Food and Agriculture Organization of the United Nations

FAO FISHERIES AND AQUACULTURE TECHNICAL PAPER

619

ISSN 2070-7010

Seafood traceability for fisheries compliance

Country-level support for catch documentation schemes

Cover photograph:
Weighing and recording of catch to be transhipped off a longline fishing vessel. Noro, Solomon Islands. © Francisco Blaha
(Photo serves an illustrative purpose and was not taken in the context of IUU fishing)
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by

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2017

ISBN 978-92-5-130040-4

Preparation of this document

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The paper was produced as part of the "Fisheries management and marine conservation within a changing ecosystem context" project (GCP/INT/JPN/228) funded by the Government of Japan and implemented by FAO. This paper contributes to focus area 5 – Traceability of fisheries products.

This paper draws on an analysis of catch documentation schemes in FAO Fisheries and Aquaculture Technical Paper no. 596 *Design options for the development of tuna catch documentation schemes*, published in 2016. It was developed as a desk study, and builds chiefly on the expertise of its authors in catch documentation systems and traceability in the seafood industry.

Abstract

This document explores ways in which individual countries in seafood supply chains can, in their capacities as coastal, flag, port, processing or end-market states, contribute to maximizing the effectiveness of catch documentation schemes.

The focus is on the traceability of seafood consignments, but the authors also explore other important compliance mechanisms that lie beyond traceability and that support the effective implementation of catch documentation schemes at the country level.

The document explains which traceability mechanisms are built into catch documentation schemes, and which additional support mechanisms must be provided by individual countries along seafood supply chains.

The study finds that traditional fisheries monitoring, inspection and sanctioning mechanisms are of primary importance with regard to flag, coastal and end-market states, whereas effective country-level traceability mechanisms are of particular importance in port and processing states.

The text is segmented into three parts:

- The first part – Chapters 1 to 3 – introduces the study and the methodology used, and describes the functioning of catch documentation schemes.
- The second part – Chapter 4 – provides findings with regard to country-level support mechanisms for catch documentation schemes for each state type participating in seafood supply chains.
- The third part – Chapter 5 – provides conclusions, recommendations and policy guidance on the basis of the findings in the second part.

Hosch, G. & Blaha, F. 2017. *Seafood traceability for fisheries compliance – Country-level support for catch documentation schemes.* FAO Fisheries and Aquaculture Technical Paper No. 619. Rome, Italy.

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Acronyms

ABNJ	areas beyond national jurisdiction
AIS	Automatic Identification System
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDS	catch documentation scheme
CMM	conservation and management measure (RFMO)
CTE	critical tracking event
EEZ	exclusive economic zone
EU	European Union (Member Organization)
FAO	Food and Agriculture Organization of the United Nations
FAOCA	FAO Compliance Agreement (1993)
FFA	Forum Fisheries Agency
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2001)
ISO	International Organization for Standardization
IUU fishing	illegal, unreported and unregulated fishing
KDE	key data element
MCS	monitoring, control and surveillance
PSMA	Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2009)
RFMO	regional fisheries management organization
SPC	Pacific Community
SWOT	strengths, weaknesses, opportunities and threats
TDS	trade documentation scheme
TRACES	Trade Control and Expert System (United Nations)
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNCLOS	United Nations Convention on the Law of the Sea (1982)
UNFSA	United Nations Fish Stock Agreement (1995)
VMS	vessel monitoring system
WCPFC	Western Central Pacific Fisheries Commission
WCPO	Western Central Pacific Ocean

1. Introduction

1.1 JUSTIFICATION FOR THIS RESEARCH

This research paper is part of the work of FAO on seafood traceability systems to promote sustainable fisheries management. The Member States have supported the discussions of traceability at meetings of the Committee on Fisheries and the work of FAO to combat illegal, unreported and unregulated (IUU) fishing. It should be borne in mind that traceability systems supporting the prevention of IUU fishing are markedly different from those supporting food safety and quality assurance, and that they are the subject of fewer studies.

In 2008 the Committee on Fisheries identified the need for an integrated and compatible traceability system that could be implemented in capture fisheries and aquaculture, and in 2010 it noted the potential benefits of integrated traceability systems, pointing out that there were differences in requirements with regard to food safety and sustainability. In 2012, the Committee on Fisheries requested FAO to conduct research on existing traceability systems and to present the findings to its sub-committee on fish trade: the focus would be to show how traceability systems could contribute to the prevention of IUU fishing. An expert was invited to produce a paper documenting best practices and to produce a gap analysis of existing systems: the former was presented to the 2014 Committee on Fisheries sub-committee on fish trade meeting in Bergen in Norway (Andre, 2014); the latter was presented to the 2016 meeting in Agadir in Morocco, and was later published as an FAO Circular (Borit and Olsen, 2016).

In 2014 and 2015 FAO carried out research into improved tuna management by regional fisheries management organizations (RFMOs) in relation to shared stocks under the areas beyond national jurisdiction (ABNJ) project funded by the Global Environment Facility. This resulted in an FAO technical paper on design options for tuna catch documentation schemes (Hosch, 2016b). This was complemented by activity 14 of the JPN/228 project on country-level implementation of catch documentation schemes (CDS) requirements and practical recommendations for developed and developing countries on improving traceability along CDS-managed seafood supply chains, emphasizing the importance of access to export markets for the fishery sectors of developing and small-island developing states.

This research paper was funded under Focus Area 5 – Traceability of Fisheries Projects of the FAO project Improved Fisheries Management for Sustainable Use of Marine Living Resources in the Face of Changing Systems (GCP/INT/228/JPN) – Output 14, covering existing CDS of the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), with a strengths, weaknesses, opportunities and threats (SWOT) analysis.

The objectives were to identify critical points in the value chain from the point of capture to the final point of importation, and to propose measures to address weaknesses in the traceability systems of RFMOs and their developing country members with a view to advising countries as to ways of redressing inefficiencies and gaps in the chain of custody. This new area of research contributes to the work of FAO and other traceability stakeholders, and its findings and recommendations reflect the FAO *Voluntary Guidelines for Catch Documentation Schemes* agreed

by Member States at the technical consultation in Rome in April 2017. The FAO Conference approved the Guidelines in July 2017.

The central traceability mechanisms of CDS have been the subject of detailed research in recent years. A central question is how CDS and traceability relate to each other, what traceability mechanisms are inherent in, and provided by current CDS, and which complementary mechanisms need to be provided along the supply chain by participating countries. This paper considers the form and function of country-level support required for a CDS to work effectively, and identifies elements to be considered in the development of country-level CDS support mechanisms along supply chains.

1.2 IUU FISHING AND MARKET-RELATED MEASURES TO PREVENT IT

IUU fishing negatively impacts fisheries worldwide. It is perpetrated by operators seeking financial gains by disregarding the rules of the fishery they exploit, and is facilitated by a lack of regulatory oversight and enforcement. Rules flouted by IUU operators may have been set by individual states and applied in their exclusive economic zones (EEZ), or by RFMOs, covering migratory and transboundary fish stocks. Unregulated fishing is perpetrated by vessels flying the flags of states that fail to meet their obligations under international law and facilitate fishing in disregard of international rules such as those established by RFMOs. IUU fishing is one reason why states and RFMOs are unable to operate sustainable fisheries. The widely accepted definitions of the three dimensions of IUU fishing can be found in Chapter 2 of the 2001 *International Plan of Action to Prevent, Deter, and Eliminate IUU Fishing* (FAO 2001).[1]

IUU fishing is addressed through a variety of monitoring, control and surveillance (MCS) arrangements, which include tools such as licensing systems, vessel monitoring systems, logbook regimes, observer programmes, sea and air patrols, landing reports, dockside inspections, intelligence gathering, data acquisition and exchange, forensic analysis and genetic analysis of samples. Many MCS arrangements relate directly to fishing operations, which is appropriate because it is the fishing operations themselves that are either legal or illegal. Fish do not become "IUU" in the can or the shop. It is hence critical to establish the legality of an operation – and the legal status of fishery products – at the earliest moment in the supply chain in order to detect IUU fishing and apply sanctions. The MCS arrangements implemented by coastal, flag and port states are crucial in determining the legality of harvesting and landing operations, and the legal status of the derived seafood products.

But because of weak oversight and enforcement by flag states with regard to fishing vessels flying their flags, and because some port states allow or ignore the landing of illegal catches, products derived from IUU fishing continue to reach lucrative seafood markets and hence generate the financial returns that encourage the practice. It is therefore important to gauge the extent to which the markets facilitate and/or drive IUU fishing and to determine how they can be closed to products derived from IUU fishing.[2]

With rising global demand for seafood,[3] fishing and seafood trade have developed into a transboundary and inter-continental business. Seafood is one of the most important renewable commodities: fish account for 10 percent of all agricultural exports and 1 percent by value of worldwide trade (FAO, 2012), and an estimated 37 percent of global seafood production is traded (FAO, 2014a). Exports and imports

[1] See definitions in Annex 1.

[2] Note that a CDS enables responsible market states to deny access to products derived from IUU fishing. In the absence of a CDS it is difficult for market states to establish the legality of products, especially in long supply chains.

[3] Global annual per capita demand for fish increased from 10 kg per person in 1976 to 23 kg in 2014 (FAO, 2015a).

of fish and fish products were valued at US$ 264 billion in 2013 – a 76 percent increase in trade value since 1995, and exports of fish and fish products reached a record US$ 136 billion in 2013, a 5 percent increase from 2012 (UNCTAD, 2016).

In terms of volume, 61 percent of fishery product exports originate in developing countries, and the net revenues are higher than the combined total for rice, meat, milk, sugar and bananas. Trade figures underline the importance of global trade in fishery products, and they highlight the fact that trade has gained in importance in recent decades and will continue to do so in the coming years.[4] It is hence clear that continued demand and trade is likely to remain a potential driver of IUU fishing and that trade-related measures must be further developed to prevent it.

The international plan of action to prevent, deter and eliminate IUU fishing (IPOA-IUU) introduces the full range of responses that RFMOs, countries and international institutions should consider. The IPOA-IUU calls upon countries to consider their quality as flag, coastal, port and market states, and includes a section entitled Internationally Agreed Market-Related Measures,[5] which urges states to adopt measures that prevent the import of IUU fishery products into their territories. Paragraph 70 states: "... stock or species-specific trade-related measures may be necessary to reduce or eliminate the economic incentive for vessels to engage in IUU fishing," and Paragraph 66 discourages unilateral trade-related measures with a view to protecting specific stocks or species and other trade-related considerations.[6] Paragraph 69 introduces the concept of "catch documentation and certification requirements" – now widely referred to as CDS – as a multilateral tool to combat IUU fishing,[7] and Paragraph 71 encourages states "... to improve the transparency of their markets to allow the traceability of fish or fish products."

None of the binding international instruments regulating fisheries – the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the 1995 United Nations Fish Stock Agreement (UNFSA), the 1993 FAO Compliance Agreement (FAOCA) nor the 2009 Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA) – provide directly for the development and implementation of trade related measures in fisheries.[8]

In July 2015 FAO called an expert consultation to develop international voluntary guidelines for CDS; this was followed by several technical consultations and the final document was approved by the FAO Conference in July 2017.

The *Voluntary Guidelines for CDS* apply the following six principles:

- conformity with international law;
- avoidance of unnecessary barriers to trade;
- recognition of equivalence between schemes;
- a risk-based approach;
- reliability, simplicity, clarity and transparency; and
- electronic formats where possible.

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[4] See: www.fao.org/news/story/en/item/214442/icode/

[5] IPOA-IUU Paragraphs 65–76.

[6] "… unilateral trade-related measures should be avoided."

[7] "Trade-related measures to reduce or eliminate trade in fish and fish products derived from IUU fishing could include the adoption of multilateral catch documentation and certification requirements, as well as other appropriate multilaterally-agreed measures such as import and export controls or prohibitions. Such measures should be adopted in a fair, transparent and non-discriminatory manner..."

[8] The PSMA measures are distinct from market-related measures: "Recognizing that measures to combat illegal, unreported and unregulated fishing should build on the primary responsibility of flag States and use all available jurisdiction in accordance with international law, including port State measures, coastal State measures, market related measures and measures to ensure that nationals do not support or engage in illegal, unreported and unregulated fishing." The compatibility of port state measures with World Trade Organization rules and unwarranted barriers to trade are therefore not mentioned in the PSMA. Port state measures should not be construed as market-related measures, but as measures applying to landing, the final action of a fishing operation.

Paragraph 4.4 stipulates that "... every effort should be made to ensure that CDS are only implemented where they can be an effective means to prevent products derived from IUU fishing from entering the supply chain." This provision establishes the objective of a CDS – to deny market access to IUU-derived products. If this objective cannot be met, a CDS is not warranted. Paragraph 5.1 requires that: "States should seek wide multilateral engagements in the development and implementation of CDS …. Multilateral or regional CDS are preferred." This reflects IPOA-IUU Paragraph 66, discussed above.

The authors of this paper took due note of the Voluntary CDS Guidelines adopted by the 2017 FAO Conference, ensuring that statements and recommendations are fully aligned.

1.3 CDS: EVOLUTION AND CURRENT STATUS

The CDS concept became formally enshrined in an international instrument through the IPOA-IUU in 2001. At the time of writing, three multilateral CDS and one unilateral CDS were in existence; a second unilateral CDS was being developed and was to become mandatory for imports of certain species into the United States of America from 1 January 2018.[9]

The first multilateral CDS were introduced in the form of trade documentation schemes (TDS) or trade information schemes by tuna RFMOs to monitor trade in the fish species they governed. The TDS is the precursor of the multilateral CDS.

The first TDS was implemented by ICCAT in 1992 covering Atlantic bluefin tuna. TDS were particular to tuna and billfish and aimed to gather information on harvests entering international trade to improve understanding of trade flows. Statistical documents were issued by flag states to accompany international consignments: they were similar to current catch certificates but omitted information relating to the early part of the supply chain, including the location of fishing trips, transhipments, port and date of landing, splits and first-sale details (ICCAT, 1994). Members of RFMOs were required to demand TDS documentation before authorizing importation of the species concerned – Atlantic bluefin tuna, bigeye tuna and swordfish in ICCAT, southern bluefin tuna under the trade information scheme operated by CCSBT as of 2000, and bigeye tuna in the Indian Ocean Tuna Commission (IOTC) and the Inter-American Tropical Tuna Commission (IATTC) as of 2002/03 (Clarke, 2010).

The TDS fell short of expectations and led to only limited improvements in the understanding of the dynamics of harvesting and trade, largely because of loopholes in the traceability framework of the schemes – but an unintended consequence was insight into which flag states were harvesting the fish. This led to the identification of many unregulated fishing vessels flying the flags of RFMO non-Member States, which are barred under the FAOCA, UNFSA and RMFO conservation and management measures (CMMs) from harvesting the resources.

The combination of TDS and the application of trade sanctions proved to be effective in identifying and eliminating the operations of fishing vessels associated with flag-of-convenience states (Hosch, 2016a), and the idea of the CDS – a TDS with expanded functionalities – emerged. The CDS were designed to overcome the shortcomings of TDS[10] by certifying the legality of the harvesting operation and the resulting catch rather than the origin of the trade: this made it possible to identify and certify units of legally unloaded catch and track them through international trade to the end market.

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[9] See: http://www.iuufishing.noaa.gov

[10] The 2007 joint tuna RFMO working group on trade and catch documentation schemes found that the statistical documentation programme had major shortcomings and that CDS should be adopted.

Illegally sourced products were prevented from entering markets through the combination of: i) certification of the legality of catches by the authorities before or at the point of landing; ii) checks by the authorities in port and processing states of catch certificates at the time of landing or importation; iii) the issue of trade certificates in the form of export or re-export certificates at the moment of export; and iv) the requirement by border authorities in end-markets for validated certificates to authorize the import of consumer products.

TDS are in place in four out of five tuna RFMOs, and are the only multilateral trade documentation mechanism in IOTC, and IATTC; ICCAT developed a CDS in 2008 (ICCAT, 2011) and CCSBT in 2010 (CCSBT 2013a), but the Western Central Pacific Fisheries Commission (WCPFC) still has none of these systems in place.[11] The CCAMLR mandate to manage toothfish fisheries in Antarctic waters led to a CDS in 2000 (CCAMLR, 2014b). The North East Atlantic Fisheries Commission operates a port state measure scheme providing oversight up to the point of landing; the CCAMLR, ICCAT and CCSBT CDS are currently the only complete multilateral documentation systems covering harvesting and trade with the objective of eliminating IUU fishing.

The ICCAT CDS covers western and eastern stocks of Atlantic bluefin tuna, CCSBT covers a single stock of southern bluefin tuna and CCAMLR covers two distinct species of toothfish – Patagonian and Antarctic. The two tuna CDS together cover substantially less than 1 percent of global tuna harvests by volume – all commercial species combined; the three RFMO CDS cover less than 0.1 percent of global wild fishery catch by volume. There is hence vast scope for expansion of the systems. IATTC, IOTC and WCPFC are planning and developing CDS for some or all of the tuna species they cover. The North East Atlantic Fisheries Commission and the Northwest Atlantic Fisheries Organization – as well as a host of other RFMOs – are not currently developing CDS.

The ICCAT, CCSBT and CCAMLR CDS are being revised. Early in 2016, when the drafting of this report began, ICCAT was starting to test its e-CDS and CCAMLR launched a review of its upgraded e-CDS. The ICCAT e-CDS was operational by the end of 2016; the upgraded CCAMLR e-CDS was operational in the first quarter of 2017. This paper refers to the CDS that were operational at the end of 2015.

The only unilateral CDS in existence, which has been implemented by the European Union (EU) since 2010 (EU, 2008 and 2009), is different. It is operated unilaterally by a single market state and does not apply to any specific species or fisheries. Instead it covers most wild-caught marine finfish traded into the EU market, and requires products to be covered by catch certificates validated under the scheme by flag state authorities. The layout and functionalities of the EU scheme reflect those of multilateral schemes, but it has few verifiable traceability mechanisms (Clarke and Hosch, 2013; Palin *et al.*, 2013; Hosch, 2016a and 2016b).

The scheme lacks a central registry to issue and record certificates. The system is hence vulnerable to fraud because the foundation for traceability in a CDS is missing (see Section 3.1), and individual traceability mechanisms applied by individual countries along their supply chains have limited scope with regard to eliminating fraud. The scheme is hence weakened because there is no effective supply chain traceability system that transcends individual country systems. This has been recognized by the EU Commission, and a central electronic registry at the EU level is being developed

[11] Development of a tuna CDS started in 2006.

to record catch certificates covering fishery imports into the EU market, with a view to closing loopholes.[12]

In view of this state of affairs, this paper focuses on the multilateral CDS model and its enhancement through national support mechanisms, including traceability. However, the single unilateral CDS is referred to where relevant for illustrative purposes and for discussions relating to CDS policy options.

1.3.1 Merits and limitations of a CDS

Little research has been published on the potential scope of CDS in terms of the types of IUU fishing that can be prevented or the limits and effects of such schemes. Hosch (2016a) is one of the few sources that compares unilateral and multilateral CDS and their merits and limits, and is the basis for the conclusions below.

A CDS can only be effective in fisheries and supply chains where the major flag, port and market states collaborate to enforce the scheme and prevent the import of products of illegal and hence non-certified origin. If ports and markets of convenience fail to enforce a CDS, IUU fishing will persist – because lucrative markets that accept non-certified products will constitute a means of converting illegally harvested products into cash. Under such circumstances a CDS cannot achieve its objective in isolation. But a CDS may be part of a suite of MCS measures deployed to protect fisheries, and will be effective where responsible state actors enforce the scheme and ensure compliance along their supply chains.

Multilateral CDS can protect particular stocks or entire species from certain forms of IUU fishing, and should hence be regarded as complete fisheries management tools.[13] Unilateral CDS, when designed effectively, can protect single markets from imports of illegally sourced fish from numerous fisheries, but their effect on any particular fishery is likely to be limited.

Multilateral CDS are based on RFMO CMMs, which have the standing of treaty law. Compliance with multilateral CDS is mandatory at all stages of the supply chain, and can be enforced. Unilateral CDS are based on national law and can only be enforced at borders at the time of importation into the final destination market: this means that enforcement from the fishery onwards is not possible. The enforceability of multilateral schemes is therefore comprehensive, whereas that of unilateral schemes is inherently more limited and hence weaker.

The ICCAT CDS has been significant in the recovery of Atlantic bluefin tuna (ICCAT 2015; Hosch 2016a) right from the start. In ICCAT the main IUU issue was under-reporting of catches by otherwise legal operators. With the CDS in place and firm adherence to its provisions by the main end-market states – notably Japan – the financial incentives of flouting quota allocations were eliminated, because over-quota catches could no longer enter the markets.

In CCAMLR the CDS had an important but less prominent role in eliminating IUU fishing. This is because IUU fishing was perpetrated largely by non-licensed pirate vessels landing their catch in ports and markets of convenience. This persistent IUU fishing, which now seems to have been largely eliminated, was addressed through a combination of robust enforcement measures such as sea patrols, satellite-based radar

[12] "Specifically, the Commission will modernize the catch certificate scheme through an IT system and will create a harmonised system to exchange and cross-check information in cooperation with the European Fisheries Control Agency. This new IT system will allow loopholes in import controls to be closed and a better monitoring of the total use of any single catch certificate split across several consignments, thus avoiding the laundering of IUU fishery products. The harmonised risk analysis will bring about a more cost-effective approach to the control of catch certificates and reduce the administrative burden for Member State customs authorities These improvements will be done during 2015-2016." EU (2015).

[13] Note that current multilateral CDS cover entire species and all their stocks at the global level, hence conferring protection at the species level.

imagery, publicized destruction of apprehended pirate fishing vessels and co-operation among state and non-state actors (Österblom *et al.*, 2015).

With regard to compliant markets for illegally caught toothfish, the CDS is fundamental in ensuring that catches are within allocated total allowable catch and quota limits. In the absence of a CDS market states cannot establish whether imports from a given source are within or beyond allocated quotas or of legal or illegal origin.[14]

The existing multilateral CDS have all been implemented in fisheries managed on the basis of total allowable catch and quotas. These CDS embody a near-real-time quota monitoring and management tool because unloading operations must be recorded in the system as the basis for issuing catch certificates and may be tallied. Regardless of whether total allowable catch and quotas are in place in any future CDS-managed fishery, a CDS can be used directly as a central quota-monitoring and management tool that is independent of flag state declarations once total allowable catch and quota functions are in place.

To be effective, a CDS must provide a verifiable traceability mechanism spanning an entire supply chain to enable the linking of certificates and reconciliation of product mass balances between transactions. The essential requirement for achieving this is a central registry through which certificates and related data are issued and recorded at every step along the supply chain.[15] The CCSBT multilateral CDS registry is still paper-based, but electronic registries are simpler and cheaper to operate, are more versatile in that they enable near real-time tracing of complex supply chain operations, and provide more powerful data analysis and oversight mechanisms.

The EU identifies non-compliant countries as meriting a "yellow card" or "red card", which are technically trade restrictive measures or trade sanctions or embargoes. This has no direct link to the EU's unilateral CDS apart from the fact that its trade restrictive measures are governed by the same legislation as its CDS (EU, 2008). Few "yellow card" or "red card" countries have been identified for non-compliance with the EU CDS: the sanctions have been applied in relation to other shortcomings that are primarily related to weak flag state performance. It is essential to dissociate trade embargoes, which are sanctions, from the operation of a CDS, which is a fisheries management tool.

1.4 OBJECTIVE OF THE STUDY

This paper considers the actions that individual countries should apply in relation to the national supply chain segments that they oversee with a view to supporting the implementation of a CDS and maximizing its effectiveness, with a focus on its traceability mechanisms.

The work is part of an examination of the way in which the traceability element of a CDS is organized, specifying which parts are usually covered by the CDS itself and which parts are the responsibility of countries harvesting, processing and/or trading seafood under the CDS. With regard to the supply chain segments governed by a country, the study investigates how functions in these segments could be developed to improve the performance of the CDS.

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[14] A CDS enables end-market states to opt to become "responsible" and ensure that no products originating from fisheries covered by a CDS are imported in the absence of valid certificates. It would be extremely complicated to become a "responsible" end-market state in the absence of a CDS, especially in long and complex supply chains.

[15] The so-called "blockchain" technology is set to revolutionize the way in which data that were centrally recorded and managed are recorded at the decentralized level in future. Our statement does not challenge this. Blockchain technology may eventually eliminate the need for central registries, and is therefore likely to reduce the complexity and cost of transnational traceability systems. Current compliance functions enforced through a CDS central registry will remain in place to identify fraudulent transactions in blockchain systems and environments. The difference between a central registry and a blockchain approach to CDS data is a matter of form, not function.

The study explains why traceability is a critical element of CDS, and how country-specific traceability mechanisms support its effectiveness. Differences among CDS are highlighted as appropriate.[16]

To provide a complete picture of the country-level support needed to implement a CDS, and to avoid the implication that this is purely a matter of traceability, the full range of country-level support functions is discussed with regard to the various state types participating in the supply chain because they also relate to the capture of other data and to the MCS functions of coastal, flag and port states – which are often essential in achieving traceability.

The paper considers national fishery administrations that oversee CDS as flag, coastal, port, processing and end-market states, and makes recommendations for each type of state actor.

[16] CDS differ somewhat in terms of design and function, so generic statements in this paper cannot be avoided. If, for example, only one CDS traces transactions through a port-state segment the text might say "CDS generally do not cover sales transactions in the port state market" – even though one CDS actually does so. The CTE and KDE tables in Chapter 4 show where such differences exist.

2. Methodology

2.1 STUDY METHODS AND LIMITATIONS

2.1.1 Methods

This paper is based on an analysis of current CDS models. It identifies their basic common design and modes of operation, points out differences and considers the ways in which the differences affect the traceability framework of the schemes and the potential effects on country-specific solutions.

The study identifies which parts of the traceability function are covered by the CDS system, and which parts are not directly covered. This involves a conceptual CDS framework that captures the basic operation of a CDS and is the basis for the assessment of country-specific traceability solutions in support of CDS implementation. These relate to the parts of the supply chain where the CDS does not provide traceability, but where traceability would benefit from country-specific support and solutions.

The conceptual CDS framework design is largely sourced from the FAO TP596 *Design options for the development of tuna catch documentation schemes* (Hosch, 2016b). Additional information about the functioning of current CDS is sourced from publications such as the *Best practice study of fish catch documentation schemes* (Clarke, 2010) and *EU market access for fishery and aquaculture products* published by the Swiss Import Promotion Programme (Blaha, 2015).

Country-specific traceability solutions are identified in a risk-analysis approach applied to a generic supply chain. The analysis is based on the assumptions that all CDS actions aim to prevent illegally harvested fish from entering legally certified supply streams, and that CDS traceability mechanisms can be used to reveal the points in the supply chain at which this might occur.

The segments of the analysis consider the state types that have custody of fishery products as they move through national supply chains from harvesting, transhipment, landing and processing, to the consumer end-market. The state types covered are coastal, flag, port, processing and end-market.[17] Each section on a state type identifies general MCS elements that should be in place and that often form the unconditional basis for CDS-related monitoring and data acquisition; these are described and their relation to CDS operation is clarified, but elements that are not specific to a CDS are not considered in detail.

The analysis focuses on country-level mechanisms that enhance the traceability framework of CDS along the supply chain. The specifics of individual CDS are discussed in detail where they have relevant traceability implications.

2.1.2 Limitations

This paper is a desktop study based on secondary sources, bibliographies and consultations with RFMO secretariats, governments, the private sector and independent experts. No site visits or travel were undertaken, which limits the analysis to some extent in terms of specific and recent traceability solutions implemented at the country level.

[17] The term "market state" can encompass the port state, the processing state and the end-market state. The "processing state" and the "end-market state" are not specifically recognized in international fisheries law, but detailed discussion of CDS mechanisms along supply chains requires the separation of market state types into these two sub-categories.

The authors are familiar with unilateral and multilateral CDS and have extensive knowledge of the ways in which they are applied in many countries. This knowledge is utilized as applicable.

2.2 STUDY BOUNDARIES

The study is limited to describing traceability solutions that should be considered by countries in support of CDS. It does not propose enhancements to CDS to improve traceability overall or in supply chain segments directly under the control of a CDS. Where there are weaknesses in CDS design in relation to traceability, they are highlighted and explained with a view to providing a full picture of traceability strengths, weaknesses and needs across systems as a whole.

The current multilateral CDS form the basis of this study:

- the CCAMLR CDS covering two species of Chilean seabass toothfish harvested in Antarctic waters, introduced in 2000;
- the ICCAT CDS covering Atlantic bluefin tuna, introduced in 2008; and
- the CCSBT CDS covering southern bluefin tuna, introduced in 2010.

The only unilateral CDS in existence at the time of writing was the EU system.[18] Its design differs markedly from multilateral schemes in that it lacks a central certificate registry,[19] and the traceability framework provided by the CDS itself is hence not comparable. For the purposes of this study it is essential to focus on CDS models that provide the foundation for effective supply chain traceability, as in multilateral schemes.

This consideration provides an important initial insight: Country-level traceability solutions cannot fix, or provide substitutes to an incomplete CDS traceability framework at the supply-chain level.

Although the current multilateral CDS cover a few species of tuna and toothfish only, this paper discusses the traceability function of the schemes and shows how it determines country-specific support. The findings apply to current and future CDS covering any number of species.

2.2.1 Segmentation of the analysis

Chapter 3 briefly analyses the common traits of multilateral CDS and explains why traceability is important, when a CDS can be regarded as "complete" in terms of its traceability arrangements and where it can or should be supported by country-specific solutions. Country-specific mechanisms are often essential for verifying and corroborating submitted data, enhancing monitoring functions and identifying and sanctioning fraudulent transactions.

The state types involved in fishing, landing, processing and trade of fisheries products along the supply chain are described. Each type of state carries out functions that contribute to the success of the CDS. The types covered are:

- Flag state. This is the state whose flag is flown by fishing vessels, whose activities it is obliged to authorize and to monitor under international law. In international fisheries targeting species under the management of an RFMO, flag states also have reporting obligations to the international body as to the activities and catches of their fleet(s). Oversight by the flag state covers harvesting, transhipment and landing operations, the latter typically regarded as the last transaction related to fishing. The flag state is crucial in a CDS in that it validates catch certificates for catches harvested during fishing trips deemed by the flag state to have been conducted legally.

[18] Officially referred to as a "catch certification scheme" by the EU.

[19] Other differences include the fact that the design of catch and trade certificates is fundamentally different – trade certificates as such do not exist – and trade certification becomes enforceable only when products are destined for the EU, which constitutes a major CDS enforcement challenge.

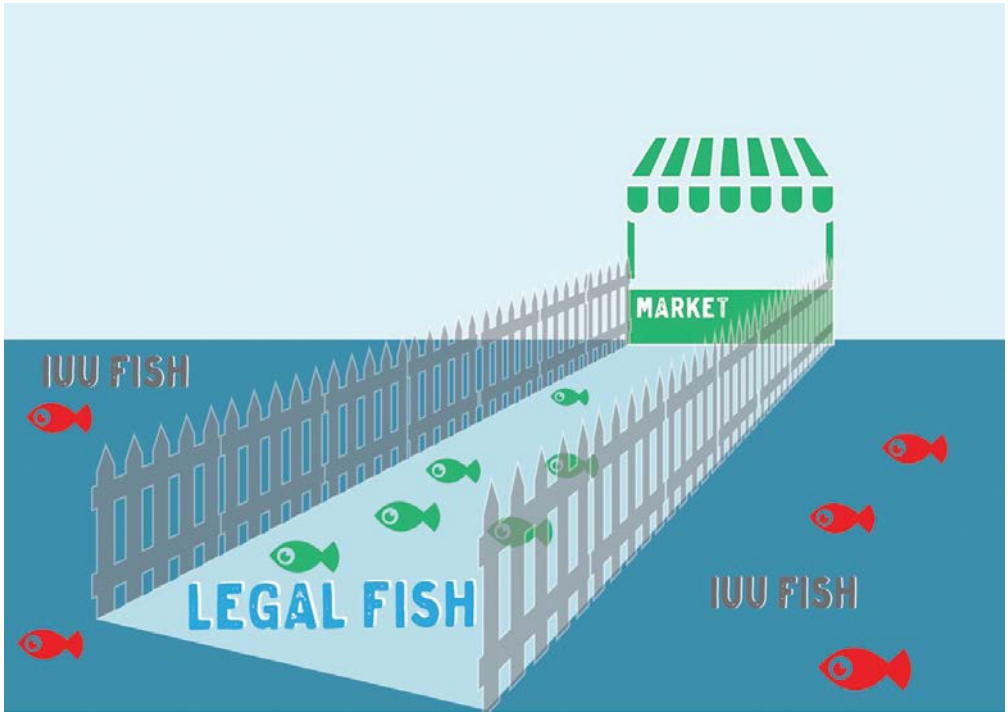
- Coastal state. This is the state in whose waters a fishing operation may be taking place, in which case the coastal state must provide the necessary oversight to ensure that foreign vessels entering its waters are authorized to operate, and report operations and catches to relevant coastal state authorities. Coastal states currently have no statutory role in existing unilateral and multilateral CDS.
- Port state. This is the state in whose port(s) fish are landed. The port state has a legal obligation under the PSMA to ensure that only legal fish are landed by carrying out rigorous in-port inspections of vessels flying a flag other than that of the port state and voluntarily entering its ports to land fish. The port state is crucial in ensuring that catch to be landed from a CDS-managed fishery are covered by valid catch certificates at the time of landing.
- Processing state. This is the state in which raw products are converted into semi-processed products or end products. The processing state may be the same as the port state, but fisheries products for processing may enter the processing state by sea, air or land. Processing states are important in CDS systems in terms of ensuring that non-certified fishery products are not imported, processed or certified for export or re-export. The "laundering" of fisheries products into legally certified supply streams occurs mostly at this level.
- End-market state. This is the territory in which final consumer products are placed on the market, acquired by customers and consumed, often after importation. In a CDS the action of the end-market state is limited to ensuring that non-certified products cannot gain access to its consumer markets – a crucial final element in guaranteeing the success of a CDS.

2.3 CORE CONCEPTS: IUU FISHING, THE SUPPLY CHAIN AND CORE CDS FUNCTIONS

In the authors' experience there is some confusion as to the nature of a CDS, its objective and its core function. There is in fact no internationally agreed definition of CDS, and the diverse terminology used to designate a CDS such as CDS, catch certification system, catch documentation and traceability system and bluefin catch document scheme further confuses the matter because the terms suggest that the underlying systems may also differ with regard to design, objective and function. It is therefore important to posit at the start the object, remit and core function of a CDS.

- CDS objective. The objectives of the three multilateral CDS are not clarified in the CMMs that establish them, though it is evident that they aim to prevent IUU fishing. The EU, however, clearly states that the objective of the CDS is to deny IUU-derived products access to its markets, thereby contributing to the goal of eliminating IUU fishing.
- CDS remit. All current CDS apply to the entire supply chain of international trade, from harvesting, landing and processing to importing products into end markets. To achieve this they all have a system of data acquisition, storage, certification and documentation in place.
- CDS core function. The CDS mode of operation is to identify a unit of legally harvested seafood, to certify that it is of legal origin, and then to track it through the supply chain – which may be highly complex – to the end market. By allowing only legally certified fish to be landed, processed and traded, the supply chain is in practice fenced off from illegally harvested fish. The core objective of the CDS is hence to prevent the entry of "laundered" IUU fish into the supply chain. The challenge – and the criterion for success – is not in keeping legal fish in the supply chain, but in keeping IUU fish out (see Figure 1). Traceability is central in the implementation of this CDS function.

FIGURE 1
CDS objective and core function – denying IUU-derived products entry into a supply chain



If IUU-derived products are denied market access by a CDS, their prices decline rapidly, the financial incentives are eroded and IUU fishing diminishes as a result. To achieve this, market access must be denied to IUU-derived products at every stage along the supply chain.

A CDS is hence not something that ends with the certification of catches by flag states. Catch certification is in fact only the start. Coastal states may wish to confirm that flag state certification of catches made in their EEZ is valid, port states must ensure that non-certified products are not landed, and market states must ensure that non-certified products are not imported, processed, sold or re-exported.[20]

In a CDS, legality is established at the first step – harvesting. Preventing "laundering" is the objective of the system at all subsequent stages.

2.4 CRITICAL TRACKING EVENTS AND DATA ELEMENTS

Bhatt *et al.* (2016) note that since publication of the 2009 report *Product tracing in food systems* the terms "critical tracking events" (CTEs) and "key data elements" (KDEs) are gaining acceptance.

Their definitions are i) CTEs – "points within a business and along the value chain where product is moved between premises or is transformed, or is determined to be a point where data capture is necessary to maintain traceability"; and ii) KDEs – "the data elements required to successfully trace a product and/or its ingredients through all relevant CTEs".

[20] All current CDS rely on flag state validation of catch certificates. The FAO Voluntary Guidelines for CDS, in Paragraph 6.3, expand this for future systems: "In the CDS validation process, different roles of relevant states to authorize, monitor, and control fishing operations and verify catch, landing, and trade should be fully recognized, consistent with relevant national and international law, multilateral measures, instruments and obligations. Validation of the catch documentation information should be done by a competent authority. According to the specific circumstances of the fisheries, all relevant states could take part in the verification of information in the catch documentation."

They also note that the "one-step forward, one-step back" requirement is CTE/KDE capture in its simplest form. Best traceability practices require that data are maintained from all points backward and through all points forward within the chain of custody of a company or trading partner. Generic CTEs may be placed into the categories of harvest, transportation, transformation, and depletion".

Research in 2014 on the traceability practices and systems of 48 seafood businesses in nine global seafood value chains identified CTEs and KDEs for eight fresh and processed seafood products (Sterling *et al.*, 2015). In March 2015 a multidisciplinary expert panel published a report recommending the establishment of a global framework to ensure the legality and traceability of wild-caught seafood (EPLAT [Expert Panel on Legal and Traceable Wild Fish Products], 2015); the report also provided an illustration of sample CTEs and KDEs for wild-caught fish products, given here in Figure 2.

Bhatt *et al.* (2016) reviewed best practice CTEs and KDEs along seafood supply chains in terms of food safety, food quality, food sustainability and food fraud considerations. The most important CTEs were point of harvest whether farmed or wild, transhipment, transport, processing and distribution.

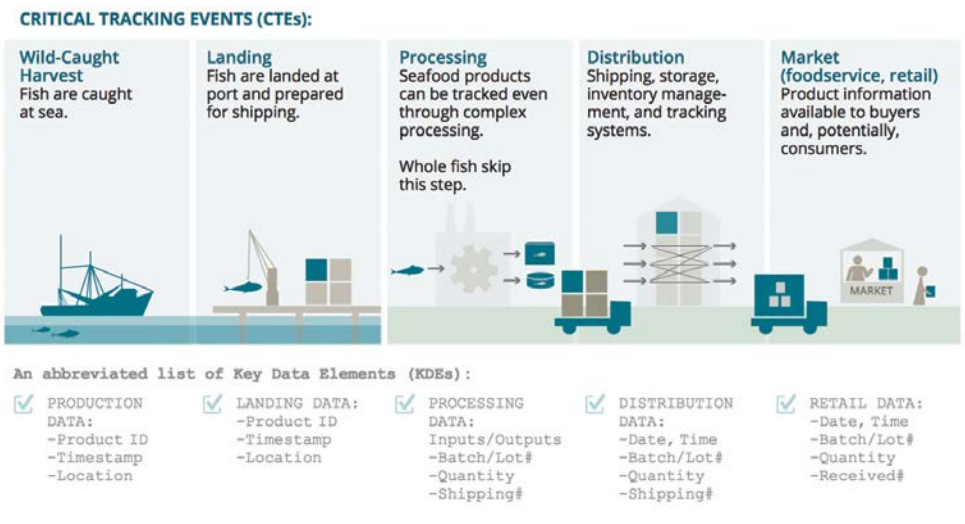
Their study did not focus on IUU fishing or the needs of a CDS, but their approach is easily adapted to the needs of the present study. This enables identification of the CTEs and supply chain stops where the acquisition of KDEs and recording mechanisms must be in place to ensure full traceability.

Every section on a state type has a table listing CTEs and KDEs that must be covered along the supply chain, with brief explanations as to why and how traceability at particular stops is achieved and optimized.

In this context a CTE or "supply chain stop" is defined as an action in the supply chain such as harvesting, landing, splitting, grouping and processing where there is a possibility of "laundering" non-originating fish into the legal supply stream.

Each CTE needs associated traceability solutions to ensure that undocumented mixing and laundering do not occur. Examples include: i) at sea: harvesting or transhipment operations; ii) at landing: pumping fish from a fishing vessel into storage basins; and iii) in the distribution chain: packing crates with fish bought from different fishing vessels.

FIGURE 2
Example of CTEs and corresponding KDEs



Source: EPLAT, 2015.

Most of the analysis in this paper and the resulting recommendations are based on the identification of CTEs under the purview of specific state actors: how they are covered by the CDS and how country-level mechanisms could or should serve to support them or supply traceability solutions in segments where CDS-related solutions are absent and must be provided by individual states.

A single state can act as all of the state types at once. Of the seafood traded internationally, 61 percent originates in developing countries and 85 percent is destined for developed countries. The current internationally integrated seafood value chains show that for most products many different administrations may be involved from catch to consumer.

Table 1 shows a standardized supply chain with the segments covered or controlled by the various state types. It is clear that few operations or CTEs along the supply chain are under the exclusive purview of a single state type and that a large number of operations fall under the purview of different state types along the supply chain. The flag state, for example, will oversee transhipments and landings, but so will the port state when these do take place in a port, and sometimes the coastal state is involved in oversight of transhipments in its EEZ.

TABLE 1
Standardized supply chain: CTEs and state control

Supply chain function	Harvesting	Transhipping	Landing	Transport to processing	Processing	Importation
Costal state	✓	✓				
Flag state	✓	✓	✓			
Port state		✓	✓	✓		
Processing state				✓	✓	
End-market state						✓

Chapter 4 discusses each CTE that is covered by more than one state, and the role of each state involved. The operation of landing, for example, which is typically regarded as the last operation of a fishing trip, is covered from the point of view of a flag state and then from the port state perspective, whose role in the chain of custody starts at this point.

2.5 TRACEABILITY, STANDARDS AND TECHNOLOGY

Although this paper describes how CDS and national traceability systems should interact, technical aspects such as the programming languages of telecommunications platforms and the international e-business standards that may be used are not explored in depth.

It is important that CDS and national traceability systems that liaise with them should be aligned with international e-business standards such as the one developed by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). This global body for the exchange of electronic business information has developed specific agri-food sector standards that are endorsed by governments and intergovernmental organizations such as the World Trade Organization, the World Customs Organization and FAO. The UN/CEFACT standards are available at no charge from its website.

Two of the examples in this paper are aligned with the UN/CEFACT standards – the New Zealand e-Cert (see Box 1) and the EU Trade Control and Expert System (TRACES) systems (see Box 6). A further example applicable to many elements of a CDS is the

EU Fisheries Language for Universal eXchange FLUX standard – a data logging and exchange system based on the UN/CEFACT "schema" system that complements its Core Component Library. The schemas can be used for all data exchanges and processes in the Universal eXchange standard, and the Core Component Library is used to harmonize data to be exchanged and published. The advantage is compatibility with other standardization projects where fishery data can be requested from sectors such as customs, trade and food, and animal traceability (UNNExT, 2016).

The structure of CDS traceability systems must be standardized to facilitate interoperability. For this purpose the International Organization for Standardization (ISO) has produced ISO 12875:2011,[21] which specifies how traded fishery products are to be identified and the information to be generated and held by the food businesses that trade the products through supply chains. The standard deals with distribution of finfish and their products for human consumption, from catch to retailers and caterers, but it does not cover data migration from one stage to another.

Similarly GS1[22] is a vendor-neutral not-for-profit organization that develops freely available standards for global use. It has developed standards for electronic data sharing – GS1 EANCOM and GS1 XML – and the 2015 GS1 *Foundation for Fish, Seafood and Aquaculture Traceability Implementation Guideline*.[23]

There is currently no off-the-shelf software for traceability tasks in a CDS. Such products exist for private-sector operators, but no ready-to-use systems are available for state-level users. Countries that are developing their own applications on the basis of existing systems and traceability standards should consider the standards outlined by UN/CEFACT for developing their systems.

[21] See: https://www.iso.org/standard/52084.html

[22] See: www.gs1.org

[23] See: https://www.gs1.org/sites/default/files/docs/traceability/GS1_Foundation_for_Fish_Seafood_Aquaculture_Traceability_Guideline.pdf

3. Multilateral CDS: design, traceability and enforcement

This chapter considers the CDS design, traceability and enforcement considerations that underpin the discussions, conclusions and recommendations in this paper. It will be of particular interest to readers who are not entirely familiar with the detailed functioning of CDS.

3.1 WHY TRACEABILITY IS CRITICAL

It is essential to understand why traceability is such a critical element of CDS. The objective of a CDS is to keep illegally sourced fish out of legally certified supply chains and prevent them from reaching the market. To achieve this, legally certified fish must be identified and quantified at the beginning of the supply chain, and the "laundering" of illegally caught fish into any stage of legal supply chains must be prevented. A CDS must hence be capable of detecting laundering as it is being attempted.

The only tool that enables this is a well-designed traceability mechanism, which must span an entire supply chain from harvests to landings and to trade. Fish legally entering a supply chain at the harvesting end must be quantified and qualified,[24] and the quantity of fish – which will be separated into thousands of individual catch certificates – must then be traced step-by-step throughout the supply chain by means of the issue and re-issue of export or re-export certificates – i.e. trade certificates – that link the traded products to their previous certificate.

The hard links between subsequent certificates makes it possible to monitor mass balance integrity as fish products move through the supply chain. The serial linking of certificates is the central concept in a CDS traceability mechanism.

The cardinal rule is that the sum of products recorded on child certificates – mother certificates show the source of a consignment and child certificates show the products derived from it – must never exceed the volume of product on the mother certificate.[25] A CDS must be capable of monitoring and enforcing this as fish move through the supply chain. In the absence of a traceability mechanism that provides for hard links between mother and child certificates, the origin and legality of product batches along the supply chain becomes an unknown. The laundering of fish is then undetectable and the CDS cannot achieve its objective; worse, opportunities for fraud are created because IUU fish can easily gain certification and market access through laundering.

If the traceability function in a CDS is well designed, however, and the CDS is implemented correctly by the parties along the supply chain, all laundering attempts can be detected, the perpetrators can be identified and sanctions applied, and the financial benefits of fraud can be forfeited. In this scenario the CDS is certain to achieve its objective.

A CDS is not a forensic tool such as a genetic test applied to a sample to establish whether a consignment actually contains the claimed species of fish. A CDS is a traceability instrument applied to an entire fishery, and in order to be effective it

[24] "Qualified" means that the form of the product – round, gilled and gutted or fillets for example – is also recorded, thereby providing an indication of losses incurred in on-board processing of the fish.

[25] Taking into account processing yields and losses.

must be able to trace products through the supply chain and automatically detect laundering attempts as they occur. A well designed CDS will forestall laundering because automated accounting routines can trigger an alarm, or can deny the issue of a certificate when mass-balance integrity rules are breached.[26]

3. 2 SHARED CDS DESIGN AND FUNCTION

Multilateral CDS are complex systems. The design and functions in the three systems covered in this paper are somewhat different. This section outlines the commonalities of these systems, and some of the weaknesses.[27]

3.2.1 Commonalities

All three CDS apply to all harvested fish of a given species covered by an RFMO, though some exemptions may apply. A CDS can cover more than one species without adding layers of complexity, as shown by the CCAMLR and EU CDS. A national competent authority is designated by the member states of an RFMO to operate the scheme with regard to its vessels, ports, processors and traders.

The three multilateral CDS operate central certificate registries in which copies of all catch and trade certificates are deposited once they have been issued. The registers are operated by the RFMO secretariats, and can be electronic or paper-based. There are differences in the operation and dependability of the registries – especially the paper-based. The traceability standard applied in all three schemes is to enable product to be traced back to the source fishing vessel.

The document system of a CDS consists of catch certificates and trade certificates. Catch certificates, which establish the legality of fishing operations, are issued for individual catches unloaded from fishing vessels and are passed on to first buyers. Trade certificates are issued when acquired products are exported or re-exported.

Catch and trade certificates have different designations in the three schemes,[28] but they serve the same function. They are linked sequentially by the document numbers to ensure a hard traceability link between transactions along the supply chain. Trade documents can be issued as many times as product from a given source continues to move through the supply chain: they only cover export or import transactions, whereas catch certificates generally only cover transactions related to fishing and unloading.

Apart from landing and first sale as recorded in the catch certificate, CDS generally do not trace movements of product inside a state's territory: they trace movements through international trade. States are responsible for ensuring that their laws and regulations provide at least the minimum conditions for traceability to support the CDS. This paper explores the ways in which individual countries can oversee supply chain segments that are not covered directly by the CDS.

The sequential linking of certificates and the central registration of all certificates is the traceability core of a CDS. It must allow for mass-balance monitoring throughout the supply chain: this is to ensure that only the original product volume shown on any certificate that has entered a country can re-emerge into international trade and move to the next segment of the supply chain. This system makes it possible to detect fish laundering at the country and certificate levels.

CCAMLR launched its e-CDS platform in 2005 and electronic submission of documents became mandatory in 2010. The new ICCAT e-CDS platform became operational in 2016. Work started in 2012 on a CCSBT e-CDS (CCSBT, 2013b).

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[26] In the ICCAT e-CDS, various alarms warn the competent authority when a data inconsistency occurs; it is generally for the competent authority to decide what action to take.

[27] For a detailed overview, see: FAO TP596 *Design Options for the Development of Tuna Catch Documentation Schemes* (Hosch, 2016b), particularly chapters 4, 6, 7, 8 and 9.

[28] For example "export certificate", "re-export certificate" and "export document".

The e-CDS is advocated internationally as the way forward (IPOA-IUU, 2001; Joint Tuna RFMOs, 2011; FAO Voluntary Guidelines for CDS, 2017) because paper-based systems cannot accommodate the many supply chain permutations and traceability needs arising in complex supply chains (Hosch, 2016b).

Seafood supply chains are complex. Fishing units – especially those operating in industrial fisheries with global markets for trading, processing, re-processing and marketing – rarely supply markets directly. Traders may distribute catch to processing units or sell straight into end-markets according to supply and demand and currency exchange rates. CDS need to be flexible enough to trace products through complex and dynamic supply chains.

The statutory responsibilities and tasks of the competent authorities of flag, coastal, port and market states with regard to CDS implementation through the various supply chain segments are critical in existing schemes. Flag states verify and validate catch certificates, port states check the legality of landings and transhipments by means of validated catch certificates, and processing states issue and validate trade certificates at the time of export or re-export to ensure that the balance of products flowing into and out of the territory is correct. End-market states verify the existence of valid certificates when products are imported.

3.2.2 Design issues

The design, implementation and effectiveness of CDS vary among RFMOs.

One issue is that none of the CDS defines its objective clearly, and the functions to be developed are hence open to debate and interpretation. This lack of clarity has led to confusion during development and in past reviews of the schemes: an example is that functions may be proposed for inclusion in the CDS that do not serve the purpose of combating IUU fishing.

A second problem is that the ICCAT scheme exempts operators from the need to validate CDS documents if individual fish are physically tagged. This leads to a situation where a significant fraction of the catch concerned is not recorded in the central registry, and the CDS hence cannot monitor the filling of quotas in close to real time and in lieu of annual catch declarations by RFMO member states. It also undermines the traceability system as a result of lack of official verification of documents at the beginning of the supply chain. Landings in domestic ports may also be exempted in some CDS, which creates problems with the issue of trade certificates in cases where the product is subsequently exported: in such cases catch certificates have to be issued after the event, thereby weakening any assurances of legality. As with exemptions related to tagging, the potential of CDS-based oversight of total allowable catch and quotas is impaired.

A third issue is that paper-based central registries are not operated in the same way in different CDS and are vulnerable to fraud. In ICCAT only the state issuing a catch certificate and the state receiving a trade certificate submit copies to the RFMO secretariat; in CCSBT the issuing and receiving states are required to submit copies of same certificates to the secretariat so that it can match all individual trades and detect irregularities at the level of individual transactions and send notifications for rectification to the RFMO member states concerned. A list of "open" transactions is submitted annually to the CCSBT compliance committee for consideration. In ICCAT, however, this is not possible, and the detection of fraud at this level is accordingly compromised.[29] In the CCAMLR electronic system the logging and validation of certificates removes the need for paper copies and verifications and eliminates errors and potential certificate fraud at source.

A fourth problem is that the timing of certificate issue is not regulated in any of the CDS, even though implementation is in practice largely unaffected. The action

[29] Note that this weakness is entirely eliminated under the new ICCAT e-CDS.

that triggers the issue of a catch certificate is not defined in any of the schemes, but it is clear that effective operation requires that the catch certificate be issued for the specific catch to be unloaded from a fishing vessel before unloading begins regardless of whether it involves transhipment, transfer of live fish or landing (Hosch, 2016b). If a catch certificate is to provide proof of legal origin – and fish can only move through the supply chain legally if accompanied by the relevant certificates – the catch certificate cannot be issued after unloading; similarly, trade certificates cannot be issued after products have been imported into the next territory.

In CCAMLR landing is not allowed unless the related catch certificate is already electronically available in the e-CDS for verification by the port state authorities. This means that flag state authorities must validate catch certificates on the basis of information available before the fishing vessel terminates its voyage.[30]

A fifth issue is that the design and application of certificates varies among RFMOs. In ICCAT the first trade – export – is recorded in a section of the catch certificate. In CCSBT it may be recorded in the catch certificate or in a separate trade certificate according to circumstances. In CCAMLR only the first point of sale at landing is indicated on the catch certificate, as in the other two CDS, but any export is always the subject of a trade certificate: this clearly separates the two functions of catching and unloading, and trading. The FAO paper on tuna CDS design concludes that separating the functions of catch and trade certificates makes for simpler and more effective systems (Hosch, 2016b).[31]

The sixth issue concerns the establishment of verified weights on the basis of estimated weights recorded at sea, which is not properly provided for in any of the CDS. It is less of a problem in CCAMLR because fish is usually pre-processed at sea, and fish are landed in boxes of standard weight. In the tuna fisheries catches recorded in catch certificates are generally estimates that have to be confirmed and adjusted after landing. It is not a major issue in long-line tuna fisheries where estimates of individual fish may be close to actual weights, but it is a real problem in purse seine fisheries, where fish are caught in bulk and stored on-board; other industrial-scale fishing operations such as pelagic and demersal trawling are similar. The CDS must therefore make provision for procedures for establishing verified weights after landing.

All three CDS suffer from imperfect linkages between catch and trade certificates – which is the most important issue with regard to traceability. It is standard practice in all three for exporters to refer to more than one source certificate for the products listed in trade certificates, leading to a break in the hard traceability link between mother and child certificates because there is no indication as to which product or how much product has been sourced from individual mother certificates. This means that the detection of fish laundering is impaired in long supply chains where mixing and splitting of batches and re-exportation are common. Even though this situation concerns only a small fraction of overall volumes of fish traded in the three CDS, it constitutes an avenue for laundering in fisheries with longer and more complex supply chains.

These imperfections underline that a CDS must be developed on the basis of a technically rigorous design that eliminates loopholes and provides for solid traceability throughout complex supply chains. The need for electronic centralised registries for catch and trade certificate data has been recognised by all three RFMOs, and these are either being currently implemented or in the process of being developed.[32]

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[30] Under the EU CDS, catch certificates under the scheme's "direct exportation" scenario are only issued following processing. These catch certificates hence post-date the fishing operation, unloading and buying and distribution following landing. The elimination of fraud in the early part of the supply chain is therefore difficult to achieve through the application of the scheme.

[31] See Chapter 6.

[32] Note that the 2017 FAO Voluntary Guidelines for CDS, in Paragraph 4.6, detail nine specific functions such electronic systems should have.

These imperfections do not affect the discussion in this paper, but they show that national data acquisition and traceability solutions are important throughout the supply chain and help to enhance CDS performance.

3.3 THE CDS CORE FUNCTION: TRACEABILITY

This section considers basic CDS architecture and the ways in which traceability is designed and implemented in existing multilateral CDS. This is important in that it is the basis for appraisal of where and how country traceability solutions can support and enhance the performance of a CDS.

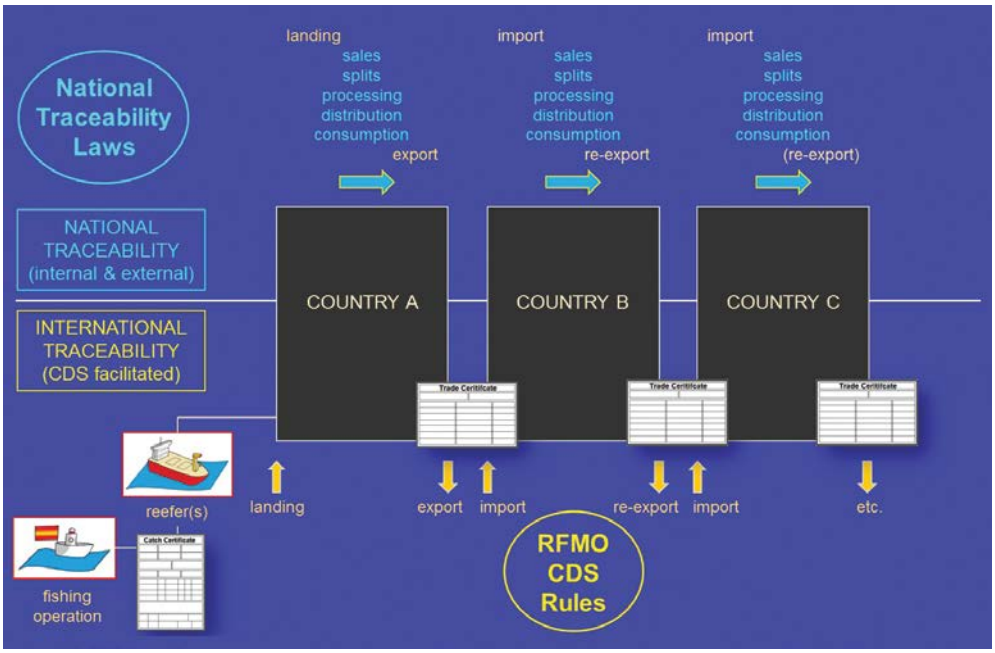
Figure 3 shows the so-called "ABC graph", which is sourced from FAO TP596 *Design options for the development of tuna catch documentation schemes* and shows the following elements:

- segments of the supply chain: national segments above the horizontal line and CDS traceability segments below;
- possible stops in the national supply chain;
- possible stops in the CDS-governed supply chain;
- regulatory frameworks governing the segments; and
- three notional countries – A, B and C – that model product flow along an international supply chain and through trade.

Figure 3 models a simple fishing, transhipment and landing operation at the harvesting end of the supply chain. More complex events such as multiple transhipments and landings and mixed unloadings are omitted for the sake of simplicity.

The basic operation of the document system through catch and trade certificates is shown at the stops in the supply chain where the documents are issued and validated by the competent authorities.

FIGURE 3
Basic CDS traceability framework concept



Source: Hosch, 2016b.

The supply chain runs from left to right, from fishing operation, transhipment and landing to products entering country A and being processed before being traded on to country B and subsequently to country C and so on.

The part of the graph below the horizontal line represents the international dimension of the CDS, managed directly by CDS-related mechanisms. All harvesting operations before landing, export, import, re-export, import and re-export are subject to the regulatory mechanism of the CDS; all transactions are recorded by the CDS and stored in its central registry in the form of certificate copies or electronic data.

The CDS directly covers only the following international segments: i) all events up to landing and the issue of a catch certificate establishing the legality of the catch; and ii) every trade event that occurs when the product moves between countries, each of which involves the issue of trade certificates and the creation of links with source certificates. In this way system-bound traceability and accountability is maintained.

The upper part of the figure represents the national traceability segments of the supply chain, where traceability is limited to the national territory through which product moves. These segments are not directly covered by the CDS but by national traceability laws and regulations, with a few exceptions. No CDS traces product movements through national distribution chains: the only CDS records generated in the supply chain after landing and first sale relate to the entry of product into national supply chains and its subsequent exit – in other words the entry of product into and out of international trade.

The first and last transaction records in the national supply chain – entry and exit – overlap with the transactions recorded by the CDS and are hence captured in both national and CDS records.

With regard to national supply chain segments, none of the current multilateral or unilateral CDS have their own mechanisms to trace movements of products through the national segments. This is regarded as best practice because: i) the mechanism works for the CDS currently in operation; ii) the alternative option of covering national segments though a CDS-bound traceability mechanism would introduce so much complexity that the system could fail; and iii) many countries would reject the idea of mandatory recording and tracing of national transactions under multilateral CDS.

Hence countries are dealt with as "black boxes" by the CDS. The CDS creates certificates recording of what enters and what exits a country, but it is blind to transactions inside a national supply chain. The CDS is nonetheless capable of establishing important indicators for any country such as: i) imported species, products and volume; ii) exported species, products and volume; and iii) the balance between them.

To be relevant to the CDS these balances must take processing yields into account[33] because the form and volume of products change during processing. Failure to account for processing yields provides an opportunity for non-originating product to enter the certified supply stream.

A well-designed CDS will automatically detect a discrepancy when trade certificates are prepared for products to be exported. What the CDS cannot do is identify the individual operator who has caused the discrepancy – unless the exporter is the only importer of products covered by a given certificate and the same products have not changed hands in the national supply chain. The latter – a national transaction – is typically not recorded at the CDS level.

If national transactions were recorded and links were enforced by a CDS, certificate fraud could be detected at the level of the individual operator. In the absence of this mechanism in current CDS and limited enthusiasm among RFMO members to consider it for the future, it is for national competent authorities to maintain

[33] See Sections 4.4.2.4 and 4.4.3.4 for discussion of processing yields in a CDS.

the integrity of national supply chains under a CDS. Although a CDS can identify fraud-related discrepancies with respect to individual certificates, state authorities are responsible for investigating any such discrepancies and identifying and sanctioning individual perpetrators.

3. 4 NATIONAL TRACEABILITY; CONTINUOUS DATA ACQUISITION OR RECORD-KEEPING?

3.4.1 The national challenge

At the country level, operations by numerous actors along the supply chain are subject to a variety of licences, authorizations and reporting obligations. These include fishing vessel registrations and licences, vessel monitoring systems, fishing and transhipment operations, logbook and observer regimes, landings, imports, sales and distribution, processing and re-processing, exportation and re-exportation. All involve different types of information generated and recorded by various means, and collected and logged by different actors such as public administrations and competent authorities.

Records may be kept on paper or electronically and held by different states and RFMOs along the supply chain. The typical information trail for a single fishing trip, its catch and the movement of product along the supply chain to the end market typically involves records kept by coastal, flag, port, processing and end-market states, and the RFMO that manages the harvested resources. This is one of the reasons why it is necessary to define and manage recorded data and focus on how traceability at each level can be organized.

A major challenge at the state level is that information is split up into separate repositories managed by different entities, and hence access by agencies such as a fisheries administration to information held by other agencies can be difficult if not impossible.[34]

To trace legal products through national supply chains and ensure that non-originating product is kept out, it is necessary to "join the dots" between national databases and bring together the information needed for effective national oversight, as a CDS does for an entire supply chain. In a country that functions as a flag, a port and a processing state, such databases are likely to be held in different government agencies. Centralizing KDEs requires a planned and consistent approach.

3.4.2 The RFMO challenge

At the RFMO level the CDS collects a selection of KDEs from the whole supply chain and governs central recording of them. The data relate to: i) harvesting and landing operations; ii) export operations; and iii) import operations. The KDEs required for traceability are thus brought together in the CDS centralized recording system, and the CDS can accomplish its primary function of detecting mass imbalances related to certified products moving into and out of a country. Mass balance inconsistencies showing that more of a product moves out of a country than into it indicate that illegal or "non-originating" harvests are being laundered into CDS-certified supply streams at the level of a specific country.

It is clear that a well-designed CDS will detect product laundering without additional state-level support. An RFMO Secretariat will notify states of detected imbalances or other inconsistencies with a view to triggering national-level action to investigate and if necessary issue sanctions. States generally report detected inconsistencies to RFMO compliance committees, which decide if action is needed.

[34] An example is a national fishing vessel register, which is likely to be held by the maritime arm of a ministry of transport, whereas a national register of licensed fishing vessels is generally managed by a ministry in charge of fisheries.

RFMO mechanisms that are limited to urging members to enforce the law in cases of recurrent inconsistencies are generally regarded as weak. Such mechanisms constitute an essential first step in regular and transparent peer-reviewed performance evaluations of CDS at the individual member state level, and also put pressure on participating states to oversee their supply chains effectively and ensure that transactions at the national level comply with regulations and that fraud can be detected and sanctioned.

In the context of assessing how country-level support can enhance CDS, the primary focus is the traceability function at the level of national supply chains with regard to detecting discrepancies and fraud. But other mechanisms that states should apply must also be considered: for example, although traceability is the main concern for port and processing states, support and control mechanisms are essential in flag and coastal states whose main aim is to ensure that illegally harvested resources cannot be certified.

The following two sub-sections discuss different approaches to traceability in support of CDS; the remaining sections cover the different state types and specify which traceability solutions and which support mechanisms are needed to support central CDS functions.

There are two ways in which a country can respond to the national traceability needs of a CDS. One is simple and cheap, based on paper records kept by economic operators along the supply chain. The second is electronic, complex, more expensive and substantially more powerful, based on near-real-time data acquisition by economic operators and relay to competent authorities. The nature of the oversight exercised by competent authorities in the two systems is different, but both enable them to identify sources of discrepancies detected by the CDS and exercise their powers.

3.4.3 Traceability based on record-keeping

The first and cheapest traceability option is to demand that all operators in a national supply chain keep certain records, which must be defined by the competent authority and kept on company premises for a set length of time. Submission to the competent authority for regular central filing is an option, but it requires additional resources and presents its own advantages and disadvantages.

Companies can, for example, be requested to record the source, volume, form and certificate numbers of products received under a CDS and to log the data in a specified common format for all outgoing products, whether for international export or onward sale in the national supply chain. The resulting "paper trail" enables full reconstruction of any product flow through the national supply chain that could be inspected by competent authorities.

When a competent authority is notified electronically by the CDS that a mass-balance anomaly has arisen relating to a certificate, inspectors can examine the records to establish the point in the supply chain at which the anomaly occurred. The certificate in question is then flagged. The first buyer of the product in the national supply chain, who is of course identified on the certificate, is the natural starting point for any investigation.

It should be noted that the amount of work created by such an inspection grows with the volume of a product that is transhipped, landed or imported and the number of buyers handling it. Small-volume cases may be solved rapidly, but large volumes involve downstream product splits, for which an increasing number of "product branches" must be investigated to identify the company at fault.

In developing countries, the number of trained inspectors who can undertake investigations at the level of fish factories can be very limited: this is largely because inspectors tasked with fisheries law enforcement usually focus on harvesting and

landing operations and their work stops at the port. And even though inspectors enforcing food law may have a wider remit, it does not usually include vessels' harvests and landing operations. In such situations fisheries inspection and law enforcement involving investigation of company records do not work in harmony.

The other major consideration relates to sanctions. It is often the case that sanctions for poor or fraudulent record-keeping are either absent or unrelated to the value of the underlying fraud. To be effective, sanctions must involve significant penalties to ensure that regulations are respected and to deter the laundering of product into a value chain: if attempts to defraud the system are detected and severely punished, fraud will rapidly decline.

3.4.4 Traceability based on a continuous data acquisition solution

The 21st century solution for national traceability in a CDS is an online national platform. This operates at the national level in the same way as an electronic certificate registry works at the global CDS level. Its functions are: i) to identify and log CDS-covered product when it enters a national supply chain; ii) to identify and log all national supply chain transactions; and iii) to identify and log all transactions relating to products leaving a national supply chain.

Product movements are logged in real time as products migrate from a seller to a buyer or custodian. A purchase must be logged by a buyer and the product deducted from the seller so that the buyer can subsequently pass it on legally: unless it is properly recorded, it is as if the transfer never occurred and the buyer is officially not in possession of any product.

In this way an importer may, for example, acquire a large volume of tuna complete with a catch certificate from a fishing vessel in a port in Asia and store it in a warehouse. The CDS will record this first sale – and so will the national platform: the last transaction of the CDS is the first transaction recorded in the national system. [35]

If the importer splits and sells the product to three processing plants, they record the volume purchased on the electronic platform, naming the seller and recording the certificate number. The system automatically verifies that no more product than that acquired by the importer under a specific certificate can be forwarded, and that the sum of products forwarded to the three buyers complies with this rule.

If the rule is breached and the importer sells more product to the factories than he has imported – a form of laundering – an alarm is triggered when one of the factories tries to log the transaction, and the system automatically identifies the party supplying false information. Instead of a lengthy inspection triggered when product leaves the country and the CDS detects the imbalance, this online system forces operators to comply with the regulations by not accepting inconsistent transactions. An automated system will hence come close to eliminating the need for national law enforcement at this level.

Box 1 shows the Animal Products E-cert platform, which has been in place in New Zealand since 2001 (AP E-cert., 2016).

There are various challenges with regard to centralized online platforms: i) a platform has to be designed that can accommodate all supply chain permutations and scenarios as they occur in reality, so that all movements and transaction types can be logged; ii) industry has to be persuaded to accept the technology and its requirements; and iii) the cost of developing and rolling out the system and related training can be substantial.

[35] Domestic transactions are covered in detail in Sections 4.4.2.4 and 4.4.3.2.

BOX 1

The Animal Products E-cert (AP E-cert) in New Zealand

The New Zealand Ministry of Primary Production requires that anyone processing or storing fish products must record any movement of product between premises or owner in the E-cert system.

There are four groups of authorized E-cert users:

i. New Zealand manufacturers, processors and consigners/consignees storing animal products before they are exported;
ii. official assurance verifiers, who verify information about products and premises and approve or audit transfer documents such as eligibility declarations;
iii. authorized persons who approve and sign export certificates; and
iv. destination country officials who inspect animal products at the border.

How the AP E-cert works

1. An authorized user accesses AP E-cert to enter the required product data and generate an internal transfer document known as an eligibility document or eligibility declaration.
2. Once the eligibility document is submitted, official verifiers review the information and approve or reject the request on the basis of their knowledge of the premises and the contents of the document.
3. Steps 1 and 2 are repeated at each transfer. Products recorded in one document may be combined with other products to create a new document; this can be repeated many times as processing occurs. In this way AP E-cert tracks the movement history of animal products in New Zealand.
4. When a product is ready for export, the exporter or agent uses AP E-cert to enter the required product and consignment data and generate a request for an export certificate. Once the request is submitted the authorized official accesses AP E-cert and approves or rejects it on the basis of knowledge of product history, premises, supporting internal transfer documents and the regulatory requirements of the destination country. When the official is satisfied the certificate is printed and signed and, with the supporting eligibility documents, accompanies the product to the destination country. A single export certificate can have one or more supporting eligibility documents. If the information provided is incomplete or the product is unsuitable for export, the official informs the exporter that the request has been rejected.
5. Destination country officials review the export certificate as part of border clearance and access AP E-cert to validate the authenticity of the certificate. Alternatively, the certificate data can be sent electronically from AP E-cert to a border control database in the destination country.

3. 5 RFMO AND CDS SANCTIONS

This section would be incomplete if it were limited to the technical operation of the CDS at the RFMO level. One of the salient points addressed in the sections on state types is the way in which sanctions of various kinds should apply in cases of non-compliance. At the country level, economic operators can fail to comply with CDS rules and national CDS support mechanisms, whereas at the RFMO level states involved in the supply chain and with specific functions relating to CDS may fail to honour their responsibilities.

RFMOs generally operate a compliance committee that handles compliance issues. It is generally supported by one or more compliance officers based in the RFMO secretariat who compile data and reports for assessment, with a view to informing

subsequent decisions as to courses of action in cases of non-compliance by RFMO members, cooperating non-members or non-members.

ICCAT, CCSBT and CCAMLR have provisions that enable annual compliance committee meetings to impose trade-restrictive measures on states that do not comply with RFMO rules or CDS rules.[36] But trade-restrictive measures are rarely used to enforce compliance: in CCSBT they may only be applied to non-contracting parties, and ICCAT has enacted import bans against several countries when all avenues for dialogue were exhausted. If trade-restrictive measures are enacted in the form hitherto used by ICCAT,[37] they can be readily enforced through a CDS by blocking the issue of certificates for catch harvested by or transiting through territories that the RFMO believes to be sponsoring IUU fishing or laundering non-originating fish into certified supply chains. Such action would immediately prevent legal trade in the suspected products and deny market access to products landed under particular flags or shipped through particular territories.

Trade-restrictive sanctions at the RFMO level are essential to create incentives for compliance by countries participating in the fishery and trade of the species managed by RFMOs.

[36] ICCAT (2006) Rec. 06-13 Concerning Trade Measures provides for the identification of contracting and/or non-contracting parties (CPCs/NCPs) by a compliance committee for failing to discharge their obligations in the application of ICCAT CMMs; a mechanism is provided whereby the Executive Secretary notifies the state concerned and demands corrective measures. Article 6. The Compliance Committee or the permanent working group should evaluate the response of the CPCs or NCPs, together with any new information, and propose to the Commission to decide upon one of the following actions:

a) the revocation of the identification;
b) the continuation of the identification status of the CPC or NCP; or
c) the adoption of non-discriminatory trade restrictive measures.

Absence of response from the CPCs/NCPs concerned within the time limit shall not prevent action from the Commission.

In the case of CPCs, actions such as the reduction of existing quotas or catch limits should be implemented to the extent possible before consideration is given to the application of trade restrictive measures. Trade measures should be considered only where such actions either have proven unsuccessful or would not be effective.

[37] ICCAT is the only one of the three RFMOs operating a CDS that has imposed trade restrictive measures in the past. It has done so by identifying CPCs and NPCs.

4. Findings

4.1 FLAG STATE AND CATCH CERTIFICATION

4.1.1 Fundamentals of flag state responsibility

A flag state oversees the operations of fishing vessels flying its flag as follows: i) it issues the registrations and licences before fishing can commence; ii) during any fishing trip it monitors the activity and subsequent transhipments; and iii) on completion of a fishing trip it handles data acquisition and mandatory filing of reports on the quantities of harvested and landed product.

There are two primary categories of fishing vessel – catchers that harvest marine resources, and support vessels such as at-sea or in-port transhipment boats often referred to as "reefers" or "carriers". The flag state is also expected to oversee the operations of such support vessels.

Administrative and technical tools such as vessel registration documents, licence registers, VMS, logbooks, observer programmes and transhipment and landing authorizations are used by the flag state to honour its responsibilities and provide effective oversight of the vessels flying its flag. Some of the information obtained is static, such as vessel registration data, whereas some such as VMS and harvest data are highly dynamic.

At the level of the CDS, catch certificates are issued on the basis of harvests, transhipments and landings carried out in this first supply chain segment. The objective is to establish that the certified catch comes from a legal fishing operation in conformity with all applicable RFMO CMMs, and with national fishery laws if this part of a fishing trip has occurred in the EEZ of a coastal state that is not the flag state.

It is therefore essential that the flag state has the maximum relevant information at hand when it is asked to validate a catch certificate. Information gaps invariably lead to uncertainty and hence to weaknesses in the flag state's assurances regarding the legality of fishery products it has certified.

4.1.2 Ideal flag state configuration

It follows that as a competent authority validating catch certificates, the flag state must have tools for the collection of timely information from and effective oversight over its fishing fleets. The tools are concerned less with traceability than with the provision of assurances based on sound oversight. A CDS is therefore only as sound as the assurances of legality provided at the beginning of the supply chain.

The following are some of the main elements to be covered by a flag state.

4.1.2.1 Vessel registration and fishing vessel registry

The registration of fishing vessels is typically a function of government departments that have no jurisdiction over fisheries, but the data must nonetheless be available to the department in charge of fishery management.

In several countries, including some sanctioned for flag-of-convenience infractions, coordination between the departments that register fishing vessels and those in charge of fishery management is poor or non-existent: in such cases the latter is not aware of fishing vessels flying the national flag and operating in distant fisheries, and flag state oversight is hence seriously impaired or non-existent.

4.1.2.2 Fishing licences

The flag state is expected to control its vessels by means of licences, authorizations or permits,[38] which are based on two complementary elements: i) a basic registration scheme in which a licence may be obtained by filling in a form and paying a nominal fee – useful as a basis for statistics and for controls based on identification of registered licence holders; and ii) the required compliance conditions regulating the licence holder or operator and the vessel and crew, in accordance with national laws and international conservation and management measures. The latter will not be identical in all fisheries, but they define the basis for the legality of the catch.

With regard to fishing vessels operating in RFMO areas of competence, the situation has improved markedly since the RFMOs established "white lists" of authorized vessels. A fishing vessel that is not on a white list would not be able to obtain a catch certificate through an RFMO/CDS interface, regardless of flag state performance.

4.1.2.3 Authorization to sail and/or fish in areas beyond national jurisdiction

The authorization to fish in distant waters – especially in the EEZ of a third country – is a rare best-practice that requires a fishing vessel operator to submit mandatory documents to the fishery administration before commencing fishing on the high seas or in third-country waters.

Such documents should include certified copies of fishing licences for operations in the EEZs of third countries. Spain has recently taken this approach to a new level of assurance by seeking confirmation of the validity of licences through diplomatic channels with the coastal states concerned, thereby corroborating the assurances of legality provided in catch certificates.

4.1.2.4 Observer programmes

A fisheries observer is an independent specialist who works on board fishing vessels as part of an observation programme administered by a government agency or third-party contractor.

The primary objectives of observer programmes vary, and may be oriented towards science or compliance. They usually develop a balance between the two and hence support the flag state in exercising its data capture and oversight responsibilities.

4.1.2.5 Logbook regime

A Fisheries Logbook records the fishing and non-fishing activity of fishers, who are required to report their activity and submit the logbook at regular intervals. Logbooks are a general licensing requirement of flag and coastal states and RFMOs; they are used to record fishing operation data in standard logsheets, or logbook pages, for presentation to the authorities of the port state of transhipment or unloading and/or to be forwarded to the flag state.

Log sheets used to be submitted in hard copy to fishery authorities during unloading, but they are now increasingly managed by means of electronic platforms. Data recording and real-time transmission to authorities in conformity with data-collection protocols is facilitating the integration of data into e-CDS initiatives.

In principle the flag state receives the e-Records, and port and coastal states are increasingly collecting logsheet data for their own use.

4.1.2.6 Vessel monitoring systems

The acronym VMS denotes systems used in commercial fishing that enable regulatory organizations to track and monitor individual fishing vessels.

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[38] See Paragraphs 7.6.2, 8.1.1, 8.1.2, and 8.2.1 of the *1995 FAO Code of Conduct for Responsible Fisheries.*

Its operation and the equipment involved differ according to the requirements of the flag or coastal state and of the RFMO in which the vessel operates.

A VMS requires each vessel to install a mobile transceiver unit, which identifies and locates a vessel by means of global positioning satellites. The mobile transceiver unit transmits the sending location and the data network identity to the receiving location, from which the data are transmitted to electronic chart display and information systems to enable the authorities to see the position of any vessel.

4.1.2.7 Oversight of unloading

Fish can be removed from a fishing vessel as a landing, an at-sea transfer of live fish into tow cages, an at-sea or in-port transhipment to a reefer vessel, or as any other form of transferring fish from a fishing vessel into the supply chain. Discards are logically ignored in CDS because they will not enter the supply chain.

The flag state will in principle record what is being unloaded by fishing vessels flying its flag and the quantity involved, but this control capacity varies considerably among states. Port states are increasingly mandated to monitor unloading at their ports and record the related data, especially unloadings from foreign vessels, according to the terms of the 2009 PSMA-IUU.

A CDS will provide a stimulus for weaker flag states to improve their oversight of unloading because catch certificates are normally issued and validated before unloading occurs. Planned unloadings must be communicated to flag state authorities, who will acknowledge and often authorize them, and the submitted information must be approved through the validation process for catch certificates.

4.1.3 Flag state CDS support mechanisms

Table 2 in Section 2.4 shows the main stops, traceability events and KDEs in a typical supply chain overseen by a flag state. The two columns – CDS and flag state – set out which CTEs and KDEs are already covered by the CDS: harvesting, the issue and validation of the catch certificate, and unloading.

It should be borne in mind that it is the flag state that validates catch certificates in all CDS, and that it is therefore essential that it can verify information submitted by reference to other data. This underlines the importance of the ideal flag state configuration discussed in the previous section.

Table 2 shows all CDEs and KDEs are normally covered under the CDS, even though imperfections persist in the design of some CDS. The typical catch certificate lists all the information needed to enable its owner to establish where and when the fish were caught and by which vessel, where and when it was transhipped or transferred, where it was landed, who acquired which species in what form and its proportion of the unloaded catch.[39]

The main functions of the flag state in a CDS are to verify the data submitted to it in catch certificate applications against independent sources, and to ensure that IUU products cannot enter the supply chain. The challenge is to acquire the capacities to do this.[40] The CDS support functions of the flag state are emphatically not to design and develop additional traceability mechanisms specific to it.

All the CTEs and KDEs needed to enable the detection of fraud are provided by the CDS. The following sub-sections discuss the relevant supply chain stops.

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[39] In commercial-scale fisheries such as tuna purse seining or trawling for small pelagic fish, catches are rarely bought by a single buyer but are split among several buyers after landing. This constitutes a particular challenge for a CDS traceability mechanism.

[40] Information sources such as logbooks or observers' reports may only become available after the validation of a catch certificate. But this does not diminish their usefulness in establishing the legality or otherwise of fishing operations, and sanctions can be applied after individual catch certificates have been validated.

TABLE 2
Supply chain points, CTEs and KDEs at flag State level

Flag State supply chain segment			CDS		Flag State	
Supply chain stop	CTE	Main KDEs*	Data capture	Notes	Data source	Notes
Harvesting	Fishing vessel operation	Unique fishing vessel ID(s)	Covered	International maritime organization number, if allocated	Vessel registration	Vessel census and registry reviews
		Permission to fish	Covered	As issued by flag state and RFMO	Licensing	Licensing reviews
	Fishing (licensing conditions)	Catch Areas	Covered[1]	Some CDS provide for general catch area ID only	VMS/AIS/logbook controls	Confirming EEZ; FAO fishing area
		Start & finish date	Covered		Reporting/logbook	VMS cross-checks
		Observer ID (if applicable)	Not Covered		Observer report to coastal and/or flag State and/or RFMO	Reception of reports/debriefing of observers Note: Observer programmes may be overseen by various entities
	End of fishing trip (reporting)	Type of unloading	Covered	Transhipment or landing	Reporting/logbook	Logbook submission/e-Report Note: In many cases the flag state only receives info after the event
		Species & product type	Covered		Reporting/logbook	
		Estimated volume to be unloaded	Covered	Design issues in several CDS	Reporting/logbook	
Catch certificate	Initialling	Document number	Covered[2]		Unloading authorization	VMS crosschecks/communications with the port state authority
	Submission	Name of master	Covered		Logbook/licensing	Logbook submission/e-Report
	Validation	Name of Gvt. officer	Covered			

* For a full list, see: FAO Technical Paper 596, Chapter 7, Table 11.

[1] Not all RFMOs operate a commission VMS and few operate port-to-port VMS monitoring enabling monitoring of entire trips in which a fishing vessel fishes in its regulatory area for at least part of the trip. Catch areas may hence be recorded by the master on the catch certificate, but the information may not be accessible to the RFMO VMS for verification of its accuracy.

[2] CCAMLR provides rules and guidance for numbering documents. Numbering of catch certificates under the EU and CCSBT CDS is at the discretion of the flag state. In the ICCAT CDS, the secretariat assigns numbers after documents have been completed, validated and received.

4.1.3.1 Harvesting

Two internationally mandated documents apply to fishing vessels: i) the vessel registration, usually issued by the maritime arm of a ministry of transport; and ii) the authorization to fish, usually issued by a fisheries department in a ministry responsible for natural resources management.

The link between these administrative bodies is not always perfect, which can result in fishing vessels flying the flag of a particular state operating without oversight in distant fisheries and without the knowledge or consent of the authorities. Such situations conflict with international fisheries law, particularly the 1993 Compliance Agreement, and some incidents have been reported in the media.

In some countries licences are issued by central and decentralized branches of the same fisheries administration, and the central authority may hence have no access to the list of licensed fishing vessels. If the issuing authorities are also the competent authority for validating catch certificates, information gaps will compromise the assurances provided in the catch certificates because the licence status of vessels shown on catch certificates cannot be readily verified.

Flag States must therefore ensure that there is a clear link between the registration and licensing of fishing vessels,[41] and that the related lists are complete and accessible online so that the competent authority can verify and validate catch certificates.

The VMS, Automatic Identification System (AIS) and logbook regimes enable flag states and fishery administrations to monitor fishing operations. The logbook system requires masters to record where, when and how much is harvested; VMS and AIS enable administrations to follow the movements of fishing vessels in real-time wherever they are and to cross-check the positions with those reported by masters, for example in logbooks and catch certificates.

These regimes may be implemented effectively in some countries, but others have not introduced them or do not apply them effectively. Unsupervised fishing vessels are known to fish illegally in closed or protected areas, in third-country EEZ and for resources covered by an RFMO to which the state is not a party.

Flag states must hence ensure that VMS and logbook regimes are legislated for, implemented and enforced, particularly for fishing vessels operating in waters beyond national jurisdiction. A flag state needs to provide credible assurances that vessels have been operating legally in accordance with the guarantees provided in catch certificates.

The master of a commercial fishing vessel nearing the end of its trip will usually know the buyer(s) purchasing the fish or the vessel(s) receiving a transhipment. This is critical in terms of completing the catch certificate – which records the port and date of landing and the first buyer, thereby: i) marking the point of entry of the fish products into the supply chain; and ii) providing the information to establish the transfer of ownership from the fishing vessel to the buyer. The procedure is not the same, however, in the EU CDS. Section 4.1.3.3 also considers the functions of flag states during unloading.

4.1.3.2 Preparation and validation of the catch certificate

For a CDS to be effective, catch certificates must have been issued and validated by the time a fishing vessel unloads its catch. This is the only way to provide the assurances of

[41] IPOA-IUU Paragraph 40: "Although the functions of registration of a vessel and issuing of an authorization to fish are separate, flag states should consider conducting these functions in a manner which ensures each gives appropriate consideration to the other. Flag states should ensure appropriate links between the operation of their vessel registers and the record those states keep of their fishing vessels. Where such functions are not undertaken by one agency, states should ensure sufficient cooperation and information sharing between the agencies responsible for those functions."

legality that enable port authorities to allow a transhipment or a landing and to enable buyers to acquire legally certified product.[42]

Catch certificates should be completed by masters at sea before landing, transfer or transhipment of a catch. This is straightforward in commercial fisheries in developed countries, where fishing vessels have online communications. But in commercial fleets in developing countries maritime communications are often limited to VHF radio or mobile telephones that can only be used in coastal waters.

The usual procedure is for masters to communicate with company offices, where certificates are prepared and submitted for validation to the nearest competent authority. Once validated, the company sends the certificate to its agent in the port of landing, who submits it to the port state authorities and to the buyer, if different from the agent.

In the absence of an online CDS central register of catch certificates, the flag state should establish its own electronic record of validated catch certificates. This will enable it to search the database and provide it with a verification tool in situations where decentralized authorities are validating certificates but do not have access to data held by other national entities.

Flag states should develop procedures that enable operators to complete the certificates themselves. In many countries the authorities assume the tasks of completing, verifying and validating the certificates, but this is not good practice: experience shows that an immediate outcome is administrative delay and consequent late issue of certificates, which in turn degrades the core function of the CDS – to detect IUU fishing products and deny them market access before unloading.

It is important that the competent authority verifies the certificates submitted to it before validating them. A document submitted for certification only becomes a valid certificate when it has been validated by stamping and signature: until then it has no legal currency, regardless of the information it contains.

It is essential that flag states establish clear rules, if necessary in addition to any RFMO rules, detailing the circumstances in which validation of a catch certificate will be denied. A competent authority can validate a certificate only when it is satisfied that all fishing activities comply with the relevant rules.

4.1.3.3 Unloading

In multilateral CDS, unloading – transhipments, transfers[43] and landings – is regulated, monitored and recorded in catch certificates. The flag state hence has the duty to oversee this stop in the supply chain. Landings and in-port transhipments are expected to be overseen by port states as well.

Transhipments and transfers are also regulated in RFMO CMMs. It is crucially important that flag states ensure that its oversight mechanisms mandate prior authorization and subsequent reporting, and that the authority validating catch certificates has access to the information.

Many flag states are unfamiliar with the rules governing the first sale of a product, especially in distant-water fisheries. Involvement in a CDS will resolve this issue and help competent authorities to develop routines for handling these data elements.

With regard to unloadings, there are often several buyers acquiring the fisheries products of a single unloading: this constitutes the first "split" in the supply chain. CDS CMMs generally do not require a single unloading to be covered by a single catch certificate: the standard rule is that all landings must be covered. A single unloading

[42] If a buyer acquires products for which the flag state later denies certification, he is unable to market the product legally and will incur a loss. The CDS must hence be designed so that only a master and his company will incur losses relating to non-compliance, IUU fishing and the refusal of certificate validation.

[43] The at-sea transfer of live fish into tow-cages.

may in practice be covered by one certificate or several provided they add up to the total volume unloaded.

If catch certificates have a section in which the full unloading is described and subsections for describing the portions sold to individual buyers, the need for more than one catch certificate does not arise – all the required information is recorded in the same certificate. If only one buyer can be referenced in a certificate, several certificates will have to be issued to cover a single unloading, each naming the individual buyer. Flag states must develop record-keeping routines that enable them to ensure that the volumes add up, especially when several certificates are issued for a single landing.

4.1.4 Institutional and sanctions frameworks

Article 19 of the UNFSA obliges flag states to investigate alleged violations immediately, report promptly on progress and outcomes, and, if a violation is proved, to ban the vessel concerned from fishing on the high seas until the penalties imposed by the flag state have been served. UNFSA also mandates that sanctions be sufficiently severe to secure compliance and deprive offenders of any financial benefits derived from IUU fishing.

4.1.4.1 Institutional framework

For a flag state to discharge obligations under international law and as a member or a cooperating non-member of an RFMO operating a CDS, it must appoint an official who is empowered to act as the CDS competent authority. The competent authority: i) must have operational access[44] to independent data sources for cross-checking the information in catch certificates; ii) must be empowered to deny the issue of catch certificates on the basis of detected irregularities that cannot be resolved; and iii) must allow its findings and reports to be used as evidence by the fisheries law enforcement organization in legal cases against offenders.

Experience shows that in many situations the competent authority and the officials tasked with validation of certificates lack operational access to independent data sources, and are not in a position to deny validation requests. In such situations validation is mostly a foregone conclusion, and the assurances of legality provided in certificates validated by such administrations are largely worthless.[45]

Competent authorities must therefore be empowered to carry out their tasks. An effective way to achieve this is to locate the flag state competent authority in the section of the fisheries administration in charge of MCS. This is logical because the object of certification is to detect fraud and deny market access to related products. MCS units have access to information on licences, registration, VMS, logbooks and previous infractions against which catch certificate information can be verified – and they are empowered to act on information and enforce the law.

In some countries, however, the competent authority validating catch certificates is not the MCS unit and has little training or experience in law enforcement. In others,

[44] "Operational access" to information means that the information for routine verifications is accessible to the officers concerned without the need to file requests for specific items to government departments, which would delay access.

[45] For example, when the EU issued the Weight-in-Catch-Certificate note in 2010 requiring flag states to issue catch certificates when product has been processed and is ready for export, not at landing, Turkey transferred the validation of catch certificates from the fisheries inspection unit tasked with enforcing fisheries law to the veterinary services unit, concerned with health inspections, as the last authority to verify that consignments complied with public health regulations. This demoted catch certification to an administrative procedure, with veterinary inspectors having no mandate and no means of accessing information regarding the legality of any fishing vessel's fishing activity. This decision was logically taken pursuant to the EU decision to have catch certificates issued well after landing, after harvests had been split and after entering the supply chain, thereby impeding the primary objective of a CDS – detecting and sanctioning IUU fishing and denying market entry to its products.

there are no MCS units because oversight and law enforcement are not functions of the fisheries administration. In these cases the national navy or maritime police may be the only organizations that can enforce the law – but they can rarely support a CDS. Participation in a CDS should be an opportunity for a country to reorganize its fisheries administration and create a central unit responsible for MCS and the administration and management of catch certification.

4.1.4.2 Sanctions

To comply with its obligations under international law and RFMO membership, a flag state must establish a system to classify and sanction fisheries infractions. This is one of the weakest features of fisheries regimes worldwide. In fishery laws – with some notable exceptions – the value of sanctions bears little relation to the value of an IUU harvest, and diligence in monitoring, verifying, detecting and sanctioning offenders is unlikely to solve the problems because the sanctions are insufficient to deter malpractice.

In a CDS a flag state has one means of overcoming such weaknesses in national fisheries law. It must apply the central tenet of the CDS CMM, which has the standing of treaty law and overrides national law – that no catch certificate be validated for any IUU product. Such non-validation amounts to a sanction that may be imposed without reference to national fisheries law, and one that reflects the value of the IUU catch because the catch will not be able to enter international trade and will be devalued accordingly.

Flag states intent on controlling their fishing vessels in a CDS must develop rules that enable competent authorities to deny catch certificates to operators who fail to comply with fishery management and conservation rules. Consistent application of this approach will help to ensure that CDS contribute directly to the prevention of illegal fishing.

4.1.5 Summary of flag state CDS support mechanisms

Under UNCLOS,[46] flag states must oversee the operations of fishing vessels flying their flags. The 1995 UNFSA also mandates this, and obliges flag states to investigate alleged violations of conservation and management measures and apply sanctions against non-compliant fishing vessels. The 1995 Code of Conduct for Responsible Fisheries also mandates this approach, and places more emphasis on the enforcement regimes of flag states.

Vessel registrations, licence registers, VMS, logbooks, observer programmes and transhipment and landing authorizations enable flag state to discharge their responsibilities under international law and to oversee fishing vessels flying their flags.

For a CDS to be useful, catch certificates must have been issued and validated by the time a fishing vessel unloads its catch – the first supply chain segment – to establish that the fishing operation was conducted legally. Flag-state authorities must, therefore, have access to all relevant information when they are asked to validate a catch certificate.

The CDS support functions of a flag state are not specific to traceability: a flag state must be in a position to verify most if not all of the data submitted in catch certificate applications against independent sources.

To provide sound assurances that vessels are operating legally, flag states must ensure that:

- registration and licensing of fishing vessels are conditionally linked, and that registration and licence lists are accessible to the competent authority responsible for verifying and validating catch certificates;
- fishing vessels are controlled through licences, authorizations or permits, which may vary in scope and according to the type of fishery;

[46] UNCLOS, Article 94.

- legislation is in place for the implementation and enforcement of VMS, AIS and logbook regimes for fishing vessels operating in waters beyond national jurisdiction;
- standard logbooks recording fishing operations are also a licensing requirement in coastal states and RFMOs;
- a fisheries observer programme is implemented and coordinated with those operated by RMFOs or coastal states in which the fleet operates;
- unloadings are communicated and where appropriate authorized by the relevant authorities; and
- transhipments, transfers and landings are regulated, monitored and recorded in multilateral CDS, and this stop in the supply chain is overseen; authorization and reporting obligations with regard to first sales must therefore be in place and the authority must have operational access to the information.

For a CDS to be effective, catch certificates must be issued by the time a fishing vessel unloads its catch. Hence flag states should develop procedures for operators to complete the certificates and must verify certificates submitted to it before validating them.

At unloading, more than one buyer may acquire the products, initiating the first splits in the supply chain. Flag states must have monitoring procedures for these operations to ensure that the volumes are accurately accounted for, particularly if various certificates for a single landing are issued.

For flag states to comply with international law and CDS RFMO regulations, it needs to run a competent authority that:

i. has access to independent sources of information to run routine verifications that allow for cross-checking of the information on catch certificates;
ii. has a legal mandate to refuse validation of certificates where irregularities are detected and irreconcilable, and to impose strong sanctions; and
iii. allows its findings and reports to be used in evidence by the law enforcement arm of the fishery administration in cases against offenders.

The more efficiently flag states carry out their functions, the stronger the assurances that IUU catches are denied entry into supply chains.

4.2 COASTAL STATES AND BLOCKING CATCH CERTIFICATES

4.2.1 Fundamentals of coastal state responsibility

This section deals with coastal states – as distinct from flag and port states – in whose waters foreign fishing vessels may be authorized to make catches under a CDS.

International law provides that coastal states have the sovereign right and a duty to manage fisheries in waters under their jurisdiction.[47]

A good deal of IUU fishing is carried out by vessels registered in coastal states, particularly in the form of under-reported or misreported catch (FFA, 2016). In other cases fishing vessels registered elsewhere operate without the permission of coastal states or in violation of the terms of access granted by the coastal state.

Because fish stocks often migrate through waters under the jurisdiction of several coastal states or between areas under national jurisdiction, IUU fishing harms the interests of other countries and organizations. In view of the transboundary and straddling nature of many fish stocks, the sovereign rights of coastal states to manage fisheries in waters under their jurisdiction also implies a responsibility and a duty to manage fisheries in compliance with international management methods and standards.

A coastal state that does not have the capacity to harvest the total allowable catch of fish in its waters has an obligation under international law to grant access to fishers

[47] UNCLOS, Articles 61 to 64.

from other states.[48] When foreign vessels can operate in coastal state waters, it is the duty of that state and the flag states concerned to ensure that fishing is carried out legally and is monitored.

The rights and obligations of coastal states are set out in UNCLOS,[49] but in most CDS systems their rights are not currently represented. Coastal states may have no role in the CDS, or they may have no capacity to object to the validation of catch certificates by flag states. It follows that catch certificates can be issued and validated by a flag state for catches in its waters even if the coastal state suspects infringements, and opportunities to address the issue with the parties concerned before unloading and first sale into the supply chain are hence denied.

4.2.2 Ideal coastal state configuration

The following requirements for good governance of fisheries in coastal states are generally recognized: i) a strategy for effective fishery management; ii) adequate laws and sanctions; and iii) cooperation with the appropriate RFMO and other regional and international fisheries bodies, particularly when it comes to licensing and access agreements for foreign fleets.

In many coastal states the fisheries sector is considered a joint responsibility of the private sector and the government. This is recognized in law in some cases in the creation of statutory committees for management, licensing and appeals whose members include representatives from the fisheries sector. In Fiji, Papua New Guinea and the Republic of the Marshall Islands this has been extended to the creation of semi-autonomous fishery management authorities acting under joint industry and government boards of control.

In discharging their obligations with regard to fishing vessels, coastal states do not automatically act as flag states. Coastal states must therefore create tools and mechanisms that enable it to collect information from and oversee foreign fishing fleets operating in their waters. These must be part of a robust regulatory framework and a capable fishery administration. The following sub-sections deal with the main elements to be handled by coastal states.

4.2.2.1 Management regimes and RFMO participation

Given that many of the requirements described above must be established in respectful cooperation with other flag and port states participating in the same fishery, particularly when transboundary stocks are involved, the participation of coastal states in RFMOs is vital. This includes the capacity to incorporate CMMs adopted by the RFMO into national legislation and regulatory frameworks and to implement them.

Because multilateral CDS initiatives are RFMO-driven, the participation of coastal states in RFMOs is the only way to ensure that their rights are fully taken into consideration. This may require the enhancement of its technical and administrative capabilities to formulate and implement fishery management plans and assess the need for follow-up action, because fishery management is a process that evolves in response to changing circumstances.

4.2.2.2 Licensing and access agreements

Vessels operating under coastal state jurisdiction must be licensed and must comply with the responsibilities of license holders or operators with regard to national laws and conservation and management measures.

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[48] UNCLOS, Article 62.

[49] See: *Bernaerts' Guide to the United Nations Convention on the Law of the Sea* – http://www.bernaerts-sealaw.com/EEC-Fisheries.pdf

A common approach is to make access subject to agreements with flag states that detail the responsibilities of a flag state with respect to fishing by vessels flying its flag. Such agreements should at least commit flag states to penalise any of its vessels that violate the terms of access, and could also commit flag states to:

- assist MCS work by coastal states;
- make violation of coastal states' fishing restrictions a violation of flag state laws; and
- remit to coastal states any fines that flag states collect for fishing violations committed by its vessels in coastal state waters.

Access agreements of this sort can foster partnerships between coastal and flag states for preventing, deterring and eliminating IUU fishing. To be effective, however, any access agreement should only provide access for vessels registered in the state seeking access.

Another approach is to require a standard regional approach governing coastal states that grant access to foreign fleets. Its effectiveness depends on regional cooperation and cohesion and central administration. Box 2 describes the Pacific Islands Forum Fisheries Agency (FFA) harmonized minimum terms and conditions for access by foreign fishing vessels, which are implemented by its 17 members.

4.2.2.3 MCS

Coastal states must use the various tools at their disposal to control fishing by vessels granted access to their waters, notwithstanding any access agreement with a flag state. The tools may include:

- keeping a record of foreign flag fishing vessels authorized to fish in waters under their jurisdiction;
- verification that flag states have authorized vessels to fish in waters beyond their jurisdiction before granting access;
- VMS and logbook regimes that are effectively enforced; and
- licensing conditions that require vessels to submit logsheets or e-Reports.[50]

Individual coastal states may have legal and enforced fisheries observer programmes requiring vessels, or a certain percentage of them, to carry independent observers.

Box 3 describes the cooperation between an RFMO, a regional fisheries organization and individual states operating observer programmes in the WCPO. Similar programmes are under way in the Indian Ocean under the aegis of the Indian Ocean Commission.

4.2.3 Coastal state CDS support mechanisms

Table 3 shows the main supply chain stops, CTEs and KDEs in a typical supply chain overseen by a coastal state. These are the harvesting event and any objection to the issue and validation of a catch certificate.

4.2.3.1 Monitoring harvesting operations in the EEZ of coastal states

Before fishing starts the coastal state must create and maintain a record of authorized foreign-flag fishing vessels in waters under its jurisdiction, and ensure that they are controlled by their flag state. This process starts with pre-fishing inspections of the vessels by the coastal state authorities, either at the vessel's home port, a port in a third-party port state or the coastal state.

These inspections involve checking a vessel's ID and operational capabilities against the documentation presented for licensing. If compliance is proven, licences are issued and the vessel is bound by the licensing conditions, which may include:

- communication of location and EEZ entry and exit times; and
- VMS, AIS and logbook regimes enabling coastal state oversight using data legally submitted by masters in logsheets or e-Reports.

[50] Such as electronic logsheets transmitted in near real time to the fisheries administration.

BOX 2

Cooperation among coastal states in the Western Central Pacific Ocean (WCPO)

Through the Forum Fisheries Agency (FFA), the WCPO coastal states have created a regional register and established harmonized minimum terms and conditions for foreign fishing vessel access. Provided a vessel meets the requirements laid out in the registration application including proof of a type approved MTU, a foreign fishing vessel in the FFA regional register automatically obtains a "good standing" status. Should it lose its good standing as a result of violation of conservation and management measures of any FFA member, the vessel will be denied access to the waters under the jurisdiction of any other FFA member. This creates a powerful incentive for compliance.

The FFA regional register recognizes that most fishing vessel operators wish to operate in waters under the jurisdiction of more than one FFA member.

FFA members undertake to ensure that any access agreements they negotiate will include all the requirements in the harmonized minimum terms:

- no foreign vessel will fish in a member state's EEZ unless a standard licence is issued;
- purse seine transhipments at sea are prohibited; they are permitted only in designated ports; longline vessel transshipments can occur at sea, subject to application and approval by the licensing state;
- foreign fishing vessels must release logbooks and catch records to officers from the licensing state;
- vessel operators must maintain and submit catch logs for operations in an EEZ and adjacent high-seas areas; these must be released to the licensing state within 45 days of any fishing trip;
- vessel operators must provide regular catch records for the licensing state while operating in any EEZ;
- vessel operators must carry observers to verify reports; they must have access to appropriate parts of the vessel and must record their observations;
- vessel operators must maintain a local agent;
- fishing gear must be stowed while transiting an EEZ;
- vessel operators must comply with the orders of licensing states;
- operators must mark their vessels in accordance with the FAO Standard Specification for the Marking and Identification of Fishing Vessels; and
- vessel operators must register automatic location communicators on the VMS Register of Foreign Fishing Vessels.

If it is impractical or unsafe to deploy observers, e-Monitoring systems can be used. Box 4 describes e-Monitoring in the WCPO.

These capabilities enable coastal states to oversee the legality of catches in their jurisdiction. Their enforcement capacities, however, are limited when vessels unload in other jurisdictions with which the coastal state has no formal linkages.

4.2.3.2 Blocking certification

Even though coastal states' rights and duties are enshrined in international law, mechanisms reflecting their rights are absent in current CDS.

The Pacific Island countries defended coastal states' rights in international fora, not least because unilateral schemes affecting them directly ignore their rights and their natural role in certification and validation.

It is essential that coastal states help to determine which catch certificates can be validated on the basis of information they collect about foreign fishing operations in

BOX 3
Observer programmes in the WCPO

The WCPFC CMM 2007-01 establishes the WCPFC regional observer programme to collect verified catch data, scientific data and information related to the fishery from the convention area, and to monitor the conservation and management measures adopted by the commission.

Each member and cooperating member of the commission must ensure that vessels fishing in the convention area accept an observer from the regional observer programme if required, except for vessels that operate exclusively in flag state waters. The members and cooperating members are responsible for providing observer coverage as required by the commission, and source observers for their vessels. The requirement is for 100% coverage of purse seine vessels and 5% for longline vessels.

The WCPFC has adopted standards for the formation and operation of observer programmes that wish to be part of the regional observer programme. The commission adopts the minimum data fields that regional observers need to collect on long liners and purse seiners, including information from fish aggregation devices. The format of the data fields is at the discretion of the observer providers, but a likely choice is the Pacific Community (SPC)/FFA harmonized format used by a number of programmes.

All FFA member countries have trained observers, and de-briefers who check the observers' data on their return to port. The observer and debriefer training is formalized under the framework of an FFA region-wide standards-based training program. Observers are trained to participate in both scientific and compliance monitoring.

BOX 4
e-Monitoring initiatives in the WCPO

An electronic monitoring system consists of a control centre connected to closed-circuit cameras, global positioning system receivers, fishing gear and engine sensors that record the use of fishing gear and a communications unit (FFA, 2016). The cameras and sensors are a "closed system" in that they do not allow external or manual inputs or manipulation of stored data.

The systems are designed to complement or substitute observers when they cannot be deployed.

Since 2013 the Oceanic Fisheries Programme of the SPC and the FFA have been collaborating with member countries' fishery authorities, international, regional and non-governmental organizations, technology service providers and the fishing industry with a view to implementing e-Monitoring and e-Reporting technologies in the WCPFC. Different systems have been tested, with the data being presented in a format that is compatible with SPC and WCPFC requirements.

The Solomon Islands will increasingly require e-Monitoring systems on fishing vessels as part of its coastal state licensing conditions for longline fleets, commencing in 2017.

their EEZ – which is often available to them alone. A new mechanism is required, but it must be grounded in the monitoring by coastal states of foreign fishing operations in their EEZ.

When a commercial fishing vessel is nearing the end of its trip and the certificate is being logged on the CDS platform, all coastal states in whose EEZ the vessel has been operating should be notified that the certificate is being applied for. Some coastal states may be overburdened by the tasks of reviewing and verifying every catch certificate,

TABLE 3
Supply chain points, CTEs and KDEs at the coastal state level

 Coastal State supply chain segment			CDS		Coastal state	
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data Source**	**Notes**
Harvesting	Fishing vessel (access/permission to fish)	Unique fishing vessel ID	Covered	If possible standard under international maritime organization rules	Vessel registration	Pre-fishing authorization checks Note: normally provided by flag state but can be confirmed by coastal state
		Fishing vessel licence information	Covered	As issued by coastal state and/or RFMO	Licensing	Licensing checks
	Fishing (licensing conditions)	Catch areas	Covered	Some provide for general catch area identification	VMS/AIS/logbook and inspections	Confirming EEZ; FAO fishing area
		Start and finish dates	Covered	Only for catch to be unloaded	Reporting/logbook	Catch dates. Zone entry/exit monitoring/sea patrols
		Observer ID, if applicable	Not covered	Coded identification	Observer report to coastal state and/or RFMO	Reception of reports/debriefing of Observers Note: Observer programmes differ in terms of oversight entities
	End of fishing trip (reporting)	Type of unloading	Covered	Distant water fleets fishing in a coastal state EEZ do not normally notify future unloading as they exit the EEZ; information would be received later	Catch certificate/ reporting/logbook	Under the PSMA, the port state should notify the coastal state and others when violations are established
		Species and product type	Covered			
		Estimated volume(s)	Covered			
Catch certification	Catch certificate validation request	Validation/ rejection	Not covered	The coastal state has no monitoring or validation function under any CDS	Catch certificate	All the above are used to establish the legality of operations in coastal state waters

* For an exhaustive list of KDEs, see: FAO Technical Paper 596, Chapter 7, Table 11.

and counter-validating them in real time to enable transhipments, landings and trade to proceed.

The best option would therefore be a system of "non-objection" with regard to validation of catch certificates by coastal states. In such an arrangement, catch certificates validated by a flag state for catches harvested at least in part in a coastal state EEZ trigger an automatic notification to the coastal state, which has the option of reviewing the certificate: if it has no objection within a set period of time, no action is required and validation by the flag state stands. If the coastal state suspects an infringement, however, it can block the certificate in the system, bring the matter before the parties concerned and investigate the suspected IUU fishing event.

4.2.4 Institutional and sanctions framework

The UNCLOS recognizes the right of costal states to regulate fishing by other states in their EEZ[51] under their own laws and enforcement procedures.[52] Paragraph 51 of the IPOA-IUU, for example, requires coastal states to undertake "effective MCS of fishing activities in EEZ."

The effectiveness of MCS depends on broad-based monitoring of fishing and investigation of possible infractions, with sufficiently severe penalties. A coastal state MCS will address some of the following:

- ensuring that fishery administrators and enforcement officers can exercise the powers available to coastal states under international law: this usually involves powers of enforcement[53] under domestic law and the procedures whereby costal states grant authorization to fish;
- supporting regional and international cooperation to reduce IUU fishing, including measures to support the enforcement of CMMs in areas under the jurisdiction of other states;
- defining the mechanisms to be used by licensing units for foreign vessels and units in charge of MCS activities, using information from monitoring and surveillance, and maximizing transparency; and
- ensuring the existence of deterrent sanctions and extending the range of compliance mechanisms available to enforcement officers.

Applying sanctions that reflect the seriousness of the offence and the value of the catch concerned is in principle one of the best tools for enforcement.

For many coastal States, however, the issue of sanctions is complicated – especially in situations where enforcement capacities are limited and where much of the unloading of catches occurs in other jurisdictions. Regional cooperation with other port and flag states, with the capacity to act on behalf of others with regard to law enforcement, is a substantial asset for a coastal state in terms of enforcement capacity. If a coastal state acting within the remit of a CDS can block catch certification (see Section 4.1.2), the standing of coastal states would be much enhanced.

4.2.5 Summary of coastal state CDS support mechanisms

Although international law provides that coastal states have the sovereign right and duty to manage fisheries in waters under their jurisdiction, their role in current CDS is minimal.

Vessels registered in coastal states or foreign vessels operating in the coastal state's waters may fish illegally; it is the duty of coastal and flag states to ensure that fishing operations are legal and monitored.

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[51] UNCLOS Art. 61, para. 2–3; Art. 62, para. 1.
[52] UNCLOS Art. 62, para. 3.
[53] UNCLOS Art. 62, para. 3 ; Art. 69; Art. 70.

Access for foreign vessels is to be established in a supportive manner with other flag and port states in the same fishery, particularly if trans-boundary and straddling stocks are involved. Participation by coastal states in RFMO decision-making and the incorporation of the resulting CMMs into their legal frameworks is a basic way in which coastal states can control the operations of foreign vessels in the way flag states do.

Coastal states need to optimize their capabilities because fishery management evolves in response to changing circumstances. They need tools that allow them to collect timely information and to oversee fishing fleets operating in their waters.

The most common approach to access is through fisheries agreements between coastal and flag states that set out the terms and conditions of individual fishing permits, and definition of the obligations of flag states with respect to fishing operations carried out by their vessels.

Coastal states need the capability to manage fishing operations in their waters. From a CDS perspective, the coastal state's CTEs and main KDEs relate to fishing operations. From the point of view of international law, it is desirable that their powers to object or agree to the issue and validation of catch certificates be given full consideration in current and future CDS.

The licences issued by coastal states impose operational conditions on vessels operating in their waters: these establish the legality of catches. MCS tools such as VMS, logbooks and zone entry and exit conditions, supplemented by an observer or e-Monitoring programme, enable a coastal state to determine the legality of harvests in waters under its jurisdiction.

The enforcement capacities of coastal states are limited, however, in cases of suspected infringements, particularly when vessels unload in jurisdictions outside a coastal state.

It is hence essential that coastal states participate in decisions as to the validation of catch certificates on the basis of their control of foreign fishing operations in their EEZ. A possible mechanism is to notify all coastal states in whose EEZ vessels have been operating that a fishing vessel is nearing the end of its trip and that the catch certificate is being applied for. A simple option is to introduce a "no-objection" mechanism with regard to coastal states' validation of catch certificates.

When a catch certificate is validated by a flag state for catches taken at least in part in a coastal state's EEZ an automatic notification is triggered in the coastal state, which then has the option of cross-checking the certificate against evidence collected by the coastal state. If it has no objection as to the legality of the operation, no action is required.

If a coastal state suspects that infringements have been perpetrated, it can block a related certificate in the system, investigate suspected IUU fishing and bring the issue to the parties concerned, and act as required. If the issue is resolved, the certificate is issued; otherwise the certificate remains blocked and sanctions are applied.

For many coastal states the issuing of sanctions is complicated, especially where enforcement capacities are limited and where much of the unloading of catches takes place in other jurisdictions. Regional cooperation with other port and flag states is the best way of optimizing the enforcement capacities of coastal states.

Coastal states participating in CDS need to be provided with a tool to compensate for their current lack of statutory enforcement powers to block the validation of catch certificates.

4.3 PORT STATES AND LANDING VERIFICATIONS

4.3.1 Fundamentals of port state responsibility

Fishing vessels bring their catch to port for landing directly as catchers or indirectly as reefers. The port is the point at which fisheries products move from the seaborne to the land-based supply chain. Few other points are as important for a CDS.

This section deals with ports as landing places for fisheries products, and hence the last stop in the fishing segment of a supply chain as recorded on catch certificates and the point of finalization or counter-validation of catch certificates. Section 3.5 on processing states also covers ports as the first stop in a national supply chain – involving warehousing, internal distribution and processing – from which products flow into processing facilities. These movements are not traced by current CDS, yet they are the most important in country-level traceability in support of CDS. It is hence useful to clarify the facets of in-port transactions discussed here, and those discussed elsewhere.

The 2009 PSMA requires port states to designate their fishing ports as the ports to which fishing vessels are limited. The PSMA requires that foreign fishing vessels must be consistently monitored in such ports, and that full dockside inspections must be carried out. The inspections should obviously not be limited to foreign fishing vessels even though in practice they are a particular concern, because port states and flag state are distinct entities in this respect and because the fishing operations are at least part conducted in distant waters. This complicates oversight by flag states, and increases the relevance of port states with regard to foreign fishing vessels.

International law recognizes that states have full sovereignty with respect to ports in their territories, and a state may:

- deny port access to vessels registered in other states;
- prohibit vessels registered in other states from landing or transhipping fish in its ports;
- require vessels seeking port access to provide information as to their identity and activities; and
- inspect vessels that are voluntarily in one of its ports.

The 2009 PSMA, which came into force in 2016, was developed to promote compliance with fishery conservation and management measures; it resonates with the operation of CDS. The use of port state measures to enforce domestic and international fishery laws is now understood as a right and a duty of port states.

In port, fishing vessels can be fully overseen because they are close to land-based facilities, and the authorities can access the vessels themselves. It is largely the quality of port state monitoring and the work of its port-based fisheries officers that determine the risk of illegally sourced fish entering the land-based supply chain.

Port states must hence be in a position to monitor all fishery transactions in its ports – mainly landings and transhipments – and subject selected transactions to full-scale inspections.

4.3.2 Ideal port state configuration

It follows from the previous sub-section that port states need a system that enables them to oversee in-port transactions of visiting fishing vessels and to detect IUU operations and their related products if they are to carry out their duties in a CDS. This sub-section considers port state configuration from a CDS perspective. A port state constitutes the last line of defence in terms of detecting infringements and denying certification of IUU-derived catches and preventing their entry into land-based supply chains.

Once a flag state and a port state have signed off a catch certificate and authorized a landing, the catch certificate stands and the product enters the land-based supply chain and the market: money changes hands, and any chance to deny market entry

to IUU-derived product is lost. From here on it is a matter of accounting and determining the form in which product certified under a particular certificate flows through the supply chain to the consumer. Falsely certified and landed IUU products no longer have to be laundered into the supply chain because: i) they have obtained official validations from flag, coastal and port states that the product is legal; and ii) product derived from an illegal fishing operation cannot normally be identified further down the supply chain.

4.3.2.1 Port state control contacts, cooperation and communication

The first element in effective management of fishing ports is to ensure that all parties can make contact with port state authorities. Operators who witness infringements may have important information to communicate with regard to fishing vessels intending to visit particular ports.

Clearly this can only happen if port state authorities in charge of fishery law enforcement are easily identified and contacted by third parties.[54] Of the webpages hosting hotline contacts for fisheries law enforcement in Australia, Norway and the Seychelles, the first provides the best example of best practice in providing contact information, to the extent of enabling witnesses to submit photographic evidence.[55]

When port states establish that infringements have been perpetrated by foreign fishing vessels and deny them port access, they should send the details to the flag states concerned and related parties such as coastal states and RFMOs.[56] Port states should also communicate inspection results[57] and the activities of foreign vessels to flag state and RFMOs.[58] Such reciprocal communications among port states and other parties are an essential element of port state actions.

Box 5 describes a recent collaboration among flag, coastal and port states that led to the sanctioning of an IUU fishing vessel off the east African coast.

4.3.2.2 Designated ports

To administer fishery law enforcement effectively, ports to be used by fishing vessels should be so designated, in line with the 2009 PSMA.[59] All non-designated ports are off-limits to fishing vessels and may only be used in cases of *force majeure*. Once ports are designated, fishery administrations must develop a suitable monitoring and inspection framework for fishing vessels moving in and out of ports.[60]

The monitoring framework must aim to record at least all inbound and outbound vessel movements and to gain prior knowledge of the activities vessels are planning when entering or leaving port (see also 4.3.2.3).

In the absence of designated ports, and in countries with large fishing fleets and numerous ports along busy coasts – Indonesia is a good example – control over

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[54] In 2016, when searching online for "fishing port fisheries monitoring surveillance centre contacts hotline" the following countries appeared with links to fishery monitoring centres and law enforcement units: i) the Seychelles; ii) Norway; and iii) Australia. No other relevant country pages or links appeared in the first 50 hits.

[55] See: http://www.afma.gov.au/monitoring-enforcement/report-illegal-fishing-activity/

[56] See PSMA, Article 8bis, Paragraph 2.

[57] See PSMA, Article 14 Transmittal of inspection results.

[58] See IPOA-IUU, Paragraph 58.

[59] PSMA, Article 7 Designation of ports:
i) Each Party shall designate and publicize the ports to which vessels may request entry pursuant to this Agreement.
ii) Each Party shall, to the greatest extent possible, ensure that every port designated and publicized in accordance with Paragraph 1 of this Article has sufficient capacity to conduct inspections pursuant to this Agreement.

[60] IPOA-IUU, Paragraph 57: States should publicize ports to which foreign flagged vessels may be permitted admission and should ensure that these ports have the capacity to conduct inspections.

BOX 5
Alerting port state authorities

In 2015 the Greek-owned Belize-flagged fishing vessel *Greko 1* was inspected while offloading in Mombasa, Kenya, and was found to have demersal fish caught off Somalia in its hold. Kenya requested confirmation from Somalia as to the validity of the licence. By the time the response was received stating that the licence was forged, *Greko 1* had been authorized to offload.

In June 2016, Somalia attended its first FISH-i Africa Task Force meeting and discussed the *Greko 1* case with officials from Kenya. FISH-i Africa is a partnership of eight western Indian Ocean countries, bringing together national enforcement authorities, regional organizations and international technical and legal experts to combat large-scale IUU fishing in the western Indian Ocean area through information-sharing and regional cooperation.

In September 2016, *Greko 1* again requested port access to offload in Mombasa, but was denied entry because of suspected IUU fishing. The vessel then sailed to Mogadishu where an inspection by Somali officials confirmed that IUU fishing had taken place.

Greko 1 fled detention in Mogadishu in early October 2016, with 30 mt of high-value IUU fish. It docked in Mombasa after claiming *force majeure* on 18 October. Contact was established between Kenyan fisheries officials and the Ministry of Fisheries and Marine Resources in Somalia, followed by a joint inspection. Charges were filed and a settlement was reached with the vessel owner for payment of a fine of US$ 65 000.

The Federal Ministry of Fisheries and Marine Resources praised the cooperation between Somalia and Kenya and expressed gratitude for the support provided by the vessel's flag state.

Source: FISH-i Africa Task Force.

fishing vessels and their operations may in practice be extremely difficult. From a CDS perspective it is essential that fishing vessels unload in designated ports staffed by competent authorities that can exercise oversight, so that attempts at landing CDS-covered IUU products are detected.

4.3.2.3 Prior notification or advance request to enter port

Prior notification of port state authorities is a matter of the vessel master announcing his intended arrival at a given port and requesting permission to enter. Required notification times range from 48 to 72 hours before arrival. PSMA Article 8 – Advance request for port access[61] builds on IPOA-IUU Paragraph 55.[62] Article 6 of the 2008 EU IUU Regulation also provides an example of this type of regulatory mechanism in a CDS context.

[61] Article 8 Advance request for port access:
i) Each Party shall require, as a minimum standard, the information set out in Annex A to be provided before granting entry to a vessel to its port.
ii) Each Party shall require the information referred to in Paragraph 1 of this Article to be provided sufficiently in advance to allow adequate time for the port state to examine the required information.

[62] IPOA-IUU, Paragraph 55: Prior to allowing a vessel port access, states should require fishing vessels and vessels involved in fishing related activities seeking permission to enter their ports to provide reasonable advance notice of their entry into port, a copy of their authorization to fish, details of their fishing trip and quantities of fish on board, with due regard to confidentiality requirements, in order to ascertain whether the vessel may have engaged in, or supported, IUU fishing.

Prior notification enables authorities to examine vessel details and paperwork such as catch certificates and to decide if an inspection is warranted before catch is landed. This is the point at which to assess the risks inherent in assessments, because it is not usually possible to inspect all fishing vessels entering a port:[63] only fishing vessels with profiles suggesting above-average risk of attempting to land IUU-derived product should be inspected.

4.3.2.4 Port entry and landing authorization

Port states should make entry into ports and landings of products conditional on the granting of prior authorizations. PSMA Article 8bis details the duties of port states with regard to this.[64]

These authorizations ensure that the mechanisms to be applied in a CDS setting are actually in existence and can be implemented. In many respects they are the centrepiece of port state action to deter IUU fishing and ensuring that CDS achieve their goals. The mechanisms will deny landing permissions to fishing vessels suspected of IUU fishing or proved to have carried it out.

It is useless to establish a CDS to ensure that no products may be landed without catch certificates validated by a flag state when a port state where landings take place: i) has not designated its ports; ii) has no system for monitoring vessel movements in and out of its ports; and iii) has no legal means or operational routines to deny port entry or landing of suspected IUU products. These conditions must be in place in port states if the CDS is to work properly at this pivotal point.

4.3.2.5 Port inspection

The designated ports must have the capability to conduct vessel inspections. Sufficient numbers of trained fisheries inspectors[65] with law-enforcement powers must be present in all designated ports to handle inspections of fishing vessels in ports.

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[63] PSMA, Article 11 Levels and priorities for inspection.

[64] PSMA, Article 8bis Port entry, authorization or prohibition:

i) After receiving the relevant information required pursuant to Article 8, as well as such other information as it may require to determine whether the vessel requesting entry into port has engaged in illegal, unreported and unregulated fishing or fishing related activities in support of illegal, unreported and unregulated fishing, each Party shall decide to authorize or to prohibit the entry into its port by the vessel in question and to communicate this decision to the vessel or to its representative.

ii) In the case of prohibition of entry, each Party shall communicate its decision taken pursuant to Paragraph (1) to the flag State of the vessel and, as appropriate and to the extent possible, relevant coastal State(s), regional fisheries management organization(s) and other international organizations. The master of the vessel or the vessel's representative shall present the authorization for entry into the port to the competent authorities of the Party upon the vessel's arrival at port.

iii) Without prejudice to Paragraph 1 of this Article, when a Party has sufficient proof that a vessel seeking entry into its port has engaged in illegal, unreported and unregulated fishing or fishing related activities in support of illegal, unreported and unregulated fishing, in particular the inclusion of a vessel on a list of vessels having engaged in such fishing or fishing related activities adopted by a relevant regional fisheries management organization in accordance with the rules and procedures of such organization and in conformity with international law, the Party shall deny that vessel entry into its ports[, taking into due account Article 4(1bis)].

iv) Notwithstanding Paragraphs 1 and 3 of this Article, a Party may allow entry into its ports of a vessel referred to in those paragraphs exclusively for the purpose of inspecting it and taking other appropriate actions in conformity with international law which are at least as effective as denial of port entry in preventing, deterring and eliminating illegal, unreported and unregulated fishing and fishing related activities in support of illegal, unreported and unregulated fishing.

v) When a vessel referred to in Paragraph 3 or 4 of this Article is in port for any reason, the Party shall deny such vessel the use of its ports for landing, trans-shipping, packaging, or processing of fish or for other port services including, inter alia, refuelling and resupplying, maintenance and dry docking. Paragraphs 2 and 3 of Article 9 shall apply in such cases, mutatis mutandis. Denial of such use of ports shall be in conformity with international law.

[65] PSMA, Article 16 Training of inspectors.

Port states should collect the following minimum information during inspections[66] and automatically forward the findings to flag states and RFMOs:[67]

- the port, date and time of any inspection;
- the flag state of the vessel, and its identification;
- the name, nationality and qualifications of the master;
- authorizations for fishing and transhipments;
- type of fishing gear;
- catch on board – origin, species, form and quantity, and catch to be landed/ retained on board;
- total catch landed and/or transhipped; and
- inspection findings.

The information collected during a vessel inspection enables port states to determine whether vessels have engaged in or supported IUU fishing. If a port state suspects that a vessel in its port has done so, it must, in line with the IPOA-IUU, call on the port state: i) not to allow the vessel to land or tranship fish in its ports; and ii) to report the matter to the flag state immediately.

In some circumstances a port state may take additional action. If IUU fishing has taken place in waters under its jurisdiction the port state may apply its regulations as a coastal state, investigate the matter and prosecute and sanction offenders. Even where suspected IUU fishing may have taken place in waters beyond the jurisdiction of a port state, it may take action against the vessel and its operators with the consent of or at the request of the flag and/or coastal states concerned.

Port state controls do not necessarily entail significant resources, but they are a promising option for developing countries. Enforcement officials should at least board vessels, examine their logbooks and collect other information. This would not involve large costs, though it would require training in boarding and inspection techniques. This could be a useful focus for assistance to developing countries in this domain.

4.3.2.6 Importation

Importation is the act of importing fishery products into a territory by means other than a fishing vessel.[68] Means of transport can be container ships, trains, trucks or aircraft, and these products never transit through fishing ports: they will have been landed in a fishing port at an earlier time and probably in another territory. The importation of fisheries products is not therefore a responsibility of port states; it is a matter for market states.

4.3.3 Port state CDS support mechanisms

This section identifies supply chain points in the segment overseen by port states, and considers how they are covered by CDS and the ways in which they could or should be supported by port-state mechanisms.

Table 4 lists the relevant supply chain points, CTEs and KDEs. The table is split into two columns to show which CTEs and KDEs are covered by the CDS and which additional functions could or should be served by port states.

4.3.3.1 Harvesting: end of a fishing trip and port entry

CDS envisage the preparation of catch certificates, their submission to flag state authorities for validation and the submission of validated certificates to port state authorities prior to landing. The EU CDS mandates compliance with a prior notice under its unilateral CDS

[66] PSMA, Article 13 Results of inspections.
[67] PSMA, Article 14 Transmittal of inspection results.
[68] While the landing of fish in a foreign port constitutes a de facto importation from a trade perspective, it is dealt with as a landing from a fisheries and CDS perspective, and therefore the limits on the term "importation" apply as indicated above.

TABLE 4
Supply chain points, CTEs and KDEs at the port state level

Port state supply chain segment			CDS		Port State	
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data source**	**Notes**
Harvesting	End of harvesting operations/fishing trip	Prior notice	Not covered		Prior notice	PSMA procedures: documentary checks, authorization/refusal of port entry
		Catch certificate(s)	Covered		Port entry and unloading authorization/use of port under PSMA	Physical verification; remote access in case of e-CDS Catch Certificate verified against information in prior notice
Unloading	Transhipment	Carrier ID and licence	Covered	Issued by flag state	Port entry notice Unloading authorization Inspections	Should appear on RFMO white list
		Observer ID	Partially covered	Only recorded in CCSBT CDS		
		Date and name of port, or geographic coordinates	Covered			Designated port for fisheries activities
		Volume, form and species - estimated	Covered			Estimates verified by monitoring using crane scales Mate's receipt, hatch plan
		Catch certificate ID	Covered			
	Landing	Vessel ID and licence	Covered	Issued by flag state		Should appear on RFMO white list Must have licences for coastal states fished
		Date & name of port	Partially covered	Only recorded in CCAMLR CDS		
		Volume, form and species - estimated	Covered[1]	Before landing, weights are usually estimated		Physical inspection of vessel and catch Note: Level of inspection as per risk analysis
		Volume, form and species - verified	Partially covered	Only recorded in CCAMLR CDS		
		Catch certificate ID	Covered		Catch certificate	
		Name of first buyer	Partially covered[2]	Not recorded in EU and ICCAT CDS	Inspection Commercial invoice CDS	Inspection records/notifications

TABLE 4 (*cont.*)

Port state supply chain segment			CDS		Port State	
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data source**	**Notes**
Distribution	Factory/warehouse entrance	Verified net weight sold to individual buyers	Partially covered	Only recorded in CCAMLR CDS. In bulk landings, verified weights are only established during grading after landing	Factory/warehouse entrance records Commercial invoice On-site monitoring by fishery authorities	Full inspection if estimated/ verified differ substantially Monitoring records
	Further domestic distribution of products following first sale, and re-exports	Refer to processing or end-market state tables				

* For an exhaustive list of KDEs, see: FAO Technical Paper 596, Chapter 7, Table 11.

[1] Only the CCAMLR and EU CDS refer to "estimated" and "verified net" weights in their catch certificates. No such references appear in ICCAT and CCSBT certificates. In the EU CDS, the catch certificate provides for the filing of verified weights, but there is no procedure for adjusting or completing after landing a catch certificate validated prior to port entry on the basis of estimated weights.

[2] Only the CCSBT catch certificate – the catch monitoring form – is designed to record splits at this level on the certificate; ICCAT and CCAMLR require photocopies of catch certificates to account for splits. Note that these are pre-2016 systems.

for landings in EU ports. Multilateral CDS require a catch certificate at or close to the time of unloading, but generally do not provide for prior notice.

Without systems for prior notice, port entry and landing it is difficult to manage and control the movements of fishing vessels in and out of ports (see Section 4.3.2). Port states participating in a CDS should therefore have, as a minimum, the following elements in place:

i. designated ports to which fishing vessel movements and operations are limited;
ii. a system of advance request for port entry and landing, with a verification and authorization procedure; and
iii. trained fisheries inspectors at the ports.

Catch certificates received from an agent or catch certificate ID numbers that enable access in online CDS registries should be verified at the time of prior notice and compared with the information in it. The PSMA provides guidance for prospective port states as to the information to request in a prior-notice procedure, including CDS-related information.

If verifications indicate suspected IUU fishing, port states must be in a legal position to refuse port entry, and, if suspicions arise after a vessel inspection in port, to refuse landing operations and access to port services.

These port-specific control and management measures are not pre-packaged in a CDS. Port states themselves must develop them in accordance with international fisheries law such as PSMA and RFMO CMMs,[69] whether port states are party to the RFMOs or not. Port states should therefore develop systems for advance requests for port entry to support CDS, of which they are a critical element.

4.3.3.2 Unloading: transhipments in port

During transhipments catch certificates are handed from fishing vessel masters to reefer masters. They must generally be counter-validated by the port states in whose port the transhipments takes place; counter-validation by the reefer's flag state is generally not required.[70] This applies in unilateral and multilateral CDS.

The port state is thus the designated authority under a CDS to ascertain that the declarations regarding transhipments and the information recorded in catch certificates are true.

With regard to in-port transhipments, the port authority must consider the following when authorizing and monitoring these operations:

- Is the fishing vessel preparing to tranship authorized to operate in the fishery from which catches originate – flag state/RFMO?
- Are there any reasons to suspect that IUU fishing has occurred?
- Is the reefer authorized to operate in the fishery from which it takes catches?
- Is the reefer complying with RFMO transhipment rules?
- Are the transhipped species, volumes and product types identical to those declared in the catch certificate?
- Has the catch certificate been validated?

It is clear that: i) port state oversight of in-port transhipments requires sound understanding of the fishery and the relevant regulations; and ii) port state action is largely limited to standard MCS and inspection functions.

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[69] See, for example, IOTC Resolution 16/11 – *Port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing*.

[70] A weakness of current CDS is that catch certificates are not counter-validated by the flag states of carrier vessels, and the reefers' ports and dates of landing are not recorded in all schemes. The verification frameworks and records for transhipped catches are clearly less robust than those for directly landed catches

4.3.3.3 Unloading: first buyers and verified weights

Landings are also carried out by reefers, with the difference that whereas fishing vessels land their own catch, reefers land catch from other fishing vessels. Reefers must be able to separate the catches of individual fishing vessels in their holds. Landings by reefer are more complex than those of fishing vessels: reefers land the catches of individual fishing vessels sequentially, and the operations take much longer. Landings from large deep-sea trawlers or tuna purse seiners can also take several days.

In regular fishing vessel landings, port state inspectors ensure that authorization to land fish is only given if they are confident that the fishing operations were legal. In any case authorization should not be granted before all paperwork has been received and processed.

The same applies to reefers, with the difference that the process is more complex, and that more paperwork is submitted. Each fishing vessel submits catch certificates and other documents and the verification take more time.

If there is no suspicion that an attempt is being made to land IUU fish, there are two things to be overseen by port state authorities: i) the actual weights of each species and product landed must be verified; and ii) the buyer(s) of the products must be identified.

Establishing actual and verified weights landed involves recording the weights "on landing site" or "off landing site" in locations such as cold stores or processing establishments. This is the first occasion when accurate actual weights can be verified by species and product type. Normally, fishing vessel crews and buyers' agents work together to establish the weights, because payments for products received are based on the weights thus established. The presence of officials is essential to avoid laundering during this process and to verify that the correct weights enter the supply chain.

If road transport is involved from port to factory, the risk of laundering in transit must be assessed. Assurances are often provided in the form of padlocked and sealed trucks, or of truck weights recorded as they leave the port and as they enter factories. Final weights may be established in port directly after landing, but final grading of bulk products and their final weights may only be established at factories buying the product, which may be located at considerable distances from ports.

Landings can be made into trucks, containers or dockside bins and transferred immediately to in-port warehouses; a single landing may involve a mix of these. Port state authorities must be able to oversee single landings, know which means of transport and storage are used, and sum all transactions to their full landing equivalent. This is to establish confidence that no product has been mixed or made to "disappear" in the process. In busy ports this is a major challenge requiring sound planning, reporting and oversight.

Most current CDS do not provide for the establishment, recording and counter-validation of verified weights.[71] These may be less important in fisheries where fish processed at sea are landed in standard-weight cartons – and the weight recorded in the catch certificate is close to the weight verified on land. But they are important in other fisheries such as tuna purse seine operations: bulk tuna of different species is landed and estimates of species mix and volume are provided by vessel masters and validated by flag states. But the weights are almost always under-estimated, and the estimated species mix is often wrong. It follows that a factory buying a full landing without adjusting the certificate for verified weights will be "short of catch

[71] A protocol in the CCSBT and ICCAT CDS establishes the verified weight of live tuna transferred to fattening farms, because the fish are transferred live and the volume cannot be estimated in the usual way. But the EU, ICCAT and CCSBT schemes have no mechanism for establishing verified landed weights.

certificate" in respect of the entire volume acquired and will not be able to export all of it legally.[72]

4.3.3.4 Unloading: laying the foundation for traceability

Establishing the accuracy of verified weights of landed catch is critical in a CDS: it is one of two data groups that constitute the initial KDEs of the land-based and country-level traceability of fisheries products, which acts in support of CDS but is not provided by the CDS itself.

The second set of KDEs supporting traceability consists of the data identifying the first buyer. In the common case of several buyers, it is also the first split in the supply chain. Ideally the amount bought by each buyer and the buyer's identity are recorded on the catch certificate passed to the buyer with CDS-covered products.

In the new CCAMLR e-CDS there is a procedure for accommodating this first split that records buyer-specific weights in numbered copies of the original catch certificate.[73] The model catch certificate in FAO TP596 on tuna CDS design[74] (Hosch, 2016a) is based on the CCAMLR certificate for this element. In all other schemes, separate catch certificates have to be issued before flag state validation for the first buyer: these list the estimated portion to be sold to all buyers, and the sum of the certificates accounts for a complete unloading.[75]

The identification of first buyers is not provided for in this way in the ICCAT and CCSBT schemes, however, and the mechanism ceases to work when catches are transhipped and the first and final buyers are unknown to the master of the fishing vessel. The CCAMLR approach of identifying the first buyer and the verified product purchased, with counter-validation by the port state is the only viable approach whereby a CDS can accommodate all supply chain permutations at this point.

The CCAMLR scheme therefore facilitates the work of port state authorities, whereas in the other CDS they are not asked for counter-validation and the data – which constitute the foundation of mass-balance traceability – have to be acquired and logged by other means (see also Section 3.5).

4.3.4 Institutional and sanctions frameworks

Port state control authorities should be aligned with national fishery administrations and the authorities responsible for MCS. In some countries – notably in Asia – where private operations ranging from factory-owned piers to entire port facilities are common, port state authorities may not even have offices at fishing ports and their powers of oversight over in-port fishing transactions can be weak.

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[72] Tuna processors in the Indian Ocean pointed this out in2011 to the EU Commission, which ordered that catch certificates be issued and validated only after the landing and grading of purse seine catches.

[73] In the current e-CDS a single catch certificate is issued for the whole catch, and several copies are created listing individual buyers. If a catch certificate identifies a single buyer it is designated AR-17-0001-E; if it is for three buyers the documents are numbered AR-17-0001-E/1, AR-17-0001-E/2 and AR-17-0001-E/3.

[74] See Annex I of FAO TP596.

[75] A major opportunity for fraud and product laundering under the EU catch certification scheme arises because buyers of portions of landings receive copies of full catch certificates covering all unloaded product, not just the product acquired individually. In the absence of a central CDS registry that logs first buyers and the portions they bought, buyers can source product from non-originating sources and launder them into the supply chain under the portions of these certificates which they never physically acquired.

Coordination and automated information exchange between port state inspection and the administration responsible for MCS are essential. The issue of port state authority and coordination at the national level is also addressed in the PSMA.[76]

A sanctions framework is partly provided by CDS. Refusal to countersign a catch certificate, for example for a transhipment or a first buyer, automatically voids the legality of the catch certificate and the operator will not be able to sell the products legally, thereby extinguishing their value. Failure to countersign a certificate hence amounts to a financial sanction equal to the value of the products to be unloaded.[77]

The other options are to deny port access to fishing vessels suspected of IUU fishing, or to deny landing authorizations and access to port services. Such sanctions constitute substantial losses for illegal operators, and there are also economic consequences in terms of delays for carriers, incomplete orders, loss of trust and in many cases financial penalties associated with incomplete volumes under contract.

If port states deny validations and authorizations in combination with effective inspections, they will make a major contribution to preventing IUU fishing products from entering their territories and land-based supply chains.

Additional forms of law enforcement such as prosecution in the courts may be regarded as a bonus, in spite of the costs involved. In developing countries the two most basic elements of CDS and PSMA implementation – denial of validation and denial of authorization to unload – amount to modest investments in terms of legal involvement and training for officials, and may be the most practical course of action to consider.

4.3.5 Summary of port state CDS support mechanisms

Under international law port states have the authority to impose conditions on entry to ports by foreign fishing vessels, and under the 2009 PSMA foreign fishing vessels must be monitored and inspected in designated ports. No other point in the supply chain is more important in a CDS than the port because it is the point where products transit from the sea-borne into the land-based supply chain.

Port states must therefore consider the following mechanisms:

- Two-way communications are essential for acquiring information about vessels using or intending to use port facilities; communications with flag states and parties such as coastal states and RFMOs are also required.
- Specific fishing ports for foreign fishing vessels must be designated, and their use made mandatory; this enables effective oversight and is fundamental in a CDS.
- Inbound vessels must formally request port entry to enable resources to be allocated for port procedures, vessel inspections if required and processing of catch certificates and other paperwork.
- A system of authorizations for entering ports and unloading should be in place to ensure that permissions are denied in cases of suspected or established IUU fishing.
- When inspections are required, trained fisheries inspectors with law-enforcement powers must be available.

[76] PSMA, Article 5 Integration and coordination at the national level. "To the greatest extent possible, parties shall: (a) integrate or coordinate fisheries related port state measures with the broader system of port state controls; (b) integrate port state measures with other measures to prevent, deter and eliminate illegal, unreported and unregulated fishing and fishing related activities in support of illegal, unreported and unregulated fishing, taking into account as appropriate the 2001 FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing; and (c) take measures to share information among relevant national agencies and to coordinate the activities of such agencies in the implementation of this Agreement."

[77] This also addresses one of the central problems of many sanctions, which is that they do not match the profits derived from of IUU fishing.

- Standard inspection information must be recorded, in accordance with PSMA and/or RFMO rules.

Certain supply chain points overseen by port states are particularly important in the operation of a CDS:

- End of fishing trip and port entry – preparation of catch certificates, submission to the flag state authority for validation and to the port state authority where the landing is planned prior to the arrival in port of any fishing vessel.
- Transhipment in port – catch certificates must be handed from the fishing vessel to the reefer master, and in most cases counter-validated by the port state. Port state authorities therefore require sound understanding of the fishery and its regulatory framework governing in-port transhipments, standard MCS routines and inspections.
- Landings, verified weights and first buyers – because fishing vessels unload their own catch whereas reefers unload several harvests, checking the paperwork and data for the former is simpler than for the latter; the procedures must be equally rigorous. Once authorization to land is granted, two essential data groups must be completed, overseen and counter-validated by the port state authority:
  - the actual weights landed, in whatever form, must be verified and the means of transport and storage established so that all transactions can be summed to account for their full-landing equivalent weight; this is the first occasion where the accurate actual weight of a harvest can be verified; and
  - the amount acquired by every buyer in terms of species, volume and form must be recorded on the catch certificate; if a CDS does not provide for this the port state must record these data in its own system.

Port state authorities are crucial in counter-validating these data groups, which constitute the foundation of national mass balance traceability in CDS.

Port states' have the capacity to sanction suspected IUU offenders by denying port access, or denying landing authorization and access to port services. This translates into substantial losses for the operator.

Further sanctions are provided in CDS in that refusal to counter-sign a catch certificate voids its validity, which amounts to a financial sanction equal to the value of the products. In a CDS, such fishery products cannot be traded legally and lose their market value.[78]

In developing countries denial of a landing authorization and denial of validation under a CDS involve modest legislative changes and can be implemented by training the relevant officials, thereby establishing a simple path to providing the enforcement function of a responsible port state.

4.4 PROCESSING STATE: TRACEABILITY, MASS-BALANCE AND RE-CERTIFICATION

4.4.1 Fundamentals of processing state responsibility

The "processing state" concept is not yet recognized in international fisheries law – yet it is the most important state type in terms of country-level traceability solutions in support of a CDS.

The processing state is a part – or a specific form – of the market state, like the end-market state in which products are consumed and from which they do not re-emerge in trade. For a CDS, it is important to distinguish the functions of the processing state from those of the port state and end-market state, so that functions can be assigned to a specific state-type overseeing transactions in parts of the supply chain under their

[78] See Hosch (2016a) on Atlantic bluefin tuna in the Mediterranean, whose value may fall by 85 percent in the absence of catch certificates, when it can only be traded illegally in domestic markets.

purview, and to present them without repetition of each state type. In doing this, it must be borne in mind that any territory may be a flag state, a port state, a processing state and an end-market state concurrently.

In this document the processing state covers all CDS-related functions involved in tracing product from landing at the port of arrival, importation, ownership changes and processing to exportation. It is important to note that consignments are certified under all existing CDS by the processing state before they leave a territory.

All CDS cover landing and importation, where product enters a market, and exportation, where products from the same market leave a territory. A CDS does not track events between these entry and exit "gates": it records only product movements at each gate, and is blind as to what happens to product inside the processing state, which is hence a "black box" for CDS.

In simple supply chains where the importer is also the processor and the exporter, and no splits occur after importation, the CDS collects the information that enables tracing of the product. In more complex supply chains, where products are imported into national markets and where changes of ownership subsequently occur, they are not traced by the CDS. This implies that exporters will be different from importers, which is where challenges emerge.

A CDS must be able to detect mass-balance violations at the country level – more product being exported than was imported – by means of certificates. But in complex national supply chains, where products under single certificates are split among several buyers, the CDS cannot establish what action, seller, buyer, processor or exporter is responsible for a mass-balance inconsistency detected at the time of exportation. The CDS can only detect problems with the balance of products intended for export, which may result from simple clerical error or from a laundering attempt somewhere in the national market system.

In complex national supply chains, which are the norm in advanced processing states, tools must be developed to trace the movement of products from the entry gate to the exit gate so that inspections can establish where anomalies occur and who is responsible for them. Without such traceability tools it may be impossible for a competent authority to establish the nature and cause of discrepancies.

If such anomalies are regular and unexplained, the country concerned may face trade sanctions and lose legal access to the fishing trade altogether. In the case of the EU CDS, its seafood products may be denied access to the end market (see Hosch, 2016a).

Whether a CDS is unilateral or multilateral, it is the responsibility of the processing state to: i) deny market entry to non-certified products; ii) ensure that laundering of fish products does not occur within its supply chains; and iii) sanction imports of illegal products into the market.[79] Although there are differences among them, multilateral CDS are designed to detect mass-balance inconsistencies and laundering attempts at the exit gate – the point of exportation – thereby creating incentives for the processing state to exercise due diligence and ensure that fraud is minimized in its supply chains and that fraudsters can be swiftly identified and sanctioned. The tools to achieve this are grounded in monitoring and traceability solutions.

When a processing state is satisfied with the legality of products and the integrity of its supply chain, it validates the trade certificates for consignments to be exported.

[79] The inability of the unilateral CDS to detect mass-balance violations deters countries from exercising due diligence in providing traceability solutions and minimizing fraud. Some responsible countries might invest in such solutions but others in the same supply chain might not do so, thereby creating an uneven playing field. Correct action by processing states under CDS that cannot detect mass-balance violations may constitute a disadvantage for economic operators in responsible countries. In the context of preventing IUU fishing, however, opting to operate legally and enforce the law must result in sanctions for IUU operators, not the other way around.

4.4.2 Ideal processing state organization

The involvement of fishery authorities in processing is recent, and many older fishery regulatory frameworks are concerned only with fishing and landing, though a few require export permits largely for statistical and revenue-gathering purposes.

Processing is generally the preserve of food safety authorities, for whom traceability is important in terms of consumer safety, information and product origin. Such authorities already have data records, traceability systems and control structures in place.

Another set of fishery-specific controls with a different focus is therefore needed, which may be challenging in the processing environment. The focus of fisheries inspectors has hitherto been harvesting and landing operations, so their work often ends at the dock. But even trained fisheries inspectors who understand processing operations and can investigate company records, inventory systems and processing practices are limited in the range of their knowledge. It is therefore important that fisheries authorities collaborate with food-safety, health and customs authorities in joint working groups and inspections.

Unfortunately, such initiatives are rare. Blaha *et al.* (2015) analysed traceability systems in ten countries, and in all cases the implementation of traceability requirements was driven by official food safety bodies that did not coordinate their work with that of any other interested parties.

Table 5 shows the critical supply chain points and the related CTEs and KDEs. The division of the table into two columns shows which CTEs and KDEs are already covered by the CDS and which supplementary functions should be implemented by a processing state.

4.4.2.1 Authorization of imports

In a CDS it is important to differentiate between fish landed by fishing vessels and imports arriving through commercial ports, which may have be partially processed beforehand.[80]

The mechanisms for imports are discussed in Section 4.4.3.1.

Requests for approval of importation should ideally be made before shipment and definitively before arrival. This enables processing states to establish the legality and acceptability of products in accordance with their system of checks and approval.

In most countries importers must be registered for customs and tax purposes, and hence records are available. In some jurisdictions, only licensed importers under the control of the processing state are allowed to import seafood products. The United States Food Safety Modernization Act (2014),[81] for example, has provisions for a voluntary qualified importer programme, import certifications for food, and prior notice of food shipments. And under the Seafood Import Monitoring Program[82] United States importers will be responsible for data collection, management, input and storage and compliance as of 1 January 2018. The importer of record, who must be a United States citizen – is required to apply for and to maintain an international fisheries trade permit.[83]

These requirements establish the identities of businesses and physical persons, ensure that records are maintained of inbound shipments, receipts, inbound lot IDs, lot splits and contact details of suppliers and buyers. Fisheries authorities tasked with CDS implementation should consider adding their requirements to existing systems instead of duplicating existing traceability systems.

In some cases major importers with a sound compliance record and robust systems for managing commercial, transport and customs records enabling rapid official checks

[80] See: https://www.ccamlr.org/sites/drupal.ccamlr.org/files//10-05_43.pdf
[81] See: http://www.fda.gov/Food/GuidanceRegulation/FSMA/
[82] See: http://www.iuufishing.noaa.gov
[83] See: https://fisheriespermits.noaa.gov/npspub/pub_cmn_login/index_live.jsp

and verifications may gain a higher approval status [84] that gives access to expedited procedural systems.

4.4.2.2 Registration and licensing of storage and processing premises

Regardless of whether fish are imported or landed, in most countries fish storage and processing premises in the export value chain are licensed and under the control of health authorities; particular conditions apply according to type of processing.

Many of the licence conditions refer to the safety controls, traceability of raw materials and market access requirements to be met for certification. An existing comprehensive traceability and record-keeping system at the industry level provides a favourable environment for CDS.

About 100 countries are authorized to export to the European Union, for example.[85] Because of the EU system for granting seafood import authorizations these states are in practice processing states, and traceability is hence part of their regulatory frameworks. The authorities responsible for seafood safety in each country must guarantee that all operators in its supply chain comply with EU requirements, of which traceability is one.

EU market access conditions require that all elements of the production chain under the control of the competent authority are uniquely identified, and that all product lots are traceable at all stages of production, processing and distribution. This ensures that the components of the production chain can be tracked through lot splits and mixing.

Many of the KDEs reflect those needed in CDS. When implementing the EU regulation [86] governing traceability and labelling, for example, the following data must be made available:

- identification number of each lot;
- external identification number and name of the fishing vessel;
- the FAO alpha-3 code of each species;
- the date of catches or the date of production;
- the quantities of each species by net weight in kg or number of individuals; and
- the names and addresses of suppliers.

An additional regulation[87] requires the following:

- the commercial designations of species and scientific names;
- the production method – caught at sea, caught in freshwater or farmed;
- the FAO sub-area where the product was caught or farmed;
- the category of fishing gear used;
- whether or not the product has been defrosted; and
- the date of minimum durability, where appropriate.

With regard to regulatory control by processing states, the EU imposes[88] controls to be followed by local authorities and food business operators to ensure that all production chain components are compliant with its rules. This establishes that the competent authority automatically carries out official controls with a frequency based on risk assessments. The controls can be imposed at any stage of the production chain.

Fish storage and processing premises involved in the export supply chain need to be licensed and under the control of the fisheries authority. Non-compliance with license conditions should automatically result in sanctions, enforcement measures and even suspension of the licence.

Details of "what to trace" are discussed in Section 4.4.3.2.

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[84] See, for example: Approved Economic Operator in Article 16.2 of the EU IUU regulation (EC no. 1005/2008).

[85] See: https://webgate.ec.europa.eu/sanco/traces/output/non_eu_listsPerActivity_en.htm#

[86] Regulations (EC) no. 1224/2009, Article 58, 5 (c) and 404/2011, Articles 67 and 68.

[87] Article 35 of Regulation (EC) no 1379/2013 on the common organization of markets in fishery and aquaculture products.

[88] Regulation (EC) no. 854/2004 on the organization of official checks on products of animal origin intended for human consumption.

TABLE 5
Supply chain points, CTEs and KDEs at the processing state level

Processing state supply chain segment			CDS		Processing state		
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data source**	**Notes**	
Importation[1]	Authorization of imports	Point of importation	Partially covered	Not recorded in EU CDS if products are imported on the basis of a processing statement	Customs pre-clearance	Documentary verifications: authorization/refusal	Note: Requires fisheries authority access to commercial ports and import clearance data
		Name of buyer/ importing company	Partially covered		Customs pre-clearance		
		Certificate ID number	Covered	Can be a catch or trade certificate	Processing of the catch certificate	Physical verification, or remote access in case of e-CDS	
		Volume, form and species	Covered	Data in for mass-balance monitoring	Receiving the catch certificate and bill of lading		
	Customs control	Document no.	Not covered		Authorization of Imports		
Distribution[2]	Product splits (initial and later)	Certificate ID no.	Not covered		CDS-related record-keeping by economic operators, paper-based or electronic		
		Volume, form and species	Not covered			Remits and invoices	
		Name of buyer	Not covered			Remits and invoices	
Storage and Processing	Processing	Volumes and species acquired	Not covered	The processor may not be the same as the importer		Weight in/grading Lot allocation/Inventory	
		Volumes and species entering processing	Not covered			Lot tracing/inventory	
		Volume, form and species for rendering/fishmeal	Not covered	Secondary products do not need to be traced		Lot tracing/product reports/inventory	

TABLE 5 (*cont.*)

Processing state supply chain segment			CDS		Processing state	
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data source**	**Notes**
Certification for trade	Domestic distribution of finished products	Documentation/ dates/CDS details	Not covered		Inward trade certificate, to be created by processing states	Physical verification and certification
	Exportation or re-exportation of semi-finished/ finished products	Trade certificate ID[3]	Partially covered	Export and re-export certificates; processing statement (EU)	CDS; bill of lading; customs declarations	
		Source CDS certificate ID	Covered	Design issues in CDS mean that links between certificates in long supply chains may break down, weakening traceability and control	CDS; supplied by exporter at the time of filing trade certificates for validation	Entrance of the certificate into the national territory is captured and logged by the competent authority at the time of importation and related authorizations
		Volume, form and species of product	Covered	Data out for mass-balance monitoring	Processing yields	To be computed and evaluated
		Name of buyer/ consignee	Partially covered	Not recorded in the EU CDS processing statement	Trade certificate	

* For an exhaustive list of KDEs, see: FAO Technical Paper 596, Chapter 7, Table 11

[1] Importation only applies to fisheries products introduced into a national territory by means other than landing from a bulk carrier or fishing vessel. Entries under "port state" apply to landings.

[2] If distribution takes place in a port state, the table applies from “distribution” onward because port states are then processing or end-market states.

[3] Processing statements in the EU CDS and export/re-export documents in the CCAMLR CDS that act as trade certificates in the systems are not numbered and hence lack a property that supports traceability.

4.4.2.3 Control over distribution and transfers

Control by fisheries authorities over the distribution and movements of fish is critical in that the volumes declared must be identified, taking into account splits of lots and sub-lots along the distribution chain. It is hence important that transactions between licensed processors or cold stores are controlled and approved by the authorities. Box 1 gives an example of this in New Zealand and Box 6 shows the controls imposed in the EU TRACES[89] system, where products move among member countries and where monitoring applies even when products are not exported or imported.

BOX 6

The Trade Control and Expert System

TRACES is an online platform run by the EU Directorate General for Health and Food Safety that enables communication among the competent authorities in EU and European Free Trade Area countries and non-EU countries. The objective is to guarantee that the European requirements under its Sanitary and Phyto-Sanitary Measures for animal health, animal welfare and veterinary public health are met. Although it does not include the EU IUU catch certification scheme elements required in parallel for seafood products entering the EU, TRACES system provides for documented traceability in domestic markets, but this does not cover the legal origin of catches.

TRACES mandates electronic certificates for consignments during importation, movements within the EU market and exportation. It also facilitates information exchange among trading parties and control authorities and hence accelerates administrative procedures by tracking the movements of consignments, and it enables rapid detection of fake certificates and hence promotes trust among partners. Parties in the system have access to all information.

The European Trade Centre's INTRASTAT system is of interest here because it focuses on trade among EU countries and re-exports from the EU, but only after a consignment has entered the EU under its importation protocol. Economic operators and competent authorities can submit Part 1 of the official trade document in a standard procedure involving: i) submission – the economic operator prepares Part I of the official document for submission to the competent authority of the country of origin; ii) certification – the competent authority of the country of origin processes Part II of the official document; and iii) control – the competent authority of the transit or destination country records the checks on the official document.

Traceability of volumes

TRACES does not control volumes acquired by domestic processors or the processing yields from different types of product because these are not of interest in terms of health. But because volumes per type of product per consignment are recorded, the balance not leaving the country is considered to have been consumed domestically.

4.4.2.4 Control of storage and processing premises

In principle, "processing" means any action that substantially alters an initial product. It can be as simple as transforming a fish from "whole" to "gutted" or "filleted" and includes changes by processes such as cooking, canning, drying and extrusion or a combination of such processes. In some cases "non-transforming" operations such as grading and packing are referred to as processing, but they have no effect on product or unit weight.

[89] See: http://ec.europa.eu/food/animals/traces_en

By-products of processing such as guts, frames and heads should be included in national traceability systems because they are usually sold for pet food, rendering or fishmeal processing.

Fraud such as species substitution, weight manipulation and mislabelling is known to occur during these operations; various cases have been documented.[90] Because processing implies a change in weight from "unprocessed" to "processed" product there are opportunities for laundering by introducing IUU fish into processing and then declaring inflated processing yields or declaring deflated processing losses.

Fishery authority controls should ideally be established in two areas:

- Cold stores and stock inventory. As previously discussed, in a CDS it is essential to identify the "ownership" of all stored raw materials and products, whether they are in processors' premises or off-site storage facilities. Most companies have inventories that enable rapid identification of location, type of product, species, volumes and number of pallets, bins or boxes. Fishery authorities must regularly inspect processing establishments and cold stores to verify the accuracy of records and inventories, either jointly with the health authorities or under a Memorandum of Understanding that provides for action on its behalf.
- Processing yields. Hosch (2016b) explains the importance of processing yields in a CDS to enable estimates of the weight of product at different stages of processing. There are two important uses of yield factors:
  - estimating the volume of round fish caught if on-board processing alters the original volume:[91] this is particularly important as a catch-monitoring tool. Figures obtained from back-calculation can be cross-checked with logbook entries to monitor their accuracy and consistency; and
  - monitoring processing yields throughout the supply chain to ensure that laundering of non-originating material into the supply chain can be detected: this enables fishery authorities to detect non-originating materials being laundered as an operator processes unreported raw product into finished products, giving rise to unusually high processing yields.

Without the reporting and monitoring of yield factors, supply chains are open to fraud because laundering attempts cannot be detected automatically.

4.4.2.5 Dispatch

Health regulations require operators to identify and check products or raw materials to be dispatched, and to record the details of what leaves the premises. Regular joint verifications by fishery and health authorities before dispatch and physical checks of consignments loaded are a simple way to ensure traceability and confirm that the correct volumes and species are recorded.

4.4.2.6 Export

In many countries exporters must be registered and licensed, and health certificates required by national or foreign markets and certificates of origin for trade and tariffs must accompany seafood exports. The issue of health and origin certificates must be carried out in compliance with the relevant regulations. The identification of consigners is essential.

These certifications include KDEs shared with CDS such as species, volumes, origin, and type of processing, so it is essential to work in coordination with health and customs authorities. Data can be verified against shipping and commercial documents such as bills of lading and insurance papers during validation of export trade certificates regardless of product category or degree of processing.

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[90] See for instance: http://www.iuufishing.noaa.gov/FAQs/SeafoodFraudFAQs.aspx or Warner *et al.* (2013).

[91] See for example: https://www.fishserve.co.nz/tools/find-a-conversion-factor

Table 5 shows the related CTEs and KDEs. The table is divided to show which CTEs and KDEs are covered by the CDS and which supplementary functions should be implemented by the processing state.

4.4.3 Processing state CDS support mechanisms

Three basic functions involving processing states in terms of supporting CDS are: i) ensuring that no illegal products enter the territory; ii) providing a national traceability system that rapidly identifies fraudulent economic operators by means of detected mass-balance inconsistencies; and iii) validating trade certificates covering consignments exported from the territory.

4.4.3.1 Importation and landing controls

Market states have a duty to ensure that no illegal product in any form is imported, whether landed as catch or imported commercially. Denial of market access is discussed further in Section 4.5. When products are imported into a processing state, it must ensure that data relating to the consignment, products and certificates are recorded in the CDS.

4.4.3.2 National traceability framework

Section 4.4.1 provides the rationale for a national traceability framework in support of CDS. Such systems enable processing states to identify sources of mass-balance inconsistencies detected by CDS through certificates when attempts are made to ship more product out of a country than was imported. In the absence of domestic traceability systems, and depending on the size of the processing industry, identification of fraudulent operators in national supply chains systems could be impossible.

What is being traced?

Once CDS-certified products are cleared to enter a processing state, the need is to trace: i) buyers of products covered by particular certificates; ii) product distribution and transformation into value-added goods; and iii) the consignments in which they are re-exported. The ultimate aim is to ensure that the transactions tally to account for the entire amount of product.

Six KDEs constitute the core data of a national traceability system:

i. product source – seller and previous owner of the product;
ii. product destination – buyer and new owner of the product;[92]
iii. species;
iv. volume;
v. product form; and
vi. certificate number.

A batch of products changing hands may be covered by more than one certificate, but the information to be recorded in the traceability system is certificate-specific. If, for example, a batch containing product from three certificates has been mixed and is being sold, the information to be logged for the transaction must still establish three individual certificate-specific records – not a single new record that would necessitate a new certificate number.

Because people often think in terms of product batches and consignments rather than product volume that may be split or mixed, it is essential to clarify whether the national system traces batches of product through the supply chain and hence ensures their integrity. There are many reasons why batches have an important role in processing.

But because landings under particular certificates may consist of different species and different product sizes, a landed batch may immediately be broken up among

[92] In electronic systems points (i) and (ii) would normally be recorded by uploading of a copy of the sales note.

several buyers – even though it is covered by the same certificate. And as product moves through the supply chain, "sub-batches" may be further distributed among economic operators. At the other end of the supply chain, semi-processed or processed goods may be mixed with product originating from other certificates, thereby merging several initial batches into a new batch for export certification.

Any traceability system is concerned with: i) the volume and form in which a particular species enters the supply chain under a certificate; ii) the volume and form of that species exiting the supply chain under that certificate; and iii) knowing every stop through which the different volumes and forms have moved within the supply chain.

Hence national traceability systems are programmed to trace the volumes of particular species and products rather than batches that enter supply chains under particular certificate numbers. It can follow these volumes as they are split or merged any number of times, and it can follow changes of form and processing losses affecting the species concerned. Every time a batch moves forward in a supply chain, the transaction, original certificate numbers, species, volume and form are recorded and deducted from the lot of certified products that originally entered the same supply chain stop.

At what points in the supply chain is tracing carried out?
Traceability records are created at the beginning and end of any supply chain stop. Economic operators in national supply chains acquire a batch of product, which may be covered by a single certificate or several, and must record the products, volumes, forms and certificate numbers. This record identifies the source of the products, and must match the exit record logged by the previous economic operator. Such a record may be seen as a "product account" owned by the buying establishment, which can now process and sell or export the products. These will be logged again in the same traceability system at exit.

System attributes
Certain attributes of national traceability systems determine their effectiveness and whether they will be accepted by the industry. They must be:

- user-friendly, simple and intuitive so that its users quickly learn to operate them effectively; record-keeping may be based on official templates and guidance set out in a user manual; these may be in online formats;
- results oriented with clear statements of expected results, and all functions should serve these results; this ensures that the system will not become complicated and hence prone to failure;
- tamper proof, providing a high level of data security, especially in online systems; the fishing industry is particularly sensitive with regard to commercial records, which must remain confidential; and
- grounded in legislation so that sanctions can be enforced in cases of non-compliance; in the absence of a legal foundation, non-compliance cannot be sanctioned and the system will fail.

4.4.3.3 National traceability framework solution 1: record keeping
The cheapest option (see Section 3.4) is to require economic operators in national supply chains to keep records of CDS-covered products, which are generated each time a product enters or leaves an operator's premises. These records should be available for verification by authorities for a legally defined minimum period of time.[93]

The records must ensure that the six KDEs set out in Section 4.4.3.2 are logged for every entry and exit of products from commercial premises and that they are

[93] If products regularly remain in cold storage for periods of years, the time during which records are available must be regulated accordingly.

complemented by additional information to enable easy verification of the links between supply-chain partners. This information, which will depend partly on the regulatory system of the national seafood sector, must include:

- invoice date and number to enable rapid identification of the time of any transaction and of the commercial invoice in company records;
- license number or other identification of sellers and buyers; and
- copies of certificates to establish that they have been exchanged, that buyers have checked that acquired products match the products on certificates, especially in CDS with no central registry where buyers cannot check certificates online.

This additional information combined with the six KDEs is sufficient to trace any CDS-covered product back along a national supply chain in which product changes ownership more than once and where splits, mixing and processing occur. Any inconsistencies signalled by the CDS at the time of exportation will relate to specific consignments handled by particular operators from which the source certificates were derived. Inspectors can if necessary audit the operators' records to trace products back to their origin to establish the point at which the discrepancy occurred. This is possible thanks to the records described in this section.

Law enforcement considerations under a record-keeping solution

In long national supply chains with numerous operators[94] and product splits, paper-based audits of records can be laborious, which raises challenges in terms of law enforcement. It is not necessarily the last operator in the supply chain who is responsible for any clerical errors or fraud: these can occur anywhere in the supply chain when product is imported, split and distributed.

An electronic interface could be set up to deny validation of a trade certificate on the basis of any anomaly identified by the automated CDS mass-balance monitoring and integrity functions when a competent authority is about to record it in the CDS.[95] This would prevent exportation because the trade certificate is not released. The option is feasible, but it has not been mainstreamed in electronic multilateral CDS.[96] It is used in countries – usually processing states – to ensure that discrepancies are detected, investigated and if necessary sanctioned.

4.4.3.4 National traceability framework - Solution 2: Electronic platform

A technically more complex solution for tracing products through national supply chains is an official online platform in which operators record their data. One advantage is that it does not require specific software to be set up at the operator level, so any operator can access the system from a standard computer with an online connection, create a user profile and start using it. Another advantage is that upgrades are greatly facilitated.

Electronic platforms largely eliminate the need for paper communications between a competent authority and the private sector because all data can be handled electronically. Such platforms can also serve to issue trade certificates, which is especially useful if the CDS has no electronic system for doing so.[97]

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[94] In sequence: i) importers and brokers; ii) initial processors; iii) processors of final consumer goods; iv) packers; and v) exporters.

[95] In the new ICCAT e-CDS, an alert is triggered if the number or weight of re-exported fish is greater than the original certified amount. These alerts do not block the system: a validating state may reject validation, or an importing state may refuse to accept the consignment, but the system does not automatically block the issue and validation of certificates. (Pers. comm. ICCAT compliance officer.)

[96] The new CCAMLR electronic platform is designed to detect discrepancies, even on the basis of unusually low processing losses, to refuse the issue of trade certificates. (Pers. comm. CCAMLR compliance officer.)

[97] New Zealand developed its EU catch certification system as an add-on to its eCERT platform (see Box 1), which was designed in compliance with the UN/CEFACT standard (see Section 2.2.1). The SPS component interacts directly with the TRACES system (see Box 6), and in principle could transmit catch certificates to the EU if the latter were to develop a CDS e-platform, as provided for in regulation EC 1005/2008.

At least two user groups are defined in electronic platforms: i) private-sector operators who input data and submit requests for the validation of certificates; and ii) competent authorities, who exercise oversight, analyse data and validate certificates.

Options for developing electronic platforms

Few such electronic platforms exist today, but their functions and usefulness in a CDS are clear. A rarely discussed option is to design them as compatible modules of CDS and to propose through RFMOs that countries adopt them.[98] This could lead to economies of scale because a single system could be customized for individual countries, which would then have an interface with CDS; paper certificates could be eliminated entirely (see also Section 2.2.1 on standardization options).

Functions of electronic platforms – user groups

Electronic platforms are more versatile and more powerful than simple record-keeping solutions. They handle data from landing, importation, distribution, ownership and exportation centrally in near-real time, thereby enabling competent authorities to track how much product is entering a country, who acquires it, how much a company holds in its inventory, what is being processed into what and how much is being exported.

For economic operators, the following functions are essential:

- Login and system overview. A user ID must be required to access the system, at which point an initial page gives an overview of pending submissions and requests and validations by business partners and the competent authority. From here operators can access all functions of the system.
- Product entry and creation of product accounts. Operators must create product accounts that link product entry to premises with the covering certificates.[99] Supporting documents such as landing or import declarations, catch certificates and invoices must be uploaded: competent authorities will validate these and authorize the creation of the product account. All processing runs and product sales are then deducted from such accounts until depletion. Busy operators will use large numbers of such product accounts.
- Product exit, subtraction from the product account and certification. Operators can generate products and prepare them for exit from their premises with trade certificates mandated in CDS. Operators can sell products in the same form or in pre-processed form to other economic operators in business-to-business transactions in the same territory and market, or they can export processed products,[100] or they can sell the obtained end-products for domestic consumption in the same territory. The details of such processing runs are logged into the system, providing product account number, species, form, volume used and volume resulting. The resulting product is deducted from the product account. These options are detailed below:
  - Business-to-business transactions. Buyers log acquired raw materials in the system, uploading copies of invoices, catch certificates and original product

[98] It is important to underline here that national supply chains – which the national electronic platform sets out to oversee and manage – generally do not fall under the management competence of RFMOs. Individual RFMO members and cooperating non-members are sovereign and free to oversee their national supply chains as they wish, and data confidentiality generally applies fully. The adoption of centrally developed and CDS-compatible national platforms would be optional rather than mandatory, and data confidentiality and exclusive country access and use would have to be guaranteed. Any server hosting national supply-chain data could also be based in-country rather than within the e-CDS.

[99] Every new entry into a premise gives rise to a new product account. If the entry is covered by more than one certificate, the product account is structured in such a way as to keep the individual certificate portions and related calculations separate.

[100] Exportation or re-exportation of non-processed products is another option. This does not affect the system's operations calculation routines; given that processing losses will be nil, the calculations will be simpler.

account numbers, which are shown in invoices. Sellers see a request to validate a sale, and the products are deducted from the sellers' product account; a new product account is created for the buyer. For a transaction of this kind no certificate is generated or validated and there is no need for validation by competent authorities.[101] The platform ensures the integrity of buyer-to-buyer transactions, and accurate debiting and crediting of the respective product accounts.

- Export transactions. Processing information is logged by operators with reference to the source product accounts for the raw materials. This is based on consignments being prepared for exportation rather than individual processing runs. For every product account operators log volumes, forms and species processed and the amounts of resulting product obtained. The system can then calculate and log processing yields, and signal if a yield anomaly is detected. Supporting documents – bills of lading, export declarations and commercial invoices are uploaded in support of submissions, which result in requests for trade certificate validation by the competent authority. When this is done, operators can pick up a printed, signed and stamped original at a designated office.[102]
- Domestic market transactions. The system records sales of products into a domestic market, either directly – which is unusual – or through wholesalers or retailers. This is also logged by consignment and is entered in the same way as a business-to-business transaction: buyers input the data and have them validated on the platform by the seller. These records close the loop at the domestic end-market blind spot,[103] but they require wholesalers and retailers to participate in the system.[104] These transactions require validation by competent authorities and result in "inward trade" certificates issued to domestic buyers. Such certificates are not mandated in CDS, but should be mandated in national CDS-supporting traceability mechanisms to ensuring that all product volumes leaving premises are traceable and reconcilable.

- Product account balance. The system must automatically compute the remaining balances in product accounts until depletion of individual accounts; a query function should be available (see next).
- Queries. The system should enable any operator to query all aspects of acquired CDS-covered products. This must cover product in storage or processed at a facility and must include past production runs, shipped consignments and product account balance status by species, form and certificate numbers to provide a full overview.

[101] In countries where these transactions require regulatory oversight – New Zealand is an example – the system can be designed to require official validation. Business-to-business product transfers remain visible to competent authorities even if a system-resident validation routine does not apply.

[102] By 2013 Thailand had established an electronic Fisheries Single Window system that enables economic operators to log import and export information for transactions governed by EU catch certificates and to request electronic validation of EU processing statements logged and submitted with scans of supporting documents. Once approved, these are collected by operators from the system's import/export centre.

[103] The "domestic end-market blind spot" applies to a processor importing product and then re-exporting part of it and selling the rest into the domestic end-market. The processor will still have product in the related product account from which to produce unless domestic sales are deducted from its product account in the same way as exports. Because domestic sales do not require permits, authorizations and health controls and because these are no longer covered by CDS anymore, this part of the system is more complex in practical and legal terms. Factory-to-retailer transactions are generally considered domestic transactions and hence not subject to traceability-for-compliance measures.

[104] In CDS once a product has cleared landing or importation controls it has entered the market and can be sold and bought without further tracing or certificates. In the system described in the text, however, products are not regarded as having fully entered the market as long as they remains in a factory. As discussed, once in a factory the product has entered the processing state, but it only enters the end-market state when it is sold from the factory into the domestic retail market. These events must be captured to achieve full traceability.

- Error correction. The system must enable operators to correct data errors.[105] Operators must be able to correct data that are as yet un-validated, and if data have already been validated, operators must be able to correct them with the agreement of the validating counterpart.[106]

For competent authorities, the following functions must be available:

- Login and system overview. Competent authorities must be able to access the system. An initial screen should show all pending validation requests, their status in case several users are simultaneously accessing the platform, and system-generated alarms. Various options should be available to enable users to navigate to functions relating, for example, to queries and blocking documents.
- Validation of actions and requests. The first function of the system is to forward validation requests from economic operators to the relevant competent authority. The three groups are: i) validation for product account creations such as buyer product entries covered by CDS certificates; ii) validation of trade certificates; and iii) validation of error correction requests. The platform enables competent authorities to view supporting documents so that verifications can be undertaken before validation is granted.
- Queries. This powerful function enables competent authorities to view the product accounts, individually or in groups, of individual economic operators, clusters or an entire national sector. Queries must make relevant information accessible to competent authorities so that they can monitor domains of interest and historical data. Interfaces can be designed that enable users to make queries that combine any type of stored data.
- Document blocking. This important feature enables competent authorities to suspend or block documents such as product accounts or trade certificates submitted for validation. Suspension occurs when an inspection is ordered to ensure that products cannot legally be exported. Blocking occurs when products in a product account or draft trade certificate are denied movement along a supply chain because fraud has been detected. Without such a mechanism competent authorities would be unable to use the traceability platform for law enforcement purposes, and could only rely on for information.

Functions of the electronic platform – calculation routines and alarms

The platform will be designed to execute a number of functions. The most important are:

- Automated product-flow monitoring. The mandated data-logging routines of economic operators for sequential handling of products along national supply chains feed into the automated product-flow monitoring process. Product is credited to a buyer's account during an acquisition transaction and is deducted from the same account when it is sold on to the next buyer. Inconsistencies can be detected immediately, just as CDS detect inconsistencies between importation and exportation. The platform monitors the product flows of individual economic operators and detects inconsistencies at this level. The platform does not have to establish the integrity of transactions involving several operators or certificates. If successive domestic transactions relating to a specific certificate are satisfactory, the balance between entry and exit at the country level is also satisfactory.

[105] The first CCAMLR e-CDS was developed without an error-correction routine. This caused problems for economic operators and CCAMLR staff when errors occurred. Such cases require staff with access to raw data tables for manual correction, which in turn may cause inconsistencies and generate database integrity alarms.

[106] Correction of errors is generally possible as long as downstream certificates are not yet linked to new owners, processing runs or product sales or exports. Without new linkages, correction of upstream errors may be impossible.

- Processing yields. The system must be capable of capturing all processing yields on the basis of volume declarations for product form "in" and product form "out".[107] The platform then establishes a database of processing yields based on species, original form, resulting form and yield factor. Statistical analysis then establishes the related mean processing yields/losses. Yield factors will fluctuate around the mean according to product quality, seasonal fluctuations of species condition indexes and the skill of factory workers to produce a normal distribution around the mean. The system can generate an alarm when a production run submitted for certification exceeds the mean by a given number of standard deviations.
- Automated alarms. The system must trigger alarms when anomalous data are logged into the system. Alarms must primarily alert economic operators: if they try to log a transaction that is inconsistent – more product than available being input for sale, for example – they must be able to rectify the situation. In cases of mass-balance inconsistency, the system must be able to reject the submission and automatically enforce the mass-balance integrity rule.[108] In cases of excessive processing yields, users may decide whether they will be justified at a later stage in case of queries by competent authorities. If erroneous data input leads to automated submission denial, the need for intervention by competent authorities is reduced substantially. Operators must ensure that their book-keeping, inventory management and data submission are accurate.

4.4.3.5 National traceability framework support mechanisms

Two of the various mechanisms supporting traceability frameworks are discussed below.

Invoicing

When products change hands in the supply chain they have usually been processed and hence have changed form and be different from the products recorded on covering certificates. To ensure that buyers know by which certificate acquired products are covered, invoices must show which certificates and product accounts the products originate from.

This information enables buyers to log trades into the system. If the information exchanged between sequential supply chain operators is not detailed and accurate, products will be at risk of "certificate hopping,"[109] which will lead to CDS-generated alarms because some certificates will be over-used. This will not be fraud, but insufficiently detailed record-keeping.

Competent authorities should therefore produce practical guidance for the private sector as to the handling and recording of transactions during domestic supply chain operations, and when products enter and exit a national supply chain.

Genetic testing

Ensuring mass-balance is not always enough to guarantee that transactions in national supply chains are compliant and legal. Alternative options are limited, however, especially when processed products whose form is altered by processing are involved, and fish cannot be identified by sight. To establish wrong-doing and to know a product's

[107] A sound approach in yield factor monitoring is not to ask operators to report yield factors, but merely to ask them to declare the amount of product in a particular form used to derive the amount of final product in and its form. The electronic platform computes processing yields automatically on the basis of these declarations, which reduces the need to verify yield calculations and declarations and closes a potential avenue for fraud and oversight lapses.

[108] The rule is: "product out ≤ product in".

[109] This occurs when a product introduced into a supply chain under certificate A exits the supply chain under certificate B as a result of a record-keeping mistake.

place of origin or the species in a sample or consignment, competent authorities must rely on other means of investigation.

This is where genetic testing and commercial DNA test kits become important. Current tests are difficult, expensive and time-consuming, but research is focusing on faster, cheaper and hand-held means of identifying seafood species on the basis of closed-tube DNA bar coding. When these tests become available (Ward *et al*., 2005), it will be possible to address substitution fraud in supply chains more effectively.

4.4.3.6 Certification of exports and trade

In a CDS the issue and validation of catch certificates establish the legality of harvests, and landings are hence certified when they enter a land-based supply chain. Trade certificates cover further movements through international trade. There are minor differences in the ways in which this applies to multilateral CDS in particular scenarios: in some, for example, catch certificates cover the first trade after landing, but the principle of distinct catch and trade certificates is shared.

Trade certificates are validated by market states into which products are landed or imported, before exportation or re-exportation. Trade certificates connect products to be exported to the certificates under which they were landed or imported, and are hence linked to catch certificates for product landed into a territory, or to trade certificates for products that were imported.

In simple record-keeping, trade certificates are completed in paper form and submitted to competent authorities for verification and validation. In countries with large processing sectors, this process can be difficult when substantial volumes are covered by CDS. In these cases CDS are the only means of establishing whether certificates being applied for are questionable, because they monitor imports versus exports and detect mass-balance violations. If CDS do not provide this function, the only way to detect mass-balance violations at the level of the processing state is for the country to develop a routine whereby: i) all inbound and outbound movements of products covered by catch certificates are recorded; and ii) regular exports from credited imports are debited on a recurrent basis. Many countries have offline record-keeping routines for the EU CDS to fulfil this missing function.[110]

In effective national electronic platforms no major issues can arise because issues are detected as soon as an economic operator attempts to generate an inconsistent record or certificate.

If an inconsistency is detected when a trade certificate is being established, the competent authority should investigate the cause. Inconsistencies can arise as a result of poor record-keeping and insufficient information passing between sequential supply chain actors regarding certificates covering batches of product. But inconsistencies can, of course, also result from attempts at product laundering.

[110] In Mauritius in 2011 the competent authority logged catch certificate information – mostly for tuna – into an Excel spreadsheet at landing or importation at its Seafood Hub in Port Louis. Each file enabled the competent authority to verify that no more product was exported than had been imported or landed. For Mauritius, an island with a single industrial fishing port and short supply chains, this solution is sufficient to ensure supply chain integrity at its level. But such individual solutions are insufficient to guarantee supply chain integrity between harvest and end-markets if there is no CDS function to tally and reconcile certified volumes moving between countries. In such CDS, laundering fraud in national supply chains can be pushed back through the submission of falsified certificates preceding product entry into national territories. In the absence of a central CDS certificate registry, such certificates are difficult or impossible to detect.

Competent authorities must establish steps for law enforcement in line with RFMO guidelines, which prohibit the establishment of trade certificates for fraudulent products[111] and exportation in the absence of trade certificates.

To protect exporters by assuming innocence where guilt is not proved, processing states need a procedure whereby trade certificates may be issued to enable exportations to proceed. But investigations must establish the cause of any inconsistencies, and if fraud is established fines of not less than the commercial value of the IUU portion of any consignment must be imposed to guarantee that no financial benefits accrue to perpetrators.[112] If an investigation establishes that an exporter is at fault and the consignment concerned has not reached its buyer, competent authorities have the options of cancelling the trade certificate or alerting destination fisheries and customs authorities that a consignment is illegal and should be refused entry.

4.4.4 Institutional and sanctions framework

The institutional framework of a processing state is difficult to define, because food processing is a competence of health and veterinary services. If they are not in the same ministry as fishery authorities, cooperation and information sharing can be difficult and duplicate inspection teams with distinct functions may emerge with consequent inefficiencies and inevitable higher costs. If the services are part of a the same ministry, collaboration and information sharing will be easier and inspection teams can be combined under institutional reforms. Even so, experience shows that cooperation among separate services can also be difficult to achieve.

It is clear that fishery inspection teams must also cover land-based supply chains, and that health inspections of seafood products and land-based premises must ensure that the mandates and information flows needed for processing states to function effectively in a CDS are in place.

Box 7 gives an example of collaboration between the fishery authority – the Ministry of Fisheries and Aquatic Resources – and the health authority – the Ministry of Health – in the Solomon Islands.

With regard to enforcement and sanctions, processing states must do more than rely on denial of certification as a sanction when fraud is detected. This is especially important if a processing state is also an end-market state, and seafood fraud is a problem: in such cases the sanctions system must be comprehensive and able to address laundering of products originating from IUU-fishing, mislabelling of endangered or prohibited species and placing unhealthy products into the consumer market.

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[111] See for instance CCAMLR CMM 10-05 (2016), CDS for *Dissostichus* spp. Article 13: "If, following an examination […] or any other inspection or investigation conducted in accordance with relevant domestic law, questions […] or requests for additional verification of documents […] arise, and it is determined […] that any information contained within a DCD [*Dissostichus* catch document], DED or DRED is invalid or the *Dissostichus* spp. were not harvested in a manner consistent with CCAMLR conservation measures, the import, export or re-export of *Dissostichus* spp. that are the subject of the document(s) is prohibited."

[112] This may seem unorthodox, but it is consistent with CDS objectives. It is not the fish that are "illegal": it is the harvesting operations and the operators placing fish on the market in violation of conservation and management rules. If a certificate is issued under the premise that the perpetrator of the fraud will be fined the value of the consignment, the benefit derived from IUU fishing is forfeited. Economic operators who accept IUU fish and attempt to launder it bear the sanction. This mirrors the CCAMLR "specially validated" catch certificates, which cover consignments of product for which IUU has been established; disposal must be overseen by the issuing authority (see CCAMLR CMM 10-05 (2016), Article 14). In such cases: "Parties shall ensure that the sale of seized or confiscated *Dissostichus* spp. does not result in any financial benefit accruing to those responsible for, or benefiting from, the activities that led to the seizure or confiscation of the catch (i.e. including operators, effective beneficiaries, owners, logistics and service providers)." The issue of a certificate ensures that IUU product is accounted for in the CDS, especially in quota-managed fisheries. To work effectively, CDS must provide for a CCAMLR-style mechanism for specially validated catch certificates whereby all catch is eventually recorded – including illegal harvests.

BOX 7

Joint inspections by fishery and health authorities in the Solomon Islands

The fishery and health authorities conduct joint checks every two weeks. The officials meet at the processing company premises, randomly select up to three lots from product reception records and cross-check incoming raw material with their own records. They then carry out traceability and mass-balance analyses of fish received at the premises, either to confirm that they are totally used or to locate remaining balances in cold storage, processing areas or storage for finished products. The team then randomly selects consignments ready for dispatch and repeat the exercise, tracing back to vessels of origin and analysing the volumes used.

The two authorities use the same checklists, keep identical records and countersign copies left at the premises and filed at their offices.

Economic operators must understand that fraud involving seafood has serious consequences such as criminal charges, jail terms, revocation of operating licences and the closure of entire businesses in cases of aggravated and repeated offences.

Box 8 describes a recent case in New Zealand to emphasize the effects of coordinated law enforcement.[113]

BOX 8

Example of a value chain investigation and charges

In September 2014 following a six-month investigation, the New Zealand Ministry of Primary Industries – Fisheries and Health led a snap investigation of Hawke's Bay Seafoods, an inshore fishing company in Napier. This major investigation involved 88 officials and investigators from the Ministry of Primary Industries, customs, police, immigration and the Ministry of Business Innovation and Employment. The team collected evidence from offices and vessels connected with the company at six locations. The police seized eight houses, five vehicles and cash alleged to have been the proceeds of a large illegal fishing operation. The investigation also covered the company's activities along the commercial supply chain – catching, landing, processing and exporting. Ministry-level inquiries commenced when large discrepancies were discovered between the company's catch and incoming-product records and its export documents, with more fish being exported than were reported as caught.

The investigation proved that the company had exported substantial quantities of fresh chilled product over an 18-month period, whereas catch records showed that the company had landed considerably less. The fraudulent figures were found to be larger than initially suspected when domestic sales during the period were included.

As a result of the investigation, in October 2015 the company directors and organizations associated with them faced a total of 380 charges with regard to fisheries misreporting, as well as non-compliances in the areas of immigration and forced labor.

Trial before a judge on 355 charges relating to a claimed 32 fish-exporting operations started on 18 May 2017.

[113] See: i) http://www.stuff.co.nz/national/10537974/Alleged-illegal-fish-export-business-hooked ii) http://www.stuff.co.nz/business/industries/72827811/Hawkes-Bay-Seafoods-directors-and-companies-face-380-charges iii) http://www.stuff.co.nz/dominion-post/news/hawkes-bay/69670364/Hawkes-Bay-Seafoods-investigated-for-worker-exploitation iv) http://www.radionz.co.nz/news/national/331055/fishing-companies-on-trial-for-under-reporting-catches

4.4.5 SUMMARY OF PROCESSING STATE CDS SUPPORT MECHANISMS

The controls to be applied by processing states can be challenging for fishery authorities in that they require trained and experienced inspectors who understand processing and can investigate company records, inventories and export trading practices.

Fishery authorities must therefore collaborate with health and customs authorities, which have their own traceability systems in place. Some of the groundwork for this is already in place in several countries.

In supporting a CDS, fishery authorities in processing states must:

- ensure that no illegal products enter their territories, whether landed or imported. Collaboration with customs and port authorities is fundamental because in a CDS all products to be imported must be covered by valid certificates, and relevant verifications must be consistently applied;
- cover the entire chain of events by means of its *national traceability* system to trace product from landing or importation at ports of arrival through ownership changes and processing exportation or re-exportation. Current CDS cover the entry of product into markets and their exportation, but processing states are treated as "black boxes". The need is for traceability tools that cover events between entry and exit "gates" into and out of the country so that regulatory controls can establish where anomalies occur and identify those responsible. These controls must cover:
  - registration and licensing of storage and processing premises to identify value chain operators; in most countries fish storage and processing premises must be licensed and controlled by health authorities, which amounts to a traceability and record-keeping system that can support CDS;
  - distribution and transfers among operators' premises: registration of internal movements of declared species and volumes makes them traceable; this requires six KDEs that must be recorded at every step along a supply chain;
  - operations in storage and processing premises involve changes in weight from unprocessed to processed product, providing opportunities for laundering non-originating fish into supply streams, so fishery authorities must establish controls to: i) check processing premises and cold stores to verify the accuracy of records and inventories, account for volumes that have been split or mixed and verify the volumes and forms of certified species entering supply chains and subsequently leaving them; and ii) verify the reporting and monitoring of yield factors to eliminate fraud; and
  - record products leaving operators' premises, regardless of destination; regular verification by fishery authorities of pre-dispatch checks and consignment loading records will ensure the effectiveness of traceability systems at the level of individual operators.

Processing states can choose to operate one of two different traceability systems:

- record-keeping, whereby operators must maintain records of the six KDEs for every entry and every exit of product from premises and provide i) invoice dates and numbers; ii) seller and buyer IDs; and iii) copies of certificates to establish which certificates were exchanged, the buyers holding them and acquired products matched with products on certificates. This is enough to trace any CDS-covered product in a national supply chain as it changes form and ownership. Such systems are economically advantageous for countries with short value chains or small industries; and
- online platforms, which are the preferred option because they enable online data handling and rapid information retrieval by any operator; users may be private-sector operators or fishery authorities.

The following functions are essential for private sector operators:

- product entry and creation of a product account linking product entry to the premises with the relevant certificates; scanned supporting documents may be uploaded when creating the product account and competent authorities then validate and authorize the product account; all transactions are deducted from this account;
- product exit, subtraction from the product account and certification for product exit from a supply chain to: i) another operator in a business-to-business transaction, with the acquired raw materials in alignment with the details of species, volumes and form; ii) a domestic market for local consumption, logged as above; and iii) exportation, with supporting documentation and details of volume, form and species so that log processing yields and any anomalies can be traced; and
- product account balance held by any operator, based on logged data and/or verified by inspection.

Other important functions for private-sector users involve mechanisms for queries and error correction.

Fishery authorities must have access and functions to enable them to:

- validate requests submitted by economic operators for product accounts, trade certificates and error correction;
- make queries to obtain an overview of the system and products within it; and
- block or suspend product accounts or trade certificates submitted for validation.

Overall the system must be capable of:

- automated monitoring of product flows and yield factors throughout national supply chains as product changes form, weight and ownership;
- capturing processing yields on the basis of volume declarations for product in and product out to establish a database; and
- triggering alarms that signal the logging of anomalous data and trigger investigation.

Online systems must be user friendly, results oriented, tamper-proof and grounded in legislation.

If products are involved whose form has been changed from the original genetic testing may be needed. Practical procedures are being developed to enable genetic identification of species and prevent substitution and fraud.

The final function of a processing state is the validation of trade certificates. Seafood exports depend on the issue of health certificates and certificates of origin, which include common KDEs used in CDS; counter-validation of trade certificates at this level is an option for enhancing national oversight.

CDS trade certificates connect products for export with catch or trade certificates. If inconsistencies are detected when trade certificates are being established, fishery authorities must investigate and enforce the law, in line with RFMO guidelines prohibiting the establishment of trade certificates for fraudulent products and denying exportation in the absence of validated trade certificates.

Institutional systems in processing states are generally the preserve of health authorities. Collaboration between fishery law enforcement and public health law enforcement should be established or improved.

Processing states need sanctions greater than denial of certification: fraudulent economic operators and corrupt officials involved in serious infractions relating to seafood trade should face the prospect of having their licences revoked and the possibility of civil or criminal charges being brought against them.

4.5 END-MARKET STATES AND IMPORT VERIFICATION

From a CDS and trade perspective it is important to distinguish between market states and processing states (see Section 4.4) primarily because product that enters an end-

market state never re-emerges in international trade, whereas this is not the case with processing states. The responsibility and actions of the end-market state are therefore much more limited.

4.5.1 Fundamentals of end-market state responsibility

An end-market state can also be a flag state, a port state and a processing state simultaneously, as previously discussed. This section covers the importation of fisheries products as consumer goods, whether by wholesalers or retailers or by processing establishments that subsequently sells them into the domestic market.

The main responsibility of end-market states is to ensure that fishery products imported under a CDS are prevented from entering the national territory without valid catch or trade certificates – which can be difficult to achieve.

One problem is that major end-market states may not be members of RFMOs, and consequently CDS rules may not be enforced at all.[114] No CDS can curb IUU fishing if major end-market states absorbing large shares of CDS-covered species disregard the scheme and allow imports and landings to take place in the absence of validated CDS certificates.

In 2014 the CCAMLR secretariat noted that: "The number of non-contracting parties that may be involved in the harvest and/or trade of *Dissostichus* spp. while not cooperating with CCAMLR by participating in the CDS continues to increase. As of September 2014, 23 non-contracting parties have been identified over the last five years to be possibly involved in the harvest and/or trade of *Dissostichus* spp. while not cooperating with CCAMLR by participating in the CDS" (CCAMLR, 2014b). End-market states clearly have a crucial role as CDS "gate keepers" because they are located at the point in the supply chain where IUU products may be exchanged for cash.[115]

4.5.2 Ideal end-market state configuration

End-market states need various mechanisms and conditions to carry out their functions in a CDS.

Table 6 shows the critical supply chain points and the related CTEs and KDEs. The table is divided to show which CTEs and KDEs are covered by CDS and which supplementary functions are to be carried out by end-market states.

4.5.2.1 Border clearance

At landing (see Section 4.3) the fishery authorities start to exercise oversight before a fishing vessel arrives in port and can apply various measures to deny entry to suspected IUU catches.

Imported products enter market states through commercial ports, which are often outside the purview of fishery authorities and typically overseen by customs authorities. In most cases veterinary, health and quarantine authorities – which may be linked to fishery administrations – oversee product entry once it is cleared by customs. There is no guarantee that CDS competent authorities will be in place to oversee the legality of imports.

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[114] Grilly *et al.* (2015), assessing toothfish fisheries and associated trade flows between 2007 and 2012, notes: "The analysis reveals a greater number of countries apparently engaged in toothfish trade than previously reported by CCAMLR through the CDS. Further investigation is required to determine if this reflects honest reporting (through ignorance of reporting processes) or deliberate failure to report allied to illegal activities."

[115] Grilly *et al.* (2015) established the existence of 11 flag states, 73 exporting states – flag, port and/or processing states – and 105 importing states. With a membership of 24 states plus the EU, it is clear that a large proportion of port, processing and end-market states are not CCAMLR members.

TABLE 6
Supply chain points, CTEs and KDEs at the end-market state level

End-market state supply chain segment			CDS		Market state		
Supply chain stop	**CTE**	**Main KDEs***	**Data capture**	**Notes**	**Data source**	**Notes**	
Importation	Import authorization	Place of importation	Covered		Customs pre-clearance procedures	Documentary verifications: authorization/refusal	Requires access by fishery authorities to commercial ports and import clearance data
		Name of importer	Covered		Pre-clearance procedures		
		Document ID no.	Covered		Pre clearance procedures	Verification, online in case of e-CDS	
		Verified volume, form and species	Covered		Border clearance		
	Customs control	Document no.	Not covered				
Domestic Distribution	Distribution events, by importer	Certificate no.	Not covered	Because products cannot re-emerge from an end-market state, there is no need to trace products beyond the point of final market entry	Importers' business records		
		Product type and volume	Not covered		Inspections and sampling	Food fraud police unit	
		Name of buyer	Not covered		Importers' business records		
	Wholesaler buyer		Not covered		Purchase records		

* For an exhaustive list of KDEs, see: FAO Technical Paper 596, Chapter 7, Table 11.

The importation of fish and fishery products is generally a shared responsibility of the authorities governing:

i. seafood products as a public health risk, normally a health authority;
ii. biological products that may harm fauna and flora, normally a quarantine or biosecurity authority;
iii. products listed as protected species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, generally environmental or wildlife authorities; and
iv. legally-sourced products in a CDS, normally the fishery authority.

Ideally, fishery authorities should be part of an official chain of information exchange, verifications and authorizations that enables them to oversee seafood imports and ensure that imported seafood products are legally sourced and covered by the appropriate certificates. This is in line with PSMA, Article 5: "...integration or coordination of fisheries related port state measures with the broader system of port state controls."

4.5.2.2 RFMO affiliation

Membership of an RFMO or cooperating non-member status gives states access to case officers who know rules governing harvesting and trading of marine products in its area of competence. When states have a stake in a CDS-managed RFMO fishery as harvesters, processors or end-markets but are not members, collaboration and the application of its rules becomes difficult, if not impossible.

There is no suggestion that end-market states must be RFMO members to import fish originating in the RFMO area of competence. The situation is different for flag states, which must be members for their fishing vessels to harvest RFMO-managed resources.

This creates problems for CDS, which cover entire supply chains. Although RFMO membership and hence oversight of fishing vessels is effective at the flag state level –the beginning of a supply chain – it becomes less effective as products flow through supply chains from flag to port states, from port to processing states and from processing to end-market states.

End-market states that are members or cooperating non-members of an RFMO from which they import products find it easier to establish controls at borders. The ideal solution for end-market states absorbing large portions of harvests originating in specific RFMOs operating CDS is to become members or cooperating non-members.

The United States of America is unique in this respect, and an example to follow. It is by far the most important end-market state for toothfish and is the third most important state in terms of re-exports. But not a single fishing vessel operates in the fishery under the American flag (Grilly *et al.* 2015). The United States is, however, a member of CCAMLR, a supporter and implementer of the CCAMLR CDS, and acts as expected as a market state.

4.5.2.3 Food fraud police

End-market states must be able to track food fraud. The difficulties of fishery authorities in land-based supply chain segments, which have been discussed previously, apply at the end-market state level. One complicating factor is that end-market states may be landlocked and have no fishery authorities at all.

Ideally, national police forces, agriculture or fishery administrations or customs authorities have law-enforcement officers to monitor, investigate and sanction food fraud in line with CDS rules. This constitutes an effective deterrent that contributes to the success of CDS.

4.5.3 End-market state CDS support mechanisms

Sections 4.5.1 and 4.5.2.2 discuss the recommendation that end-market states should be members or cooperating non-members of RFMOs. This is not a technical support

mechanism, but it will allow end-market states to cooperate with RFMO to ensure that IUU products are identified and denied market access. Because products in end-markets do not re-emerge into international trade, there is no need from a CDS perspective to trace imported products.

4.5.3.1 Border clearance procedures, coordination and institutional framework

In CDS national authorities must have statutory powers to deny entry to consignments scheduled for importation: i) if the legality of the products cannot be verified by the authorities of the country of dispatch; and ii) if the national authority has established that the information and paperwork are insufficient. To this end, national laws establishing the statutory nature of CDS certificates are a prerequisite.

To do this, national authorities must have systems for: i) prior notification of importation and authorization for importation; and ii) coordination among customs and fishery authorities, because the former are responsible for establishing which goods may or may not enter a territory and which tariffs apply.

The two options are: i) customs authorities integrate the functions of competent authorities with regard to CDS and carry out verification tasks; or ii) competent authorities are empowered to carry out verifications in coordination with customs authorities.[116] In nearly all cases the latter option is preferred because fisheries and fishery trade are complex and best handled by trained fishery officials with links to fishery administrations, and because customs officers, who deal with most aspects of international trade, may not be technically competent to handle fishery-related matters.

Hosch (2016b) presents the case of Spain as a best-practice model, arguing that the best models for ensuring that CDS-managed fisheries are adequately monitored are collaborative in that the Ministry of Agriculture, Fisheries, Food and the Environment – the competent authority – and the customs agency work together, exchanging information and sharing responsibility for verifications. The ministry uses an online interface – SIGCPI[117] – in which importers log details of inbound consignments and which caters for imports under the ICCAT, CCAMLR, CCSBT and EU CDS. Details of inbound consignments are logged by economic operators with scanned supporting documents. All submissions are verified and authorized or suspended by the competent authority. If a consignment is suspended, additional documentation is required, and the customs agency will deny release of the consignment until further notice.

SIGCPI is integrated with the customs agency's electronic platform, eliminating the need for exchanges of paperwork between the two institutional partners. For every importation, the competent authority electronically transmits only the harmonized customs code, the product weight and the import authorization number to the customs agency platform, and the agency is notified with a reference to "EU IUU Regulation", regardless of the CDS under which products are to be imported, and suspends its procedure until the competent authority has authorized the importation. Once it has been authorized, the customs agency applies its own risk-based assessment and authorization procedures. Fishery-specific checks are thus carried out by the competent authority; the customs agency has no part in the CDS-related process at all, and the system is applied in the same way to exportations.

This best-practice example from an EU processing and end-market state suggests that end-market states overseeing the importation of CDS-managed products should

[116] CCAMLR CMM 10-05 (2014), Paragraph 9: "Each Contracting Party, and non-Contracting Party cooperating with CCAMLR by participating in the CDS shall ensure that its customs government authorities or other appropriate government officials request and examine the documentation of each shipment of *Dissostichus* spp. imported into or exported from its territory. […]"

[117] *Sistema Integrado de Gestión y de Control de la Pesca Ilegal*. The initial development costs amounted to EUR 700 000.

implement similar oversight procedures, thereby achieving the most important duty of end-market states.

Box 9 illustrates the downward trend in Japan's Atlantic bluefin tuna imports, primarily as an end-market, following the implementation of the ICCAT CDS.

BOX 9

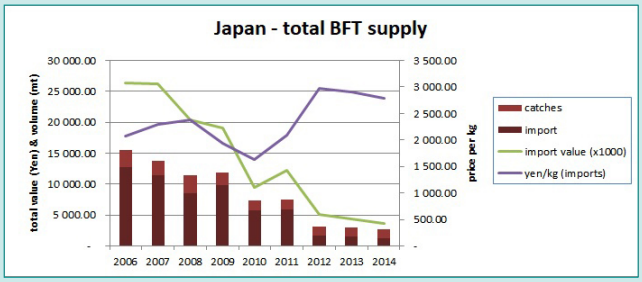
Japan's BFT imports under the ICCAT bluefin catch document

Japan is the main global market for fresh high-quality tuna, particularly bluefin tuna covered by the ICCAT and CCSBT CDS. Indications are that Japan is applying the ICCAT and CCSBT schemes as an end-market state, and no bluefin tuna can be traded to Japan through official channels and ports without the necessary paperwork.

The figure below shows the volume, value and price of Atlantic bluefin tuna imported into and caught by Japan between 2006, just before the CDS came into force, and 2014.

The evidence of trade fluctuations resulting from the enforcement of both tuna CDS and the resulting supply constraints must be considered in the context of a rapidly contracting Japanese market for sashimi-grade tuna driven by exogenous factors relating to consumer preferences and changing eating habits. It is, however, possible to detect patterns in this decline. Japan's imports of higher-priced Atlantic bluefin tuna covered by the CDS fell by 89 percent between 2007 and 2014 (see figure below).

Total bluefin tuna available to Japan – imports plus catches – between 2006 and 2014



Source: Hosch, 2016a.

4.5.3.2 Food fraud police

Border clearance procedures should be supported by a police unit responsible for detecting and investigating food fraud. Such a unit could participate in border clearance and could address in-country food fraud after importation, pressing for sanctions where fraud is proven. Otherwise the incentives to commit food fraud and reap the economic benefits will remain. Warner *et al.* (2013) showed that even mislabelling can substantially increase illicit profits, and that in the United States of America 44 percent of the retail outlets studied sold at least some mislabelled fish.

France provides an interesting example. The *Office Central de Lutte Contre les Atteintes à l'Environnement et à la Santé Publique*[118] was founded in 2004 to track food fraud, doping in sports and counterfeit drugs. It was responsible for uncovering the substitution of horsemeat for beef in 2013, known as the "French horsemeat scandal".[119]

[118] Central Office for the Fight against Environmental and Public Health Violations (author's translation).

[119] The French processor Spanghero was at the heart of the highly publicized scandal, in which horsemeat was substituted for beef in lasagne. It dismissed a number of managers and 140 employees. The company did not collapse, but it had to change its name and registration and its performance was affected for some years as a result of the fines imposed.

Such expert food-fraud units should be part of national legal and law-enforcement systems to ensure that fraudsters are detected and punished. Their existence shows that market states are prepared to address this form of fraud, and CDS-covered imports will benefit directly. Investigations into CDS-related fraud must be communicated to coastal, flag and port states and RFMO secretariats.

4.5.4 Sanctions

With regard to sanctions, the logic applied to processing states also applies to end-market states. Seafood fraud is not only a matter of importing and selling IUU fish: it also affects consumers because the origin, handling and processing history are unknown and the products may constitute a public health risk.

Would-be importers of fraudulent consignments must be aware that such consignments will be refused entry at the very least,[120] and know that they may face prosecution and large fines for handling and selling IUU and undocumented or falsely documented products into national markets.

4.5.5 Summary of end-market state CDS support mechanisms

End-market states can also be flag, port and processing states simultaneously. This section considered the importation of fishery products as consumer goods.

The main responsibility is to ensure that fishery products imported under a CDS do not enter national territories without valid catch or trade certificates. This is complicated by the fact that end-market states are not necessarily members of RFMOs operating CDS and are hence not obliged to enforce CDS regulations and controls. This reduces the effectiveness of even the best designed CDS.

End-market states need various mechanisms to implement their functions in CDS.

The first is involvement of fishery authorities in overseeing CDS and legal requirements before border clearance. This is because imported products normally enter countries through commercial ports, which are often outside the purview of fishery authorities.

Fishery authorities must be involved in verification and authorization with customs, health and biosecurity authorities to ensure that only legally sourced and certified products enter a territory. The competent authority must have statutory powers to deny entry to non-compliant consignments, which normally requires the development of new regulations.

A system of prior notification and authorization for imports must be in place. Fishery authorities can either undertake their own verifications for the CDS control function, or do so in coordination with customs authorities.

End-market states ought to engage with RFMOs operating CDS under which they import products to streamline the imposition of border controls. Otherwise, the best option is to become an RFMO cooperating non-member and to participate in CDS by adopting border-clearance safeguards.

End-market states must be able to investigate and sanction food fraud. One option is operate a multi-agency task force that also covers fraud originating from imported seafood under the rules of a CDS.

The importation of IUU fish into national markets affects the sustainability of fisheries and increases public health and safety risks. Non-compliant consignments must be refused entry, and fraudulent operators should bear civil and criminal liability and face the risk of prosecution and substantial sanctions.

[120] In Spain, when a consignment is denied importation by the Ministry of Agriculture, Food and the Environment, it is also automatically denied importation by the Customs agency. The economic operator is given 15 days to remove it, which can normally only occur through re-exportation.

5. Discussion and recommendations

This chapter makes recommendations based on the foregoing findings, focusing on existing multilateral CDS and the ways in which the various state types intervene along international supply chains to support the CDS in which they are stakeholders.

The SWOT analysis in Section 5.1.1 offers some general points that are not directly related to the design and implementation of CDS at the RFMO and country level but that relate to the political context to highlight issues relevant to the topic.

5.1 GENERAL REVIEW AND SWOT ANALYSIS

Different state types – coastal, flag, port, processing and end-market – with their different responsibilities are located along supply chains covered by CDS. This paper uses them to segment the supply chain and identify the mechanisms that must be in place to ensure that CDS are effective.

CDS operate on twin tracks – the CDS framework itself, serviced by RFMO secretariats, and country-level support mechanisms operated by national competent authorities (see Section 3.3, Figure 3). These organizations and their actions must combine for CDS to operate effectively along entire supply chains and achieve their objectives.

Multilateral and unilateral CDS are different in terms of design, legal foundation and governance. Only multilateral CDS are covered in this paper. The traceability frameworks in multilateral CDS are whole in themselves,[121] supported by country-level traceability mechanisms that complete the system and make it possible to identify, prevent and sanction the laundering of IUU products into supply chains. This is why country-level support mechanisms are so important.

Country-level CDS support is not all about traceability. Many country-level support mechanisms are concerned with oversight and law enforcement rather than additional traceability solutions. The collection of good MCS data and appropriate action, for example when deciding to validate a catch certificate or to authorize port entry and landing, are as important as traceability mechanisms may be further down the supply chain.

5.1.1 Broad-spectrum SWOT analysis

The SWOT analysis below (see Table 7) relates to current and future CDS development at RFMO and country levels. SWOT analyses are generally domain-specific: here we look at three CDS with similar designs. The responsibilities of states along supply chains and their capacities and performance vary as products move from harvesting to processing and on to end-markets and consumption. This SWOT analysis is hence generic, but it provides useful insights into the social, economic and political contexts within which CDS will have to develop in the medium term.

[121] The basic framework is the same in the three multilateral CDS, but there is room for improvements in all of them.

Strengths

There is evidence that CDS can help to prevent IUU fishing[122] and contribute to stock protection and recovery. Private-sector and civil-society actors and NGOs accordingly endorse CDS, and states are increasingly willing to seek to prevent illegal marine fishing. An example of this was the signature by US President Barack Obama of the Seafood Import Monitoring Program under the Magnuson-Stevens Fishery Conservation and Management Act in December 2016. The objective of the monitoring programme is "... to prohibit the import and trade, in interstate or foreign commerce, of fish taken, possessed, transported or sold in violation of any foreign law or regulation or in contravention of a treaty or a binding conservation measure of a regional fishery organization to which the United States is a party." (NOAA, 2016). This system embodies the latest unilateral CDS, which is different in terms of basic design but part of the family of CDS nonetheless.

Weaknesses

CDS depend on the participation of all state types along supply chains, which are only as strong as their weakest link. Assessments of CDS performance have been few and their achievements insufficiently publicized. Lack of standardization and harmonization among systems leads to a situation where CDS may be poorly understood and design flaws may pass undetected and be repeated in new systems, whose effectiveness is then reduced. This compromises the commitment of states with regard to the development and adoption of CDS; market states in particular may have little interest in them because such states are often driven by social and economic rather than resource-management considerations.

The CDS responsibilities and duties of some state types in a supply chain are more onerous than those of others. This is exacerbated because such states may be at different stages of economic development and lack some of the capacities required to implement the schemes. A weakness relating to market states is that fishery law enforcement has been largely confined to harvesting operations and unloading in ports, and the institutional changes required for CDS implementation are likely to be challenging. It must also be understood that the threat of RFMO trade restrictions and sanctions is generally insufficient to force non-compliant states into line.

Opportunities

Studies such as this of the objectives, functioning and effects of CDS that are now appearing provide a foundation for debate regarding CDS design and function. Major NGOs active in this field of fisheries regulation are giving greater consideration and support to more effective CDS designs and models, thereby nurturing public debate as to what works and which design elements are critical.[123] In the medium term this may improve the case for sound system-based approaches and lead to eventual harmonization of CDS. A major opportunity is to develop super-CDS as a single standardized and harmonized online platform to which any RFMO or state can subscribe and which can be implemented as ready-to-use technology operated by a central institutional provider. Such an approach would be supported by an increasing number of states, because awareness of IUU fishing and the need to prevent it is increasing, and the burden of development, adoption and compliance would be greatly reduced.[124]

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[122] See Hosch (2016a) on the effects of the ICCAT CDS on trade volumes and prices of Atlantic bluefin tuna entering the Japanese market, and the ensuing stock recovery after years of systematic over-fishing and under-reporting.

[123] See: EJF (Environmental Justice Foundation), Oceana, Pew and WWF (2016a and 2016b)

[124] See Hosch (2016a) for detailed discussion of harmonization of future CDS into a single platform.

Threats

A major threat to continued development of CDS is the lack of clear understanding of their objectives and operational modalities among political leaders and national fishery administrations. CDS are becoming an increasingly sensitive topic politically, *inter alia* because of the rise of alternative end-market-operated models and their unilateral sanctions mechanisms.[125] Eco-labelling initiatives are desirable, but they can be misunderstood as constituting an alternative to CDS. These factors have led to situations where individual RFMOs are blocked for years, either discussing the need to develop CDS without reaching consensus – IOTC is an example – or developing CDS but failing to complete them in reasonable time – WCPFC, for example, has been formally discussing the development of a CDS for a full decade.

CDS may hence continue to evolve in different directions, and a variety of unilateral models may continue to dominate the field in terms of media attention. Proliferation of unilateral schemes will increase the burden of compliance for economic operators and national administrations (Hosch, 2016a), and may ultimately dissuade RFMO members from considering further multilateral systems.

TABLE 7
SWOT analysis: CDS/RFMO and country levels

	CDS/RFMO level	Country level
S	Multilateral CDS shown to eliminate certain forms of IUU fishing Endorsed by private-sector and civil-society actors and NGOs	More and more states understand and support the need to combat IUU fishing Most states have in place basic systems on which CDS support mechanisms can be founded
W	CDS success depends on support, implementation and cooperation throughout the supply chain The effects of CDS impacts are rarely studied or published Variety of CDS models and approaches, and system design flaws and inconsistencies Different levels of interest and commitment to CDS among RFMO members such as distant-water fishing nations or coastal states Insufficient incentives for processing and end-market state participation at the RFMO level	Uneven implementation of CDS duties among states at the various levels Threat of RFMO-based trade sanctions generally insufficient Different levels of capacity and resources among national fishery administrations in the same RFMO Limited involvement of fishery authorities in processing and importation into processing and end-market states
O	More studies of CDS in recent years, fostering improved understanding of potential Major NGOs now more nuanced in CDS models they support and champion Alignment of CDS design, leading to harmonization and unification of platforms and standardization of technology	Willingness to consider and contribute to the development of new multilateral CDS approaches, with a focus on standardization and harmonization More awareness and interest by civil-society and consumers in combating IUU fishing and supporting CDS initiatives
T	Insufficient attention paid to trade-related tools – including CDS – as avenues for combating IUU fishing Politically sensitive, partly as a result of the recent increase of unilateral CDS CDS are insufficiently understood by fishery leaders, politically and technically	Proliferation of unilateral and non-harmonized multilateral CDS, creating excessive burden of compliance Proliferation of private certification and labelling schemes that confuse consumers

[125] The yellow and red card procedure in EU IUU Regulation of 2008, and the "negative certification" procedure in the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006; these have far-reaching trade and economic implications.

5.2 MULTILATERAL CDS: CONCLUSIONS AND RECOMMENDATIONS

This section considers ways in which individual countries can contribute to the development of CDS at the RFMO level.

The objective of a CDS is to prevent IUU fishing and deny market entry to its products. This largely negates the commercial value of IUU products, thereby removing incentives for operators to fish illegally. CDS are therefore recognized as a fisheries MCS tool – but RFMO CMMs establishing CDS do not as a rule set out the objectives clearly enough.

Recommendation 1

The objective of CDS should be clearly defined in the CMMs establishing them. This is to ensure that CDS are designed and developed to achieve their specific purpose and to prevent overburdening the systems or adapting them to respond to other needs.

The few multilateral CDS currently in existence cover a mere 0.1 percent of the global marine fisheries catch. In view of recent CDS successes in addressing and eliminating IUU fishing in some RFMOs and contributing to stock recovery, there is clearly a case for expanding them. New CDS could be developed for any RFMO managing trans-boundary stocks, but increasing the number of CDS must not also multiply the burden of compliance: they should be developed so as to foster harmonization and the potential unification of schemes in the future.

Recommendation 2

Members of RFMOs that have no CDS should take steps to ensure that they fully understand current CDS and their potential for preventing IUU fishing. In situations where trade-based measures would provide clear gains in terms of protecting resources, they should promote the CDS concept at annual RFMO meetings and advocate for their development and adoption.

Recommendation 3

When CDS are being developed, RFMO members should propose practical mechanisms to harmonize their design with existing schemes. Eventual unification of e-CDS would simplify compliance requirements to the advantage of economic operators, individual state actors and their competent authorities. The CDS operated by ICCAT and CCAMLR are sound examples to follow.

CDS are trade-related measures to combat IUU fishing, and they operate along entire supply chains. CDS typically cover harvesting, landing, distribution, processing and import/export trading operations. Formal participation by all states along a supply chain is essential for success.

Recommendation 4

RFMO members should ensure that state-level supply chain actors are formally committed to supporting the operation of CDS. This is the only way to ensure that statutory implementation of CDS covers products along supply chains from harvest to final importation.[126]

[126] It must be emphasized that because CDS cover entire supply chains it is wholly insufficient to limit statutory certification powers and duties to flag states.

Recommendation 5

RFMO members should ensure that countries known to participate in a supply chain but that are not cooperating with the RFMO are invited to join as members or cooperating non-members. This will ensure that the CDS is respected and implemented at the relevant state-actor level. End-market states are a possible exception, but RFMO members should ensure that they are encouraged to prevent IUU products from entering their markets through the enforcement of the certificate system at final importation.

Current CDS share a fundamental structure in terms of a central certificate registry and a documentation system for catch and trade certificates. But there are differences: some CDS are related to particular needs of specific fisheries, others involve design issues that may compromise performance, which is not surprising in systems that did not exist only 17 years ago. The CDS review mechanisms in RFMOs will identify weaknesses and faults to be rectified and will promote learning and best practice with a view to improving CDS design.

Recommendation 6

RFMO members should individually promote and contribute to the activities of CDS review panels. They should appoint national experts to participate, or provide critical and constructive reviews of proposals made by the panels. Development of a global standard against which existing systems may be benchmarked would be a useful starting point. Members should insist that issues affecting CDS performance are addressed and resolved promptly: examples include lack of online systems, problematic exemptions and absence of counter-validation procedures.

Recommendation 7

When participating in CDS development, RFMO members should individually ensure that consideration is given to the central importance of full traceability of internationally traded products along entire supply chains. They should promote practical mechanisms to achieve this, and ensure that no nascent CDS advances beyond the design stage unless this fundamental element is fully provided for.[127]

With regard to the recommendation above relating to the central traceability element of CDS, this paper suggests that: i) e-CDS are the only viable option for the future; ii) national-level traceability systems supporting CDS are most powerful and useful to economic operators and competent authorities when they are based on electronic systems; iii) the burden of compliance must be reduced; iv) oversight and deterrence must be maximized; and v) national online traceability platforms could interface directly with e-CDS.

Recommendation 8

RFMO members should promote the development of customizable national traceability modules that can interface with e-CDS, thereby guaranteeing seamless inter-operability and maximizing performance. Such modules could be hosted centrally or in a member country, and they should be adaptable to national systems to eliminate the need for development of individual solutions, which is expensive. This approach will optimize data exchange and ensure that a maximum number of member countries are operating effective CDS support platforms.

[127] See: *FAO Voluntary Guidelines on CDS*, para. 4.4.

The effectiveness of CDS depends on their supporting enforcement frameworks and the willingness of members to impose sanctions when infringements occur. The best RFMO enforcement option involves the adoption of an enabling CMM that provides for trade-restrictive measures and sanctions to be imposed against states that consistently fail to comply with RFMO rules. In the absence of the threat of trade sanctions a major deterrent to IUU fishing is missing and compliance with CDS is weakened.

Recommendation 9

RFMO members should ensure that CMMs enabling trade-restrictive measures are developed and adopted if they are not yet in place. This will enable identification of member and non-member states involved in illegal trade of CDS-managed species and those consistently violating CDS rules.

For CDS to operate as mature accounting and traceability tools regulating international trade, they must cover all fishery harvests in their areas. There are exemptions from CDS coverage in at least one current scheme, and they may occur in the future unless sound counter-arguments are presented. The principal argument is that exemptions create markets and supply chain segments in which products can circulate without certificates, which means that oversight is weak.

If CDS fail to cover all harvests they are no longer useful as real-time catch and quota monitoring and enforcement tools. This means that such tools will have to be established separately by individual states, which is wasteful in terms of human and financial resources and will increase the burden of compliance because identical data will have to be entered repeatedly into separate systems. As a result, opportunities for fraud will multiply in the gaps between non-integrated systems.

Recommendation 10

RFMO members reviewing existing CDS or developing new CDS should consider the negative effects of exemptions from certification of primary products and seek to eliminate the practice. This will ensure that CDS can cover real-time catch reporting and quota management in their fisheries. RFMO members should also promote mechanisms to record in the CDS any identified IUU products for which an application for a trade certificate has been made regardless of the ultimate fate of the products, as in CCAMLR.[128]

5.3 COUNTRY-LEVEL CDS SUPPORT: CONCLUSIONS AND RECOMMENDATIONS

All state types – flag, coastal, port, processing and end-market – have essential roles in the implementation of CDS.[129] Some responsibilities and duties are directly related to the implementation of rigorous traceability mechanisms, whereas others are only loosely related – but together they provide the conditions in which CDS traceability functions can be enforced.

CDS with a sound traceability system detect imbalances at the individual certificate level each time product exits and re-enters international trade. In complex national supply chains, especially those in processing states, the identification of fraudulent

[128] In CCAMLR a "*specially validated Dissostichus catch document*" (SVDCD) may be issued for illegally harvested toothfish. This makes it possible to account for the harvest in terms of quotas and total allowable catches, and to allow the fish to enter the market. But the market state may refuse such a document – as is the policy of the USA with regards to SVDCDs – in which case proof that a sanction has been issued and served for the infringement should be provided with the certificate.

[129] In existing CDS coastal states have no statutory responsibilities or duties. This paper argues, however, that this should change to reflect the rights and duties of coastal states under UNCLOS (see Section 3.3).

operators requires effective national traceability systems. This paper establishes that traceability is an essential country-level CDS support mechanism. Other support functions are important, of course, but they relate primarily to flag, coastal and end-market states.

The following sections set out conclusions and recommendations regarding traceability and support mechanisms for each state type.

5.3.1 Flag states

Flag states have a duty to oversee the operations of their fishing vessels, and are hence the starting point of any CDS. They must have tools and procedures in place to: i) establish the legality of harvests landed by their vessels and certify them accordingly; and ii) oversee fishing vessels flying their flag to ensure compliance with international law and RFMO rules. If flag states certify IUU harvests as legal in a CDS, the entire process is undermined.

Recommendation 11

To ensure that RFMO CMMs are complied with, flag states must apply all RFMO rules and oversee and control fishing vessels flying their flags. This involves linking vessel registration and licensing, VMS, observer programmes, transhipment and landing authorizations, logbook and catch reporting, cooperation with other states and a sanctions framework that acts as a deterrent to IUU fishing.

Recommendation 12

Flag states must designate competent authorities with the statutory powers to check catch certificates submitted for validation against independently collected MCS data before validating them, or to deny validation of certificates where evidence of IUU fishing has emerged. Even if other forms of sanction are unavailable, this powerful deterrent to IUU fishing enables CDS to function effectively.

5.3.2 Coastal states

Oddly, coastal states are not directly involved in current CDS. UNCLOS provides coastal states with the right and the duty to oversee and regulate fishing in their EEZ, within which most of the world's fishing operations occur. There appears to be no justification for coastal states to be precluded from validating the legality of catches taken in their waters.[130] This reflects a legal deficiency in existing CDS[131] and FFA members, for example, are concerned that they have no statutory voice in the validation of catch certificates covering catches made in their waters in systems such as the EU CDS.

Recommendation 13

Coastal states participating in RFMOs developing new CDS should ensure that options are considered whereby coastal states can validate or counter-validate certificates, or formally endorse the validation of certificates made by other authorities – such as the flag state. Such options should be developed into formal CDS validation mechanisms to provide coastal states with the statutory role provided under international law.

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[130] Where the coastal state and the flag state are different entities.

[131] The *FAO CDS Voluntary Guidelines* do not identify flag states as sole validators of catch certificates and note that any state could potentially assume the function "... depending on the circumstances of the fishery... " [Paragraph 6.3], which implies that any arrangement is conceivable under the terms of the Guidelines, including a non-objection mechanism for coastal states in the validation of catch certificates.

5.3.3 Port states

If all IUU catches were prevented from being landed and hence refused entry into land-based supply chains, the practice of IUU fishing would end immediately. Port states are the second stage in CDS,[132] and their role is to ensure that CDS harvests that are not certified cannot be landed, which destroys the commercial value of the harvest. The PSMA provides for port states' implementation of all CDS, thereby providing an international legal foundation for their function.

Recommendation 14

Port states participating in CDS and complying with PSMA must prevent the unloading of IUU products in fishing ports by: i) designating specific fishing ports; ii) requiring advance notice of and authorization for vessel entries; iii) mandating port inspections; iv) checking the existence of validated catch certificates; v) monitoring landings; vi) establishing verified weights for landed products; and vii) collaborating with national authorities and other fishery authorities.

Having ensured that products to be unloaded are of legal origin, port states must counter-validate catch certificates during in-port transhipments, or counter-validate rectified and verified catch certificate product weights following unloading, grading and weighing. These procedures by port states constitute the foundation for national traceability of products entering processing states through designated fishing ports.

Recommendation 15

States operating fishing ports where capacities for oversight and statutory CDS functions are not available should close such ports to transhipments and unloading of CDS-managed fishery products. Port states that provide only a transit hub for transhipments, unloading, warehousing and re-exportation, implying statutory CDS functions, should at least participate in RFMOs as cooperating non-members.[133]

Recommendation 16

States that function as both port and processing states should ensure that the competent authorities for CDS overseeing port and processing activities are either the same, or that they collaborate and exchange data effectively.

Port states have a critical function in CDS and PSMA enforcement – denial of port entry to fishing vessels suspected of IUU fishing. This is a powerful deterrent, and is the second line of defence in CDS in that market entry is denied to IUU products even before they can be unloaded.

Recommendation 17

Port states must establish legally empowered institutions that can deny access to ports for fishing vessels suspected of IUU fishing, and to prevent unloading of IUU products after a vessel has entered port. If authorization to unload products derived from IUU fishing is given, port states must ensure – individually or in collaboration with relevant coastal and flag states – that any fines imposed on fraudulent operators will be sufficient to cancel any proceeds derived from the sale of IUU products.

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[132] Ports are only considered in their fisheries-related capacity as fishing ports – the place of landing or transhipment of fisheries products. Importation of fisheries products as goods is covered under the sub-section on market states.

[133] If a CDS is designed to allow only validations and counter-validations by RFMO members and cooperating RFMO non-members, the ports of RFMO non-members are automatically reduced to end-market state ports from whose territory product cannot re-emerge in trade.

5.3.4 Processing states

Market states may be either processing states or end-market states; they must be clearly distinguished in CDS because the roles are different.

CDS traceability mechanisms enable the tracking of certified products through international trade from one territory in a supply chain to the next. Sound traceability mechanisms alert users when product mass-balance violations occur, indicating that illegal products have entered legally certified supply streams. But CDS constitute a "blind spot" when products move through national supply chains in that they cannot track or record country-level operator-to-operator movements or transactions. CDS tracking can resume only when products re-emerge from a country. Only processing states can trace product movements in their national supply chains.

In complex processing state supply chains where landings and imports may be split, distributed, re-mixed, processed and re-processed by several economic operators, and where exporters are often different operators from importers, the need is to complement CDS traceability mechanisms with national-level data capture and traceability frameworks enabling the identification of sources of discrepancies and fraud.

Recommendation 18

Processing states should develop national traceability capacities in support of CDS to identify sources of inconsistencies in product transactions that trigger CDS alarms. This is the only way in which processing states can prevent the laundering of IUU fishery products in national supply chains.

The two options for achieving national traceability are: i) mandatory record-keeping by economic operators without a central database to enable the tracing of product movements; this is simple and relatively cheap, but it does not operate in real time; and ii) a central online platform in which all economic operators log transactions of CDS-covered products and movements into and out of their premises in real time; this is more complex and more expensive. The advantage of the second option is that data converge, and competent authorities can trace and oversee all movements of CDS-covered products through national supply chains in real time.

Recommendation 19

Competent authorities must ensure that: i) any traceability system can track products throughout an entire national supply chain and can accurately identify fraudsters; ii) the supporting legal framework mandates complete record-keeping and provides for sanctions on a scale that deters laundering fraud. As a minimum standard, processing states should refuse to issue trade certificates in cases of fraud.

Recommendation 20

Competent authorities opting for a simple mandatory record-keeping system must ensure that records are regularly audited by trained and experienced inspectors to check their accuracy and detect inconsistencies.

Recommendation 21

Competent authorities opting for a system with provision for remote user login and an online central database must ensure that it enforces mass-balance rules at the time of data input so that attempts to falsify records are detected at source, thereby ensuring supply chain integrity and minimizing the burden of law enforcement.

Fishery law enforcement generally focuses on harvesting and landing; few administrations also cover the post-landing segments of the supply chain, which are

the traditional preserve of health and veterinary services. Law enforcement throughout a seafood supply chain is hence a challenge in trade-based systems such as CDS.

Recommendation 22

To enforce fishery law throughout a supply chain, fishery authorities and other agricultural and public-health administrations and their law-enforcement agencies should ensure that systems for joint inspections, data exchange and intelligence gathering are in place.

Seafood may be landed by fishing vessels or imported as goods into processing states. Processed products leave processing states through two distinct channels: i) exportation or re-exportation; or ii) distribution into national consumer markets, in which case processing states also become the end-market state.

The distinction is important. CDS record all movements into processing states, but only record outward movements relating to exportation; sales into end-markets are invisible to CDS traceability mechanisms. Because internal and external distribution are not summed and reconciled with landings and imports there is a gap in the system that can be exploited to launder non-originating products into national markets or into international trade through export markets.[134]

Recommendation 23

Fishery authorities in processing states with end-markets for CDS covered products should establish traceability mechanisms based on "inward trade" certificates; these should be issued to buyers by processors to account for sales into national end-markets. This mechanism: i) ensures traceability and accountability in product flows; ii) enables accurate monitoring of mass balances as products move in and out of supply chain segments; and iii) prevents laundering of IUU products. This mechanism should be integrated with the traceability systems described in Recommendations 19, 20 and 21.

Recommendation 17 also applies to processing states in terms of denial of importation (as opposed to unloading) of non-certified fisheries products.

5.3.5 End-market states

End-market states may or may not be RFMO members. Under World Trade Organization rules end-market states are free to import any type of legally produced goods without being members of international organizations. This constitutes a challenge to CDS, which depend on collaboration by all states along supply chains, including end-market states. In cases where end-market states absorb the bulk of a harvest – the United States for toothfish and Japan for southern bluefin tuna are examples[135] – and fail to collaborate with RFMO CDS or prevent illegal landings and imports, no CDS can succeed in eliminating trade in illegally harvested products. But

[134] When a company acquires 1000 mt of seafood certified under a CDS and re-exports 800 mt, the remaining 200 mt can be distributed into the national end-market. In the absence of a CDS-related mechanism recording such sales, the competent authority will only "see" that 800 mt have been exported and that 200 mt remain on the operator's books, theoretically in cold storage. In the meantime the same company may already have sold 500 mt into the national market, of which 300 mt would then be non-originating. When such national sales are not monitored by the CDS fraud can remain undetected.

[135] In these examples relating to fish stocks under CDS managed by CCAMLR and CCSBT, the end-market states of Japan and the USA are members of the RFMOs. On the other hand Hong Kong, another important importer of toothfish, is not a member of CCAMLR and does not normally require catch certificates prior to importing toothfish. Hong Kong has, however, committed to developing the domestic legal framework needed to enforce the CCAMLR scheme at its border.

recent research establishing the large number of toothfish end-market states[136] shows the impracticality of suggesting that all end-markets become cooperating non-members or members of RFMOs.

When importing CDS-managed fishery products, end-market states should ensure that CDS-mandated documents are examined and that authorization to import is conditional on their validity. An end-market state must therefore be aware of the CDS concerned and the products covered, and must manage border clearance in a way that enables positive identification of CDS-covered products, which must be checked in accordance with CDS-specific procedures. Any end-market state must be capable of investigating food fraud and prosecuting offenders in its territory, thereby supporting CDS operations.

Recommendation 24

End-market states should establish collaboration agreements between agricultural, public-health and customs authorities to ensure that border clearance of seafood imports is subject to a system of prior notice and clearance. In this way competent authorities can ensure that species that should be covered by CDS documents may only be imported if the documentation is valid.

Recommendation 25

End-market states that are not full members of RFMOs operating CDS should ensure that their laws enable them to implement CDS; this may include actions such as denying border clearance and hence importation of suspicious seafood consignments.

Recommendation 26

End-market states should establish units tasked with the investigation of food fraud in their markets. Investigations relating to CDS-related fraud should always be communicated to other states and RFMOs that may be affected.

[136] Grilly *et al.* (2015).

References

Agnew, D. & Barnes, C. 2004. Economic aspects and drivers of IUU fishing: Building a framework. *In*: OECD. 2004. *Fish piracy. Combating illegal, unreported and unregulated fishing*. Paris, OECD Publishing.

Andre, V. 2014. *Review and analysis of current traceability practices*. COFI:FT/XIV/2014/Inf.6. Rome, FAO.

Bhatt, T., Cusack, C., Dent, B., Gooch, M., Jones, D., Newsome, R., Stitzinger, J., Sylvia, G. & Zhang, J. 2016. Project to develop an interoperable seafood traceability technology architecture: Issues brief. *Comprehensive Reviews in Food Science and Food Safety* 15: 392–429.

Blaha, F. 2015. *EU market access for fishery and aquaculture products.* Swiss Import Promotion Programme (SIPPO). Zurich, Switzerland. Available at: https://issuu.com/s-ge/docs/150415092504-88a348eb62024831911746e5069f4aa7

Blaha, F., Borit, L. & Thompson, K. 2015. *Traceability of fisheries products. A comparative study of 10 country cases under the framework of the programme GCP/INT/253/JPN*. Rome, FAO.

Borit M. & Olsen, P. 2016. *Seafood traceability systems: Gap analysis of inconsistencies in standards and norms*. FAO Fisheries and Aquaculture Circular FIAM/C1123. Rome, FAO.

CCAMLR (Convention for the Conservation of Antarctic Marine Living Resources). 2014a. *Catch documentation scheme for Dissostichus spp*. Conservation Measure 10-05 (2014). Hobart, Tasmania, Australia.

CCAMLR. 2014b. *Implementation of conservation measure 10-05 CCAMLR catch documentation scheme*. CCAMLR-XXXIII/BG/13 Rev. 2. Hobart, Tasmania, Australia.

CCSBT (Commission for the Conservation of Southern Bluefin Tuna). 2013a. *Resolution on the implementation of a CCSBT catch documentation scheme*. Modified 17 October 2013. Canberra.

CCSBT. 2013b. *Proposal for a web-based electronic CDS (eCDS) system*. CCSBT-CC/1310/BGD02. Canberra.

Clarke, S. 2010. *Best practice study of fish catch documentation schemes*. MRAG (Marine Resources Assessment Group), Asia Pacific. London.

Clarke, S. & Hosch, G. 2013. *Traceability, legal provenance and the EU IUU regulation: Russian whitefish and salmon imported into the EU from Russia via China*. Available at: www.sasama.info/en/pdf/reports_17.pdf

CODEX. 2016. *Codex procedural manual*. 25th Edition. Rome, FAO. Available at: http://www.fao.org/3/a-i5995e.pdf

EJF (Environmental Justice Foundation)**, Oceana, Pew, WWF.** 2016a. *Modernization of the EU IUU regulation catch certificate system*. EU IUU coalition position paper. Available at: www.iuuwatch.eu/wp-content/uploads/2016/07/Modernisation-FINAL.pdf

EJF, Oceana, Pew, WWF. 2016b. *Risk assessment and verification of catch certificates under the EU IUU regulation*. EU IUU Coalition Position Paper. Available at: www.iuuwatch.eu/wp-content/uploads/2016/07/Risk-Assessment-FINAL.pdf

EPLAT (Expert Panel on Legal and Traceable Wild Fish Products) **.** 2015. *Recommendations for a global framework to ensure the legality and traceability of wild-caught fish products*. Available at: http://solutions-network.org/site-legaltraceablefish/files/2015/03/EPLAT_FinalReport_March2015_Webview.pdf

EU. 2008. Council regulation (EC) no. 1005/2008 of 29 September 2008 establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending regulations (EEC) No 2847/93, (EC) No 1936/2001 and (EC) No 601/2004 and repealing regulations (EC) No 1093/94 and (EC) No 1447/1999. *Official Journal of the European Union* L 286/1.

EU. 2009. Commission regulation (EC) no. 1010/2009 of 22 October 2009 laying down detailed rules for the implementation of council regulation (EC) no. 1005/2008 establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated fishing. *Official Journal of the European Union* L 280/5.

EU. 2015. Communication from the Commission to the European Parliament and the Council on the application of council regulation (EC) no. 1005/2008 establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated fishing. COM(2015) 480 final. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0480&from=EN

FAO. 2002. *Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*. Rome. Available at: www.fao.org/3/a-y3536e/y3536e00.htm#Contents

FAO. 2009. *Guidelines for the ecolabelling of fish and fishery products from marine capture fisheries*. Rome. Available at: http://www.fao.org/docrep/012/i1119t/i1119t.pdf

FAO. 2012. *The State of World Fisheries and Aquaculture 2012*. Rome. Available at: http://www.fao.org/docrep/016/i2727e/i2727e00.htm

FAO. 2014a. *The State of World Fisheries and Aquaculture 2014. Opportunities and challenges.* Rome. Available at: http://www.fao.org/3/a-i3720e.pdf

FAO. 2014b. *Best practice guidelines on traceability*. Available at: www.fao.org/cofi/29510-0d3ea0e690044579673debe9c27579459.pdf

FAO. 2015a. *The state and trends of the fish world market*. Presentation by Jogeir Toppe and José Estors Carballo, CEIPA (Centre for European and International Policy Action) second regional forum. Manta, Ecuador.

FAO. 2015b. *Report of the expert consultation on catch documentation schemes. Rome, 21–24 July 2015.* FIPM/R1120 (En). ISSN 2070-6987. Available at: http://www.fao.org/3/a-i5063e.pdf

FAO. 2016. *Seafood traceability systems: Gap analysis of inconsistencies in standards and norms*. Fisheries and Aquaculture Circular no. 1123. Rome. Available at: http://www.fao.org/3/a-i5944e.pdf

FAO. 2017. *Voluntary guidelines for catch documentation schemes*. Rome. Available at: http://www.fao.org/fi/static-media/MeetingDocuments/CDS/TC2016/wpAnnex.pdf

FDA (United States Food and Drug Administration). 2011. *Food safety modernization act*. Available at: www.fda.gov/Food/GuidanceRegulation/FSMA/

FFA (Forum Fisheries Agency). 2016. *Analysis of the costs and benefits of electronic fisheries information systems applied in FFA countries and identification of the legislative, regulatory and policy supporting requirements*. Port Douglas QLD Australia, Poseidon Aquatic Resource Management Consultants.

Fishwise. 2015. *Pre-conference workshop: Exploring the elements of effective seafood traceability, including key data elements*. Available at: http://fishwise.org/index.php/press/blog/274-2015-seafood-summit-preconference-traceability-workshop

Grilly, E., Reid, K., Lenel, S. & Jabour, J. 2015. The price of fish: A global trade analysis of Patagonian (*Dissostichus eleginoides*) and Antarctic toothfish (*Dissostichus mawsoni*). *Marine Policy* 60: 186–196.

Hosch, G. 2016a. *Trade measures to combat IUU fishing: Comparative analysis of unilateral and multilateral instruments*. Geneva, ICTSD (International Centre for Trade and Sustainable Development). Available at: www.ictsd.org/themes/environment/research/trade-measures-to-combat-iuu-fishing-comparative-analysis-of-unilateral

Hosch, G. 2016b. *Design options for the development of tuna catch documentation schemes*. FAO Fisheries and Aquaculture Technical Paper 596. Rome. Available at: www.fao.org/3/a-i5684e.pdf

ICCAT (International Commission for the Conservation of Atlantic Tunas). 1994. *Resolution by ICCAT concerning the effective implementation of the ICCAT bluefin tuna statistical document program*. Res. 94-05. Madrid.

ICCAT. 2006. *Recommendation by ICCAT concerning trade measures*. Rec. 06-13. Madrid.

ICCAT. 2011. *Recommendation by ICCAT amending recommendation 09-11 on an ICCAT bluefin tuna catch documentation program*. Rec. 11-20. Madrid.

ICCAT. 2015. *Report for biennial period 2014-15 part I (2014)*. Vol. 2 English version. Madrid.

ISO (International Organization for Standardization). 2011. *Traceability of finfish products: Specification on the information to be recorded in captured finfish distribution chains*. 12875:2011. Geneva.

Joint Tuna RFMOs. 2011. Background for agenda item VII.c.iv. Topic: Market measures/ CDS/trade tracking. Document K3-013. Kobe III, July 2011. Kobe, Japan.

Le Gallic, B. 2008. The use of trade measures against illicit fishing: economic and legal considerations. *Ecological Economics* 64(4): 858–866

MRAG Asia Pacific. 2016. *Towards the quantification of illegal, unreported and unregulated fishing in the Pacific Islands region*. London, Forum Fisheries Agency. 101pp.

NOAA (National Oceanic and Atmospheric Administration) . 2016. *Magnuson-Stevens fishery conservation and management act: Seafood import monitoring program*. Available at: https://federalregister.gov/d/2016-29324

Olsen, P. & Borit, M. 2013. How to define traceability. *Trends in Food Science and Technology* 29(2): 142–150.

Österblom, H., Bodin, Ö., Sumaila, U. & Press, A. 2015. Reducing illegal fishing in the Southern Ocean: A global effort. *The Solutions Journal* 4(5): 72–79. Available at: www.thesolutionsjournal.org/node/237225

Palin, C., Gaudin, C., Espejo-Hermes, J. & Nicolaides, L. 2013. *Compliance of imports of fishery and aquaculture products with EU legislation*. European Parliament Directorate General for Internal Policies. Brussels.

New Zealand Ministry of Primary Industries. Animal products e-cert webpage. Available at: www.foodsafety.govt.nz/industry/exporting/e-cert/animal-products/

UNCTAD (United Nations Conference on Trade and Development). 2016. *Sustainable fisheries: International trade, trade policy and regulatory issues*. UNCTAD/WEB/DITC/ TED/2015/5. Geneva.

UNNExT (United Nations Network of Experts for Paperless Trade and Transport in Asia and the Pacific). 2016. *Handbook on implementing UN/CEFACT e-business standards in agricultural trade*. Bangkok. Available at: http://www.unescap.org/sites/default/files/ UNNExTeBusinessHandbook.pdf

Seafood Traceability Glossary. 2016. *Future of fish*. Available at: www.futureofish.org/ content/traceability-101

Sterling, B., Gooch, M., Dent, B., Marenick, N., Miller A. & Sylvia, G. 2015. Assessing the value and role of seafood traceability from an entire value-chain perspective. *Compr Rev Food Sci F* 14(3): 205–68.

Ward, R.D., Zemlak, T.S., Innes, B.H., Last, P.R. & Hebert, P.D.N. 2005. DNA barcoding Australia's fish species. *Phil. Trans. R. Soc. B* 360, 1847–1857. DOI:10.1098/ rstb.2005.1716.

Warner, K., Timme, W., Lowell, B. & Hirshfield, M. 2013. *Oceana study reveals seafood fraud nationwide*. Washington DC, Oceana. Available at: http://oceana.org/sites/default/ files/reports/National_Seafood_Fraud_Testing_Results_FINAL.pdf

Annex 1

DEFINITIONS

Batch	A quantity of marine products derived from a single operation. The following terms are commonly used in relation to seafood supply chains: i) raw material batches – the fish component; ii) ingredient batches – other components; and iii) production batches; commercial companies use the term, but it does not imply that any particular standards are applied.
Catch documentation scheme; CDS	A system that uses certificates and other documents to determine whether marine products in a supply chain originate from legal catches. The objective is to deter IUU fishing by denying its products entry to national and international supply chains and markets. CDS may be unilateral or multilateral.
CDS-bound international traceability	The hard-wired relationship between catch certificates and trade certificates, and in long supply chains between consecutive trade certificates. This is the basis of traceability covering international trade.
Chain of custody	Measures to guarantee that an ecolabelled product in a market or supply chain is in fact derived from a certified fishery and that its volume is accurately stated.
Consignment	A quantity of product covered by validated trade documents that is delivered or destined for delivery from one commercial operator to another. The operator sending a consignment is the "consigner"; the recipient is the "consignee".
Critical tracking event; CTE	Any point in a business and along a value chain where product is moved between premises or is transformed. Any point where data capture is necessary to maintain traceability.
Electronic traceability	Seafood traceability information stored in an online database, from which it can be accessed. This can involve the use of cloud-based databases, enterprise resource planning, electronic data interchange and bar codes.
External traceability	The ability to track key data elements and other information about seafood products as they move between trading partners and through national supply chains. See also "One-up, one-down traceability" below.
FAO alpha-3 species code	A three-letter code to identify each aquatic species. For example: CDS for Siamese crocodile (*Crocodylus siamensis*).

FAO fishing area	FAO has established 27 areas of sea and ocean used for harvesting marine resources. These numbered areas are internationally agreed, and are used for statistical purposes.
Internal traceability	The ability of a company to track batches as they move into, through and out of its premises and at critical tracking events such as when a batch is aggregated, disaggregated, transformed, transported or otherwise altered.
IUU fishing	Illegal, unregulated and unreported fishing, or fishing that is inconsistent with or in violation of the management or conservation measures of a particular fishery. The IPOA-IUU provides internationally recognized definitions for the three dimensions of IUU fishing.
Key data element; KDE	A data element required to trace products and/or their constituents through all CTEs.
Laundering	Concealing the illegal origin of fish so that it can enter legitimate markets. This type of fraud can involve fishermen, middlemen, processors and vendors, who falsify documentation to conceal the IUU origin of products and make them appear legal. It occurs for example when operators: i) mix illegally harvested fish with legal harvests in the supply chain; ii) inflate conversion factors to conceal weight loss in processing, and hence process more product than was declared; iii) falsify certificates in CDS with weak traceability systems; and iv) under-report catch at the point of unloading, and sell larger or over-quota quantities into black markets.
Mass balance	The balance of volume of a given species and product form obtained by subtracting the volume of certified fishery products leaving a supply chain segment from the volume that entered that segment. Applicable yield factors must be accounted for.
Mass balance reconciliation	Verification of mass balance to ensure that volumes of certified products at the end of a supply chain segment do not exceed the volumes entering that segment. It is used by auditors to ensure that total product weight sold does not exceed total product weight purchased.
Mother and child certificates	Sequentially issued certificates covering a product as it moves through international trade. A source or "mother" certificate is the basis for an initial transaction, which generates secondary or "child" certificates. A child certificate can become the basis for a further transaction, and hence becomes a mother. This hard connection between sequential certificates is essential in CDS: i) to enable mass balance reconciliation; ii) to protect flows of legally certified seafood products through international supply chains; and iii) to prevent laundering of IUU fish.

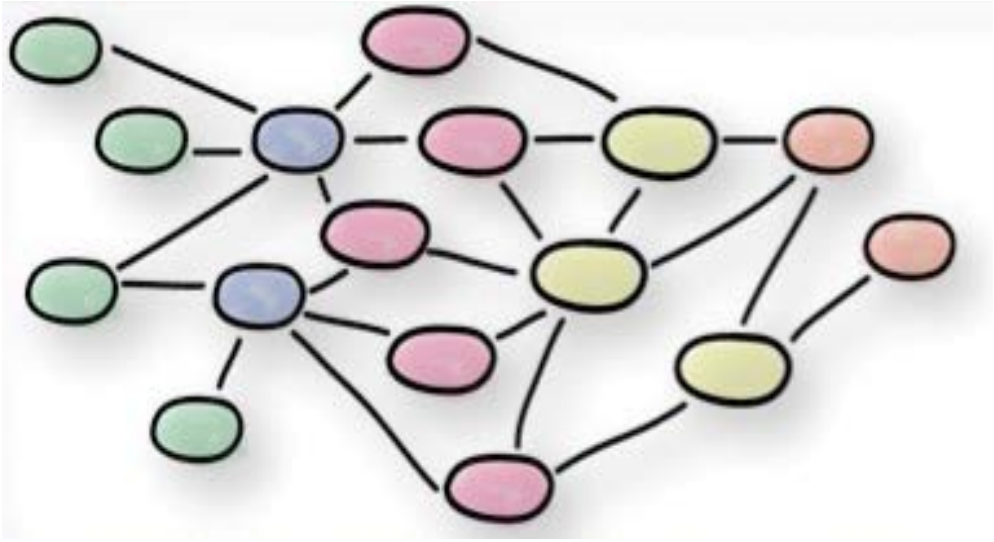
One-up, one-down traceability	Each operator in a supply chain documents receipt and use of all inputs for production, and the operator to whom products are subsequently delivered. Operators must respond promptly to requests for data to enable traceability through an entire supply chain.
Regional fisheries management organization; RFMO	A regional fishery body with a management mandate.[1] RFMOs impose mandatory conservation and management measures on their members.
Supply chain	A sequence of commercial operators involved in supplying seafood from the point of harvest to purchase of the final product by consumers (see Figures 4 and 5 below). It includes production, processing, brokering and distribution of seafood from catch to consumer. Seafood may be transformed several times along a supply chain as it changes hands from one operator to another.
Supply chain segment	A commercial operator constituting a single element in a supply chain. Product enters a segment from "upstream" – from the preceding operator – and exits "downstream" – to the next operator. In any segment product modifications occur such as splitting or mixing of batches and processing. It is important that all these modifications are recorded to ensure the legality and traceability of product batches.
Traceability	Tracking fishery products through entire supply chains from catch and landing through division and processing to final sale and consumption. It is achieved by means of identification and record-keeping in systems such as CDS. See also: i) The ability to follow the movement of a food through specified stage(s) of production, processing and distribution (CODEX, 2016). ii) The ability to trace the history, application and location of that which is under consideration (ISO, 2011). iii) The ability to access any or all information relating to that which is under consideration throughout its entire life cycle by means of recorded identifications (Olsen and Borit, 2013).
Tracing backwards	Using traceability information or records to identify the origin, attributes or history of a product in a supply chain.
Tracing forwards	Following a product or batch as it moves down the supply chain towards the end- user
Yield factor	Weight lost or gained when marine products are processed, changing them from their original form into processed form. If, for example, weight is lost the yield factor is a number between 0 and 1. Yield factors apply to product pairs designating the initial and processed forms of a product, and should be species-specific.

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

FIGURE A1.1
Simplified supply chain

source: http://futureoffish.org/content/t101-seafood-traceability-glossary

FIGURE A1.2
Complex supply chain



source: http://futureoffish.org/content/t101-seafood-traceability-glossary

This document explores ways in which individual countries in seafood supply chains can, in their capacities as coastal, flag, port, processing or end-market states, contribute to maximizing the effectiveness of catch documentation schemes.

The focus is on the traceability of seafood consignments, but the authors also explore other important compliance mechanisms that are not directly related to traceability but that support the effective implementation of catch documentation schemes at the country level. The document explains which traceability mechanisms are built into catch documentation schemes, and which additional support mechanisms must be provided by individual countries along seafood supply chains. The study finds that traditional fisheries monitoring, inspection and sanctioning mechanisms are of primary importance with regard to flag, coastal and end-market states, whereas effective country-level traceability mechanisms are critical of particular importance in port and processing states.

ISBN 978-92-5-130040-4 ISSN 2070-7010

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I8183EN/1/11.17