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Evaluation framework for regulatory requirements related to data recording and traceability designed to prevent illegal, unreported and unregulated fishing

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ABSTRACT

In 2001 FAO published the "International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing". Based on this plan, national and supranational authorities have developed legislation to fight the so called IUU fishing. A key aspect of the legislation proposed so far is the mandatory recording of some data elements and the requirement that these data should be available for access through a traceability system. This article outlines a general framework for evaluation of these types of requirements, using a predictor-outcome N-way matrix. A "good practise" system is described, against which the existing systems and practises can be evaluated. The framework can be used to assess if the regulatory requirements ensure that the relevant IUU fishing identification data are made available, and it can also be used to evaluate the requirements imposed on the traceability system.

1. Introduction

1.1. Background

The problem of illegal, unreported and unregulated (IUU) fishing in world fisheries is considered to be "of serious and increasing concern" [1]. Some claim [2,3] that by the beginning of the 21st century, almost 30% of the global fish catch could be counted as IUU in its diverse forms, with a total worldwide catch annual value of between 7.5 billion euro and 17.11 billion euro [4]. In the European Union (EU), the IUU fishing imports are estimated to be 10% of the total value of the fish and fish products imports (1.1 billion euro) [5]. Moreover, if un-confronted, IUU fishing can lead to the non-accomplishment both of management goals and of sustainability of fisheries [6]. Therefore, the issue of tackling IUU fishing has received a lot of attention from researchers, fisheries managers, policy makers, non-governmental organisations and fishing industry alike. The "International plan of action to prevent, deter and eliminate IUU fishing" (IPOA-IUU) [1] was developed by the United Nations Food and Agricultural Organisation (FAO) as a response to this increasing problem. This initiative sets out voluntary measures for governments to prevent, deter and eliminate IUU fishing. Furthermore, it urges states to develop their own National Plans of Actions to fight IUU fishing. An important recommendation in the FAO document is to improve the transparency of the markets in order to allow traceability of fish and fish products to be used as a tool to stop IUU fish from entering the legitimate fish supply chain. Thus traceability, a tool or principle which in the food sector is mainly used for documenting properties relating to food safety and quality, labelling, certification or resource use [7], is in the capture fish industry used to document origin, sustainability and legality of catch (non-IUU operation provenance of the fish) [8–10].

Most major seafood exporters/importers, such as China, Japan and Canada, do not impose seafood traceability legal requirements in connection with their fight against IUU fishing, but their legislation includes traceability aspects related to safety, quality and origin of food in general [11]. In the USA there is now under consideration the adoption of very stringent electronic traceability requirements related to all food imports [12]. However, the main driver for these new requirements [13,14] is to strengthen the food safety legislation in general, and not to address IUU fishing specifically.

Following the principles of the IPOA-IUU, in 2008 EU adopted new fisheries regulations, specially designed to address the IUU

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fishing problem: the EU IUU Regulation 1005/2008 [15] and the EU Control Regulation 1224/2009 [16]. Derived from the guidelines of implementation of the IPOA-IUU [17], Regulation 1005/2008 "seeks to ensure full traceability" [18] "from fishing net to the plate" [19] "of all marine fishery products traded with the Union, by means of a catch certification scheme" [18]. Moreover, this Regulation is thought to provide "improved traceability of fishery products, which could be substituted against private traceability systems" [20]. Regulation 1224/2009 aims "to back up the traceability system introduced by the IUU Regulation" [21] by "introducing a comprehensive traceability system to track all fish and fisheries products throughout the market chain" [22].

When designing such regulatory requirements, a good understanding of both IUU fishing and of the principles of traceability systems is important in order to appropriately follow the recommendations of the IPOA-IUU and of its implementation guide. Therefore, the crucial question is:

- How to evaluate to what degree the existing or proposed regulatory requirements will enable the identification of IUU fish and at the same time be compatible with the traceability systems?

This paper provides an answer to this question. Its overall objective is to describe a theoretical framework designed for evaluating regulatory requirements, which intend to use traceability in order to prevent, deter and eliminate IUU fishing. This is accomplished by deriving the components of a functional and efficient fish and fish products traceability system from the internationally relevant documents and practices from both IUU fishing and traceability of food and food product domains. This results in a "good practise" traceability system, where all IUU fishing relevant information is always recorded, passed on and retrievable. The existing systems and practises can then be evaluated against the "good practise" system, and shortcomings in the existing systems can thus be identified.

The rest of this paper is organised as follows: for a better understanding of the concepts, the specialised terms are defined in Section 1.2, while in Section 2 the method used to design the framework is explained with a thorough description of the source documents used in its development. Section 3 presents the results of this method, with visualisation of the framework, application instructions and general interpretation advice. The significance of the framework, together with its strengths, weaknesses and limitations, is stated in Section 4, while concluding remarks are made in Section 5.

1.2. Definitions

1.2.1. Traceability

The most precise definition of product traceability is given by the international standard ISO 8402 (now incorporated in ISO 9000 with wording changed). This states that traceability means "the ability to trace the history, application or location of an entity by means of recorded identifications". ISO 8402 adds that when applied to products, traceability relates specifically to the documentation of "the origin of materials and parts, the product processing history and the distribution and location of the product after delivery". This means that for traceability of a product to be present, recordings related to origin, processing and distribution/location must be made. In addition, these recordings must be interconnected and made available in such a way that it is possible to trace (or find, follow, or identify) the history, application and location of the product and all its ingredients through the entire supply chain. To achieve this, a traceability system is needed.

1.2.2. Traceability system

The core components of a traceability system are described in various articles [23–25]. In practise, a traceability system consists of:

- The units (products, ingredients and components) that are traced, often referred to as "traceable resource units" or TRUs [23].
- An identification or numbering scheme that provides codes or numbers, used to uniquely identify TRUs or groups of TRUs.
- A method for associating the TRU with the respective code or number. The simplest method of this type is physical printing/marking directly on the TRU or its container, but there are also other methods, which are not expanded upon in this article.
- Functionality for recording unit properties so that the recordings are linked to the codes and identifiers and, through them, to the TRUs.
- Functionality for getting access to the codes/numbers and the associated recordings, typically through a request-response scheme.

In practise, a traceability system is often implemented using computers, software and possibly also automatic data capture, but this is not a mandatory requirement and there are numerous examples of well-designed paper-based traceability systems [26,27].

It is worth noting that verification and validation of the recorded data are not part of the traceability system. The product properties that one gets access to through a traceability system are not guaranteed to be true or accurate, and other mechanisms (for instance inspection, certification or use of analytical instruments or methods) are needed to verify or validate the data.

1.2.3. Critical IUU fishing traceability control points (IUU-CTCPs)

If the infiltration of IUU fish in the supply chain is seen as a hazard, which can be prevented by means of traceability, then all the points along the custody chain where the possibility of appearance of the hazard is high can be defined as critical IUU fishing traceability control points (IUU-CTCPs). The fish and fish products can enter a legitimate fish supply chain through three different points: at sea, at landing and at onshore distribution chain. This distinction is important as different IUU-CTCPs can be identified at each IUU fish entrance point.

1.2.4. Chain of custody

In general, "chain of custody" refers to the chronological documentation or paper trail showing the seizure, custody, control, transfer, analysis and disposition of evidence, physical or electronic [28]. However, in the fish industry, the term "chain of custody" has taken on a more specific meaning. Documentation of chain of custody is part of what is required for certification, especially certification related to use of eco-labels. The exact chain of custody requirements vary, but in two important areas there is in practise a difference between documenting traceability and documenting eco-label type chain of custody:

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

(2) Beyond the rules about not mixing, eco-label type chain of custody requirements contain no provision for keeping separate units and associated recordings. If the rule is "you are not allowed to mix together fish from two different suppliers" there is (from an eco-label type chain of custody view) no difference between two boxes of fish that come from that same certified supplier, even if the fish is caught by different vessels or on different days. In a good traceability system, this is regarded as essential information and the boxes should have separate unique identifiers and separate sets of properties. In this respect, traceability requirements ("if units are physically separated, they should be documented separately") are stricter than the eco-label type chain of custody requirements ("as long as you do not mix in violation of the eco-label rules, you do not need to differentiate between units that are of the same category").

It is worth pointing out that this difference between documentation of traceability and documentation of eco-label type chain of custody is largely due to the fact that the eco-label certification agencies have appropriated the term "chain of custody" and assigned a very specific meaning to it. In theory, the two terms might mean very much the same thing, but in practise, in the fish industry there is a difference between traceability and eco-label type chain of custody, as outlined above.

1.2.5. Framework

A framework is "a basic conceptual structure" [29], and the notions "framework" and "conceptual structure" are often used interchangeably. In this paper, the framework is the predictor-outcome N-way matrix [30] where:

- Each row heading is a descriptor (generic class) – parameter (specific class) pair either for IUU fishing related data, that can or should be recorded and made available through the traceability system, or for traceability system provisions, which may be demanded by the regulatory requirements.
- Each column heading indicates the legislative requirements at sea, at landing and onshore, respectively.
- Each matrix entry indicates whether a legislative requirement exists or not for this data element in the respective part of the supply chain.

For further description of the framework, see Section 2.

2. Methodology

The purpose of the evaluation framework is to assess: (1) if the data recording provisions of the regulatory requirements contain all the relevant information for identifying IUU fishing, and (2) if the regulatory requirements establish a functional traceability system.

2.1. Data recording of IUU fishing related information

Specific data elements have to be recorded in order to ascertain whether a fishing activity can be classified as IUU fishing. In the evaluation framework, these data elements are referred to as "identifiers", and they are defined by descriptors (the generic class) and parameters (the specific class). These identifiers are derived from the definition and interpretation of the IUU fishing concepts and from general fisheries management measures. While selecting the identifiers, it was considered, based on the provisions of FAO IPOA-IUU (e.g. Articles 18, 22, 48, 52–56, 74), that the IUU fishing concept has five components: (a) IUU fishing actors (both at national and supranational level: individuals/companies or non-cooperating states), (b) IUU fishing activities, (c) IUU fishing vessels (both fishing and support vessels), (d) IUU fish and (e) IUU fishing ports. Thus, relevant data for IUU fishing assessment is assigned to the descriptors and parameters according to the process described in Table 1.

2.1.1. Definitions and interpretations

The definitions and interpretations given to the IUU fishing concept are the first sources used to determine the identifiers. The basis of their identification is the statements contained in FAO IPOA-IUU. In addition, the IUU fishing definition contained in the EU IUU Regulation is also taken into consideration when pointing out the descriptors and parameters. This is done because EU is the biggest market and the leading importer of fisheries products in the world with the value of imported fisheries products (except crustaceans and molluscs) amounting to nearly 20 billion euro in 2006 [31], and the provisions of the EU IUU Regulation have impact on all states, which export fish and fish products to EU (around 100 countries [32]).

2.1.1.1. FAO IPOA-IUU. FAO IPOA-IUU contains the commonly accepted and internationally agreed definition of IUU fishing activities. The provisions of its Article 3 indicate in detail the conditions in which fishing has to be conducted in order to be considered IUU.

2.1.1.2. EU IUU Regulation. The IUU fishing activities are described in Article 2 of the EU IUU Regulation exactly in the same manner as in the FAO IPOA-IUU. Moreover, in Article 3 (1), the EU legal norm provides clear and extensive means of identification of IUU fishing vessels. For a thorough understanding of the requirements, the EU IUU Regulation provisions must be read together with the ones of the EU IUU Implementation Regulation [33].

It is important to note that in contrast with the FAO IPOA-IUU interpretation of IUU fish, the EU IUU Regulation treats as IUU fish all the fishery products caught by IUU fishing vessels or originating from non-cooperating third countries, not only those specific catches caught during IUU fishing activities (Articles 37 (9) and 38).

Table 1
Description of the steps to be taken when defining descriptors and parameters for data recording of IUU fishing related information.

#	Description of step	Example
1	Identify definition/ interpretation/management measure	"It shall be presumed that a fishing vessel was engaged in IUU fishing if it fished without a licence" or "Area X is closed for fishing all year round"
2	Identify the illegal fishing activity	"Fishing without a valid licence" or "Fishing at any time in area X"
3	Describe the identifier	Descriptor: "with or without a valid licence"+parameters: "licence number", and "valid to" or descriptor: "right or wrong place"+parameter: "area of catch"
4	Identify other linked IUU fishing components	"What vessel was engaged in this specific IUU fishing activity?", "What actors were involved in the IUU fishing activity?", "What products were obtained during this IUU fishing activity?"
5	Describe linked identifiers	Descriptor: "IUU fishing vessel or not"+parameters: "vessel name", "vessel flag", "vessel call sign", "vessel IMO/ Lloyd's/EU number" or descriptor: "bad will vessel owner"+parameters: "registered vessel owner name and address", "registered vessel owner nationality"

2.1.2. General fisheries management measures

During the last two decades, FAO has published several documents, which provide advice on general fisheries management measures, and these include, among others: Code of conduct for responsible fisheries (1995) [34], Fisheries management (1997) [35], Implementation of the IPOA-IUU (2002) [17] and the ecosystem approach to fisheries (2003) [36]. The fisheries management measures proposed by all these documents are the second source used to determinate the identifiers when following the process described in Table 1. When applying the method for evaluating regulatory requirements, one also has to use the specific fisheries management measures adopted in the respective setting in order to transform the general descriptor ("area X is closed for fishing all year round") into an explicit one ("FAO area 27.7.a is closed for fishing all year round").

Table 2
Description of the steps to be taken when defining identifiers for traceability system related provisions.

#	Description of step	Example
1	Identify definition/ interpretation	"Traceability is the ability to trace the history, application or location of an entity by means of recorded identifications"
2	Identify functional and efficient traceability requirement	"Traceable resource units should be uniquely identified"
3	Describe the identifier	Descriptor: "unique identification of traceable resource units"

2.2. Traceability system related provisions

There are some requirements, which must be fulfilled by a traceability system in order to be functional and efficient. The method used for identifying these requirements follows the same pattern as in Section 2.1, but this time the identifiers are derived from the definition and interpretation of traceability and related concepts, critical IUU fishing traceability control points (IUU-CTCPs) and chain of custody. The data necessary to specify a functional and efficient traceability system are thus clustered around descriptors and parameters as described in Table 2.

2.2.1. Critical IUU fishing traceability control points (IUU-CTCPs)

In order to identify the IUU-CTCPs, this paper proposes the steps suggested in Fig. 1. These steps were designed following the decision tree modelling method [30] and Principle 2 of Hazard Analysis and Critical Control Points [37]. In this context, the step

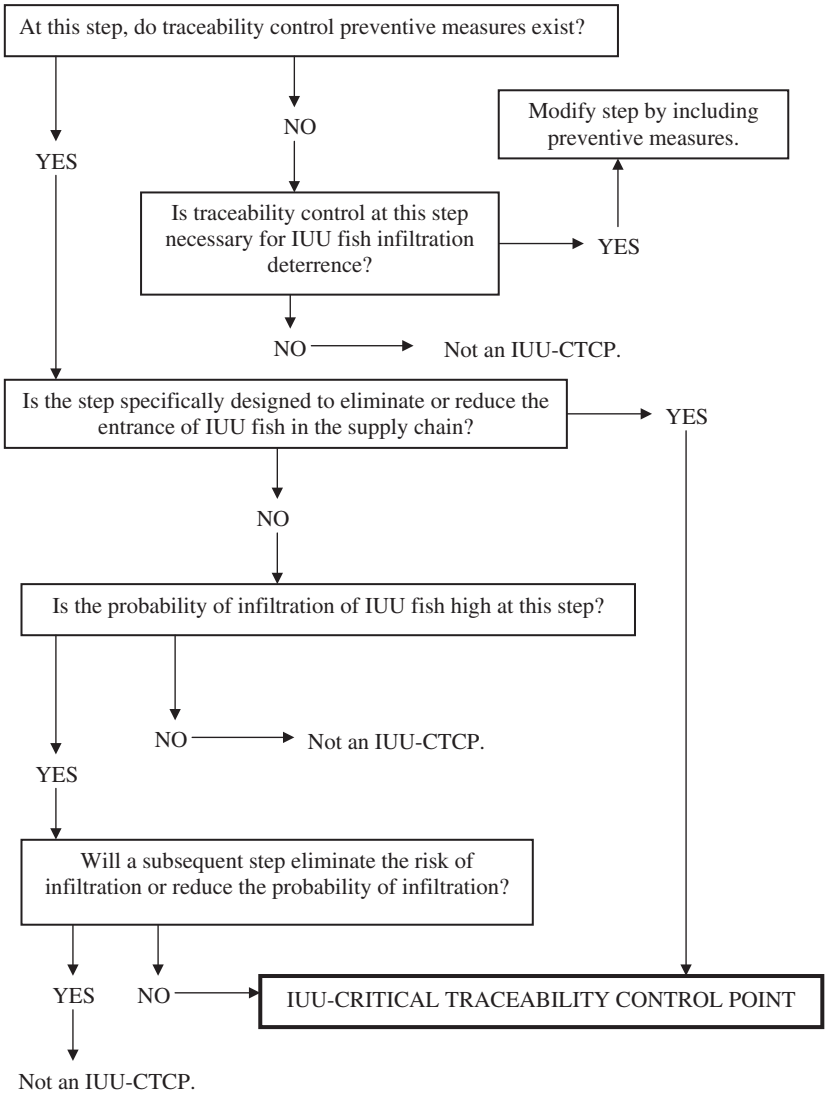

Fig. 1. Decision tree to identify critical IUU fishing traceability points in the fish supply chain.

is defined as an operation (e.g. harvesting, landing) or transformation (e.g. splitting, joining and grouping) in the fish supply chain, from primary production to final consumption, the point in the chain where the possibility for mixing non-IUU fish and IUU fish exists. Each of the points identified will need traceability controls to ensure that mixing does not occur. Among the IUU-CTCPs identified according to this method there are, for example: (1) at sea: fishing, harvesting or transhipment operations; (2) at landing: pumping fish from the fishing vessel into basins; (3) at onshore distribution chain: packing crates with fish brought by different fishing vessels or even fish from the same vessel, but from different catches. The identification of IUU-CTCPs along the fish supply chain is important as it indicates the weakest links of the supply chain, the points where the entrance of IUU fish in the legitimate trade could be stopped or reduced by means of traceability.

2.2.2. Categories of traceability

Traceability can be distinguished into two interrelated categories: internal and external. The last category is more commonly referred to as chain traceability. Internal traceability refers to the ability to keep track of what happens to a product, its ingredients and packaging within a company or production facility. For example, when a company receives a box of mackerel and uses the fish to produce flavoured smoked mackerel, it should keep records from whom the fish was received, if the fish was mixed with other received raw material, what smoking process was used and what temperatures, what ingredients were used and where did they come from, where the finished product packing came from, and where the finished product goes. Chain traceability refers to the ability to keep track of what happens to a product, its ingredients and packaging in the entire or part of a supply chain, across companies and individual facilities. For example, if a customer in a supermarket wants to know if the purchased fish was caught by trawl or long line, it should be possible to find this information with a chain traceability system.

2.2.3. Traceable resource units (TRUs)

The concept of TRU is a key aspect in traceability. A TRU must be uniquely identifiable and linked to the relevant records in order to be followed along the supply chain: it can be one fish (e.g. one tuna), one box of fish, one catch, one day's catch or one week's catch. It has been the prerogative of the industry to define the appropriate unit [38]. Typically, the fish industry will refer to batches, logistic units and trade units. Batches are linked to catch or production, and all the fish that are part of the batch will have been caught or produced in the same way at roughly the same time. Trade units are the smallest identified units that pass between the companies (or the processes). After landing and processing, the trade unit is typically a box of fish. Logistic units are trade units grouped together for transport or storage, typically pallets or containers. In general, only the trade unit will keep its integrity (i.e. remain unopened) from source to destination. Logistic units will often be opened underway and the contents split up or joined together to meet customer orders, where as production batches in general are not kept together as one single unit. For this reason, it is necessary to use the trade units as TRUs, if systematic information loss is to be avoided. Note also that batches relate to internal traceability, while trade units and logistic units relate to chain traceability. This distinction is important because in a "good practise" system globally unique identifiers will be given to TRUs involved in chain traceability, and since a production batch is an internal matter, it does not need to have a globally unique identifier (but of course it should be assigned a unique internal number).

2.2.4. Operations/transformations and mass balance

At each point of the supply chain the TRUs go through different types of operations/transformations (transfer, addition, etc.). In order to achieve efficient traceability of the product, the information that is linked to that product must undergo a parallel operation, so the product and the information will remain linked. There are six main types of operations/transformations related to TRUs and their linked data [39,40]. Some of them are more exposed and susceptible to infiltration of IUU fishery products or can facilitate it, as, for example, the transfer, the joining or the splitting of traceable units. To be able to trace both backwards, to find the origin of the product, and forward, to find where the product went, it is vital to record all transformations the lowest TRU is subject to and such recording procedures have been previously described [41].

Mass balance accounting is a very important aspect in a fish traceability system, as it prevents the infiltration of fish from untraceable provenance, usually from IUU fishing activities, during the operations/transformations the non-IUU fish undergoes. The fish net weight delivered should be less or equal to the fish net weight received and the mass balance has always to be calculated and recorded. For example, a tuna canning factory receives five tonnes of uniquely identified tuna fish crates, but delivers cans that contain in total seven tonnes of net weight of tuna fish. The question that arises is where do the additional two tonnes of tuna fish come from? If no recorded evidence can be found according to applicable legal provisions in order to identify the provenance of the two extra tonnes of tuna (no unique identification codes, no catch certificates, etc.), then it is clear that the fish is likely to have an IUU fishing origin. The same accountability process can be applied at national level for example when checking the internal trade and exports of fish and fish products against the internal catches and imports.

2.2.5. Chain of custody assurance

The differences between traceability and eco-label chain of custody were explained in Section 1.2. The evaluation framework adapts eco-label type chain of custody requirements (which are available in a more or less standardised form) in order to use them as a source for identifying descriptors and parameters for the traceability related data.

To summarise the main ideas of Sections 2.2.1–2.2.5, there are five key elements of a functional and efficient fish and fish products traceability system (a "good practise" system): (1) data recording of unique identification codes starts from the smallest TRU (preferably the trade unit); (2) mass balance of TRUs is always calculated; (3) all transformations/operations the TRU undergoes are always recorded; (4) the properties of the TRUs are always recorded; (5) special measures are in place at each link of the supply chain in order to assure the chain of custody of the TRUs.

3. Results

The visual layout of the assessment framework is displayed in Table 3.

Anyone who wants to use the framework in order to evaluate if the existent or proposed regulatory requirements fulfil both the needs of IUU fishing deterrence and of traceability systems has to observe the following steps:

(1) Identify the IUU-CTCPs for the specific fish supply chain and introduce them into the matrix.
(2) Identify the IUU-CTCPs covered by the regulatory requirements under assessment and introduce them into the matrix with their respective article number. If an IUU-CTCP is similar to the one identified at step (1), only the second entry should be made.

Table 3
Simplified version of the predictor-outcome N-way matrix for evaluation of regulatory requirements, which intend to use traceability in order to prevent, deter and eliminate IUU fishing. The rating system used when filling in the matrix is: "x" for existence, "/" for non-existence and "N/A" if the entry is not applicable at the specific point of analysis. For example, if the mass balance requirement is existent in the provision about declarations filled in at the point of first sale, the box relative to the mass balance descriptor will be rated with "x". Accordingly, if the same mass balance requirement does not exist in the provision about declarations filled when delivering the products to transporter, the same box will be rated with "/".

			Name of regulatory requirement		
			IUU-CTCPs		
			1. At sea	**2. At landing**	**3. At onshore distribution chain**
	Identifiers		**1.1. Record name**	**2.1. Record name**	**3.1. Record name**
	Descriptors	**Parameters**	**Article number**	**Article number**	**Article number**
I. IUU fishing	I.1 genuine species identification	I.1.1 species composition by scientific name			
		I.1.2 product code			
	I.2 right or wrong fishing place	I.2.1 specific area of catch			
II. Traceability	II.1 Unique identification	–			
	II.2 Mass balance	–			
III. Chain of custody	III.1 Control/management system in place	III.1.1 Description of formal document control system			
		III.1.2 Training support to control			
	III.2 Secure product labelling	III.2.1 Presence of label			
		III.2.1 Uniqueness of the label			

(3) Go thoroughly through the regulatory requirements and the matrix at the same time and make the necessary ratings. When filling in the matrix, one should take into consideration the specific, but not the general provisions of the regulatory requirements. For example, if the requirement reads: "all fish products shall be traceable from catch to final consumer", this provision cannot in itself be analysed, but the specific ones, which refer to concrete measures, taken to enable the traceability of fish products can be.
(4) Conclude if the respective regulatory requirements cover all the IUU-CTCPs by cross-checking the entries under steps (1) and (2).
(5) Assess whether the requirements capture all the relevant data for IUU fishing deterrence by checking the entries under rows I. It may happen that not all the data is captured by the regulatory requirements, and in this case it has to be interpreted in what degree the recorded data is helpful in IUU fishing deterrence.
(6) Assess if the traceability system principles were used in a functional and efficient way by checking the entries under rows II and III. In the presence of such a traceability system, all boxes under these rows have to be rated "x". If not all them have this rating, it has to be interpreted in what degree the regulatory requirements really impose a traceability system.

The framework and the method described above have been used to evaluate the provisions of the EU IUU Regulation, the EU IUU Implementation Regulation and of the EU Control Regulation, but the details and conclusions of the respective evaluations are beyond the scope of this paper [42].

4. Discussion

This framework can be used to evaluate if the respective regulatory requirements fulfil both the specifications of a traceability system and of an IUU fishing deterrence scheme. Hence, it is useful for policy makers at any management level for analysing the content of regulatory requirements under both *de lege lata* and *de lege ferenda* approach. Together with the process mapping method for analysing material flow, information flow and information loss in food supply chains [43] and the *ex ante* cost-benefit analysis method of investing in a traceability system [44], the framework detailed here can be considered one of the tools available to policy makers in assessing the efficiency and functionality of a certain traceability system required in the fish supply chain. It is important to have such an assessment methodology at hand, as there is now a tendency in the fisheries management sector to try to use traceability as a tool in order to prevent, deter and eliminate IUU fishing. However, as any other tool, traceability has to be properly used in order to achieve its intended goals.

The rating system being straightforward, as existence and non-existence are not matters of interpretation, but of strict identification, the framework is replicable for any regulatory requirements. The comprehensive display and the multitude of inferences that can be made are probably the strongest assets of the developed methodology. Nevertheless, at some point, their width and depth could also be the weakest point, as the multiple-entry format may seem intricate to some. However, being a threefold assessment (IUU fishing, traceability and regulatory provisions), the chosen display seems to be appropriate, as it enables the integration of all the data in a readable and predictable manner. The framework is constructed to be generic, flexible and extensible, and should be easy to apply at different regulatory levels and to different fishery specific cases.

5. Conclusions

It is believed at the international level that traceability can be used in fish supply chains not only for quality and safety assurance, but also for IUU fishing deterrence. Therefore, fisheries managers around the world from different regulatory levels (individual company, state or supra-state) are trying to use traceability as a tool in their endeavour to stop pirate fishing. At the same time, NGOs, academics, industry and consumers alike are trying to decide if the existent regulatory requirements satisfy their intended goal. The framework proposed here offers all these actors an instrument with an important function: assessment of existent or proposed regulatory requirements from a double stand-point – IUU fishing identification and traceability. However,

interdisciplinary approaches are always more difficult than disciplinary ones. Therefore, a good understanding of the IUU fishing on one side and of traceability principles on the other side is necessary. The proposed framework bases itself on a thorough interpretation of the involved concepts and offers policy makers from any regulatory level a robust tool in correctly tackling IUU fishing from a traceability perspective.

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