade and/or systemic weaknesses in the scheme.

Those schemes that currently have the most robust checks and balances are considered to represent best practice.

4.3 Limitations of the methodology

As discussed before, this study assessed the individual country based on the interpretation of the secondary sources provided (i.e. the 10 reports). Hence, the quality of this study's interpretation depends on the quality of the source report when reflecting the legal provisions of the respective country in connection with IUU fishing, sanitary measures and traceability.

While members of the authors' team are more or less familiar with the realities of some of the analysed countries, this knowledge was not reflected in the assessment.

5 Analysis results

5.1 Individual country analysis

5.1.1 Argentina

Argentina's report addresses partially the assessment of traceability by cataloguing a substantial amount of regulations, many of them not truly related to the issue in hand. None of these defines or requests traceability or its institutionalization *per se*.

The product value chain in Argentina can be complex, involving auctions and landings distributed among different processors that then consolidate into one export consignment.

The traceability system described in the reports is primary linked to the landing reports issued by DNCP (*Dirección Nacional de Coordinación Pesquera* – National Directorate for Fisheries Coordination) and a sanitary certification issued by SENASA (*Servicio Nacional de Sanidad y Calidad Agroalimentaria* – National Office for Food Safety and Quality). These documents are attached to the transport documents and to the invoice supplied to the factories with the product coming from each vessel.

Each processing plant has a log of all products entering and leaving (local sales, exports). DNCP and SENASA representatives control products entering or leaving a plant, when these are based in the plants, which is not always the case.

Plant logs are required to be weekly contrasted with the landing reports from DNCP. The plant logs are checked with the frozen stored products. For the same reason, SENASA does not control every product at the plant entrance, but has an office in each plant and develops regular inspections in cold stores and during processing operations. If fresh products have to be exported, SENASA representative is in the plant to control the products at the entrance gate. However is not clear how this works out in reality. SENASA also inspects the exported products and issues the sanitary certificate for export, but no details are given on the depth and scope of this activity.

As traceability is evaluated along the industrial production chain (90% of the processing establishments in the country are authorised for the EU and the US market), consequently operators are required to have plans in regards with traceability compliance; nevertheless this limits the traceability spectrum to those products that are exported.

Hence, the functionality of the traceability system is limited in relationship to the basic lack of a systemic and legal framework in which to define and assess it.

While in principle, the system seems effective, as the traceability to vessels or origin is a sanitary certification requirement, nevertheless there seems to be a risk associated with product passed to processors by middleman and fish buyers, as well as "pre processors" (fazones) that process "on behalf" bigger Food Business Operators (FBOs) whose standing in the traceability system both from a sanitary and fisheries stand point is not clear in the report.

The suitability of the traceability system seems to be compromised in principle, by the lack of organisational strength provided due to the lack of a legal standing and standardization of traceability along all elements of the production chain.

Traceability is mostly implemented as a EU and US market requirement, and not a national standard. Furthermore, it has been the domain of the health certification, whose core functions do not include legal origin and mass balance along the production change.

The report itself recognises the present limitations of traceability in the country, by concluding that; "… *although infrastructure and systems are improving in general, traceability still can be considered as weak as there is a lack of financial resources to carry out long term traceability programs, and poor information management systems along the chain from capture to marketing".*

Based on the above analysis, the authors can infer the following about the described traceability scheme

described:

Inclusivity: The scheme responds mostly to export market access requirements and is enforced only for some species of interest to those markets. It is not inclusive to all landings and/or harvests. Hence is not fully inclusive.

Impermeability: There are systems developed to control the legality of landings and mitigation strategies along the production chain, but these do not seem to be generalized among all the landings and the complex national processing structure. Hence the system is not fully impermeable.

Verifiability: Traceability is verified by the CA in function of the commercial interest associated only to exports, but not as intrinsic part of the national compliance system. Hence the system is not fully verifiable.

5.1.1.1 Matrix Analysis

IUU fishing data: It seems that the traceability system imposed by the legislation analysed by the report is able to provide most of the relevant information for identification of IUU fishing at the "at sea" part of the production chain. The same can be inferred for several points of the "at landing" part of the chain (i.e. ports and operators facilities) and of the "on shore" part (i.e. final processing and export). However, based on the text of the report we can say that the traceability system captures less of this relevant information at the remaining points. In some parts of the production chain and for some data, the recording process is monitored and verified by a government agency.

Food safety data: Food safety systems that meet HACCP requirements seem to be established and verifiable, at least on the export market production chain. Sanitary eligibility in terms of the EU market requirements seems to be in place with Food Business Operators (FBOs) uniquely identified, however the standing of middleman and processors "on behalf" is not clear in the report.

Traceability Assessment: The report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.1.2 Recommendation

While the country has a developing regulatory structure aimed to control IUU fishing, it should define and institutionalize traceability requirements and controls, starting from the domestic prerequisite for the registry of fishing business operators. Once this is achieved, the valid recommendations of the report could be implemented more effectively.

The data recording requirements should be modified so the traceability system captures the IUU fishing relevant data at all the points in the production chain.

5.1.2 Barbados

Barbados fisheries is largely focused around a small pelagic fishery resource in the in the southern Lesser Antilles, and is exploited by a group of seven small island states (Dominica, Martinique, Grenada, St. Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago). It is exploited mainly as a food source by Barbados, which is responsible for over 60% of the regional flyingfish catch. Expanding fleet capacity and limited implementation of cooperative measures are cause for concern that the resource may be become overfished if not properly managed at the national and regional levels.

The Fisheries Division provides physical infrastructure at common landing sites in the form of computerised catch recording program (CARIFIS) to facilitate statistical data gathering. Vessel and fisher identification information and catch quantity is recorded, however the current database lacks specific data in relation to catch identification, area, dates, the vessel involved and any transhipment activity. In order to correct this, the Fisheries Division has begun to draft legislation, which will mandate the use of logbooks on national fishing vessels.

The national legislation 1993 Fisheries Act (amended in 2000) may be considered to vaguely address the prevention of IUU fishing by tactfully placing the right to deny or rescind fishing rights at the discretion

of the Chief Fisheries Officer or the Minister of Agriculture as appropriate on the basis of the following blanket condition of "proper management of fisheries resources". Sanctions are commonly applied to the owner, charterer and master as appropriate in cases of legislative violation. No specific mention is made, however, of standards for presenting evidence of illegal fishing activity.

The hospitality sector purchases 70% of the filleted flyingfish produced in the island, and is responsible for the sale of 80% of the cooked flyingfish to consumers, including tourists. The prevalence and profitability of local flyingfish consumption makes the issue of export a low priority in the eyes of decision makers. As there is consistent local demand and (as yet) minimal foreign demand for the commodity, local agricultural health and food control (AHFC) is currently considered adequate for the purposes of this particular fishery. Hence, the combined efforts make up the existing agricultural health and food control regime have resulted in an adequate system, which effectively minimizes risk in terms of local food safety through appropriate application of technical capacity and infrastructure for monitoring and inspection. The current system is not in alignment with international standards, guidelines and codes of practice, and therefore, not equivalent to the sanitary and phytosanitary (SPS) measures implemented by potential international trading partners. The Inter-American Institute for Cooperation on Agriculture (IICA) and the World Organisation for Animal Health (OIE) during 2008-2009 found a number of weaknesses contributing to non-compliance. Therefore, Barbados does not have a sanitary agreement or any facilities listed for the EU.

Implementation of IUU prevention measures is limited by inadequate and out dated legislation, regulation and management plans, lack of monitoring, control and surveillance, and inadequate resources for implementation, despite the existence of relevant regional and international guidelines and commitments.

Due to the lack of a traceability system, the sector lacks the capacity to maintain records of harvest data throughout the supply chain. Identification of unique batches of fish begins in the post-harvest sector if at all, and the design of internal traceability procedures are typically driven by food safety or financial accounting concerns, with no regard for IUU fishing prevention or sustainable fisheries.

As a result, traceability remains non-existent in the Barbados fishing industry except in a minority of cases in which private sector entities have dictated the use of internationally compliant measures by their suppliers in the fishing industry, even despite regional pressure for implementation by regional instruments. It is planned that traceability and the application of best practices along the supply chain will be implemented upon operationalization of the NAHFCA in the near future, but no specific management plans related to the flyingfish fishery and IUU fishing prevention exist in the pipeline.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: There appears to be no scheme in place, except of private sector entities for export or financial gains.

Impermeability: There is no real regulation but reference to auspices of proper and/or precautionary fisheries management measures

Verifiability: Requirements and resources are significantly lacking to undertake this activity.

5.1.2.1 Matrix Analysis

IUU fishing data: Based on the information included in the report, the data relevant for IUU fishing identification, prevention and deterrence are not registered.

Food safety data: The current system meets local requirements and is not in alignment with international standards, guidelines and codes of practice, and therefore, not equivalent to the sanitary and phytosanitary (SPS) measures implemented by potential international trading partners.

Traceability Assessment: Based on the information of the report, the principles of effective traceability systems are not met.

5.1.2.2 Recommendations

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of relevant data provided by the analysed report.

5.1.3 Morocco

The report is relevant and comprehensive, it includes most of the important aspects and the requirements for having a traceability system, as Morocco has very close linkages with the EU market via various private and official agreements with the EU, has expanded into other geographical markets.

A traceable unit is defined as the amount of fish landed at a given time by a particular vessel. The catch certificate will be validated if the unit has sufficient quantity at the time of exporting that is creating an account for this unit to be debited in the circuit and used for export.

The driver for following traceability requirements is a function of the value of the fish. Where the value of the fish is deemed low, the inclination of the fishermen to provide information is less than the high value species destined for more lucrative markets.

Vessel Monitoring System (VMS) are in place for the creation of catch reports by the captain for coastal and artisanal fishing catches, which are afterwards validated by the DPM. The first sale document (purchase statement) is then submitted by the ONP to the wholesaler who has at his disposal the information in the catch report and the purchase statement. Computerized traceability system (SAMACNA) is established with the intention of reducing the use of paper documents and ensuring continuous traceability and verification from landing to export, however it is not fully integrated.

The factory gains access to the catch information from the wholesaler, to establishes a catch transfer, which, together with the information contained in the other documents, allows the factory owner to ensure the traceability required to be transmitted to the exporter. At the end of the chain, the exporter will have all the traceability needed to ask for the validation of the catch certificate.
For offshore fisheries, the pattern is much simpler. The catches are generally directly exported, reducing the number of key stakeholders.

Implementation and adoption of legal framework (Law No. 15-12) on the prevention and the fight against IUU fishing has faced challenges. Hence, the law establishing the rules to be observed by fishing vessels to land and / or tranship fishery products in the Moroccan ports and also laying down measures to ensure that fishery products marketed in Morocco are not derived from IUU fishing is not fully implemented or enforced.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The system looks to include all parts of the supply chain, and defines the traceable unit back to the vessel. However, not enough information is provided as to define its total inclusiveness.

Impermability: As the systems begin on the vessel, the system is enforced, as the information flow is consistent. However, not enough information is provided as to define its full impermiability.

Verifiability: Systems exist both in paper and electronic form to allow for the variability of competent authority to assess data captured. However, not enough information is provided as to define its total verifiability.

5.1.3.1 Matrix Analysis

IUU fishing data: The report does not provide enough information in order to assess if the data relevant for IUU fishing deterrence are recorded by the traceability system. The few data provided are unclear. However, it seems that the “at sea” step in the production chain is the one that the report (and implicitly the legislators) focused most on, as some IUU fishing relevant data are recorded at this step. In some parts of the production chain and for some data, the recording process is monitored and verified

by a government agency.

Food safety data: It is implied that food safety systems are in place for the Moroccan fisheries products to meet the EU Market Access Requirements, however the level and standards being met are not inferred, not the effectiveness of food safety related traceability in the non-EU and domestic sector.

Traceability: Except the information about the unique logistic unit identifier that is recorded at almost all the points in the production chain, the report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.3.2 Recommendation.

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of data provided by the analysed report.

5.1.4 Peru

Peru's report addresses the assessment of traceability analysis by cataloguing a substantial amount of regulations, unfortunately not all of them related to the issues at hand.

Encouragingly, since 2013, Peru (Ley N° 30063) defines traceability in law, as part of the creation and functions of SANIPES as the Competent Authority for seafood safety and official assurances for the export market. Their definition reads (*translated from Spanish*):

Traceability: Also called tracing or tracking. Possibility to find and follow the trail through the entire production chain of a food, feed, hydro-biological resource for production food or substance intended to be incorporated in food or feed or likely to be. The law also makes SANIPES responsible of… *sets standards, directives, guidelines, guides, systems, plans and procedures for guidance needed to comply with this purpose*.

Prior to this, traceability was only legislated officially for bivalves[5]. As in other countries, traceability was enforced as a food safety related Market Access Requirement for the production chain aimed to exports and later as a fishery management measure. The requirements were drafted by different official bodies that do not act normally in coordination. Furthermore Peru's fisheries profile is highly segmented accordingly to the type of products and the use; human consumption (HC) or non-human consumption (NHC *i.e. fish meal*), hence implementation of traceability is to be complex.

In the industrial fisheries sector (mostly non-human consumption by volume) the production chain is relatively short, which helps to keep traceability systems simple. A logbook (bitacora) is compulsory for all industrial fishing vessels, and in many cases this is compared with the observer's[6] (TCI) reports. Landing reports are filed at ports, barges or operations by "bitacoreros" that have been delegated control functions (3rd party organizations as SGS and CERPER), and these in turn relay information to the fisheries CA. As this product is not aimed for HC, the seafood safety CA has limited involvement.

The opposite scenario applies to the small scale/artisanal fisheries sector, which is the major source of exports for human consumption. In addition, control from the fisheries side is delegated to weaker regional organizations, and as the production chain involves middlemen (comerciantes/acopiadores) (who are not under the control of either fisheries and/or sanitary CAs) the permeability and verifiability of the scheme is limited, even if there is transport document (guia) to be employed for internal transport, which focus more on proving that the products have not been stolen than on traceability.

The sanitary CA requires traceability of product to individual vessels in the artisanal sector, however as they are not involved in verifying the volumes landed vs. the carrying capacity of the fishing vessels and mass balance exercises, they have to rely on the information provided by exporters only.

[5] Acuerdo Consejo Directivo Nº 029-015-2010-ITP/CD Control oficial relativo a la trazabilidad de los moluscos bivalvos

[6] Tecnico Cientifico de Investigacion

Hence, the functionality of the traceability system is limited in relationship to the scope in which to define it and assess it. Said so traceability is legally defined and allocated as core function to the sanitary CA, hence this is great building block to further develop.

The suitability of the traceability system is compromised in principle for the limited scope in relationship to the total spectrum of fisheries activities, and a lack of institutional collaboration in between the fisheries and the sanitary CA.

The report itself recognises the present limitations of traceability in the country, by concluding that: … *"The authorities have to implement control systems in artisanal fishing vessels and small scale… Apply control measures in smaller scale and artisanal vessels and …. Develop programs formalization of artisanal vessels in collaboration with the Regional Governments"*

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The scheme responds mostly to export market access requirements and is enforced only for some species of interest to those markets. It is not inclusive to all landings and/or harvests. Hence is not fully inclusive.

Impermeability: There are systems developed to control the legality of landings and mitigation strategies along the production chain, but these do not seem to be generalized among all the landings and the complex national processing structure. Hence the system is not fully impermeable.

Verifiability: Traceability is verified in function of the commercial interest associated to exports by a CA, or by a contracted 3rd party for some of the non Human Consumption landings but not as intrinsic part of the national compliance system. Hence the system is not fully verifiable.

5.1.4.1 Matrix Analysis

IUU fishing data: It seems that the traceability system imposed by the legislation analysed by the report is able to provide most of the relevant information for identification of IUU fishing at the "at sea" part of the production chain (where the data recording process is monitored by a government authority). The same can be inferred for the point "operators facilities" (where the data recording process is monitored by a third party) at the "at landing" part of the chain, and explicitly only for some species at the point "ports", same part of the chain, and point "final processing" and "export", at the "on shore" part of the production chain. For all the other points, the report data are missing or not clear.

Food safety data: Food safety systems that meet HACCP requirements are established and verifiable, at least on the export market production chain. Sanitary eligibility in terms of the EU market requirements seems to be in place with Food Business Operators (FBOs) uniquely identified, however the sanitary standing and traceability back to the vessels on the small and artisanal sector is incomplete.

Traceability: The report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.4.2 Recommendation.

While the country has a developed regulatory structure aimed to control IUU fishing, it is mostly aimed to one industrial (non human consumption) fisheries sector and to its bivalve rearing operations. The human consumption sector is mostly small scale and under the control of regional offices, instead of a centrally organised structure, therefore less effective. The country should aim to standardize systems along the whole sector.

Based on the matrix analysis, it is recommended that IUU fishing relevant data is recorded at all the points in the production chain, including at the "at landing" and "on shore" parts of the chain.

5.1.5 Senegal

Senegal's drivers for traceability and management of IUU fishing are for product destined for the European Market only. Local markets are only concerned with sanitary measures.

There was no definition for traceability within the text, although the general concept was used throughout the report.

Legal and regulatory framework is fully enforced for registration of, and licencing of industrial vessels. There appears to be inadequate framework and loose enforcement for traditional fisheries.

Directorate for the Protection and Surveillance of Fisheries (DPSF) is in charge of the implementation of the policy defined by the State in terms of marine and continental fisheries. Monitoring, control and surveillance to enforce the established management measures is carried out in collaboration with structures such as the Directorate of Marine Fisheries (DMF), the National Marine, the Oceanographic Research Center of Dakar-Thiaroye (CRODT), the National Gendarmerie, the Customs services, Dakar Port Authorities, professionals and the local communities of fishermen in the framework of the participatory surveillance of traditional fisheries.

Monitoring and control are undertaken through documents and electronic systems to best capture and communicate data. Validation steps for the information captured appear to occur at each step of the process until the point that the product is processed and not intended for export.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The scheme responds to industrial vessels and is not focused on traditional fisheries. Hence cannot be identified as fully inclusive.

Impermeability: There are developed systems to monitor and surveillance by multiple bodies, both government and industry to prevent IUU fishing activities. However due to the fragmented control structure, the systems cannot be assess as fully impermeable.

Verifiability: Verification of process appears to occur at sea, at landing and in instances where product is processed intended for export. Verification for local market is primarily focused on sanitary measures. However due to the fragmented control structure, the systems cannot be assess as fully verifiable.

5.1.5.1 Matrix Analysis

IUU fishing data: The legislation analysed by the report requires that only few IUU fishing relevant data are recorded along the supply chain and only for some species. None of the points of the three parts of the production chain ("at sea", "at landing", "on shore") is fully covered by these requirements. In some parts of the production chain and for some data, the recording process is monitored and verified by a government agency.

Food safety data: Unique identification exists throughout the supply chain, however the standards being operated too are not implied.

Traceability: According to the analysed report, very few data relevant for assessment of efficient traceability requirements are recorded at some points of the production chain. Otherwise, the report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.5.2 Recommendation.

The recommendation suggested to prevent IUU fishing activities is the development of an efficient traceability system. Based on the matrix analysis, it is recommended that IUU fishing relevant data is recorded at all the points in the production chain and that the effective traceability principles cover al the points of the supply chain.

5.1.6 Sri Lanka

Sri Lanka has a rich and expansive exclusive economic zone that plays an important part in the economy, as well as providing more than 50% of the protein requirements for the local population.

Traceability practises of small pelagic fisheries; shrimp, lobster and cephalopods are not really developed as the large pelagic fishes. Regulatory structure is well established to prevent IUU fishing

activities of this variety, however monitoring and surveillance activities at a field level are deemed to be week and need to be strengthened.

Regulatory requirements under the Fisheries and Aquatic resource act and subsequent amendments exist to enforce registration annually and to have a valid operating licence for fishing method and equipment. Mechanized fishing vessels are required to record catch in a logbook, this is well implemented for multiday vessels, but not successful in the more artisanal fleet. Verification of data collected from the multiday vessels is well established, but once again gaps exist in the artisanal fleet.

Infrastructure for transporting and processing fish under sanitary conditions is not established and hence the ability to achieve certification to recognised standards is not possible. It is noted as one of the strengths that food safety requirements are well in place for export fish products.

However the Commission's assessment, "*Sri Lanka has not sufficiently addressed the shortcomings in its fisheries control system identified in November 2012. The main weaknesses include shortcomings in the implementation of control measures, a lack of deterrent sanctions for the high seas fleet, as well as lacking compliance with international and regional fisheries rules*". As a result, the Commission tables a ban on fisheries products caught by Sri Lankan vessels being imported into the EU.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: Application is mainly focused on the large pelagic fisheries; smaller artisanal fisheries are excluded from the requirements. However due to the fragmented control structure, the systems cannot be assess as fully inclusive.

Impermeability: Opportunities to exploit could be achieved through the lack of implementation of control measures. Hence cannot be assessed as impermeable

Verifiability: Regulatory requirements exist for large pelagic fisheries; smaller artisanal fisheries are excluded from this activity, as a consequence the system in not fully verifiable.

5.1.6.1 Matrix Analysis

IUU fishing data: Based on the information included in the report, the data relevant for IUU fishing identification, prevention and deterrence are not registered except in some cases at the "at sea" point of the production chain. In these cases, the data recording process at this point is monitored by a government agency.

Food safety data: Implies that requirements to meet export markets are in place, however basic infrastructure is not in place to meet these requirements.

Traceability: The report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.6.2 Recommendations

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of data provided by the analysed report.

5.1.7 Tanzania

This report addresses the fact that even though policy and strategy statements exist to address fisheries management they are not well implemented.

Traceability is detailed upon in The Fisheries Act (CAP. 279): "the management of fish and aquaculture establishment shall, for the purpose of traceability from upstream to a market, recall and retrieval of the fish and fishery product, develop a traceability system, which shall include: location, vessel, date of landing/catch/harvest and quantity, date of processing, name (common and scientific), state of product and quantity."

Requirements are in place for the registration of fishing crafts, in spite of their existence and the

relatively low fee for licences, most fishing and related activities are informal. Other legal provisions are in place to encourage professionalization of fisheries and other related activities, but are deemed futile.

The system for traceability practices in Tanzania is largely revenue driven and is centred round a certification/permit system which involves numbers of procedures in order to get permits. The permits are given for both local and foreign vessels for fishing in Tanzania in these particular fisheries, and for importation or exportation of fisheries products produced and processed in Tanzania. The current system found to be complicated which does not have impact in fisheries since it focus on revenue rather than management of sustainable fisheries in Tanzania.

As the report was written as an explanation of the legislation and requirements, as opposed to the actually practise of undertaking them, it is hard to determine if there are any activities legitimately at play that are implemented well.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The regulations and legislation is inclusive of marine fisheries, however it is unclear in areas of smaller fisheries, where this is hidden in obscure parts of the regulations. However due to the fragmented control structure, the systems cannot be assess as fully inclusive.

Impermeability: It is unclear in the report where areas of impermeability may occur, as the implementation of the regulations in practice is not provided. Hence cannot be categorised as Impermeable.

Verifiability: Verification activities are undertaken as a fault finding and revenue gathering exercise, as opposed to strengthening the fisheries management. Hence the verifiability of the system does not seem to be complete.

5.1.7.1 Matrix Analysis

IUU fishing data: The legislation analysed by the report requires that only very few IUU fishing relevant data are recorded along the supply chain and only for some species. The data recording process is verified in some of the cases by a government agency while in other cases (at several points in the "at landing" part of the production chain) by a third party. None of the points of the three parts of the production chain ("at sea", "at landing", "on shore") is fully covered by these requirements. Otherwise, the report does not provide enough information about the data to be recorded.

Food safety data: Systems and registration in place for the purposes of exporting, not seen to be a key aspect of local production.

Traceability: The report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.7.2 Recommendations

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of data provided by the analysed report.

5.1.8 Turkey

Turkey's report outlines the complexities and difficulties of implementing EU requirements. This is largely due to the traditional and small-scale structure of the fisheries, the many combinations of fishermen and disembarkation locations, mixed fishing tools and immigrant fishermen. Turkish legislation covers general provisions that aim to inform consumers but it does not contain all the information that the EU legislation requires.

Traceability is defined as one-step-forward and one-step-backward and deemed to be mandatory. The specific details of what information should be available is outlined in the packaging and labelling standards (Ministry of Food, Agriculture and Livestock, 1995) for marketing processed seafood;

manufacturers name, and address, product name, type, production date, net weight. However this standard is not applied to seafood under 50kg that are being marketed by local fisherman.

Tracing tools for the fisheries and aquaculture have been implemented since 2001, including logbook for fishing vessels over 12m, sales report (for the first sale), transport document and certificate of origin. Fisheries Law (No. 1380) enforces taking "Certificate of Origin" from the Agriculture Ministry Province or District Offices or appointed cooperatives near the disembarking location that enables tracing legally caught seafood from the catch location to the table of consumer in order to sale and transport. Automatic Identification System (AIS) is mandatory for the fishing vessels over 15 m length since 2010.

As of 2013 Turkey has been collecting almost all fishing effort data (except IUU) by fleet register system (GKS) and licences, fish processing and catch per unit effort data by questionnaires, more than half of the landing data by sales notes and licences and nearly half of the biological and VMS data by sampling within fishery data collection programme SUBIS integrated Fleet Register System has been effective in collecting vessel data.

Monitoring and traceability could not be fully implemented in practice, which would allow consumers to monitor seafood from catch to the dish. Misreporting and incomplete logbooks are the main problems for reliable and incomplete usage of logbooks. The lack of traceability causes circulation of IUU products on the market and marketing of less valuable products as if they are valued and recognized seafood.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: Application of regulations is only applicable to vessels greater than 12m, or the sale of fish products greater than 50kg. Hence the system cannot be assessed as fully inclusive.

Impermeability: Information recorded in relation to catch may be misreported as the consequences of being caught are outweighed by the value. Hence the system cannot be assessed as fully impermeable.

Verifiability: Verification activities are not fully undertaken which would allow the full traceability from catch to consumer. Hence the system cannot be assessed as fully verifiable.

5.1.8.1 Matrix Analysis

IUU fishing data: It seems that the traceability system imposed by the legislation analysed by the report is able to provide some of the relevant information for identification of IUU fishing at the "at sea" part of the production chain and at the first part of the "at landing" part, but only for some species. The data recording process in these cases is monitored by a government authority. The report does not provide details about the IUU relevant data recording requirements for the other points in the production chain.

Food safety data: The application of food safety systems or requirements are not implied throughout this report, however a member state, the EU standards and requirements for processing and registration should apply.

Traceability: For some species it seems that the traceability system imposed by the legislation covers most of principles of effective traceability principles at the "at sea" part of the production chain and at the first part of the "at landing" part. The report does not provide details about this aspect for the other points in the production chain.

5.1.8.2 Recommendations

Based on the matrix analysis, it is recommended that IUU fishing relevant data is recorded at all the points in the production chain and that the effective traceability principles cover all the points of the supply chain.

5.1.9 Uganda

The application of EU IUU Regulation excludes fresh water fish. Therefore, the report is focused on health aspects and the requirement for IUU catch certification is overlooked in this report.

Uganda has no comprehensive law governing safety and traceability of food products. The liberalization

of trade and open access nature of the fishery in Uganda has led to the deterioration of the fishery outputs especially in terms of quality.

Most of Uganda's fish is exported illegally to the neighbouring countries. According to Bank of Uganda, in 2007, 30% of catches from Uganda water bodies were illegal, unregulated or unrecorded (IUU).

Practices in place centralize the registry of fishing vessels and the issuance of number plates to each is currently in place as a way to trace fisheries.

Fish landing sites that are gazetted (handling export products) by law, under DFR, are regulated by fish inspectors under the respective district local governments working through the semi-autonomous local beach management units (BMUs). All fish landed must be traced by source, species and volume at landing by law and all catches must be registered for origin and destination and issued with a fish movement permit. Verification activities are undertaken by fish inspectors in main markets and border crossings.

Where actions have been undertaken to address immature fish trade and cross border illegal fish trade, it initially drove demand of legal size fish, however faced a challenge of corruption through bribes and political interference and driving actions to disband organisations involved.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The coverage of the systems seems to be limited only the export production chain. Hence it's not inclusive.

Impermeability: Information recorded in relation to catch may be misreported due to demand for fisheries out weighing consequences. Furthermore as the systems focus on the export chain, the Impermeability of the scheme cannot be concluded.

Verifiability: Verification activities are undertaken by fish inspectors for the source, species and volume, but the verifiability of the system cannot be assured.

5.1.9.1 Matrix Analysis

IUU fishing data: The legislation analysed by the report requires that only few IUU fishing relevant data are recorded along the supply chain and only for some species. The data recording process in these cases is monitored by a government agency. None of the points of the three parts of the production chain ("at sea", "at landing", "on shore") is fully covered by these requirements.

Food safety data: No indication was provided in the report on the sanitary standards in place or the identification of facilities.

Traceability: According to the analysed report, very few data relevant for assessment of efficient traceability requirements are recorded at some points of the production chain. Otherwise, the report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.9.2 Recommendations

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of relevant data provided by the analysed report.

5.1.10 Vietnam

The Vietnam report provides an indication of the proactive government initiatives undertaken prior to the introduction of EU IUU Regulation. It addresses the current regulation in place and the effectiveness of implementation and key failures of the whole system.

Two pieces of national legislation for Vietnam exist in relation to traceability and prevention of IUU, including Circular No. 03/2011/TT-BNNPTNT and Circular No. 28/2011/TT-BNNPTNT.

Ministry of Agriculture and Rural Development (MARD) defined "tracing" as meaning the possibility to monitor and locate a product unit through specific steps of production, processing and distribution (by *Codex Alimentarius* standards). [7] This was in relation to the tracing and recalling of fishery products railing to meet food quality and safety requirements.

"Traceability" was identified as ability to monitor a unit of product through step by step during the producing, processing and providing this product. This Circular also set requirements on traceability such as fishery plants have to set a traceability system by "one-step-back, one-step-forward" methodology to ensure the finding, marking a unit of product at any certain steps.

The second piece of legislation was focused on the validation of catch certificates and statements for exportation into the European market was defined Illegal, Unreported and Unregulated (IUU) fishing activities are considered illegal, unreported and unregulated if organizations and individuals engaged in fishing activities commit any of the violations listed.[8]

Small scale, multispecies and multiple fishing gears are special characteristics of Vietnam fisheries. The application of regulations was defined fishing vessels with main engine capacity of 50HP or greater, In addition, a large number of fishing vessels and many landing sites along the long coast are leading to many difficulties on fisheries management.

Sub-DECAFIREP has the responsibility at a regional level to monitor fishing vessels' activities, store documents, organize training course and guide to owners of exported enterprises and fishers about traceability and IUU prevention regulations and finally directly provide Catch Certificates as well as Catch Statement for Raw Materials.

All fishing vessels have to obtain fishing licenses before undertaking fishing operations. Consequently, the issuance of fishing licenses is based solely on technical safety and registration instead of sustainable resource management. This has led to overcapacity, and subsequently to economic losses, eventually exacerbating poverty among coastal and artisanal fishers. Nevertheless, it is also well recognized that fishers would try to refrain from applying for fishing licenses and certificates when they are constrained and controlled by fishery authorities, while also trying to purposely delay payment of registration fees for as long as possible.

Maintaining fishing reports and logbooks is compulsory for fishers and skippers of fishing vessels, but managing and inspecting the information provided by fishers and skippers are the responsibility of fishery authorities (Decision 3477/QD-BNN-KTBVNL). In reality however, these are not practiced, as the procedures would require considerable amount of efforts, since each province has thousands of fishing vessels.

Fishers do not strictly enforce fishing report and logbook keeping because Vietnam's regulations on this are not complete. There are no current laws and regulations that set any criteria for accurate inputting into logbooks based on specific requirements for keeping fishing logbooks and reporting procedures nor is there a system of validating the data reported. Owners also fear that if forced to fill out logbooks, their skippers may abandon their work and move to other vessels. In general, the process to achieve the catch certificate is not satisfied with requirement of IUU Regulation.

Complexity is added to the process as some processing facilities buy fishery products from many middlemen or fishers, making it difficulty for authorities on traceability Catch Certificate issuance.

Trading of fish products in Vietnam is usually done through middlemen, whose involvement is not documented in the transhipment process of fishery products at sea. There is no regulatory requirement's for middlemen's involvement to be declared on the Catch Certificate, and hence the introduction of IUU declared catch, as no traceability exists.

The catch certification form is submitted by exporters to fishery authorities but in order to receive a

[7] Circular No. 03/2011/TT-BNNPTNT issued on 21st of January, 2011

[8] Circular No. 28/2011/TT-BNNPTNT of April 15th, 2011

valid catch certificate from the authorities, exporters should also provide copies of logbooks together with the fishing license and a complete catch certificate form. Since exporters request a catch certificate after buying fish from middlemen, the information may not be as precise as that of the skipper's. It is implied that exporters could just write any species and corresponding volume caught by a particular fishing boat, as verification does not appear to be occurring in the issuance of certificates.

The report infers that the skipper's could provide appropriate information; such as features of the fishing vessel, species and yields in the catch certificate form, but this activity is not currently occurring.

Inspection by concerned authorities is not effective, notwithstanding a requirement in the IUU regulations stipulating the need for authorities to carry out random inspections of at least 5% of the total average landings and trans-shipment transactions at fishing ports each year. Regarding tuna landings, the concerned authorities are not able to inspect fishing vessels at ports because tunas are unloaded immediately upon landing. By the time fishery authorities receive the catch certificate application form from exporters, the fish is already in processing factories.

Conflict of interest and competition of fishing grounds also encourage fishers to conceal trip information or misstate information on fishing areas and routes, especially in cases when banned species are caught or when highly productive fishing grounds are discovered which could attract the interest of other competing fishers. Reluctance to declare catch is also driven by the government might impose high taxes on them, and that they might have to pay more for their social duties

Forgoing the zealous implementation of the regulations limitations existed in the fisheries, by lack of education of fisherman, where only 11% of fishers have complete secondary school or high education, and hence do not have the skills to complete necessary documentation.

Based on the above analysis, the authors can infer the following about the described traceability scheme described:

Inclusivity: The scheme responds to vessels with 50HP or greater, but does not capture artisanal fleet. Hence is not totally inclusive.

Impermeability: There are developed systems to control the traceability requirement and the Catch Certificate scheme through a logbook system, however the fisher's capacity to complete the required data accurately not under duress is questionable. Hence its level of impermeability is questionable.

Verifiability: Traceability is verified by the logbook system, however this data is often misrepresented or not recorded at all. Verification activity is not robust and hence not enforced. Therefore the system cannot be considered a verifiable.

5.1.10.1 Matrix Analysis

IUU fishing data: The report mentions explicitly that only few IUU fishing relevant data are recorded along the supply chain and only for some species. The data recording process in these cases is monitored by a government agency. None of the points of the three parts of the production chain ("at sea", "at landing", "on shore") is fully covered by these requirements. Otherwise, the report does not offer any information about the other data. It is maybe worth to mention that the points "at sea" and "export" are the best covered by recorded data.

Food safety data: Food safety requirements are not addressed in this report; there is no indication of the regulations in place or if there is any system to identify processors.

Traceability: According to the analysed report, very few data relevant for assessment of efficient traceability requirements are recorded at some points of the production chain. Otherwise, the report does not provide enough information in order to assess if the principles of effective traceability systems are met.

5.1.10.2 Recommendations

Regulate the requirement for accurate reporting of information and completion of log books. Support to be provided to fishers to assist in up-skilling and education for a better comprehension of

requirements and to build capacity within the industry to complete required documentation. The inclusion of all parts of the supply chain to be involved in the accurate communication of information, this includes middlemen.

Except the general recommendation of registering all the IUU relevant data and following all the requirements of effective traceability, the authors cannot formulate any recommendations based on the matrix analysis, due to lack of data provided by the analysed report.

5.2 Overall analysis

5.2.1 Common Issues

Unfortunately, none of the reports provides enough information to assess whether the principles of effective traceability are met by the traceability systems of the 10 respective countries.

Maybe these requirements are actually provided by the respective legislation, however the authors of this study cannot infer this from the text of the reports. Nevertheless, some common issues are identifiable in regards the expectations of the terms of reference.

5.2.1.1 Relevance for combating IUU fishing

None of the reports provides enough information to assess whether the data recorded by the traceability system of the 10 respective countries is designed to record data relevant for IUU fishing identification, deterrence and prevention. Furthermore, the fact that traceability is not legally defined in most countries limits the legislative ability to prosecute when based on evidence originating from analysing data recorded by traceability systems.

Hence is important to have a defined methodology in regards with assessing traceability in terms of its validity as a tool for combating IUU fishing.

Similarly to the case of food safety/sanitary eligibility, most countries included traceability into fisheries controls as a response from the demand of the EU market "Catch certification scheme", however this seems to focus only on species or fisheries that could potentially enter the EU market, but contribute little to the rest of the captures.

5.2.1.2 Ensuring Food Safety / Sanitary Eligibility

With the exception of Barbados, all of the countries reported are authorised to export to the EU, hence it is assumed that the sanitary controls over the "EU destined" production chain are to be considered as equivalent to those in the Member States. Therefore, the requirements in relation to sanitary traceability as defined in Regulation 178/2002 should have been met.

However, the analysis of the reports shows that is not always the case, and the omission of the Rapid Alert System for Food and Feed (RASSF)[9] notifications, and the review of the FVO reports for the respective countries in relation with food and feed safety could have provided additional clarity on the implementation of traceability within the country.

Furthermore, the fact that many seems to run a "split" system (a set of rules for the EU production chain, and other for domestic and non EU exports), has created parallel channels of seafood handling and production, where all the focus of traceability has been only as a consequence of a perceived market access need.

5.2.1.3 Reducing vulnerability to threats and crises especially for small scale sector

Small-scale fisheries make an important contribution to nutrition, food security, sustainable livelihoods and poverty alleviation – especially in developing countries. Despite this significant contribution, the impact of ineffective traceability systems small-scale fisheries remain poorly understood.

[9] RASSF Portal https://webgate.ec.europa.eu/rasff-window/portal/?event=SearchForm&cleanSearch=1#

The analysis of the country studies shows that, with the exemption of Peru (particularly for it key HC export Giant Squid *Dosidicus gigas*), Senegal and Barbados where most exports originate on the small-scale sector, the bulk of the traceability efforts in terms of sanitary eligibility and legality of catches is focused on the industrial sector. In developing countries with limited resources to monitor compliance chances are that the small scale and artisanal sector are to be the less controlled and therefore most exposed to threats.

Besides the environmental impact and the associated threat to food security, IUU fishing also harms a range of other actors. IUU fishing results in significant economic losses for legitimate fishers and to legal fisheries in general. IUU fishing depletes fish populations, which could otherwise be fished by legitimate actors, and generally degrades the marine environment, producing a vicious circle, which further reduces fish populations.

FAO[10] estimated that over 500 million people in developing countries depend, directly or indirectly, on fisheries and aquaculture for their livelihoods, hence failures in the inclusivity, impermeability and verifiability of the countries traceability systems has direct impact in the small scale sector.

5.2.2 Role of RFMOs

Unfortunately, none of the reports provides tangible information in regards the mechanisms of the country in function of established RFMOs lead CDS. Many quoted their adherence to principles by ROs and IOs such as FAO, CARICOM and OLDEPESCA, confusing the concepts of ROs, IOs, RFBs and RFMOs.

RFMOs per se, have been actively dealing with primary and secondary objectives of their CDS. There are many sources of information about the various trade and CDS currently in place by RFMOS[11], i.e. those established by the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the Inter-American Tropical Tuna Commission (IATTC), International Commission for the Conservation of Atlantic Tunas (ICCAT), and the Indian Ocean Tuna Commission (IOTC), and while the EU regulation to prevent, deter and eliminate IUU fishing, could be functionally included, it is not a RFMO but rather a market access condition by a trading block.

A country that is a member of any of these RFMOs should comply with their requirements; hence when applicable this could be extended into the domestic market. Nevertheless, most of these RFMO lead CDS are species specific, oriented towards international trade and are not fully harmonized.

Hence the role of RFMOs in the internal traceability of a country is at best limited, with the introduction of electronic document systems in many aspects of international trade including some of the RFMO schemes themselves. Member countries could use the platforms available as a based to develop their own systems in a way that is compatible to the needs of the RFMO.

One of the benefits of electronic document schemes is that if common information standards can be agreed amongst countries and RFMOs, data from a variety of paper formats can be held in a single database format common to all requirements. As a result, the need for format standardisation has been eclipsed by the need for consistency and compatibility of information across schemes.

ROs and IOs, on the other side could play a more vital role in the development and standardization of compatible traceability systems among its members. Furthermore, the development costs on any system would be greater reduced is shared among many countries.

6 Discussion

Is not the aim of this study to list the many and varied advantages that effective traceability systems provide to a country. Boyle (2012), from a generic point of view, resumes it in a simple way; "*If seafood is not fully traceable it is difficult to recall a product lot when it is found to be unsafe to eat, impossible to*

[10] http://www.fao.org/climatechange/17792-0d5738fda3c03582617e6008210ab1e3a.pdf

[11] Joint Tuna RFMOs. 2009 http://www.tuna-org.org/Documents/TRFMO2/16%20ANNEX%205.8%20ENG.pdf

prove it is from legal sources, if it is accurately labelled, from sources that meet social and human rights standards, or meets the sustainable sourcing commitment".

There are various issues raised by this analysis that require warrant further discussion by FAO and the participant countries. Among these, this study focuses on the following.

6.1 Assessment of traceability systems

From the cases where the reports included data relevant for this analysis, the authors can say that it seems that the traceability systems of the 10 countries were designed for export purposes, and not for internal purposes. This might indicated that the drivers for traceability (e.g. human safety, security, environmental documentation, quality assurance) are not strong at internal level.

The main cause for the reports not providing the necessary data for this analysis seems to be the non-operational and non-standardized specification of the objective of these reports. As discussed in Section 4.1.1, even though traceability is considered a good tool for risk management in production chains, agreeing on what traceability actually is raises controversies at many levels. Thus, the task handed in to the reports makers should have defined exactly what it is meant by traceability.

Furthermore, since traceability is a generic tool, the task should have identified exactly what kind of data should the authors look for in the analysed legislation, in order to make sure that these data are relevant for IUU fishing deterrence and prevention, as well as for food safety/sanitary eligibility.

6.2 Different authorities

Even if traceability systems are well designed and generally well implemented, they can fail with lack of implementation at a single step, hence is vital to have coordination in between the different FBOs in the production chain, but as well in the control of traceability systems by the CAs involved.

In addition, this analysis indicates that the point "at sea" is the one where most of the IUU fishing relevant data is recorded. Besides maybe being the easiest point where to perform this activity, it is possible that this situation is due to the traditional view that monitoring, control and surveillance (including traceability as a tool for MSC) is something that only happens at sea, a view that is sustained also by the EU legislation (e.g. the IUU Regulation 1005/2008 does not provide clear requirements for the "on shore" part of the production chain).

The country analysis section identifies cases where implementations of traceability requirements are driven by different official bodies (i.e. Health, Customs, Fisheries, etc.) that do not act normally in coordination. This study recommends any approach to the establishment of traceability systems to be holistic and integrate all stakeholders in order to be effective.

6.3 Issues not requested by the ToRs

While not requested by the ToRs, the authors will like to highlight the following issues, that are in their view considered important in terms of developing effective traceability systems.

6.3.1 National and cross-countries traceability

A further topic of importance, which had minimal cover in the reports, is the integration in regards to cross-countries (in between countries) and national (inside the country) traceability, particularly in the light of many countries with excess processing capacity and low labour cost that import fish and fishery products for further processing and re-exports (such as China, Vietnam and Thailand for example).

National traceability is organised by national administrations and governed by national laws. While many countries require one-step forward / one-step backward traceability requirements associated to an export market, and enforce it with a varied degree of effectiveness, few to none provide electronic traceability systems where specific types of products (*e.g.* fish covered by an RFMO CDS) are electronically traced through the entire national supply chain from point of landing/import to point of export/re-export.

The cross-countries traceability (in between countries) stops at the point of entry into a country, and re-

starts at its point of exit. This is different to the "first point of sale" in an import market. If a product does not re-emerge as an export, following landing or import, it is deemed to have gone into domestic consumption.

This coherence is to be incorporated into the traceability systems design as to accommodate the realities those in many countries the largest importers of fish raw materials are not processors but diversified import–export companies. These companies are sometimes servicing a variety of industries, such as textiles and machinery, and often supply to, and distribute fish on behalf of, large, and probably small, re-processors. Although this service comes at a price, it may offer essential flexibility in the dynamic channelling of raw material to a network of factories as market conditions change. Although this situation is perfectly legal, the fact that fish may change hands one or more times while in the country has implications from the traceability systems perspective.

6.3.2 Information management systems

The analysed reports inform on a mixture of mostly paper-based systems with some more advances systems in terms of electronic/information management. Good information managements tool are increasingly the norm in terms of managing traceability systems. Nevertheless, while traceability systems can also use information system technologies for electronic data entry and database management services, just having an information system would not be sufficient to establish a traceability system.

Various commercially available platforms that allow for customization, or benchmark for further development exist presently. Their entry cost reduces as their capacity expands, hence the cost effectiveness if incorporating informatics into traceability systems is in most cases substantial.

Hence new integrated approach is ought to be developed on the basis of an electronic traceability system, consisting of a centralised database with multiple user logons. Existing traceability systems ought to migrate to such an electronic platform, in order to reduce the operational and administrative burden to an absolute minimum, and improve the quality and utility of the generated data towards the objectives of the system and its connectivity and integration with other systems.

7 Conclusions

Traceability is not a trivial term, and the systematic analysis of the 10 country reports shows that there is a lot of confusion and inconsistencies in the meaning, scope, legal status, implementation capacity and control of traceability systems.

Traceability systems implementation was catalysed by market access requirements; which initially were the domain of the EU health certification and later on (after 2010) supplemented by the EU catch certification. However, most of the countries analysed have not legislated and standardised traceability as a requirement. Furthermore there seems to be little interaction in between the health CA and the fisheries CA in terms of their assessment.

Furthermore, the exercises aimed to evaluate traceability systems should identify exactly what kind of data should the authors look for in the practices along the production chain and the analysed legislation, in order to make sure that these data are relevant towards the outcomes of the exercises.

It seems that efforts towards the implementation of traceability systems in the analysed countries and across countries have not been supported in an interdisciplinary and standardised way. Ensuring traceability through the seafood production chain can be accomplished by careful planning, taking the time to gain consensus among the operators and authorities. In order to gain trust, the traceability system in place must meet the set standards.

Traceability *per se* is difficult to achieve with little money, little human resources and lack of political will. It would be good if smaller steps are taken, steps that together will lead to implementing, at the end, effective traceability: clear definition of traceability in respective legislation, implementation of traceability requirements within companies and afterwards between companies, following in the beginning the one-step-up, one-step-down approach and afterwards moving to the integrated

approach. These initial steps should be defined by risk and start with the fisheries with higher IUU fishing and food safety risk profiles, but in a holistic way, so that other fisheries can be incorporated in the systems at a later point.

The authors of this study believe that FAO, as in other aspect of fisheries and seafood production, in its unique position can lead this standardization efforts by expanding on the work initiated by the "Draft Best Practice Guidelines on Traceability"[12] as requested by the thirteenth session of the Sub-Committee on Fish Trade (COFI:FT) in Bergen, Norway, 24–28 February 2014.

As the Sub Committee was requested to provide guidance on how the Secretariat should proceed with work on developing best practice guidelines for traceability, the findings and recommendations of this studies will complement the work to be done.

The authors of this report support the proposition that FAO should convene an expert consultation, which would benefit from the findings of this report and include international experts on traceability from all geographical regions, as well as representatives of the various stakeholders along the seafood supply chain, as to provide not only a set of guidelines on how to implement traceability systems, but equally importantly, how to evaluate them.

8 Recommendations

The authors of this study provide two sets of recommendations: one for FAO and one for the 10 countries the analysed reports referred to.

8.1 Recommendations to FAO

1. Further support the work initiated by the "Draft Best Practice Guidelines on Traceability" as requested by the thirteenth session of the Sub-Committee on Fish Trade (COFI:FT)
2. Convene an expert consultation to provide not only a set of guidelines on how to implement traceability systems, but equally importantly, how to evaluate them, following up-to-date research in the field.
3. Produce a set of guidelines and analytical tools (i.e. matrixes and parameters) to identify exactly what kind of data should authors of traceability evaluation reports look for in the practices along the production chain and legislation, including in order to make sure that these data are relevant towards the outcomes of the exercises, especially in connection with the fight against IUU fishing.
4. Commission an analysis of the documents implementing traceability (primary data sources), following a common methodology.
5. Provide and /or facilitate capacity building and institutional strengthening opportunities for those responsible for developing, integrating, implementing and/or evaluating traceability systems
6. Provide and /or facilitate capacity building and institutional strengthening in terms of the legislative ability to prosecute when based on evidence originating from analysing data recorded by traceability systems.
7. Ensure harmonization in the work to be done in terms of the *Best Practice Guidelines on Traceability*, with the work done on the *FAO Harmonized Catch Documentation Guidelines* as requested by COFI FT during 2015;
8. Support country and regional organizations efforts aimed to better data collection and analysis by government agencies along the domestic production chain as to strengthen the overall efficiency of their traceability systems

[12] http://www.fao.org/cofi/29510-0d3ea0e690044579673debe9c27579459.pdf

9. Lease with academic, research, civil and technical organisations in order to continue developing knowledge and understanding traceability standards and integrated information management tools, thereby highlighting and prioritizing issues requiring international co-operation and management, both in general and in connection with the fight against IUU fishing.

8.2 Recommendations to countries

1. Define within legislation and institutionalize traceability as integral part of their fisheries regulatory framework from a catch legality and sanitary controls perspective, including standardized best practices, definitions and internationally recognized standards.
2. Re-evaluate the meaning, scope, legal status, implementation capacity and control of their respective traceability systems, focusing on maximizing their Inclusivity, Impermeability and Verifiability by utilizing the methodology suggested in the present report.
3. Include cross-countries traceability linkages along the strengthening of their national systems.
4. Harmonize the actions and policies of the different official bodies (i.e. Health, Customs, Fisheries, etc.) having responsibilities regarding seafood traceability systems.
5. Liaise with Regional Organizations (ROs), International Organizations (IOs) and Bilateral Organizations (BOs) to provide institutional strengthening and capacity building in fisheries and traceability related issues under a FAO harmonised action umbrella.
6. Draw on the existent academic body of knowledge when improving existent traceability systems.

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