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Design options for the development of tuna catch documentation schemes



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Yellowfin tuna. Port of General Santos; The Philippines. © Gilles Hosch
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by

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Preparation of this document

Catch documentation schemes (CDS) have been a topic of debate for more than 16 years, and continue to mean different things to different people. This paper clarifies the nature of CDS and what they can achieve, and identifies the factors to be considered in the design of such schemes as a management and monitoring, control and surveillance tool in tuna fisheries.

This paper was developed in the framework of the Common Oceans ABNJ Tuna Project funded by the Global Environment Facility and implemented by the FAO.

The Common Oceans ABNJ Tuna Project harnesses the efforts of a large and diverse array of partners, including the five tuna RFMOs, governments, inter-governmental organizations, non-governmental organizations and private sector.

The Project aims to achieve responsible, efficient and sustainable tuna production and biodiversity conservation in the areas beyond national jurisdiction focusing on three thematic areas, namely; improving management, combatting IUU fishing, and protecting biodiversity.

This paper was written by Mr Gilles Hosch, fisheries expert and consultant to FAO, under the auspices of Mr Alejandro Anganuzzi, Global Project Coordinator of the Common Oceans ABNJ Tuna Project.

Preparation of the paper involved analysis of all current catch documentation schemes and visits to 20 countries with significant roles in global tuna supply chains. Concepts were developed and ideas tested at over 100 meetings with public and private-sector stakeholders.

A small-scale survey covering catch documentation schemes at the Brussels Seafood Show in April 2015 sampled feedback from the industry on these schemes in relation to tuna fisheries; some of the results are referred to in this paper in support of design option proposals.

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Abbreviations and acronyms

BCD	Bluefin tuna catch document (ICCAT)
BET	Bigeye tuna (<i>Thunnus obesus</i>)
BFT	Atlantic Bluefin tuna (<i>Thunnus thynnus</i>)
CA	Competent authority
CC	Catch certificate
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CCS	Catch Certification Scheme (EU)
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDP	Catch Documentation Programme (ICCAT)
CDS	Catch documentation scheme
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CMM	Conservation and management measure (binding RFMO resolution)
CNPC	Cooperating Non-Party to the Commission
CPC	Cooperating Party to the Commission
EU	European Union
FBO	Food Business Operator
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
IRCS	International radio call sign
IUU	Illegal, unreported and unregulated
JFO	Joint fishing operation
MCS	Monitoring, control and surveillance
NCP	Non-contracting party
PSMA	Agreement on Port State Measures
SDP	Statistical document programme
SKJ	Skipjack tuna (<i>Katsuwonus pelamis</i>)
SPS	Sanitary and phytosanitary
TAC	Total allowable catch
TC	Trade certificate
TDS	Trade documentation scheme
TIS	Trade information scheme (CCSBT)
UNFSA	United Nations Fish Stocks Agreement
VMS	Vessel monitoring system
WCPFC	Western Central Pacific Ocean Fisheries Commission
WCPO	Western Central Pacific Ocean
YFT	Yellowfin tuna (<i>Thunnus albacares</i>)

Glossary

CCest.	Catch certificate issued and validated before unloading on the basis of estimated weights.
CCver.	Catch certificate issued and validated on the basis of verified weights, following landing and grading, or confirmation of estimates.
CCsimp.	Simplified catch certificate issued and validated for fish collected in artisanal fisheries on the basis of verified weights.
CDS	A CDS is a system of certification that provides a framework to trace fish and fisheries products from harvesting, unloading and through international trade to the end market. A CDS establishes the legality of fish or fishery products harvested and unloaded from a fishing vessel, on the basis of a catch certificate validated by an appropriate and accredited competent authority. When any portion of certified fish or fishery product enters international trade, trade certificates are issued and validated by appropriate and accredited authorities along the supply chain, linking traded fish or fishery products to their original catch certificate(s) – limiting trade to certified products only.
Certification	The act of validating a catch or a trade certificate.
Competent authority	Government authority notified to, and approved by the RFMO operating the CDS, as the body accredited to verify and validate certificates. Competent authorities may be linked to the flag, the coastal, the port or the market state. Competent authorities must have relevant powers of oversight over the supply chain segments for which they validate or counter-validate certificates, and they have the possibility to delegate their powers to subsidiary bodies.
Consignee	The party shown on the bill of lading or air waybill to whom a shipment is consigned, in most cases the buyer.
Counter-validation	A validation that serves to formally establish agreement with, or to validate additional data, which have already been validated in their full or partial (estimated) form by another competent authority upstream in the supply chain. Where counter-validations are required, certificates must bear both in order to be complete and officially valid.
e-CDS	A CDS based on online centralised electronic infrastructure, providing remote user access for the submission, verification, validation, management, storage, linking, querying and analysis of CDS data.
Fishing vessel	Without prejudice to any accepted definition, in this paper “fishing vessel” is a vessel that harvests fish, not a support vessel such as a reefer or mothership.
Graded	In this paper, catches that have been unloaded and the mix and weights of species established. Verified weights can only be formally established for graded batches of fish; this may be done before unloading.
Hard traceability	A level of traceability that enables the identification, quantification and mass-balance reconciliation of batches of fisheries products moving in distinct lots or consignments, between their entry into and their exit from discrete segments along the supply chain. Hard traceability allows full traceability of batches through segments in which splitting and/or grouping of batches occurs.

Issuance	The act of filling and submitting a document such as a catch certificate, prior to the validation by a competent authority.
Landing	Unloading fish from a fishing vessel or reefer on to a dock or beach, regardless of its customs status.
Mass balance	The balance of volumes of a discrete lot of fisheries products, obtained by subtracting the volume of fisheries products leaving a supply chain segment from the volume that has entered the same segment, accounting for applicable yield factors.
Mass balance reconciliation	The act of verifying mass balance, ensuring that the volumes obtained at the end of a supply chain segment do not exceed the volumes inserted at the beginning of the same segment.
Mothership	A vessel whose purpose it is to collect fish from fishing vessels with which it operates as a group on the fishing grounds. (also “Ramasseur”)
Non-graded	A mixed catch that has not been graded into species, and for which the verified weight of individual species has not been established.
Ramasseur	See: “mothership”.
Reefer	A vessel that receives catch from fishing vessels either at sea or in port and delivers it to markets.
Risk-based	A planning approach in audits and inspections focusing on operations in which illegal practices are more likely to occur. Risks are identified in a risk-assessment matrix designed for the purpose.
Scenario	A combination of supply-chain events that is of special interest, particularly with regard to CDS, since particular scenarios may pose specific challenges to the system.
Stop (n.)	A supply-chain event such as a transshipment, a landing or an importation.
System-bound	A function provided and controlled by the system (e.g. CDS), without the possibility or need for external interference.
Traceability	The ability to trace the history, application or location of an entity by means of recorded identifications. (ISO 8402:1994)
Trade certification	Certificate issued for products exported or re-exported under a CDS from a territory, detailing the source certificate from which the products were obtained, the original and the current form of the products, and the volume of the products in the consignment. Trade certificates can be re-issued as many times as product continues to trade between countries.
Unloading	Moving fish from a fishing vessel. This is either a landing, an at-sea transfer of live fish to tow cages, an at-sea or in-port transshipment or any transfer of fish from a fishing vessel into the supply chain. Discards are ignored in catch documentation schemes.
Validation	Signing, stamping and/or sealing of an official document by a competent authority by physical or electronic means. Catch and trade certificates cannot be accepted as official without validation. The act of validating a certificate provides “certification” regarding the legality of the products and/or the transaction.
Verification	Actions undertaken by a competent authority to establish whether information submitted to it in the form of a filled certificate is accurate and truthful.
Yield factor	In fish processing, the yield factor provides a relative value (%) informing what volume of end product has been obtained for the original volume of fish used in production.

Executive summary

Including the introduction, this paper is structured into thirteen chapters.

Chapter 1 provides the introduction, establishing that the paper aims to provide technical guidance for tuna RFMO's that may decide to develop CDS for commercial tuna fisheries in the future. It then provides a historical background to CDS evolution, provides a CDS definition, and describes basic attributes of existing schemes. The fundamental importance of traceability is underlined. The first chapter also highlights the differences between unilateral and multilateral CDS, and explains why the RFMO-based multilateral approach is the appropriate approach for tuna CDS. It ends by highlighting the merits and limits of CDS, noting that all schemes – foremost of which the ICCAT scheme – have had direct and measurable success in eliminating given forms of IUU fishing since their coming into force.

Chapter 2 defines the objective of a CDS as combatting IUU fishing, by creating markets restricted to the circulation of legally-certified tuna products. The potential for secondary CDS objectives is analysed, noting that the complex tasks of a CDS make it a tool unfit to pursue other objectives, without incurring the risk of overburdening and weakening it. The objective to use a CDS as a TAC and quota management tool falls within the natural capacity of a CDS, without requiring the development of extra data submission routines, or system functionalities.

Chapter 3 establishes the concept of supply chain mapping, as a fundamental first step in designing a CDS. The supply chain and its complexities regarding product flows must be mapped out and understood, before the system can be designed. The chapter delves into the supply chain segments covering harvesting, unloading, distribution, processing and trade. Details on arising options regarding specific supply chain events and scenarios are presented and discussed, and first options regarding CDS design in covering these are articulated. Special cases covering small-scale fisheries and tuna fattening are also covered.

Chapter 4 is a key part of the paper regarding system design, as it presents the basic conceptual CDS framework on which all current unilateral and multilateral CDS are based. The concept presents a supply chain regimented into national and international supply chain segments, of which the former is managed through national rules and regulation, and the latter is directly subjected to the rules of the CDS. This implies that transactions inside countries are not directly covered by the CDS, but that the CDS functions as a “gate keeper” detecting potential discrepancies in product flows going into, and coming out of individual countries. The chapter also sets a traceability standard, endeavouring – with exceptions – to achieve certificate level traceability from the point of importation into the end-market back to the source fishing vessel.

Chapter 5 addresses the issue of estimated and verified weights, which is of particular importance to tuna fisheries. Current CDS do not provide adequate mechanisms to allow for the adjustment of estimated weights established at sea, and before unloading, into verified weights following landing and grading in a factory. The importance of yield factors in back-calculations and mass-balance monitoring is discussed, as well as the issue of recorded weight types in certificates in general.

Chapter 6 is another key part of the paper regarding system design, describing the document system on which the CDS hinges. In electronic systems, documents are data assemblages – but in designing the system, it is easier to refer to “documents” to designate groups of data that have to be recorded and validated at given points along

the supply chain. The two fundamental certificates that form the system are introduced; a) the catch certificate, and; b) the trade certificate. Rules for how and when certificates are to be issued, and when and by whom they should be validated or counter-validated are presented in this chapter. The document system and the related rules for issuance, validation, counter-validation and circulation provide a fully coherent system on the basis of which most relevant tuna supply chain events can be effectively covered by the CDS.

Chapter 7 provides details regarding information to be recorded in certificates, for the full and the simplified catch certificates, and the trade certificate. It discusses the importance of the layout of certificates, even for electronic systems, so that printed copies can be easily read and understood. It explains in detail how the links are established between “mother” and “child” certificates in order to maintain full traceability, and to remain able to reconcile volumes of fish moving through the supply chain in ever altering forms.

Chapter 8 discusses a swathe of points related to the development of an electronic CDS (e-CDS), and the function of a central database – conceived of as a central online certificate registry. The location, architecture and parameters of the system are discussed, arguing that a single centralized electronic platform providing for global remote user access is the most solid option. The argument is made for direct private-sector data input, and the limitation of competent authority action to data verification, validation and (potentially) certificate blocking – reducing overall burden to operate the system. Essential e-CDS functionalities, such as automated alarms, mass-balance monitoring and data integrity enforcement routines are discussed, including matters of data confidentiality.

Chapter 9 presents a number of key factors that must be taken into account when designing a CDS. These include the relevance of risk analysis, the coverage of species, products and types of fishing operations, document security, and the place of logbooks, VMS and observers in CDS. The need for CDS implementation protocols is highlighted, and the benefits of excluding these from the CMM are discussed. Options are also presented for handling closed-cycle tuna aquaculture and its products in otherwise CDS-controlled markets – a futuristic but ever more realistic prospect.

Chapter 10 discusses oversight and enforcement in the CDS, and details how the principle of subsidiarity assigns enforcement mandates between centralised and least-centralised authorities. Automated oversight routines under the CDS are considered, as well as formal reconciliation reports to be produced by the Executive Secretary. At the national level, a swathe of measures is presented that are key to enabling the state in ensuring that products moving through national supply chain segments are properly monitored and accounted for. These measures include the enacting of sufficiently severe sanctions, of ensuring effective coordination between fisheries and customs authorities, and subjecting food business operators to relevant audits. Importantly, the concept of the competent authority, to be based by definition in a cooperating non-member or member state of the RFMO, is formalised.

Chapter 11 looks at CDS development from a project perspective, detailing which elements should be taken into consideration when it is decided to develop a CDS, and how the project – overall – could be segmented and managed. This discussion includes considerations regarding the development of the CDS conservation and management measure itself, the development of the electronic system, its testing, and the need for a multi-faceted awareness raising and training program. The chapter finishes by considering key decisions that need to be made regarding roll-out of the CDS.

Chapter 12 takes a step back, and assesses what the consequences of individual RFMO CDS, covering but a fraction of any particular global tuna species would be. All current RFMO-based CDS cover an entire species throughout its global range, while all future RFMO-based tuna CDS would not. It is argued that such partial coverage would

give rise to individual RFMO-based CDS with a weak foundation, leading to the logical conclusion that for species straddling RFMO areas of competence, a unified global tuna CDS would be the better approach.

Chapter 13 provides a model conservation and management measure for a harmonised tuna CDS established on the principles and options outlined in this paper; the model CMM can be used as a draft foundation text to establish a global tuna CDS harmonised between tuna RFMOs – or to develop a tuna CDS for a single tuna RFMO.

Annexes I, II and III contain model catch and trade certificates developed on the basis of the principles and options outlined in this paper.

1. Introduction

Catch documentation schemes (CDS) have been a topic of debate for more than 16 years, and continue to mean different things to different people. This paper clarifies the nature of CDS and what they can achieve, and identifies the factors to be considered in the design of such schemes as a management and MCS tool in tuna fisheries.¹

This paper does not review existing schemes. Existing CDS have been analysed to varying degrees – for example by Agnew, 2000; Clarke, 2010; Tsamenyi *et al.*, 2010; Palin *et al.*, 2013; Clarke and Hosch, 2013; Knucky and Koopman, 2014; DG MARE, 2014. This paper makes reference to existing CDS to illustrate points which are useful to the achievement of the paper's objectives.

The paper sets out to clarify and to discuss the following:

- what is a CDS, and what does it intend to achieve?
- how does it work – what is the basic concept and design?
- which key functions does a CDS need to meet its objective?
- what factors must be carefully considered when designing a CDS?
- what would a model CMM and model certificates look like?

This paper takes into account the historical evolution of CDS, and what CDS have come to embody today. Its primary intention is to provide a technical reference for the development of new CDS for tuna fisheries. Therefore, the tuna RFMOs currently not covering all of the tuna species under their mandate are directly targeted; these are the Inter-American Tropical Tuna Commission (IATTC), the International Commission for the Conservation of Atlantic Tuna (ICCAT), the Indian Ocean Tuna Commission (IOTC), and the Western Central Pacific Fisheries Commission (WCPFC).² Hence, the tuna species primarily targeted by this paper are Albacore, Bigeye, Pacific Bluefin, Skipjack, and Yellowfin tuna.

Operators of existing CDS – including CCAMLR – may find valuable elements in the paper, when CDS performance reviews are being undertaken, or system upgrades are being considered.

The recommendations and options provided in this paper are those of the author, and in several instances these represent a particular option amongst several others that has been favoured for reasons of practicality, simplicity or effectiveness – in light of the objective the CDS pursues. Reasons for favouring given options over existing or potential alternatives are indicated throughout the paper. Insights for judgements have been derived from the analysis of existing CDS schemes, interviews with a wide array of global tuna industry stakeholders, and critical assessments of CDS features that may be considered effective, of features that could be added or modified, or of features that should be avoided.

¹ See “IATTC (2002): Consideration of a Catch Certification Scheme” for a summary of the thinking at the turn of the millennium.

² The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) covers a single tuna species, Southern Bluefin tuna, and has been operating a CDS since 2010. It is therefore not included in the list of immediately targeted RFMOs. ICCAT also operates a CDS for Atlantic Bluefin tuna, but has not yet developed a scheme to cover the other tuna species under its mandate.

The paper is written from the perspective that future systems will be electronic, and that harmonisation between tuna CDS – to the point of merging them into a unique global scheme – will be pursued. The latter point (merging of systems) does not condition the validity of this paper's recommendations, while the former (electronic systems) does. Design options for (non-electronic) paper-based tuna CDS – and regardless of how undesirable such an approach could be – would require a fundamentally different approach and set of options and recommendations.

1.1 HISTORICAL BACKGROUND

The idea of CDS evolved from trade documentation schemes (TDS) and trade information schemes (TIS), which were based on a statistical document programme (SDP). The first TDS, developed and implemented by ICCAT in 1992, covered Atlantic Bluefin tuna. The TDS and TIS were particular to tuna and billfish: they were intended to gather information about the proportions of certain species entering international trade, with a view to understanding product trade flows more clearly. To achieve this, regional fisheries management organizations (RFMOs) such as ICCAT and later the IOTC and the IATTC decided that statistical documents had to be issued by exporting states, and that such documents had to accompany international trade consignments. The species covered were limited to Atlantic Bluefin tuna, Bigeye tuna and Swordfish in ICCAT, to Bigeye tuna in IOTC and IATTC, and to Southern Bluefin tuna under the TIS operated by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) from 2000 onwards.

Trade documentation schemes were not as useful as expected in improving understanding of resource exploitation and trade dynamics because they contained gaps, flaws and exemptions – but an unintended consequence was much improved knowledge as to who was harvesting the fish; this led to the identification of scores of illegal, unreported and unregulated (IUU) fishing vessels flying the flags of states that were not members of the commissions tasked with management of the resources.

The idea of the CDS as an improved monitoring, control and surveillance (MCS) tool in the form of a TDS with expanded functionalities emerged from these developments.³ A CDS would start with the harvest rather than the trade, allow for the identification and certification of units of legal catch and then track the units through international trade to end markets. With authorities at the harvesting end certifying the legality of catches and authorities at the market end requiring validated certificates authorizing importation of the product, markets would effectively be sealed off to illegally sourced fish (see chapter 12.)

1.2 CATCH DOCUMENTATION SCHEMES

The first complete CDS, designed by the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), covered the two commercially exploited species of Patagonian and Antarctic toothfish or Chilean seabass⁴ in the Southern Ocean. In force since 2000, the CDS does not cover tuna, but it is one of the schemes that is useful to illustrate how successful systems may be designed.

Table 1 summarizes some information relating to existing CDS.

³ The 2007 Joint Tuna Regional Fishery Management Organizations (RFMO) working group on trade and CDCs found that "... SDPs had major shortcomings, and that movement to catch documentation schemes [...] was needed."

⁴ Patagonian toothfish (*Dissostichus eleginoides*); Antarctic toothfish (*Dissostichus mawsoni*).

TABLE 1
Current CDS

Organisation	Species	CDS start	Annual volume (approximate)
CCAMLR	Toothfish	2000	16 000 mt
ICCAT	Atlantic Bluefin Tuna	2008	13 000 mt
CCSBT	Southern Bluefin Tuna	2010	13 000 mt
EU	Wild harvested marine finfish exported to EU market	2010	6,2 million mt

This paper does not refer to traceability systems limited to national supply chains as CDS. Referring to national documentation systems as CDS reflects an emerging practice in the western central Pacific, for example, where countries responding to regulatory requirements of the EU IUU Regulation (EC 1005/2008) use the term CDS to refer to the often novel national systems for tracing fisheries products through national supply chains.⁵

Norway, Canada and other countries have established similar national systems for certifying the legality of national landings, also in response to the requirements of the EU IUU Regulation. The EU has conferred equivalence on several such national certification programmes for direct exportation of fisheries products to the EU market and the regulatory and administrative arrangements underpinning them, waiving the requirement that such programmes and certificates follow the procedures of the EU IUU regulation. These systems are not understood as full CDS: they are national certification schemes based on national rules and administrative procedures covering landing or importation at the border, to export of the products from the national territory. These systems are limited to national supply chains.

In this paper, CDS always cover the international dimension of an entire supply chain involving harvesting, landing, processing and international trade until products are imported into end markets.

1.3 DEFINITION OF A CATCH DOCUMENTATION SCHEME

Currently, no internationally accepted official definition of CDS exists. A clear definition for the purpose of this paper is needed to establish what it is and what it does:

A CDS is a system of certification that provides a framework to trace fish and fisheries products from harvesting, unloading and through international trade to the end market. A CDS establishes the legality of fish or fishery products harvested and unloaded from a fishing vessel, on the basis of a catch certificate validated by an appropriate and accredited competent authority. When any portion of certified fish or fishery product enters international trade, trade certificates are issued and validated by appropriate and accredited authorities along the supply chain, linking traded fish or fishery products to their original catch certificate(s) – limiting trade to certified products only.

A CDS emerges as a market-based instrument for: i) tracing fisheries products through international supply chains; ii) limiting trade to certified products, and iii)

⁵ See, for example, Knuckey and Koopman (2014).

denying market access to products derived from IUU fishing.⁶ The CDS thus “wall fences” product certified as “legal” as it moves through the supply chain, preventing non-originating materials to enter the supply chain. This reduces the potential value of fisheries products derived from IUU fishing, and hence the financial incentives to engage in IUU fishing.⁷ A CDS is therefore appropriately referred to as a “market-based MCS tool to combat IUU fishing”.⁸

1.4 ATTRIBUTES OF A CATCH DOCUMENTATION SCHEME

The CDS is a “traceability framework” or system. Traceability and the capacity to maintain it throughout the supply chain is a fundamental attribute determining the success of a CDS. The weaker the standard of traceability, the more the system is permeable and the more “non-originating” product may be laundered into certified supply streams.

Therefore, the standard of traceability to be maintained throughout the supply chain must be clearly defined. Lack of a definition of a traceability standard is a fundamental weakness of all current CDS.⁹

The CDS is based on a certification system that implies the accreditation of competent authorities to receive, verify and validate certificates.

Two types of activity and two types of certificates form the backbone of a CDS documentary system: i) harvesting and unloading at the start of the supply chain are covered by a catch certificate; and ii) processing, and trading of products between countries is covered by trade certificates. The latter types of certificates evolve under different designations in current CDS, and more certificates may be needed when tuna farming or fattening is involved, or when tuna is being sourced from small-scale fisheries.

Existing CDS systems all certify the legality of harvested and traded products. Other characteristics could be certified without modifying the basic design of a CDS.

Through her review of CDS systems for the Western and Central Pacific Fisheries Commission (WCPFC), Clarke (2010) established three essential qualities that a CDS should have to make it effective:

1. Inclusivity. Measurement of the extent to which the scheme is designed to provide documentation for all legally caught fish of the species or fishery in question. Inclusivity should be as high as possible for maximum effectiveness. Derogations for fish to be landed or traded without certificates tend to reduce the impermeability of the scheme.

⁶ The fact that CDS are traceability mechanisms is reflected in the FAO 2014 *Best Practice Guidelines on Traceability*, paragraph 6: “More recently, interest in traceability schemes has revolved around efforts to combat illegal, unreported and unregulated (IUU) fishing activities, which threaten sustainable resource management and are especially difficult to control in Areas Beyond National Jurisdictions (ABNJ). For example, Regional Fisheries Management Organizations (RFMOs) have worked independently to implement documentation systems that enable contracting parties and cooperating states to verify that fish products have been caught in compliance with the requirements of inter-governmental agreements, and therefore can be legally traded in international markets.”

⁷ Price differentials between legally and illegally landed products subject to RFMO conservation and management measures (CMMs) have already been established for the case of CCAMLR in 2000 (Agnew, 2000). During the fieldwork for this paper it emerged that black-market BFT in the Mediterranean – landed but not covered by ICCAT BCDs – may trade in national “black” markets at prices below that of yellowfin tuna at about 15 percent of its legal international market value.

⁸ See also IPOA-IUU paragraphs 66 to 76

⁹ See “Review and Analysis of Current Traceability Practices” submitted to the 14th session of the Committee on Fisheries sub-committee on fish trade in 2014 (André, 2013).

2. Impermeability. Measurement of the extent to which the scheme is designed to exclude illegal fish. A scheme's impermeability determines its effectiveness in terms of combating IUU fishing and of monitoring compliance. Impermeability is achieved through processes such as good MCS, electronic data access, robust traceability, mass-balance accounting, and multilateral engagement in the scheme's operation at flag, port and market State levels.
3. Verifiability. Measurement of: i) the extent to which the scheme is audited by third parties, not those directly responsible for completing and validating forms; ii) the effectiveness of sanctions for infringements; and iii) the extent to which data are analysed to detect IUU patterns leading to action based on this intelligence.

This technical paper does not describe or classify suggested practice options in CDS design according to the three qualities established by Clarke, but they are relevant benchmarks and are referred to where appropriate.

1.5 TWO FUNDAMENTALLY DIFFERENT CDS MODELS

Current CDS are multilateral schemes founded on international treaty law establishing RFMOs and their rule-making powers, with the exception of the EU CDS, which is a unilateral scheme based on the EU IUU Regulation.¹⁰ The fundamental difference between the EU IUU Regulation and current RFMO-based schemes is that it limits the range of action open to the EU in regulating the operation of its CDS. Limits to the EU's regulatory reach apply specifically to fishing vessels, waters, territories and trading partners that are outside the jurisdiction of the EU.

Because no country or block of nations can impose internationally binding rules, the EU decided in 2008 to regulate the types of fisheries products that could or could not enter its territory. It ruled that fisheries products sourced from IUU fishing would be denied entry into the common EU market as of the beginning of 2010.¹¹ The EU market – and not any particular fishery or fish stock – is the basis of the EU CDS.

In all other cases the fishery and stocks under the purview of an RFMO are the basis of the CDS, and the CDS is legally established through an RFMO CMM that is binding on its members and has the force of international law. The CMMs cover the harvesting and trade dimensions of the CDS and are applicable to the entire fishery, all the trade regardless of supply chain length and permutations, and – by logical extension – all stakeholders that deal with the products in the fishery or in international trade.¹²

Current RFMO-based CDS cover the entire stock unit throughout its global range, and must therefore also be understood as a fisheries-management measure that supports the conservation and management of the species as a whole. Any stock harvested under an RFMO-based CDS is subject to the protection conferred by the CDS.

¹⁰ EU Council Regulation no. 1005/2008 establishing a community system to prevent, deter and eliminate IUU fishing. OJ L286/1.

¹¹ EU IUU Regulation; Preamble (13): "Trade with the Community in fishery products stemming from IUU fishing should be prohibited. In order to make this prohibition effective and ensure that all traded fishery products imported into or exported from the Community have been harvested in compliance with international conservation and management measures and, where appropriate, other relevant rules applying to the fishing vessel concerned, a certification scheme applying to all trade in fishery products with the Community shall be put in place."

¹² NCPs may receive direct landings or consignments of fish covered by a CDS as end market states, but they will not be able to re-export them, since they do not have the statutory accreditation to validate certificates under the scheme. When receiving landings or imports, even as NCPs they are expected to verify and enforce the presence of valid catch or trade certificates. Differences between existing schemes do exist.

Another major difference between the EU scheme and RFMO-based schemes is that under the former fish from any fishery are to be certified if it is eventually to be exported to the EU market. Under RFMO schemes, on the other hand, all harvested fish is subjected to certification¹³ regardless of its final destination. The EU scheme thus protects its market from the importation of illegal products, whereas RFMO schemes protect entire stocks from IUU fishing. The EU scheme would only effectively protect stocks from IUU fishing if the entire harvest from an individual fishery was traded to the EU – *i.e.* if “inclusivity” was maximised.

Although the EU is one of the most important global import markets for fishery products, there is no fishery from which all catches are traded to the EU. Indeed, there are few fisheries from which most harvests are exported to the EU, of which none in tuna fisheries. The three major world markets for tuna are the EU, Japan and the USA; a number of emerging markets are gradually gaining in importance. The importance of a market varies according to the product that is being traded: the Japanese market, for example, is significant for sashimi-grade tuna, whereas the US and EU markets are more important for canned or canning-grade tuna.

In view of the Code of Conduct for Responsible Fisheries, which guides FAO work in fisheries, it is essential that fisheries management measures be applied to the stock unit as a whole to achieve the desired effect.¹⁴ If particular tuna stocks are to be protected through CDS, and if the impact of the CDS is to be maximized, these systems should apply to the stock unit as a whole, all harvests should be subject to certification and all trade should be covered. It follows that, ideally, tuna CDS should apply to individual species and their stocks, and be multilateral in nature.¹⁵

This paper accordingly explores the multilateral CDS option as the most appropriate mechanism for designing tuna CDS, and it highlights experiences and lessons learned from the EU IUU Regulation where appropriate.

1.6 TUNA CURRENTLY COVERED BY CDS

The global tuna catch has been steady at an average annual 4.6 million mt since 2003. Twenty-three tuna stocks of seven major species are exploited commercially in the world's oceans. Table 2 shows the number of stocks by major species.

The three species of Bluefin tuna account for only 1 percent of global tuna harvests by volume. The IATTC started discussions on the design and implementation of a CDS for Pacific Bluefin tuna in 2013,¹⁶ but only the two stocks of Atlantic Bluefin tuna are currently covered by the ICCAT catch documentation programme (CDP), and the single stock of Southern Bluefin tuna is covered by the CCSBT CDS; both fisheries are managed on a total allowable catch (TAC) and quota basis.

¹³ Except for specifically exempted fish.

¹⁴ Code of Conduct for Responsible Fisheries; Paragraph 7.3.1: “To be effective, fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account previously agreed management measures established and applied in the same region, all removals and the biological unity and other biological characteristics of the stock [...]”

¹⁵ The IPOA-IUU provides the same understanding in Paragraph 68: “States should cooperate [...] to adopt appropriate multilaterally agreed trade-related measures [...] that may be necessary to prevent, deter and eliminate IUU fishing for specific fish stocks or species.” (highlight by the author)

¹⁶ 85th Annual Meeting of IATTC: Proposal IATTC-85 B-1B submitted by the EU: “IATTC Resolution on the Creation of a Working Group to Progress on CDS for Tuna Species”; and Proposal IATTC-85K-1 submitted by Japan: “IATTC Resolution for Conservation and Management Measures for Bluefin Tuna in The Eastern Pacific Ocean”.

TABLE 2
Tuna species and number of stocks

Species	Number of stocks
Albacore tuna (ALB)	6
Bigeye tuna (BET)	4
Yellowfin tuna (YFT)	4
Skipjack tuna (SKJ)	5
Atlantic Bluefin tuna (BFT)	2
Southern Bluefin tuna (SBT)	1
Pacific Bluefin tuna (PBF)	1

With a combined annual catch of 26 000 mt, Atlantic Bluefin tuna and Southern Bluefin tuna account for about 0.5 percent of global tuna catches. It follows that although three of the 23 tuna stocks – 13 percent – are covered by CDS, 99.5 percent of global tuna harvests by volume are not.

In view of the emerging merits of tuna CDS, there are sound reasons for considering the expansion of CDS.

1.7 MERITS AND LIMITS OF CATCH DOCUMENTATION SCHEMES

The evident merits of CDS have recently been demonstrated in high-value RFMO-managed fisheries. Two of the most prominent such fisheries are CCAMLR and ICCAT (see Hosch 2016 for a detailed review).

Some IUU fishing operations and illegal trade still occur, and always will as a result of the residual openness of markets-of-convenience or black-market segments in otherwise compliant and vigilant markets. It is thought, however, that the numerous unlicensed fishing operations and the staggering historic amounts of under-reporting by legal operators have largely been brought under control as the respective CDS have come into force in CCAMLR and in ICCAT. In ICCAT the gradual recovery of the Atlantic Bluefin tuna stock, which in 2015 led to the first TAC increase since 2006, may be largely attributed to the success of its CDS in tackling the major IUU issue of under-reporting of quotas since it came into force in 2008.¹⁷ In 2015, the Coalition of Legal Toothfish Operators estimated the fraction of the unreported/ illegal catch to be 6% of the total annual harvest, crediting the CDS as one amongst several effective enforcement actions instrumental in achieving this result.¹⁸

A similar narrative applies to the CCSBT experience in that the Southern Bluefin tuna stock started to gradually recover and TACs increased by 33.3 percent between 2010, when the CDS came into force, and 2015. As in ICCAT, limited national TACs were the basis for the recovery, and the CDS provided the tool to effectively enforce these.

Nonetheless, a CDS system is one MCS tool among others and must not be regarded as the “silver bullet” that solves all IUU-fishing problems in a given fishery. It may have to be complemented by other relevant enforcement mechanisms in order to be successful, as CCAMLR’s experience shows.

¹⁷ Japan, the main end-market for BFT, judges the programme to be so effective that it requires Mexican exporters of PBF originating from the IATTC area of competence to fill ICCAT CDP-based catch certificates to accompany consignments of PBF bound for Japan.

¹⁸ www.colto.org/toothfish-fisheries/iuu/

A CDS can neither prevent nor quantify trade in IUU fishing products between flag and market states that collude to disregard RFMO conservation and management measures.¹⁹ Although RFMOs should urge such states to become parties to the Commission (CPCs) or cooperating non-parties (CNPCs), these forms of IUU fishing and illegal trading must be addressed with other tools such as sea patrols, more robust port and customs inspection regimes.

In general, RFMO-based CDS have proved that they can address and largely eliminate certain forms of fraud in fisheries, and that they are an important element in a mix of measures that has achieved positive outcomes in the management of those fisheries.

¹⁹ In paragraph 4 of its 2014 report “The Implementation of Conservation Measure 10-05 CCAMLR’s CDS” the CCAMLR Secretariat notes: “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.”

2. Objective of a CDS

With the exception of the EU's IUU Regulation, the objective of CDS is not clearly defined in the CMMs on which they are based, and some interpretation of the text is required to establish it. In the EU CDS, the objective is clearly articulated in the preamble of the Regulation, which sets out to "... make sure that fishery products imported into its territory do not originate from IUU fishing".²⁰ Defining the objective in such clear terms as this is to be regarded as best practice.

Failure to define the objective clearly is a major issue because it leaves space for interpretation as to what the scheme is actually intended to achieve. Since any CDS is global and is used by thousands of public-sector and private-sector stakeholders, interpretations can – and do – vary if the objective is not established beyond doubt.

The second issue is that without a clear objective the detailed functions of the CDS cannot be clearly formulated, and negotiation as to whether a particular function could or should not be part of the tool-set developed under a CDS can become extremely onerous. Evaluating the effectiveness of a scheme whose objective is not defined is also difficult.

A CDS should be simple, effective, user-friendly and serviceable. It should not evolve into a burdensome machinery that needs constant updating. The addition of functions, however "interesting", beyond what is needed to enable the CDS to achieve its objective, is a major source of problems and can hamper its development. Clearly stated objectives help to restrict "mission creep" during CDS reviews.

2.1 GOAL AND OBJECTIVE

The existing CDS embody market-based tools to combat IUU fishing. The law establishing the EU CDS clearly stipulates this, and the CCAMLR, ICCAT and CCSBT CMMs operate in this general sense. An examination of the multilateral schemes and their functions and modes of operation reveals that they pursue the same objective.

During fieldwork, a large number of stakeholders were asked what the objective of existing CDS was. Although some answers contained more than a single objective, the objective of combating IUU fishing consistently emerged as the most common response – and the mechanism for achieving this was generally identified as denial of market access for products derived from IUU fishing.

The 2013 United Nations General Assembly Resolution on Sustainable Fishing²¹ and the 2014 FAO Committee on Fisheries²² both refer to CDS as tools to combat IUU fishing.

²⁰ EU IUU Regulation; Preamble (9): "[...] As the world's largest market for, and importer of fishery products, the Community has a specific responsibility in making sure that fishery products imported into its territory do not originate from IUU fishing. A new regime should therefore be introduced to ensure a proper control of the supply chain for fishery products imported into the Community."

²¹ Para. 67 and 68. Resolution A/RES/68/71: Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments.

²² Para. 58. Report of the 31st Session of the Committee on Fisheries (FAO, 2014): "The Committee noted the usefulness of catch documentation schemes in combating IUU fishing and welcomed initiatives to harmonize current schemes, *inter alia*, in order to reduce the administrative burden and costs."

It is hence clear that for any CDS the protection of stocks by combating IUU fishing is the goal, and denial of market access for fisheries products derived from IUU fishing is the objective by which that goal is to be attained.

The goals and objectives of existing CDS mirror this understanding, even though they may not be explicitly spelled out. This goal and this objective therefore apply to current and future tuna CDS, as discussed in this paper.

2.2 CAN SECONDARY OBJECTIVES BE ENVISAGED?

Many public-sector stakeholders feel it odd to limit a CDS to a single objective, and often have a sense that several objectives will make the CDS more valuable and more efficient – if not more effective altogether. Instead of merely establishing the legality of catches and tracing them through international trade, various other data could be collected and analysed to feed the science, management and enforcement functions of fisheries governance.

From behind a desk the suggestion sounds reasonable – but from a beach in the Philippines or Indonesia where artisanal handline tuna is landed to enter international trade later in the day it sounds less so. What is often forgotten is that the basic data and documents are established at the beginning of the supply chain, which for any major tuna stock comprises hundreds of fisheries and thousands of fishers speaking dozens of different languages, all of whom must be able to individually or through their buyers and agents deal with the scheme, its paperwork and its electronic applications.

The real-world consequence is that the CDS should be based on clear and fit-for-purpose functional specifications developed to meet its objective. The CCAMLR, ICCAT and CCSBT schemes apply to sophisticated industrial fleets, but this would not be the case if a scheme set out to cover Yellowfin tuna in the Western Central Pacific Ocean (WCPO), for instance, which covers hundreds of artisanal and industrial fleets of many different nationalities using different gear types and harvesting tuna from around thousands of islands.

The CDS should therefore not be developed to meet additional functionality that is outside the scope of its objectives. Any secondary objectives that would entail the collection of more information, more paperwork or more time to comply with formalities must be avoided: such add-ons could potentially make the system fail.

Effectively eliminating IUU fishing from major fisheries ought to be regarded as a sufficiently important and valuable goal to achieve.

2.3 COLLECTING SCIENCE AND MANAGEMENT DATA THROUGH A CDS

Various tools are in place – or can be put in place – enabling scientists and managers to gather information from fisheries. Data can be gathered from sources such as logbooks, vessel monitoring systems (VMS), port sampling schemes, landing declarations and vessel movement reports, all of which have specific roles in fisheries data-acquisition and in driving scientific, managerial and compliance processes.

The CDS is one such tool, and it has a specific and complex task to fulfil. As discussed in the previous chapter, the benefits of getting a CDS right can be significant. Therefore a streamlined and effective scheme is required – provided the minimalism does not undermine its effectiveness. Simplicity is defined in terms of a scheme that captures the data necessary for the achievement of its objective, in the most effective way.

The CDS should not capture data that are acquired through other systems designed for other purposes. Logbooks are the tool most often likened to a catch certificate (CC), and some argue that the CC duplicates the function of the logbook. This is not so; the two data sets are fundamentally different: the data recorded in a CC is a mere fraction of the variety of information recorded in a logbook.

However, logbook and VMS data are prime sources of information against which CDS data must be cross-checked during verifications. Complementarity and comparability between tools are essential. Duplication and overlaps should be avoided. The CDS should therefore not be designed to collect data other than those that enable it to achieve its objective.

The issue of tagging, which can contribute very valuable data for science, is discussed in section 6.2.

2.4 THE CDS AS A QUOTA MONITORING TOOL

Only one achievable secondary objective emerged during fieldwork that does not entail modification of the basic CDS design, and can be achieved on the basis of a system designed to achieve its primary objective: the use of the CDS as a quota-monitoring tool.

The existing RFMO-based CDS systems – CCAMLR, ICCAT and CCSBT – all apply to TAC and quota-managed fisheries. Quota overruns and misreporting, which have been particularly damaging in ICCAT and CCSBT fisheries, underline the need for sound TAC and quota-monitoring capabilities. If all unloadings, transshipments, transfers and landings of fish are covered by the CDS, the entire volume of harvested fish is formally recorded and certified in near real-time. This entails that the filling of quotas can be monitored as CCs are issued and centrally recorded, and that the issue or validation of CCs can be suspended when catch limits have been reached.²³

The positive spin-off is that tuna fisheries that have no TAC and quota-management in place, but that are implementing a CDS, have already, as a matter of course, adopted a system capable of monitoring and enforcing quotas.²⁴ Hence a secondary benefit of a CDS is that fisheries management can consider implementing output limits rather easily, because they are already in possession of the tools to manage, monitor and enforce them.

²³ ICCAT CMM 11-20; Paragraph 13.b): “The CPCs shall validate the BCD for all Bluefin tuna products only when [...] accumulated validated amounts are within their quotas or catch limits of each management year, including, where appropriate, individual quotas allocated to catching vessels or traps [...]”

²⁴ Note that if the system is not designed at the onset to monitor catch limits, system functionalities will have to be added, but the technical foundation to achieve this is given.

3. Supply chain mapping

In order to recommend design options for a tuna CDS, it is necessary to first identify and map all potential events that may occur in the supply chain

The supply chain in fisheries, and in tuna fisheries in particular, is like a complex ecosystem. Within the system there is an almost infinite number of pathways and permutations through which the product enters, meanders and eventually reaches its end market destination. The system is by no means a transparent sequence of established linear relationships that are easy to follow and to understand. On the contrary, the tuna supply chain is dynamic, with relationships determined by shifting supply-and-demand dynamics, exchange rates, labour markets and costs, technological innovations, tariff rates, trade agreements and economic sanctions – to name but a few factors. Shifts in markets cause upstream and downstream changes in the supply chain from one week to the next: these affect how and by whom tuna is caught, in what form and whereto it is traded, where it is processed and where and in what form it goes on to its next destination. There are usually several stops between the point of capture and the consumer; short supply chains involving only catching and landing into the end market are the exception.

Two basic characteristics apply to the tuna supply chain: i) the major tuna-processing states source almost all of their tuna from abroad; and ii) tuna is often processed in two stages in two countries; this is called “semi-processing” and “re-processing” in this paper.

The most important challenge for a CDS is to accommodate all possible supply-chain events, permutations and scenarios as it traces a batch of legally certified fish through the maze of the supply chain to the end market. To design a CDS that can do this, the supply chain and its most complicated features – and potential future features – must be mapped and understood. The documentary system on which the CDS is based can then be tested against this map. The CDS must be designed to accommodate all possible – as distinct from desirable – supply-chain events and scenarios so that traceability can be sustained.

Some possible supply-chain events or scenarios might not be desirable from a fisheries-management perspective – transshipping catches at sea to several reefers is an example – and might be prohibited in given RFMOs. But if such events are tolerated in a current setting, the CDS design must accommodate them.

There are many ways of handling tuna along the supply chain. Accommodating this complexity in a CDS can be challenging, but the processes may be perfectly legitimate and grounded in good manufacturing practice (GMP).²⁵ The design of a CDS must therefore be approached with a view to identifying and accommodating legitimate practices. If a CDS cannot accommodate real-world supply-chain dynamics and scenarios it will fail – and the supply chains will find creative ways of working round it.

The objective of supply-chain mapping is to describe it in qualitative terms – that is, to list actual events and possible scenarios. The objective is not to quantify them: it is not of primary concern to understand what proportion of transshipments at sea are

²⁵ An appropriate example is the reluctance of longline vessel captains to consider the mandatory tagging of sashimi grade tuna in tropical tuna fisheries. The additional time the fresh product must spend on deck – exposed to ambient temperatures – to be tagged, formally measured and recorded, before being sent to the hold, doubles the time on deck, and has a direct impact on product quality and grade, and hence its market price.

partial or what proportion of reefer landings to factories are partial, for example. What is crucial is to identify the existence of such practices in order to develop functional specifications for the CDS that are able to accommodate them.

The supply-chain stops to be mapped and analysed are:

1. Harvesting:
 - a) single-vessel operations;
 - b) joint fishing operations (JFOs);
 - c) joint net-to-hatch operations; and
 - d) ramasseur vessel and shore-based fish collection operations.
2. Unloading:
 - a) Transshipping –
 - i. transshipments at sea or in port;
 - ii. full and partial transshipments; and
 - iii. transshipments to non-reefer vessels.
 - b) Transferring (tuna fattening / aquaculture) –
 - i. transfers to tow cages;
 - ii. direct transfers to fish farms; and
 - iii. transfers between farms.
 - c) Landing –
 - i. reefer or fishing vessel landings;
 - ii. full and partial landings;
 - iii. landing at home or abroad;
 - iv. landing into container;
 - v. warehousing;
 - vi. direct landings at processing facilities;
 - vii. collecting (artisanal fisheries); and
 - viii. harvesting (tuna fattening / aquaculture).
3. Distribution:
 - a) reefers;
 - b) containers; and
 - c) air freight.
4. Processing:
 - a) semi-processing;
 - b) re-processing;
 - c) by-products; and
 - d) contract processing etc.
5. Trading:
 - a) domestic markets; and
 - b) international markets.

The analysis aims to provide a complete picture of the supply-chain stops, dynamics and scenarios in tuna fisheries. Care has been taken to be as thorough as possible.

Implications for CDS design options are provided in the following sections. They are referred to in later chapters and sections of this paper.

3.1 HARVESTING

The harvesting operations considered cover purse seine, longline fishing, pole and line fishing and handline fishing, which cover the largest share of worldwide tuna operations by volume. Other types of operations such as trolling and harpooning are marginal in terms of volume contributed to global tuna catches, and there are few indications that they involve other supply-chain stops or dynamics.

Harvesting is arguably the simplest stop in the supply chain. A vessel is either authorized or not to engage in a fishing operation in a particular area over a period of

time, and it is either operating with legal fishing gear, bycatch mitigation devices and species retained on board or it is not. From a CDS perspective, a means of verifying the legality of harvesting operations must exist and be utilized if officially validated CCs are to have any value.

If the authorities validating or counter-validating CCs do not apply monitoring and inspection routines to fishing operations and fishing vessels as reported in certificates, the value of the certificates is zero. The CDS by itself does not establish legality; the underlying processes leading to the validation of a certificate do. The CC then ensures that catch certified as legally harvested remains traceable and certified until it reaches the end market.

The primary responsibility for ensuring the legality of fishing-vessel operations falls to the flag state under international law (UNCLOS, 1989) and international treaties such as the 1993 FAO Compliance Agreement, the 1995 United Nations Fish Stocks Agreement (UNFSA), and voluntary instruments including the 1995 Code of Conduct for Responsible Fisheries, the 2001 International Plan of Action to Combat, Deter and Eliminate IUU Fishing, and the 2014 FAO Voluntary Guidelines on Flag State Performance.

Whether fishing vessels are chartered to companies incorporated in other states and are operating in the waters of that state and landing products primarily into its ports has no effect on the primary responsibility of the flag state to oversee its vessels. Any coastal state may – and possibly should – consider whether implicit or explicit authorization of such operations undermines its capacity to manage and police its fisheries, and whether vessels operating as national entities in all but their flag should be re-flagged to the coastal state in question. It is not for a CDS to change international rules on the responsibilities of flag states, as has been suggested by some stakeholders: it is for coastal states to decide the best course of action with regard to overseeing fishing operations in their waters.

Suggested practice on primary validation of catch certificates

It is the responsibility of a flag state to oversee its fishing vessels in accordance with the Law of the Sea and related fisheries treaties, and to ensure that they do not engage in IUU fishing. On the basis of MCS means available to the flag state – and sometimes to the flag state alone – validation of CCs must devolve to the flag state in the first instance. This must occur without prejudice to mechanisms that may grant other state-level stakeholders (e.g. port or market states) along the supply chain the authority to complete or counter-validate CCs or parts of them.

3.1.1 Single-vessel operations

Single-vessel operations are the norm. They are defined as a single fishing vessel operating alone without the support of other vessels on the fishing grounds at the time of harvesting. A single-vessel operation does not prevent the vessel from preparing to tranship its harvest to another vessel at sea or in port.

Single-vessel operations simplify matters with regard to logbooks and operating a CDS. In such operations all catches are attributed to the single vessel, and it is a straightforward matter to determine whether the fishing trip was legal, and hence whether the products to be unloaded are legal also.

A particular complication from a CDS point of view are the notions of “fishing trip” and “fishing trip number”. Fishing trip numbers are formally recorded in some logbook regimes, and it has been suggested that they should be included in a CDS. The fishing trip number can be an essential data element in a logbook or vessel movement monitoring regime, but not all management systems assign trip numbers, and not all tuna RFMOs mandate them.

The fact that trip numbers are not fully implemented in national and regional fisheries management regimes and can hence not be viewed as a common denominator, it would be questionable to introduce them as part of a CDS. In some tuna fisheries, especially longline fishing, vessels can remain at sea for periods of more than a year, which complicates matters because in a CDS it is essential to know the length of time over which products to be certified have been harvested. In the case of vessels at sea for long periods, “fishing period” (Date from and Date to) can be a more accurate data element than the trip number, and it can be cross-checked against VMS data and logbooks. This makes “fishing period” a compatible and comparable data element, and is preferable to knowing from which particular fishing trip catch originated. In view of the legitimate practices of partial transshipment and partial landing, collating catches with trip numbers could be a great deal more complex and less useful than simply recording them against the fishing period in which they were made.

Table 3 gives an analysis of the options.

TABLE 3

Options regarding the implementation of a trip number

For	Against
The certificate can be issued and validated for a specific trip.	Not all tuna fisheries have a system for assigning trip numbers.
The entire trip can be certified as legal or illegal.	A system for assigning mandatory trip numbers would have to be established through the CDS.
	In some fisheries, the concept of “trip” is not useful because vessels may remain at sea for years.
	A fishing period can be more accurate than a fishing trip number for vessels at sea for long periods or for vessels unloading only portions of their catch.
	A fishing period is directly compatible with other data sources for cross-checking and inspection purposes.

Suggested practice on fishing trip number as a data element

In view of the difficulties related to the implementation of fishing trip numbers in many fisheries and their potentially limited value, the fishing period over which catches were accumulated is suggested as a more appropriate way of reporting data in CCs. This is currently the case in all CDS, including the EU CDS, and should be regarded as the best option.

3.1.2 Joint fishing operations

Joint fishing operations (JFOs) are defined as those implemented by a group of fishing vessels working together. The catch may be brought aboard one or more of the vessels, but for quota-management purposes the harvest may be allocated according to a distribution key to all vessels that are part of the JFO. This is how JFOs are managed under ICCAT for the Atlantic Bluefin tuna PS fisheries: in this particular case, vessels not actually bringing fish aboard merely need to be present in the area during the fishing operation to qualify for a JFO submission.

From a CDS point of view, JFOs require a higher degree of organization in terms of planning and oversight, and the complexity of the data generated under the CDS will vary according to the design of the system. This is because the catch brought aboard one or more vessels is discounted against the quota of all the vessels involved in the operation.

The CDS and potential quota-allocation and accounting routines must be designed in a way that enables simple and accurate handling and recording of JFO data so that downstream CDS arrangements are not affected by the fact that a product stems from a JFO rather than a single vessel. The system should process the finally recorded catch allocated to each vessel in the same way as catch harvested by single-vessel operations.

Like transshipments, JFOs are subject to their respective authorization and reporting obligations. From a CDS perspective, a catch certificate should only be issued to the lead fishing vessel(s) that took the catch aboard, and it should state in a separate section which vessels were part of the JFO and what percentage of the catch was allocated to each; for catch accounting purposes, including TAC and quota accounting, this includes the vessel(s) that brought the catch aboard.

3.1.3 Net-to-hatch or group seine operations

These are defined as fishing operations by a group of fishing vessels, one of which does the fishing and the others receive and stow the fish. In net-to-hatch operations, fish are hauled on to the deck of the vessel doing the actual fishing and loaded directly into the support vessel, which does not do any fishing itself but merely receives, stows and transports the fish. The two vessels together carry out the functions of a single-vessel operation. These are industrial-scale fishing operations.

A good example of this type of operations is a Filipino fleet of small purse seine vessels operating in the waters of Papua New Guinea. Their mode of operating, which is legitimate and recognized under WCPFC rules,²⁶ is different from the traditional sense of transshipment from a hatch-fitted fishing vessel to a reefer. In this case, a single “catcher” may be associated with several “carriers”, which receive fish in rotation and carry them to port, or a single carrier may accept fish from several catchers.

From CDS and MCS perspectives, the difficulty resides in the fact that oversight over this type of operation is complicated and requires a framework that enables monitors to verify that fish landed by specific carriers comes from particular catchers. The alternative is simply to associate the landed fish with the carriers, which is reasonable in the sense that the vessels are regarded as a single unit or operation – but the fact that carriers bring the fish ashore opens a potential loophole for receiving fish at sea from non-eligible IUU fishing vessels. To ensure legality, there is clearly a need for a robust set of rules to govern this type of operation and effective oversight by flag and port states involving accurate recording of landings and catcher operations and monitoring indicators such as catch-per-unit-effort.

Table 4 gives an analysis of the options.

TABLE 4
Options regarding net-to-hatch operations

For - catcher certification	For - carrier certification
This is the actual fishing vessel that has caught the fish and is the physical and legal source thereof.	From a legal point of view, this is also the “fishing vessel” and hence the legal source of the fish.
Certification routine under the CDS can be the same as that applied to normally transhipped catches.	It is easy to apply for a certificate once the fish from the catcher(s) has been collected.
	It is easy to verify the landing in port, and no separation of fish in the hold or hatch would be required because the carrier is legally regarded as being the “fishing vessel” of any catch it collects.
Against - catcher certification	Against - carrier certification
Applying for a catch certificate is more cumbersome in that many more certificate applications are filed, as with regular large autonomous fishing-vessel operations.	Very difficult to oversee from an MCS perspective, especially in situations where the carrier works in areas and ports beyond national jurisdiction.
Catches in the hatch of the carrier must be kept separate to allow for inspections in port and accurate grading and specification of catch and verification of the weight per catcher.	An invitation to would-be offenders to source fish from IUU fishing vessels at sea.
	Requires a robust, effective and dedicated data-reconciliation regime in the CDS.
	No means of inspecting any catcher harvests directly in port.
	Open invitation to launder non-originating fish into legally certified supply chains.

²⁶ WCPFC CMM 2009-06 on the regulation of transshipment; section 2.

Suggested practice on net-to-hatch operations

Net-to-hatch operations must be fully regulated by a non-CDS authority to establish what is permitted and what is not. The potential combination of options is immense: several catchers unloading into one carrier, one catcher unloading into several carriers, a carrier transshipping onto one or more other carriers, and carriers landing parts of catches at several ports and potentially several countries. All this gives rise to a system of operations in which the traceability of catches is lost, and which is incompatible with the spirit of a CDS, in which traceability is key.

To minimize the temptation to use this situation to launder non-originating fish into certified supply streams and to obviate the need to design a dedicated CDS module and certificates for this type of operations, thereby cluttering and overburdening the system, it is suggested that net-to-hatch operations be dealt with by the CDS as regular transshipments.

This entails a strict minimum requirement that carriers guarantee the separation of catches by effective and verifiable means, and that they maintain traceability throughout the supply chain they are involved in.²⁷

3.1.4 Ramasseur vessel and shore-based fish collection operations

A ramasseur operation is defined as fishing operations implemented from a mother-ship – the “ramasseur” vessel²⁸ – which operates a group of dories or other canoes or boats that it may carry with their crews to the fishing ground. The ramasseur collects the fish from the boats for as long as the operation continues, provides supplies for the canoe crews and transships or lands the fish in its own name. The association of the ramasseur and the canoes doing the fishing varies: the ramasseur may exercise tight control over them, or it may collect fish from independently operating canoes or boats.

The shore-based collection type of operation is associated with factories or other fish business operators (FBOs) collecting catches from artisanal fishing communities and beach-based fishers with whom they have formal or informal supply contracts. The fish are generally transported to market overland in refrigerated trucks. The FBOs often supply ice, fuel and fishing implements for the communities they source fish from, and buy their products in return.

From an MCS point of view, it is easier to oversee the ramasseurs than the canoes, especially where the association is loose or the canoes operate independently. The same applies to collector operations, which in countries such as Madagascar may only be carried out if they are covered by formal authorization in the form of a fish-collector permit, and operators must follow legal regulations governing the recording of information, book-keeping and data supply.

These types of operation are generally limited to those on the borderline between artisanal and small-scale commercial fisheries. The volume of catch from these operations can be important, and they contribute substantial amounts of tuna to international trade. The dynamics of these two types of operation are essentially identical: examples include the artisanal handline fisheries of Indonesia and the Philippines targeting high-value Yellowfin tuna for export.

From a CDS point of view, the question arises whether a catch certificate should be issued for every vessel contributing catch to the ramasseur, or whether the certificate ought to be issued to the ramasseur itself with the option of listing in an annex the boats

²⁷ Under WCPFC CMM 2009-06, exemptions can be subject to specific conditions under Paragraph 28: “[...] The Commission may attach to each granted exemption any conditions or requirements that it determines necessary to achieve the objectives of the Convention, such as limitations on areas, time periods or species, the fishing vessels that may be transhipped to, and any additional requirements necessary for the purposes of monitoring, control and surveillance.”

²⁸ See Kelleher (2002).

from which the catch was sourced. The latter option corresponds to the Simplified Catch Certificate applied to artisanal fisheries under the EU IUU Regulation.

In artisanal or small-scale fisheries where catch is collected from canoes at sea or on shore, a large number of boats contribute small amounts of product to high-volume pooled consignments destined for export. A major challenge in issuing individual catch certificates for single-vessel landings is that a single consignment may have hundreds of associated individual CCs.²⁹

Table 5 shows an analysis of the options.

TABLE 5

Certification options in small-scale collection-based operations

For - vessel certification	For - collector certification with vessel annex
In line with CDS standard for tracing catches back to individual fishing vessels.	Pragmatic approach for dealing with many vessels and small individual volumes entering international trade in large pooled consignments.
	The only possible approach to certification in many rural settings, avoiding an otherwise insoluble technical barrier to trade.
	Inspection routines focusing on vessel-annex data can be developed to provide the required level of oversight.
Against - vessel certification	Against - collector certification with vessel annex
Administrative burden of issuing individual certificates may be prohibitive.	Traceability back to individual vessels is lost. The entity collecting the fish and the artisanal fishery of a particular country or region becomes the origin of the fish.
The burden on factories of accounting for large numbers of individual CCs in single production runs is prohibitive and impractical.	
Inspection routines become extremely onerous when dealing with hundreds of certificates rather than single certificates; MCS capacity is undermined.	

Suggested practice for certification options in small-scale collection-based operations

With its Simplified Catch Certificate the EU CDS provides a practical alternative that allows for product to be sourced from small-scale operations and to enter international trade. Harvests are subject to an effective CDS routine that accommodates the specifics of artisanal fisheries and collection; it is generally difficult or impossible to accommodate these in the CDS routine as applied to industrial-scale fisheries.

On the basis of the analysis of options in Table 5, the practice of issuing a Simplified Catch Certificate in collection-based small-scale fisheries is regarded as the best practice to be adopted.

The question that arises, and which has to be answered on the basis of specific operations, relates to what constitutes a fishing operation small enough to qualify for this mode of certification.

3.2 UNLOADING

As discussed in a later chapter, unloading is the primary focus of CDS: most of the information in a CC relates to this point in time.³⁰ Unloading can occur in three forms – transshipment, transfer or landing (see p. xii).

Unloading from a tuna fishing vessel is always carefully planned, especially in the

²⁹ Thailand faced this challenge for a number of years when the Maldives were issuing single-vessel full-catch certificates for artisanal tuna landings under the EU CDS, instead of using its simplified catch certificate model. Single consignments exported from the Maldives to Thailand were accompanied by boxes full of catch certificates, making the situation largely unmanageable. The Maldives eventually adopted the simplified catch certificate, putting an end to the impasse.

³⁰ With the exception of the location and date of landing and the verified weight of the harvest by species, all information is in place when a master prepares to unload the catch.

case of large vessels. When the master of a fishing vessel decides to unload he will organize the time and place, and identify the recipient or buyer of the fish, if the choice has not already been determined.

The event is crucial from an MCS point of view in that it is the time at which harvested fish leave the fishing vessel and enter the next stop in the supply chain. The question as to whether the fish have been harvested legally or illegally may not have been formally settled at this point by a competent authority.

The closer the determination of legality is to the time of unloading, the more relevant the checks that can be applied, and the higher the chances of detecting any wrong-doing.

From a CDS perspective, the critical question is the precise moment at which to begin the process of issuing the CC, and by logical extension the time by which the CC must be validated. Should the process be initiated before unloading takes place? Or should it be initiated at some point after unloading? Does the buyer of the fish receive a validated CC, or will it be issued and validated at a later time?

The answers to these questions have profound implications with regard to the level and type of controls in the CDS, and the impermeability of the system as a whole. It is important to note that this has not been satisfactorily addressed in any existing CDS,^{31, 32} but controls have improved and become more detailed in systems that have been reviewed and have evolved over time.

It must also be emphasized that the issue of a catch certificate “after unloading” might actually take place a long time after unloading – or a long way down the supply chain. The further fish moves down the supply chain without a certificate, the weaker the traceability and the more compromised the impermeability of the system.³³

³¹ See the 2009 EU proposal to the IOTC for a YFT CDS, paragraph 5: “The fishing vessel master, or its authorized representative, or the authorized representative of the flag State shall complete the Yellowfin Catch Document by providing the required information in appropriate sections and request validation in accordance with paragraph 7 for a YCD for catch landed, caught or transhipped on each occasion that it lands, catches or tranships yellowfin tuna.” Paragraph 7 b): “The flag CPCs shall validate the YCD for all yellowfin tuna products only when all the information contained in the YCD has been established to be accurate as a result of the verification of the consignment, and only [when the accumulated validated amounts are within their quotas, catch or effort limits of each management year and] when those products comply with all relevant provisions of the conservation and management measures.” With regard to paragraph 5, the time when the YCD should be issued and validated is not defined, though several potential supply-chain stops are listed, and paragraph 7 suggests that the certificate should only be validated at the time the consignment may be verified. Under this proposal, the issue of the CC spans the entire supply chain from catching through landing, processing and pooling of products into a consignment, and is unfit for the purpose of establishing an impermeable system-bound traceability mechanism. If the CC is established at the time of preparing the consignment, as suggested in paragraph 7, the scheme would become a TDS, rather than a CDS.

³² Under the EU IUU Regulation (art. 6), for instance, it is established that foreign fishing vessels entering EU ports to land fish must provide a validated catch certificate 72 hours prior to port arrival, clearly establishing the rule for that particular scenario that CCs must be issued and validated prior to unloading.

³³ An appropriate example for late or deferred catch certification arises under the EU IUU Regulation’s direct exportation scenario (art. 12), applying to vessels landing catch in their country, which is the state whose flag they fly, further regulated through the Weight-in-Catch-Certificate Note issued by the EU Commission in mid-2010. The CC is only to be issued for products once they are added to a consignment for exportation. In tuna fisheries (amongst other fisheries), this entails that many CCs would only issued after processing. The supply chain stops of harvesting, unloading, and distribution are then not covered or traced by the CDS, and fish are moving through a substantial part of the supply chain outside a system-bound traceability mechanism. The fact that the “catch certificate” under this scenario is only established at the time of exportation turns this part of the CDS into a *de facto* TDS.

Another critical characteristic of tuna fisheries at the time of unloading is that the exact weight by species of the catch to be unloaded is unknown. This varies according to the various types of gear: purse seining is typically the operation in which the degree of variation between estimated catch and verified and graded catch is highest. Chapter 5 explores ways of addressing this challenge, but it is relevant to establish at this juncture that a CC issued and validated prior to unloading can only be based on estimated weights by species.

Table 6 gives an analysis of the options.

TABLE 6

Options for the timing of issuing and validating of the CC

For – Catch certificate issued before unloading	For – Catch certificate issued after unloading
Competent authorities are informed about unloading before it takes place to enable them to undertake checks and establish the legality or illegality of the fishing operation and the resulting unit of catch to be certified.	Low administrative burden.
The master of the fishing vessel can provide a validated catch certificate to the buyer, providing guarantees that the fish has (and is likely to maintain) legal status and its related market value.	
Fish moves through the early part of the supply chain – which is most prone to malfeasance – covered by a certificate, ensuring traceability and opening mass balance monitoring capabilities.	
Against – Catch certificate issued before unloading	Against – Catch certificate issued after unloading
High administrative burden.	The catch is not certified at the time when most conditions are in place to establish legality, weakening the controls and system impermeability.
	Catch moving through the early part of the supply chain is not covered by a certificate.
	Fisheries inspectors inspecting catch not covered by a catch certificate cannot inspect it from a CDS perspective because it is not clear whether it will ever be certified.
	As long as the catch certificate is not issued, non-originating fish may easily be added to the catch.
	The receiver of the fish has no guarantee that the product will ever be certified.
	The financial liability of potential non-certification is at least partly passed on to downstream supply-chain actors who have no responsibility for legality or illegality of the original fishing operations.

Suggested practice on timing regarding the issue and validation of CCs

From the analysis of options in Table 6 it emerges that there is no sound argument to delay the issue and validation of the catch certificate until after unloading. But there are several strong arguments in favour of issuing and validating the certificate before this critical supply-chain event. The CCAMLR CDS scheme is the only one in which this principle is consistently applied to all operations, and no catches may enter any port or be unloaded unless a validated CDS has been initialled and approved by a competent authority on the electronic interface accessible to fisheries officers worldwide.

Validation of a catch certificate by the flag state before unloading provides the highest degree of guarantees and MCS options, and is the obvious best practice solution for tuna CDS systems.

3.2.1 Transshipment

Transshipment is the single most important stop in the supply chain: it is the moment at which illegal fish may easily be laundered into legal supply chains. Transshipment is a very common form of unloading fish from a fishing vessel in the global tuna industry. It follows that the act of transshipment needs to be subject to appropriate controls.

Longline vessels often make transshipments at sea, whereas purse seine vessels often transship in port. Direct landings are less common than might be expected. Catches transhipped to reefers are referred to as “regular transshipments” in this paper. Under all regular regimes, transshipments from fishing vessel to fishing vessel are only permitted under circumstances of *force majeure*, and transshipments to merchant vessels such as container ships are strictly prohibited. Reefers that have received catches at sea sail to a port where the catch will then be formally landed.

From a CDS perspective, the most important aspect of transshipment is that catch unloaded from a fishing vessel onto a reefer is formally recorded in the system and remains identifiable and traceable from the source fishing vessel to the point of landing. For this reason reefers must be able to provide physical separation of catches on board, either by stowing catches in separate holds or by separating them with netting or some other material that can keep catches separate.

3.2.1.1 *Transshipments at sea or in port*

Transshipments can take place in two types of location: a port, or the open sea – including archipelagic waters, an exclusive economic zone (EEZ) or the high seas. For transshipments at sea, the role of oversight is generally limited to flag states; when transshipments occur in port the role devolves to the port state.

On the high seas, transshipments fall under RFMO rules; transshipments in an EEZ and archipelagic waters may be governed by national or RFMO rules depending on the area of competence of the RFMO.³⁴ Transshipments at sea are the most difficult to control because direct monitoring and inspection possibilities are limited. Current RFMO control measures include formal registration and monitoring of reefers receiving catches at sea, definition of which fishing vessels are allowed to transship at sea, prior-transshipment notices and authorization regimes, and on-board observers.

In waters under the jurisdiction of coastal states, regulatory frameworks for transshipments vary from rigorous monitoring, reporting and oversight to regimes that involve little actual monitoring or oversight by the coastal state and that may provide substantial opportunities for fraud.

In port, optimal oversight can be exercised. In this case, the quality of the port state’s monitoring framework and the work of its fisheries officers are determinants of the risk of illegally sourced fish entering the supply chain.

It is important to determine the direct CDS tasks (mandatory), and supporting CDS tasks (facultative) that state-level actors have to carry out during transshipments. Flag states are continuously responsible for the operations of their vessels regardless of at-sea transshipments, but defining the role and tasks of port states under a CDS with regard to in-port transshipments is complicated, not least because their only function or responsibility with regard to the tuna fishery concerned may be to provide the services of a port. Sometimes in such cases the port state simply does not accept the idea that it should assume functions such as monitoring or counter-validating catch certificates.

If a port state does actively participate in the CDS, however, oversight is enhanced and the impermeability of the system preventing IUU fish from entering the supply chain is considerably improved. This generally requires that the port state be a cooperating member or cooperating non-member of the Commission under which the

³⁴ The IATTC area of competence includes EEZs, but the areas of competence of the IOTC or the WCPFC, for instance, are limited to the high seas. These differences are critical with regard to the effectiveness of the rules that apply to a given area.

CDS is operating: only such Commission members and non-members can participate in the CDS and receive, verify, validate and log documents according to its rules.³⁵ If applied judiciously, this mechanism can be leveraged to deny transactions to take place in ports of NCPs, owing to their incapacity to give rise to counter-validated, and hence, complete and valid catch certificates.

Suggested practice regarding formal port state involvement in relation to transhipments in port

With regard to system impermeability, it is essential to bind port state authorities formally into the CDS verification and validation processes for transhipments in port. This limits such transhipments to members or cooperating non-members of the Commission by whose rules they are bound, and hence improves the levels of oversight and control in this part of the supply chain. Failure to bind port states formally would limit oversight options and open opportunities for fraud at this supply-chain stop. This principle also applies to counter-validation of landings (see section 3.2.3.3).

3.2.1.2 Full and partial transhipments

Full transhipments are cases in which all the fish from a fishing vessel are transferred to a reefer. Partial transhipments are cases where only a part of the fish on board is transferred to a reefer. The practice of partial transhipment is legitimate in the fishing industry. It enables the operator of a vessel to decide, for example, the time at which he/she will introduce a specific grade or species of fish into the market.

From a CDS perspective, given that unloading triggers the issue and validation of a catch certificate for the fish to be unloaded, it is of no consequence whether all or only a part of the fish aboard the fishing vessel is transhipped. In a CDS it is important that each and all of the tuna leaving the fishing vessel be recorded on a catch certificate in order to link the specific amount of fish to that particular fishing vessel.

CDS data may be used at any time by a competent authority for cross-checking against logbook data, periodic catch reports or other data sources that help to establish the legality of the fishing operations and the accuracy of information submitted for validation.

Suggested practice regarding partial and full transhipments

A CDS should be designed to function effectively whether transhipments are partial or full. To achieve this, catch certificates should be issued and validated before unloading takes place and should be limited to record the amount of fish to be unloaded from the fishing vessel.

3.2.1.3 Transhipments to non-reefer vessels

Two types of transhipment fall into this category: transhipments from one fishing vessel to another fishing vessel, and transhipment from a fishing vessel to a container or cargo ship.

Transhipments from fishing vessel to fishing vessel are a complicated matter because they blur the picture of which vessel has caught what fish. Fishing vessels are not normally equipped to function as reefers. Separation of catches is often difficult – even impossible – and when these transhipments occur there is always the risk of transhipment of illegal catch from IUU vessels to vessels operating legally in the fishery. From a fisheries management point of view, this type of transhipment can only be allowed in cases of *force majeure*.

³⁵ The Seychelles, for instance, has become a cooperating non-member of CCAMLR so that it can participate in the CDS. The Seychelles does not flag fishing vessels operating in the CCAMLR area.

The at-sea transshipment of fish to merchant vessels such as container and cargo ships must be ruled out absolutely. Merchant vessels do not fall under the purview of fisheries authorities, and no control can be exercised over such transshipments; they are known to occur, and are invariably associated with IUU fishing operations. If fish is to be moved from a fishing vessel onto a merchant vessel in port, then the transaction is to be regarded as a landing, and subsequent loading onto a merchant vessel for exportation. CDS documentation is to be filled accordingly.

Suggested practice regarding fishing vessel to fishing vessel transshipments

In a CDS this type of transshipment should be dealt with as a regular transshipment. A fishing vessel must therefore be defined in the system as being capable under exceptional circumstances of receiving and landing or transshipping fish from another fishing vessel.

Suggested practice regarding transshipments from fishing vessels to cargo or container vessels

A CDS should make no provision for such transshipments at sea, and RFMOs should impose a formal rule prohibiting them if such a rule is not already in place. If in port, then the fish is regarded as landed first, and then loaded onto the container vessel next.

3.2.2 Transfers to tuna fattening farms

Transfers of tuna from seine nets to tow cages occur in tuna farming operations. This is essentially limited to three places worldwide and three tuna species: Southern Australia (Southern Bluefin tuna), the Mediterranean Sea (Atlantic Bluefin tuna) and Mexico's Baja California (Pacific Bluefin tuna). Two of these operations are covered by ICCAT and CCSBT CDS, providing a good source of existing practice and experiences.

Tuna are caught by a purse seiner, kept alive in the seine net and then transferred to tow cages. The tow cages are then towed to the fish farm where the tuna are transferred to the farm cages where they will be fattened before being culled and exported to the end market. Grow-out periods vary substantially from less than six months in the Mediterranean to two to three years in Mexico.

The first challenge is to establish the number and volume of fish removed from the fishery. Accuracy is particularly important in quota-managed fisheries to establish the exact volume harvested by each vessel, which is then deducted from its quota. Because quotas for Southern Bluefin tuna and Atlantic Bluefin tuna fisheries are limited and very valuable, the operators have the greatest interest in a sound method that establishes volumes accurately and is applied uniformly and equitably to all harvesting units operating in the fishery.³⁶

The next challenge involves the development of traceability from harvest to farm and from farm to market, and agreement as to which certificates are needed to record this. Such traceability will differ from the regular harvest-to-processing-to-market chain of custody because the farm constitutes an extra stop in an otherwise similar supply-chain.

In CCSBT, a special caging certificate issued by the purse seiner itself³⁷ establishes the amount of tuna received by the farm. If a CDS is well designed, such a document is not needed because the farm receiving the fish will record the verified weight of the fish in the catch certificate covering the transferred fish, as is the case with ICCAT.

³⁶ Few examples in tuna CDS design are more appropriate to show why clear and uniform protocols are needed for a routine to be applied so as to guarantee a fair, transparent and replicable operational framework.

³⁷ The caging certificate is called a farm stocking form (FSF) in the CCSBT system; it does not exist in the same form in ICCAT.

Suggested practice with regard to transfers

Purse seining operation supplying tuna to farms should be treated as a regular fishing operation. The matter does not require to be complicated by the fact that the fish are not killed and are transferred to a farm. The fish are removed from the stock, and therefore a catch certificate should be issued by the purse seiner on the basis of the estimated harvest. During transfer to the farm, the number and volume of fish must be verified and the catch certificate adjusted and counter-validated accordingly.

A trade document will subsequently link tuna harvested from the farm to the original catch certificate (see section 3.2.3.8).

3.2.3 Landing

After transshipments, landings are the next major stop in the supply chain. They are part of the unloading operation from fishing vessels when no transshipment or transfer has taken place.

3.2.3.1 Reefer landings vs fishing-vessel landings

In industrial fisheries, the first major difference is between “indirect” landings by reefers and “direct” landings by fishing vessels. Reefers land catch on behalf of fishing vessels, whereas fishing vessels land catch in their own name. This makes landings from reefer vessels more complicated, and more prone to malfeasance.

For a reefer to land fish on behalf of a fishing vessel, it must be equipped to maintain separation among the several catches collected from fishing vessels: large reefers have many separate holds and a stowage plan is part of the official set of documents in which the names of the fishing vessels that transhipped catches are recorded against specific holds.

Suggested practice with regard to reefer landings

From CDS and MCS perspectives, it is essential that reefers maintain separation of catches. Failure to do so makes it impossible for the CDS to record the links between landed catch and source fishing vessels. A clear and unconditional rule that catches must be kept separated should be established by RFMOs, if not already in force.

3.2.3.2 Full and partial landings

Full landings are the simplest scenario, and are the general rule in small-scale handline, pole-and-line and longline fisheries. In purse seine fisheries, however, partial landings are quite common.

The catch certificate covering the portion of catch being unloaded from a fishing vessel onto a reefer is a clear concept; but in cases where a reefer lands only a portion of its received catch – a common scenario in practice – the matter becomes more complex. The CDS must be able to accommodate this scenario while maintaining traceability and accurate volume accounting.

3.2.3.3 Landing at home or abroad

A reefer or a fishing vessel can land catch in a port of the country whose flag it is flying, or it can land it in a foreign port. In tuna fisheries, and in industrial-scale fisheries generally, landings in foreign ports are the most common scenario. In the case of landing at a home port, the flag state and the port state are the same and typically apply the same policies to flag-state and port-state matters. A lenient flag state will often be a lenient port state, and vice-versa.

From a CDS perspective the important question is what authority and tasks fall to port state authorities (see also section 3.2.1). In accordance with the 2009 Agreement on Port State Measures (PSMA), the port state should exercise full oversight over foreign vessel landings in its ports, and the flag state and the port state have joint responsibility

for ensuring that fishing and port operations are legal. This is a useful consideration in CDS, and can work to increase the verifiability and hence the accuracy of information recorded and validated in catch certificates.

It can be assumed that landed catch is entering either its end market destination or a transit hub – this is not common in tuna fisheries – or a processing state, which is the most likely first destination of most landed tuna.

The controls by port-state authorities of tuna consignments being landed into the end market destination are the last line of defence, and hence one of the most critical control points in the system. Failure by the port state to subject CDS-covered landings to a proper port-state control framework exposes the market of that state to IUU-sourced products. Depending on the importance of the market, this can facilitate the outflow of substantial and unknown volumes of non-documented fish from a documented fishery. Because the fish are entering the end market, none will re-emerge into international trade, and hence the benefits of system-bound traceability and controls inherent to the CDS are lost.

When tuna is landed into a processing state, on the other hand, the benefits of system-bound traceability achieved by linking original catch certificates with the resulting trade certificates provides a degree of system-enforced integrity that is much harder to undermine. In this scenario the port state has every interest in ensuring that only valid catch certificates enter its territory because problematic certificates are likely to be detected by automated system-bound traceability and mass-balance accounting mechanisms inherent to the CDS.

Suggested practice with regard to port state oversight

In view of the importance of the port state as the last line of defence, the PSMA principles of port state control should be naturally applied to any tuna CDS. Any opportunity to give formal authority to the port state should be exploited, including formal counter-validation of validated portions of catch certificates. Doing so will limit landing operations to non-final destination market ports to CPCs and CNPCs bound by Commission rules, and will hence improve the oversight and controls governing this part of the CDS.

3.2.3.4 Landing into containers

Landing into (freight/shipping) containers occurs in many tuna fisheries, notably longline and purse seine operations. In purse seine fisheries it generally occurs without grading into species or direct weighing of fish, which are only estimated – though good approximations are generally obtained when port-based trucks are weighed empty on arrival at the port and full on their way out. This also applies to longline fisheries, in which grading into species is often carried out at landing; and in purse seine and longline landings, exact weights will normally only be established at the factory or warehouse entrance.

In the case of purse seine landings, and sometimes in longline fisheries, containers may not be immediately destined for a factory in the country in which the fish are landed. In such cases they are loaded onto a container ship and will likely be delivered at a commercial port rather than a fishing port. Non-graded fish arriving in a commercial port in a country other than the country of landing always pose MCS challenges.

In this case the important point for CDS is that the mix and verified weights of species are not established by the time that landing is completed. This introduces the notion that landing operations in tuna fisheries can be concluded in port – whereas from a CDS point of view they can only be concluded when catches have been graded. It follows that the activities of landing and grading may not necessarily occur on the same day or even in the same country.

The CDS must therefore include a routine that allows for deferred grading of product, and must hence provide for the issue of catch certificates on the basis of an observed mix of species and an estimated weight of each species. It must then provide for updating, confirmation and counter-validation of the verified weights at the destination, where weighing and grading into species takes place.

3.2.3.5 Landing into a warehouse

Tuna is sometimes landed in bins to warehouses for storage before transfer to a factory, especially in the case of purse seine fisheries. It often happens that no grading is done until the product is moved to the factory, where the product will be graded and weighed and the verified species and weights established.

If a fishing vessel, warehouse and factory are all operated by the same company, fish may never be formally graded and weighed at all. In such a case the company may opt to work with the estimates provided by its vessel masters. In this case the flag state and/or port state must determine whether it has the necessary monitoring capabilities and can accept the estimates as verified weights. The CDS may allow for such automated estimated-to-verified weight conversion if both the flag and port state agree that oversight is sufficient.

Cases where verified weights are not established between landing and production are rare, but they do exist and are regarded as legitimate modes of operation. In these cases, estimated weights are generally close to actual weights and are accepted as verified and correct by operators.³⁸ This does not, however, imply that a formal counter-validation of verified weights is unnecessary: the steps and checks mandated in the system must apply equally to all landings. In all other cases, this scenario is similar to that of landing into a container.

If non-graded catch is to move from a warehouse into a container shipment, the system has to have a mechanism that enables accounting for it, including the possibility of splits into different consignments at this point.³⁹

This is an appropriate stop in the supply chain for pointing out that any particular landing may be partially retained and processed in the port of landing, partially transhipped, partially warehoused or partially re-exported after a period of storage. An effective CDS needs to accommodate all such permutations of the supply chain while keeping track of the sources, species and volumes.

If fish are graded on arrival at the warehouse, as in the Papua New Guinea example, the catch certificate with verified weights can be issued before storage.

3.2.3.6 Direct landing at a processing facility

In the case of direct landings at processing facilities, grading occurs at the factory. This is in many ways the simplest scenario – but in tuna fisheries it is generally the exception rather than the rule. An example of such landings are landings of Grupo Calvo company purse seine catches at their canning and loining factory in La Unión, El Salvador.

³⁸ This is generally only applicable to large-scale landings by longline vessel, where fish have been individually weighed and recorded on board.

³⁹ In Papua New Guinea, for instance, the National Fisheries Authority monitors all movements of tuna into and out of cold storage and requests operators to grade products and establish verified weights before storage. This allows the authority to document exactly how much enters and is removed from cold storage, resulting in full national oversight at this level. This is an option for PNG to comply with the EU IUU Regulation: the EU document system has no mechanism allowing for warehousing, splits and re-exports of non-graded catches, and authorities are asked to adapt their work practices to accommodate the EU CDS framework.

Products landed directly at processing facilities are usually processed there, but there are exceptions. The CDS must therefore be able to deal with direct landings at factories as if they were landings into warehouses, with or without grading.

3.2.3.7 *Collecting (artisanal fisheries)*

Collecting catches in ramasseurs and from beaches in artisanal fisheries is discussed in section 3.1.4 and is not repeated here.

For small-scale fisheries providing products that enter international trade, a simple framework is needed for issuing catch certificates, and which does not involve modification of the trade segment of the CDS. This approach enables small-scale operators to access international markets, but it also affects the level of traceability that can be achieved: in fact, tracing individual catches back to the source vessel becomes impossible. It also weakens the level of control that can be exercised over such fisheries.

Addressing these weaknesses is largely a matter of applying the monitoring and control routines developed by national authorities to ensure compliance by small-scale operations.

3.2.3.8 *Harvesting (tuna fattening)*

This section deals only with tuna originating in wild-capture fisheries. The process of transferring fish into cages is discussed above in section 3.2.2; closed-cycle aquaculture tuna is discussed in section 9.10.

Fish are harvested from cages after a period of fattening, when they weigh substantially more than when they were caged. All harvesting takes place on the basis of pre-arranged sales transactions.

Following the logic of the supply chain from capture to transfer to fattening to harvest and to export and seeking analogies with the regular supply chain that does not involve farming simplifies the task of designing a CDS because the approach minimizes the need to adjust the system.

From a supply chain point of view, catching and transfer of products into a farm are analogous to catching and transshipping/landing in regular fisheries. This is because the fish have been removed from the stock. Nothing prevents the system from being designed to enable the issue of a catch certificate based on verified weights at the time when fish is transferred to a farm, as in ICCAT.

Following the period of fattening, the fish are generally harvested directly into reefers or containers bound for the end market destination. The harvesting operation is hence analogous to a first trade transaction based on a trade certificate, linked to a catch certificate.

The CDS in ICCAT and CCSBT vary substantially with regard to aquaculture: ICCAT treats farm harvests as harvests covered by Bluefin tuna catch documents (BCD) already issued for the fishing operation that delivered the tuna to the farm, whereas CCSBT regards farm harvests as unloadings and issues catch certificates for tuna harvested from a farm, instead of issuing them for the fishing operations at the time of catching operations.⁴⁰ This latter approach does not follow the linear logic of the supply chain in the way the ICCAT approach does.⁴¹

⁴⁰ CCSBT accounts for transfers to farms through a “farm stocking form” (FSF), of which one is issued and validated per purse seine vessel per season.

⁴¹ Note that if a catch certificate is not issued at the time when fish are caught by the purse seiner and removed from the stock, the usefulness of the CDS as a quota-monitoring tool is diminished and the impermeability of the system is weakened. This is because harvesting and unloading (transfer) occur without the issue and recording of catch certificates. Catch certificates are filled in near-real time, and allow automated near-real time quota monitoring, which is not the case in CCSBT where the farm stocking form (see previous footnote) is only submitted once per season.

Suggested practice for aquaculture supply chain CDS design

Analogies should be applied to the design of the CDS between the regular capture and farming scenarios to simplify the system and minimize the need for extra certificates and the associated burden of administration. These analogies are shown in Table 7, which indicates the associated notifications and authorizations needed to proceed from step to step and to ensure that adequate oversight is exercised by the authorities.

TABLE 7
Tuna fattening supply-chain analogies

Supply-chain events, analogies and certificates issued					
Regular supply chain	Capture	Transshipment	Landing to factory	Processing	Export
Certificate	CC _{est} *		CC _{ver} **		Trade certificate
Farming supply chain	Capture	Transfer to tow cage	Transfer to farm	Fattening & harvesting	Export (incl. dom. market)
Certificate	CC _{est}		CC _{ver}		Trade certificate

* Catch certificate issued on the basis of estimated weights. (see Chapter 5)

** Catch certificate issued on the basis of verified weights, following landing and grading, or confirmation of estimates. (see Chapter 5)

If tuna is to be transferred live between farms, a trade certificate must be issued by the source farm, and validated by the farm state, indicating “live” twice as original and resulting product type.

3.3 DISTRIBUTION

Distribution occurs at several stages of the supply chain, typically after unloading, when raw materials are distributed to processing facilities, and subsequently at the post-processing stage when products are shipped to market or for re-processing. The various methods used for distributing and shipping the product vary, and so do the challenges for the CDS.

The main forms of distribution and some of the major considerations for CDS design are discussed in the following sections.

3.3.1 Reefers

Reefers are typically engaged only in the first stage of distribution, when tuna are transferred from fishing grounds to processing establishments. Reefers are often operated by large brokerage firms such as Trimarine and Itochu, which typically receive fish from more than one fishing vessel and distribute the pooled catches to various clients, which may be located in different countries.

Reefers are also used in tuna fattening farms and in harvesting operations where catches are loaded directly on to the reefer, which when fully loaded brings them to market. In this case the reefer is the means of transport of an export consignment into the second stage of the supply chain: it is clearly not a transshipment operation, and this way of using reefers is uncommon in tuna fisheries.

From a CDS perspective, an effective regulatory framework that ensures the physical separation of all products aboard reefers must be given. This control framework is not “CDS specific”. The wording of the rules varies among RFMOs and among countries and can influence the effectiveness of implementation.

3.3.2 Containers

Containers are used in pre- and post-processing stages of distribution. Vessels can land catches into containers that are loaded on to merchant vessels for delivery to clients, and factories almost invariably ship semi-processed or finished products to international markets in containers. In both cases, with the exception of bulk tuna in pre-processing distribution, the movement of product is covered by a trade certificate.

The important point from the CDS and MCS perspective is the degree of control exercised by the competent authority over commercial transactions in container ports. A country that imports container loads of tuna covered by a CDS must, regardless of volume and whether they are for production or consumption, be in a position to ensure that the competent authority has the information necessary to decide whether an inspection of the goods and/or the related paperwork is in order.

Suggested practice with regard to collaboration between customs and competent authorities

Collaboration and coordination between customs administrations and competent authorities are absolutely necessary. See section 10.2.4 for details on how such collaboration may be achieved effectively.

3.3.3 Air freight, trucks and trains

Air freight is generally only used to send fresh product from the country of harvest directly to the end market. Sashimi-grade tuna from artisanal fisheries are often chilled on ice and delivered by air. In tuna fattening operations, individual specimens of exceptional quality and size may be sent by air freight also.

Overland delivery by truck and train are the exception in the global tuna trade. Much of what applies to the collaboration between customs administrations and competent authorities earlier in this section applies to all other forms of freight. It is essential that fisheries authorities have a full understanding of which fisheries products enter and leave the national territory, especially products covered by a CDS, calling for effective collaborative ties between customs and fisheries authorities.

3.4 PROCESSING

The first elements of processing may take place at sea, and therefore product types must be indicated on catch certificates. Tuna are generally gilled, gutted and deep frozen at sea in longline fisheries, but otherwise little or no processing takes place at sea in tuna fisheries. This may be referred to as pre-processing, and only serves to safeguard the quality of the fish.

Sashimi-grade and canning-grade tuna move through the initial segments of international trade in various frozen forms with little or no processing. Sashimi-grade tuna is cut up in the destination market, usually before it enters domestic trade; bulk tuna is generally received at processing facilities in round form for processing into semi-finished or finished products such as loins, flakes and canned tuna.

In processing plants, fish are received “at the gate”. It is usually here that bulk tuna is graded, whether straight from a fishing vessel, off a reefer or out of containers. During grading, the mix of species and the exact weight per species is established. In some cases, the weight will have been established before this point, but it is usually done at the factory gate.

This is crucial for the practical functioning of a CDS. It is generally only at this point in the supply chain that the exact weight of tuna can be determined and verified.

Hence it is only at this point that a catch certificate issued on the basis of estimated weights can be adjusted and counter-validated by a competent authority. Importantly, tuna has often migrated through a complex supply chain before reaching this point:⁴² it is hence clear that the system must be primed to deal with this scenario.⁴³

3.4.1 Semi-processing and re-processing

The distinction between semi-processing and re-processing is relevant from a CDS point of view in terms of the certificate on which the processing run is based, and where in the supply chain it occurs.⁴⁴

Semi-processing may occur when product accompanied by a catch certificate completed on the basis of verified weights is first delivered to a factory. When a portion of the semi-processed product (*e.g.* loins) is exported to another country for processing into finished products, it will be accompanied by a trade certificate. In re-processing, the trade certificate is the documentary basis of the received consignment. It links the batch of received semi-processed product to its original catch certificate.

If the products of re-processing can be used for further processing to create more refined products, another trade certificate might be issued that links to the previous trade certificate in the chain of certificates. CCSBT has recorded up to three re-exports of products combined with various types of processing and/or splits or pooling of products before they reached the end market.

From a CDS perspective, it is essential that an indefinite number of trade and re-processing events, splits or pooling of products can be covered without creating barriers to trade or creating weaknesses in the CDS ability to trace batches of products along the supply chain.

In re-processing the source certificate of the materials being processed is a trade certificate; in initial processing, including semi-processing, it generally is a catch certificate.

3.4.2 By-products

The tuna loin and canning industry generates numerous by-products, the utilization of which varies according to the country concerned. In Thailand, for example, by-products are mainly utilized in the form of tuna meal, tuna oil and tuna soluble concentrate. In the Philippines most of the by-products from the canning industry are converted to tuna meal, but black meat is also canned and exported to neighbouring countries. Edible tuna by-products such as heads and fins from the fresh and chilled tuna sectors are used in soups and viscera are utilized to make local delicacies or to produce fish sauce; scrape meat and trimmings are also used for human consumption. In Spain and Ecuador, by-products of the aquaculture industry go to the fish meal and fish oil industry to satisfy increasing demand; the products are used mainly in animal feed.⁴⁵

In most cases by-products are exempt from CDS coverage. This is entirely justifiable because the raw materials and the processing and trading of the primary commercial

⁴² A batch of tuna caught by a purse seiner, for example, may have been transhipped to two reefers, which have each proceeded to several ports to unload: this creates splits at two distinct levels – transshipment and landing – before the first catch certificate based on verified weights can be issued at a factory.

⁴³ Note that in many other industrial fisheries, including the CCAMLR toothfish fishery, fish are processed on-board the fishing vessels, and the exact weight of the product to be landed, the number of boxes, etc. is known before the fishing vessel enters port.

⁴⁴ Semi-processing and re-processing (occurring in factories) are distinct from pre-processing occurring on-board a fishing vessel.

⁴⁵ Adapted from Garrido Gamarro *et al.* (2013).

products – chilled and frozen meat, loins, flakes and cans – drive trade and profits in the commercial tuna life-cycle, and there is little to gain from subjecting by-products to the strictures of a CDS.

Under an effective CDS the source materials from which by-products are derived are already covered and monitored and therefore do not need to be covered any further. And if an irresponsible state player was to condone the landing and internal processing and trade of non-certified tuna, coverage of the by-products in a CDS would not solve the primary issue – owing to the local market circulation of most by-products.

3.4.3 Contract processing

Product is not always owned by the processor, and in some cases products are not legally imported into a territory for processing in customs terms. China is a prime example of a country in which a good deal of “contract processing” takes place. In this scenario the owner of the raw materials ships them to China to have them processed into an agreed form, and then has them shipped back, or forward to a destination market. The owner of the materials has never lost ownership of the goods, even though they have moved through international trade, been processed at a factory owned by an entity in another country, and then sent to market.

From a customs perspective, the raw materials have never left the source country. This scenario shows the importance of separating the customs logic of exports and imports from the CDS logic. From a CDS perspective, the documents related to the raw materials have moved from the source country to the processing country, and then moved back to the source country or to a market other than the source country. CDS certificates must document this trail, regardless of the customs and tariff status of the goods.⁴⁶

The contract type under which products are processed, the ownership of the products and their tariff status are largely irrelevant to a CDS. In a CDS, every single transaction in which products move through international trade must trigger the issue of the appropriate certificate. If tuna moves from Japan to Korea for contract processing, but never enters Korea for customs purposes, a trade certificate must still be issued to the Korean company receiving the fish to link the materials to the source certificate. The same applies when products are shipped back to Japan or to a destination market. Failure to do this would enable product covered by a CDS to move through international trade without certificates, which would constitute a violation of the fundamental CDS principle that product cannot move between supply chain stops without being covered by a consignment-specific certificate.

3.5 TRADING

Tuna products account for eight percent of the international seafood trade. As one of the most important traded seafood products, tuna often crosses several national boundaries on its journey from production to consumption. The main consumer markets are Japan, the EU and the USA; each has distinct and differing tastes for specific tuna products.

Tuna can be traded in domestic markets after importation just as it can be traded internationally. Trade and the tracing of consignments through international trade constitute a major challenge to a CDS.

⁴⁶ Even though products are not “imported” the territory in a customs sense (import taxes are generally waived), customs takes great care in monitoring the in- and out-flow of such products, meaning that the institutional collaboration between customs and the competent authority outlined further above fully applies under this scenario also.

3.5.1 National markets and trade

The term “domestic consumer market” generally refers to the end or destination market in which final products are bought by consumers. Products do not normally emerge from domestic consumer markets to re-enter international trade, but they are distributed or traded in end markets between the point of importation and the point of last sale by a retailer.

Domestic consumer markets can be extremely complex because a large number of national economic operators may interact with the product during its distribution within a country. Even in developed countries, private-sector operators and national authorities may find it very difficult to follow the pathways along which products move through the domestic market supply chain.⁴⁷

If product enters a country for processing, the supply chain is usually fairly short. In such cases, product is usually imported by the processor and re-exported by the same entity after processing, but there is always the possibility that some of the product will enter the domestic market for consumption also.

Products imported into domestic markets for consumption move to a number of first destinations that are quite distinct from each other. These include: i) wholesale markets and auctions; ii) trading companies, or brokers; and iii) large retail outlets such as supermarkets. Domestic consumer markets are as diverse and culturally distinct as the number of countries through which tuna products move.

From wholesale markets and auctions, products will often move to retailers such as restaurants and fishmongers, sometimes via agents and other intermediaries. From brokers, products generally go to processing units before being distributed into the domestic market or re-exported.

Supply-chain actors in the international segment of the tuna trade often specialize in tuna and handle it exclusively, but this is not generally the case in domestic markets, where tuna is often one commodity among many. At this level, tuna moves through the market in smaller quantities, hundreds or thousands of splits occur and the tuna is often traded as part of consignments that contain other fish products. The number of supply-chain actors handling tuna commercially in national distribution chains is much larger than the number of actors moving tuna through international trade.

National traceability laws dictate which record-keeping rules regulate supply-chain actors when they receive, handle, process and sell products. The general rule is that such records are generated and kept at the company level and that they may be audited by various types of authorities. Virtually no country, developing or developed, has a national seafood distribution traceability system that requires supply-chain actors to log commercial transactions electronically in real time along the entire national supply chain. Direct oversight in national food distribution chains usually begins and ends at the border in that once a product has crossed the border it is no longer directly overseen.

This has implications for CDS traceability functions at this level. In fact no existing CDS in CCAMLR, ICCAT, CCSBT or the EU traces product through domestic markets, whether they are transit countries or the final destination of end products. All systems, even though they vary in their design, provide a documentation system that traces fish from harvest and catch certification through international trade to the point of importation into the end market – but none attempt to trace products through national markets.

⁴⁷ With the growing dominance of trading companies and large retailers in the trade of sashimi-grade tuna, distribution systems have become increasingly complex and opaque. According to one industry representative, “Distribution systems have now become very, very complicated – we cannot understand them. [...]” (Hamilton, A. *et al.* 2010 on Japanese market status and trends)

Suggested practice with regard to real-time tracing in domestic markets

In view of: i) the large number of actors in national distribution chains, many of whom are not tuna specialists; ii) the splitting and mixing of consignments as they move through national supply chains; and iii) the sensitivity of domestic trade data and the right of countries not to have these subjected to supra-national scrutiny, the best option is to record at the CDS level only the products that move into a country, and the products that move out. National food laws governing traceability and record-keeping are applied by national authorities to ensure the traceability of products that are imported and then re-exported in the same form or as a processed commodity. These rules should be incremented by specific mechanisms in support of CDS traceability (see section 6.6.6)

With regards to consumer products entering their final market destination, it is sufficient to ensure that the products are covered by valid certificates at the time of importation; from a CDS point of view no further traceability is required.

3.5.2 International markets and trade

All goods traded internationally are subject to international trade laws, customs procedures and internationally recognized documentation standards.⁴⁸ The fundamental characteristic of international trade in tuna is that the consignments shipped between destinations are large and partly or wholly made up of tuna. Since consignments move between countries, they are subject to sanitary and phytosanitary (SPS) and customs control systems that identify and record outbound and inbound movements.

Because such standard systems are already in place for logistics, controls, personnel training and the recording and handling of trade data, tracing consignments through international trade is a lot more straightforward than attempting to trace batches of products through national markets. Discrepancies between customs-derived trade data and CDS data does occur though, and is often due to the assigning of erroneous harmonised customs codes to imports or exports. Consistent discrepancies may indicate the existence of intentional mislabelling fraud to flout CDS rules.

For bulk canning-grade tuna, much of the international trade process actually occurs aboard reefers before the product is landed for the first time. Reefers receive transhipped catch and land it in portions for clients in ports where processing factories are located, as described in section 3.3. Distribution in international trade after processing, semi-processing, or re-processing generally involves containers and other standard freight channels.

Suggested practice with regard to tracing in international trade

From a CDS perspective, the system has to be designed in such a way that it can trace international transactions in the segments associated with reefers (aquaculture and fisheries) and freight, the latter being purely concerned with trade. Transactions must be recorded at the CDS level in real time, and must be the subject to formal verification routines and validation before any physical movement takes place.

Important inconsistencies between trade and CDS data regarding imported/exported volumes should be investigated.

⁴⁸ A useful set of reference materials is provided by the UK Government at: www.gov.uk/international-trade-paperwork-the-basics

- regulatory frameworks governing these segments; and
- three notional countries – A, B and C – that model the flow along an international supply chain and trade.

At the harvesting end of the supply chain, the graph limits itself to a simple fishing operation and a single transshipment. The potentially more complex events, such as multiple transshipments, mixed unloadings, etc. are omitted for the sake of simplicity.

Catch and trade certificates are shown at the stops in the supply chain where they are issued and validated for the first time (see Chapter 6).

It is understood that the more segments, stages and transactions the CDS covers, and the more stakeholders intervene in the system, the more complex the CDS becomes. To minimize administrative burden and to assure effectiveness, the simpler the conceptual framework, the simpler and the more intuitive the resulting CDS will be.⁵⁰

4.1 INTERNATIONAL AND NATIONAL SUPPLY-CHAIN SEGMENTS

In this paper, harvesting and trade of tuna between countries fall into the “international” segments of the CDS. This is because harvesting, trade and the movement of products occur outside the countries involved in the supply chain. Trade and distribution within a country are referred to as “national” segments, because they occur inside a country whether the product re-emerges to re-enter international trade, or whether it is consumed. National segments are made up of internal (inside companies) and external (between companies) traceability sub-segments.

In Figure 1 the supply chain runs from left to right, from fishing operations, transshipment, and landing to products entering the first country and being processed before being traded on to the next country, and so on.

The part of the graph below the horizontal dividing line represents the international dimension of the CDS. All harvesting operations prior to landing, export, import, re-export, import and re-export are subject to the regulatory mechanism of the CDS, and all transactions are recorded in it. In short, the CDS only directly covers the 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, which involves the issue of trade certificates and creation of links with source certificates. In this way system-bound traceability and accountability is provided for and maintained.

The upper part of the graph represents the national traceability segments of the supply chain. National traceability is limited to national segments through which product moves. These segments are not directly covered by the CDS: they are governed by national traceability laws and regulations. The CDS does not trace product movements in national distribution chains, and the only CDS records to be generated cover the product’s entry into and exit from national supply chains.

In fact the first and last transactions in the national supply chain – entry and exit – overlap with the transactions recorded by the CDS, and hence have both national and international attributes.

With regard to national traceability, none of the current RFMO-based or EU CDS have system-bound mechanisms to trace movements of products through national supply chains. This should be regarded as best practice: i) because the mechanism works for the tuna CDS currently in operation; and ii) because the alternative option

⁵⁰ It emerged during the preparation of this paper that staff from one RFMO may not fully understand the operation of a CDS in another RFMO, unless they spend important amounts of time studying it. This is because of the complex nature of the rules and certificates involved, and also because there is no underlying harmonized CDS framework concept on the basis of which existing systems were designed.

of covering national segments though a CDS-bound traceability mechanism would introduce prohibitive complexities that would be likely to make any system fail (see also section 3.5.1).⁵¹

In the CDS framework concept shown in Figure 1, countries are dealt with as “black boxes” by the CDS. The CDS captures data on what enters and what exits a country, but the system does not “see” what happens inside. Nonetheless, the system remains fully capable of calculating and establishing important indicators for any country; these include:

- i. species, product form and volume imported into the country;
- ii. species, product form and volume leaving the country; and
- iii. the balance between (i) and (ii).

This balance is critical in terms of oversight at the country level. It can take three forms (based on net fish weight):

- i. exports > imports: non-originating materials are laundered into the supply stream;
- ii. exports = imports: 100 percent are processed and re-exported, and there is no domestic consumption; and
- iii. exports < imports: the balance is consumed domestically.

To be relevant to the CDS these balances must take into account processing yields, because the form and volume of the product change during processing. Failure to account for product yields provides an opportunity for non-originating product to enter the certified supply stream (see also Chapter 5).

The CDS will automatically detect a discrepancy at certificate level when trade certificates are prepared for products to leave a country. What the CDS cannot do is to identify the individual operator that has given rise to the discrepancy – unless the exporter was also the importer, and products have not changed hands in the national market. If national transactions were recorded and links were enforced by the CDS, common types of certificate fraud could be detected at the level of the individual operator – and the CDS could enforce them. In the absence of this a mechanism, it pertains to individual national competent authorities to ensure and enforce national supply chain integrity under the CDS, while the CDS identifies all individual certificates for which discrepancies must be investigated.

4.2 TRACEABILITY AND TRACEABILITY STANDARD

The standard of traceability to be pursued by a CDS is a question that no existing CDS fully addresses. In current schemes the traceability standard is largely implicit in the CMM establishing the CDS: in general it amounts to the desired ability to trace products in end markets back to the fishing vessel that harvested the source material – but this is usually a matter of interpretation of the text of the CMMs.⁵²

The traceability standard must be clearly defined in order to establish the data that must be collected and the means whereby “soft” and “hard” data links between

⁵¹ From a political and regulatory perspective, it is unlikely that CPCs would agree to a CDS-bound traceability mechanism that requires the logging of national-level commercial transactions for submission to subsidiary RFMO bodies for compliance monitoring, regardless of the data-confidentiality rules that might apply. Many CPCs would see such a mechanism as a transgression of the boundaries of RFMO competence.

⁵² The clearest expression of a traceability standard is in the second paragraph of the preamble of the Resolution on the Implementation of a CCSBT CDS: “*Noting* the need for Members and Cooperating Non-Members to provide for the tracking and validation of legitimate product flow from catch to the point of first sale on domestic or export markets.” It is assumed that “from catch” refers to the fishing vessel as the source. The “point of first sale on domestic or export markets” implies that product is not traced through national supply chains, but it is traced through international trade.

certificates are to be established to maintain the desired standard throughout the supply chain. Failure to do this could result in failure to achieve the desired traceability target.

There are different standards of traceability that could be set in a CDS, from the most detailed data logging and coverage of transactions to the least detailed. The basic options are the following:

- i. *Detailed full supply chain.* This involves detailed traceability in all international and national supply-chain segments, the application of yield factors to all changes in the form of the product, and allowance for mass-balance reconciliation by catch certificate and supply-chain actor: the product is traceable from the fishing vessel through all stages of the supply chain to retail in the end market.
- ii. *Detailed country black box.* This involves full traceability through international supply-chain segments only, the application of yield factors to all changes in the form of the product and allowance for mass-balance reconciliation between certificates: the product is traceable from the fishing vessel through all stages of the supply chain to the point of importation into the end market.
- iii. *System-level black box.* This involves system-level traceability covering the catch certificates issued and their entry into the end market, without any further transactions recorded along the supply chain. Trade certificates do not exist. There is the option to apply tabulated reference yield factors and approximate mass-balance reconciliation between the catch certificates issued and their entry into the end market. The product is theoretically traceable back to the fishing vessel at the point of importation into the end market, but no system-bound traceability mechanism guarantees the validity of the submitted paperwork.

These three levels of traceability standards reflect standards that are found or are being researched in current seafood supply chains, and that are applied – with minor additions or deletions – in the various CDS in force.

The detailed full supply chain standard – see (i) above – is the norm referred to by the Marine Stewardship Council as the “gold standard”. It provides the highest possible level of guaranteed traceability to assure authorities and consumers that the product is “what it says on the can”. This level of traceability involves real-time logging of all transactions along the supply chain from harvest to consumer, and enables quasi-hermetic sealing of the supply chain to prevent alien materials from entering. This level of traceability is an unrealistic aim in a tuna CDS for reasons related to complexity, administrative burden, data confidentiality considerations and jurisdiction, as discussed in section 4.1.

The detailed country black box standard – see (ii) above – is the one that applies, with variations, to the three existing RFMO-based CDS. Countries are treated as black boxes and all international harvest and trade transactions are recorded and subject to a system of catch and trade certificates: this results in a traceability system that maintains a direct link between batches of product circulating in international trade and the source fishing vessel that harvested them. Product form resulting from on-board and land-based processing is an essential data element in catch and trade certificates of existing CDS systems: this enables the back-calculation of processed product to its original unprocessed weight and oversight of yields in general.⁵³ As discussed above, the system’s low level of complexity and small administrative burden make it possible to maintain high levels of system-bound assurance and to monitor and enforce mass-balance consistency at the catch certificate level along the supply chain. This is clearly the traceability standard of choice for tuna CDS.

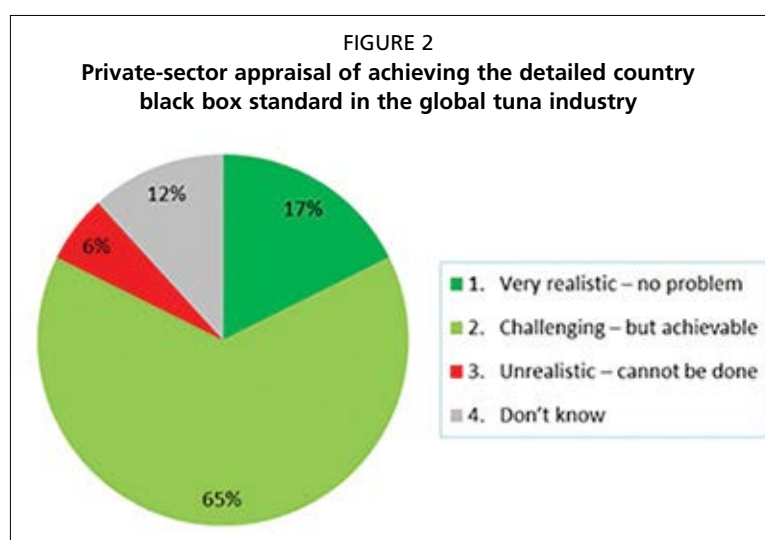
The system-level black box standard – see (iii) above – is the lowest level of traceability. In such a system the initial catch certificates are recorded at the time of

⁵³ Unusually high product yields are an indication that alien material might be laundered into the certified supply stream; this is one of the reasons why they have to be monitored.

issue and then recorded again at the border when the product enters the final destination market. The entire supply chain is hence treated as a black box: no trade certificates are involved, and the system merely allows for monitoring of the amount of product entering a designated end market⁵⁴ under any type of certificate; it does not enable the identification or investigation of potential supply-chain issues. With the absence of trade certificates and the existence of a designated end market requiring catch certificates at the point of importation, the mechanisms of the EU IUU Regulation⁵⁵ reflects this standard to a certain degree – without, however, achieving it.

The absence of a central registry for certificates in the EU IUU Regulation means that catch certificates covering imports are neither logged, nor reconciled, and hence the lowest level of verifiable and system-bound traceability is not achieved.⁵⁶ A central registry system is a given in all other CDS, and understood as a core element in the architecture of a traceability system covering international trade (see chapter 8). This situation is a result of deficient CDS design.

The latter standard is clearly inappropriate for tuna CDS, and would do little more than provide a tool for estimating the volume of product from IUU fishing less an unknown volume of product consumed domestically along largely anonymous supply chains. This is a result of the “blindness” of the system-level black box standard in which it is not possible to determine the location of potential fraud in the supply chain, or to address it, on the basis of system-bound capabilities and functions.



⁵⁴ The “designated final market” means that the final market is known from the start, and that certificates entering that particular end market are recorded.

⁵⁵ Under the EU IUU Regulation’s direct importation scenario (art. 12), processing statements are not used to cover trade. Under its indirect importation scenario (art. 13), where processing statements are used, no provision is made for re-processing, implying weaknesses with the certificate trail in longer supply chains (see section 6.1 also)

⁵⁶ Officers of the UK Port Health Authority interviewed during this work, who were tasked with border checks of EU IUU catch certificates covering seafood products entering the UK/EU market, stated that it was generally difficult or impossible to establish either the geographical origin of seafood or the countries through which it had been traded on the basis of EU catch certificates. Generally, only the last country of shipping could be established with confidence. Spanish authorities stated that virtually all detected cases of irregularities and fraud were based on the identification of incorrectly completed certificates, and not as a result of irregularities relating to supply-chain traceability, mass-balance reconciliation or laundering infringements.

In view of the challenges facing supply-chain actors in terms of maintaining separation between batches of product acquired under different certificates, tuna industry representatives at the 2015 Brussels Seafood Show were asked to assess the feasibility of applying the *Detailed country black box standard* to tuna supply chains in a CDS with an electronic interface for logging international traceability events.⁵⁷ The results are shown in Figure 2. Although they acknowledged the challenges inherent in such a standard of traceability, 82 percent of the respondents indicated that the standard ought to be achievable, while only 6 percent held that it was not achievable.

Table 8 illustrates some of the essential monitoring capabilities that are present – or absent – with respect to a particular traceability standard.

TABLE 8
Traceability standard and monitoring potential

Traceability standard	Monitoring potential				
	MBR* between catch cert. & final import	MBR at country level (in/out)	MBR at certificate level (in/out)	Identify source of fraud (certificate)	Full resolution supply chain data
(i) Detailed full supply chain	✓	✓	✓	✓	✓
(ii) Detailed country black box	✓	✓	✓	✓	✗
(iii) System-level black box	✓	✗	✗	✗	✗

* Mass-balance reconciliation.

The best-practice traceability standard, and the one to be considered for a tuna CDS, should be the detailed country black box standard. It allows for: i) certification and recording of all catches of a given species or group of species by product type and weight by a particular fishing operation; ii) identification of the point of introduction of this product into the first market; and iii) traceability along the supply chain through international trade and all countries importing and re-exporting it to the point of final importation.

Traceability involves a “line-by-line” process that enables identification of any product moving along the supply chain, and tracing back to the fishing vessel concerned and the original record in the source catch certificate. This in turn enables mass-balance reconciliation of all product lines between import/landing and export certificate pairs along the entire supply chain, taking into account processing yields. Mass-balance anomalies can thus be detected at country and certificate levels, and potential fraud can thus be detected and addressed by national authorities (see Table 8).

4.2.1 Traceability standard in tuna fattening operations

In ICCAT, separation of catches from individual fishing vessels or joint fishing operations at the farm level is obligatory: this means that catches from individual fishing vessels must be kept in separate cages and cannot be mixed with catches from other vessels. In CCSBT, this is not obligatory.

Making separation of catches from individual fishing vessels obligatory at the farm level enables CDS to trace catches back to individual fishing vessels or joint fishing

⁵⁷ The survey question was: “Within a CDS system for tuna fisheries, how realistic is it to implement electronically logged traceability of all individual product batches and shipments from the originating fishing vessel, through international trade (and changing product forms through processing), to the point of importation into the end market? [Note: this implies that for every product at importation level into the end market State, the source vessel and fishing trip - or date and point of landing - can still be identified]. Circle one.”

operations. Tracing individual fish back to fishing vessels through this mechanism, however, results in significant economic inefficiencies at the farm level: this is because every farm operates a finite number of cages, and when small transfers of catches are received, operators are obliged to keep some cages below capacity in order to maintain separation. The farms cannot operate at maximum capacity, and are affected by the vagaries of successful and less successful sets in the purse seine fishery supplying the tuna.

From an SPS point of view there is little value in tracing catch back to individual fishing vessels in tuna fattening operations. This is because any potential effect of the vessel and the netting on the health and quality of the tuna at the time of harvest is likely to be zero.

With regard to legality assurance in the CDS, there is no reason to maintain traceability back to individual fishing vessels either. If the number and volume of fish entering a farm is controlled through catch certificates issued on an estimated-and-verified basis, the number of fish legally entering a farm is established. All that is needed to satisfy legality requirements is to ensure that the number of fish leaving a farm is never greater than the number entering. To achieve this, farms merely have to indicate the pool of certificates from which they are harvesting.

From a customs and tariff point of view matters can be more complex, but this is largely outside the purview of the CDS. Generally, if tuna are transferred to a farm from a foreign vessel and later shipped to the same foreign country, no tariffs apply. But tariffs are likely to apply if, in the same scenario, the tuna is later imported into the national market. This matter has to be settled among operators and customs authorities through national, regional or bi-lateral trade legislation. The issue is currently specific to the Mediterranean Atlantic Bluefin tuna fisheries only, because the Australian Southern Bluefin tuna fishery and the Mexican Pacific Bluefin tuna fishery exclusively involve national fishing vessels transferring tuna to national farms.

Hence from a suggested practice point of view, there should be no need for a standard to trace back to individual fishing vessels in tuna-fattening operations. The system should be designed to provide an accounting mechanism that monitors the number of legally harvested fish transferred to the farm and guarantees that it never exceeds the number of fish leaving the farm; and the farm must be able to account for the mix (in terms of originating fishing vessels) of fish in every cage. The CDS must be completed with a framework of notifications and authorizations for catching, transferring, caging and harvesting, and direct oversight by inspectors at critical supply chain stops. Otherwise the same standard as proposed in the previous section should apply in full to tuna fattening operations as well.

4.2.2 Traceability standard in artisanal fisheries

The inherently different nature of operations and landings in artisanal fisheries is discussed in sections 3.1.4 and 3.2.3.7. The analogy between artisanal fisheries and tuna fattening discussed in section 4.2.1 could not be more direct.

Just as catches from several fishing vessels may be pooled in a particular cage in a fattening farm, so collectors pool the catches of several small-scale artisanal fishers. In farms the rationale for pooling catches in single cages is one of economic efficiency, but in artisanal fisheries it is primarily a matter of logistics. Individual fishers are generally not able to bring individual tuna or small volumes of tuna to market, and hence collection operations pool the catches and bring them to market in economically viable quantities.

There are two basic options for certifying artisanal catches: i) vessel by vessel, to maintain traceability back to individual fishing vessels; and ii) collection-run by collection-run, which merely indicates the vessels from which the tuna was sourced

and the original quantities involved (see Table 5). The EU CDS practice of having a simplified catch certificate to cover such catches is highly appropriate. No such mechanism exists in current RFMO-based tuna CDS.

The detailed country black box standard should apply to artisanal fishing operations also, with the same caveat that tuna cannot be traced back to individual small-scale vessels but to a pool of fishing vessels only.

4.3 NATIONAL TRACEABILITY LEGISLATION AND OVERSIGHT

Even though general food-safety laws may be in place, many countries have not enacted general or seafood-specific traceability rules. In developing countries, the absence of traceability legislation for specific foods is the rule rather than the exception. Among the major tuna harvesting and processing countries that lack formal traceability legislation are Indonesia, Papua New Guinea and Thailand.

The immediate consequence is that a system of statutory record-keeping covering the activities and businesses of national supply-chain actors is often missing. This absence of mandatory record-keeping to establish at least some traceability undermines the ability of individual countries to exercise adequate oversight over domestic product flows, which in turn makes it impossible to obtain a complete picture of the situation when audits of particular supply chain actors are undertaken. The pace at which audits and inspections can be undertaken is consequently reduced, and the assurances such countries can provide in terms of enforcing supply chain integrity are limited.

A number of accessory measures that should be put in place in CDS to optimize the system of controls in the absence of traceability legislation are proposed in Chapter 10. Such measures are not system-bound, but they do provide an entry point enabling competent authorities to implement and back the CDS effectively at the national level.

If the means of enforcing supply-chain integrity in a given country are weak, the risk of fraud in its supply chains inevitably increases. Common infractions include under-reporting of catch in harvest operations, and laundering of non-reported or otherwise non-originating material into certified supply-streams. A partial response to these practices is that a CDS established on the detailed country black box standard does detect mass-balance inconsistencies at the country level and at the catch certificate level. This means that the CDS can alert competent authorities of inconsistencies as they arise, on the basis of individual catch certificates.

This provides the RFMO with the means to identify countries that do not maintain supply chain integrity, giving it the option to exert pressure with a view to improving compliance. It also provides the competent authority with actual certificate numbers relating to detected issues, thereby simplifying the processes of audit, identification and sanctioning of fraudsters.⁵⁸

This alignment of national accessory measures and CDS functionalities ensures that the CDS can function effectively, even when national traceability laws and mechanisms are sub-optimal.

4.4 SUMMARY

The proposed framework concept envisages the CDS as a traceability system divided into national and international segments along the supply chain. All transactions between entry into and exit from a country are understood as national and subject

⁵⁸ Identifying a fraudster in a national supply chain can be difficult as a result of the practice of “splits”. If several processors in a national market acquire split lots under a single catch certificate and one of them decides to ship more than was legitimately acquired, an audit of some or all of the sequence of splits might have to be undertaken to detect where the fraud occurred.

to national traceability and oversight regulations. All other transactions – harvesting, landing and international import and export transactions – are international and governed by the traceability rules and document system of the CDS. This proposal conforms with the architecture of existing RFMO-based CDS, some of which have proven to be highly effective. All national electronic traceability systems for seafood that have been developed, most recently in response to the EU IUU Regulation, align with and directly support the implementation of tuna CDS under this concept.

The traceability standard that emerges as the most appropriate for any tuna CDS is one that enables the tracing of products on a certificate-by-certificate and line-by-line basis from the source fishing vessel through all stages of production. Exceptions in terms of tracing back to individual source vessels are proposed for artisanal fisheries and tuna fattening operations, where the processes are cumbersome, economically ineffective or irrelevant in terms of guarantees of legality. The proposed standard also conforms with the traceability standard in existing RFMO-based CDS, and there is confidence in the industry that this level of traceability can be maintained at all stages of production and trade to the end market and the point of final importation.

Although weaknesses in traceability legislation and oversight mechanisms increase the risk of fraud in some national supply chains, the CDS system as a whole is structured in such a way that its checks and balances enable the identification of issues related to countries and individual certificates. The existence of system-bound mechanisms to detect fraud is essential to ensure a level playing field on which all supply-chain actors and countries are subject to consistent checks and balances.

The system as proposed does not hermetically seal off the supply chain and prevent fraud, but it is sensitive enough to identify countries where fraud takes place. National and RFMO-specific actions can then be implemented to address the matter.

5. Estimated and verified weights

A challenging aspect of tuna fisheries is the fact that the mix of species and the exact weight per species are often unknown at the time of unloading, because it is difficult or impossible to grade the catch at sea. This is particularly so in purse seining and pole-and-line fisheries, but it also applies to some extent in longline fisheries, especially in fleets operating smaller vessels.

If catch certificates are to be issued prior to unloading with the exact weights unknown, it can only be done on the basis of a weight estimate. When a factory buys a large batch of ungraded catch it is likely to find after grading that the mix of species and the estimated volumes do not exactly match those recorded and validated on the catch certificate. Because the catch certificate stands at the beginning of the supply chain and is the document against which all traceability functions are carried out, the processor is likely to encounter difficulties with mass-balance reconciliation if more of one species than was estimated has been acquired, recorded and validated on the catch certificate.

Fishing-vessel masters generally tend to underestimate their catches by a few percentage points, and estimates rarely exceed the actual volume unloaded. This leads to a situation in which the total volume of unloadings in the tuna industry invariably exceeds the volume that is estimated, recorded and validated in certificates. For this reason it is important to design a mechanism that enables the verification of weights at the time of grading, when the adjustment and counter-validation of a catch certificate issued on the basis of estimated weights can be undertaken.⁵⁹

Without such a mechanism, the system cannot function properly. The verified and estimated weights are not relevant in the simplified catch certificate model because correct weights are established when the product is collected from fishers and money changes hands. But they are relevant to tuna fattening operations, where best practice is to establish the verified weight when tuna is transferred from tow cages to the farm, not at sea immediately following harvest.

5.1 FROM ESTIMATED TO VERIFIED WEIGHTS

In CCSBT and ICCAT the number of individual fish is recorded in certificates along with the weight of the catch. This works in fisheries that land relatively small numbers of individual fish,⁶⁰ but the recording of large numbers of individual fish in major tuna fisheries would in most cases be impossible.

Neither the ICCAT nor the CCSBT catch certificates provide for the recording of estimated and verified weights; catch certificates are generally issued after landing when verified weights can be established, before validation of the certificate. On the other hand CCAMLR and the EU provide for an “estimated weight to be landed” and a “verified landed weight” in their catch certificates, but they do not provide a clear regulatory mechanism for moving from estimated weights to verified weights.⁶¹

⁵⁹ A large number of processors encountered during the fieldwork emphasized that this paper should provide an effective mechanism for estimated and verified weights. Their remarks were based on their experience with the EU CDS and the fact that no clear mechanism is provided for in the legislation.

⁶⁰ In 2012 and 2013, about 350 000 fish were landed annually in the Southern Bluefin tuna fishery; in the Atlantic Bluefin tuna fishery the number was about 100 000 fish or less.

⁶¹ In CCAMLR, the cooperating parties decide how to handle this part of the CDS.

With regard to the EU CDS, EU Member States and non-EU countries tend not to issue a catch certificate until a catch has been landed and graded. This removes the need to record estimated weights and so resolves the issue in some situations. It does not work, however, for transshipments followed by split landings into more than one territory; and because this is a common and significant supply-chain scenario in purse seine fisheries and the distribution of bulk tuna, processors are obliged to find creative ways of overcoming this system-bound constraint.

In tuna fisheries, estimated weights are therefore a necessary evil that has to be accommodated. The CDS must provide a documentation process that allows products to move along the supply chain as estimated weights first, and that establishes verified weights gradually – or in portions – as sub-lots of a given unloading are shipped to market, for example by a reefer.

A grading operation, for example at a factory, and a commercial invoice can together establish the verified weight of fish received at a given facility. Only at that time can the catch certificate be completed and counter-validated with the correct mix of species and the verified weights.⁶²

5.1.1 Validation and counter-validation of catch certificates

As noted in Chapter 3, flag states should maintain their primacy regarding the validation of catch certificates; but port states should also have a formal role in validation.

The need to establish verified weights after landing introduces the need to consider counter-validation of the catch certificate by port state authorities with regard to the verified weights established when the product is landed, transported and graded and weighed at processing facilities. Port state authorities are physically present, and can verify and validate the accuracy of the figures presented by operators in a meaningful manner.

For further discussion of the role of coastal states in validation, see section 6.5.3.

5.2 YIELD FACTORS

Yield factors, also known as yield ratios, conversion factors or processing yields, establish how much weight is lost (or gained) when material being processed changes from its original form to the processed form. Weight is usually lost, and the yield factor is then a number between 0 and 1.⁶³ The closer it is to 0, the smaller the amount of end product derived from the raw material; the closer it is to 1, the smaller the amount lost in processing. A typical yield factor in the tuna industry applies to bulk tuna from purse seine vessels as it is used to produce tuna in cans: the figure is usually about 0.45, which means that a little more than half of the round weight⁶⁴ of tuna is lost in production of the canned product.⁶⁵

⁶² Laser technologies are being developed for species identification and weight estimation in purse seine operations as fish are brought aboard; CALVO S.A. is spearheading the initiative. Technologies are also being developed to provide accurate trail weights in transshipments and landings; these are sometimes interfaced with Bluetooth technology and electronic transfer of weight data on to the tablets of inspectors, as in the current trial in Papua New Guinea. The adoption of such technologies across the industry lies in the future, however, and CDS should consider them as they become available as a means of enhancing verifications rather than the platform for the CDS itself.

⁶³ Yield factors can also range far above 1, but only when the final product is a mixed product that contains tuna – seafood salad or seafood pasta for example. Such products are generally not considered “fisheries products” and would not fall under the remit of the CDS. When the net drained weight of tuna in the finished product is considered, the yield factor will invariably be <1.

⁶⁴ The wet weight of raw fish.

⁶⁵ If the factory opts to produce fishmeal as a by-product from the offal, the remaining 50 percent are not “lost” from a production point of view, only from the production of cans.

Yield factors are associated with weights because they make it possible to estimate the weight of the material in different stages of processing. Two important uses of yield factors are:

- i. estimating the volume of round fish caught if processing on board the vessel alters the original volume of fish harvested; and
- ii. monitoring processing yields throughout the supply chain to ensure that any laundering of non-originating material into the supply chain can be detected.

Point (i) above is particularly important when a CDS is to be used as a quota-monitoring tool. Figures obtained from back-calculation can also be cross-checked with logbook entries to monitor the accuracy and consistency of logbook reporting by masters.

Point (ii) is fundamental from a CDS perspective: it is a critical tool that enables competent authorities to detect instances where non-originating materials are laundered into the certified supply chain. Without the reporting and monitoring of yield factor, the supply chain is open to fraud. If 1 000 mt of landed and certified tuna provides 1 000 mt of certified tuna in cans, it is obvious to the trained eye that over 1 000 mt of non-originating product has been laundered into the legal supply chain.

5.3 WORKING WITH YIELD FACTORS

Yield factors are handled in various ways in CDS, and, unsurprisingly, some options work better than others.

The first point is that industry should not be asked to provide yield ratios as a data element on a form or a certificate. If a yield factor is established so that the industry and its legality can be monitored, asking for yield factors is clearly not a good idea. A better approach is to limit data requests to the amount of original product processed and the weight of the resulting product. The CDS can compute yield ratios automatically from these figures and populate a system database.

The second point is that a range of standard product types result from on-board processing such as gilled-and-gutted or dressed fish. In CCSBT, ICCAT and CCAMLR codes embedded in catch certificates enable masters to indicate the product type being landed. Tabulated standardized yield or conversion factors can then be used to estimate the original round weight of the fish at the time of harvesting. The EU does not provide reference tables, and the EU catch certificate requires a six-digit harmonized customs code⁶⁶ instead of product type.

Table 9 lists product types in the CCSBT catch certificate guidelines. The codes used by ICCAT and CCSBT are similar, but not identical: the CCSBT list of product types is more detailed than the table used by ICCAT and therefore makes it possible to compute more accurate estimates of live weights based on the standard conversion factors. The default generic conversion factors (CF) used by CCSBT are also listed in Table 9.

⁶⁶ Harmonized customs codes do not distinguish between different ways of processing fish on board and do not allow to identify the landed product type or to estimate the original round weight harvested. This introduces an impermeability weakness at the beginning of the supply chain. It is conceivable that frozen round product reported on an EU CC is later introduced into the supply chain as frozen dressed/tail off, enabling the operator to substitute the weight lost in on-board pre-processing with non-originating material. This highlights weaknesses introduced into systems when catch certificates are not exclusively designed and limited to documenting harvest-related activities, but also serve other functions related to trade and customs needs.

TABLE 9

Product types used by ICCAT and CCSBT in catch certificates

ICCAT		CCSBT		
Product type	Description	Product type	Description	Default CF
RD	Round	RD	Round	
GG	Gilled and gutted	GGO	Gilled and gutted – tail on	1.15
DR	Dressed	GGT	Gilled and gutted – tail off	1.15
FL	Fillet	DRO	Dressed – tail on	1.8
OT	Other (specify)	DRT	Dressed – tail off	1.8
FR	Frozen	FL	Fillet	2.5
F	Fresh	LOI	Loins	2.5
		OT	Other	
		F	Fresh	
		FR	Frozen	

There is no system that also provides a published list of product type codes for processed products. Atlantic Bluefin tuna and Southern Bluefin tuna in particular are primary sashimi-grade species, and a number of typical products such as *katsuobushi*, *sashimi* blocks or neck meat are prepared from them for trade. Adding market-level product types to the list of codes for trade certificates is an appropriate way of ensuring that monitoring of processing yields in later supply chain stages remains effective. With regard to canning-grade tuna, product types such as loins, cooked loins and flakes are product types relevant to trade certificates.

The third and crucial point is that yield factors must be used to track mass-balance along the supply chain, because products change when processed and much of the original weight is lost. The rule is that weight is lost when a product is processed and the amount of weight lost falls into a typical range for the type of processing. From a systems perspective it is not a good idea to “enforce” given values of yield factors, or to attach fixed tolerance margins. Yield factors vary substantially between seasons for the same type of processing according to the condition index of fish, and the skill of the workers in handling fish and minimizing waste.

Section 8.7.9 describes in more detail how an e-CDS should be set up to work with yield factors, taking the above into consideration.

5.4 WEIGHTS IN END PRODUCTS, SHIPPING AND TRADE

As indicated above, yield factors can be confusing when weights and product types become mixed along the supply chain. Tuna (in the form of cooked loins) used to produce a seafood salad, for example, may produce a yield ratio of 20 or 30, when in reality the yield ratio for the net drained weight of tuna in the salad is likely to be close to 1, which signifies minimal product loss in processing.

Existing schemes deal with this in different ways. In CCSBT trade certificates covering transactions involving semi-finished or finished processed products, the “weight of fish” is required, whereas CCAMLR and ICCAT require the “net weight of fish”. In the EU CDS, catch certificates and processing statements initially requested any type of weight preferred by the country of origin, but later required that the weight in the catch certificate must equal the weight indicated in the health certificate.

In order to maintain effective oversight over yields and mass-balance, and to prevent the laundering of non-originating materials into supply chains, weights must be dealt with consistently. Because the recording of data on fish weights in the CDS starts with the net weight of fish only, either round or in pre-processed forms, weight data recorded later in the supply chain must also relate to the fish alone. Failure in this respect would undermine the use and the usefulness of yield factors. Trade certificates must therefore record the net weight of the fish in the consignment; the gross weight of the consignment is of little concern to the CDS.

5.5 IMPLICATIONS FOR THE DOCUMENT SYSTEM

The main implication for the document system (see Chapter 6) is the need for a routine in which catch certificates are issued on the basis of estimated weights and then adjusted and counter-validated on the basis of verified weights when catch is graded – which might occur some way down the supply chain after several splits and at some distance from the time and place where the catch was landed or transhipped. The CDS must be able to accommodate these complex real-world dynamics of tuna supply chains, which is why the counter-validation of verified weights by port states is recommended.

With regard to yields, it must be borne in mind when designing the system that working with net fish weight is a good option to establish meaningful yield factors. Other weights may also be recorded on a trade certificate, but they should not substitute or obscure the net fish weight. Additional weights might help to facilitate the paperwork from a trade and customs perspective.

6. The document system

A central element of a CDS is its system for generating and handling data, and generating documentation. Data submission and data linkages establish what documents can or should exist in a scheme, the information to be regrouped in them, the connections between the documents and the times when they are to be issued and validated along the supply chain.

The idea of a document system remains useful in a CDS in which data is generated and logged electronically (e-CDS), as it helps people to think in “documents”, rather than looser “data assemblages”. Along the supply chain, when information becomes available and when it is logged, linked and recorded, the system allows for information to be retrieved and individual documents to be printed out. The electronic systems currently in use provide for the retrieval and printing of electronically generated documents in just this way.

Electronic CDS do not eliminate the need for a functional document system. From a CDS development perspective, designing the data flow and data linkages on the basis of a document system is intuitive, as it helps to determine finite datasets which must be made available at given steps along the supply chain, and to show how they connect to one another. Therefore, the document system can be used to guide the development of the electronic interface.

In the e-CDS (see Chapter 8), certificates can be thought of as physical repositories for datasets that have to be made available at specific points of the supply chain.

6.1 OVERVIEW OF CDS CERTIFICATES IN EXISTING SCHEMES

The first question is: What types of certificates are needed to achieve the CDS objective? Table 10 lists the certificates currently in use in the CCAMLR, ICCAT, CCSBT and EU schemes.

TABLE 10
Certificates in use in existing CDS systems

	CATCH				TRADE	
CCAMLR	Dissostichus* catch document	Specially validated catch document			Dissostichus export document	Dissostichus re-export document
ICCAT	Bluefin Tuna catch document				Bluefin tuna re-export certificate	
CCSBT	Farm stocking form	Farm transfer form	Catch monitoring form	Catch tagging form	Re-export/export after landing domestic product form	
EU	EU catch certificate	EU simplified catch certificate			(Processing statement)	European re-export certificate

* Patagonian toothfish.

Table 10 splits certificates into two groups: those covering the harvesting segment of the supply chain, and those covering the trade segment(s). The schemes differ in the number of certificates they use: ICCAT uses two certificates whereas CCSBT uses five, even though both RFMOs and their fisheries target similar species, end products, trade dynamics and end markets. It is hence evident that there are different options of designing a document system. But if the farm-specific documents in the CCSBT

scheme are excluded, all the schemes work with two basic types of document – a catch certificate and a trade certificate, often known as an export certificate.

With regard to terminology: i) CCSBT refers to all certificates as “forms”; ii) CCAMLR refers to all certificates as “documents”; iii) ICCAT refers to catch certificates as “documents” and the trade certificate as “certificates”; and iv) the EU CDS refers to catch certificates as “certificates” and the document covering indirect trade as “statements”. A CDS will also include numerous other notifications, authorizations and forms that have to be completed, validated and logged, so it will be easier to manage when the documents are appropriately named. When a document or form establishes the legality of a harvesting or a trading event, for example, it should always be referred to as a “certificate” for the sake of clarity.⁶⁷

It should be borne in mind that these systems were designed as paper-based operations in which printed certificates were to be carried and completed on board fishing vessels. It follows that the advantages of electronic systems – ease of use, remote log-on, central databases and certificate registries are examples – were not incorporated at the design stage and have not driven system design towards the standards of simplicity and effectiveness that ought to be taken for granted today.

6.1.1 Trade certificates

In most schemes there is a single trade certificate. CCAMLR works with two, which are identical apart from two fields that differentiate between a first and a later trade event; the two certificates could be combined into a single document quite easily, if necessary.

In the EU CDS, the processing statement covers only the “indirect exportation” scenario involving a country that has processed but not harvested the fish to be exported to the EU, with a view to establishing the link between source catch certificates and the resulting product at a processing plant before it enters trade. It identifies the processing plant and the producer, but it does not establish the identity of the importer in the end market, and so fails to create the relevant trade-related traceability link in the international supply-chain segment (see Chapter 4). The statement was not conceived as a full trade certificate as in other schemes: it is not numbered,⁶⁸ it is not regarded as a certificate in the CDS, and it may be validated by competent authorities other than those notified and approved under the EU IUU Regulation.⁶⁹

In the EU’s “direct exportation” scenario, the catch certificate is also used as the trade certificate, and a trade certificate proper does not exist – as discussed in section 4.2.

The European re-export certificate, the final page of every EU catch certificate, only applies to EU operators re-exporting imported product covered by the same catch certificate.⁷⁰ An important feature of this trade certificate is that processors must provide a “remaining quantity” balance from the total quantity declared in the catch

⁶⁷ In 2015, as part of its review of the CCSBT CDS, the Secretariat proposed a change in the names of its core CDS documents: the current term “form” should be replaced by “certificate” in future.

⁶⁸ It therefore lacks the basic data element for functioning as a linkable and searchable document in a certificate registry.

⁶⁹ Only flag state authorities are notified under the EU IUU Regulation; states that only import and process fisheries products and export to the EU are not required to notify a competent authority – but they can and do issue and validate processing statements. This means that under the EU CDS processing-only states function largely outside a framework of oversight. It is not yet clear whether the legal provisions of the EU IUU Regulation can be used to caution or even ban non-cooperating processing-only states, as is the case for flag states.

⁷⁰ Landings in the EU by vessels flagged to EU Member States are exempt from the EU CDS. Such landings are covered by other EU reporting and control mechanisms.

certificate.⁷¹ There is no equivalent re-export certificate to be completed by EU non-member countries along the supply chain. Hence the EU CDS is different from all others in that it has no dedicated trade certificate. In the direct exportation scenario the catch certificate is issued on the basis of the consignment, which – as argued previously – turns the scheme into something more akin to a trade documentation scheme. The result is that the EU CDS can only formally accommodate the simplest of real-world supply-chain scenarios.⁷²

In CCAMLR, ICCAT and CCSBT, trade certificates are simple one-page documents that record:

- the source catch certificate or trade certificate;
- a description of the products by species, type and weight;
- the identity of the exporter;
- the identity of the importer; and
- transport details (CCAMLR only)

Apart from some caveats discussed below, in CCAMLR, ICCAT and CCSBT a single trade certificate makes it possible to cover the full trade dimension of the CDS. The main issue with these schemes in terms of traceability is that the trade certificate cannot provide a hard link between source certificates and the resulting trade certificates, even though the initial intention was to create and maintain this link.⁷³ This results in a situation where mass-balance reconciliation on the basis of an individual certificate cannot be achieved anymore, once the product has been traded from one country to another: this in turn results in a “blind spot” in terms of verifiability and impermeability for all products that are not directly traded between the country of landing or production and the end market.

Given this weakness in RFMO-based schemes, and in spite of its own shortcomings, the EU processing statement provides the best model for recording and linking product information in a trade certificate. It contains a single table that records: i) the source catch certificate number; ii) the weight of product processed; and iii) the resulting weight of processed fishery product. This enables direct computation of yield on the basis of the figures provided, and mass-balance accounting throughout the international segments, regardless of the number of re-exportations that will occur.

6.1.2 Catch certificates

An important point in Table 10 is the difference in the number of certificates covering the harvest segment of the supply chain. The document system acts as an effective traceability mechanism, and the simplest and most effective system will be the one that engenders the smallest administrative burden.

⁷¹ To achieve an acceptable degree of mass-balance assurance in a CDS-based traceability system, in/out volume figures must be logged and registered in its certificate registry and balances must be computed automatically if they are to have any verifiable value. The EU processor might have imported only a fraction of the products listed on the catch certificate or acquired a fraction of it in the EU market: the original catch certificate as a single document is hence not an adequate reference against which to carry out mass-balance accounting.

⁷² The accommodated scenarios are: i) full transshipment or full landing; ii) directly exported to the EU; and iii) exported to a processing state, and then exported to the EU. The Regulation does not provide for splits or re-processing at any level.

⁷³ In the three schemes, import and export information, on one hand, and the source certificate number, on the other, are recorded in separate tables. This makes it impossible to complete a single trade certificate when catches from more certificates are pooled, processed and exported. This is, however, the real-world scenario that must be accommodated, and it is the reason why the hard traceability link fails in re-exportation; exporters simply list all of the source certificate numbers in the one table of a single certificate, and then product weights and forms in the other table, failing to link individual certificates to their respective product lines.

In ICCAT, the BCD is divided into sections: section 2 establishes catch information, and sections 3 and 8 record trade details for wild-caught or farmed fish. Farming details such as farm transfer, stocking and harvesting information are recorded in sections 4, 6 and 7, as in the stand-alone documents issued under CCSBT; the two systems are otherwise quite different, however, as discussed above.

The particularity of the ICCAT catch certificate is that it remains “open” once it has been issued. After first validation, when splits occur, or when products sourced from the original BCD are processed and shipped, the BCD is photocopied and a two-digit serial number is added to the document number. The original catch certificate hence becomes the basis of new catch certificates, and as their various sections are completed and validated the CDS generates a cascade of related “child” catch certificates that contain parts of products derived from the original or “mother” catch certificate – but only in the first country of landing.

The Atlantic Bluefin tuna re-export certificate is completed and validated only when a product enters the second country in the supply chain following a first exportation, and is then re-exported. Hence ICCAT traces all transactions through the first country on the basis of the catch certificate and its cascade of numbered “child” certificates. It treats all subsequent countries as black boxes, and the catch certificate and its number sequence become static. This complex hybrid system in which the first-country is dealt with as a “white box” and all subsequent countries as a “black box” is unique to the ICCAT CDS. The first-country “white box” arrangement will likely be terminated within the e-CDS system currently being developed by ICCAT.⁷⁴

In CCSBT the catch certificate is called the “catch monitoring form”. Farm-specific transactions are handled in separate certificates, but the first section of the catch monitoring form shows whether the harvest originates from the wild fishery or a fish farm.⁷⁵ The first section is the catch/harvest section. Trade data are also covered by the catch monitoring form – namely the first destination of exportation. No first-country domestic market transactions are traced, and the first country is treated as a black box. All subsequent other countries are black boxes, and the “re-export/export after landing domestic product” form is used, reflecting ICCAT practice in the trade segment. The catch monitoring form is a static document: once established and validated it does not change. The only trade data covered by the catch monitoring form is the first destination of exportation.

In CCAMLR, the “*Dissostichus* catch document” provides a streamlined version of a catch certificate in that it is almost exclusively concerned with the harvesting segment of the supply chain. Its various sections cover the fishing vessel, details of the catch and transshipment and landing information. The only required information relating to operations other than harvest is the name of the recipient of fish at the first point of sale; provision is made in the rules for cases where more than one buyer receives a split landed catch. The *Dissostichus* catch document is static, and does not change once the fish has been landed and received by the buyer(s) – but amendments may be requested.

In the EU CDS, catch and trade are blended into a single “European Community catch certificate”. Two articles in the EU IUU Regulation explain how the certificate is to be used by EU non-member states when exporting to the EU market.⁷⁶ The first

⁷⁴ ICCAT has stated that trade within the first country would not be tracked electronically from trade to trade. An initial document printed through the e-BCD portal would be issued for the products; if a trader along the supply chain decides to export some of the products bought, a profile is created on the e-BCD site and a unique code is entered into the system and referenced on the BCD; a BCD for export is then generated. The e-BCD will therefore drop the first country “white box” approach and align with the CCSBT and CCAMLR approaches.

⁷⁵ This is a semantic difference between ICCAT and CCSBT schemes. In ICCAT, BCDs are issued before caging; in CCSBT catch monitoring forms are issued after harvesting from cages.

⁷⁶ EU IUU Regulation EC 1005/2008, Articles 12 and 14.

seven sections cover harvesting information, but – critically – they fail to establish the date and time of landing of direct or transhipped catches.⁷⁷ The harvesting portion of the European Community catch certificate is validated by the flag state once the exporter is known – this is provided in the preceding section. Hence if no international trade event occurs after landing, the European Community catch certificate cannot be completed and validated. This in turn implies that the time at which the certificate is issued occurs after processing in cases where products are to be processed in the country of landing, or when products are prepared for shipment to the next country.⁷⁸ The question of the time of issue of the European Community catch certificate is not addressed in the Regulation.

On the other hand, the EU IUU Regulation is the only CDS that has introduced a simplified catch certificate to cover artisanal fisheries. This was done with a view to simplifying data management and paperwork in contexts where compliance with a full CDS might constitute a barrier to trade. The simplified certificate is issued by and validated for the fish collector, usually a factory or exporter, instead of being initiated by the master of the vessel or his representative; the collector merely provides a list in an annex to the certificate of the vessels from which fish were collected and in what quantities. This catch certificate can then stand at the beginning of the supply chain and link into a trade certification system in the same way as a full catch certificate. A simplified certificate will be essential in Albacore, Bigeye, Yellowfin and Skipjack CDS systems, but it was clearly not needed in industrial CCAMLR fisheries.

In all CDS the harvest section of catch certificates establishes:

- the identity of the fishing vessel(s);
- the dates and fishing zones concerned;
- a description of the species, product types and weights;
- details of transshipment at sea to a reefer or in port;
- the port and date of landing of products;⁷⁹ and
- the identity of the first buyer.

The information in these categories, which is discussed in detail in chapter 7, serves to establish the basic dataset and the baseline for traceability at the beginning of the supply chain.

6.2 TAGS AND CERTIFICATES

In ICCAT and CCSBT, tuna are tagged. In ICCAT, tuna can be tagged in partial substitution for the CDP: if they are, the BCDs are filled by operators but are not validated by the competent authority. Canada and the USA, for example, exclusively tag tuna and the BCDs issued by operators are not validated or submitted by the competent authority to the ICCAT Secretariat as stipulated in Paragraph 19 of CMM 11-20. The outcome is that only a portion of the harvested Atlantic Bluefin tuna is actually subject to the traceability system of the CDS, and the ICCAT Secretariat only sees documentation for part of the fishing operations and trade transactions that actually take place.⁸⁰

⁷⁷ This omission is critical because it fails to identify the introduction of catch into the land-based supply chain and hence introduces a major impermeability weakness. This is also the case in CCSBT and ICCAT.

⁷⁸ But this does not reflect the terms of Article 6(2) of the Regulation, which requires masters of foreign vessels entering an EU port to submit validated catch certificates three working days before estimated arrival; under that scenario, catch certificates must be issued well in advance of unloading.

⁷⁹ CCAMLR only.

⁸⁰ In 2013, BCD copies submitted to the ICCAT Secretariat covered only 66 percent of the total harvest reported by the contracting parties: hence a third of the catch bypassed the CDS reporting and traceability system.

In CCSBT, all tuna are tagged and tag logs are submitted to the Secretariat, listing the associated catch monitoring form number, the number of each tag and the size and weight of every fish. To date, consensus has not been reached by Members to make CCSBT tagging data available for scientific analysis, and they may currently not be used for any purpose other than filing. The CCSBT tagging programme is probably the only sampling programme in the world in which every single fish harvested is tagged and measured; the scientific value of the information is unquestionable, but collecting the data and then not using it is. Tagging data and the forms on which they are recorded are not understood to embody a CDS “certificate” in the sense that the term is used in this paper.

In all other tuna fisheries, where much larger numbers of fish are involved, tagging in substitution of the CDS would not be feasible. In tropical tuna fisheries, the fish have to clear the deck into the hold as fast as possible to ensure that quality is maintained. Tagging and measuring can double the time on deck, with fish exposed to heat, and tagging would thus bear a direct and objectionable impact on product quality and value. Tagging fish individually in purse seine operations would be wholly impossible.

6.3 SUMMARY FINDINGS REGARDING THE DOCUMENT SYSTEM

The basic CDS consists of two basic types of certificates: i) the catch certificate covering the harvesting segment of the supply chain; and ii) the trade certificate covering the trade segment of the supply chain after landing. The best option for tuna CDS is to limit certificates to these two types, and to make provision for a simplified mechanism for artisanal fisheries. Tuna fattening can be accommodated in such a scheme on the basis of the information in Table 7 and by providing farm-specific sections in catch certificates.

Catch certificates should establish what has been unloaded, by whom, and how it has reached land. Once catch has been landed, it must be graded to determine the mix of species and weights, and the recipient(s). Splits occur at this stage, and must be accommodated by the catch certificate system. Catch certificates are first validated on the basis of estimated weights by the flag state before unloading, and then counter-validated by the port state on the basis of confirmed weights after grading. Once the catch certificate has been counter-validated and graded weights are known, no more sections need be added to establish complete, verifiable and traceable information, and the catch certificate constitutes the formal starting point of CDS traceability.

Trade certificates are issued at the next stop in the supply chain when product leaves a territory on the basis of a verified catch certificate. Trade certificates provide three crucial pieces of information: i) a product table with source certificate lines and resulting product lines detailing product type and weight used and obtained (in processing); ii) the identity of the exporter; iii) the identity of the importer; and iv) transport details. This is a static document which does not evolve once issued. It can be used to repeat re-exportation and re-processing events as often as necessary in the supply chain without loss of traceability. Grouping occurs at this stage, and the trade certificate must be able to accommodate more source certificates - repeatedly.

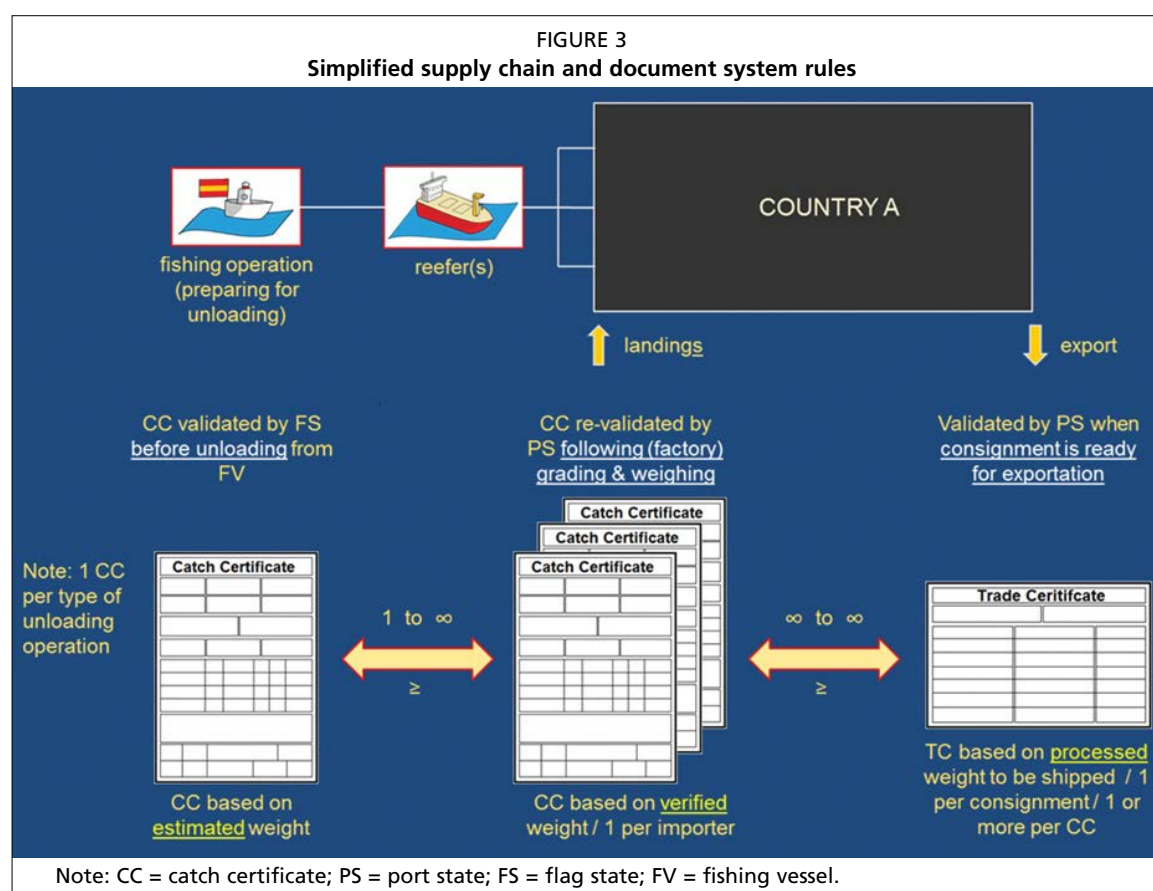
Tags can and should be used for purposes of scientific research, but they should never be used as a substitute certificates in a CDS because this would prevent the CDS from being used as a quota-monitoring tool and undermines traceability control mechanisms once tuna is cut up in processing and trade.

The document system must be linear, logical and based on the minimum information needed for full traceability, and it must prevent overlaps between catch certificates and trade certificates. Trade information in catch certificates should be limited to identifying the first buyer. Catch certificates and trade certificates are hard-linked line-by-line to provide for direct links and mass-balance reconciliation.

The resulting option for a document system involves two static certificate types – catch certificates and trade certificates – which do not evolve once the essential information is recorded and validated. Any downstream supply chain events give rise to new certificates linking obtained products with their source certificates to maintain supply-chain traceability and mass-balance reconciliation at all stages.

6.4 DOCUMENT SYSTEM RULES

It will be argued in Chapter 8 that the only way of developing a new CDS is to provide for electronic submission, exchange and linking of information. This is crucial: a paper-based scheme cannot function in the same way as an electronic scheme, and hence some rules and ways of doing business will inevitably differ. Paper-based and electronic schemes are not directly compatible.



Electronic systems are widely regarded as best practice in CDS: ICCAT and CCSBT are transferring their schemes to electronic platforms;⁸¹ CCAMLR started to develop electronic CDS means as of 2004.⁸² This paper provides a particular system of rules for an e-CDS platform. The rules governing paper-based systems are mentioned to highlight the efficiencies gained in an e-CDS.

Figure 3 provides a simplified graphic of the supply chain up to the first country of landing, and some rules for timing and the issue of catch and trade certificates. It serves as a visual guide for the discussions in the following sections. The reader is invited to note in particular the relationship between the two types of catch certificates; catch

⁸¹ The EU has also signalled an interest in exploring electronic solutions in 2015, possibly based on existing electronic EU infrastructure, such as DG SANTE's TRACES software.

⁸² The CCAMLR e-CDS became mandatory in 2010.

certificates are first established by the master of the fishing vessel on an estimated basis (called “CC_{est.}”), and are then re-issued or completed by the recipient on the basis of verified weights (called “CC_{ver.}”). More than one CC_{ver.} can be derived from a single CC_{est.}, in case more than one buyer is acquiring catch from a particular landing.

6.5 DOCUMENT SYSTEM RULES FOR THE CATCH CERTIFICATE

The most complex part of a CDS relates to the harvest segment of the supply chain. This is because the route followed by fish from a fishing vessel to a factory is generally complex, and the rules governing the certification system must accommodate any combination of events at this level. If a functional document system and rules for this part of the supply chain are established, the main challenge in designing an effective CDS and traceability mechanism is solved.

6.5.1 Timing and basis of issuing the catch certificate

In Chapter 3 it was argued that the optimum time to issue the catch certificate was before unloading. In Chapter 5 it was explained that the initial catch certificate can as a rule be issued only on the basis of estimated weights. These are two fundamentals for the set of rules governing the issue of catch certificates in tuna fisheries:

- the catch certificate based on estimated weights (CC_{est.}) is issued before unloading takes place; and
- the CC_{est.} is issued on the basis of the estimated weights and mix of species.

At the time of issue, the master or his/her representative⁸³ completes the entire certificate, covering potential transshipments, transfers and/or landing; the certificate is then validated by relevant parties as appropriate.

6.5.2 Issue and validation of catch certificates

As in all existing systems, the catch certificate must be issued by the master of the fishing vessel or his/her legal representative. The master vouches for the legality of the fishing trip and formally signs the certificate to that effect.

The certificate must be validated by a flag state competent authority that is accredited in the CDS. In the e-CDS, competent authorities are automatically notified to validate certificates once the electronically signed catch certificate has been entered into the system. In international law the flag state is primarily responsible for monitoring and guaranteeing the legality of the operations of fishing vessels flying its flag. Therefore:

- the CC_{est.} is issued and signed by the master or his/her representative; and
- the CC_{est.} is validated by the flag state competent authority or a designated alternate.

In an e-CDS with private-sector user logons, all information is generated and signed electronically. The certificate can be printed out and circulated in paper form,⁸⁴ but the proposed options do not involve signatures on paper and print-outs have no legal validity.

The system automatically assigns a unique document number to the catch certificate.

⁸³ It is often noted that electronic issuance at sea may pose serious logistical problems to many operators. In such cases, where access to an online electronic platform is not possible at sea, certificates may be issued and submitted into the system by the representative based on land. Every seagoing fishing vessel must be able to communicate with land, and transmission of certificate information to a legal representative should therefore be achievable. In the event of impossibility, the option of last resort is to fill, submit and obtain validation of a catch certificate in the port of landing or transshipment, before unloading takes place – ensuring upholding of the principle.

⁸⁴ Buyers need to know the certificate number and the line(s) from which they are buying catch. The easiest way to communicate this information is for buyers to have a copy of the catch certificate at the time of the transaction. The CDS rules will therefore provide for copies of the certificate to be available from this point onwards.

There is no need for a competent authority to approve in advance the issue of a catch certificate by an operator, as is the practice in some CDS. If a dataset for a catch certificate is created, but not submitted for validation to the competent authority, its content and legal status are not recognized in the CDS.

6.5.3 Validating authorities

Various competent authorities must be designated in this part of the CDS. Flag state authorities validate the CC_{est} . Port state authorities counter-validate the catch certificate on the basis of verified weights ($CC_{ver.}$). In cases where bulk tuna is exported to landlocked countries where products will be graded before processing, a processing state competent authority will have to be designated to provide the functions of a port state competent authority.

With regard to the validation of simplified catch certificates in artisanal fisheries, a coastal state competent authority provides the functions of a flag state authority. The coastal state authority validating simplified catch certificates is not necessarily the institution overseeing industrial fisheries.

More and more coastal states, notably in the western Pacific, are demanding a direct oversight role in CDS for industrial-scale catches in their waters, a matter over which they currently have little control. This reasonable claim can be accommodated in CDS validation routines.

Some coastal states would be overburdened by the tasks of reviewing and verifying every catch certificate and counter-validating them in real time to enable transshipments, landings and/or trade. The best option is, therefore, to introduce a system of “non-objection” with regard to the validation of catch certificates whereby catch certificates issued and validated by a flag state for catches from its EEZ trigger an automatic notification to the coastal state regarding the content of the certificate. The coastal state reviews the certificate, and if it has no objection as to the legality of the operation no action is required and the validation by the flag state stands. If, on the other hand, the coastal state has reasons to suspect an infringement has occurred, it can block the certificate in the system and address the issue with the parties concerned.

6.5.4 Certificate ownership: CC_{est} .

The question of ownership of certificates is not addressed in any of the existing CDS. The catch certificate issued before the catch changes ownership enables a fishing vessel master to sell it to a legal market system.

The CC_{est} is therefore owned by the master of the fishing vessel. Once the landed fish has been sold, the certificate has lost its value.

6.5.5 Direct landings

Direct landings – *i.e.* landings without transshipment – provide the simplest of scenarios. Regardless of the destination of the catch, a single CC_{est} is issued before the landing takes place according to the CDS rules.

Whether the landing is sold to one or more parties or retained by the company operating the land-based facilities,⁸⁵ a copy of the certificate is passed on to buyers with the draft invoice; indicating from which line(s) in the certificate the catch they bought originates.

Buyers grade the product on its arrival at the factory: the verified weight of the landing is agreed by the parties (master and buyer) and the invoice is finalized. As in the split indirect landings scenario (see below) individual buyers log on to the e-CDS and

⁸⁵ In the case of so-called “vertically integrated” companies running fishing operations and operating processing facilities, operations are generally split into separate legal entities: a regular invoice would hence be issued in most cases as if the vessel operator were selling to a different company.

enter their portion of the bought catch against the catch certificate, thereby establishing the verified portions of the acquired catch in the system. This calls for a number of rules:

- A single $CC_{est.}$ may give rise to several $CC_{ver.}$ as a function of the number of first buyers acquiring the landed catch.
- The buyer must log on to the e-CDS and enter verified weights line by line against $CC_{est.}$ to generate a $CC_{ver.}$
- The buyer must upload the invoice and the verified species/weight data.
- Data submission is incomplete in the absence of an uploaded invoice.
- In the case of incomplete submission, a $CC_{ver.}$ cannot be finalized or counter-validated.
- The factory is the owner of the $CC_{ver.}$

As argued in Chapter 3, port state authorities should be the final counter-validating authority of the $CC_{ver.}$. Hence the authority must be a CPC or a CNPC of the RFMO and adhere to its rules. This establishes a double-signature “group validation” mechanism, entailing direct oversight between parties, and thus enhancing oversight, verifiability and impermeability in the CDS.⁸⁶ Therefore:

- The $CC_{ver.}$ must be counter-validated by the port state competent authority.
- In the absence of port state counter-validation, the $CC_{ver.}$ is void and cannot become the basis of exportation.⁸⁷

6.5.6 Split 1: Concurrent unloadings from a single fishing vessel

As stated in Chapter 3, a fishing vessel can unload its catch in several consignments, for example by transshipping one portion, landing another to a factory and landing a third portion into containers for export. The CDS is presented with two basic options: a) either the split is formally recorded with one certificate issued per type of unloading; or b) a single document is issued for all unloadings and the various portions are later discounted against the single certificate. The latter option is favoured by proponents of a CDS that can also be used as a catch-per-unit-effort monitoring tool, and those who believe that a CDS must be able to report the totality of the catch from a single fishing trip in a single catch certificate. However, the CDS is not a substitute for logbook-type data.

The most effective option to handle this type of split is to issue a separate certificate for each type of unloading: the split then does not require to be accounted for in the downstream calculations of the e-CDS because it is addressed by assigning catch into separate first-level documents – simplifying the system. No information is lost and traceability is maintained. Hence one $CC_{est.}$ should be issued per type of unloading.

If the vessel lands its products in one port, and then sells the catch to more buyers, a single catch certificate is issued (see section 6.5.5). An exception to this rule must be made for cases where ungraded catch is landed and exported in the same ungraded form to several buyers (see section 6.5.11).

6.5.7 Transshipment and reefer rules

In all RFMOs reefers must be identified when receiving catch from tuna vessels. In many scenarios, for example receiving catch at sea, they must be authorized and carry observers on board. To ensure the legality of transshipments reefers must be bound into the CDS.

⁸⁶ Enhanced assurances related to group validation of catch certificates can be more limited when the flag and the port state are the same.

⁸⁷ This simple mechanism limits non-end-market supply-chain states to RFMO parties and cooperating non-parties.

The $CC_{est.}$ is issued before unloading, so the master or his representative may submit the catch certificate number to the master of the reefer or his representative in order to access the system and sign off on the reefer and transshipment details completed by the master of the fishing vessel. Therefore:

- The reefer master must receive the document number from the master of the fishing vessel at the time of transshipment.
- The reefer master or his representative must electronically sign off the transshipment portion of the $CC_{est.}$
- The transshipment portion must be signed off immediately after transshipment itself.
- Without the signature of the reefer master the $CC_{est.}$ is void, regardless of validation by the competent authority.

This means that validation by the competent authority is only good when the relevant counter-signatures on the certificate can be obtained. It also means that any reefer receiving catch should carry a copy of the catch certificate, or an electronic reference established in its name, with the estimated mix and weight of tuna received from the fishing vessel. Hence in the CDS reefers will not be able to receive or transport tuna from the fishing ground to shore unless it is covered by a catch certificate. This is important with regard to MCS and the impermeability of the CDS; it is not currently regulated or may be implemented inconsistently under current schemes. Therefore:

- No reefer may receive fish at sea or transport it to port without the related catch certificate having been validated by a flag state.

There is no need for an observer's signature in the e-CDS. If observers are present during fishing operations they must be given an electronic or printed copy of the $CC_{est.}$ so that they may opt to flag potential issues related to the catch certificate in their reports.

6.5.8 Split 2: Multiple reefer landings from a single unloading

A reefer may receive the full unloading from a purse seiner, but may land it in split (multiple) portions to client factories – the scenario this section refers to.

This is the usual way in which tuna harvested in purse seine operations are delivered by reefers to canneries; such landings are also called “indirect split landings”. This is one of the more complex scenarios in tuna fisheries, and in existing paper-based CDS the scenario is ignored.

In an e-CDS all information appears online in near-real time as catch is delivered to factories and data are electronically logged by the recipients; opportunities for fraud are greatly reduced. It is hard to conceive how this type of operation could be effectively accommodated and monitored in a paper-based CDS.

The reefer receives an estimated volume of fish from the fishing vessel, recorded in a validated catch certificate. It is the responsibility of the reefer master and his company – often a large tuna brokerage firm – to ensure that all of the product reaches its destination, and is accounted for. Failure in this could cause catch certificates to be blocked for investigation, which would be detrimental for processors and would jeopardise commercial relationships among reefer operators and client factories. There is hence a strong commercial and financial CDS incentive to deter reefer operators from engaging in illegal transshipments.

At each reefer delivery, regardless of the number of countries or ports, fish recorded in particular certificates as estimated weight will be sold to factories. The transactions generally involve truck scales in port and double data logging by reefer crews and factory staff, and a second round of grading at the factory. The invoice issued and agreed between commercial parties lists species and graded weights as received and paid for.

During this transaction the factory also receives the $CC_{est.}$ number and possibly a copy of the $CC_{est.}$ itself. It logs on to the e-CDS, accesses the certificate from which it is buying products, and completes the verified weight portion of the certificate with the species and weights received from the reefer. The system automatically recognizes the identity of the factory (owing to the logon procedure) and assigns the fish to that factory. A portion of the catch from the $CC_{est.}$ is now verified. When entering the verified weight data, the operator uploads a copy of the invoice from the reefer to provide documentary proof of acquisition.

This scenario is repeated until the whole of the catch loaded on to the reefer has been distributed to client factories. When the last factory logs its verified weight into the system, the verified weight of the original $CC_{est.}$ is accounted for completely.⁸⁸ In this scenario, several $CC_{ver.}$ are derived from a single $CC_{est.}$ to account for the portions bought by individual buyers. Figure 3 helps to illustrate this process.

From a CDS point of view this scenario matches the direct-landing scenario and the rules governing direct landings apply, except that it is the master of the reefer who provides the $CC_{est.}$ copy for first buyers, identifying the lines from which they are buying product. Counter validation by port state authorities is also the same as for direct landings.

6.5.9 Transfers

In view of the analogy in Table 7, transfers must be handled in the same way as landings, except that they go to a farm. The CDS must have a mechanism that enables the parties to log this transaction as a live transfer in terms of volume and number of fish. Hence when “transfer of live fish” is selected, the CDS requires the volume and number of fish to be recorded. The estimation and verification routine remains unaltered: the volume of fish to be caged is estimated at sea, and the verified volume and number are established at the time when the fish are transferred to the cage(s) at the farm. The $CC_{est.}$ is issued before the transfer to tow cages.

Once the fish are received and counted, the farm logs on to the system and enters the verified volume⁸⁹ and number of fish into the catch certificate.

If more than one farm receives fish from a single fishing operation, individual $CC_{est.}$ are issued for each farm. This enables the identification and recording of the intended recipient, before towing begins. If fish were delivered to several farms under a single catch certificate the destination could not be easily indicated. This differs from a direct or indirect landing sold to several buyers, where a buyer is only identified at the final step. Raising individual $CC_{est.}$ is important from an MCS point of view, as it provides maximum CDS impermeability while fish are in transit from fishing grounds to farms.

Therefore:

The $CC_{est.}$ is validated before fish are transferred to tow cages.

One $CC_{est.}$ is issued for every farm receiving fish.

- $CC_{est.}$ are issued on the basis of species and volume of fish.
- The $CC_{ver.}$ is issued on the basis of number of fish and verified weight transferred to the farm, following counter-validation by the farm state.

⁸⁸ Note that, given the estimated nature of the $CC_{est.}$, the summed volume of the $CC_{ver.}$ that were derived from it will invariably have the tendency to be somewhat larger than the starting estimated volume – given the tendency for masters to slightly underestimate their catch. As long as this discrepancy remains within the remit of known and accepted fluctuations, no action is required. If however, the sum of verified weights goes beyond the norm, then the counter-validating port state will have to investigate the matter, and collaborate with the reefer and the fishing flag states to resolve the issue.

⁸⁹ Even though the volume established at the farm remains an estimate, it is estimated on the basis of an established and often scientifically validated protocol, and the weight is therefore regarded as “verified”.

Note that especially in TAC and quota managed fisheries, it should be the weight of the $CC_{ver.}$ established after caging that is used for quota monitoring purposes, not the estimated weights recorded by the master on the initial $CC_{est.}$.

6.5.10 Certificate ownership – $CC_{ver.}$

The owner of the $CC_{ver.}$ is the farm, factory or company that receives and grades the catch to establish the verified weights. The recipient is legally entitled to own, process and export derived products under the CDS to the next destination market, or to the domestic market.

Hence the onus to produce a certificate in the CDS and throughout the supply chain is on the harvester or the exporter. This applies to all certificates and all transactions. Fish must be covered by a certificate before landing, or before entering trade; and not at some stage after arriving at its destination. When it arrives at destination, the recipient logs the transaction and the reception of the products in the central online registry, and ownership of the title is then bestowed on the recipient.

6.5.11 Landing without grading

Where landings are made without grading and where product may be exported without grading, a $CC_{ver.}$ cannot be issued. Such instances arise when: i) a landing of ungraded catch is made into a container; and ii) non-graded product is warehoused in port and may later be (re-) exported. The question is how this can be managed with regard to trade.

When reefers accept non-graded catch and deliver it to a country other than the flag state of the fishing vessel, the process is in terms of trade and customs an export, and tariff rules apply. In the CDS, however, the transaction is not made on the basis of a trade certificate: it occurs in the harvest segment of the supply chain and is covered by a $CC_{est.}$. This example shows why the use of the terms “import” and “export” in a trade and customs sense does not necessarily mirror similar events within a CDS.

Ungraded catch unloaded into several containers for immediate onward exportation is covered by a $CC_{est.}$ in line with the rules governing unloadings by a single fishing vessel (see section 6.5.6). If ungraded catch is shipped to more than one buyer the same rule applies as for farm transfers, meaning that the identity of each recipient is logged into a separate $CC_{est.}$ before the consignment enters trade. This ensures that no consignment is traded without being accounted for or without a verifiable destination, which provides the basic assurances for verifiability and impermeability.

On receipt of a consignment, the buyer logs the graded weights into the e-CDS, uploads the finalized invoices and obtains counter-validation from the port (or processing) state’s competent authority.⁹⁰ The $CC_{ver.}$ for the consignment is hence established in the system and can be used in processing and further trade. Two rules emerge:

- For ungraded landings into containers, the number of $CC_{est.}$ issued is equal to the number of first buyers for that unloading.
- The first buyer is identified in the $CC_{est.}$ before it is validated by the flag state’s competent authority.

In the case of warehousing without grading, the situation is more complex. The first complication is that, although the recipient is identified, the catch is not graded and hence verified weights are not established. The procedure for graded tuna and the establishment of the $CC_{ver.}$ cannot be used in this case.

⁹⁰ The processing state may not be a port state, especially if it is a land-locked processing state. In such cases the port state competent authority that would normally counter-validate catch certificates must be selected from a processing state authority.

To cater for this situation, the certificate must enable the recipient to record either verified weight per species or bulk weight for the mix of species. It should be noted that if bulk tuna is purchased without grading, the total weight must be established as the basis for the invoice.⁹¹ Because the CDS must accommodate the whole range of supply-chain events, the warehousing of bulk tuna without establishing net bulk (*i.e.* ungraded) weight should be prohibited. Generally, landing without establishing and reporting the nature of the catch undermines the collection of fisheries data and fisheries management efforts; no CDS should be designed to facilitate such approaches. Warehouses must be subject to rules obliging them to keep non-graded catch in marked bins separated from other fish products. A warehouse can, of course, grade the catch and a CC_{ver.} can be issued in the normal way at any point in time. A number of rules emerge:

- The net bulk weight of ungraded tuna in warehouses must be established before storage of products occurs.
- An invoice must be uploaded with the data establishing bulk weight.
- The CC_{est.} must be completed by indicating verified bulk weight (not verified weight after grading); the single bulk weight applies to the mix of species in the certificate.
- The resulting catch certificate remains a CC_{est.} and cannot link into a trade certificate.⁹²
- The CC_{est.} completed after reception of the fish must be counter-signed by the port state's competent authority.
- The warehouse may grade the bulk tuna at any time and issue a CC_{ver.} in its own name.

After warehousing, two particular situations may arise: i) the product is distributed to domestic buyers; or ii) all or part of the product is re-exported in bulk without a decision having been made before unloading.

In the first instance – distribution into the domestic market – there is no issue: buyers buy a portion, grade it, log the verified weights into the e-CDS and their portion of the CC_{ver.} is automatically generated. This entitles them to re-export portions of the purchased materials.

The second instance is a challenge in that the CC_{est.} is already issued and the needs are to: i) identify the recipient of the bulk tuna; and ii) re-issue, amend or add information to the CC_{est.} before it can be used to move the tuna back into trade, so there is clarity as to the next recipient in the supply chain and the amount of tuna being moved. To manage this, the CC_{est.} with verified bulk weight contains the option of forwarding of bulk tuna to clients by identifying the second and final destination and the weight to be traded. On delivery, the recipient must grade the tuna and issue the CC_{ver.} as if the tuna had been acquired from a regular CC_{est.} A number of rules emerge:

- The identity and the bulk weight to be shipped must be recorded in a special section of the CC_{est.} covering the trade.
- No processing may take place at the warehouse between reception and subsequent dispatch.
- The second and final buyer of bulk tuna must grade the fish and issue a CC_{ver.}

Any product landed and re-exported on the basis of estimated weights must be accompanied by CC_{est.} until it is graded and a CC_{ver.} can be issued.

⁹¹ If this transaction takes place within the same legal entity – the same company operating the fishing vessel and the warehouse – a document reflecting the internal warehouse entry record must be uploaded.

⁹² This is discussed in detail in section 6.6. The logic and linearity of the CDS prevents the design of a system where a CC_{est.} is established, then a trade certificate, then a CC_{ver.} and then another trade certificate. The system is designed to maintain a linear document flow, from CC_{est.} to CC_{ver.} and ultimately to a trade certificate.

6.5.12 The simplified catch certificate

In the simplified catch certificate (CC_{simp.}) weights are recorded on the basis of verified weights when catch is bought from fishers or middlemen at the landing site. The estimation and verification procedure does therefore not apply to the CC_{simp.}

The CC_{simp.} is generated and logged in the e-CDS by the collector or the factory, and is validated by the competent authority of the coastal state; there is no counter-validation. It records product type and weight as received at the landing site.

Whether all or part of the collected tuna is exported in a single consignment, a trade certificate must be issued to cover the export. In many cases the product will have been processed and changed form, and the trade certificate must record the weight of raw materials used and the weight of processed product obtained to enable yield-factor monitoring.

Therefore:

- The collector must generate the CC_{simp.} and log it into the e-CDS.
- Only the coastal state may validate the CC_{simp.}
- CC_{simp.} may not be used alone but must be linked to full trade certificate, the principal document covering the trade.

6.6 DOCUMENT SYSTEM RULES FOR THE TRADE CERTIFICATE

The trade certificate, the final document in the CDS, is relatively simple. Every time product enters international trade, a trade certificate is issued to cover the trade, regardless of how many trades between countries take place along a particular supply chain.

6.6.1 Timing and basis of certificate issue

Trade certificates are issued at the next stop in the supply chain after products have been landed and (potentially) processed, and are ready to leave a territory as a consignment. The processor logs on to the e-CDS, generates the trade certificate, logs information such as links to the appropriate line(s) in source certificate(s), uploads the invoice and submits it for validation by the processing state competent authority. Therefore:

- The first trade certificate in a supply chain is always issued on the basis of a catch certificate (CC_{ver.} or CC_{simp.}); subsequent trade certificates are always issued on the basis of the preceding trade certificate.
- A trade certificate is issued by the processor when the products and their destination are known and the consignment is being prepared.
- Trade certificates are signed electronically by the processor.⁹³
- The commercial invoice for the trade is uploaded with the data.

6.6.2 Issue and validation of the trade certificate

The e-CDS automatically alerts the competent authority that a request for validation of a trade certificate has been filed by an exporter. The competent authority verifies and signs the trade certificate electronically, giving it legal validity. Hence:

- The trade certificate must be validated by the processing state's competent authority – before the consignment ships.
- No counter-validation is required.
- If the competent authority has not validated the trade certificate, it is void and the consignment cannot enter trade.

Every trade certificate is assigned an automated document number.

⁹³ See section 7.2 regarding the « signing » of electronic documents

6.6.3 Certificate ownership

The exporter is the owner of the trade certificate, which enables the exporter to export his products legally to the next destination market. Once it is received and logged by the importer at the destination, ownership of traded products changes and the trade certificate becomes the property of the importer. The importer now holds products that may be further processed for re-export or sale in the domestic market. Hence:

- The trade certificate is initially the property of the exporter; it becomes property of the importer at the destination market.

6.6.4 Validating authority

The validating authority of trade certificates must be established in the exporting State. Relevant exporting States must formally participate in a CDS and provide the appropriate verification and validation of trade certificates. This therefore restricts export of product under a particular CDS to export States that participate in the CDS and provides assurances in relation to the implementation of other controls as required by the CDS.

Within a country, the validating authority should be associated with the competent authority of the flag state (if it exists), ideally the ministry for fisheries or animal health. This affiliation is important because national competent authorities must communicate effectively to ensure that their oversight efforts are compatible and consistent. It would be questionable to designate a competent authority for the validation of trade certificates that has no stake in international fisheries, because the consequences of poor oversight would not reflect on it.

6.6.5 Sequencing of certificates

The trade certificate links either to a $CC_{ver.}$, a $CC_{simp.}$ or to a prior trade certificate. The trade certificate cannot link into a $CC_{est.}$ because detailed line-by-line traceability between a $CC_{est.}$ and a trade certificate is impossible.

Therefore:

- A trade certificate cannot be issued on the basis of a $CC_{est.}$.

Once the trade certificate is issued in the supply chain in relation to a catch certificate, and for as long as the products and processed forms continue to move through international trade, a trade certificate must be issued to cover the transactions, regardless of the number of re-exports and importations of the products. In accordance with the principle of linearity, the CDS does not permit to shift from a trade certificate back to a catch certificate and subsequently back to a trade certificate. Therefore:

- No catch certificate can be issued on the basis of a trade certificate.
- Once a batch of product enters international trade on the basis of a trade certificate, trade certificates must be established as often as the same products continue to change hands in international trade. After the first trade, trade certificates are established on the basis of trade certificates.

6.6.6 Supply chain challenges

A batch of product for processing often originates from several sources. A producer of Yellowfin tuna sashimi blocks, for example, may have a size-graded batch of loins for processing that originated under different catch certificates.⁹⁴ In the production run, the resulting trade certificate will be based on the catch certificates used in production:⁹⁵

⁹⁴ The same Yellowfin tuna may also originate from different RFMO areas. This example underlines the weakness of a single-RFMO CDS as opposed to a harmonized global CDS covering all tuna RFMOs (see Chapter 14).

hence the CDS must allow for several catch certificates to be accommodated in a single trade certificate, whose layout will be such that only one trade certificate is necessary per consignment. Therefore:

- A single trade certificate has to link with all the catch certificates used in the preparation of a consignment.

Domestic supply chains are not covered by the CDS. A resulting challenge is to ensure that products are correctly identified and linked to their source certificates in domestic supply chains. If an importer distributes large quantities of tuna to national processors to transform into value-added products for re-export, those transactions (distribution) are not subject to CDS data logging. Hence the seller and the buyer must ensure that details of the catch certificate and/or trade certificate and the lines the buyer is supplied from accompany the invoice and the products.

In the absence of the originating catch- or trade-certificate information, a processor would be unable to raise a trade certificate, and to legally export the tuna. This challenge can be addressed by requiring national FBOs to indicate catch and trade certificate numbers on invoices – especially if re-export is anticipated. The CDS has no rule arising from this, but processing states should establish mechanisms to ensure that national operators use invoices to guarantee that certificate information is forwarded with domestically traded consignments; such formal national record-keeping mechanisms also facilitate audits.

In the sashimi-grade tuna trade, sellers and buyers already have systems in place that enable buyers to select vessels and fishing trips from which they buy. Catch certificate numbers would merely be an additional data element to be kept on traders' books.

6.7 COUNTRY-SPECIFIC CERTIFICATION SYSTEMS

National catch certificates such as the Norwegian Catch Certificate⁹⁶ have been developed recently in response to the EU IUU Regulation.⁹⁷ In these systems a country issues a catch certificate when catch is landed and a consignment-based catch certificate when it is exported. Further transactions in the national supply chain are often not traced, and yield factors may not be monitored either. Such systems apply only at the national level, and may be used by the authorities for purposes such as providing assurance of the legality of exportations of national products.

Because they are limited to the national market, and because they have been developed as a national system to service the requirements of a CDS covering international fisheries and trade, they are not regarded as a CDS in the sense of the definition provided in this paper.

⁹⁵ In practice, many factories globally, producing consumer-level products (e.g. sashimi slices, sashimi cubes, saku blocks, etc.) in individual portions, grouped in boxes, and grouped further on pallets, often do not have the necessary traceability infrastructure in place to determine the origin of every single portion produced from individual fish or individual certificates. However, the group of certificates from which production occurs must be known, and it is the responsibility of every factory to discount final weights resulting from production runs against certificate holdings in a way that most closely reflects real usage in production. Mass balance rules always apply.

⁹⁶ See: www.catchcertificate.no/en

⁹⁷ Canada, New Zealand and the USA have developed national catch certificates that are accepted as equivalent by the EU IUU Regulation and can be submitted instead of those based on the model in Annex II of the EU IUU Regulation.

7. Certificates: data, layout and links

Chapter 6 showed that the most effective way of designing a CDS is to keep the number of certificate types to a minimum and to ensure that harvest operations are recorded in catch certificates and trade transactions in trade certificates.

The electronic options available today, which are discussed in Chapter 8, make it possible to simplify the information management routines in the CDS, and to eliminate many of the requirements particular to paper-based systems.

Regarding the language of certificates, the accepted international maritime language should be used, *i.e.* certificates should be issued physically in English.⁹⁸ However, the user interface of the e-CDS should be designed to be interacted with in multiple relevant languages.

7.1 WHAT CERTIFICATES ARE NEEDED?

Chapter 6 establishes that two fundamental certificate types are required: the catch certificate and the trade certificate, with a simplified catch certificate to cover small-scale commercial fisheries. The trade certificate must be designed to be compatible with both. Hence the certificate types in the CDS are the:

- catch certificate;
- simplified catch certificate; and
- trade certificate.

These constitute the basic documentary layout of the CDS, and are considered the absolute minimum to support a CDS deemed to cover the majority of tuna supply-chain events and permutations. The system of certificates and their associated rules for issuance, completion and validation – as outlined in Chapter 6 – provide and maintain the required level of traceability the CDS seeks to achieve.

Documents other than CDS certificates naturally persist in tuna fisheries, such as authorizations to cage or harvest in farms, or authorizations to tranship tuna at sea. Existing rules and documents specified in RFMO CMMs, providing for effective oversight, are not affected by the certificates introduced by the CDS.

7.2 INFORMATION RECORDED IN CERTIFICATES

The information recorded in certificates should be the minimum necessary to achieve the targeted traceability standard and to guarantee that stakeholders, processes and products remain clearly identifiable and traceable.

The electronic signatures of private-sector operators are not listed as data elements in the tables below: such users “sign” a logged dataset by submitting it to its competent authority for validation in the system, an implicit declaration that the data submitted are accurate and that the operator is liable for any omissions or errors. The log-on and log-off routine automatically identifies the user and its interaction with the system.

7.2.1 The catch certificate

The (full) catch certificate⁹⁹ was discussed in Chapter 6. Table 11 details the minimum information requirements for catch certificates, with details of validation and counter-validation.

⁹⁸ See: Bocanegra-Valle, A. (2010)

⁹⁹ The “full” catch certificate, as opposed to the “simplified” catch certificate.

TABLE 11
Catch certificate data

Information category/section	Information to be recorded	Notes
0. Document properties	Certificate number (automated)	Two-digit flag state code, followed by "FCC"*, followed by 10 randomly generated digits
	Certificate number extension (automated)	Three randomly generated digits for first buyer, and second buyer in cases of bulk trade
	RFMO (manual)	identifies RFMO in which catches were made
1. Fishing vessel identity	Full name of master	
	Master's licence number	
	National flag of vessel	
	IMO** number	
	RFMO vessel number	Issued by the RFMO
	Intl radio call sign	
	Vessel registration number	Issued by the flag state
	Name of fishing vessel	
	Fishing gear	
	Fishing licence number	Issued by the flag state
	Fishing licence validity	Date from and Date to
	Licensed fishing area(s)	EEZ/RFMO(s)
	JFO	Option to indicate JFO
	Other fishing vessels in JFO/ % shares of catch	
	% share of catch of lead fishing vessel	
2. Fishing dates and zones	Fishing zone	EEZ; FAO fishing area, sub-area and division(s) as applicable for RFMO reporting
	Start and end dates of fishing	Only for catch unloaded
3. Catch table	Line number	Assigned automatically
	Species	FAO 3-alpha code
	Product type	Code from list provided
	Estimated net product weight in kg	
	note: the following sub-section is only filled for live tuna transferred to farms	
	Live transfer to farm	Yes/no
	Number of individual fish	
	Estimated net weight in kg	
4. Flag state Farm state Validations	Electronic signature	Validates sections 1, 2 and 3
	Electronic signature	Validates section 3, last three items
5. Transhipment	Full name of master	
	Master's licence number	
	Flag of reefer	
	Reefer IMO* number	
	Reefer registration number	
	RFMO reefer ID number	
	Reefer intl. radio call sign	
	Name of reefer	
	Reefer licence number	Issued by the flag state
	Reefer licence validity	Date from and Date to
	Reefer licence area(s)	EEZ/RFMO(s)
	Transhipment location	At sea/in port
	Location coordinates	Longitude and latitude; name of port
	Transhipment dates	Date from and Date to
	Full name of observer	If present
6. Reefer counter-validations	Flag state electronic signature	Counter-validates section 5
	Port state electronic signature	Counter-validates section 5 if transhipment takes place in port

Information category/section	Information to be recorded	Notes
7. First point of sale	Name of port or farm	Also geographic coordinates
	Dates of landing or caging	Date from and Date to
	Name of agent	
	Name of company	
	Address of company	
	Line number	As in section 3
	Species bought	As in section 3
	Product type bought	As in section 3
	Product net weight in kg	
8. Port state counter-validation	Electronic signature	Validates section 7.
9. Second trade of non-graded bulk tuna	note: this section to be completed only for non-graded bulk tuna exported from a first buyer from bulk storage	
	Name of manager	
	Name of company	
	Address of company	
	Line number	As in section 7
	Species bought	As in section 7
	Product type bought	As in section 7
	Estimated product net weight bought in kg	
	Verified product weight in kg	
	Country of exportation	
	Consignment gross weight	
	Bill of lading/airway bill ID number	
	Date of exportation	
	Port of exportation	
	Port of destination	
10. Export state validation and import state counter-validation	Electronic signature	Validates exporter data in section 9
	Electronic signature	Validates importer data in section 9

* "FCC" stands for (full) catch certificate – as opposed to simplified catch certificate

** International Maritime Organization

The paper-version of the proposed catch certificate is appended in Annex I. The catch certificate will be completed gradually from the first unloading to final grading at a factory – using the electronic interface. It accommodates supply chain stops and information about JFOs, transshipments, unloading and storing of non-graded bulk tuna, transfers of live fish to farms and sales of non-graded bulk tuna to second buyers. The state parties along the supply chain have mandatory powers to counter-validate the data supplied by operators, thereby ensuring adequate oversight at each supply-chain stop.

In practice, cases in which every section is completed do not exist; some of the sections are in fact mutually exclusive. In the case of a direct landing of tuna to a factory, for example, sections 0, 1, 2, 3, 4, 7 and 8 of those shown in Table 11 would be completed and the document locked. The flag state would validate the catch, and the port state would counter-validate the graded and verified weight received at the factory.

The document number identifies the flag state of the fishing vessel, and the CDS automatically assigns a random ten-digit number for each certificate issued. Such an approach ensures document security and confidentiality: ten random digits provide for 10 billion possible document numbers, so they cannot be guessed, and non-secured queries can easily be made through the submission of a document number.

Once a first buyer and the verified graded weight for a landing and sale are established, the catch certificate is counter-validated by the port state competent authority and its number is automatically increased by three random digits. The buyer

then has a uniquely numbered buyer-specific CC_{ver} . Several such catch certificates may be generated from a single CC_{est} , each uniquely numbered and recording the portion of catch sold to each buyer. In the case of non-graded bulk tuna traded from a first to a second buyer, a second random three-digit extension is added to the catch certificate number.

As shown in sections 1 and 5 in Table 11, there is no universal vessel identification system and vessel identities vary among RFMO areas. Several identifiers are needed, and the e-CDS can easily offer the option of requiring all operators to register fishing vessels individually in the system at the first transaction involving them; this does not apply to the simplified catch certificate. This option enables the system to assign a unique vessel identifier to each fishing vessel registered in the e-CDS, eliminating the need for the repeated filling of the complex vessel identification data shown in Table 11. The onus is on fleet operators to ensure that vessel information is correct.

Fishing zones must be reported according to RFMO requirements, and the system must provide for listing fishing periods and areas. Fish from any unloading may come from several areas, which must be reflected in the catch certificate, and which may be used for cross-checking with verifiable information stemming from VMS or logbooks.

Details of the catch (species, type, estimated and verified weight) are shown in the columns of a table, which is completed gradually as fish move from fishing ground to processing facility; the system guarantees the integrity and linkages of the records. Each combination of species and product type and its weight is recorded in a single line, with a unique automatically generated line (or row) number. If, for example, a longliner unloads two types of yellowfin tuna, one round and chilled on ice, the other headed, gutted and deep frozen, two lines must be completed. On the other hand, there is no reason to split a unique species/product type combination into separate lines, which would complicate single-line traceability, and must be avoided.

Buyers must upload commercial invoices – sections 7 and 9 – ideally in pdf format. These constitute initial proof for the competent authority that data submitted are correct.

Counter-validation by reefer, flag, port and processing states ensures that supply chain events in intermediate state markets can only occur in countries that are RFMO CPCs or CNPCs. This secures maximum CDS-related oversight over the supply chain between the point of capture and the end market. NCPs do not participate, and are limited in their role as importers of tuna into end-market states.

7.2.2 The simplified catch certificate

With the CC_{simp} , the CDS traces fish from the point of collection instead of the point of capture. It is simpler than the full catch certificate because supply chain events such as transshipments and estimated weights are eliminated. Table 12 shows the data to be collected. Unlike the full catch certificate, where only certain data fields are populated, all data fields in the CC_{simp} must be completed¹⁰⁰ before it can be validated by a competent authority.

¹⁰⁰ Except section 1 if there are no data: for example a collector vessel's RFMO number or IRCS may not have been assigned.

TABLE 12
Simplified catch certificate data

Information category/section	Information to be recorded	notes
0. Document properties	Automatic CC _{simp.} number	Two-digit coastal state code + 10 randomly generated digits
	RFMO (manual)	identifies RFMO in which catches were made
1. Buyer details	Name of manager	
	Name of company	
	Address of company	
	Mode of collection	on land (shore) or at sea
	<i>note: collector vessel details in sub-section below are required only for collection at sea</i>	
	Full name of master	
	Flag of collector vessel	
	RFMO vessel number	If issued
	International radio callsign	If issued
	Vessel registration number	If issued
	Name of collector vessel	
	Fishing licence number	
	Fishing licence validity	Date from to Date to
	Licensed operating area(s)	
	Maritime area of collection	EEZ, FAO fishing area, sub-areas and divisions as required by RFMO
2. Fishing zones, dates and landing location(s)	Landing location of collector vessel	
	Date of landing	
	Fishing zones for all trips	EEZ, FAO fishing area, sub-areas and divisions as required by RFMO
	Period of fishing for all trips	
3. Combined catch table	Landing locations: land-based collection only	
	Line number	Automatically assigned
	Species	FAO 3-alpha code
	Product type	Code from list provided
4. Fishing vessel list	Verified net weight in kg	
	Note: this section enables users to log any fishing vessel the buyer has bought from at any location	
	Name of fishing vessel	
	Vessel registration number	
	Vessel/operator fishing licence number	
	Species	FAO 3-alpha code
	Product type	code from list provided
5. Coastal state validation	Verified net weight in kg	
	Electronic signature	Validates sections 1 to 4

The paper-version of the proposed simplified catch certificate is appended in Annex II.

It is difficult to define fleets to which the CC_{simp.} applies in terms of vessel size, engine power or gear. As discussed in chapter 4, decisions as to which fleets should use the CC_{simp.} and which the full catch certificate will depend on the weight of landed catch and the existence of pooling and collection frameworks.

Parts of the Indonesian pole-and-line fishery¹⁰¹ provide an example: vessels of between 6 GT and 30 GT unload small tonnages daily on to reefers with deep-freezing capacity. The reefers can collect catch from up to 30 vessels before moving its catch to market. Fish are graded on board but catch is not separated because it is landed and marketed in graded form. The CC_{simp.} accommodates this established mode of operation, whereas use of the full catch certificate would cause the CDS to fail and

¹⁰¹ This major tuna fishery harvests about 100,000 mt annually.

would probably lead to the generation of fake certificates. Many of the vessels in question would not qualify for the use of the CC_{simp.} under article 6 of EU Com. Reg. (EC) 1010/2009.¹⁰²

The CC_{simp.} as proposed cannot cover an international trade transaction in the same way as the full catch certificate can for bulk tuna. The CC_{simp.} is completed on the basis of verified weights and locked as soon as the buyer has acquired the fish and sent it to the factory.

7.2.3 The trade certificate

Like the CC_{simp.}, the trade certificate is simpler than the full catch certificate. Table 13 summarizes the data to be collected in the trade certificate to maintain traceability.

TABLE 13
Trade certificate data

Information category/section	Information to be recorded	Notes
0. Document properties	Automated trade certificate number	Two-digit market state code + 10 randomly generated digits
	RFMO (automated)	identifies RFMO in which catches were made – may be multiple selection
1. Product table	Source catch certificate or trade certificate number	for closed-cycle aquaculture tuna, an option is provided to select “CLOSED CYCLE” instead of a certificate number
	Line number in the source document	
	Original species	From source CDS document
	Original product type	From source CDS document
	Original net product weight in kg used in processing	
	Resulting product type	Code from list provided
	Resulting net drained fish weight after processing, in kg	
	Resulting net product weight, including fish and other elements after processing, in kg	
	Note: The number of fish is only required for harvests from a farm	
	Number of individual fish	
2. Processor/ exporter	Name of manager	
	Name of company	
	Address of company	
3. Buyer/importer	Name of manager	
	Name of company	
	Address of company	
4. Transport details	Country of exportation	
	Consignment gross weight	
	Bill of lading/airway bill number	
	Date of exportation	
	Port of exportation	
	Port of destination	
5. Processing state validation and counter-validation	Electronic signature	Validates sections 1 to 4
	Electronic signature	Validates section 4

The paper-version of the proposed trade certificate is appended in Annex III.

The most important data groups in the trade certificate are the product table – section 1 – and the identities of the exporter and importer – sections 2 and 3. These generate the link to the source products and show the resulting products and their weights and the next international destination in the supply chain.

¹⁰² “This Article shall apply to third country fishing vessels: (a) with an overall length of less than 12 metres without towed gear; or (b) with an overall length of less than 8 metres with towed gear; or (c) without a superstructure; or (d) of less than measured 20 grt.”

The important data elements in section 1 relates to the source catch certificate or trade certificate, which is required for every original product type and species combination. Mass-balance and processing yields are monitored between pairs of “mother” and “child” certificates, not between the source catch certificate and a second or third trade certificate. It is therefore essential to link the product data in the source (or “mother”) certificate with the resulting product data following processing in the “child” certificate.

If the importer buys products for re-processing and further exportation, the received certificate must be registered in the CDS with an electronic copy of the commercial invoice. End-market state importers are not normally expected to register certificates in the system because there is no mechanism for this; and end-market state importers may be NCP states, which do not have access to the system.

7.3 SUGGESTED LAYOUT

The layout of certificates is important, even in a fully electronic system. In paper-based systems, notably the CCAMLR¹⁰³ and CCSBT systems, the source certificate is not shown in the first column of the product table (section 1 in Table 13) of the trade certificate, but in a box at the top of the page. Exporters and re-exporters of pooled products sourced from several source certificates record the source certificate numbers in the box and record the rest of the data in the table: the outcome is that the hard link between the source product line and the resulting product is broken. Mass-balance cannot be monitored and the system becomes prone to fraud because non-originating products laundered into the supply chain can no longer be detected. See Annex III and section 1 of the certificate for an adequate trade certificate layout in this respect.

With regard to the catch certificate, the catch table (section 3 in Table 11) must be designed as a single table to accommodate the various supply-chain stops that may arise. This enables line-by-line traceability for given species and product type combinations and prevents confusion and line errors. See Annex I and section 3 of the certificate for an adequate catch certificate layout in this respect.

Because certificates may be printed out several times along the supply chain, the layout must present data in correct alignment and with correct linkages, and be easily readable and as intuitive as possible.

7.4 HARD TRACEABILITY LINKS BETWEEN CERTIFICATES

The most important element of the CDS is traceability throughout the supply chain, achieved by linking sequential certificates. Without it the CDS is unable to monitor mass-balance from one step in the supply chain to the next – a major flaw in most existing CDS.

When mass-balance cannot be monitored or anomalies be detected between adjacent supply-chain steps, opportunities for fraud arise in the form of laundering non-originating product into the supply chain. The first task of the CDS is to prevent this, which it does by establishing hard traceability links between certificates all the way from the initial catch certificate to the final trade certificate.

This is not complicated: it hinges on the proper design of the catch table in the catch certificate and the product table in the trade certificate. The three hard traceability links to be maintained are:

- i. between the first and second buyer of bulk tuna in a full catch certificate;
- ii. between a catch certificate and a trade certificate; and
- iii. between a trade certificate and a subsequent trade certificate.

¹⁰³ CCAMLR export and re-export certificates are not part of the e-CDS; only the catch certificate is issued and registered electronically in the registry.

This is based on the “cascade” concept: the system links source certificates with “child” certificates and monitors the mass-balance along the supply chain. Product types also cascade from the initial round fish through intermediate product types such as gilled-and-gutted or dressed to final product types – loin, saku block or neck meat, for example.

The CDS does not try to establish, trace or monitor mass-balance between an apex source catch certificate and the population of certificates that may be derived from it, and which could number in the hundreds. The CDS connects and monitors pairs of “mother” and “child” certificates, and the monitoring framework enables the detection of mass-balance anomalies between individual certificate pairs. When a “child” certificate becomes the basis for a further transaction, it becomes the “mother” certificate for that next transaction: all the CDS does is to ensure a hard connection between subsequent certificates. This hard-link approach “wall-fences” the flow of legal tuna products through international supply chains and prevents fish derived from IUU fishing from entering the supply chain.

7.4.1 CDS data enabling hard traceability links

The CDS data enabling hard traceability links between certificates – the line number, the species and the product type – are repeated in exactly the same form in any pair of “mother” and “child” certificates. In catch certificates, they are part of the combined catch table; in trade certificates they are part of the product table. The catch certificate sets up downstream hard traceability links by assigning a single line number to every species and product type combination.

“Child” certificates must show the source line number and species and product type combination of the preceding certificate under which original product was acquired. The trade certificate product tables specify how much of the item was used in production and the resulting product type and weight. If another trade certificate is generated from the first, as for re-processing, the product type in the preceding trade certificate becomes the reference. This maintains the hard link between the source certificate and the “child” certificate. The mass-balance rule to be monitored and enforced is that the sum of weights in a “child” certificate for any given line in the source certificate can never exceed the total original weight.

The examples in Figure 4 show hard links at the three levels in the CDS referred to in the previous section. Red highlights data repeated from one table to another to create the hard traceability link.

FIGURE 4
Hard traceability link between section 3 and section 9 of the full catch certificate

Section 3. Catch table						
Fish to be unloaded from f.v.				Live transfer to farm		1 st pt of sale (section 7)
Line #	Species	Product type	Product weight (est.) in kg	Number of fish (live)	Est. weight (live) in kg	Product weight (ver.) in kg
1	YFT	RD	4,500			
2	BET	RD	6,700			
3	SKJ	RD	12,500			

Section 9. Second trade (ungraded bulk tuna)				
Line #	Species	Product type	Product weight (estimate) in kg	Product weight (verified) in kg
1	YFT	RD	4,500	4,256
2	BET	RD	6,700	6,980
3	SKJ	RD	12,500	12,425

In Figure 4, three species of tuna are acquired in bulk from a first buyer and are not graded. They are then exported in their totality to a second buyer, who after grading logs the verified weights in the certificate. All three line numbers are repeated between section 3 and section 9, together with the species and product combination.

FIGURE 5
Hard traceability link between catch certificate and trade certificate

Section 3. Catch table						
Fish to be unloaded from L.V.			Live transfer to farm		1 st pt of sale (section 7)	
Line #	Species	Product type	Product weight (est.) in kg	Number of fish (live)	Est. weight (live) in kg	Product weight (ver.) in kg
1	YFT	RD	4,500			4,256
2	BET	RD	6,700			6,980
3	SKJ	RD	12,500			12,425

↓

Section 1. Product table								
Preceding CDS source doc. ID no. (CC or TC)	Line # (source)	Number of fish processed (farmed tuna)	Species	Original product type	Original product weight used in processing (in kg)	Resulting product type	Net drained fish weight after processing (in kg)	Net product weight after processing, including fish (kg)
ID-FCC-1234567890	3		SKJ	RD	4,500	CAN	2,250	2,975

In Figure 5 canned tuna is produced from a single line of the source catch certificate; only Skipjack tuna is involved, which is only a fraction of the product originally acquired under the certificate. Therefore only line 3 is referenced in the trade certificate, with the related species and product type combination. The line number remains the same as in the catch certificate.

FIGURE 6
Hard traceability link between subsequent trade certificates

Section 1. Product table								
Preceding CDS source doc. ID no. (CC or TC)	Line # (source)	Number of fish processed (farmed tuna)	Species	Original product type	Original product weight used in processing (in kg)	Resulting product type	Net drained fish weight after processing (in kg)	Net product weight after processing, including fish (kg)
SP-FCC-1234567890	2		YFT	RD	7,000	LOI	2,800	2,800

↓

Section 1. Product table								
Preceding CDS source doc. ID no. (CC or TC)	Line # (source)	Number of fish processed (farmed tuna)	Species	Original product type	Original product weight used in processing (in kg)	Resulting product type	Net drained fish weight after processing (in kg)	Net product weight after processing, including fish (kg)
KR-TC-1234567890	2		YFT	LOI	1,400	SUS	1,280	1,280

In Figure 6 Yellowfin tuna *saku* blocks are produced from loins imported into South Korea, as shown by the referenced source trade certificate number in the bottom table, which had been acquired from a Spanish fishing vessel, as shown by the referenced source catch certificate number in the top table, and turned into loins in South Korea,

as shown in the top table. In this example, two processing steps are referenced in two trade certificates – the first from round tuna to loin, and the second from loin into sliced *saku* used for sushi.

In all three examples yield factors may be calculated to check that yields are as expected and reasonable. In Figure 5 and Figure 6 only part of the original product in the source certificate was used in processing. In an e-CDS the balance remaining for any line on any certificate can be computed automatically and queried by FBO's and/or associated competent authorities.

When this mode of data logging is applied consistently throughout the supply chain and yield factors are factored in correctly, opportunities for fraud within the CDS are minimized.

7.4.2 Traceability in tuna fattening

In tuna fattening, individual live fish are counted during caging, and their weight is “verified” on the basis of a protocol that is established by the RFMO. The farm receives a catch certificate, which establishes the verified number of fish received and their “verified” weight.

Obviously, after a period of fattening, the weight of the fish will have increased substantially, and weight cannot be used in the same way as it is used for dead fish in mass balance reconciliation between the catch certificate and the resulting trade certificate(s). Therefore, reconciliation in tuna fattening should be done on the basis of numbers of fish only. The balance rule here is that no more fish can leave a farm, than have been introduced into a farm.

Once fish have been harvested, killed and exported, the normal mass-balance rules between subsequent trade certificates will naturally apply.

8. The e-CDS and the certificate registry

Recent appeals for the further conceptualisation and development of CDS systems, including the latest by the United Nations General Assembly and the FAO Committee on Fisheries, call for the potential of developing future CDS on the basis of electronic infrastructure to be fully assessed.

Electronic CDS bear a requirement for a central CDS operator maintaining a database in which all certificates and related data are recorded.¹⁰⁴ Except in the EU CDS this central operator is the RFMO Secretariat; in CCSBT it handles certificates in paper form; in CCAMLR and ICCAT it handles certificates in a mix of paper and electronic forms. In the EU CDS there is no central operator or registry: data are held only on the certificates themselves, and in paper-based archives and heteroclite electronic records in countries exporting and importing fisheries products.

The previous chapters show that paper-based tuna CDS cannot accommodate all real-world supply-chain permutations and that e-CDS is the only convincing approach, especially for tuna species in supply chains that are more complex than those for the Bluefin tuna fisheries currently covered by CDS.

8.1 DEFINITION OF e-CDS

There is no internationally agreed definition of CDS or e-CDS, so for this paper the following definition is used for e-CDS:

A CDS based on online centralised electronic infrastructure, providing remote user access for the submission, verification, validation, management, storage, linking, querying and analysis of CDS data.

Various considerations arise from this definition:

- The system is central: in any traceability system information must converge so that links can be created and maintained. If separate “boxes” each hold partial information, links cannot always be created or maintained, and verification, queries and analysis may be limited or impossible. This does not preclude options for national electronic systems to link into centralized e-CDS infrastructure for accessing/managing agreed data.
- An electronic database provides for multiple logons and secure remote user access, and logging of user sessions.
- The central electronic system provides various functions accessible to all users – vessel operators, processors, traders, competent authorities and RFMO Secretariats. The functions cover all tasks to be carried out in the e-CDS from initial data logging to eventual data analysis. The e-CDS rules determine who can submit data, who validates data and who may analyse and act on which data.

8.2 THE e-CDS MASTER FUNCTION: PROVIDING A CENTRAL CERTIFICATE REGISTRY

The essential function of an e-CDS is to provide a “one-stop-shop” that can be accessed from any device connected to the internet and that enables the management of certificates and supporting documents. Information is held in a central database

¹⁰⁴ The submission of data or document scans by operators by email or on electronic media sent by the post, and which are then input by the operator into a platform which cannot be remotely accessed by the users of the system, is not recognised as an e-CDS.

to enable the generation of traceability links and the implementation of oversight functions.

In current paper-based systems such as CCSBT, the Secretariat carries out all CDS tasks. In particular, certificates are completed manually, with copies mailed by courier – or via email – from competent authorities to the Secretariat, which collates information, matches trades and checks on a trade-by-trade basis whether information provided is complete and correct. Workloads are hence considerable, and errors are frequent.¹⁰⁵

In an e-CDS, paper documents and the associated problems of access and circulation are eliminated. The electronic verification process is enhanced by setting the interface to accept only complete and correct sets of data and to allow “mother-child” links only between certificates that are eligible. The need for human oversight of a mass of paper is eliminated. Because all data are linked in a single database access is easy and controlled by confidentiality rules, and authorities can query certificates and relationships between certificates and trace supply chains to establish where issues originate.

The administrative burden is thus drastically reduced, oversight at the national and RFMO levels is enhanced, and work on the data is easier. This is a major consideration for all users, especially developing countries and small-island states.

8.3 OPTIONS FOR e-CDS LOCATION AND OPERATION

An e-CDS should be set up by IT professionals, who will design the system, register the domain name, install and maintain the servers and carry out routine maintenance to ensure 100 percent connectivity. The physical infrastructure and the Secretariat should be located in a place with fibre-optic high-speed internet access, an ideal which may be difficult to achieve in some of the existing RFMOs Secretariats. For ICCAT, IATTC and CCSBT the location of the Secretariat does not pose a challenge.

Two options arise from these considerations: i) the RFMO Secretariat can hire IT staff to set up and operate the e-CDS in-house; or ii) the Secretariat can outsource the setting up and operation of the e-CDS to an external service provider. In either case an e-CDS will require a dedicated IT team and an annual budget to function.

Two examples of successful outsourcing are provided by Norway and by the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Norway implements its Norwegian catch certificate system through a service provider called Catch Certificate SA founded for the purpose.¹⁰⁶ In CITES, certificate data are generated and initially registered at the national level, then pooled in a central database; the United Nations Environment Programme provides digitization and centralization services for an annual fee of US\$ 100 000.¹⁰⁷

8.4 ARCHITECTURE OF THE e-CDS

The architecture of an e-CDS can be designed in various ways:

- as a decentralized system based on interconnected national databases but no CDS central database;
- as a satellite system based on national databases that relay data to a CDS central database; or
- as a single centralized system providing all functions and accessed through an internet log-on routine.

¹⁰⁵ RFMOs operating paper-based CDS inform that an important degree of validated certificates contain errors.

¹⁰⁶ It comprises an electronic platform through which catch certificates for landings and catch certificates for export and trade are completed, validated and issued. It responds to the requirements of the EU CDS, but is not a CDS in itself.

¹⁰⁷ Personal communication. Marcos Regis Silva, (former) Chief of Knowledge Management and Outreach Services, CITES.

The first option is being discussed in the Western Central Pacific by the Forum Fisheries Agency members, some of whom have national database systems for fisheries and wish to continue with them. The system could work with a limited number of countries using similar platforms, operating in contiguous time zones and speaking the same language, but: i) it could not encompass all the countries in the global tuna supply chain; ii) any downtime of national servers would prevent access to traceability information; iii) CDS data standards would have to be agreed in advance; and iv) all countries would have to have interconnected online databases. The combined costs would be beyond the means of many countries. And any change to the system would require changes to every individual database, making it extremely inflexible.

The second option is the basis of the CITES model. Individual countries develop their own electronic database for the submission, validation and registration of certificates according to standards developed by CITES. Some of the data are periodically pooled in a central database. The drawbacks are: i) high total cost, with each country paying to develop, operate and maintain its own system; ii) system updates, upgrades and reviews are difficult to implement; and iii) system failure in a single country undermines the entire operation.

The third option is the best in all respects. Development, operation and maintenance costs are shared by all parties, and the e-CDS can be upgraded centrally without the need for changes to national systems. In such a centralized and professionally managed system, online time is maximized and the risk of problems affecting the issue and validation of certificates and the trade of tuna products is minimized. The e-CDS is flexible and national administrative burden is small. CCAMLR operates such an e-CDS, ICCAT is developing one and CCSBT is considering the option.

8.5 SYSTEM PARAMETERS

In designing a central database with global access and multiple functions, the number of operations to be carried out and the amount of data to be handled are significant issues. Guidance can be obtained from the number of operators and vessels registered and certificates issued in current CDS; other useful information can be obtained from RFMO vessel records.

8.5.1 Number of users

The numbers and categories of private-sector stakeholders in CCAMLR and CCSBT are shown in Table 14.

TABLE 14
CDS users in CCAMLR and CCSBT

CCSBT			
Year	Vessel operators (companies)	Processors/ exporters	Importers*
2010	486	169	53
2011	439	135	71
2012	399	121	86
2013	483	175	91
2014	362	132	90
5-year average	434	146	78
CCAMLR			
Year	Vessel operating companies**	Processors/ exporters	Importers
2010	18	29	390
2011	21	83	376
2012	19	98	280
2013	23	110	309
2014	27	108	283
5-year average	22	86	328

* Underestimated because importer data of NCP's not known.

** Underestimated because company data in the database is incomplete.

These CDS have hundreds of users producing up to 20 000 m of fish a year. The different ratios between vessel operating companies, processors, exporters and importers reflect the different fisheries and market dynamics. In CCAMLR, relatively few companies operate vessels in southern waters; in CCSBT many companies operate vessels of varying sizes but relatively few operators buy, process and export the fish. In tuna fisheries in general the number of vessel operators will be greater than the number of processors and exporters, as reflected in the CCSBT figures.

The ratios of exporters to importers are also different. In CCSBT the ratio is one importer for every two exporters; in CCAMLR it is four to one. Tuna fisheries in general will probably reflect the CCAMLR figures because the diversity of end-markets is high. Japan is by far the largest end-market for Southern Bluefin tuna, but other commercial tuna fisheries have numerous end-markets: hence a ratio reflecting the CCAMLR figures would be a good basis for gauging the numbers of import companies.

There is no definite figure for the numbers of vessels or operating company figures in the global tuna fleet. It is currently estimated that 580 industrial-scale purse seine vessels and 1 000 or more distant-water longline fishing vessels are in operation,¹⁰⁸ and many thousands of intermediate-size longline pole-and-line and gillnet vessels and tens of thousands of small-scale commercial vessels must be added to this figure.

Table 15 shows estimates of the numbers of users likely to interact with an e-CDS for RFMOs that are yet to develop a CDS, based on global tuna catch volumes. These figures are indicative, and serve to gauge the approximate scale of any future tuna e-CDS.

TABLE 15
Estimate of CDS users under future RFMOs

RFMO	Rel. tuna catch (volume)	Vessel operators (companies)	Processors/Exporters	Importers	Total
IATTC	13%	2 600	910	3 250	6 760
ICCAT	10%	2 000	700	2 500	5 200
IOTC	19%	3 800	1 330	4 750	9 880
WCPFC	58%	11 600	4 060	14 500	30 160
Global	100%	20 000	7 000	25 000	52 000

8.5.2 Number of CDS transactions

The number of CDS transactions refers to the number of certificates to be issued and validated and the many other operations, which will largely be queries, to be handled. The number of queries will be a function of system design and the query types and other interactions available to users. The latter is difficult to establish because there is currently no evolved system on which to base an estimate.¹⁰⁹ Envisaged future systems would be more versatile and flexible, and would contain numerous additional functions for use by private-sector and public-sector users.

The best reference for an estimate of transaction numbers in future tuna CDS is the EU CDS, which covers a range of small-scale, intermediate-scale and industrial-scale fisheries. This is a useful starting point in that it is anticipated that future tuna CDS would cover canning-grade and sashimi-grade tuna and that products would be traded in all possible forms in consignments ranging from single fish from small-scale fisheries to bulk shipments of up to 1 000 m from industrial purse seine fisheries.

¹⁰⁸ Forum Fisheries Agency. 2011. *Market and Industry Dynamics in the Global Tuna Supply Chain*. Available at: <http://agritrade.cta.int/Fisheries/Topics/Market-access/Market-and-industry-dynamics-in-the-global-tuna-supply-chain> FFA

¹⁰⁹ The unique CCAMLR e-CDS enables users to validate documents and view the related supply chains. Officials may query CDS data for exports and imports relevant to their countries.

According to a 2014 report for the European Commission's Directorate-General for Maritime Affairs and Fisheries,¹¹⁰ between 2010 and 2011 the EU imported 7.16 million mt of fisheries products; the live weight equivalent was estimated at 16.8 million mt,¹¹¹ of which 74 percent – 12.4 million mt – was covered by EU CDS certificates. These imports were covered by 553 559 EU catch certificates, 31 982 EU processing statements and 2 573 RFMO catch certificates.

The average live-weight fish equivalent covered by an EU CCS certificate is hence 21.1 m. By applying this to the annual 4.6 million mt catch of global tuna fisheries we can estimate the number of certificates to be issued by a future tuna CDS (see Table 16). It should be noted that because the EU CDS does not apply catch certificates and trade certificates consistently as advocated in Chapter 6, the number of certificates could be three times larger;¹¹² this is factored into the estimates.

TABLE 16
Estimated annual number of certificates issued in future tuna CDS

RFMO	% of tuna catch	Volume of tuna catch (mt)	Number of certificates
IATTC	13	598 000	85 024
ICCAT	10	460 000	65 403
IOTC	19	874 000	124 265
WCPFC	58	2 668 000	379 336
Global	100	4 600 000	654 028

In an RFMO such as WCPFC that covers all commercial tuna species, this means that about 1 000 certificates would be issued per day, every day of the year.

Table 17 provides figures for the CCAMLR and CCSBT CDS for comparison. In CCSBT more catch certificates are issued per unit of catch than in CCAMLR, and in CCSBT the ratio of trade certificates to catch certificates is 1:10, whereas in CCAMLR it is 4:1. This is because trade dynamics are different, and importantly because CCSBT catch certificates frequently cover the first trade transaction, whereas in CCAMLR trade transactions after the first point of sale at landing are strictly limited to trade certificates. The latter point shows how the document system affects the overall number of documents to be generated in a CDS.

TABLE 17
Certificates issued in the CCAMLR and CCSBT CDS

Certificates issued in the CCAMLR and CCSBT CSOs

CCSBT			
Year	Catch monitoring form	Export and re-export form	Total
2011	2 336	291	2 627
2012	2 596	211	2 807
2013	2 931	259	3 190
3-year average	2 621	254	2 875
3-year average TAC	10 215mt		
Average live fish weight per certificate	3.6 mt		
CCAMLR			
Year	Catch document	Export and re-export documents	Total
2011	687	2 565	3 252
2012	1 025	3 483	4 508
2013	1 073	4 650	5 723
3-year average	928	3 566	4 494
3-year average catch	11 733mt		
Average live fish weight per certificate	2.6 mt		

¹¹⁰ Study of the implementation of Council Regulation 1005/2008 of 29 September 2008 establishing a system for eliminating IUU infiltration.

¹¹¹ European Market Observatory for Fisheries and Aquaculture Products, 2014.

¹¹² Based on the 21.1 mt live fish weight equivalent per EU CDS certificate; the re-calculated weight is 7.0 mt per certificate.

It arises that the estimate for the number of certificates in Table 16 – based on 7 m per certificate – is conservative, and that future CDS must be designed to handle larger numbers of certificates per year.

8.5.3 Data load

The estimated data load¹¹³ is important for determining system capacities in terms of data storage and use. Data fields for catch certificates and trade certificates were defined in Chapter 7, but the full range of fields for catch certificates is closer to 70 data points; for trade certificates the figure is 25 data points. But because not all catch certificate fields have to be completed, a working figure of 50 data points is reasonable.

Combining these figures with the certificate numbers above and assuming a 1:2 ratio of catch certificates to trade certificates gives the estimates in Table 18.

TABLE 18

Estimated annual number of data points generated in future tuna CDS

RFMO	% of tuna catch	Number of certificates	Number of data points
IATTC	13	85 024	2 805 792
ICCAT	10	65 403	2 158 299
IOTC	19	124 265	4 100 745
WCPFC	58	379 336	12 518 088
Global	100	654 028	21 582 924

Bearing in mind that static information such as addresses and vessel details is system-resident and that data loads will build up over time, the figures in Table 18 must be viewed as conservative. The e-CDS must therefore be capable of handling much larger data volumes. It must also be borne in mind that catch certificate and trade certificate transactions require scanned and uploaded documents in numbers proportional to the number of certificates.

8.6 PRIVATE-SECTOR AND PUBLIC-SECTOR LOGON

One of the simplest and most innovative proposals in this paper is to design the e-CDS interface so that all data can be entered directly by operators in the tuna industry. This requires a modular interface catering for two different groups – private-sector users and public-sector users.

Private-sector users – vessel operators, processors and exporters – log in to complete a certificate and submit it for validation or to register receipt of products covered by a certificate. Public-sector users – competent authorities – log in to respond to validation requests.

The two main arguments in favour of this mode of operation are : i) the private sector is responsible for data submitted for validation, and hence competent authorities cannot make mistakes in transcribing private-sector data into official forms; and ii) the administrative burden on competent authorities in terms of data transcription and the management and filing of official forms is reduced to a strict minimum.

An example is the Thai Fisheries Single Window system, which enables processors to submit EU CDS processing statements with scans of supporting documents. This reduces processing times and administrative burden.

Logon routines must accommodate first-time users creating profiles for immediate validation by administrators. Competent authorities must be responsible for approving the profiles of national private-sector operators; the system administrator must be responsible for checking the accuracy of the profiles of national competent authorities.

¹¹³ Data loading is the process of copying and loading data or data sets from a source file, folder or application to a database or similar application. It is usually implemented by copying digital data from a source and pasting or loading the data to a data storage or processing utility.

The public sector in each user country must be able to create logon identities for authorities with validation or counter-validation tasks – flag, port, farming, coastal, export, import and processing state competent authorities, as they appear in certificates (see Annexes I, II and III). Public and private organizations must be able to define as many users as necessary for internal supervisory purposes so that individual interactions in the CDS may be fully monitored.

The twin logon routines for the private and public sectors are the most important element in the CDS because they reduce administrative tasks and overall costs to a minimum. Because no information submitted to the CDS is official until it is validated, there is no loss of oversight by competent authorities.

8.7 ESSENTIAL e-CDS FUNCTIONALITIES

When an e-CDS is designed, a full functional specification is required. A functional specification details the scope of the CDS and user requirements.

The following sub-sections present essential functionalities of an e-CDS. Most highlight the ways in which users will interact with the system. The list is not exhaustive, but it illustrates the kind of system proposed.

8.7.1 Registration of private-sector and public-sector user groups

The CDS must have a procedure whereby a state can identify the competent authority dealing with flag, port, coastal, processing, import and export matters. In some cases a single competent authority will cover a number of these functions.

The next step is to register the authority as a user group and define the kinds of validation and oversight functions it will carry out. The definition determines the sections of certificates that the authority may validate or counter-validate, the certificates that it may block and the data that it may access or query.

It would be impractical for private-sector companies such as vessel operators, processors and importers to go through a notification process. A company's first interaction with the CDS should involve the creation of a user group and user accounts.

The e-CDS must include a routine that suppresses multiple registrations of the same user group, for example when lack of internal communication results in different managers attempting to create user-group profiles for the same company.

8.7.2 Fleet and vessel data

The most demanding parts of certificates are those requiring vessel identity details. In most current schemes these data have to be given repeatedly, which creates an unnecessary administrative burden.

The e-CDS must have a routine whereby operators can create a record of their fishing vessels that can be updated as the data changes. In this way vessel operators can generate catch certificates by completing a single field, after which an auto-complete routine will provide the vessel's identity from the details in the registry.

The e-CDS can be designed to update the vessel registry, for example by sending an automatic notification with regard to any vessel that has not issued a catch certificate for 12 months that its profile will be erased by a given date unless the company requests otherwise. If a vessel is erased but subsequently becomes active again, the operator merely has to create a new profile. Such a routine will also enable RFMOs to improve the updating of their own records of active fishing vessels.

8.7.3 Logons and passwords – all users

In order to control usage of the CDS, users must be registered on the system and log in by means of a user ID and password.

Registered competent authorities and companies must be provided with administrator accounts within their user groups to enable them to manage individual user accounts and determine which staff members have access to the e-CDS, the functions they can access and the tasks they can carry out.¹¹⁴

8.7.4 Automated logging of user sessions

Once users are registered, individual interactions with the e-CDS can be logged to provide additional oversight. User-group administrators must have access to these logs so that they can see the activities carried out by each user and ensure compliance with rules.

8.7.5 Create, recall, cancel and modify documents

People make mistakes. The e-CDS must enable private-sector users to recall, modify and cancel certificates issued so that errors can be rectified. It must also be possible to save partly completed documents so that they can be retrieved later and completed for validation.

There are two scenarios under which requests to recall or cancel a certificate may occur: i) the certificate has been opened by a competent authority for validation; or ii) the certificate is still pending validation. In the first scenario a request for “de-validation” must be filed with an explanation of the reasons; once the validation has been rescinded the certificate can be modified or cancelled. In the second scenario, access to the certificate can be granted without interaction with the competent authority.

Certificates with validated “child” certificates should not be modified unless the effect on downstream certificates is zero.

8.7.6 Upload supporting documents

The e-CDS must enable uploads of supporting documents when certificates are submitted for validation. In existing systems, operators submit scans of such documents in pdf format, but they must not exceed a given number of kilobytes. The system can be designed to enforce the document format and size.

This simple routine enables the e-CDS to eliminate the use of paper, while achieving a high degree of oversight and control.

8.7.7 External document queries based on document number

The e-CDS must have a URL to an internet page containing a search box in which the number of any registered certificate may be inserted. Because the numbering system is based on randomly generated digits (see Chapter 7) the chance of an unauthorized person entering a real certificate number is close to zero. The search function can therefore be openly accessible, even to parties not registered as users (e.g. end-market border control officers or buyer).

When a genuine certificate number is searched for, the e-CDS must automatically display a static pdf file of the validated certificate that can be downloaded and printed. Certificates that have not been fully validated or counter-validated must only be displayed under specific circumstances, and a watermark must indicate the non-validated status of the document.

¹¹⁴ A user in a competent authority, for example, may be given the authority to validate certificates but not to block them, a function carried out only by particular officers.

8.7.8 Blocking documents

The e-CDS must provide a routine enabling competent authorities to block a certificate over which they have validation authority. Blocking, which means that no more “child” certificates may be issued, may be necessary if fraud is detected and a certificate cannot be used any longer, or if the products imported under a given certificate have been used up completely.

The blocking of a document should not normally affect existing downstream “child” certificates unless it is established that the recipients of the products and certificates were complicit in fraud.

8.7.9 Yield-factor data pooling and monitoring

Yield factors constitute a complicated e-CDS domain. Yield factors vary for given species and start/end product type pairs such as round tuna processed for canning. The variations relate as much to the condition index of the species as to the skill of factory workers processing the fish – some factories employ skilled workers to minimize wastage and maximize yields, but others do not. Yield factors are hence variable but tend to fluctuate around an average.

The question is whether the e-CDS should enforce yield factors at the level of individual certificates. The short answer is “no”. If the e-CDS is to enforce a given yield-factor and tolerance margin, it must have a function that tolerates a specified amount of laundering of IUU fish. This is because shrewd operators would be able to take advantage of a good fish-condition index and skilled workers to launder non-originating fish into the supply stream while remaining within the tolerance margin. And enforced figures are not flexible enough to accommodate environmental changes or mishaps at factories, which would create challenges for fixed yield factors enforced by the system.

A better approach is for the e-CDS to compute yield factors for each species and pair of product types on the basis of all trade certificates registered in the system and to create system-resident yield-factor datasets. Over time such datasets can provide means and standard deviations for yield factors related to all types of processing, and the e-CDS can produce reference figures for factories, countries, species and seasons for any given product type pair.

When a processor issues a trade certificate indicating the used and obtained weight for a given type of processing, the e-CDS can automatically compare the resulting yield factor with the resident dataset. The e-CDS can be designed to respond if the yield factor lies beyond a given statistical distance from the mean of existing data. For a normal distribution that distance is normally defined in terms of standard deviations, and the limit is defined in the e-CDS.¹¹⁵ The beauty of this approach is that the tolerance margin is defined by real-world processing data and the resulting normal distribution of yield-factor data, not by a percentage figure unrelated to the processes causing the variation.

The e-CDS can be primed to alert the processor and the competent authority if submitted figures fall outside the normal range of the yield-factor dataset. The processor may be alerted first and given the option to review the figures before submitting them to the competent authority. The competent authority must be able to see yield factors on-screen during submissions, and an on-screen alarm must be

¹¹⁵ The system is concerned with the prevention of laundering of IUU fish, which drives yield factors up. The system is hence only “interested” in triggering alarms for yield overruns to the right of the mean, not yield-factor under-runs. In the normal-distribution curve, 1 standard deviation to the left and right of the mean contains 68.2 percent of all data; 1.5 standard deviations contain 86.6 percent of all data; 2 standard deviations contain 95.4 percent of all data – a potentially appropriate level to trigger an alarm.

triggered if the yield-factor limit is exceeded so that action can be decided – suspension of validation, an audit of the factory, refusal of validation of the certificate or validation if a satisfactory explanation is provided by the processor.

8.7.10 System queries

The e-CDS interface must enable private-sector and public-sector users to make queries. A list of frequently asked questions may be developed, and improved over time.

A private-sector company may wish to know how many certificates it has registered, or obtain a snapshot of its current inventory stock. The possibilities are many, and the interface must be designed with the needs of the private sector in mind.

Queries should be developed to help competent authorities to carry out their administrative and oversight functions. Listings of certificates by company and usage, company inventories, import and export destinations, dates, volumes and countries of origin, fishing vessels and suppliers must be accessible and modifiable, with filters to enable searches. Yield-factor data reports for specific product type pairs, for example, must be accessible to competent authorities. Supply chains for individual certificates must be readily visible and adequate data resolution provided (see section 8.8 on data confidentiality also).

The usefulness of queries and other features useful to private and public stakeholders must be monitored, and additional functionalities may be developed provided they do not impair system performance.

8.7.11 Automated reconciliation reports

The term “reconciliation” relates to e-CDS data analysis and assessment of the consistency of product-volume logging and flows along the supply chain. Reconciliation can be done at various levels: one of the most important is determining how much product enters a country and how much leaves it over specific periods of time. Reconciliation reports are discussed further in Chapter 10.

The e-CDS can be designed to generate reconciliation report figures automatically at set times. The use of these reports will be decided by the RFMO Commission. For countries where mass-balance reconciliation issues are established, these must then be formally addressed by the Commission.

8.7.12 System alarms

The e-CDS can include an alarm function that is triggered when an anomaly is detected or when a user attempts an inconsistent action.

The alarms can be designed to: i) send alerts to external or internal users in the form of pop-up windows or e-mails; ii) reject certain data logging or other data manipulation routines to prevent the logging of erroneous data; and iii) flag the violation of a rule – for example that a yield factor is out of bounds – with the option of blocking the process.¹¹⁶

The e-CDS must enable administrators to compile thematic lists of frequent alarms. A recurrent, formal listing of rule-violation alarms, for example, will enable CPCs, CNPCs and RFMOs to address issues of non-compliance.

¹¹⁶ An alarm in relation to a mass-balance rule violation, for example, may be triggered by the last exporter issuing a trade certificate in the e-CDS – but the trader may not be a fraudster, particularly if the same certificate is used by several processors and exporters. Automatic blocking on the basis of a mass-balance anomaly is not necessarily the right response in all cases.

8.7.13 Quota monitoring and enforcement

As shown in chapter 2, an e-CDS can be used as a TAC and quota-monitoring tool. In TAC and quota-managed fisheries, CPCs allot quotas to individual vessels in the national fleet. The e-CDS can be designed to work with country TACs, in which case all vessels land catch until the national TAC is reached and the fishery is closed. Alternatively, individual vessels are apportioned quotas through a routine in the e-CDS that is accessible to the competent authority, in which case vessel profiles must be registered, or quotas are allotted to companies operating a group of vessels. The e-CDS can be designed to provide complete flexibility at this level.

When a national TAC or an individual company or vessel quota is filled, the e-CDS can prevent the issue of further certificates; it can also warn companies or individual vessels when they are approaching their quota. The e-CDS can be designed so that importing countries can determine whether fish come from a country that has exceeded its quota. In such cases, the Commission must establish the rules governing quotas and overruns and programme the e-CDS to implement them. One reasonable option for marginal country TAC overruns is to accept them up to a specific limit, then to close the fishery concerned and discount the overrun from the next year's country TAC. This approach is currently used in some quota-managed fisheries.

8.8 DATA CONFIDENTIALITY

The importance of data confidentiality cannot be overstated. The fact that ICCAT CDS data are wholly confidential and cannot be accessed by anybody for any purpose underscores the significance of the issue and the sensitivities of stakeholders. The tuna industry is concerned about e-CDS data confidentiality, in that insecure data could enable users to fraudulently access commercially sensitive and otherwise confidential information. The e-CDS will contain hundreds of thousands of commercial invoices – for instance – containing information that individual companies do not want to be visible to competitors.

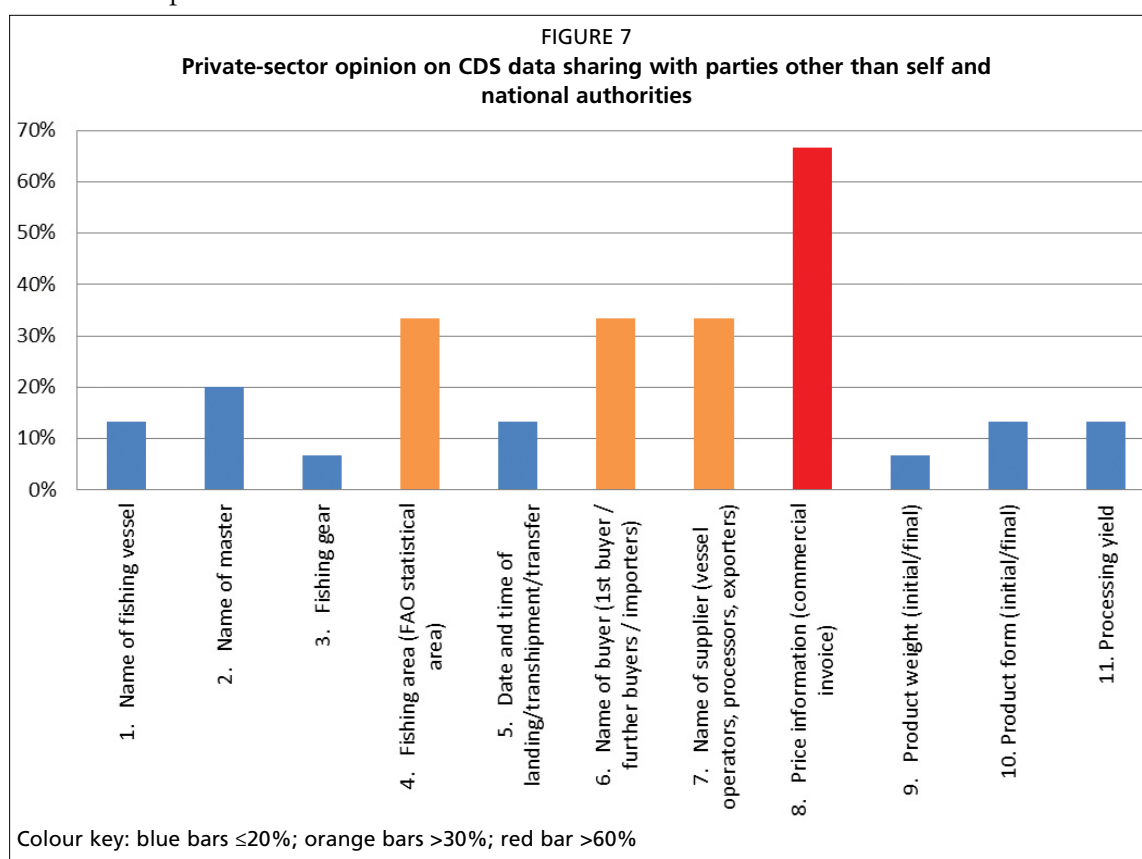


Figure 7 shows the opinions of tuna industry representatives at the 2015 Brussels Seafood Show with regard to e-CDS data availability: 67 percent of the representatives stated that price information should never be shared, and a third stated that information about supply-chain actors and FAO fishing area statistics should remain confidential. The representatives also thought that price and supply-chain information should be restricted to stakeholders with an immediate interest.

The important point is not to stifle the e-CDS by declaring all data off-limits: it is essential to lay down rules to determine which parties may access which data and for what purposes. And it must be borne in mind that the less the transparency in terms of access to e-CDS data, the less the e-CDS might be able to detect and address IUU fishing and product laundering.

The ICCAT CDS works within the limits placed on CDS data access largely because the largest share of Atlantic Bluefin tuna is exported to Japan and other likewise responsible end-market states, effectively giving this group of states the power to enforce the CDS. In a situation where markets are much more diverse and contain markets not minding the absence of certificates at import, the situation is different, and a higher degree of data access and analysis would likely be required to substantially counteract IUU fishing and laundering of fish through the system.

A sound option is to charge national authorities with the primary burden of oversight (see Chapter 10), to grant them full access to national data and to ensure that any related upstream or downstream supply-chain data are stripped of sensitive details but retain the potential to detect and address fraud. Non-compliance detected by the e-CDS must be reported to the Commission, and CPCs and CNPCs must address the issues and report back to the Commission on remedial action (see Chapter 10).

8.8.1 Existing CDS data sensitivities

Sensitive data issues identified by stakeholders during consultations for this work are set out below.

- Not all vessel operators want buyers and other downstream supply-chain actors to see the volumes of fish unloaded because the information allows other parties to estimate the efficiency of operations, which in turn affects commercial negotiations and pricing. This can be partially addressed by not making available the data in full catch certificates when trade certificates are circulated.
- In quota-managed fisheries, remaining TAC and quota figures for any country, operator or vessel are sensitive; displaying them on the e-CDS interface is disputed because it could affect commercial negotiations and the pricing of products.
- Information on commercial invoices uploaded into the e-CDS should be limited to competent authorities to enable them to establish the veracity of submissions for catch and trade certificates before validation. No other use should be allowed.
- The identities of upstream supply-chain actors should be protected because they are commercially sensitive. The information should be restricted to the essentials with regard to access by downstream businesses: this can be achieved by displaying country names instead of upstream supply-chain actor identities.

9. Additional CDS principles and considerations

This chapter addresses questions of risk analysis, coverage, exemptions, document security, rules and protocols, logbooks and reporting, observers, vessel monitoring and closed-cycle aquaculture with a view to covering practical matters that affect and condition the development of e-CDS.

9.1 RISK ANALYSIS

Risk analysis is often mentioned in relation to the development of e-CDS. Approaches should be risk-based in the sense that the level of risk of an adverse situation occurring should determine the nature and the intensity of the mitigating response.

In world tuna fisheries, and for high value stocks in particular, IUU fishing is a serious problem that may thwart an RFMO's efforts to managing stocks sustainably.

Misreporting and underreporting of catches by otherwise legal and licensed operators is currently understood to embody the most important forms of IUU fishing in global tuna fisheries. It was the key problem in both CCSBT and ICCAT Bluefin tuna fisheries before the putting in place of the respective CDS, and it has also recently been established as the single-most important issue in WCPO tuna fisheries.¹¹⁷ Misreporting, under-reporting and illegal transshipments are unique forms of IUU fishing that a CDS can tackle effectively when all other operations are legal – making a CDS the weapon of choice to tackle this risk.

IUU fishing is understood to increase profit margins. But the incidence of IUU fishing is not merely a function of fish availability and the prospect of larger profits: it is also a function of the existence (or absence) and effectiveness of existing law enforcement systems. In any fishery where disregard of the rules results in higher financial returns, the absence of a solid enforcement regime will naturally fuel the expansion of IUU fishing.

Hence there is good reason to look beyond risk analysis *per se* when deciding whether a CDS would be appropriate as a fisheries-management tool. The important issue is to recognize the links between the level of IUU fishing and effective deterrence. Establishing a CDS as a deterrent in tuna fisheries is likely to be a solid option, especially in fisheries where TAC and quota systems are being introduced, and specifically with a view to annulling the financial benefits of misreporting catches.

9.2 CDS COVERAGE – SPECIES

Risk identification and management is the first consideration when determining what species ought to be covered by a CDS. Apart from the risk of IUU fishing, it must be borne in mind that RFMOs – with the exception of CCSBT – manage a number of tuna species. The question then arises as to whether one or several species should be covered by a CDS.

¹¹⁷ The 2016 MRAG report, seeking to quantify IUU fishing in the tuna fisheries of the Pacific Islands Region, found that “estimates of IUU are dominated by the licensed fleet, accounting for over 95 percent of the total volume and value of IUU activity”. In both purse seine and tropical long-line fleets, “reporting violations”, “misreporting”, and “illegal transshipping” (which leads to unaccounted-for fish, and therefore translates into underreporting) were identified as the most important forms of identified IUU fishing across the WCPO.

Bearing in mind that: i) an effective enforcement system will maximize compliance and reduce IUU fishing, especially under stringent future management regimes considered in section 9.1; and ii) the development costs of a CDS are the same for one tuna species or several, it follows that covering all tuna species managed by any RFMO in a single CDS is an appealing option.

A CDS is likely to be advocated when a stock is not performing well, as in the case of Indian Ocean Yellowfin tuna in the 2000s.¹¹⁸ Atlantic Bluefin tuna and Southern Bluefin tuna were also under-performing at that time. IATTC and WCPFC are currently considering the introduction of a CDS for the stock of Pacific Bluefin tuna, which is not performing well. But this so-called “catastrophe-driven” approach is not necessarily the best way to manage stocks. It can be argued that all stocks, including imperilled ones, should enjoy the same level of protection from IUU fishing. And any stock for which catch limits are being considered should be protected through a CDS, ideally before the limits come into force. The CDS is currently the only mechanism capable of serving as an overarching enforcement tool in tuna-management regimes based on catch limits.¹¹⁹

It is also important to consider the end-products covered by CDS certificates. It is conservatively estimated that 75 percent of the volume of global captures goes into canned tuna products. Almost all of the world’s tuna purse seine fleet, which lands 66 percent of the volume of tuna catch, and much of the global longline and pole-and-line fleet supply tuna for this market. All species of tuna, except the most valuable Bluefin tuna species, are used in canning.

In the USA, a major market for canning-grade tuna, a distinction is made between “white-meat tuna” from Albacore tuna and “light-meat tuna” from Bigeye, Yellowfin and Skipjack tuna. Labelling laws are different in different countries, and processors may simply indicate on the can the type of tuna product rather than the species (see Figure 8).



If tuna species are only partially covered, accounting for them through a CDS becomes a problem because species-specific information for canned tuna is lost in many countries. Mislabelling is a serious issue in the tuna industry: this must be taken into account in any CDS so that incentives for such practices are eliminated. The most effective way of doing this is to cover all commercial tuna species managed by any RFMO: if all commercial species were covered, mislabelling would be largely eliminated as an option for fraud.

Mixing billfish with tuna products and mislabelling the cans is not a major issue, though mixing and mislabelling of billfish products themselves might occur. The decision to cover billfish must be based on risk analysis and the management system for these stocks. If the incidence of IUU fishing is perceived to be low, stocks are performing well and the management regime is unrestrictive, coverage of the species is hardly warranted. But in any other situation they should be covered also.

¹¹⁸ This led to a proposal for an IOTC YFT CDS – Ref: IOTC-2009-S13-PropK. In 2014 the EU and Australia were setting up a working group on CDS development.

¹¹⁹ The 2009 IOTC general assembly – Ref: IOTC-2009-S13-R[E] – debated catch limits for Bigeye and Yellowfin tuna and swordfish but failed to reach agreement. Such instances are a regular occurrence in RFMOs.

9.3 CDS COVERAGE – PRIMARY AND SECONDARY PRODUCTS

The tuna products fall into several categories:

- primary round and semi-processed tuna products – round, gutted, dressed or loined products made up entirely of fish for use in the preparation of tuna end-products for human consumption;
- end-products for human consumption – these may be tuna-only items such as sashimi slices or ingredients in products such as tuna in cans;
- secondary tuna products – by-products from processing such as heads, tails, eyes, gill plates, guts, skin, meat scrapings and bones, which may be used locally for human consumption or in products for animal consumption; and
- end-products for animal consumption or other industrial uses – normally obtained from secondary tuna products, and used in pet food, fish meal for aquaculture, essential oils and other derivatives.

A CDS must cover the primary tuna products and monitor their transformation into consumer items, the part of the chain of custody where most added value and revenues are generated and where IUU operators seek to make profits. IUU fishing to provide raw materials for secondary markets can be disregarded because it makes little economic sense and rarely occurs. CDS coverage of by-products for uses other than human consumption would do little to improve the protection of a fishery.

It would be difficult to cover trade in tuna by-products for uses other than human consumption, because they fall under different customs headings and because labelling rules are generally non-restrictive or not detailed enough.¹²⁰ In most jurisdictions it would hence be difficult or impossible to identify the tuna content of traded products such as animal feed.

9.4 EXEMPTIONS – FLEET OPERATIONS

This section deals with exemptions in terms of the types of operations that might be excluded from the CDS. Possible exemptions relating to species or product-type coverage have been considered in sections 9.2 and 9.3.

9.4.1 Domestic landings

A number of flag states consider that all landings except domestic landings must be covered by a CDS. This view is largely held because domestic landings may actually be tightly controlled by some states, and a CDS would constitute excessive oversight. But the exemption of domestic landings from certification has a number of implications for a CDS in terms of the assurances it can provide and the functions it can perform.

First, establishing a CDS is regarded by MCS practitioners in countries with large tuna fleets and weak flag-state oversight as a way of encouraging governments to develop more robust control and oversight mechanisms. In countries where such mechanisms are in place it is easy to developing administrative procedures for certifying national landings.

Second, if domestic landings were exempted and products could subsequently re-enter trade, the catch certificate – as the nexus of the traceability system – does not exist. It has never been suggested that domestic landings should be exempt from certification for international trade: hence, under a domestic exemption, the catch certificate must then be issued at a later time, close to the moment of exportation of the products derived from a domestic landing; which is a considerable time later, and opportunities to apply relevant flag-state oversight are lost. This reflects the tendency

¹²⁰ For example, under EU regulation EC 767/2009 governing the labelling of animal feed, the presence of marine animals must be indicated only if any of the following conditions are met: protein >10 percent, crude oils and fats >5 percent and/or moisture >8 percent. Pet foods containing fish do not usually specify the species.

to regard the issuing of a catch certificate as a mere administrative formality, which weakens the CDS at the critical juncture when the legality of a catch may be established and documented (*i.e.* before unloading). In the case of exempted domestic landings, the CDS would become just another TDS.

Third, if the CDS is to be used as a quota-monitoring tool in an output-limited fishery, all landings must be covered without exception. The only alternative to a centralized and self-enforcing quota-monitoring system under a CDS is the standard reporting by flag states – but this is an unreliable system that has contributed to near stock collapses in high-value tuna fisheries in the past.

For these reasons exemption of domestic landings must be avoided at all costs. CDS rules must apply equitably to all operators in a fishery regardless of where fish are unloaded. Responsible flag states must have the authority to issue or refuse catch certificates as a means of implementing optimum oversight of national operators and a rigorous system of sanctions. A CDS helps to enhance national oversight, whereas the exemption of national landings fuels lack of oversight, and critically weakens the CDS.

9.4.2 Operators

Another question concerns which operators may be exempted from CDS coverage. This applies mainly to small-scale artisanal fisheries targeting large pelagic fish for local markets. There are few such fisheries,¹²¹ of which the Comoros in East Africa is a good example: the fisheries are so informal, landing sites are so many and so widely distributed that there is no practicable way of regulating them in a CDS. As long as the fish do not enter international trade they can be exempted from CDS certification. But if the CDS is used to establish harvest statistics or to monitor TACs and quotas, catch from exempted small-scale fisheries must be accounted for through alternative reporting and estimation routines.

If small-scale artisanal fishers contribute catch for foreign trade, however, the CDS must apply in full. The simplified certificate can be used to enable artisanal fishers and similar medium-scale operators to participate in international supply chains if they wish.

All medium- and industrial-scale commercial operators must be subject to the CDS regardless of the intended destination of their products.

9.5 DOCUMENT SECURITY

Document security, which refers to the prevention of forgery and false or erroneous information, is largely dependent on whether the CDS is paper-based or electronic.

In paper-based systems such as the EU CDS document security is low. This is a serious problem in schemes intended to guarantee the legality of transactions: paper documents may be forged by photocopying or editing software and there is no register that can be queried by stakeholders, who must follow a lengthy procedure to confirm the authenticity of a certificate, or accept it as authentic knowing that the opposite could be the case.

In paper-based systems document security can be enhanced by restricting the issue of documents to originals only, which must have watermarks, holograms, original signatures and stamps to establish their authenticity. But in a CDS where splits occur along the supply chain and where certificates multiply in locations a long way from competent authorities that can issue originals, this option is wholly impracticable.

In e-CDS, document security is maximized because all originals are registered in a database that can easily be queried by stakeholders. Forgery of paper copies is still possible, but it has little practical value. It might be possible in theory to hack into the

¹²¹ Small-scale artisanal fisheries typically target coastal small pelagic fish and demersal fish; they rarely target large pelagic fish.

e-CDS and alter data in the database, but this can be prevented by electronic security routines.

9.6 CDS – RULES AND IMPLEMENTATION PROTOCOLS

CDS are complex and involve a large number of rules governing the processes whereby stakeholders participate in the fishery and the trade of its products. Rules must be clear to ensure that the CDS is implemented as intended. Processes must be clearly set out to ensure compliance with rules. Documents, for example, must be completed accurately in accordance with the supply-chain variant opted for by operators, such as landing and transshipping part of the catch during the same unloading.

In the transfer of tuna to farms, where exact numbers of fish and estimated weights must be established, the protocols determining matters such as sampling may change with the development of new technology. The protocols for establishing these figures must be clear and apply equitably to all stakeholders to ensure fair and equal treatment of operators in various countries involved in tuna fattening.¹²²

Most CDS are based on a single law¹²³ or a single CMM, even though the CMM establishing a CDS may have links to other CMMs.¹²⁴ If a rule is to change or a protocol is added, the law or the CMM as a whole has to be reviewed, which is difficult because decision-making processes are complex and there are political dimensions to be considered – while protocols are largely or exclusively technical in nature.

In the 2014 review of its CDS, CCAMLR decided to set out detailed procedures and protocols in its e-CDS User Manual¹²⁵ accompanying CMM 10-05. ICCAT revised its multi-annual recovery plan for Atlantic Bluefin tuna in the eastern Atlantic and Mediterranean in 2014 (Rec. 14-04). This included placing detailed protocols for using stereoscopic cameras in tuna caging and farming in annex 9 of that CMM, showing that CDS-related procedures can be set out in a separate document. The establishment of numbers and weights has direct links to the CDP and to quotas and TAC management, so the decision as to which text should contain detailed procedures may not be straightforward.

The ideal option is that opted for by CCAMLR. It is important to ensure that CDS rules are complete and clear at the level of the CMM, and that detailed implementation procedures are set out in a manual that can be accessed and updated as necessary. The legal standing of the manual and the procedures it contains must be firmly established.

9.7 LOGBOOKS AND E-REPORTING

Logbooks and their electronic variants, often referred to as “e-reporting” or “e-logbooks”, are the tool of choice for reporting fishing operations. They are integral parts of the regimes developed by tuna RFMOs to collect information from the fisheries.

¹²² During fieldwork in 2014, Maltese tuna farm operators indicated that the protocol for using stereoscopic cameras and evaluation of the footage to estimate numbers and weights was not detailed enough to guarantee consistent implementation among CPCs. Such uncertainties can result in differences in weight estimates and quota management, which are perceived to be unfair. Protocols must be detailed enough to prevent “implementation through interpretation”.

¹²³ From a CDS perspective, the Council and Commission Regulations EC 1005/2008 and EC 1010/2009 are understood as a single text of law; Commission Regulation 1010/2009 is in fact a subsidiary text to Council Regulation 1005/2008.

¹²⁴ CCAMLR’s CDS is implemented through CM 10-05 and the e-CDS User Manual, and is linked to CMs 10-02 (licencing), 10-03 (port inspections) and 10-04 (VMS).

¹²⁵ The e-CDS User Manual is defined as follows in paragraph 1 of CCAMLR CM10-05 (2014): The CCAMLR-developed document that describes, *inter alia*, the roles, responsibilities, processes and steps associated with the operation of the e-CDS for the creation, validation and storage of *Dissostichus* catch documents, DEDs and DREDs.

The question often arises as to why a CDS and a logbook regime should coexist when they are designed to do the same job. It is also regularly suggested that the CDS be used to supplement catch reporting with a view to contributing to scientific work such as stock assessment.

A CDS is neither a substitute for nor an extension of a logbook regime. The CDS collects a minimum amount of information, which is a sub-set of the data collected in a logbook.

In a CDS, only the species covered by the scheme are recorded, but not by trip or by set; the latter are, however, recorded in logbooks. Bycatch and non-tuna commercial species that are caught, transhipped or landed are not recorded by the CDS. Target species brought on board and subsequently discarded¹²⁶ are never unloaded and hence not certified; but such discards are generally recorded in logbooks. In short, CDS data are insufficient for the kind of detailed monitoring and documentation of fisheries made possible through the use of logbooks.

A CDS and a logbook regime serve different requirements. A logbook collects a variety of information to serve scientific fisheries processes such as stock assessment. A CDS is intended to identify a unit of unloaded catch, certify its legality and trace it through the supply chain to the end-market. The function of a logbook ends with unloading at the end of a fishing trip, whereas the function of a CDS as a traceability tool starts at unloading. A CDS cannot be a substitute or an extension of logbooks. The two tools and their objectives must be clearly defined and kept separate.

In MCS terms, relevant data cross-checking of CDS and logbook data ought to occur. For problematic vessels, masters or operators, routines for such cross-checks must be defined by the competent authority (see Chapter 10).

9.8 OBSERVERS

The deployment of observers is an important element in the management of commercial tuna fisheries. They may be deployed on large-scale vessels such as purse-seiners, on medium-sized vessels such as longliners, or on reefers licensed to operate in a fishery to observe transhipments. The central question is whether they should have a formal role in the CDS and have a part in validating certificates or verifying the information relating to transhipments.

There are two factions of MCS practitioners: one advocates observer schemes with no enforcement powers, the other advocates observer schemes with enforcement powers and a role in signing off paperwork in CDS systems.

Highly skilled observers operate in some fisheries, but many lack the technical means, training and skills to estimate accurately the mix and volumes of tuna transhipped. In most cases, therefore, the signature of the observer reflects administrative due diligence rather than a guarantee that the data in a certificate are factually correct.

An observer should have access to all information, including certificates covering transhipments or landings, with a view to notifying the competent authority of fraud – if suspected. This will lead to an investigation and, if fraud is proved, the blocking of any issued certificate and the application of sanctions.

9.9 VESSEL MONITORING SYSTEMS

VMS make it possible to establish where a fishing vessel is or has been operating. CCAMLR and WCPFC operate systems whereby their Secretariats have direct access to VMS data for vessels operating in their areas of competence. CCSBT, IATTC,

¹²⁶ During high-grading at sea, small tuna may be discarded to make space for larger or more valuable specimens.

ICCAT and IOTC have mandatory VMS in their areas of competence but have no direct access to the data, which are only accessible to the flag state of the fishing vessel.¹²⁷

A vessel's area of operation is fundamental in establishing the legality of a fishing operation. Because it is reported on the catch certificate, the existence of VMS transponders aboard fishing vessels covered by the scheme is critical.¹²⁸ In the absence of VMS, the area of operation of a fishing vessel cannot easily be determined.

A Commission VMS is clearly the best arrangement in a CDS, and it should be considered by RFMOs that plan to develop a CDS. It provides an additional layer of flagstate oversight, which would directly discourage weak national competent authorities from validating catch certificates for fishing trips outside their licenced zones of operation. In the absence of a Commission VMS the national competent authority is the sole arbiter of the legality of a fishing operation, a weakness in a fishery that operates in international waters under the authority of an RFMO.

In 2013, the CCAMLR Secretariat verified 600 *Dissostichus* catch documents against VMS position data in response to requests by US authorities in their capacity as the end-market state overseeing importation of the products. This shows that a Commission VMS can generate a good deal of additional work and cost. Future e-CDS systems should be designed to integrate VMS and catch certificate data to cross-check a fishing vessel's area and period of operation automatically. Issues can then be flagged automatically for the attention of the authorities tasked with validating submitted certificates.

9.10 CLOSED-CYCLE AQUACULTURE

There is currently little closed-cycle tuna aquaculture, but research and development is progressing in Europe and Asia. Pacific Bluefin tuna is being produced from eggs in Japan and Korea and sold to markets. The first-ever batch of closed-cycle Atlantic Bluefin tuna was put on the market by Ricardo Fuentes y Hijos Ltd. early in 2015.

An e-CDS provides a management framework for protecting tuna stock from IUU fishing, but mixing the same species of tuna from two sources complicates matters. Pacific Bluefin tuna is not covered by a CDS, but Atlantic Bluefin tuna is: Ricardo Fuentes y Hijos Ltd. had to apply for extra documents from ICCAT to exempt its first batch of aquaculture Atlantic Bluefin tuna from certification when it was marketed, which highlights the issue in that the budding e-CDP in question did not provide for the possibility of closed-cycle aquaculture.

If the same species of tuna is fished and also farmed in closed cycle and the wild-caught catch is subject to a CDS, the aquaculture portion must also be subject to the CDS or have a certification scheme of its own. The latter option would probably involve a wastage of resources because it would effectively have to duplicate the CDS.

The legal implications are complex. RFMOs do not have a mandate to manage national aquaculture operations, but an initial solution is for CPCs and CNPCs to legislate at the national level to including tuna aquaculture in the e-CDS and to provide

¹²⁷ CCSBT does not regulate an area of competence but a "species of competence" that covers Southern Bluefin tuna throughout its natural range. For an RFMO operating on this basis the definition of a Commission VMS would be complicated because there is no defined area within which the Commission VMS would apply.

¹²⁸ Rules on sizes of vessel to be covered by VMS differ among RFMOs. The IATTC CMM C-04-06 mandates that vessels longer than 24 metres must be fitted with transponders; IOTC CMM 06/03 mandates that vessels longer than 15 metres and operating on the high seas are to be covered. From a CDS perspective it is advisable that all vessels capable of operating in areas beyond national jurisdiction be covered, regardless of size.

for the certification of aquaculture operators. This would provide for farms to issue regular trade certificates at harvesting that show that the tuna is sourced from closed-cycle farming, in which source catch certificate numbers are not normally recorded.

In this case the farms must be registered in the e-CDS and trade certificates must list species, the number of fish and the total weight to be shipped, along with the date of shipment and the consignee.

Failure to cover closed-cycle aquaculture tuna would constitute a weakness in the CDS, which works on the assumption that it covers all the stock and species from a given region. If a source of tuna were to arise that was not covered by the CDS and the tuna entered international trade without being subject to the traceability framework, it could be used to launder non-originating product into the supply chain. This could become a distinct possibility within the next ten years.

10. Oversight and enforcement

Oversight and enforcement are critical aspects of a CDS. Oversight refers to management and monitoring functions, and enforcement refers to implementation of the rules and the application of sanctions in cases where rules are flouted.

With regard to enforcement, the principle of subsidiarity generally applies in RFMOs. This means that enforcement should be handled by the least centralized competent authority: in a CDS enforcement actions should therefore be carried out at the CPC level rather than by the RFMO itself.

Flag-state and port-state authorities may be unclear as to the enforcement measures applicable in a CDS for infractions such as false claims, submission of falsified documents and illegal fishing operations. Some of the questions that arise are: i) If IUU fishing is detected, should the competent authority refuse to issue a CDS certificate? ii) If IUU fishing is detected and the sanctions imposed are served by the offender, can the products be considered non-IUU and the CDS certificate issued? iii) If a requested CDS certificate is not issued, must the products be destroyed? iv) Can a competent authority decide to disregard instances of fraud and validate the CDS certificates concerned? v) What enforcement functions ought to be applied at the RFMO and CDS levels in cases where non-compliant requests are automatically rejected? vi) What is the appropriate level of sanctions for particular infractions? vii) Is refusal of a requested CDS certificate a sufficient sanction in certain circumstances?

These questions must be addressed in the design of a CDS. Oversight and sanctions must be implemented transparently and fairly to ensure that common infringements are met with similar responses.

10.1 RFMO LEVEL

The Secretariats of RFMOs should exercise general oversight to enable the Commission and members to obtain information about the functioning of the CDS. The mechanisms must be detailed enough to show how the CDS is working and the results it is producing. To do this, the Secretariat must be given a mandate by the Commission to monitor activities.

10.1.1 Automated oversight

“Automated oversight” means that routines designed to ensure the integrity of data are hard-wired into the e-CDS and not handled by the Secretariat or a body tasked with managing the scheme.

In the CCSBT paper-based CDS, the Secretariat implements automated oversight (manually) to ensure correct management and operation of the scheme. The Secretariat receives twin certificate submissions for all international Southern Bluefin tuna trade transactions, files the copy from the exporter and the one from the importer and establishes their authenticity. If either copy is missing, the Secretariat contacts the competent authority concerned to establish the reason. At the end of a cycle the listing of “open trades” – trades where one copy has not been submitted to the Secretariat – is sent to the compliance committee for consideration.

In an e-CDS system the Commission must decide which functions are overseen by the RFMO and which are automated. This ensures that fraud and certain categories of error are prevented by the CDS. In cases where automated enforcement routines are in place, errors in submissions automatically lead to refusals of the certificates applied for.

The following elements must be considered in relation to automated enforcement:

- Certificate linkages, line-by-line traceability, product-type cascades and mass-balance rules. The CDS must not allow errors in the links between certificates: i) “line-hopping” cannot be accepted – a product always comes from a specific species and product-type line in the source certificate; ii) a processed product cannot revert to a previous less-processed product type; this is known as “preserving the integrity of product cascade”; iii) a “child” certificate line cannot contain more product weight than the source certificate line to which it refers after yield factors have been taken into account.
- TACs and quotas. Depending on the flexibility of a TAC and quota management system, the CDS interface must raise an alarm if a country or individual vessels reach their TAC or quota limit. The CDS can be designed to reject applications for certificates when vessel or country limits are exceeded.¹²⁹

10.1.2 Periodic reconciliation reports

Periodic reconciliation reports, which are considered in Chapter 8, can be an automated function in an e-CDS to enable RFMOs to produce detailed reports on the consistency of trade flows along supply chains.

The CCSBT Secretariat is mandated to prepare a set number of reconciliation reports each year under its CDS. The CCAMLR Secretariat was so mandated in 2014, with the first reconciliation reports due in 2015. The ICCAT Secretariat has no mandate to analyse CDS data, which cannot be accessed by any group because such action has never been agreed. In the EU CDS data are not centralized, therefore reconciliations are impossible.

If reconciliation of data is not possible, oversight is deficient and there is considerable uncertainty as to the thoroughness and consistency with which the CDS is implemented by the stakeholders. Lack of reconciliation reporting amounts to a failure to exercise due oversight in a system designed to keep IUU fishing products out of supply chains. In the absence of oversight, fraud cannot be detected or eliminated, and such a CDS cannot achieve its objective.

The reconciliation reports of the CCSBT Secretariat are the following:

1. Farm Discrepancy Report. Analysis of numbers of fish and estimated weights delivered to farms compared with verified numbers and weight leaving farms.
2. Transshipment Discrepancy Report. Analysis of weights reported in catch monitoring forms compared with weights reported in transshipment declarations and weights reported by observers.
3. Catch Monitoring Form/Catch Tagging Form Reconciliation Report. Analysis of catch monitoring forms compared with catch-tagging forms.
4. Trade Certificate/Re-Export and Export Form Discrepancy Report. Comparison of product volumes reported in catch monitoring forms and trade certificates and between subsequent trade certificates.

There are many options for reconciling various “positions” in a CDS, so new types of reconciliation reports may be developed. A critical reconciliation report to add to the list is based on analysis of apparent domestic consumption of products in each country’s section of an international supply chain.¹³⁰ Internal consumption is a critical

¹²⁹ ICCAT Rec. 11-20, Paragraph 13. b) The CPCs shall validate the BCD for all Bluefin tuna products only when [...] the accumulated validated amounts are within their quotas or catch limits of each management year, including, where appropriate, individual quotas allocated to fishing vessels or traps [...].

¹³⁰ Apparent domestic consumption is obtained by subtracting estimated live weight volumes exported under the scheme from estimated live weight volumes imported under the scheme (assuming domestic landings are subject to certification also).

factor in understanding the percentage of products covered by certificates and entering a country that would normally not be re-exported: this enables the estimation of the proportion of certificates that are not to be re-used in trade.

Unused portions of legally held certificates whose products have been consumed domestically provide opportunities for fraudsters to launder non-originating fish into certified supply chains. The monitoring of internal consumption trends is one of the only ways to detect such laundering of non-originating fish into unused and legal portions of certificates held by operators. In processing countries such as Thailand, the normally unused portion of certificates should be low because most of the imported products are used in processing and then re-exported. In China, the portion consumed domestically is likely rising, reflecting the economic transition the country is undergoing. In prime consumer countries such as Japan, where large amounts of product may be processed and then consumed domestically, the normally unused portions of certificates is likely to be much greater.

In every territory along a supply chain, trade transactions are logged on a certificate-by-certificate basis. This gives a time-integrated total for imports and exports, which enables: i) assessment of the consistency of product mass-balance on a country-by-country basis; ii) estimation of domestic consumption trends; and iii) detection of mass-balance anomalies and potential introduction of non-originating fish into the supply chain.

Yield factors by processing type and country can also be monitored for consistency and anomalies, and published in a reconciliation report.

10.1.3 Compliance and trade-restrictive measures

All tuna RFMOs have a subsidiary body tasked with handling compliance issues. Such a compliance committee is generally supported by one or more compliance officers based in the Secretariat tasked with the compilation of data and reports for assessment and decisions as to the course of action to be taken in cases of irregularity and non-compliance.

The tuna RFMOs and CCAMLR have provisions enabling trade-restrictive measures to be imposed on states that do not comply with their rules,¹³¹ including those regulating CDS. But such trade-restrictive measures are little used for the

¹³¹ For example ICCAT (2006) Rec. 06-13 Concerning Trade Measures provides for the identification of CPCs and/or NCPs (through the action of the Compliance Committee) failing to discharge their obligations in the application of ICCAT CMMs; a mechanism is provided for the Executive Secretary to notify the State of the identification, and to demand 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.

enforcement of compliance. In CCSBT it applies only to non-contracting parties, but ICCAT has enacted import bans against several countries when all avenues for dialogue were exhausted without result.¹³²

Trade-restrictive measures in the form used by ICCAT can easily be imposed through a CDS by blocking the issue of certificates for catch harvested by territories suspected of IUU fishing or laundering of non-originating fish into supply chains. Such automatic blocking would immediately prevent legal trade in the suspected products, and would likely be more effective than leaving it to importing states to ensure the legality of products landed under particular flags or from particular territories.

10.1.4 IUU fishing, rogue processing and sanctions

A challenge arising from the principle of subsidiarity is that CPCs and CNPCs can decide what sanctions to impose for particular infractions in fisheries subject to RFMO conservation and management mandates. The flag state has primary responsibility for implementing RFMO CMMs and ensuring that its vessels comply with requirements.

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

The UNFSA provisions are endorsed by the tuna RFMOs, and CPCs and CNPCs are expected to take action against national IUU operators and to sanction serious violations of CMMs in accordance with UNFSA provisions.¹³³ RFMO-level sanctions include the blacklisting of fishing vessels and quota reductions, both of which can be implemented more effectively through an e-CDS because individual vessels can be blocked in the system and monitoring and enforcement of quotas can be automated and be highly accurate and effective.

A CDS must include a clear definition of IUU fishing and of the legal status of the products involved. Existing schemes are largely silent on this matter and provide little guidance as to actions to be taken by flag states and the possible certification of catch harvested during IUU fishing trips.

¹³² For example ICCAT (2000) Rec. 00-15 Regarding Belize, Cambodia, Honduras, and St. Vincent and the Grenadines Pursuant to the 1998 Resolution Concerning the Unreported and Unregulated Catches of Tuna by Large-Scale Longline Vessels in the Convention Area.

Article 1. ICCAT recommends that Contracting Parties take appropriate measures, consistent with provisions of the 1998 Resolution, to the effect that the import of Atlantic bigeye tuna and its products in any form from Belize, Cambodia, Honduras and St. Vincent and the Grenadines be prohibited, effective from the time this Recommendation enters into force [...].

¹³³ CCAMLR CM 10-05 (2014) on Catch Documentation Scheme for *Dissostichus* spp. establishes in Paragraph 14. [...] To the extent practicable, Parties shall ensure that no financial benefit arising from the sale of seized or confiscated *Dissostichus* spp. accrue to the perpetrators of IUU fishing

The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) defines IUU fishing.¹³⁴ If fishing operations fall under any of the definitions in its paragraph 3, the catch concerned is an IUU fishing product and hence illegal and not eligible for a validated catch certificate and hence should not be allowed to be legally traded.

The CMM establishing the CDS must be explicit regarding which infractions constitute IUU fishing from a CDS point of view. The CMM must establish the rule that products derived from IUU fishing cannot be certified in the CDS, and also state whether sanctions imposed for proven IUU fishing, and which have been duly served, can lead to eventual certification thereafter. Failure to regulate this critical aspect of the CDS would lead to uneven treatment of participating states and to certification of products that might not have been legally harvested, hence undermining one of the central purposes of the CDS.

A second set of considerations applies to processing and trading states, which are largely overlooked by international fisheries law in that there is no equivalent to “flag-state responsibility” for states primarily involved in the processing of fisheries products. Not all current CDS have rules governing standards of performance for flag states and processing states. Under the EU IUU Regulation the flag-state’s competent authority is the sole authority permitted to sign certificates, and the identification procedure only provides for identification of flag states and the imposition of trade restrictions against such states. Hence a processing state that tolerates the landing, importation and/or processing of products derived from IUU fishing, and their subsequent re-exportation, is not subject to the potential sanctioning mechanisms of the system.

Like port states,¹³⁵ processing states are responsible for ensuring that products imported by air, land and sea and through direct or indirect landings are free of products stemming from IUU fishing. Failure to do so puts such states on par with under-performing flag states or port states, and they should hence face the prospect to be identified as rogue states undermining international law and providing a conduit for IUU operators to bring illegal catches to market. Processing states must ensure

¹³⁴ 3.1 Illegal fishing refers to activities:

3.1.1 conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations;

3.1.2 conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or

3.1.3 in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

3.2 Unreported fishing refers to fishing activities:

3.2.1 which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or

3.2.2 undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

3.3 Unregulated fishing refers to fishing activities:

3.3.1 in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or

3.3.2 in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

¹³⁵ The 2009 Agreement on Port State Measures sets out standards of performance for port states with regard to regulating fisheries transactions in port and to combatting IUU fishing.

that only legal products are used in processing. In a CDS, any state in which mass-balance anomalies are detected with regard to flows of certified products and that fails to address the issue satisfactorily should face sanctions in the same way as a flag states or port states do.

In a CDS it is essential to ensure even-handed enforcement of the rules governing the integrity of catch and products along the supply chain from harvest to the end market. Fraud can be detected by the CDS at any stage along the supply chain, and a regulatory framework must be in place to enable the imposition of sanctions on states failing to discharge their duties, whether they are flag, port, processing or market states.

10.1.5 CDS review

Since 2008 most tuna RFMOs have implemented performance reviews¹³⁶ to establish whether they are achieving their objectives and to identify areas where performance might be improved.

Such performance reviews are essential for CDS. Performance criteria must be developed by consulting technical guidelines (such as this document), the Voluntary Guidelines on Catch Documentation Schemes being developed by FAO, and any other sets of standards developed collaboratively by RFMOs operating CDS.¹³⁷

The CCAMLR review of its CDS in 2014 led to the amended CM 10-05 (2014). CCSBT reviewed its CDS in 2015, during which it was decided to move it to an electronic platform.¹³⁸ ICCAT reviewed its CDS in 2011, leading to the amended Recommendation 11-20. The EU CDS is the only scheme where no guidance regarding a formal review has been provided since the inception of the scheme.

IUU fishing is concealed and difficult to quantify, and CDS review must focus on system design and functions, aiming to identify gaps in the scheme. The prevention of IUU fishing and the flow of illegal products through international trade largely depends on the soundness of CDS design, ensuring that gaps are minimised and that the enforcement framework performs as planned. This involves the concurrence of non-CDS elements such as port inspections, and at sea and air surveillance.

Rogue states will, unfortunately, continue to operate IUU fleets and allow the landing and the domestic marketing of non-certified catches. For some of these state-sponsored or tolerated malpractices, black markets will continue to persist, and CDS is not the primary weapon of choice. But other forms of IUU fishing, such as under-reporting of catches and fraudulent trading, can be effectively addressed by a CDS.

A review should always aim to enable an RFMO to make informed decisions on improvements to its CDS in an encompassing way, which makes the link between IUU fishing profiles and the way the CDS is able to address these in the most effective manner.

10.2 NATIONAL LEVEL

CPCs and CNPCs must ensure that state operators abide by all CDS rules. The performance of each state in managing its fishing fleet, traders importing and exporting products, processing companies, distributors and retailers, and in ensuring that no products derived from IUU fishing enter the supply chain must be centrally monitored by observing the inflow and outflow of products. Ultimately it is the diligence of individual states in this respect that will determine their performance and standing in the CDS.

¹³⁶ ICCAT: 2008; CCSBT: 2008 and 2014; IOTC: 2009; IATTC: 2015.

¹³⁷ The 2014 CCSBT performance review used the 2007 OECD Recommended Best Practices for Regional Fisheries Management Organizations as one of three sources.

¹³⁸ CCSBT is the only RFMO that has mandatory terms for CDS reviews: CMM Paragraph 9.2.

A central challenge affecting current CDS and the model presented in this paper is that they do not trace products through national markets.¹³⁹ Traceability through national markets is provided by national laws, as shown in Figure 1; tracing in the CDS stops when a product enters a country, and re-starts when it leaves. The challenge relates to the capacity of individual countries to track products from landing and importation to onward trade and exportation.

If a single company imports, processes and re-exports products, there is no sequence of transactions to be tracked in the CDS. If, however, a broker imports products and sells them to domestic processors who then re-export them, the domestic trade transactions are not covered by the CDS or logged outside company records. If an anomaly is detected,¹⁴⁰ the national traceability framework must enable the identification of the responsible party.

It is therefore a matter for individual countries to develop and maintain a functional traceability framework to oversee product flows in their territories and to identify and sanction operators who commit fraud.

10.2.1 Accessory measures at the national level

Accessory measures are rules and tools that may be used by CPCs and CNPCs to enhance their capacity to trace products covered by a CDS through their markets with a view to accelerating investigations into anomalies and minimizing the administrative burdens of competent authorities, particularly with regard to eliminating IUU fishing products from national supply chains and responding to CDS alarms.

10.2.1.1 Measure 1: Linking certificates and commercial invoices

To enable a competent authority to trace certificates through the national supply chain, it should be mandatory for commercial invoices to show the source certificate number and line identifying the acquired products. This must apply to products that might be re-exported, but need not apply to products traded into the domestic retail network.¹⁴¹ If a commercial invoice covers products from several certificates or several lines in a single certificate, it should be clear as to which product originates from which certificate and line. This information must be passed between seller and buyer because the latter must issue a trade certificate, providing a hard traceability link between the source certificate and the “child” certificate.

Mass-balance anomalies occur when single certificates are over-used. When an anomaly is detected the competent authority must order an inspection and require the sellers of product from the over-used source certificate to produce the original invoices or the catch certificate identifying them as first buyers. The e-CDS can easily be designed to produce such a list (see section 8.7.10). Copies of these commercial invoices must be obtained from both the sellers and buyers, and cross-checked for consistency. Such investigations should normally establish which buyer is exporting products that were not acquired in the declared quantities, or not acquired at all.

A major complication arises when a mass-balance anomaly occurs for products imported into two separate territories under a single catch certificate, which is possible in most existing CDS. But it is unlikely to occur in a system based on the system proposed in this paper (see Chapter 6) because a CC_{ver.} is issued to the importer on the basis of verified weights and given a three-digit extension to the document number. This makes the document number unique for each territory.

¹³⁹ The only exception is that the ICCAT paper-based CDP traces product through the market of first landing, but this might be discontinued in the e-CDP.

¹⁴⁰ Usually when the mass-balance between the volume of tuna imported and exported under a given certificate is incorrect, and more product was exported than was available – a clear indication that IUU-fishing products are being laundered into the supply chain.

¹⁴¹ It must be understood that if a commercial invoice does not provide detailed certificate information, the products acquired may not re-enter international trade.

If the same document number existed in two countries, a joint investigation would have to be led by the competent authorities concerned with a view to imposing sanctions severe enough to discourage future malpractice and to annul any financial benefits (see section 10.2.1.2).

10.2.1.2 Measure 2: CDS-specific business traceability records

National authorities should consider regulating business records of purchases, processing and sales of products covered by CDS certificates. If businesses are required to keep traceability records, competent authorities will be able to carry out audits and fraud investigations more easily. Developing a standard national format for the keeping of such records is advisable.

In such records, FBOs should keep certificate-by-certificate accounts of: i) product acquired, identifying the seller; ii) product processed; iii) product sold, identifying the buyer; and iv) product sold into domestic markets for consumption. This procedure does not entail the need to upload or transmit these data – which would imply the development of a separate electronic platform. The records must merely be kept at the premises, and be made available on request to inspectors, and must be kept by FBOs for a specified period, usually three years.

This enables competent authorities to easily establish the inventory of product holdings under individual certificates for each company when they are audited, and detect discrepancies.

10.2.1.3 Measure 3: Sanctions

A major issue in current CDS is that sanctions relating to non-reporting, mis-reporting or under-reporting, to documentary fraud or non-compliance with regulations are rarely severe enough to deter malpractice and encourage operators to comply.¹⁴² National fishery laws and other legal instruments must be invoked in cases where fraudulent documents are submitted to a competent authority for validation in a CDS, and states must ensure that any sanctions imposed are severe enough to deter fraudulent operators.

10.2.2 Acting on CDS-generated alarms

Chapter 8 discussed automated alarms in an e-CDS, and sections 10.2.1.2 and 10.2.1.3 show that: i) countries must exercise effective oversight of CDS; ii) systems for tracing certificates through supply chains are essential; and iii) detected anomalies must lead to sanctions – if fraud is verified.¹⁴³

Failure to prevent product laundering at the national level leads to mass-balance and yield-factor anomalies. Countries must, therefore, act on detected infringements and submit the outcomes of investigations to RFMOs to inform them about instances of malpractice and the resulting sanctions so that they can determine whether the problems are satisfactorily resolved.

¹⁴² For example in 2015 under Japanese fisheries law the penalty for inaccurate reporting was EUR 2 100, and that for logbook non-compliance was EUR 750 – but the financial benefits were several orders of magnitude higher. In Indonesia, fisheries law contained no provision enabling the state to impose deterrent sanctions for infringements by its operators in areas beyond the national jurisdiction.

¹⁴³ This principle is established in RFMO CDS. The CCSBT resolution on the implementation of a CDS establishes in Paragraph 7.4: “Each Member and Cooperating Non-Member shall cooperate and take all necessary steps with relevant authorities, and within domestic law, to review, investigate and resolve any concerns identified in 7.1 [verification of consignments] and 7.2 [data anomalies] and notify the Executive Secretary of the outcome of any such action for inclusion in its report to the Commission.”

10.2.3 Data cross-checking

It is important to cross-check data at the start of a supply chain when the legality of a catch is being established and when catch certificates are issued and validated. Various documents relating to catching, transshipping and landing are issued at this time, and the information in them should corroborate the information in catch certificates. Such documents include logbooks, transshipment requests and authorizations, landing requests and authorizations, transfer and caging requests and authorizations, and VMS data. The amount of data available to national authorities may be increasing, but routine cross-checking of this kind is the exception rather than the rule. Attitudes towards enforcement will have to change in some countries.

In some RFMOs, CPCs and CNPCs are already mandated to cross-check information at the start of the supply chain¹⁴⁴ with a view to guaranteeing that catch is legal and that only legal catch is certified. In ICCAT, these cross-checks are applied to all transshipments, landings, transfers and cagings. In commercial tuna fisheries with larger outputs it would be impractical to cover all events, so data cross-checks should be risk-based – operators with high risk profiles should be checked more regularly than operators with clean track records.

10.2.4 Cooperation between customs and fishery authorities

Customs authorities are responsible for the initial checks on products arriving for importation; this role is sometimes referred to in CDS.¹⁴⁵ Products regulated by CDS must comply with its requirements, and countries must ensure this before the products are allowed to enter a territory. A customs organization must also deal with the complexities of the regulations governing trade in renewable natural resources such as fisheries products, which involve a variety of regional and international agreements, restrictions and certification systems.

The best country-level models for ensuring that no fisheries products covered by a CDS enter or leave without the relevant certificates are collaborative – customs and fisheries authorities work together to exchange of information and share the responsibility for checks.

In Spain, for example, the Ministry of Agriculture, Food and the Environment¹⁴⁶ and the Spanish customs agency collaborate most effectively in dealing with the importation of fisheries products covered by a CDS. The ministry uses an electronic interface – SIGCPI¹⁴⁷ – in which importers log details of inbound consignments and which caters for imports under ICCAT, CCAMLR, CCSBT and EU CDS and other SDPs.

¹⁴⁴ For example ICCAT Rec. 14-04 Paragraph 70 states: “CPCs shall verify, including by using inspection reports and observer reports, VMS data, the submission of logbooks and relevant information recorded in the logbooks of their fishing vessels, in the transfer/ transshipment document and in the catch documents. The competent authorities shall carry out cross checks on all landings, all transshipment, transfers or caging between the quantities by species recorded in the fishing vessel logbook or quantities by species recorded in the transshipment declaration and the quantities recorded in the landing declaration or caging declaration, and any other relevant document, such as invoice and/or sales notes.”

¹⁴⁵ For example CCAMLR CM 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. [...]”

¹⁴⁶ The Ministry is responsible for fisheries. It has since been re-named “Ministry of Agriculture and Fisheries, Food and the Environment”.

¹⁴⁷ *Sistema integrado de gestión y de control de la pesca ilegal*. The initial development costs for the system amounted to EUR 700 000.

Scanned supporting documents are uploaded; originals must be submitted to the ministry within ten days. Economic operators log directly into SIGCPI and must enter all data for fisheries products to be imported. All such electronic submissions are verified and authorized or suspended by the ministry. If a consignment is suspended, additional documentation is required and the customs agency cannot release the consignment.¹⁴⁸

SIGCPI is integrated with the customs agency's electronic platform, so no paperwork is exchanged. For any importation the ministry sends only the harmonised customs code, product weight and import authorization number to the customs agency. Customs sees a reference to "EU IUU Regulation" on the interface regardless of which CDS is involved and suspends its procedure until the ministry has approved the importation. Once it is approved the customs agency applies its own risk-based assessment and authorization procedure. All fisheries-specific checks are thus carried out by the ministry; the customs agency has no part in the CDS-related process at all. The system is applied in the same way to exportations.

It is not suggested that all countries develop such an electronic system, linking fisheries and customs for CDS-covered fisheries products, and wider so-called national "single windows" projects may provide the basis to achieve useful integration of IT platforms, allowing competent authorities to exercise better oversight. Customs and fisheries authorities should develop collaborative arrangements to enable competent authorities to identify and verify inbound and outbound CDS-covered consignments before they are released by customs. Under such arrangements the procedures of the customs authority are augmented by the CDS-specific verifications carried out by the competent authority.¹⁴⁹

10.2.5 CDS training and information

National authorities should develop information and training materials regarding regulations governing the CDS. These must cover matters such as dealings with customs and fisheries authorities, the filing of paperwork, deadlines and sanctions. RFMO information and training materials must also be developed (see Chapter 11) but they will only cover the central parts of the system and apply equally to all stakeholders and operators under the CDS, for example in relation to use of the e-CDS web interface. Such materials must be publicised and available to all FBOs so that they can incorporate the regulations into their operational procedures.

10.2.6 National CDS-related traceability needs

Figure 1 in Chapter 4 shows that the national traceability segment of a supply chain is governed by national law and administered by national authorities. Countries along the supply chain are responsible for ensuring that no IUU products enter their segment and that no non-originating materials are laundered into supply streams for re-export. To implement such responsibilities countries must develop effective oversight tools, as discussed in sections 10.2.1.1, 10.2.1.2 and 10.2.1.3.

The CDS is established as a traceability system, and in order to work effectively, verifiable traceability must be maintained in both the national and international segments of the supply chain covered by the CDS.

¹⁴⁸ If a consignment is rejected by the ministry it is automatically rejected by the customs agency, and the economic operator has 15 days to remove it. This is applied in Spain but is not harmonized across the EU. Like all other CDS, the EU IUU Regulation does not establish harmonized sanctions for infractions.

¹⁴⁹ A customs organization should only be designated as a competent authority if it has fisheries expertise. In most cases, for obvious reasons, the competent authority should not be part of a fisheries administration.

A “one step forward, one step backwards” national traceability rule provides a useful national legal foundation for record-keeping that should be required at the national level, enabling countries to effectively support the implementation of the CDS.

10.2.7 Business-to-business transactions

Factories may run out of raw materials and seek short-term supplies, which may involve buying raw products directly from other companies or even competitors outside the regular supply channels. Such transactions may complicate traceability in national supply chains, and are one reason why businesses must keep detailed records with respect to CDS-covered transactions.

If such record-keeping is put in place, notably that suggested in section 10.2.1.1, business-to-business transactions will not constitute a major problem; but if it is not, insoluble problems will arise as a result of the lack of means to conduct audits, trace certificates and identify malpractice.

10.2.8 Warehouse and factory audits

A well-managed CDS will provide clear figures for imports and purchases of raw or semi-processed tuna. National authorities should develop risk-based audit routines, which may be embedded in existing SPS-related audit routines, to monitor warehoused inventories and to ensure the accuracy of company records.

Audits should involve only minimum interference with FBOs, but they signal to the private sector that the competent authority is actively managing the CDS. For example, certificates that have been discontinued as a result of wastage or non-certified sales into the domestic market but that are still listed in business records should be part of annual audits: this approach would lead to more accurate domestic consumption figures and improved oversight at the national level.

10.2.9 Oversight of artisanal fisheries

Simplified catch certificates and the practice of collecting product via motherships or at beaches create weaknesses in the CDS control framework at the start of the supply chain, because fishing vessels operate outside the segment covered by the CDS.

In the absence of a clear MCS policy in these fisheries, they can easily develop into a supply chain entry point for IUU products. MCS tools such as central listings of vessels authorized by RFMOs, VMS data and logbook regimes are often non-existent, and need to be developed if participation in a CDS is envisaged. Failure to do so would nullify the assurances provided by the CDS.

This is a matter for national authorities. In countries such as Indonesia with numerous artisanal tuna fisheries, it is often resource-limited provincial and municipal fisheries authorities that are tasked with such controls.

Among the tools needed to enable local fishery authorities to implement an oversight mandate are: i) up-to-date lists of the fishing permits of small-scale fishing vessels and operators; ii) lists of past infractions and sanctions; and iii) access to fisheries laws and regulations.

The verifications that fisheries officers should periodically carry out to ascertain the truthfulness of information submitted to them include, *inter alia*: i) assurance that the fishing vessels identified in catch certificates actually exist; and ii) the calculation of catch-per-unit-effort for vessels that regularly appear in catch certificates, and to ensure these are realistic.

10.2.10 Competent authority

The need for, and the establishment and accreditation of competent authorities under the CDS, has been referred to throughout this paper. The principle that law enforcement cannot be achieved in the absence of oversight – and the threat of enforcement and

sanctioning – is evident. When well designed, automated enforcement routines can achieve a lot, but they will not be sufficient to address all oversight, verification, validation and enforcement needs under the CDS. The need for competent authorities along the supply chain, with the competence to administer and supervise the activities that pertain to specific supply chain segments, arises from this consideration.

The CDS should be designed in a way that all competent authorities along the supply chain, other than end-market authorities, belong to states that are either CNPCs or CPCs of the RFMO operating the CDS. Exclusion is achieved by denying validation or counter-validation powers to would-be competent authorities of states not cooperating with the RFMO. This arrangement effectively excludes NCPs to play any active role along the supply chain, and limits non-cooperating states to a position of end-market states. In this way, the CDS is laid out in a way that ensures that states actively involved in the supply chain upstream from the end-market are primed to actively implement and enforce the scheme – thus increasing its effectiveness.

11. Developing and rolling out a CDS

This chapter provides an overview of elements to be considered in developing and rolling out a CDS.

11.1 DRIVERS OF CDS DEVELOPMENT INITIATIVES

Development of the current RFMO-level CDS has been largely catastrophe-driven. For example, the highly-prized Patagonian toothfish triggered large-scale fishing soon after it was discovered and had become accessible: this threatened a rapid collapse of stock in the absence of sturdy enforcement measures. Atlantic and Pacific Bluefin stocks covered by CDS have fallen rapidly as a result of overfishing and under-reporting and continue to evolve well below maximum sustainable yield (MSY) levels, though there are signs of recovery. It seems that the risk of stock collapse was needed to make the RFMO impose a CDS on its membership. A good deal of evidence suggests that the three fisheries were affected by high levels of IUU fishing.

The main driving forces in these cases were clearly the risk of stock collapse and high levels of IUU fishing.

It is still not clear whether the international community is prepared to introduce CDS before fisheries deteriorate to the point where drastic measures must be taken – and at a time when significant economic returns from some fisheries are being lost because the resource base is severely diminished, reproductive potential is declining and spiralling costs are eroding profits.

Based on ICCAT's experience, tuna RFMOs must recognize that IUU fishing can be significantly reduced when an effective CDS is introduced. The development of CDS should therefore be considered as a proactive step towards sustainable management of tuna resources rather than as a reactive last-resort attempt to save stocks from collapsing – at a point in time when much of the economic value of the fishery has been destroyed.

11.2 CMM ON CDS: DEVELOPING THE TEXT THROUGH THE RFMO

CDS are complex constructs because they must provide a seamless traceability system for complicated supply chains, minimizing opportunities for fraud and yet keeping the administrative burden to an acceptable level.

The design of a CDS should be entrusted to specialists to ensure that it is practicable, dependable and consistent. But RFMOs should assign working groups to consult with the specialists to provide clear guidance as to how the CDS should operate and which functionalities are required. Effective guidance constitutes the foundation of the CDS to be developed.

The elements to be considered by an RFMO with regard to a CDS as discussed in this paper are:

- Objective. What is the CDS intended to achieve?
- Coverage. Which species and fishing gear will it cover?
- Document system. Is a basic catch certificate and trade certificate system required, with verifiable traceability and mass-balance reconciliation functions? Are there practical alternatives?
- Traceability. What standard is being aimed for?

- Timing of certificate issue and submission. Are products always to be covered by a certificate before moving to the next step in the supply chain?
- What is to be validated? Will validation be in compliance with national and RFMO regulations, or one or the other?
- Type of scheme. Is an e-CDS or a paper-based CDS considered?
- Is tagging to be considered, and if yes, what functions will it serve?
- If an e-CDS is required, what system architecture should be developed?
- Exemptions. Are any operations, such as domestic landings to be exempted?
- Are validations and counter-validations required; notably from port states?
- Is there a role for coastal states in validation or counter-validation?
- Automated enforcement. Are routines needed that automatically enforce given parameters for matters such as data integrity, TAC and quota overruns?
- Automated alarms. Is the system to generate alarms for situations such as mass-balance and yield-factor anomalies?
- Administrative and financial burden. Is this to be a guiding consideration in system design?
- Monitoring and reporting. Who will be tasked to monitor, analyse and report on CDS data? Will there be reconciliation reports?
- Enforcement. What are the roles and responsibilities of CPCs, CNPCs and RFMOs in relation to action on non-compliance with CDS regulations?
- Data confidentiality. What rules apply regarding data confidentiality?
- Sanctions. What rules apply for particular types of non-compliance?
- Protocols. Will a user manual and implementation protocols be provided externally to the CMM establishing the CDS?
- How will capacity building in terms of using the system be addressed?
- Review. How will the effectiveness of the CDS be assessed?

The RFMO Secretariat should be mandated to draft a discussion paper on these questions and suggest initial options. The paper should also consider the effects of the different options on system design and its capacity to achieve its objective. Feedback must be requested from interested parties. The seventh meeting of the CCSBT compliance committee, for example, requested the Secretariat to prepare a report “exploring the costs and benefits of a web-based e-CDS” for distribution to its members for feedback and discussion by the Commission.¹⁵⁰

Agreement on these elements at the RFMO level will establish the principles on which the CDS will be based, and will enable the drafting of the CMM for discussion and adoption at the general assembly. Because the CMM and the CDS are closely linked, the experts tasked with system development should be involved in developing and drafting the CMM to ensure consistency from the CDS perspective. Not all the elements to be discussed will have a direct effect on CDS design: the point on sanctions, for example, will not affect the design but it is fundamental to the ultimate effectiveness of the CDS.

Once the CMM has been adopted, development of the CDS can start. The advice of ICCAT to CCSBT in 2013 with regard to e-CDS development was to “...revise and update all procedures, compliance regulations and rules before developing the [electronic] system. ICCAT found it difficult and complex to accommodate all of the existing rules and regulations into e-BCD since some were ambiguous, obsolete, or contradictory, which could have been reviewed before starting development to streamline the process.”¹⁵¹

¹⁵⁰ See: CCSBT-CC/1310/BGD02.

¹⁵¹ See: CCSBT-CC/1410/16.

The important point is that the CMM must be developed for the individual e-CDS to ensure that it is “fit for purpose”. As noted earlier, e-CDS are more versatile and flexible than paper-based systems, and the rules of implementation are different.

11.3 FUNDING AND PROJECT FORMULATION

Once the CMM is agreed, the Secretariat must be mandated to set up a CDS development project and to seek funding. A project document must be drafted to identify the project team and set out matters such as the definition of required profiles, tasks and responsibilities, timelines, costs, funding sources and deliverables.

The development of an e-CDS may be devolved to an external company. In this case the best option is to have a specialist team from the company working in the Secretariat alongside the Secretariat’s IT and compliance departments and other relevant staff for the duration of the project. This option enables direct exchanges of information, learning and prevention of misunderstandings and mistakes.

The project document should cover the following stages of development and preparation for roll-out:

- Logical framework – goals, results and activities.
- Project team and member profiles.
- e-CDS development – system parameters, functionalities and platforms.
- System tests.
- Development of user manuals.
- Awareness-raising.
- Development of multi-lingual training materials.
- Training.
- System roll-out.
- Periodic progress reports to the Secretariat and RFMO.
- Timelines and budgets.

In a project of this size it is difficult to gauge all parameters accurately at the start, and the likelihood of delays and challenges is high. Additional time, work and funding may well be needed and should be allowed for. A good project document and progress reports are essential in terms of communicating with potential funding sources and resolving issues rapidly and efficiently. Transparency is an essential requirement, especially where extra funds or additional support are needed.

11.4 e-CDS DEVELOPMENT

The team designated to develop the e-CDS should include a chief programmer, an assistant programmer and a tuna fisheries CDS expert such as an RFMO compliance officer with IT competence.

The architecture, purpose, functions and specifications of the e-CDS must be clearly defined from the outset, as discussed above, and the team should be made aware of the complexities of tuna fisheries and supply chains and the details of the related system functions and tasks. This will be a responsibility of the tuna fisheries CDS expert.

System routines and functions have a tendency to grow in number and complexity as a system is developed, and allocations of time and funding should be made accordingly. The list of system functions and specifications in the project document should be revised at an early stage and then on a recurrent basis as work progresses to ensure that potential overruns are identified. System interfaces, input screens and results pages should be tested by staff not involved in the design process to obtain unbiased user feedback, and adjusted accordingly.

11.5 e-CDS PILOT TESTING AND ADJUSTMENTS

Once a pilot version of the e-CDS is ready, tests must be run. These should follow a formal “test plan” to ensure that all real-world supply-chain permutations, data combinations and system functions such as recalls, cancellations, corrections, queries and blocking of certificates are functional. A first round of adjustments based on the identification and logging of defects should follow.

Once the e-CDS has been tested in this way, external partners should be identified for pilot system tests – national competent authorities and future private-sector users could be included.

When the e-CDS is fully hosted and can be accessed through its web interface, tests of accessibility and compatibility are needed. The chosen external users should be invited to log on to the system and carry out agreed tests relating to matters such as creating user profiles and entering fleet and factory data. They will then submit sample data for validation, simulated exportations and importations, simulated processing runs and linking of certificates complete with e-CDS test routines on yield-factor calculations, mass-balance monitoring, system alarms and e-mail notifications, and reporting.

The pilot testing phase should conclude with online access to some actual supply chains involving several fishing vessels, processing states, market states and the various competent authorities and businesses to ensure that the e-CDS performs correctly across the entire range of its functions.

The pilot tests can take a substantial amount of time to complete because it is an iterative process that perfects the e-CDS gradually. The end is reached when obvious defects have been successfully identified and eliminated. The time taken to complete this phase largely depends on the quality of programming, communications among the development team members and the thoroughness of the testing programme.

11.6 AWARENESS AND TRAINING

The development of a new CDS or the upgrading of an existing CDS calls for good communication to ensure that users are aware of developments, and able to use the system effectively. To this end, information must be made available in the appropriate languages.

11.6.1 Awareness raising

In parallel with the development of the e-CDS, an awareness raising campaign should be implemented with regard to roll-out of the system in a fishery. RFMO Secretariats must ensure that national authorities and private-sector entities are informed about the e-CDS and how it will affect their work once it comes online.

The Secretariats must not be tempted to think that because CPCs and CNPCs participate in events at which development of the e-CDS is considered that they will have informed their national competent authorities in detail as to what is planned. It is often the case that the compartmentalized nature of national fisheries administrations means that information does not naturally flow from the RFMO level to other relevant national-level bodies.

In particular, the managers of the e-CDS development programme must engage with governments to identify the designated national competent authorities that will deal with the e-CDS at the flag, port, farming, processing and market state levels and to ensure that they are included in information exchanges. On their part, the designated competent authorities should provide feedback on national tuna-sector operators so that they can be contacted and informed.

The awareness campaign should ensure that the vast majority of potential users of the e-CDS are informed about its development before testing begins: they should know when it will come into force and whom to contact for further information.

A web-page should be set up to show the progress of the project and provide for questions to be answered.

11.6.2 User manuals

User manuals must be prepared for all user groups – operators of fishing vessels and reefers, processors, traders, competent authorities and Secretariat staff with system access. A comprehensive manual covering all system functions should be made available for system administrators, but user manuals need only cover the information and functions required by individual user groups. The user manuals should be trialled during the pilot testing phase to obtain feedback from users as to completeness and user-friendliness.

The user manuals should be published online and be printable, and be designed to be kept in ring binders so that pages can be replaced as updates are introduced. The website should always contain the latest versions and updates.

The detailed rules of implementation given in the user manuals must be fully harmonized with the CMM governing the e-CDS and subsidiary to it. Any changes to the user manuals must be approved by the RFMO, but flexibility must be provided for user manual changes addressing bugs and defects, and which do not alter any of the established rules. In such cases, formal RFMO approval should be allowed to follow system fixes, and changes made to the manuals.

11.6.3 Training materials and courses

Simply circulating awareness-raising materials and user manuals will not guarantee that users will go through the initial log-on routine and then use the e-CDS proficiently. If the system is well designed and the online guidance and help functions are effective, much of the training and guidance for using the e-CDS can be handled through the system itself.¹⁵²

Training materials should be developed for public-sector and private-sector users. They should include exercises, multiple-choice tests and other familiarization options, and must complement the user manual.

Training courses for competent authorities and private-sector users should be set up in the appropriate languages in locations where groups from several countries can participate at the same time. Full use should be made of the internet in the form of online tutorials in handling the interface and in carrying out particular tasks and functions; specific online tutorials can be as short as three or four minutes.

11.7 ROLL-OUT

The RFMO must communicate to all stakeholders the dates on which the e-CDS will go online and on which it will become mandatory. The designated competent authorities must relay these notifications to national tuna FBOs. It is a good idea for the RFMO to also directly notify national tuna business associations in all CPC and CNPC countries, asking them to notify their members.

A one-week or two-week period should be fixed before the e-CDS comes into force during which competent authorities and public-sector operators can log on to enter their details, vessels, factories, and to create their user profiles complete with logons and passwords. Ideally, most users – especially vessel operators and competent authorities – should be ready when the e-CDS enters into force, to prevent bottlenecks when the first certificates are issued and validated.

¹⁵² Complex online banking or tax administration e-interfaces are commonly used without prior training; online guidance should be provided for users.

Only catches made after the date of roll-out can be managed under the e-CDS. In the EU CDS, for example, catches made before 1 January 2010 were exempted, even if they were traded after that date. In a new e-CDS only catches actually unloaded before the start date should be exempted: this is appropriate, since the unloading is the event that triggers the issue of the catch certificate.

A central question regarding roll-out relates to the continued existence of paper copies of certificates and the continuation of parallel systems in cases where paper-based CDS switch to an electronic platform. The issue is one of minimizing disruptions to trade: when ICCAT started to move to an e-CDS, for example, it decided to keep this option in place.

In an e-CDS designed from the outset as an electronic system there is no paper-based equivalent, so the question of compatibility does not arise. In ICCAT, paper documents were retained after the switch to the e-CDS because the original CMM did not envisage the change; the e-CDS will therefore continue to be based on the limited functionality of a paper-based system, but with the advantage that certificates can be submitted electronically.

System uptime for an e-CDS must be guaranteed at a rate of 99.95 percent system availability or better.¹⁵³ Interruptions for scheduled maintenance must be notified to all users by automated e-mails; unscheduled interruptions must be notified immediately. Returns to full system availability must also be notified immediately. In the case of short interruptions, data requiring logging, submission and validation will be dealt with when the e-CDS resumes. If the e-CDS has to be suspended for a day or more, the opportunity for adjustments and upgrading should be taken.

An online help-desk should be maintained by the Secretariat or the operator to respond to users' questions in real time, especially during the first months of the e-CDS, so that disruptions to trade are minimized. Answers to questions must be practical rather than generic. The helpdesk should be staffed by professionals with detailed knowledge of the e-CDS and the rules of implementation. The helpdesk and the IT team must remain on 24/7 stand-by, especially in the early stages, to address all queries and system faults in real time. Competent authorities should be encouraged to develop their own e-CDS helpdesks to assist the tuna businesses in their countries.

¹⁵³ Equivalent to downtime of 3.6 hours per month or 50.4 minutes per week. Scheduled downtime should be planned for times when average system usage rates are lowest.

12. Harmonization of tuna CDS

A growing cause for concern in the fishing industry is an apparent proliferation of documentation schemes, including schemes for purposes other than the certification of legal provenance. Examples include: i) the Marine Stewardship Council sustainable fishery certification scheme; ii) the multilateral ICCAT and CCSBT CDS covering the tuna industry; iii) the unilateral EU CDS covering marine fish imports into the EU market; iv) the Presidential Task Force on IUU Fishing, developing a unilateral risk-based CDS for the US market; and v) tuna RFMOs such as IOTC, IATTC and WCPFC, which are considering or actively developing multilateral CDS.

CDS constitute a third set of trade-related regulations for businesses after those determining tariffs and SPS rules – all determining eligibility for exportation to certain markets. Hence the concern among stakeholders is that a large number of certificates will have to be completed, logged, verified and validated by competent authorities to ensure that products are covered from catch to unloading and export into markets, creating major administrative burdens.

12.1 CDS COMMON STANDARDS AND HARMONIZATION

In IPOA-IUU (2001) paragraphs 69 and 76 call for “... consistent and effective implementation...” of trade-related measures to combat IUU fishing and for “... certification and documentation requirements...” to be “... standardized to the extent feasible”. Initial work on harmonizing trade and catch documentation started with an FAO expert consultation in 2002, which produced a standardized list of data to be collected in certification schemes, but which did not consider how the data would flow between fishing grounds and end markets.

After several meetings on standardization and harmonization of trade and catch documentation schemes, COFI members agreed in 2009 to formulate best practice traceability guidelines. FAO produced *Best Practice Guidelines on Traceability* in 2014, and launched the development of *Voluntary Guidelines for Catch Documentation Schemes* in 2015.

A tuna RFMO forum supported by FAO met in 2007 in Kobe, Japan, followed by three more meetings.¹⁵⁴ Four areas were identified in which RFMOs should cooperate: the first was “... harmonization and improvement of the trade tracking programmes and, as appropriate, development of catch documentation including tagging systems as required...”.¹⁵⁵ This was considered by a technical working group in Raleigh, USA, which also noted that: “... SDPs had major shortcomings and that movement to catch documentation schemes [...] was needed.” As a result, ICCAT changed its Bluefin tuna Statistical Document Programme to a CDS,¹⁵⁶ and CCSBT followed suit two years later. But these schemes are not “harmonized”, even though they cover Bluefin tuna fisheries that are similar in terms of gear, supply chains and end markets.

Another workshop on MCS ensued in 2010,¹⁵⁷ and the final Kobe III meeting was held in 2011. Little progress was made with regard to CDS apart from generic recommendations adopted by some participants at the 2010 workshop:

¹⁵⁴ Generally referred to as the Kobe process.

¹⁵⁵ See: www.tuna-org.org/documents/other/kobe%20report%20english-appendices.pdf Appendix 14, section II.

¹⁵⁶ Report of the Tuna RFMOs Chairs’ Meeting, 2008.

¹⁵⁷ Joint Tuna RFMOs, 2010. Report of the International Workshop on Improvement, Harmonization and Compatibility of Monitoring, Control and Surveillance Measures, Including Monitoring Catches from Catching Vessels to Markets

- CDS should be expanded to more tuna species and to sharks.
- Modern technologies such as electronic systems must be utilized.
- RFMO CDS should supersede unilateral schemes.
- Coastal and port states should be fully involved in CDS systems because validation of certificates by flag states alone was insufficient.
- Tagging as a form of “certification and validation” needed to be considered.
- Artisanal fisheries needed a simplified mechanism to channel catches into trade.
- A grace period was needed for the implementation of expanded CDS.

The Kobe process did not produce binding recommendations¹⁵⁸ or a process for harmonizing tuna CDS in terms of objectives, standards and formats, but it did broadcast some important messages. Clarke (2010) argued that the Kobe process emphasized that the primary objectives were CDS optimization and the adoption of shared high-level objectives. Actors in the Kobe process argued that harmonization was a matter of making the range of functions compatible in all CDS.

The options presented in this paper are fully consistent with, and reflect the Kobe findings.

12.2 GLOBAL TUNA CDS: AN OPPORTUNITY

IOTC members, and particularly WCPFC members, have for some years been advocating for CDS development in their RFMOs; IATTC members have recently advocated for a Pacific Bluefin tuna CDS. In WCPFC the process has been ongoing for ten years, which shows how complex CDS design and implementation can be and highlights the need and usefulness to develop a better understanding of the concept and to promote standardization through the current FAO initiatives.

Currently 99.5 percent of global tuna catches are not covered by CDS. Every effort should therefore be made to ensure a consistent approach to developing standardized CDS for global tuna fisheries in accordance with options outlined in this paper, and forthcoming documents such as the FAO *Voluntary Guidelines on Catch Documentation Schemes*. RFMOs must be at the heart of this process.

The obvious and rational solution would be to create a single global CDS that covers all remaining commercially exploited tuna stocks and species. This would address stakeholders’ requirements in terms of: i) preventing proliferation of separate CDS; ii) minimizing administrative burden; iii) minimizing the costs of designing and operating CDS; and iv) maximizing the effectiveness of CDS.

Political considerations aside, the development of a single global tuna CDS for all remaining commercial tuna stocks covered by four RFMOs is technically feasible. The inter-RFMO diversity of CMMs does not impede CDS functions or certification processes: catch certificates establish compliance with conservation and management measures, and the traceability framework and re-issue of trade certificates through international trade to end-markets does not require different handling from an RFMO perspective. A single effective system that can accommodate complex supply-chain permutations would provide the required safeguards against the introduction of IUU products into certified supply chains worldwide.

The ICCAT and CCSBT CDS systems for Bluefin tuna could join such a global scheme: ICCAT could do so immediately for the remaining tuna species under its purview, and CCSBT could do so when the conditions justifying the switch are satisfied.

¹⁵⁸ Joint Tuna RFMOs, 2011. Background document K3-013. “After the Workshop, CDS proposals were submitted to IATTC, ICCAT and IOTC, taking into consideration the discussions at the Workshop. For various reasons, none of the RFMOs adopted any of these proposals, but decided to continue discussions.”

Harmonization would be achieved naturally and authorities and operators worldwide would need to become familiar with only a single interface and system. In practical terms the catch certificate requires only a section indicating the RFMO the tuna comes from;¹⁵⁹ RFMO-specific rules determining the information to be recorded can be switched on or off in the CDS.

From a technical point of view a harmonized CDS would not prevent RFMOs from administering their areas of competence or from having their data protected from unauthorized access. The involvement of RFMOs in operating and administering the CDS could then be reduced to a minimum. It is conceivable, for example, that a global tuna CDS based on a minimum CMM shared among RFMOs could determine system capabilities: individual RFMOs could set their own mechanisms for data confidentiality, data monitoring and oversight through subsidiary CMMs detailing the application of the CDS to their fisheries. In this sense it is useful to think of the CDS as an MCS tool such as VMS that supports a set of technical capabilities that can be adapted and utilized in diverse ways by different RFMOs.

Chapter 13 provides a model CMM that could serve as a baseline from which to negotiate a harmonized CDS shared by all tuna RFMOs.

12.3 IMPLICATIONS OF TUNA CDS LIMITED TO INDIVIDUAL RFMOs

Table 2 in Chapter 1 lists the 23 tuna stocks exploited on a commercial scale, of which two stocks of Atlantic Bluefin tuna are covered by the ICCAT CDS and one stock of Southern Bluefin tuna is covered by the CCSBT CDS. Both CDS cover the full geographic extent of the species – that is, no part of an Atlantic Bluefin or Southern Bluefin tuna stock is fished outside the remit of these CDS. The same applies to the CCAMLR CDS. Hence the existing RFMO CDS cover all stocks and the global range of the species.

All other tuna species are constituted of four to six distinct stocks distributed across the globe: they are not limited to the area of competence of a single tuna RFMO. The important question is: What would happen if any of the major tuna RFMO's was to roll out its own CDS covering any or all of the major commercial tuna species – Albacore, Yellowfin, Bigeye and Skipjack – without the other RFMOs following suit?

While oversight challenges at the start of the supply chain regarding the issue of catch certificates will be more limited, substantial challenges arise further down the supply chain when catches are distributed, pooled, split, processed and re-processed, and eventually exported or re-exported to destination markets.

Thailand, for example, is the most important tuna processor in the market: it sources tuna globally and processes up to 800,000 mt annually – a fifth of global catches. What mechanism could prevent individual processors from buying tuna without certificates from a CDS-managed fishery and re-labelling it as tuna from a non-CDS fishery where no certificates are required for products to enter and leave countries and circulate in international trade?

The short but inconvenient answer is that no system-bound mechanism could account for all sources of tuna at a border.¹⁶⁰ Such a mechanism would have to be instituted by each country to establish the portions of species originating from a particular RFMO and to trace them through their markets; there would be no overall system of oversight. In the real world such a system is doomed to failure because of the resource implications for setting it up and implementing it, the lack of central oversight and the resulting differences in implementation between countries. Such differences

¹⁵⁹ See Annexes I to III. The RFMO selection in trade certificates would be automated in the CDS and would be completed on the basis of the information in the source catch certificate.

¹⁶⁰ The system-bound mechanism only accounts for CDS-covered tuna entering any country.

would provide opportunities to be exploited by IUU fishing interests, hence creating channels through which non-originating fish could reach markets; the illegal economic gains would be likely to undermine the benefits to be derived from the CDS as a whole.

If one of the four major tuna RFMOs¹⁶¹ were to set up its own CDS covering any of the major commercial species without mirror schemes in the other three, the inclusivity and impermeability of the CDS would be compromised at the level of international trade: with the large quantities of tuna of the same species legitimately traded without certificates, the CDS would be severely compromised in its ability to combat IUU fishing. This was recognized in the 2008 report of the Tuna RFMO Chair's Meeting, which noted: "It was also recognized that tracking systems for the same species should be established and [...] be harmonized around the world, emphasizing the desirability to move toward use of CDSs."

In ICCAT, catches taken in the Atlantic have been misreported as having been taken in the Indian Ocean in the past, where no quota limits applied (ICCAT, 2005). This shows that IUU fishing operators exploit gaps and the lack of harmonization among RFMOs with regard to tuna fisheries management. "Fragmented"¹⁶² tuna CDS would fare no better: IUU catches taken in RFMO areas subject to a CDS could simply be "re-labelled" as originating from an RFMO area where no CDS applies and enter markets without difficulty.



Labelling requirements for tuna consumer products, showing the ocean and RFMO area where the source products were harvested are not usually robust enough to support CDS in terms of counteracting fraud. For example, EU labelling requirements for prepared and preserved fish such as canned tuna allow for multiple areas of catch origin. Figure 9 shows the label of a can of pole-and-line caught Skipjack tuna in a German supermarket in September 2015: it displays five FAO areas as the origin, corresponding to parts of all the major tuna RFMO areas except IATTC.

Harmonization of CDS would hence save significant resources and simplify tuna CDS

matters for all stakeholders. With regard to the major commercial species, harmonized and simultaneous CDS coverage of all tuna RFMO areas of competence may be the only practicable approach if an effective and results-driven tuna CDS is to be achieved. This view is shared by industry leaders in tuna sourcing and processing.¹⁶³

Experience with the existing RFMO CDS shows that if a harmonized CDS were implemented to cover all the major tuna RFMOs and the four commercial species of tuna as yet not covered by a CDS, the oversight of tuna harvesting, processing and trade would reach new levels of effectiveness, and the most damaging forms of IUU fishing would be reduced. A harmonized global tuna CDS would also enable the RFMOs to monitor quotas and TAC for species where such output controls would contribute significantly to improved resource management.¹⁶⁴

¹⁶¹ CCSBT is excluded because it only manages Southern Bluefin tuna, which is already subject to a CDS. This does not prevent CCSBT from joining a harmonized global tuna CDS in future.

¹⁶² Refers to non-harmonized CDS limited to single RFMOs.

¹⁶³ "I think a universally applicable and effective catch documentation scheme would be the most rigorous way of proving legal provenance of tuna product and properly combating IUU fishing." Personal communication, sourcing manager of Bumble Bee Seafoods, San Diego, USA.

¹⁶⁴ IOTC and WCPFC are regularly faulted by environmental groups for failure to apply TACs in the management of stocks, especially those that show signs of overfishing. A global tuna CDS would enable quasi-immediate and effective implementation of such management tools.

13. Model CMM for a harmonized tuna CDS

This final chapter offers a model CMM based on the suggested options presented in this paper as the basis for the development of an effective CDS. Whatever the political and diplomatic issues, it is hoped that this paper will help to rekindle the Kobe discussions on the harmonization of CDS between RFMOs, or indeed lead to the discussion and development of a harmonised global tuna CDS shared by all tuna RFMOs.

The model CMM is divided into headings and numbered articles. Table 19 lists which articles are common core elements of a harmonized shared CMM that leading to a global CDS capable of providing the required degree of traceability and control over legal tuna product flows from harvest to end market. The other elements, shown as best-practice proposals, may be adjusted at the RFMO level without prejudice to the shared nature of a global CDS.

Where the formulation is in agreement with the options presented in this paper, the suggested provision is likely to have been sourced directly or in modified form from the CDS CMMs of CCAMLR, CCSBT and ICCAT.

13.1 MODEL TUNA CDS CONSERVATION AND MANAGEMENT MEASURE

Catch Documentation Scheme for Tuna and other Highly Migratory Species

Preamble

The Commission,
concerned that illegal, unreported and unregulated (IUU) fishing for tuna and highly migratory species (HMS) in the Convention Area threatens serious depletion of stocks;
aware that IUU fishing involves significant by-catch of endangered species such as sharks and seabirds;
noting that IUU fishing is inconsistent with the objective of sustainable fisheries management and seriously undermines the effectiveness of conservation and management measures;
noting the responsibility of Flag States to ensure that their vessels conduct their fishing activities in a legal manner;
mindful of the right and obligations of Port States to promote the effectiveness of regional fishery conservation and management measures;
emphasizing the right and duties of Processing States and Market States to promote effective regional fishery conservation and management measures through the monitoring and regulation of trade;
recognizing that the implementation of a Catch Documentation Scheme (CDS) for tuna and other HMS will provide the Commission with the information necessary to promote the management objectives of the Convention;
committed to taking steps consistent with international law to identify the origins of tuna and other HMS entering the markets of Cooperating Parties (CPCs) and

Cooperating Non-Parties (CNPCs) to the Commission and to determine whether species harvested in the Convention Area that are imported into, processed in and/or traded through their territories are caught in a manner consistent with [RFMO] conservation and management measures;

wishing to reinforce the conservation measures already adopted by the Commission with respect to tuna and other HMS;

aware of the importance of enhancing cooperation with non-contracting parties (NCPs) to help to deter and eliminate IUU fishing in the Convention Area; and

inviting NCPs whose vessels fish for tuna and HMS in the Convention Area or participate in the processing and/or trade of these species to participate in the CDS;

hereby adopts the Conservation and Management Measure (CMM) set out below.

Definitions

1. Catch certificate. An electronic document generated through the interface of [the RFMO]'s electronic catch documentation scheme (e-CDS) documenting the harvest, transshipment, transfer, landing and first sale of tuna and HMS.
2. Trade certificate. An electronic document generated through the interface of [the RFMO]'s e-CDS documenting the importation, processing and export or re-export of consignments of tuna and HMS products in harvested or processed form.
3. Certificate number. A system-generated random ten-digit sequence that uniquely identifies any catch certificate and trade certificate in the e-CDS.
4. Competent authority. The State authority responsible for the verification, validation and/or counter-validation of catch certificates and/or trade certificates. A competent authority may be constituted in a coastal, flag, port, processing or end-market State.
5. Coastal state. The State in whose Exclusive Economic Zone (EEZ) tuna and HMS may be harvested, which is entitled to verify the validity of catch certificates issued and validated for fishing operations in its waters.
6. Flag state. The State that controls fishing vessels flying its flag and operating in the Convention Area whose competent authority has primary responsibility for validating catch certificates.
7. Port state. The State that controls a particular port area or free trade zone for the purposes of landing and transshipment whose competent authority has primary responsibility for verifying and counter-validating landing details in catch certificates, including verified weights of landed products.
8. Processing or market state. The State that controls a particular territory or free trade zone for the purposes of importing, warehousing, processing, exporting and re-exporting products whose competent authority has primary responsibility for verifying and validating trade certificates.
9. End-market state. The State importing fisheries products within whose territory imported products are consumed in their totality regardless of further processing in that territory; products imported into end-market states cannot re-enter international trade as exports or re-exports.
10. Landing. The first movement of catch in its harvested or processed form from a vessel to a dock or to another vessel in a port or free trade zone where the catch is certified as landed by an authority of the Port State. Landings can be done by fishing vessels, reefers and motherships.
11. Mass-balance anomaly. A condition arising when more product than the quantity recorded in a certificate enters the supply chain. The e-CDS detects such anomalies at the individual certificate level.

12. First point of sale. The farm, company or trader identified in the catch certificate acquiring a batch of live-transferred or landed fish; the verified weight of landed product is established at the first point of sale.
13. Importation. Catch entering any part of a State's territory, except where the catch is landed or transhipped according to definitions of 'landing' or 'transhipment' in this CMM.
14. Exportation. Any movement of catch in its harvested or processed form from territory under the control of the State or free trade zone of landing, or, where that State or free trade zone forms part of a customs union, any other member State of that customs union.
15. Re-exportation. Movement of catch in its harvested or processed form from the free trade zone or the State territory or the territory of a State member of the customs union of import unless the entity concerned is the first place of import, in which case the movement is an 'exportation' as defined in this CMM.
16. Transhipment. Movement of catch in its harvested or processed form from a vessel to another vessel, the latter including reefers and motherships, and, where such transfer takes place in the territory of a Port State, for the purpose of removing it from that State. To forestall doubt, temporarily placing a catch on land or an artificial structure to facilitate such transfer shall not prevent the transfer from being a transhipment where the catch is not landed according to the definition of 'landing' in this CMM.
17. Transfer: Movement of live fish from the nets of a fishing vessel either directly or via tow cages into the growing cages of a fattening facility or fish farm.
18. Unloading. Removing fish from a fishing vessel either as a landing, an at-sea transfer of live fish into tow cages, or an at-sea or in-port transhipment, or any other movement of fish from a fishing vessel into the supply chain; discards are not covered.

CDS objective and coverage

19. The objective of the CDS is to combat IUU fishing by denying fisheries products derived from IUU fishing access to markets. Only products certified in the CDS as being of legal provenance may be landed and enter international trade and markets.
20. CDS data may be useful in combination with other information for research and MCS efforts. Such uses are to be determined by the Commission and are subject to the data confidentiality rules provided in Paragraph 40.
21. The CDS embodies a near-real time catch accounting mechanism that can be adapted for use as a TAC and quota-monitoring tool in output-managed fisheries.
22. The species to be covered by the CDS at launch are the commercial species of: i) Bigeye tuna; ii) Yellowfin tuna; iii) Albacore tuna; and iv) Skipjack tuna. The fishing gear used to harvest these species is covered by the CDS.
23. Other HMS managed by the [RFMO] but not covered initially may be covered at a later date as decided by the Commission. Such species may include billfish and sharks.
24. The fishery products covered by the CDS include all forms of fresh or frozen meat and preserved forms of fish products for trade and consumption. Secondary products – heads, tails, guts, gill plates, fish meal, bones, oils, offal, eyes, roe and hearts are exempt from the CDS.
25. Small-scale artisanal fishery products are exempt from the CDS if such products are destined for domestic consumption and markets and not for international trade. All other domestic and foreign harvesting and unloading operations are covered by the CDS regardless of the final market of the harvested products.

Traceability and mass balance

26. The CDS implements verifiable traceability equitably and transparently with respect to all States and individual economic operators participating in the harvesting and international trade of the tuna species covered.
27. With two minor exceptions (see Paragraph 41 and Paragraph 67) the CDS traces fish products from the fishing vessel through unloading and through international trade to the point of final import into the end-market state.
28. The CDS provides international traceability by logging and tracing trade among countries and territories until the product reaches the end-market state.
29. The CDS does not provide national traceability. Product movements and commercial transactions inside countries and territories are not covered directly.
30. The CDS traces batches of harvested products recorded in separate rows in the catch certificate catch table (see Annex I, section 3) throughout the supply chain by line number.
31. The e-CDS automatically monitors line-by-line mass-balance between all pairs of source certificates and the associated resulting export certificates, and triggers alarms when mass-balance anomalies arise.

Electronic means and data confidentiality

32. The e-CDS is a web-based central electronic platform and database; it is accessed by users remotely through individual log-on procedures.
33. The e-CDS allows any number of tuna RFMOs to participate and can be customized to allow for the integration of RFMO-specific rules and functions.
34. Private-sector and public-sector users have access to the e-CDS as provided in Paragraph 32.
35. The e-CDS has four user groups and customized interfaces for each:
 - i. The private-sector interface, enabling the logging and submission of certificates for validation and other functions to which they have access.
 - ii. The public-sector interface, enabling competent authorities to validate or counter-validate certificates, access information and use other functions of the e-CDS to which they have access.
 - iii. The RFMO interface, enabling oversight and access to the information needed for monitoring and reporting.
 - iv. The administrator interface, enabling technical personnel to administer the system.
36. Certificate data are entered into the e-CDS by private-sector users, who are wholly responsible for the accuracy of the data. No data forming part of certificates are entered or submitted by competent authorities.
37. Sessions by all users logging onto the system and their actions during each session are logged.
38. The e-CDS provides functions such as data logging, data saving, querying of datasets and automated alarms. Specific functions allow users to:
 - i. create fleet and processing facility profiles;
 - ii. initiate sessions to issue certificates;
 - iii. log certificate data;
 - iv. link certificates;
 - v. submit certificates for validation;
 - vi. upload supporting documents;
 - vii. open and validate certificates;
 - viii. trace certificates;
 - ix. verify mass balance along the supply chain;
 - x. review and edit certificates; and
 - xi. block certificates, etc.

The User Manual referred in articles 55 to 57 details the user groups' access to CDS functions and the applicable rules.

39. The e-CDS enables the integration of national and Commission VMS data for automated verification of fishing vessels' reported areas of operation.
40. The e-CDS data are subject to the following minimum data confidentiality rules:
 - i. Access by private-sector users is limited to data relating to their company, fleet and factory operations and to immediate upstream certificate information allowing them to create links with certificates from which products are sourced. Upstream certificate information is stripped of details not relevant to the creation of links.
 - ii. Access by competent authorities is limited to national datasets and immediate upstream certificate information.
 - iii. The Commission, its subsidiary bodies and Secretariat have access to data for the purposes of reporting, research and enforcement (see Paragraph 99 and Paragraph 100). Any use of data other than those specified in this CMM requires a specific decision by the Commission.

Document system and rules

41. The document system of the CDS is based on the catch certificate (unloading) and trade certificate (import/export).
42. Certificate models are unique and supplied by the e-CDS as shown in the annexes to this CMM.
43. A simplified catch certificate may be used in artisanal and small-scale commercial fisheries where separation of catches cannot be maintained because of the accepted modes of harvesting, unloading and pooling of catches at sea or on land.
44. Under the simplified catch certificate, traceability back to individual fishing vessels is forfeited.
45. The catch certificate is completed and submitted electronically for validation by the vessel operator at each planned unloading. The catch certificate covers the part of any catch to be unloaded. The validated catch certificate must be in place before unloading takes place.
46. The catch certificate cannot be submitted or validated after unloading, except in cases of *force majeure*.
47. Trade certificates may link back to catch certificates and simplified catch certificates and are not affected by the type of catch certificate to which they are linked.
48. The catch certificate is always issued on the basis of estimated weights; the simplified catch certificate is always issued on the basis of verified weights.
49. A model catch certificate and a simplified catch certificate are appended in Annex I and Annex II of this CMM.
50. The trade certificate is completed and submitted electronically for validation by the exporter each time a consignment is readied for export. For a first export the source certificate of the trade certificate is a catch certificate or a simplified catch certificate; for any re-export, the source certificate is the earlier trade certificate under which the source products were imported.
51. The importer of a consignment must record the acceptance of a consignment in the e-CDS. Failure to do so entails that the trade certificate is not available for re-export and that the consignment has reached its end-market destination.
52. The trade certificate model to be used for export or a re-export is the same.
53. The CDS and its rules do not in any way replace existing documents, forms, applications or authorizations provided for in other CMMs unless specifically provided for in this or any other CMM.

User manual

54. The Executive Secretary will establish and maintain an e-CDS User Manual.
55. The User Manual provides detailed procedures for managing and completing catch and trade certificates. The User Manual may be revised or expanded upon the initiative of CPCs, the Commission, a subsidiary body to the Commission or the Secretariat, when the need arises. An *a priori* or an *a posteriori* decision of the Commission is required to formally adopt any revision or expansion implemented by the Secretariat.
56. The procedures in the User Manual cannot run counter to the rules established in this CMM.
57. The User Manual has two versions, one for private-sector operators and one for public-sector authorities. Core sections of the manual are shared between both.
58. The User Manual provides guidance under the following headings:
 - i. seeking helpdesk assistance
 - ii. using the e-CDS user interface;
 - iii. the e-CDS functions available to the user groups, the applicable rules and guidance for use;
 - iv. procedures for completing certificates and the submission and uploading of supporting documents;
 - v. procedures for issuing catch certificates for transshipments, unloadings to several recipients, transfers and re-export of bulk tuna;
 - vi. procedures for the amendment, cancellation or blocking of issued certificates;
 - vii. procedures for estimating live fish weights transferred into farms; and
 - viii. rules for preparing CDS reconciliation reports and specification of the levels of data aggregation and confidentiality required.

Roles of CPCs and CNPCs

59. CPCs and CNPCs must provide to the Executive Secretary the name and address of their competent authorities and the nature of their responsibility – coastal, port, flag or market. This information must first be made available two months before the e-CDS enters into force, and may be updated thereafter on an as-needs basis.
60. Coastal state or flag state CPCs and CNPCs must notify the Executive Secretary of the small-scale artisanal and small-scale commercial fisheries eligible to use simplified catch certificates. This information must first be made available two months before the e-CDS enters into force, and may be updated thereafter on an as-needs basis.
61. Competent authorities should develop risk-based verification routines to enable them to establish the legal standing of transactions in certificates submitted to them for validation.
62. Competent authorities must validate certificates in cases where verification provides assurance as to the legality of transactions to be certified.
63. Flag state competent authorities must verify catch certificates submitted by their fishing vessel operators to establish the legality of fishing operations.
64. Market state competent authorities must verify trade certificates submitted by their food business operators to establish the correctness of information in certificates relating to source materials, processing, processing yields and invoicing.
65. Market state competent authorities must inspect the facilities and audit the records of national food business operators in cases where mass-balance anomalies are detected.

66. Coastal state competent authorities should verify catch certificates for fishing operations in their waters. Coastal state competent authorities must block flag state validation of such certificates if there is evidence of IUU fishing in their waters. Coastal state approval is based on the principle of non-objection: only if a coastal state competent authority objects to the validation of a certificate will its validation be blocked. In the event of a blocked catch certificate, the flag and the coastal States must cooperate directly to investigate and resolve the matter.
67. Port state competent authorities must verify validated catch certificates before transshipments, transfers or landings can be authorized in its ports.
68. Port state competent authorities must counter-validate the verified weight of landed products shown in catch certificates when they are received and graded at a facility.
69. Port and market state competent authorities must ensure that no primary products (see Paragraph 24) are imported into their territories without a validated certificate.
70. Market state competent authorities must ensure that no primary products (see Paragraph 24) are exported from their territories without a certificate validated by them.
71. CPCs and CNPCs should inform the Executive Secretary and the Commission about CDS implementation issues and where appropriate submit proposals for improving its operation.

Rights and duties of NCPs

72. NCP private-sector operators may not access the e-CDS and may not issue certificates.
73. NCPs are encouraged to apply CDS rules with regard to product landings and imports to provide assurances that no products enter their territory without validated certificates provided by flag states or market states.
74. NCPs involved in the trade of products covered by the CDS must gain CNPC or CPC status in order to fully participate in international trade of the products in any function other than the final importing end-market state.

Tuna aquaculture

75. In tuna-fattening aquaculture, accounting for fish for reconciliation purposes is undertaken on the basis of numbers of fish, not weight. The number of fish received by farms compared with the number harvested from them is used by the e-CDS to establish mass-balance compliance. Verified weights received by farms and verified weights removed from farms are also recorded.
76. In tuna-fattening aquaculture, transfers from several fishing vessels may be pooled in single grow-out cages for the purposes of the CDS, without prejudice to rules of origin and tariff considerations, which may require cages to be separated according to source fishing vessel flag and destination markets.
77. A trade certificate is issued when tuna is harvested from a farm whether its destination is domestic or international.
78. With regard to cages in which fish from more than one transfer are pooled, trade certificates are issued sequentially on the basis of the catch certificates for fish delivered to the farm and the dates of caging. The first catch certificate received for a cage is the first catch certificate to be used to link trade certificates until it is exhausted, after which the next catch certificate is used, and so on.
79. In aquaculture operations where species covered by the CDS are obtained from eggs, CPCs and CNPCs must require the issue of [RFMO] trade certificates for all harvests and select "CLOSED CYCLE" in the first column of section 1 of the trade certificate.

Non-Compliance and Sanctions

80. Non-compliance with national fisheries laws and conservation and management measures established under the [RFMO] Convention, constitutes IUU fishing. Certificates covering product shown to be derived from IUU fishing must not be validated or counter-validated by competent authorities pending sanction under national law(s).
81. Coastal states must block validated and counter-validated catch certificates relating to proven IUU fishing operations in their waters.
82. Such blocking of catch certificates by coastal states must occur before the port state counter-validates the certificates: this is to limit financial prejudice to legal operators in the supply chain following the landing, buying and grading of products.
83. No product harvested in contravention of national and international fishery rules should be destroyed unless it poses a health hazard.
84. Harvested IUU products may ultimately be certified and channelled to markets once sanctions have been imposed on perpetrators and have been serviced: this shall confer the status of legal provenance on the products.
85. As a minimum, any financial benefits accruing to perpetrators of fraud from IUU fishing must be wholly forfeited under the sanctions imposed.
86. CPCs and CNPCs should, where necessary, revise national fishery laws to ensure that genuinely deterrent sanctions are available to them (see Paragraph 84).
87. Any financial benefit derived from IUU fishing additional to legal fishing operations should guide sanctioning authorities; this must be done transparently.
88. States involved in cases of fisheries fraud as parties exercising jurisdiction as flag, port, market or coastal states should cooperate in terms of investigating, sharing evidence and imposing sanctions to the extent permitted under national laws.
89. States involved in cases of fishing fraud but not in agreement with the sanctions imposed by the flag state may refuse to counter-validate certificates and: i) a port state may prohibit a landing; or ii) a coastal state may refuse to lift an objection to a catch certificate. In all such cases the products concerned are barred from landing and international trade.
90. Catch certificates blocked by a coastal state or lacking port state counter-validation cannot be used as a source certificate to give rise to a trade certificate.
91. If a flag state imposes non-validation of a catch certificate as a sanction for established fraud, it must validate the certificate and then block it to ensure that the certificate data are recorded in the e-CDS.
92. Validation of trade certificates should be refused by market states if mass-balance anomalies are detected, pending investigation. If fraud is established sanctions in line with the standards in Paragraph 85 should be applied, including the option of indefinite non-validation of submitted trade certificates.
93. States may refuse the importation of products covered by trade certificates flagged in the e-CDS as “over-used”^{*} pending clarification from the exporting state as to the outcome of investigations and any sanctions imposed. States may decide whether to accept or reject importation of the consignment on the basis of such information.
^{*} This means that the exporting state is exporting more product under a particular certificate than has been landed or imported into its territory.
94. In order to limit financial prejudice to legal operators in the supply chain, the blocking of upstream certificates cannot affect validated downstream certificates; it may only prevent future transactions from taking place with regard to the blocked certificate.

Role of the Executive Secretary

95. The Executive Secretary shall report annually to the Compliance Committee and the Commission with regard to the work in this respect.
96. A record of designated CPC and CNPC competent authorities in charge of CDS matters will be established and maintained by the Executive Secretary.
97. The Executive Secretary shall promptly circulate all information about scheduled system downtimes, system malfunctions and solutions to CPC and CNPC competent authorities and private sector users.
98. The Executive Secretary supervises the technical implementation of the e-CDS, logs technical issues and solutions and proposes improvements to the Compliance Committee and the Commission annually.
99. The Executive Secretary liaises with CPCs and CNPCs with regard to mass-balance anomalies and records official CPC and CNPC communications about resolution of the issues and, where applicable, sanctions imposed.
100. The Executive Secretary has full access to e-CDS data for oversight purposes, but may not share disaggregated data with any party other than the party that validated the data.
101. The Executive Secretary issues annual e-CDS reconciliation reports, as stated in the User Manual. As a minimum, reconciliation reports shall cover the following:
 - a. Total Catch Report. An annual mid-year report on data from the year preceding publication covering total tuna catch by flag, month, species and gear type, based on catch certificate data, which must be compared with catch reported by CPCs and CNPCs and with TAC and quota allocations where applicable.
 - b. Mass-Balance Anomaly Report. A report published two months before compliance committee meetings covering: i) mass-balance anomalies logged in the e-CDS by flag, farm, port or market state; ii) all relevant supply-chain transactions; iii) investigations and solutions to anomalies applied by CPCs and CNPCs; iv) the status of all listed certificates at the time of publication to be indicated – unblocked, blocked pending resolution or terminally blocked; and v) a compliance estimate in terms of product affected by mass-balance anomalies compared with the volume circulating in trade.
 - c. Supply Chain Report. An annual mid-year report on data from the year preceding publication covering: i) product flows; ii) the main ports of landing; iii) the main processing states, re-processing states and end-market states; iv) the main imported product types; and v) an analysis of trends.
 - d. Apparent Domestic Consumption Report. An annual mid-year report on data from the year preceding publication covering: i) apparent domestic consumption, by species, of all port and market states participating in the tuna supply chain, derived by subtracting the estimated green weight of products exported from the estimated green weight of products landed and imported; ii) analysis of long-term domestic consumption trends, by country, compared with domestic consumption figures from other sources; and iii) highlights of significant trend deviations.

Role of the Commission

102. The Commission shall request the cooperation of NCPs that are engaged in the fishing, processing or importation of species and products covered by the CDS, and encourage such States to join the Commission as a CNPCs or CPCs.
103. The Commission must annually review information on CDS implementation and compliance presented by the Secretariat.

104. The Commission will discuss proposals and take decisions with regard to improving implementation of the e-CDS, expanding its coverage or improving its effectiveness.
105. The Commission should invite other tuna Commissions to join the e-CDS if this is deemed to be advantageous.

Annexes I, II and III

[See the models in Annexes 1–3 of this paper.]

13.2 NOTES ON THE MODEL CMM

The elements proposed in the model CMM are based on the options presented and discussed in this paper.

The document system rules in the proposed User Manual (see Paragraph 57 iv) are a new approach. They were first introduced by CCAMLR in 2015 for its e-CDS, and are in broad agreement with the documentation rules in Chapter 6 of this paper in that they detail where, when, by whom and how individual catch certificates are issued, submitted and validated within the e-CDS for given types of unloading and scenarios. The catch certificate system is complex and will require more detailed procedures; the trade certificate system is simpler and needs fewer rules.

The same applies to the e-CDS functions to be developed, as discussed in Chapter 8. Numerous functions should be made available to users, and it would overload the CMM to specify them all; they are in any case likely to evolve and multiply to make the interface more user-friendly over time.

13.3 CORE AND SUGGESTED-BEST-PRACTICE CMM ARTICLES

Table 19 provides the headings and articles of the model CMM – core articles defining the CDS as a technical tool, and best-practice elements to be developed by the Commission according to the use of the e-CDS with a view to enhancing compliance and eliminating IUU fishing. These headings can, of course, be discussed and modified as required.

TABLE 19
Core and Suggested Best Practice CMM Headings and Articles

CMM heading	Core	Suggested best practice	Notes
Preamble		✓	
Definitions		✓	
CDS objective and coverage	✓		Species coverage may be immediately expanded
Traceability and mass balance	✓		
Electronic functions and data confidentiality rules	✓		Some details may be left out in a first iteration of the CMM
Document system and rules	✓		
User manual		✓	
Roles of CPCs and CNPCs	✓		
Rights and duties of NCPs		✓	

CMM heading	Core	Suggested best practice	Notes
Tuna aquaculture		✓	
Non-compliance and sanctions		✓	
Role of the Executive Secretary	✓		
Role of the Commission	✓		
Annexes – certificate models	✓		

It is possible to omit six of these headings to provide a skeleton CMM sufficient for the development of the e-CDS – but it will then be necessary to negotiate the reinstatement of some or the introduction of new ones to provide regulatory substance covering e-CDS rules, aquaculture operations and – most important – the sanctions for non-compliance. These are critical to the success of the e-CDS in preventing IUU fishing.

13.4 ENFORCEMENT AND SANCTIONS FRAMEWORK

The sanctions framework is a major weakness of all current CDS. It generally allocates enforcement powers to the parties responsible for validating certificates and largely fails to provide a transparent framework and acceptable accountability.

In Table 19 the proposed sanctions framework in the model CMM is assessed as “suggested best practice” rather than “core” because: i) it goes beyond the standard enforcement provisions in current RFMO CMMs; and ii) because it will challenge state parties that do not currently investigate or sanction violations of international fisheries law effectively or consistently.

If an e-CDS is to be effective in addressing IUU fishing, bolder provisions are needed that provide for genuinely deterrent sanctions. Such provisions must lift state actors out of the comfort zone in which they may have been solely responsible for deciding on sanctions to be imposed and the information to be communicated to parties such as RFMOs. In supply chains where parties pass on legally certified product from one step in the supply chain to the next, parties cannot continue to evolve in isolation from one another or decide for themselves which infringements they will investigate and sanction, and which ones they will not.

In the sanctions framework proposed in the model CMM, this is achieved by creating a system of: i) peer-pressure and oversight; ii) automated checks and alarms; iii) transparency regarding compliance and fraud; iv) transparency regarding sanctions applied; and v) supply-chain induced stakeholder-to-stakeholder checks and balances in which supplier and recipient pairs of supply-chain state parties must agree on the appropriateness of measures undertaken to sanction established fraud in the supply chain.

The objective of the e-CDS is to combat IUU fishing. To achieve this difficult goal it must be endowed with enforcement and deterrence mechanisms that are transparent and effective.

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Annex I – The harmonized full tuna catch certificate model

HARMONISED FULL TUNA CATCH CERTIFICATE						
Catch certificate ID no.		[XX] – FCC – _____				
RFMO	CCSBT	IATTC	ICCAT	IOTC	WCPFC	
Section 1. Fishing vessel identity						
Name of Master	Master's licence no.	Vessel flag	Vessel IRCS	Vessel IMO no.	RFMO vessel ID no.	
Vessel registration no.	Vessel name	Fishing licence no.	Fishing licence validity	Licenced fishing areas	Fishing gear	
JFO	Share of catch (%) – lead f.v.	Other f.v. in JFO	Share of catch (%)			
		1.				
		2.				
Section 2. Fishing dates & zones						
Fishing zone(s)			Period (from-to)			
Section 3. Catch table						
Fish to be unloaded from fishing vessel				Live transfer to farm		1 st point of sale (section 7)
Line #	Species	Product type	Product weight (est.) in kg	Ver. number of fish (live)	Ver. weight (live) in kg	Product weight (ver.) in kg
1						
2						
3						
Section 4. Flag State validation				Farm State counter-validation		
Flag State CA		Validation date		see Section 8.		
Section 5. Transshipment						
Name of Master	Master's licence no.	Reefer flag	Reefer IMO no.	Reefer RFMO ID no.		
Reefer registration no.	Reefer name	Licence no.	Licence validity	Licenced operating areas		
Reefer IRCS	Transshipment (sea / port)	Transshipment coordinates & name of port	Transshipment period (from-to)	Name of observer		

Section 6. Reefer Flag State and Port State counter-validations					
Reefer Flag State CA		Validation date		Port State CA	
Section 7. First point of sale (or farm)					
Port of landing or farm (coordinates & name)				Landing date (or date of caging)	
Name of agent		Company name		Company address	
Section 8. Port / Farm State counter-validation					
Port / Farm State CA				Validation date	
Section 9. Second trade (ungraded bulk tuna)					
Line #	Species	Product type	Product weight (estimate) in kg	Product weight (verified) in kg	
1					
2					
3					
Transport details (international trade only)			2nd buyer details		
Export destination (country)	Bill of lading / airway bill no.	Consignment weight	Name of manager	Company name	Company address
Date of exportation	Port of exportation	Port of destination			
Section 10. Export State validation			Import State counter-validation		
Export (Port) State CA		Validation date		Import State CA	

Annex II – The harmonized simplified tuna catch certificate model

HARMONISED SIMPLIFIED TUNA CATCH CERTIFICATE					
Catch certificate ID no.		[XX] – SCC – _____			
RFMO	CCSBT	IATTC	ICCAT	IOTC	WCPFC
Section 1. Buyer details					
Name of manager		Company name		Company address	
Mode of fish collection					
at-sea using collector vessel			on land using refrigerated truck (or equivalent)		
()			()		
Collector vessel details (if applicable)					
Name of Master	Vessel flag	RFMO vessel ID no.	Vessel IRCS	Vessel registration no.	Vessel name
Fishing licence no.	Fishing licence validity	Licensed operating areas	Maritime area of fish collection	Landing location of collected fish	Landing date of collected fish
Section 2. Fishing zones, dates & landing locations					
Fishing zone(s) covered by all fishers / contrib. fishing vessels		Period covering all fishing trips (from-to)		Landing location(s) (for land-based collection only)	
Section 3. Combined catch table					
Line #	Species	Product type		Product weight (verified) in kg	
1					
2					
3					
Section 4. Fishing vessel & catch table					
Vessel name	Vessel registration no.	Fishing licence no.	Species	Product type	Product weight (in kg)
Section 5. Coastal State validation					
Coastal State CA				Validation date	

Annex III – The harmonized tuna trade certificate model

HARMONISED TUNA TRADE CERTIFICATE									
Trade certificate ID no.		[XX] – TC – -----							
RFMO		CCSBT	IATTC	ICCAT	IOTC	WCPFC			
Section 1. Product table									
Preceding CDS source cert. ID no. (CC or TC)	Line no. (source)	Number of fish processed (farmed tuna)	Species	Original product type	Original product weight used in processing (in kg)	Resulting product type	Net drained fish weight after processing (in kg)	Net product weight after processing, including fish (in kg)	
Section 2. Processor / exporter details									
Name of manager			Name of company		Address of company				
Section 3. Buyer / importer details									
Name of manager			Name of company		Address of company				
Section 4. Transport details									
Country of export destination	Consignment weight (gross)	Bill of lading / airway bill no.	Date of exportation	Port of exportation (from)	Port of destination (to)				
Section 5. Processing State validation									
Processing State CA			Validation date		Import State CA		Validation date		

Catch documentation schemes have been a topic of debate for almost 20 years, and continue to mean different things to different people. This paper sets out to clarify the nature of catch documentation schemes and what they can achieve. It explores the factors to be considered in the design of such schemes as a management tool, and a monitoring, control and surveillance tool in tuna fisheries.

The paper assesses the following points in detail:

- what is a CDS, and what does it intend to achieve?
- how does it work – what is the basic conceptual CDS design?
- which key functions does a CDS need in order to meet its objective?
- what factors must be carefully considered when designing a CDS?
- what would a model RFMO conservation and management measure for a CDS look like?

This paper aims to provide technical guidance for tuna regional fisheries management organizations that may decide to develop catch documentation schemes for commercial tuna fisheries in the future. The preparation of the paper involved analysis of all current catch documentation schemes and visits to 20 countries with significant roles in global tuna supply chains.

