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Exploring the Transnational Governance of Illegal, Unregulated and Unreported Fishing: A Network Approach

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Student	Merel A. de Korte
E-mail	m.a.dekorte@students.uu.nl / m.a.dekorte@outlook.com
Student number	5606292
University	University of Utrecht
University supervisor	Dr. Agni Kalfagianni
E-mail	a.kalfagianni@uu.nl
Internship organisation	Ahold Delhaize
Internship supervisors	Laura Jungmann, MSc.
E-mail	laura.jungmann@aholddelhaize.com

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Merel A. de Korte

Preface

This thesis has been written as a part of the Master programme Sustainable Business and Innovation at the Utrecht University. The initial ideas for this research stemmed from my experiences as an intern at the Product Integrity department at Ahold Delhaize, an international food retailer. To drive sustainability in their supply chains, the company takes up active roles in initiatives acting on issues such as deforestation or forced labour. To me, a challenge that seemed recurring for Ahold Delhaize was the challenge of prioritising their engagements in a seemingly fragmented environment in which a plethora of initiatives are present. At the time of my internship, the sustainability issues around IUU fishing gained momentum for action and with a multitude of initiatives also being present around this issue, the company faced the same prioritisation challenge. Upon this basis, I aimed to focus my thesis research on this challenge, specified to the case of IUU fishing.

From consultations with my internship supervisors at Ahold Delhaize, it became evident that the decision to engage in an initiative is determined by its perceived effectiveness to resolve the issue in scope. It was this understanding that shifted the research scope as I found the question of effectiveness to be embedded within a wider research area around the increased activity of private actors in the governance of sustainability issues. Research in this area revolves around the question whether this trend leads to more fragmented institutional environments and whether this affects governance outcomes, hence impairs or enhances effective governance. Recognizing that this area of research is still in its infancy, I made the decision to focus on determining whether the presence of private actors leads to a more fragmented institutional environment around IUU fishing. In this way I aimed to add to the understanding of what should be at the basis of research around effectiveness, thereby not contributing to Ahold Delhaize's challenge directly but to a research approach towards it.

As I am working on similar types of topics in my current job as a sustainability consultant, I am looking forward to advancing my skills and understanding of using network theory and analysis – the approach taken in this research - in analysing institutional environments and other complex systems. I would like to thank dr. Agni Kalfagianni for making me think out loud in our meetings in order to identify and tackle research difficulties together and for her flexibility around my move to England last April which affected my thesis time planning. Also, I would like to thank Laura Jungmann from Ahold Delhaize for providing me with fruitful experiences during my internship as well as for her continuous interest and input in the research. Last but not least, I would like to thank my family and friends for their unwavering support and optimism over the last few months.

Summary

The global issue of Illegal, Unregulated and Unreported (IUU) fishing is recognised as a governance challenge due to both a lack of enforcement as well as insufficiencies in the current policy framework around the issue. In response to these short-fallings, transnational institutions have been emerging which would characterise the total institutional environment around IUU fishing as a regime complex. This research identifies how the presence of transnational institutions in the regime complex around IUU fishing influences its degree of fragmentation. As different degrees of fragmentation can be linked to differences in structure, a network-based approach is taken to measure the structural properties of the regime complex. To this end, two networks are created, one based on direct interactions between institutions and one based on overlapping actor constellations. The network outcomes indicate that the structure of the total regime complex around IUU fishing can be characterised as cohesive and connected modular, with a low to moderate degree of fragmentation and as limitedly influenced by the presence of transnational institutions. These results should be read with caution since currently existing theories do not provide for conclusive guidance in interpreting network outcomes in the context of regime complexes. Further research should focus on these methodological caveats.

Contents

List of abbreviations

AIS	Automatic Identification System
CDS	Catch and Documentation Scheme
CSO	Civil society organisation
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agricultural Organisation
FIP	Fishery Improvement Programme
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
IUU	Illegal, Unregulated and Unreported
MCS	Monitoring, Control and Surveillance
NGO	Non-governmental organisation
PSMA	Port State Measures Agreement
RFMO	Regional Fisheries Management Organisation
SNA	Social Network Analysis
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UVI	Unique Vessel Identifier
VMS	Vessel Monitoring System

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1. Introduction

1.1 Background

Marine fish play an important role in maintaining ocean ecosystems and securing the livelihood of millions of people by serving as a source of food as well as supporting their jobs and income (Sumaila, 2012). Global fish stocks however are declining due to overfishing thereby threatening the health of ocean ecosystems and the resources it can provide (FAO, 2016; Global Ocean Commission, 2014). To address these threats, multiple international legal measures for sustainable fisheries management have been adopted over the past few decades[1]. It has made many fishers aware of the need to safeguard fish populations and the marine environment and has legally obliged them do so. The established norms, however, have shown not to be enough to tackle fish stock depletion as global fish stocks are still declining to date (FAO, 2016). The current largest contributor to the problem of fish stock depletion and one of the key challenges in governing marine fish and fisheries successfully, is the issue of Illegal, Unregulated and Unreported (IUU) fishing (Global Ocean Commission, 2014; Sumaila, 2012). Especially in international waters that do not fall under any country's jurisdiction (also called high seas) and the Exclusive Economic Zones (EEZ)[2] of developing countries, the problem of IUU fishing is pressing (Flothmann et al., 2010). These practices undermine the conservation and management measures currently in place which endangers fish stocks and impairs fishers and fisheries that respect the rules.

The governance challenge of tackling IUU fishing has been described by several scholars (see e.g. Ebbin, Hoel, & Sydness, 2010; Sumaila, 2012). In recent years the efforts of national and international institutions have been complemented by the work of transnational institutions. Transnational institutions are those institutions that include non-state actors such as companies, industry associations, international or local non-governmental organizations (NGO's). As such it can be said that the institutional environment in which IUU fishing is trying to be tackled has evolved from a single regime to a regime complex, characterized by involving many different institutions, both interstate and transnational (Pattberg, Sanderink, & Wi, 2017). This trend of *transnationalisation* can be observed more widely in the global governance of sustainability issues nowadays (Abbott, 2012; Acharya, 2016; Andonova, Betsill, & Bulkeley, 2009).

A recurring issue of attention in the emerging body of literature around transnational governance, linked to the emergence of new institutions, is the issue of fragmentation (Abbott, 2012; Acharya, 2016; Biermann, Pattberg, van Asselt, & Zelli, 2009; Zelli & Van Asselt, 2013). The fragmentation of global governance can be described as the emergence of a "patchwork of international institutions that are different in their character, their constituencies, their spatial scope, and their subject matter" (Biermann et al., 2009). Following the

[1] See p.7 of Global Ocean Commission (2014) for an illustration of international legal measures
[2] Exclusive Economic Zones are defined as areas beyond and adjacent to the territorial seas, for which the designated coastal state has sovereign rights (see United Nations (1982), Article 55)

review of Zelli & Van Asselt (2013), the current academic interest in institutional fragmentation revolves around four main questions: i) the reasons for emergence of new institutions, ii) how to map and measure the degree of fragmentation, iii) the consequences of the degree of fragmentation on governance outcomes and iv) how to respond to or manage fragmentation. This classification shows the importance of mapping and measuring the degree of fragmentation as a first step to further analyse governance outcomes of regime complexes and its effectiveness. Most of the research focused on the mapping and measuring of fragmentation, however, suffice with mapping individual institutions through listing, typologies or conceptual maps (Widerberg, 2016). Although this is seen a necessary first step in describing and understanding regime complexes, there is a clear quest for more robust measurements to advance these understandings.

In advancing the mapping and measuring of regime complexes and fragmentation, network theory and analysis is increasingly being used (see e.g. Dias, Isailovic, Widerberg, & Pattberg, 2015; Widerberg, 2016). Network analysis can uncover underlying system structures by focussing on connection partners between elements of the system, rather than on the elements itself (Kim, 2013). In analysing regime complexes through network analysis, the principal units of analysis are not the institutions engaged in governance, but the interactions between those institutions.

1.2 Research aim

This research aims to explore how the presence of transnational institutions in the realm of the governance of IUU fishing influences the degree of fragmentation of the regime complex, by deploying network theory and analysis. Thereby this research aims to contribute to both quests of improving the understanding of the role of transnational institutions within regime complexes and quantitively enriching the academic discussions on degrees of fragmentation. It aims to do so by answering the following research questions and sub-questions:

Research question:
How do transnational institutions within the regime complex around IUU fishing influence its degree of fragmentation?

Sub-question 1:
Which interstate and transnational institutions constitute the regime complex around IUU fishing?

Sub-question 2:
Which network structures can be identified in the regime complex around IUU fishing?

The research consists of seven sections, including this introduction. The theory section (2) elaborates on concepts and definitions of regime complexes, degrees of fragmentation, and network theory. The background section (3) provides the reader with information on the issue of IUU fishing and its regulatory environment., necessary to understand the research design described in the methodology section (4). This is followed by a section displaying the results (5) which are evaluated in the conclusion (6) and discussion (7) section.

2. Theory

This section elaborates on the theories and concepts used within this research. First, a background is provided on global governance and the way that the scope of this topic has broadened over the last few decades. This is followed by a more specific explanation on regime complexes. Next, the theoretical accounts on the institutional complexity and fragmentation of such regime complexes are discussed and definitions are provided. Finally, the use of network theory in analysing fragmentation is discussed.

2.1 Global governance and regime complexes

2.1.1 From state-centric to a multifaceted view on global governance

Global governance is about governing issues and tackling policy questions that have an impact across national borders and political jurisdictions. Traditionally global governance has been conceived as an interstate affair (Kreuder-Sonnen & Zangl, 2015; Willets, 2014), thereby giving legitimacy only to the decisions or rules and regulations made through interstate interactions or by international organisations. This state-centric view would fit the classical examples of global peace-keeping and free trade, however, it would only allow for a partial view in analysing the governance of global sustainability issues. Within the governance of these issue areas, one can see a clear proliferation of institutions involving non-state actors such as companies, industry associations, international and local non-governmental organizations (NGOs) as well as subnational governments such as cities and states (Abbott, 2012; Andonova et al., 2009; Henriksen & Ponte, 2017). The reasons for emergence can be numerous and are linked to the type of non-state actor involved, e.g. increased globalized economic activities, sustainability issues becoming more salient or the absence of international obligations.

The growing significance of institutions involving non-state actors in global governance has been acknowledged by many scholars (Abbott, 2012; Visseren-Hamakers, 2015). These type of institutions are generally referred to as transnational institutions which define as institutions having "regular interactions across national boundaries where at least one actor is a non-state actor or does not operate on behalf of a national government or an international organization" (Risse-Kappen, 1995, p.3). A clear distinction should be made here between transnational *actors*, such as multinational corporations or international NGO's, and transnational *institutions*, which would consist of multiple actors making up a 'coalition of the willing' to tackle a certain global issue (Abbott, 2012; Biermann et al., 2009; Bulkeley et al., 2012). Where transnational actors are viewed as potential influencers of the governance around a certain issue area, transnational institutions are regarded elements of global governance themselves (Abbott, 2012; Willets, 2014). Transnational institutions are thereby placed on the same level as international nations institutions which would underline the multifaceted view on global governance (Andonova et al., 2009; Bulkeley et al., 2012).

2.1.2 Conceptualizing global governance as a regime complex

The institutional structure around the global governance of a single-issue area can be conceptualized as a regime complex. This term originates from the work of Keohane and Victor (2011) on the global governance

around climate change for which they identified a multitude of non-integrated or hierarchically nested interstate institutions, rules and regulations. They conceptualize this 'loosely coupled set of regimes' as a regime complex. This conceptualization emphasizes the possible presence of multiple forms of governance in a given issue area, however, it has a sole focus on interstate arrangements which would not reflect multifaceted global governance as described in section 2.1.1. Abbott's (2012) governance triangle, see figure 1, builds on the concept of Keohane and Victor but broadens its scope from solely interstate to all types of institutions. The triangle is divided into seven zones that each represent a different type of institution. Zone 1-3 make up for institutions that are governed by actors of a single type – state, firm or civil society organisation (CSO), zone 4-6 make up for institutions governed by two actor types and zone 7 includes those institutions in which all actor types are equally represented. Based on the identity of its most constituent member(s), i.e. those that make up the biggest group of members, the founding members or members with decision-making power, institutions are placed in one of the triangle zones.

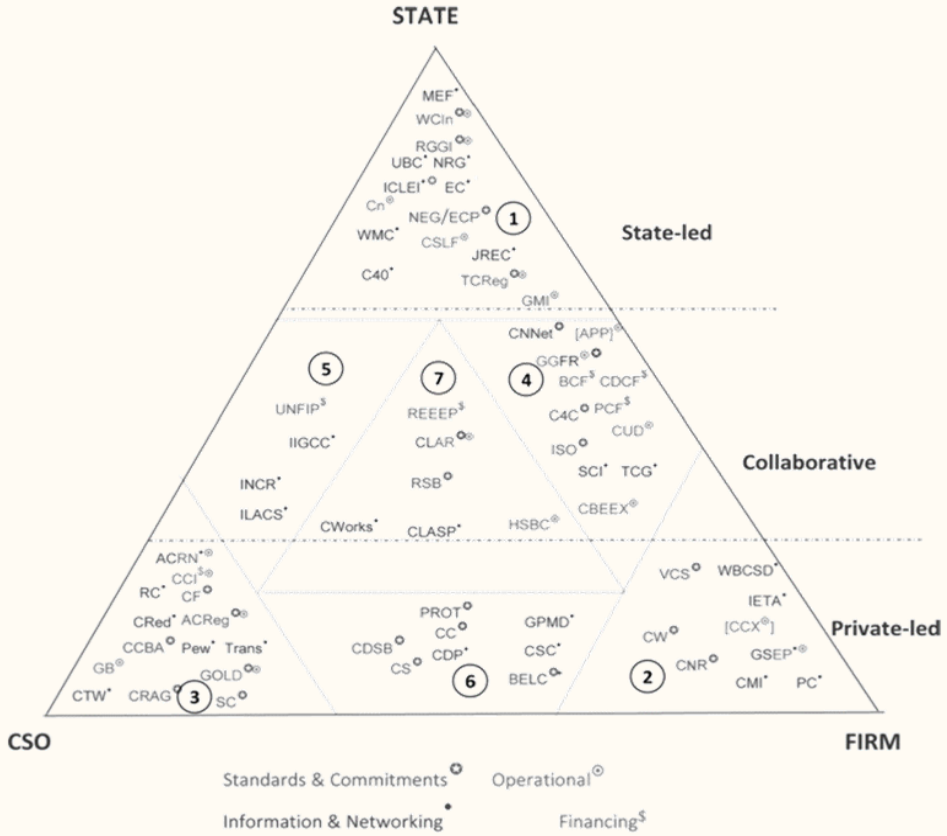

Figure 1. The Climate Change Governance Triangle. Copied from Abbott (2012).

The governance triangle has been used to map regime complexes around different issue areas, such as climate change (Abbott, 2012), forestry conservation (Pattberg, Widerberg, Isailovic, & Guerra, 2014) and marine fisheries and aquaculture governance (Arnau, Kristensen, Kristian, Widerberg, & Pattberg, 2017). Mappings along the governance triangle allow for different types of analysis, such as the coverage of institutions in different zones, the distribution of governance functions among different zones and the nature of governmental involvement. In this research, the governance triangle provides for a framework to systematically identify and classify the regime complex around IUU fishing, and to differentiate between the

interstate (zone 1) and transnational institutions, either collaborative transnational (zone 4, 5, 7) or private-led transnational (zone 2, 3, 6), that are present.

2.1.3 Identifying institutions within a regime complex

To be included in a regime complex governance triangle, an institution must have 1) the intention to steer their members or a broader target group, 2) a public governance goal and 3) a governance function through which to achieve the governance goal (Andonova et al., 2009; Bulkeley et al., 2012). The first criterion entails either self-governance in which the members of the institutions attempt to steer their own policies and behaviour or a form of governance in which the institution seeks to steer actors external to the institution (Bulkeley et al., 2012). Next to that, the transnational and international governance institutions included in a regime complex must share a clear governance goal related to the regime complex' issue area. To be considered part of a regime complex, an institution should therefore explicitly mention its public governance goal. To avoid ambiguity in applying this criterion, Arnau et al. (2017) specified the governance goal that institutions needed to have to be included in their regime complex around marine fisheries and aquaculture. This research follows this method by pre-setting governance goals for institutions to be included within the regime complex around IUU fishing, which is further operationalised in methodology section 4.2.1.1. Lastly, for an institution to be considered an institution of governance, it needs to engage in one or more governance functions.

Governance functions are those actions that an institution undertakes to accomplish its governance goal. Three main governance functions can be identified that could be taken up by all types of institutions: standards and commitments, operational activities, and information and networking (Abbott, 2012; Andonova et al., 2009; Bulkeley et al., 2012). Those institutions engaging in standards and commitments focus on activities such as rule-making, norm establishment and target setting. Where interstate institutions mostly engage in setting legislative rules and regulations, the standards and commitments of transnational institutions are voluntary in nature although they could be mandatory for its members. The standards and commitments of transnational institutions could either exist alongside interstate rules and complement them or serve as an alternative in case no rules or regulation are in place (Andonova et al., 2009). The second type of governance function include operational activities focused on capacity building and implementation. These activities can be focused on enhancing the capacity of actors to effectively implement already agreed-upon standards and commitments or on creating action bottom-up. Either way, a key characteristic of this governance function is the use of material and non-material resources of its constituents, such as technologies, know-how, contacts or financial resources (Andonova et al., 2009). Lastly, information and networking as a governance function focuses on knowledge-generation and information sharing. As emphasized by both Andonova et al. (2009) and Bulkeley et al. (2012), there is a considerable grey area around what constitutes this governance function. To this end, a difference should be made between information as a tool of leverage or a tool of governance. In the former, information is used to pressure actors outside the institutions' constituency which leaves open whether this information is used or acted upon and would therefore not represent a function of governance (Andonova et al., 2009; Bulkeley et al., 2012). Information and networking would take up a governance functions whenever it steers or enables

the institutions' members or closely affiliated actors. An example of this would be an institution setting up explicit learning programs for members.

2.2 Fragmentation of regime complexes

The increased institutional complexity characterizing the global governance of sustainability issues nowadays, has given rise to a debate on the issue of fragmented governance. As indicated by Zelli & Van Asselt (2013) and Isailovic, Widerberg, & Pattberg (2013) there is lack of consensus around the concept of fragmentation, both in terms of the terminology used and its characteristics. This section evaluates the literature around these two aspects to arrive at a definition of fragmentation for this research.

2.2.1 Terminology around the issue of fragmentation

In conceptualising fragmentation within global governance, an element of confusion is the synonymous use of "institutional complexity" and "institutional fragmentation". As described in the previous section there is overall academic consensus about the presence of multiple forms of governance and actors in governing global issues. Naturally, these type of governance arrangements are more institutionally complex than state-centric governance, hence the referral to it as regime *complexes.* By associating the emergence of regime complexes with the rise of 'increasingly fragmented systems', several scholars make fragmentation an inevitable characteristic of a regime complex (see e.g. Acharya, 2016; Biermann et al., 2009). As opposed to this, several other scholars argue that an increase in institutional complexity does not necessarily lead to more fragmented institutional structures and that regime complexes should be assessed in a richer relational context to assess their level of fragmentation (Zelli & Van Asselt, 2013). To mediate these discrepancies in conceptualisation, this research views regime complexes as inherently institutionally complex, characterized by 'the presence of a mixture of transnational and international institutions that are different in their constituent actors, geographical scope, subject matter and activities' (adapted from Biermann et al., 2009[3]), and optionally fragmented, which is defined in the following section.

Although there is consensus among scholar that the fragmentation of regime complexes is a matter of degree (Zelli & Van Asselt, 2013) and should be understood to exist along a continuum (Dias et al., 2015; Keohane & Victor, 2011; Pattberg et al., 2014), differences can be found in the way this continuum is described. Those scholars taking fragmentation as an optional characteristic of regime complexes present fragmentation and coherence on opposite ends of the continuum (Pattberg et al., 2014). Those scholars focusing solely on the term fragmentation tend to describe these opposite ends with different types of fragmentation (Biermann et al., 2009) or low and high levels of fragmentation (Dias et al., 2015). In line with its definition of institutional complexity as inevitably fragmented, Biermann et al. (2009) for example conceptualizes fragmentation along a continuum of synergistic, cooperative or conflicting fragmentation,

[3] 'Transnational institutions' are added to the definition to include all types of global institutions that are present within a regime complex. Also, the wording of the characteristics (constituent actors, geographical scope, etc.) is adapted to correspond to the wording around institutional complexity used by Abbott (2012).

with synergistic and conflicting fragmentation on the opposite ends on the continuum. In describing synergistic fragmentation, however, Biermann et al. makes use of the terms coherent and integrated. The same accounts for the conceptualization of the continuum with low and high fragmentation, where low fragmentation is characterized as more coherent. These two examples indicate that although terminology differs, its underlying concept does not differ. To mediate these differences in terminology, this research presents degrees of fragmentation along a continuum with 'fragmentation' at one end and 'coherence' at the other end.

2.2.2 Indicators of the degree of fragmentation

The degree of fragmentation, i.e. the place on the fragmentation/coherence continuum, is dependent on the indicators that are used to characterise and hence analyse the phenomenon. Within the current body of literature, various types of indicators are used, ranging from single indicators (i.e. the number of institutions present within a regime complex) to indicators embedded within a richer relational context (i.e. a regime complex' underlying discursive structure) (Zelli & Van Asselt, 2013). In comprehending this conceptual richness, a distinction can be made between the following types of indicators: 1) the presence of different types of institutions, 2) differences in content and 3) structural elements.

Firstly, the presence of multiple and different types of institutions within one regime complex is in some cases taken as an indicator of fragmentation. Pattberg, Sanderink, & Wi (2017), for example, include the distribution of institutions across the seven zones of the governance triangle as an indicator of fragmentation. They understand the regime complex to be fragmented in cases whenever there are institutions in all zones, and highly integrated whenever all institutions fall into just one zone. However, following the definition of institutional complexity given in section 2.2.1., the presence of different types of institutions would be an indicator of institutional complexity, rather than fragmentation. Secondly, differences between the institutions' contents are used as indicators of the degree of fragmentation of a regime complex. These content indicators include the institutions' governance goals, norms, and actions. Although institutions within a regime complex focus on the same issue, the way they work towards a solution could differ among them. Arnau et al (2017) refer to this type of difference as a difference in governance goals, Isailovic et al. (2013) and Pattberg et al. (2017) as differences in discourses. Next, related more specifically to the standard-setting institutions within a regime complex, the presence of norm conflicts between institutions is included as a characteristic of fragmentation (Biermann et al., 2009; Isailovic et al., 2013). This could be related to differences in governance goals and discourses but should be a distinctively different feature, as two institutions sharing the same governance goal could have different norms. The emergence of private regulations can be an example of this. In some cases these regulations provide an alternative to more stringent regulations, thereby leading to different levels of 'good practice' within a regime complex (Glasbergen, 2009). Furthermore, a lack of alignment of actions of the institutions within a regime complex is used as an indicator for fragmentation. In a regime complex characterised by this, the use of resources such as money, technology and ideas, is not coordinated between institutions, leading to a duplication of efforts (Henriksen & Ponte, 2017; Keohane & Victor, 2011). In a fully coherent regime complex, on the other hand, aligned joint actions are taken in which there is limited overlap or

duplication between institutions. All three indicators are mutually reinforcing, e.g. institutions that align on goals and norms, are more likely to coordinate their actions.

Regarding the structural elements of a regime complex, lastly, the presence of interactions between institutions is universally agreed upon among scholars as an indicator of fragmentation. The use of institutional interactions as an indicator of fragmentation is based on the understanding that an increased amount of interactions encourages alignment on goals, norms and actions, hence reduces the degree of fragmentation (Keohane & Victor, 2011). Similarly, a structural element like the actor constellations of institutions within a regime complex is considered an indicator of fragmentation. An actor constellation consists of all actors that are involved in an institution. The degree of fragmentation is low whenever actor constellations show overlap, meaning that there is overlap in the actors involved in the different institutions, and high whenever they vary between institutions, meaning that different actors are involved in different institutions. As such, the structural elements like interactions and actor constellations among institutions feed into the content indicators of fragmentation as listed above, thereby serving as an indicator of fragmentation itself. The concepts of institutional complexity and degree of fragmentation are visually represented in figure 2.

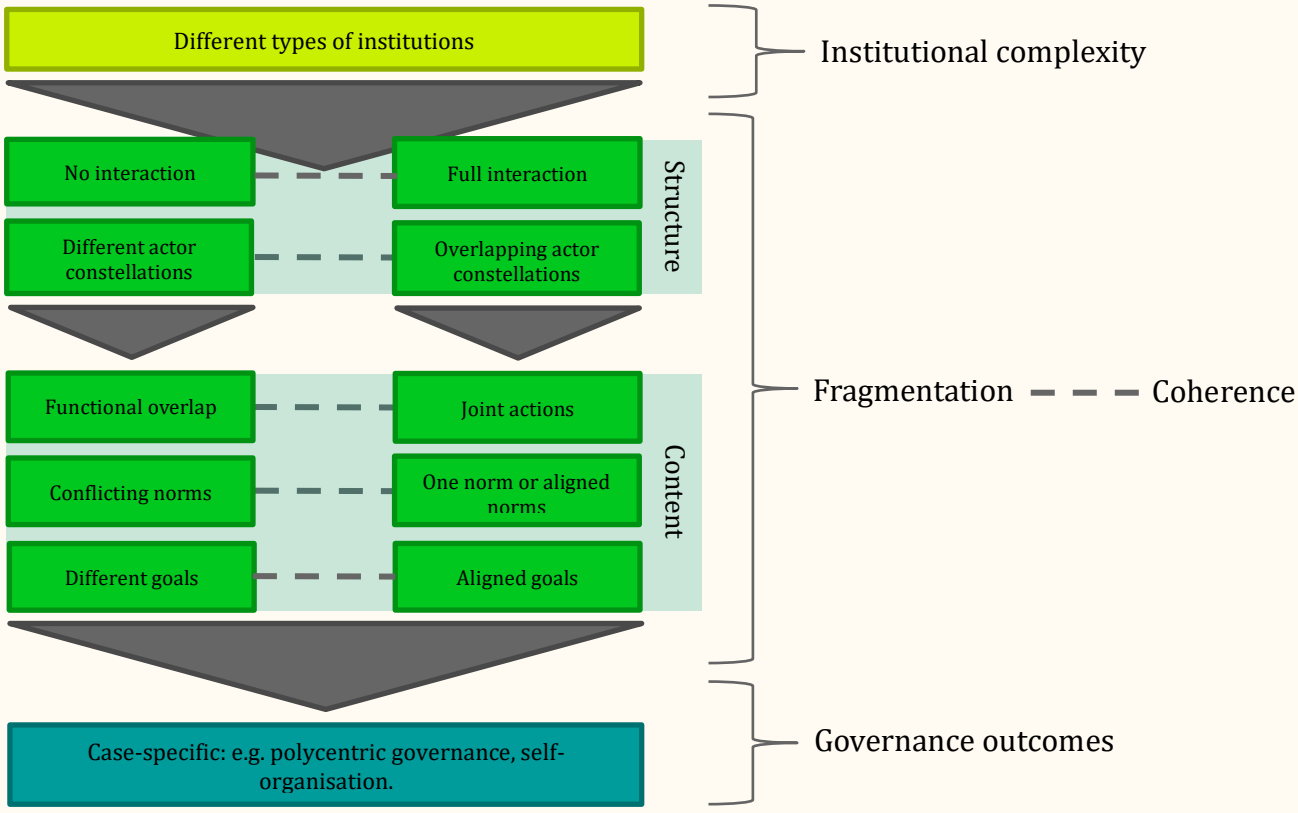

Figure 2. Indicators of fragmentation within a regime complex.

It is important to emphasize that this figure illustrates archetypes of complete fragmentation and coherence. It is recognised, however, that in reality, most regime complexes are expected to be somewhere along the dotted lines of the continuum. As such, this figure is best used as a relative concept, comparing

two regime complex and determining the degree of fragmentation in one regime complex in relation to the other. Also, it is important also to emphasize that the degree of fragmentation is considered value-free. This means that neither coherence or fragmentation is a preferred characteristic of a regime complex. Glasbergen (2009) underlines this by describing that e.g. having different norms with a regime complex could be either positive for the process of governance, opening up the possibility to experiment with a variety, or unfavourable, when the avoidance of the most stringent norms would lead to a race to the bottom. Other scholars emphasize that a preferred degree of fragmentation might differ between different stages of governance (e.g. initiation, agenda-setting, implementation) (Bodin & Crona, 2009; Pattberg et al., 2014) Lower degrees of fragmentation might be effective in initiating a process, whereas implementation might be favoured by more fragmented systems where information and knowledge builds in separate sub-groups and is therefore less likely to be homogenized. These examples indicate that the relation between the indicators of fragmentation and governance outcomes is not uniform and would require additional research (Bodin & Crona, 2009; Zelli & Van Asselt, 2013). Although outside the scope of this research, governance outcomes are presented in figure 2 since research on the degree of fragmentation within a regime complex would feed into further analysis on this topic.

2.3 A network approach to analysing fragmentation

To analyse the degree of fragmentation within a total regime complex, analyses on the level of the whole system are required. Currently these types of analyses are mainly done by developing lists, typologies and conceptual maps around the regime complex and doing separate analyses of e.g. dyadic or triadic interactions among institutions. In finding more quantitative ways to assess whole regime complexes and degrees of fragmentation, the use of network theory and analysis is gaining interest among scholars (see e.g. Dias et al., 2015; Pattberg et al., 2017; Widerberg, 2016). Social network analysis (SNA), more specifically, has proven to be of great value in researching global and local governance processes by allowing for the examination of formal and informal relationships between institutions within the context of the whole governance system (Bodin & Crona, 2009; Kapucu, Hu, & Khosa, 2017).

Network theory can shortly be summarized as a study of relations within a network. SNA is the application of network theory to the analysis of relations within social systems, which can range from online communities to terrorist networks and governance systems. A network analysis aim to uncover underlying system structures by focussing on the connections between parts of the system, rather than on the parts itself (Kim, 2013). Assumed is that varieties in system structures, such as having many or little ties or being central in the overall network structure, account for differences in outcomes of the system (Borgatti, Mehra, Brass, & Labianca, 2009; Scott & Carrington, 2011). This rationale connects to the theory around fragmentation in regime complexes that considers structural elements like interactions and overlapping actor constellations as enablers for joint action and alignment on goals and norms, and thereby as influencers of governance outcomes. As such, social network analysis would also be suitable in this research. This section will further elaborate on the theoretical accounts of network analysis and discusses how its concepts and methods can be used for the analysis of the degree of fragmentation within regime complexes.

2.3.1 Constructing a social network

To perform a SNA, firstly, a network must be constructed. A network is defined as a set of nodes that are connected to each other through one or more ties. Prior to constructing a social network, it should be specified which nodes and ties are theoretically relevant for the given research (Bodin & Crona, 2009; Scott & Carrington, 2011). This cannot be determined empirically but is dependent on the explanatory theory of the researcher around the research question to be studied under the SNA (Borgatti & Halgin, 2011). In social networks, most commonly the nodes are persons, organisations or institutions and the ties are the social relations among them (Scott & Carrington, 2011). Depending on the research question. the researcher can choose to define the node network as an unipartite or one-mode, or bipartite or two-mode network (Borgatti, Everett, & Johnson, 2013; Scott & Carrington, 2011). In a one-mode network, all nodes represent the same type of actor and connections are made to and from the same type of node. A two-mode network includes two types of actors which are divided into two groups of nodes, the main nodes and the sub nodes. Within a two-mode network, connections can only be made between main nodes and sub nodes, not between nodes within one of the groups. For example, in case a research question revolves around the affiliations between people and organizations, people would be one group of nodes and organisation the second group of nodes.

Next to defining the nodes, a choice on the type of ties has to be made and whether these ties should be directed or undirect, and binary or valued. Borgatti et al., (2009) define four types which include social ties, similarities, social relations, interactions and flows, see table 1. Strictly taken similarities are not social ties as they do not depict a direct relation between two nodes. Empirically, however, these types of connections are used in SNA as a *proxy* for social ties (Borgatti & Halgin, 2011). Among them are comemberships, co-participation in e.g. events, geographical proximity and similar views (Borgatti & Halgin, 2011). These ties are considered to contribute to forming 'real' social ties, such as social relations and interactions. Through comembership, it would for example be likely for members to meet each other and form 'real' ties.

Table 1. Types of social ties as defined by Borgatti et al. (2009).

Similarities			**Social Relations**				**Interactions**	**Flows**
Location	*Membership*	*Attribute*	*Kinship*	*Other role*	*Affective*	*Cognitive*	e.g.	e.g.
e.g.	e.g.	e.g.	e.g.	e.g.	e.g.	e.g.	Talked to	Information
Same	Same clubs	Same	Mother of	Friends of	Likes	Knows	Advice to	Beliefs
spatial and	Same events	gender	Sibling of	Boss of	Hates	Knows	Helped	Personnel
temporal		Same		Student of		about	Harmed	Resources
space		attitude				Sees as		

Next to defining the relevance of social relations in a certain network, it important to determine whether these relations would be directed or undirected, and binary or valued (Scott & Carrington, 2011). Directed ties go one way while undirected ties would define a mutual relation between two nodes without having a direction. Undirected ties are used for the similarity type of ties and those ties where direction must always

be reciprocated (e.g. was seen with). Both types of edges can be binary, meaning existing or non-existing, or valued, meaning that the relationship to or between certain nodes is present to a certain degree.

To use SNA in the analysis of regime complex, a choice needs to be made on what constitutes a node and what constitutes a tie. As described above, this decision is dependent on the research question that is central. Pattberg et al. (2017), for example, aimed to analyse a governance system based on the linkages of actors within the system. To that end, a two-mode network was created consisting of institutions within the regime complex and their members. In this network the institutions and members are the nodes, and membership affiliations create ties between the two. In other examples, there could be only an interest in the direct interaction between institutions in a regime complex in which case institutions are taken as nodes and their interactions serve as ties.

As the institutions within a regime complex are the central actors in this research, these would be taken as the main nodes. In determining which ties to use, the indicators of fragmentation as described in section 2.2.2 are leading. The structural indicators of fragmentation can feed into ties directly, as these indicators are social relations in itself. Therefore, an 'interaction' network, based on the direct interactions between institutions and a 'similarities' network, based on overlap in actor constellations can be created for this research. For the interaction network, a tie would be created whenever there is direct interaction between the main nodes. This can exist in the form of a partnership or, as described by Widerberg (2016), whenever an institution shows adherence to the rules or norms of another institutions. Such a network constitutes a one-mode network as it connects main nodes to main nodes. The similarities network, on the other hand, would take the form of a two-mode network as it connects institutions to underlying actors which are two different types of nodes. In constructing a network based on actor constellations, data on the members of institutions is mostly central (see e.g. Pattberg et al., 2017; Widerberg, 2016). The eligibility of actors to be members of an institution is in most cases determined by the type of institution, e.g. in most cases only nation states can be members of interstate institutions. As this dependency influences the potential overlap in actor constellation between different types of institutions, the network of actor constellations should include more than just membership data. To this end, information on institutions' partners could be added to the network as this information is independent from the type of institution, i.e. both private or public actors could partner with either interstate or transnational institutions. Partners are those actors with whom institutions form strategic alliances or who might be providing funding support. Further operationalisation of these concepts is dealt with in methodology sections 4.2 and 4.3.

2.3.2 Identifying the structural properties of a network

Once the network data has been obtained, it can be used to measure and analyse the structural properties of the network. The pattern of absence or presence of ties between nodes constitutes its structure (Scott & Carrington, 2011). To identify the structural properties of a network, specialized software tools are generally used which allow for calculations of network metrics and for visual representations of the network (Hanneman & Riddle, 2011). Network metrics express the structural properties of the network. The network metrics within SNA can be divided into macro-, meso- and micro-level metrics, i.e. whole

network, group and individual node characteristics (Hanneman & Riddle, 2005; Scott & Carrington, 2011). As this research focuses on the network structures of a whole network, i.e. a regime complex, this section will mainly elaborate on the network metrics at the level of whole networks.

2.3.3.1 Network structure archetypes

Whole-network metrics can determine the structural properties of the network as a whole by focussing on the ties among all pairs of nodes in the network (Borgatti et al., 2013). As indicated by Bodin & Crona (2009) different network structures are expected to lead to differences in governance processes. For example, in networks with a large number of ties compared to the number of possible ties, referred to as high density networks, nodes are more likely to engage in joint actions. Besides density, the degree of centralization and cohesion, and sub-group interconnectivity are expected to lead to different network structures and hence, different governance processes (Bodin & Crona, 2009). As indicated also by other scholars (see e.g. Pattberg et al., 2014) it is a combination of different of whole-network metrics that lead to a certain network type.

Four main network archetypes can be identified, based on different network metric combinations, see figure 3 (Bodin & Crona, 2009). These are cohesive networks, modular networks, centralized networks and connected modular networks. This research makes use of these network archetypes to determine to what extent the structural elements of the regime complex (interactions and actor constellations) lead to fragmented network structures. In the following, the underlying network metrics of these network structures as well as their degree of fragmentation are discussed.

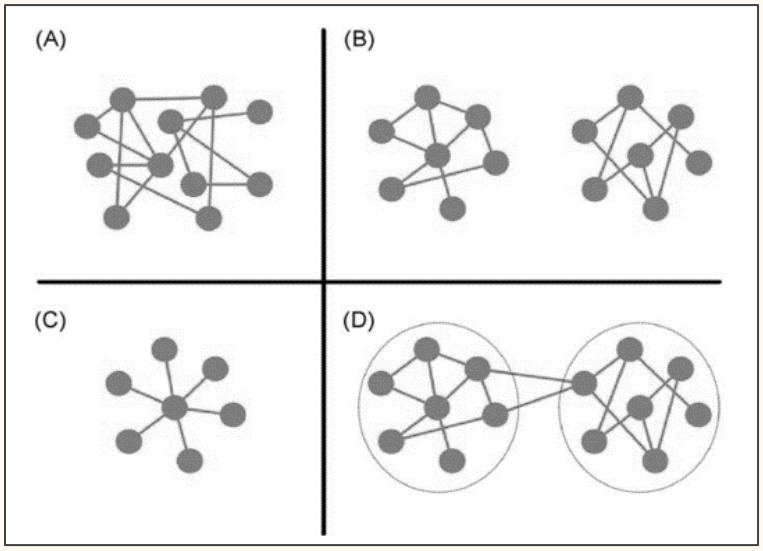

Figure 3. Schematic representation of four archetypical network structures. (A) cohesive, (B) modular, (C) centralised, (D) connected modular network. Copied from Bodin & Crona (2009).

2.3.3.2 Connectedness: cohesive and centralised networks

The network structures presented in figure 2A and 2B can be explained by combining the network metrics density or average degree and centralisation. Both density and average degree provide for a way to express the network connectedness on the level of the whole network. Density is the number of total ties in the

network, calculated as a proportion of the total number of possible ties between nodes (Bodin & Crona, 2009; Borgatti et al., 2013). A fully connected network has a density of one and this value will lower with lesser ties being present within the network. If in a comparison of networks, the sizes of the networks largely differ, average degree would be a more suitable metric to characterize connectedness as densities are naturally lower in larger networks (Borgatti et al., 2013). Average degree is the average number of ties within a network, calculated by averaging the number of ties that each node has. In a fully connected network, average degree would be equal to the maximum number of ties that a node could have while this value would equal zero in an unconnected network.

The metrics on network connectedness do not indicate anything about the distribution of ties within the network (Borgatti et al., 2013), i.e. they could be indicative for highly connected nodes as well as for the connectedness of the network as a whole. To overcome this issue, density or average degree should be analysed together with the distribution of ties. A whole-network metric for the distribution of ties would be the level of centralisation. Centralisation measures the variability in the number of direct ties of each node, also referred to as node centrality. A high variability in node centrality scores leads to a high centralisation score which would indicate that the network is concentrated to a single node or a small set of nodes, in case the highest centrality score is the same for more nodes (Cyram Inc., 2017b).

A network in which average degree is high and centralisation is low is characterised as a cohesive network and would look like the network depicted in figure 2A. A network that combines a lower average degree with a high degree of centralization is characterised as a centralised network which would be illustrated by figure 2C. In cohesive networks, the high amount of social ties improves communications, increases the possibilities for collective action and helps to avoid conflicts within the network (Bodin & Crona, 2009). In centralised networks, central actors have the ability to coordinate actions within the total network (Bodin & Crona, 2009; Pattberg et al., 2014). The governance processes that are present within these networks align with the indicators of coherency within a regime complex as described in section 2.2.2, which include joint actions and norm and goal alignment. As such, both cohesive and centralised network structures are considered to be indicative for relatively low degrees of fragmentation.

2.3.3.3 Sub-group formation: (connected) modular networks

The network structures illustrated in figure 2B and 2D are characterised by the presence of sub-groups. A sub-group consists of a set of nodes that are linked by ties to such an extent that they could be considered as a separate group within the overall network (Borgatti et al., 2013). The ties between the nodes of a sub-group are referred to as bonding ties. As opposed to bonding ties, bridging ties are referred to as ties that provide for a connection between sub-groups (Bodin & Crona, 2009). A general procedure for sub-group analysis is described by Lee & Sohn (2015) in which a simple component analysis is performed first, followed by a community analysis that allows for a more elaborate identification of the identified component. The component analysis identifies the sub-sets of nodes that have no disconnections among them, referred to as components (Scott & Carrington, 2011). The number of components would resemble the number of sub-groups present in the network, with the only exception that a single component indicates

the absence of sub-groups. Community analyses are designed to identify those sub-sets of nodes, referred to as communities, that have more ties within than outside the sub-set (Scott & Carrington, 2011). A wide variety of community identification methods are developed to serve different purposes of community detection (Porter, Onnela, & Mucha, 2009). Network in which communities are present are considered to have a certain degree of modularity which increases with the identification of more communities.

In case the component or community analysis indicates that sub-groups are present in the network, the presence of bridging ties should be identified to determine the connectedness of those sub-groups. To identify bridging ties, the node-level metric 'betweenness centrality' could be used (Widerberg, 2016). Betweenness centrality measures the extent to which a node lies on the path that connects all other pairs of nodes (Cyram Inc., 2017b). Betweenness centrality increases the more a node appears on these paths. Large variability in betweenness centrality scores in the network would indicate that certain nodes in the network have relatively high betweenness centrality scores compared to other nodes. If that is the case, the node(s) with the high betweenness centrality, would have bridging functions.

A network in which components and/or communities are present is characterised as a modular network. If the modular network shows high variability in betweenness centrality scores, it is characterised as a connected modular network and would look like the network depicted in figure 2D. If the betweenness centrality scores are comparable across the network, the network would just be characterised as modular, illustrated by figure 2B. In modular networks, the ability for knowledge or information to reach all nodes reduces (Bodin & Crona, 2009; Lee & Sohn, 2015). Based on this understanding, more modular network structures are considered to be indicative for higher degrees of fragmentation. In connected modular networks, the availability of bridging ties reduces the degree of fragmentation as it increases the capacity for collaborative processes among sub-groups (Bodin & Crona, 2009).

Table 2 summarizes the underlying network metrics of the four network structures as well as their relative degree of fragmentation. This table provides the basis for the choice of network metrics in this research, which is dealt with in methodology section 4.4.1.

Table 2. Structural properties of the four archetypical network structures.

Network structure	Network metric	Metric value	Degree of fragmentation
(A) Cohesive	Density / Average degree	High	Low
	Centralisation	Low	
(B) Modular	Components	More than one	High
	Modularity	High	
	Betweenness centrality	Comparable	
(C) Centralised	Density / Average degree	Low	Low
	Centralisation	High	
(D) Connected modular	Components	More than one	Moderate
	Modularity	High	
	Betweenness centrality	Highly variable	

3. Background: IUU fishing

This section elaborates on the issue of IUU fishing and builds on the brief explanation given in the introduction. As the words 'illegal', 'unregulated' and 'unreported' imply, the issue of IUU fishing is rooted in the regulatory environment around fisheries. Therefore, this section will elaborate on this regulatory environment. It will also detail on the formal definition of IUU, the challenges in addressing the issue and additional measures that are deemed necessary to further combat the issue. Thereby it provides the background for a better understanding of the following sections.

3.1 Background on the issue

3.1.1 Its emergence

The emergence of the issue of IUU fishing can be best understood when seen in context of the global expansion of marine capture fisheries and changes in marine environment and fisheries regulations from the late 20th century onwards (Christensen, 2016). Before that time the 'freedom of the sea' was the leading principle in international law. Only those areas for which nation sovereignty was accepted (mainly coastal strips) could not be freely exploited. The vast increase of fishing operations combined with limited fishing restriction given under this principle, gave rise to increased concerns of overexploitation of the maritime environment with the threat of severe depletion or even extinction of fish species (Christensen, 2016).

In recognition of this issue, a reform of ocean governance was internationally negotiated from the 1960's onwards. This led to the establishment of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982. This international agreement sets guidelines for all uses of the maritime environment and its resources. It divides the maritime space into three zones, namely the territorial seas, Exclusive Economic Zones (EEZ's) and the high seas. Some major provisions are connected to this division. Firstly, UNCLOS increased the national jurisdiction of coastal states by giving them a sovereign 'right' over their EEZ, in addition to the sovereignty that they already possessed over their territorial sea. Having this right, means that coastal states have the obligation to conserve this area as well as the exclusive right to exploit the resources in this area. It is obliged to e.g. sets catch quota and can give foreign fishing vessels access to this area. This meant a significant change in fisheries management, as most fishery resources were obtained in EEZ's at the time that UNCLOS was developed. Secondly, UNCLOS established the concept of flag state jurisdiction, meaning that any ship on the high seas is subject to the jurisdiction of the nation whose flag the ship is entitled to fly. Furthermore, it restricted the amount of freedom on the high seas by giving nations that deploy the area the duty to conserve and manage its living resources (e.g. establish allowable catch) and to cooperate with other states in taking such measures (United Nations, 1982).

In the years following on the enforcement of UNCLOS, supplementary regulation has been developed that focused on fisheries and fishing operations specifically. Both the UN and FAO played major roles in this. Especially on the topic of high sea fishing, additions to the provisions in UNCLOS were deemed needed as due to technological improvements in the 1990's the high seas were increasingly deployed for fishing. The

1993 FAO agreement to 'Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas' and the 1995 'Fish Stocks Agreement' of the UN supplements UNCLOS on this issue. Both are legally binding instruments. The FAO Compliance Agreement extends the measures that flag states need to take to manage the vessels that are fishing the high seas under their flag. It requires nations to keep records of fishing vessels flying under their flag and to cooperate in exchanging this information with the FAO and other signatories of the agreement. With these increased measures, the agreement aims to increase the ability to identify 're-flagging' vessels and those fishing without permission. The UN Fish Stock Agreement focuses on transboundary fish stocks specifically. It adds to the existing legal framework by adding provisions on international cooperation for the management and conservation of these stocks. It puts Regional Fisheries Management Organisations (RFMO's) forward as the main measure for international cooperation. RFMO's are made up of states with an interest in a certain fishing region. The RFMO provides for a platform to discuss and agree on conservation and management measures, which all states that are party to that RFMO would agree to adhere to. Both the Compliance and Fish Stock Agreement form an integral part also of the International Code of Conduct for Responsible Fishing, developed by the FAO in 1995. This soft-law instrument further develops the regime around fishing by serving as a reference instrument for the sustainable development of the fishery sector (FAO, 2016).

3.1.2 Policy measures

The conservation measures put in place by the abovementioned instruments created an environment in which the issue of IUU fishing could occur on a global scale. The combination of legal fishing becoming more restricted and an ever-increasing demand for seafood products, increased the economic incentive for and hence, the prevalence of IUU fishing. Consequently, IUU fishing became recognised in the late 1990s as a global issue. The FAO has given response to the issue through the development of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) in 2001. This soft-law instrument is the first instrument focussing specifically on the issue of IUU fishing. It provides measures to states and RFMO's to tackle the issue of IUU fishing and guidelines on implementation. A first definition of IUU fishing has been given in the IPOA-IUU[4], which will be elaborated on in the next paragraph.

The IPOA-IUU already emphasized the importance of ports in combatting the issue of IUU fishing and in response to that, the 2009 FAO Agreement on Port State Measures was developed. The Port State Measures Agreement (PSMA) is the first legally binding instrument that focuses on IUU fishing specifically. It adds a new level of control to fishing operations by including measures that port states can take on foreign vessels that seek to land their catches. Through this mechanism it provides for a way to block the flow of IUU caught fish within national and international markets. Overall, the international policy framework around fisheries and IUU fishing consists of both legally binding and soft law instruments. The legally binding instruments include UNCLOS, the Compliance Agreement, the Fish Stocks Agreement and the Port State Measures

[4] The full formal definition of IUU fishing can be found in Paragraph 3.1-3.3 of the IPOA-IUU.

Agreement, while soft law instruments include the Code of Conduct of Responsible Fisheries and the IPOA-IUU. For both type of instruments, the latter ones are developed specifically around the issue of IUU fishing.

3.1.3 Formal definition

In short, IUU fishing refers to vessels operating in violation of fishery regulations of a coastal state or RFMO or outside the reach of fishery regulations. The formal definition of IUU fishing is given in the IPOA-IUU and can be summarized as follows:

- Illegal fishing refers to fishing activities that violate the conservation and management measures of States and RFMO's within the sea zones under their jurisdiction. The exact obligations differ per State and RFMO and are specified towards the area and species they aim to conserve and manage.
- Unreported fishing refers to the non-reporting or misreporting of fishing activities. Unreported fishing can be classified as either illegal or unregulated fishing (FAO, 2016). Unreported fishing is illegal whenever the reporting it is not in line with the measures of States and RFMO's. The fishing itself may not necessary be illegal. Unreported fishing is unregulated if the non-reporting happens for fishing activities that are outside the reach of fisheries regulation.
- Unregulated fishing refers to fishing activities occurring outside the reach of fisheries regulation. This can relate to fishing activities that are undertaken in areas for which there are no management and conservation measures in place or in areas under RFMO jurisdiction whenever the fishing activities are conducted by a stateless (unflagged) vessel or by a vessel flying the flag of a state that has not ratified the international agreements.

The definition of IUU fishing shows that within national or RFMO jurisdiction, IUU fishing is an enforcement issue, while outside any jurisdiction, it is a governance issue. An example of a deficit in enforcement would be the lack of flag state control. A country that has ratified the above agreements, could still fail to meet its obligations under these agreements to provide proper authorizations for fishing and control fishing vessels flying their flag. This lack of enforcement creates so-called 'Flags of Convenience' which can provide fisheries with a cover of IUU fishing practices. Likewise, a lack of port state controls would lead to the rise of ports of convenience, providing a way for fisheries to land IUU catches. A complicating factor for effective governance of fishing is recognised also in the practice of transhipments at sea where a fishing vessel on the high seas offloads its catch to a cargo vessel that transports the catch to port (Gianni & Simpson, 2005). This practice can be used to launder IUU catches as it allows fishing vessels to evade most monitoring and enforcement measures (Gianni & Simpson, 2005).

3.2 Additional measures to combat the issue

In addition to the already established international policy framework around IUU fishing and in response to its perceived short fallings, the need for additional measures in curbing the issue has been put forward by several scholars (see e.g. Cordes, 2015; Flothmann et al., 2010; Global Ocean Commission, 2014). Proposed additional measures should focus on improving traceability, denying market access for IUU catch and improving policy solutions for those fishing areas that are currently not under any jurisdiction.

Firstly, a lack of traceability of seafood supply chains is seen as the biggest obstacle in the enforcement of (FishWise, 2018; Flothmann et al., 2010; Global Ocean Commission, 2014; Young, 2015)existing measures around IUU fishing (FAO, 2016; Young, 2015). As such, improving traceability is considered a key measure in fighting the issue. Full traceability would enhance the identification and removal of seafood associated with IUU fishing, either directly or through transhipping, from supply chains and would ideally prevent it from entering the supply chain initially (FishWise, 2018). The use of a Unique Vessel Identifiers (UVI's) for fishing vessels, such as the globally available International Maritime Organization (IMO) vessel number, is mentioned as way to enhance traceability in seafood supply chains (Flothmann et al., 2010). Additionally, improvement potential is seen in the development and application of technologies such as satellite-based Vessel Monitoring Systems (VMS's) (Cordes, 2015; FAO, 2001; Flothmann et al., 2010) and vessel- or satellite-based Automatic Identification Systems (AIS's) (Cordes, 2015) which would make information available on vessel movement. Furthermore, improved information exchange between port, flag and market states as well as supply chain actors is advocated. In light of this, the set-up of global information sharing systems, such as an international Monitoring, Control and Surveillance (MCS) networks and a global vessel register has been put forward (FAO, 2001; Flothmann et al., 2010).

A second measure that is commonly called for to deter illegal fishing is to restrict or deny market access for IUU catch (see e.g. Young, 2015, 2016). To this end, the establishment of trade-related measures is advocated. With these types of measures states or supply chain actors can limit the access to their markets only to those products that meet their requirements regarding non-IUU fishing, thereby reducing the economic benefit for IUU fishing. Publicly operated Catch Documentation Scheme (CDS) and private certification and labelling schemes are recognised to this end. The importance of seafood supply chain actors as enablers of these kind of measures is often mentioned, as they could restrict their sourcing based on them (Global Ocean Commission, 2014). Additionally, import controls and procurement decisions based on listed IUU vessel or failure of flag states to control vessels are trade-related measures that could have a role in combatting IUU fishing (Young, 2015).

Lastly, in addition to improving traceability and developing trade-related measures, efforts should be taken to establish new and ratify existing policies and practices. In acknowledgement of the potential of the current policy framework, a need to promote ratification among member states and to increase guidance on its implementation is emphasized. Additionally, broadening the policy framework to fishing areas for which there are currently no management and conservation measures in place is advocated. Next to that, improvement potential in fighting IUU fishing is seen in the alignment of regulatory efforts around the issues of IUU fishing, safety in the fishery sector, forced labour and fisheries crime as similarities between these issue multiple issue areas have been identified (Lindley & Techera, 2017; Petrossian, 2015).

The information presented here is used to identify the regime complex around IUU fishing, which is further operationalized in methodology section 4.2.1.1.

4. Methodology

This section describes the methodology used in this research. Section 4.1 will outline the research design. Section 4.2 describes the data collection procedure which includes an explanation on the desk research approach. The data cleaning and preparation procedure are described in section 4.3. Section 4.4 gives an overview of the way in which the data is analysed. Section 4.5, finally, reports on the quality of the research and on the ways in which the researcher has aimed to increase the reliability and validity of the research.

4.1 Research design

To examine the way in which the presence of transnational institutions in the regime complex around IUU fishing influences its fragmentation, a four-step methodological approach was applied, see figure 4. In step one, data was collected on institutions that are involved in addressing the issue of IUU fishing. In step 2, data was collected on the direct interactions between those institutions as well as their members and partners. Next, social network data was created by transforming the collected data into main and sub nodes, and 1-mode and 2-mode networks. As a fourth and last step, network metrics of the social networks were calculated to determine network structures and degrees of fragmentation, relative to the presence of transnational institutions. The methodological steps are elaborated on in the following sections.

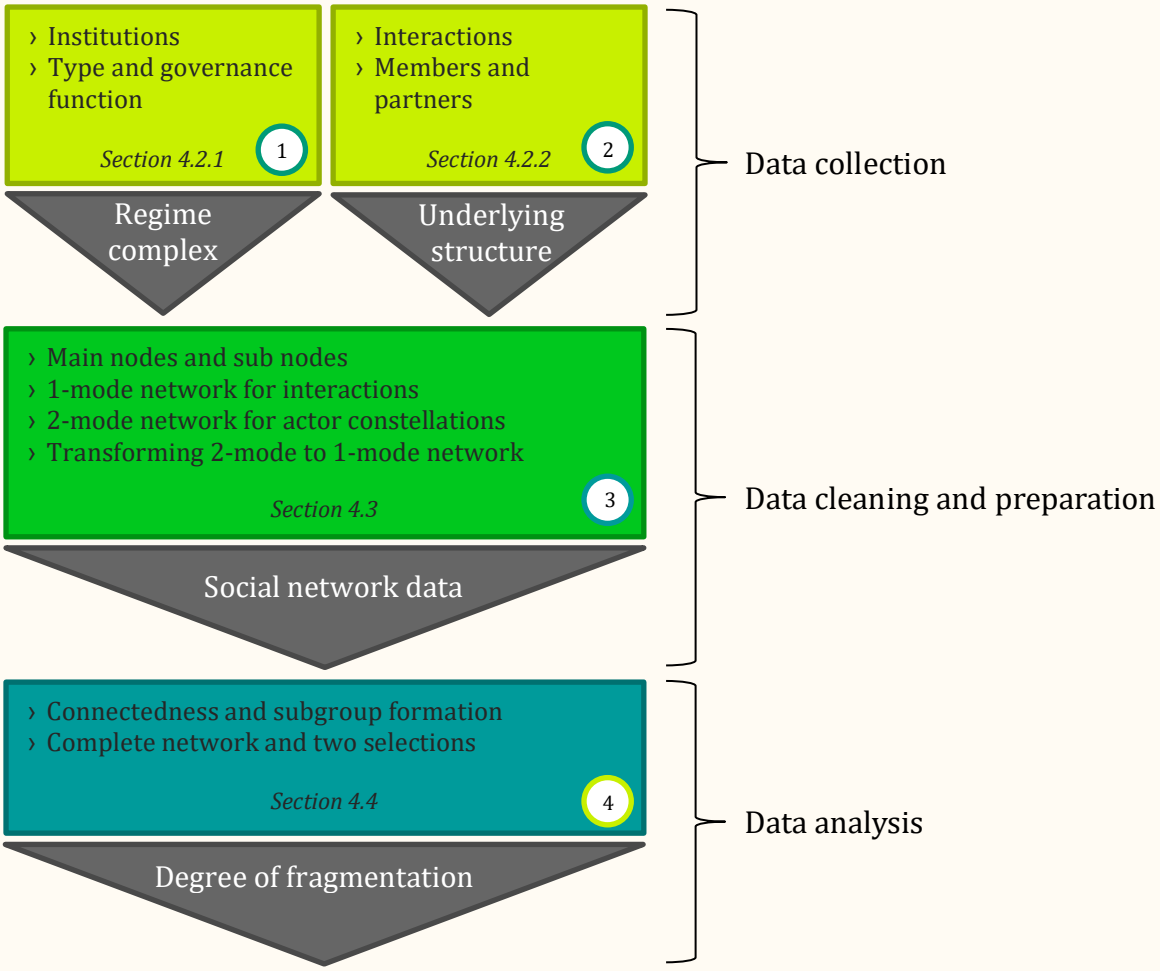

Figure 4. Research design.

4.2 Data collection

To construct the regime complex as a network, firstly the regime complex was mapped by identifying all relevant institutions (hereafter referred to as IUU institutions). Secondly, direct interactions between the IUU institutions and its members and partners were mapped.

4.2.1 Institutions

4.2.1.1 Criteria

To keep the identification of IUU institutions as objective as possible, a detailed set of inclusion criteria was established. Firstly, for an institution to be included, it had to meet issue-specific criteria. This meant that institutions were only included if the topic of IUU fishing was featured in the institution's plan, vision, mission or work programs, or was mentioned otherwise as one of their focus areas. In addition, those institutions focusing on one of the measures to combat the issue of IUU fishing as outlined in section 3.2, i.e. improving traceability, trade-related measures or improved policies, were included. Institutions focusing on stricter marine conservation measures were excluded, as these aim attention at expanding the scope of what comprises IUU fishing and hence were not considered to focus on the issue as is. As a second criteria, only transnational and interstate institutions were included in the mapping of the regime complex, using the definition of Risse-Kappen (1995)as set out in section 2.1.1. As this research focused on the global governance around IUU fishing, there was an interest in the institutions that operate alongside each other on this issue, referred to as horizontal institutions (Aggarwal, 2005). This was added as a criterion in order to only include autonomous institutions, i.e. exclude those nested under any other international or transnational institution. As such, for example RFMO's were excluded from the analysis as these are working under the supervision and mandate of the FAO. Lastly, all criteria developed by Bulkeley (2012) and Andonova (2009), as outlined in theory section 2.1.3, were included.

In sum, a total of six inclusion criteria were used to identify and map institutions within the regime complex of IUU fishing: 1) focus on the issue of IUU fishing, 2) transnational or interstate, 3) horizontal, 4) intention to steer members or a broader target group, 5) have a public governance goal, 6) take up a governance function. All criteria had to be met for an institution to be included in the analysis.

4.2.1.2 Developing the dataset

As this research was concerned with *all* institutions present within the boundaries specified in the previous section, a data collection approach for mapping 'complete network' data had to be taken (Scott & Carrington, 2011). As described by Isett et al. (2011) this required the application of snowballing techniques. Snowball techniques can generally be referred to as using an initial amount of information to identify new information. In most cases snowballing techniques refer to the recruitment of new participants for a study through the acquaintances of existing participants. In the context of desk research, it is used a search approach. Taking snowballing as a search approach, the strategy for developing the dataset of IUU institutions for this research was as follows. Firstly, an initial set of IUU institutions (the 'snowball') was drawn from searches in Google and Google Scholar using key words derived from the background research

on IUU fishing (section 3). The following keywords were included: IUU, illegal fishing, traceability, transparency, monitoring control and surveillance, MCS, Automatic Identification System, AIS, Vessel Monitoring System, VMS, Catch Documentation Schemes, CDS, certification, high seas, seafood businesses. This led to the identification of individual institutions as well as to articles listing institutions (see e.g. Arnau et al., 2017 and Lindley et al., 2017). All identified institutions were analysed and those institutions that met all criteria laid down in the previous section, were selected and added to the dataset. This dataset provided the starting point for a snowballing process. The IUU institutions' publicly available information (e.g. on associates) was scanned to identify potential additional institutions. These again, were analysed for compliance with the inclusion criteria and in case compliant, added to the dataset. Newly identified IUU institutions went through the same snowballing process to identify potential additional relevant institutions. The process stopped when no additional IUU institutions were found.

For each IUU institution, information was collected on its membership structure and most constituent member. This information was used to assign the institution to one of the seven zones on the Abbott governance triangle, on the basis of which the triangle was visualized. Additionally, information on the governance function of each institution was presented on the triangle through colour coding. The mapping of institutions served as input for the social network analysis, which is further elaborated on in section 4.3.

4.2.2 Interactions, members and partners

To map the interactions between IUU institutions, two types of data were obtained: data on the direct interactions between institutions and membership and partnership data.

4.2.2.1 Criteria

Direct interactions refer to the interactions between the IUU institutions. This included formally established partnerships between two (or more) of the institutions as well as the use of outputs (e.g. information, regulations, private standards, tools) of one institution by another institutions. Partnerships represent mutual interaction between institutions, whereas interactions through the use of outputs could be one-way, i.e. an institution could be building on FAO rules, without the FAO interacting with this institution. In obtaining membership and partnership data, actors with a position to influence the rules and decision-making of the institution were included as members of an institution (Arnau et al., 2017). These included founders, actors present on the board of directors, the advisory board or within committees. Partners included those actors that supported or collaborated with an institution or were committed to the institution's work, e.g. as a signatory of its commitment or endorser of its standards, without having decision-making power.

4.2.2.2 Developing the dataset

Data on the direct interactions between the IUU institutions was obtained through a set of Google searches. The first search included the names of two institutions, i.e. institution A and institution B. As a second search, the complete website of one institution was explored for referral to another institution. This in-website search was performed using the web domain of the first institution and adding the name of the

second institution, i.e. site:<URL of institution A> and institution B. For those institutions whose main output is a standard, commitment or legislative document (e.g. the PSMA), an additional search was done within this document to identify possible interactions. To collect data on the members and partners of the IUU institutions, their websites and foundational documents were consulted. Information on members was collected already during the identification of institutions, as this information was needed to determine its governance triangle zone. Whenever an identified member or partner was one of the IUU institutions itself, this was included as a direct interaction between the two IUU institutions.

4.3 Data cleaning and preparation

To transform the collected data into social network data, a decision was made on the software to be used, as this influenced the required data format. Next, data was transformed to main nodes, sub nodes and networks. Some data cleaning was required throughout this process which is detailed upon below.

4.3.1 Software selection

A wide array of social network analysis (SNA) software was available. Software was chosen on the basis types of its functionality, i.e. the types of analysis and visualization options it can provide. Additionally, the beginner level experience and skill of the researcher in doing network analysis level was considered. Based on the review of Huisman & van Duijn (2011), the SNA software package NetMiner (Version 4: Cyram Inc., 2017a) was selected for this research due to its possibilities for data exploration and visualization and its perceived suitability for novice users.

4.3.2 Creating social network data

The IUU institutions were uploaded into NetMiner as the main node set. The zone was added as an attribute as this provided the option to filter for different types of institutions during the data analysis. The identified members and partners were uploaded to NetMiner as a sub node set. To this end, the identified members and partners were consolidated to one list. Duplicates were removed and the names of those members or partners that were disclosed in different ways were harmonized to one name.

The direct interactions between the IUU institutions were included in NetMiner as ties in a 1-mode network, linking main nodes to main nodes through a matrix data structure. The data in this network was directed, as not all ties between the main nodes were per definition reciprocated as explained in section 4.2.2.1. For the member and partner data, a 2-mode network was created in NetMiner, linking the main nodes to the sub nodes. The data in this network was undirected, as memberships and partnerships inevitably create reciprocated ties. As there were large differences in the number of members and partners between institutions, the data was normalized (Transform > Value > Normalize). To connect this information to the main nodes – the primary units of interest – the normalised 2-mode network was transformed to a 1-mode network by using NetMiner's Correlation – Inner Product computation (Transform > Mode > 2-mode Network). The inner product is the mathematical operation that draws a relationship between main nodes on the basis of overlap in sub nodes, creating a proximity matrix among the main nodes, referred to as a co-

membership matrix (Cyram Inc., 2017b). The transformation process created ties to institutions themselves, as naturally, institutions have full member and partner overlap with themselves. To exclude these (diagonal) values from further analysis, they were removed from the dataset. As the transformation of the network led to valued ties while most network metrics used in this research required binary value input, the data was dichotomized (Transform > Value > Dichotomize). To exclude the member and partner overlaps that were of lesser significance, a threshold value was set for the dichotomisation process based on the mean of the values in the 1-mode network of actor constellations (Statistics > Descriptives > Matrix).

4.4 Data analysis

Once the interaction and actor constellation networks were derived, various analyses were performed. To this end, network metrics were selected and calculated in NetMiner. As this research examined the influence of transnational institution on network structures, a distinction was made in these calculations between interstate and transnational institutions through node filtering.

4.4.1 Selecting network metrics

This research made use of the network metrics listed in table 2 as a starting point for further operationalisation. Firstly, as this research analysed networks of different sizes, the network metric average degree was selected over density to determine the overall connectedness of the network to control for size. Secondly, a community identification method had to be selected for the network metric modularity. To this end, the method of modularity optimization was selected, as this method provides for the network metric modularity optimisation value Q for value is larger than 0.3-0.4, the network would indicate significant community structures (Fortunato & Barthé, 2007). All other network metrics in table 2 were used as is. Since NetMiner was used to perform the analyses, the network metrics used in this research were matched to the computation options within NetMiner of which an overview is given in table 3.

Table 3. Overview of network metrics and their associated NetMiner computations.

Network metric		NetMiner computation
Average degree	Absolute value	Neighbour > Degree
Centralisation	Percentage	Centrality > Degree
Component	Component value Isolates	Cohesion > Component
Modularity	Optimisation value Q Number of communities	Cohesion > Community > Modularity
Betweenness centrality	Mean Standard deviation	Centrality > Betweenness > Node

4.4.2 Calculating network metrics

The same network metrics were calculated for the interaction and actor constellation network. Besides calculating the network metrics for the complete network, network metrics were calculated for two selections of the network comprising of only interstate (zone 1) and interstate and collaborative transnational institutions (zone 1,4,5,7). To this end, two attribute filters were applied in the calculations.

With regard to the network metrics for connectedness, firstly, the average degree was calculated for the two networks, through the computation Neighbour -> Degree, with the number of ties selected as a measure. The calculated average degree, indicated as 'mean', was taken as a result from this analysis. Next, for the centralisation measure, Centrality > Degree was calculated with the number of ties selected as a measure. From this analysis, the network degree centralisation index and the three institutions with the highest degree centralities were taken as results.

In calculating the network metrics around sub-group formation, firstly the computation Cohesion > Component was performed to identify the number of components in the network. As the interaction network consisted of directed ties, 'strong component' was selected[5]. As the actor constellation network consisted of undirected ties, either 'strong' or 'weak components' could be selected. From these analyses, the isolates, number of components and in case present, the members of components were taken as results. Next, the modularity analysis was calculated through Cohesion -> Community -> Modularity. The components that were identified in the previous calculations were used as filters in these calculations. In this calculation, the directed ties of the interaction network were automatically symmetrized[6]. The modularity optimisation value Q, referred to as best modularity value, and the number of communities were taken as results from this analysis. Lastly, the betweenness centrality was calculated using Centrality > Betweenness > Node. From this analysis, the mean and its standard deviation were taken as results.

4.5 Quality of the research

The research design chosen is subject to reliability and validity issues. Measures were taken to increase the internal and external reliability and validity of this research. However, issues remained which will be discussed too. Internal reliability issues were inherent to the subject under study, as governance system are highly volatile. Due to this, the data used in this study changes overtime and results differ when conducted at later point in time. Regarding the external reliability, the use of clear and unambiguous criteria in this research to identify institutions, interactions and member and partner overlaps increased the ability for another research to collect the same data and reach the same conclusions. The validity of the research was improved by selecting the network-metrics that were used to analyse the network data on the basis of multiple data sources, although for some network-metrics limited data sources were available.

[5] NetMiner has a component analysis for directed networks specifically, in which two types of components can be chosen: weak components are computed assuming undirected ties and strong components assuming directed ties.

[6] The symmetrising of data was a pre-requisite of computing this network metric in NetMiner.

5. Results

This section discusses the results of the data collection by presenting the identified interstate and transnational institution on the governance triangle. Also, an overview of the identified number of interactions and overlapping members and partners between institutions is given. Finally, the results of the analyses in NetMiner on the network of interactions and actor constellations are discussed based on the calculated network metric values.

5.1 Overview of interstate and transnational institutions

The current regime complex around IUU fishing comprises of 34 institutions. Appendix A provides for background information on all institutions as well as for an overview of inclusion criteria per institution. As indicated by the governance triangle illustrated in figure 5, there is large private actor contribution in the governance around this issue. In most cases CSO and private actors partner together in institutions (zone 6). Focusing on the transnational institutions that are led by a sole actor, more CSO (zone 3) than firm-led (zone 2) institutions are present. The public sector is represented in 16 institutions, of which 12 are exclusively state-led (zone 1). The FAO takes up a prominent role in this zone with several initiatives and standards around IUU fishing.

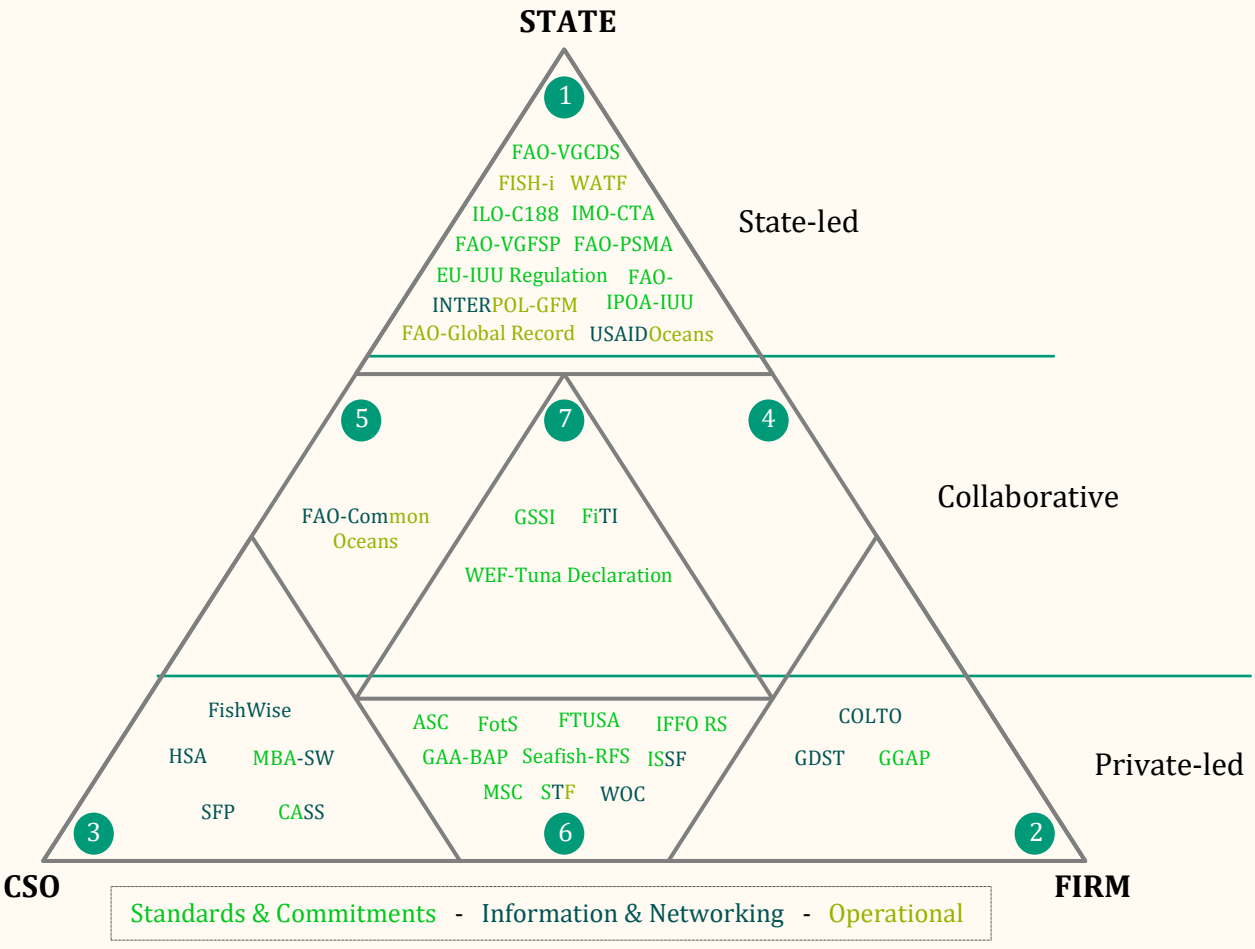

Figure 5. The governance triangle of the regime complex around IUU fishing.

Within this regime complex, there are no institutions in which states and firms collaborate directly (zone 4). However, these actors do work together in institutions that also include CSO actors (zone 7). Overall, the regime complex is characterized by having a higher share of transnational (zone 2-7) institutions than interstate institutions (zone 1). Standard setting is the most common governance function within this regime complex, with 17 institutions exclusively taking up this function and another four institutions combining this governance function with other ones. The information and networking roles are mostly present among CSO-led institutions. Operational activities are limitedly present within this regime complex and almost exclusively taken up by interstate institutions.

5.2 Interactions, members and partners within the regime complex

With the presence of 34 institutions, a maximum amount of 1122 direct interactions could be present within the regime complex. The data collection identified 152 cases of direct interactions between institutions, corresponding to 13.5% of the maximum amount of interactions possible. Appendix B provides an overview of these interactions and their sources. The collection of member and partner data identified a total of 1653 members and partners. An overview of the sources that were used in developing the member and partner dataset can be found in Appendix C. Of the total number of members and partners, 1282 were unique actors which means that 385 of them were linked to more than one of the institutions in the regime complex. With a total of 832 partners and 821 members, there was an almost equal divide between members and partners in the regime complex. Member and partner overlap was identified for 24 institutions and provided for 113 ties between them, corresponding to 20.1% of the maximum number of ties possible[7].

5.3 Network metric values

The values of all network metrics calculated in NetMiner are summarized in table 4 and 5 and will be explained in the following sections. In those explanations, 'zone-1' refers to the selection of interstate institutions and 'zone-1457' to the selection of interstate and collaborative transnational institutions.

5.3.1 Connectedness: average degree and centralisation

As shown in table 4, the average degree in the interaction network increased with the presence of transnational institutions (zone-1 selection vs. complete network) which means that these institutions increased the average number of ties in the network. The same accounts for the actor constellation network, see table 5. In both cases also, the increase in average degree from the zone-1 to the zone-1457 selection was smaller than the increase from the zone-1457 selection to the complete network which indicates that mainly the private-led transnational institutions were responsible for this increase. In comparing the interaction and actor constellation network, one can see a higher average degree in the actor constellation network which coincides with the larger number of ties in this network (see section 5.2).

[7] Since the member and partner data was undirected, the maximum number of ties equalled 561, half of the maximum number of ties based on interactions, which was directed data.

Table 4. Overview of network metric values of the interaction network.

Network metric		**Interaction network**		
		Zone 1	*Zone 1,4,5,7*	*Complete network*
Average degree		2.67	3.00	4.47
Centralisation	Absolute value	52.89	56.89	32.87
Components	Component value	2	2	2
	Isolates	5	8	6
	Number of communities	4	4	3
Modularity	Optimisation value Q	0.107	0.049	0.308
	Number of components	2	2	3
Betweenness centrality	Mean	0.052	0.042	0.056
	Standard deviation	0.064	0.056	0.063

Table 5. Overview of network metric values of the actor constellation network.

Network metric		**Actor constellation network**		
		Zone 1	*Zone 1,4,5,7*	*Complete network*
Average degree	Absolute value	3.67	4.25	6.65
Centralisation	Percentage	36.36	36.19	26.89
Components	Component value	1	1	1
	Isolates	3	3	6
Modularity	Optimisation value Q	0.131	0.207	0.271
	Number of communities	2	3	2
Betweenness centrality	Mean	0.083	0.073	0.039
	Standard deviation	0.105	0.077	0.038

In both the interaction and actor constellation network, the degree of centralisation decreased with the presence of transnational institutions, see table 4 and 5. Only in the interaction network the zone-1457 selection slightly increased the centralisation measure at first. In comparing the interaction and actor constellation network, higher degrees of centralisation were identified in the interaction network which indicates that the number of ties in this network were directed to fewer nodes. Hence, the interaction network was more centralised.

As shown in table 6, in the interaction network, the presence of transnational institutions diverted the centrality of the interstate Port State Measures Agreement (FAO-PSMA) to a centrality position shared with the private-led transnational Marine Stewardship Council (MSC). In the actor constellation network, the presence of transnational institutions coincided with them being the most central institutions in the network, with the collaborative transnational Fisheries Transparency Initiative (FiTi) and the private-led transnational Global Dialogue on Seafood Traceability (GDST) and MSC virtually having the same centrality values, see table 6. Hence, sharing the most central position within the actor constellation network.

Table 6. The three most central institutions in the networks.

	Interaction network			Actor constellation network		
Selection	*Zone 1*	*Zone 1,4,5,7*	*Complete network*	*Zone 1*	*Zone 1,4,5,7*	*Complete network*
Top three institutions	FAO-PSMA	FAO-PSMA	MSC	FAO-PSMA	FAO-Global Record	FiTi
	FAO-IPOA-IUU	FAO-IPOA-IUU	FAO-PSMA	FAO-Global Record	FAO-PSMA	GDST
	FAO-VGFSP	FAO-Global Record + FAO-VGFSP	FAO-IPOA-IUU	Interpol-GFE	FiTi + Interpol-GFE	MSC
Centrality value	0.73	0.73	0.45	0.64	0.60	0.45
	0.64	0.60	0.42	0.64	0.53	0.42
	0.45	0.40	0.33	0.55	0.47	0.42

5.3.2 Sub-group formation: components, modularity and betweenness centrality

As shown in table 5, the component analysis of the actor constellation network only returned component values of 1, indicating that no components were present in this network. Hence, no strict divide could be detected between the nodes in this network. The component analysis of the interaction network, however, identified the presence of two components. As table 7 indicates, one component consists of only two interstate institutions, Fish-I and West African Task Force (WATF) while the other component consists of all other institutions in the network, excluding isolates. In both networks, the presence of transnational institutions had no effect on the number of components. Furthermore, regarding the isolates in both networks, table 7 and 8 show that the identified isolates were unique to their network. This indicates that isolates in one network were not isolates in the other network, meaning that in a combined analysis of the two networks these nodes would in fact not be isolated.

Table 7. Isolates and members of identified components in the interaction network.

	Zone 1	*Zone 1,4,5,7*	*Complete network*
Isolates	ILO-C188, USAID Oceans, IMO-CTA, Interpol-GFE, EU-IUU Regulation	ILO-C188, USAID Oceans, GSSI, WEF-Tuna Declaration, IMO-CTA, Interpol-GFE, EU-IUU Regulation, FiTi	COLTO, HSA, ILO-C188, IMO-CTA, Interpol-GFE, FiTi
Component members	1 - Fish-I, WATF 2 – FAO-IPOA-IUU, FAO-PSMA, FAO-VGFSP, FAO-VGCDS, FAO-Global Record	1 - Fish-I, WATF 2 – FAO-IPOA-IUU, FAO-PSMA, FAO-VGFSP, FAO-VGCDS, FAO-Common Oceans, FAO-Global Record	1 - Fish-I, WATF 2- All other institutions (26)

Table 8. Isolates in the actor constellation network.

	Zone 1	*Zone 1,4,5,7*	*Complete network*
Isolates	FAO-IPOA-IUU, FAO-VGFSP, FAO-VGCDS	FAO-IPOA-IUU, FAO-VGFSP, FAO-VGCDS	FAO-IPOA-IUU, FAO-VGFSP, FAO-VGCDS, WOC, FotS, COLTO

In determining to what extent nodes tend to cluster together, the modularity analysis indicated that in the interaction network, with optimisation value Q exceeding the quality indicator of 0.3, significant community structures could be identified. As the zone-1 and zone-1457 selections did not reach optimisation Q values above 0.3, the clusters observed in the interaction network could be attributed to the presence of transnational institutions. As shown in table 9, community 1 consisted mainly of interstate institutions

(zone 1), community 2 of interstate as transnational institutions and community 3 of mainly private-led transnational institutions (zone 2,3,6). The modularity analysis of the actor constellation network returned optimisation Q values below 0.3. Hence, this network was less clearly clustered than the interaction network and no community structures could be identified.

Table 9. Members of the identified communities in the interaction network.

		Community 1	*Community 2*	*Community 3*
Community members	Zone 1	FAO-IPOA-IUU, FAO-VGFSP, FAO-VGCDS, FAO-Global Record, FISH-i, WATF	EU-IUU Regulation, FAO-PSMA, USAID Oceans	
	Zone 2		GDST	GGAP
	Zone 3		FishWise	MBA-SW, SFP
	Zone 5	FAO-Common Oceans		
	Zone 6		ISSF, STF, WOC	FotS, ASC, GAA-BAP, FTUSA, Seafish-RFS, MSC, CASS, IFFO RS
	Zone 7		WEF-Tuna Declaration	GSSI

Lastly, the betweenness centrality analysis showed that the betweenness centrality values in both networks were highly variable, with standard deviations in most cases equalling or exceeding the means, see table 4 and 5. This indicates that, in both networks, there were a number of nodes that had higher betweenness centrality values than others and could therefore have bridging capacities. As the betweenness centrality serves as a measure in networks showing modularity, its value was only relevant for the interaction network. Similar to the overall observation, the interaction network showed high variability in betweenness centrality values, with the standard deviation exceeding the means. The three institutions with the highest betweenness centrality values in the interaction network are listed in table 10. Comparing these with the community members displayed in table 9 indicates that each identified community included one member with high betweenness centrality values. Hence, each community included a member with bridging capacities that provided for ties between all communities.

Table 10. The three institutions with the highest betweenness centrality values in the interaction network.

Top three institutions	FAO-Common Oceans	MSC	ISSF
Betweenness centrality value	0.23	0.23	0.17

6. Discussion

This section discusses the results presented in section 5. First, the calculated network metric values are consolidated to most important findings. Based on these, the network structure of the regime complex around IUU fishing is described and the influence of the presence of transnational institutions on this structure and implications for the degree of fragmentation are evaluated. Lastly, methodological considerations are discussed and recommendations for further research are given.

6.1 Interpreting the results

Firstly, regarding the overall connectedness of the networks, the results indicate that in both the interaction and the actor constellation network, the presence of transnational institutions increased the average degree while at the same time reduced centralisation. Also, it changed the most central institutions in both networks from interstate to transnational institution types. In applying the network structure archetypes (see table 2) to these results, this indicates that both networks changed from more centralised to more cohesive network structures with the presence of transnational institutions. Secondly, with regard to sub-group formation, the results indicate that components and connected communities were only present in the interaction network. The number of network components did not change with the presence of transnational institutions. The connected communities, on the other hand, were only identified with the presence of transnational institutions. In applying the understandings of the network structure archetypes to these findings, the interaction network could be characterised as a connected modular network in which the modularity is partly due to the presence of transnational institutions. Summarising the key findings of the two networks, the interaction network could be characterised as a cohesive and connected modular network while the actor constellation network could be characterised as a cohesive network.

As both networks are taken as proxies for real-life structures in the regime complex around IUU fishing, their results should be interpreted together to characterise the overall regime complex. Taking the two networks together enhances the understanding of the regime complex as cohesive as it creates more and, in some cases, multiple ties between nodes. The level of centralisation cannot be understood from interpreting the two networks alongside each other and would require additional network analyses, which is further discussed in the next section. It can be said, however, that with their presence, transnational institutions take a more central position within the regime complex than interstate institutions. Furthermore, since no components or communities were identified in the actor constellation network, this could indicate that the actor constellations in the regime complex provide for additional connections between the sub-groups in the interaction network, beyond the identified bridging ties.

Based on these combined findings, this research considers the structure of the total regime complex to be best characterised as cohesive and connected modular. As a cohesive structure create possibilities for joint actions and other collaborations in the regime complex that create alignment (Bodin & Crona, 2009), this structure characterises as having relatively low degrees of fragmentation. As the capacity for collaborative

processes in the regime complex (Bodin & Crona, 2009) reduces with the presence of sub-groups, but increases again with the connectedness among sub-groups, this structure characterises as having moderate degrees of fragmentation. As such, the overall structure of the regime complex could be characterised as having a low to moderate degree of fragmentation. This structure changed from a more centralised structure with a relatively low degree of fragmentation that was present in the case of interstate institutions only. As such, the results of this research suggest that the presence of transnational institutions within the regime complex around IUU fishing has influenced its structure but limitedly influenced its degree of fragmentation.

6.2 Methodological considerations and limitations

The identification of the regime complex structure and degree of fragmentation should be read with caution as they are subject to some methodological considerations. Firstly, the interpretation of network outcomes in this research is based on archetypical network structures and archetypical indicators of fragmentation. Although these are useful in explaining the general concepts, they prove to be less useful in interpreting network outcomes due to two main issues. Firstly, and most importantly, the structures and indicators do not provide any guidance on how to interpret network outcomes that differ from the extreme structures and indicators that they embody. Due to this it is difficult to determine which network structures can actually be identified from the network outcomes and whether a network indicates low or high degrees of fragmentation. This has been described also by Widerberg (2016) who points at the lack of calibration of network metrics in the context of governance outcomes and describes the same difficulty this creates in interpreting them. Secondly, as shown in this research and related also to the previous point, network outcomes can be indicative for multiple network structure archetypes (e.g. cohesive as well as modular network structures).

Next, as touched upon in the previous section, this research has performed network analyses on the interaction and actor constellation network separately instead of on a combined network. As described by Howison, Wiggins, & Crowston (2011), merged networks in which tie strengths are included are more reflective of real-life structures. Although limited research is available to guide decisions on relative tie strengths for the types of networks in this research, it is acknowledged that a merge of the two networks would be more reflective of real-life regime complex structures and hence, improve analysis.

Thirdly, in analysing the modularity in the interaction network, the selected SNA software only allowed for calculations on symmetrised data. As such, the network outcomes are not based on the directed ties that were actually present in this network but on undirected ties. This indicates that information was lost in calculating the modularity analysis of the interaction network and network outcomes could be different in cases where the selected SNA software would allow for modularity analyses on networks with directed ties.

6.3 Recommendations for further research

Building on the methodological consideration laid down in the previous section, additional research on using network theory for the analysis of regime complexes should be directed to these areas, e.g. to identify how different networks could be meaningfully combined. Additionally, the use of other network analysis functionalities should be further explored, e.g. the use of institution attributes. Adding the goals and norms of institutions as institution attributes might provide a way to analyse goal and norm alignment between institutions through network analyses as well. Lastly, considering the considerable time effort in constructing a database of institutions and interlinkages and the fast-changing nature of such systems, further research should identify ways to ease this process, e.g. by identifying relevant proxies for institutional interaction for which information could be more easily obtained. Directing research in these directions could lead to improvements in the approach of mapping and measuring regime complexes and thereby contribute to the farther goal of advancing research on the effectiveness of governance systems and regime complexes.

7. Conclusion

This research explored the degree of fragmentation in the transnational governance around IUU fishing through the following research-question: *how do the transnational institutions within the regime complex around IUU fishing influence its degree of fragmentation?*

To answer this research question, first, the interstate and transnational institutions in the regime complex around IUU fishing were identified based on inclusion criteria drawn from literature around regime complexes. With the presence of institutions across most levels of the governance triangle, the institutional complexity of the regime complex around IUU fishing, and hence referral to it as a regime complex, was substantiated. Next, to identify the degree of fragmentation, the network structure of the regime complex and the way in which transnational institutions influence this structure, was analysed. To this end, first, a literature study was conducted to determine indicators of fragmentation in regime complexes and to determine how differences in network structure correspond to different degrees of fragmentation, drawing from literature on regime complex and literature on the application of network analysis to governance systems. Based on this literature study, four types of network structures were identified that could be linked to the degree of fragmentation in regime complexes. To identify the presence of these network structures in the regime complex under study, two networks were created, one based on the interactions between the institutions in the regime complex and one based on overlap in actor constellations.

Taking the network outcomes of both networks together, the structure of the total regime complex around IUU fishing can be characterised as cohesive and connected modular, with a low to moderate degree of fragmentation and as limitedly influenced by the presence of transnational institutions. These results should be read with caution since currently existing theories do not provide for conclusive guidance in interpreting network outcomes in the context of regime complexes. Next steps in this field of research should therefore focus on these methodological caveats.

8. Business recommendations

This research was performed partly to provide Ahold Delhaize with an increased understanding on how to determine the effectiveness of their engagement in initiatives and institutions around IUU fishing and sustainability issues in general. This research has focused on the structural characteristics at the level of whole networks. Looking at the characteristics of the network from a node (institution) and sub-node (actor) perspective can provide and understanding of the structural position and potential influence of Ahold Delhaize in the overall network.

Ahold Delhaize is a member or partner of 7 out of the 34 institutions identified: Aquaculture Stewardship Council, GLOBALG.A.P., GAA Best Aquaculture Practices, Global Dialogue on Seafood Traceability, Global Seafood Sustainability Initiative, Seafood Task Force and the WEF Tuna Declaration. Based on current literature and keeping in mind the methodological caveats as outlined in the discussion, this research indicates that Ahold Delhaize's current engagement in initiatives and institutions around IUU fishing benefits the overall effectiveness of the regime complex. As indicated in table 9, Ahold Delhaize has presence in two out of three identified subgroups. Thereby the company contributes to the bonding ties between these subgroups, which is generally identified as contributory to the governance outcomes of the regime complex as it benefits the collaborative processes and information flows. It would be recommended to Ahold Delhaize to recognize their bridging role and further explore how their network position could benefit the governance outcomes of the regime complex.

Based on this case specific research, a wider recommendation to Ahold Delhaize would be to always determine the effectiveness of their actions on sustainability issues in relation to the wider institutional environment in which they operate. Taking such an approach, as opposed to separate individual analyses of initiatives and institutions, would allow the company to make more strategic decisions for engagement and e.g. assure their presence in subgroups of institutions that contribute to knowledge development and to be aware of their current and potential network position and utilize their position accordingly.

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Appendices

Appendix A. Overview of inclusion criteria per institution

Background	Issue specific criteria	Intention to steer	Public governance goal	Governance function	Substantiation	Membership structure	Constituent actor	Zone
Food and Agricultural Organization - International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) http://www.fao.org/fishery/ipoa-iuu/about/en								
The IPOA-IUU is a soft law instrument developed in 2001. It provides measures to states and RFMO's to tackle the issue of IUU fishing and guidelines on how to implement these measures.	Providing for the international policy framework around fisheries and IUU fishing. Mission: prevent, deter and eliminate IUU fishing by providing all States with comprehensive, effective and transparent measures.	Providing states with measures by which to act to prevent, deter and eliminate IUU fishing	Prevent, deter and eliminate IUU fishing.	Standards & commitments	The IPOA-IUU establishes measures and guidelines.	N/A	State (based on characteristics of organisation itself)	1
Food and Agricultural Organization - Port State Measures Agreement (PSMA) http://www.fao.org/fishery/psm/agreement/en								
The PSMA is a legally binding instrument that was developed in 2009 and entered into force in 2016. It details on the measures that port states should take on foreign vessels that seek entry to their port to block the flow of IUU-caught fish into national and international markets.	Providing for the international policy framework around fisheries and IUU fishing. Mission: prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing through the implementation of robust port state measures.	Legally binding instrument for all ratifying states	Prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing through the implementation of robust port State measures.	Standards & commitments	The PSMA is a rule of international law	Ratifying member states (51)	State	1
Food and Agricultural Organization - Voluntary Guidelines on Flag State Performance (VGFSP) http://www.fao.org/fishery/topic/16159/en								
The VGFSP spell out a range of actions that countries can take to ensure that vessels registered under their flags do not conduct IUU fishing, including MCS activities, such as VMS and observers.	Providing for the international policy framework around fisheries and IUU fishing.	Providing states with measures to increase control of IUU fishing by vessels flying their flag.	Prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing through improved flag state controls.	Standards & commitments	The VGFP establishes measures and guidelines.	N/A	State (based on characteristics of organisation itself)	1

Food and Agricultural Organization - Voluntary Guidelines for Catch Documentation Schemes (VGCDS) http://www.fao.org/fi/static-media/MeetingDocuments/CDS/TC2016/wpAnnex.pdf								
The VGCDS assists states, regional fisheries management organisations, regional economic integration organizations and other intergovernmental organisations when developing and implementing new CDS, or harmonising or reviewing existing CDS.	Providing for the international policy framework around CDS to be used in preventing IUU.	Member states, RFMO's and other intergovernmental organisations.	Assist states, RFMO's and other intergovernmental organisations when developing and implementing new CDS, or harmonising or reviewing existing CDS.	Standards & commitments	The VGCDS establishes guidelines.	N/A	State (based on characteristics of organisation itself)	1
Food and Agricultural Organization - Areas Beyond National Jurisdiction Program (Common Oceans) http://www.fao.org/in-action/commonoceans/en/								
The Areas Beyond National Jurisdiction (ABNJ) Program – often referred to as Common Oceans – is a broad-scale, innovative approach to achieve efficient and sustainable management of fisheries resources and biodiversity conservation in marine areas that do not fall under the responsibility of any one country.	Common Ocean addresses global calls to reduce the illegal, unreported and unregulated fishing currently undermining efforts for promoting sustainable ecosystem-based practices.	Governments, regional management bodies, civil society, the private sector, academia and industry.	Establish the strong networks, best management practices and facilitated information sharing needed to make a transformational impact towards responsible and sustainable use of ABNJ resources.	Information & networking Operational	I&N: bring together policy, technical, and scientific partners as well as industry. O: technical/ analytical assistance, testing innovative and appropriate management tools.	Partners	State + CSO	5
Food and Agricultural Organization - Global Record http://www.fao.org/global-record/en/								
Global Record is a phased and collaborative global initiative to make available, in a rapid way, certified data from state authorities about vessels and vessel activities.	Providing a tool to deter and eliminate IUU fishing activities, within the framework of legal instruments available to make it more difficult to operate outside the law.	Member states, NGO's and the general public.	Combat IUU fishing by enhancing transparency and traceability.	Operational	Global Record provides for a tool and for assistance in using the tool.	Funding partners (4) and member states (11)	State	1
European Union - Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU regulation) https://ec.europa.eu/fisheries/cfp/illegal_fishing_en								
The IUU Regulation sets out a CDS (requiring flag states to certify the origin and legality of the fish), processes for	Providing for the EU framework around fisheries and IUU fishing.	Member states	Prevent, deter and eliminate trade in fisheries products deriving	Standards & commitments	The IUU Regulation sets out rules adopted at EU level which should be	Member states	State	1

	improvement in case CDS cannot be operated fully and possibilities for a trade ban for non-cooperating countries.			from IUU fishing into the EU.		applied in all Member States.			
International Maritime Organization - Cape Town Agreement (CTA) http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/The-Torremolinos-International-Convention-for-the-Safety-of-Fishing-Vessels.aspx http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2017/10/the-cape-town-agreement									
	CTA was developed in 2012 but did not yet enter into force. It details on standards for design, construction, and equipment of fishing vessels. Also, it outlines regulations for crew and calls for harmonized inspections—those that consider fisheries, labour, and safety issues.	Contribute to the fight against IUU fishing by facilitating better control of fishing vessel safety by flag, port and coastal States.	Member states: once it is entered into force, it becomes a legally binding instrument for all ratifying states.	Facilitate better control of fishing vessel safety by flag, port and coastal States and contribute to the fight against IUU	Standards & commitments	The Cape Town Agreement has been developed to become a rule of international law	Ratifying member states (7)	State	1
International Labour Organization - Work in Fishing Convention C188 (C188) http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_596898/lang--en/index.htm									
	C188 was developed in 2009 and came into force in 2017. It sets out requirements to address issues concerning work on board fishing vessels, including occupational safety and health and medical care at sea and ashore, rest periods, written work agreements, and social security protection.	Contribute to the fight against IUU fishing by facilitating better control of labour conditions on fishing vessels.	Member states: legally binding instrument for all ratifying states	Ensure decent work for workers in the fishing sector	Standards & commitments	The Work in Fishing Convention is a rule of international law	Ratifying member states (10)	State	1
INTERPOL - Global Fisheries Enforcement (GFE) https://www.interpol.int/Crime-areas/Environmental-crime/Projects/Project-Scale									
	GFE (formerly Project Scale) provides for a global platform to support member countries in identifying, deterring and disrupting transnational fisheries crime.	GFE is an INTERPOL project to support member countries in identifying, deterring and disrupting transnational fisheries crime (which includes IUU fishing).	Member states: help them identify, stop, and prevent fisheries crime by exposing criminals and their networks.	Address illegality and criminality which facilitate or accompany illegal fishing activities.	Information & Networking Operational	GFE has a role in capacity building, information exchange and operational support.	N/A	State	1

International Seafood Sustainability Foundation (ISSF) https://iss-foundation.org/our-team/ + https://iss-foundation.org/what-we-do/areas-of-focus/illegal-fishing/								
ISSF is a global partnership among scientists, the tuna industry and the environmental NGO community aiming at the long-term conservation and sustainable use of global tuna stocks, reducing bycatch and promoting tuna ecosystem health	Companies that participate in ISSF commit to several conservation measures regarding illegal, unreported, and/or unregulated fishing, and ISSF uses a rigorous compliance process for any such allegations.	Member companies: companies that participate in ISSF commit to several conservation measures regarding IUU fishing, and ISSF uses a rigorous compliance process for any such allegations.	Undertake and facilitate science-based initiatives for the long-term conservation and sustainable use of global tuna stocks, reducing bycatch an d promoting tuna ecosystem health.	Standards & commitments Information & networking	S&C: ISSF members have to comply with its conservation measures. I&N: ISSF establishes networks to establish science-based approaches, policies and conservation measures to improve sustainability. Also, ISSF provides for 'ProActive Vessel Register' which can be consulted for information on vessels.	Board of directors (9), environmental stakeholder committee (10), scientific advisory committee (10) and participating companies (28)	Firm + CSO	6
IFFO Responsible Supply (IFFO RS) https://www.iffors.com/about								
IFFO RS is an independent third-party business to business certification programme for the production of marine ingredients	Eradicating the use of IUU fishing material in IFFO RS approved raw material.	Target group: offering marine ingredient producers a way to show their commitment to responsible practices.	All marine ingredients produced globally will be sourced from responsibly sourced fisheries products and produced in a safe manner.	Standards & commitments	IFFO RS provides for three standards: the Global Standard for Responsible Supply, the Chain of Custody for Responsible Supply, and the Improver Programme.	Governance board (13) and technical advisory committee (11)	Firm + CSO	6
Seafood Task Force (STF) http://www.seafoodtaskforce.global/aims-objectives/ http://www.seafoodtaskforce.global/wp-content/uploads/2016/09/shrimp-report-A4-Aug-2016.pdf								
STF is a group of seafood processors, feed producers, buyers, retailers, government representatives and NGOs who	STF recognizes that forced labour / human rights issues and marine conservation problems are closely linked	Members: expected to map their seafood	Tackle human rights and environmental issues in seafood	Standards & commitments Operational	S&C: STF creates Codes of Conduct that member companies and	Companies (34) and non-commercial	Firm + CSO	6

	have come together to address issues surrounding labour and illegal fishing in seafood supply chains currently focusing on the seas around Thailand.	to IUU fishing and tries to tackle these issues simultaneously.	supply chains, work with STF to develop a plan for traceability and social audits and work with the supply chain and within the company to adopt/comply with the plan.	supply chains through supply chain oversight		their supply chain need to comply with O: STF supports its members in mapping their supply chains, implements track and trace systems and assists in driving FIP's	stakeholders (19)		
FishWise https://fishwise.org/our-work/traceability-and-anti-iuu-guidance/									
	FishWise works with seafood companies to improve the sustainability and traceability of their seafood supply chains. It convenes government, industry, and non-profit organizations to create new strategies for traceability and combating human rights abuses in seafood supply chains.	FishWise focuses on improving the traceability of seafood supply chains as a means to tackle IUU fishing.	Target group: seafood businesses	Promote the health and recovery of ocean ecosystems by providing innovative market-based tools to the seafood industry, supporting sustainability through environmentally and socially responsible business practices.	Information & networking	Information & networking: FishWise convenes government, industry, and non-profit organizations to create new strategies for improving traceability and combating human rights abuses.	N/A	CSO (based on characteristics of organisation itself)	3
Conservation Alliance for Seafood Solutions (CASS) http://solutionsforseafood.org/about/									
	The Conservation Alliance for Seafood Solutions connects leading conservation groups from North America, South America, Europe, and Japan that work with businesses throughout the supply chain from fishermen and fish farmers to retailers and restaurants.	CASS requires committed business to ensure products are traceable back to legal sources (i.e., vessels or farms) and that aquaculture inputs such as hatchery stock and feed are also legal and traceable.	Target group: seafood businesses	Help business to solve problems and advance their sustainable seafood commitments through expertise and the development of tools.	Standards & commitments Information & networking	S&C: companies can commit to CASS' Common Vision. I&N: CASS provides expertise and develops tools to help businesses solve problems and advance their sustainable seafood commitments.	Members (17), Collaborators (25), Advisory Board (8)	CSO	3

Global Dialogue on Seafood Traceability (GDST) https://traceability-dialogue.org/								
The GDST is an international, business-to-business platform established to advance a unified framework for interoperable seafood traceability practices. The Dialogue brings together a broad spectrum of seafood industry stakeholders from across different parts of the supply chain, as well as relevant civil society experts from diverse regions.	There is a need to promote interoperable traceability within the seafood sector to meet rising concerns about the marketing of seafood which is sourced from illegal, unsustainable, or socially irresponsible practices.	Members: companies engaged in the seafood supply chain endorse the GDST goals and make a commitment to be involved in the process.	Catalysing the development of interoperable practices to improve the reliability of seafood information, reduce the cost of seafood traceability, contribute to supply chain risk reduction and secure the long-term social and environmental sustainability of the sector.	Information & networking	GDST offers a precompetitive discussion forum focused on the alignment of business practices for achieving interoperable traceability within the seafood sector.	Members (34), Advisory Group (unknown)	Firm	2
Marine Stewardship Council (MSC) https://20.msc.org/about-the-msc/what-is-the-msc https://www.msc.org/healthy-oceans/sustainable-fishing/combating-illegal-fishing/								
The MSC is an ecolabel and fishery certification program that aims to contribute to the health of the world's oceans by recognising and rewarding sustainable fishing practices.	Fisheries can't be MSC certified if they systematically engage in IUU fishing, or if IUU fishing by others is having a negative impact on the fishery's sustainability. Meanwhile, MSC Chain of Custody requirements help to improve traceability and transparency within supply chains globally. The MSC Chain of Custody Standard not only ensures that no IUU fish makes it into MSC labelled products, but also requires that certified companies don't do business with those implicated in IUU fishing.	Target group: fisheries	Contribute to the health of the world's oceans by recognising and rewarding sustainable fishing practices, influencing the choices people make when buying seafood and working with our partners to transform the seafood market to a sustainable basis.	Standards & commitments	MSC develops fishery and Chain of Custody standards for marine seafood.	Board of trustees, technical advisory board and stakeholder advisory council	Firm + CSO	6

Sustainable Fisheries Partnership https://www.sustainablefish.org/About-Us/About-Us								
SFP is a global non-profit that operates globally to rebuild depleted fish stocks and reduce the environmental and social impacts of fishing and fish farming. The organization works by engaging fishery stakeholders and seafood businesses throughout the supply chain.	To improve wild fisheries and reduce problems such as illegal fishing, SPF presses for FIP's.	Target group: global seafood industry	Engage and catalyse global seafood supply chains in rebuilding depleted fish stocks and reducing the environmental impacts of fishing and fish farming.	Information & networking	SFP creates supply chain roundtables that bring together key commercial stakeholders in a pre-competitive environment.	N/A	CSO (based on characteristics of organisation itself)	3
High Seas Alliance (HSA) http://highseasalliance.org/about-us								
The HSA is a partnership of organizations and groups aimed at building a strong common voice and constituency for the conservation of the high seas.	Advocating for governance of fishing areas currently not covered within the legal/policy framework (unregulated fishing).	Target group: policy makers and member states	Facilitate international cooperation to establish high seas protected areas and to strengthen high seas governance.	Information & networking	HSA is working to ensure that UN discussions around the treaty result in recommendations for robust and effective conservation measures that address gaps in current ocean governance.	Members (37)	CSO	3
The World Ocean Council (WOC) https://www.oceancouncil.org/about-us/mission/vision/								
The WOC offers the Ocean Business Community the structure and process to collaborate on sustainable development and ensures that the policy makers and other stakeholders understand and engage with leadership companies from the Ocean Business Community	The WOC is actively monitoring, analysing and reporting for its Members and the Ocean Business Community on major ocean policy, governance, and decision-making processes and developments. As appropriate, the WOC catalyses the input of its Members by coordinating Ocean Business Community involvement in specific processes.	Members commit and actively involve in the WOC mission.	Provide companies the ability to collectively address cross-cutting ocean sustainable development challenges and shape the future of the ocean by engaging and working with other ocean stakeholders.	Information & networking	WOC actively monitors, analyses and reports for on major ocean policy, governance, and decision-making processes and developments. As appropriate, the WOC coordinates involvement of ocean businesses in specific processes.	Members	Firm + CSO	6

Seafish - Responsible Fishing Scheme (Seafish – RFS) http://www.seafish.org/about-seafish/news-and-events/news/seafish-seek-new-organisation-to-manage-operate-the-responsible-fishing-scheme								
RFS is a voluntary vessel-based programme certifying high standards of crew welfare and responsible catching practices on fishing vessels. RFS provides evidence that the seafood landed by a vessel has been responsibly harvested, handled, and preserved to industry agreed best practices.	The Seafish – RFS provides evidence that the seafood landed by a vessel has been responsibly harvested, handled, and preserved to industry agreed best practices.	Target group: commercial fishing vessels	Facilitate the market demand for independent due diligence audits of fishing vessels.	Standards & commitments	RFS certifies high standards of crew welfare and responsible catching practices on fishing vessels	Oversight board, technical committee and technical working groups	Firm + CSO	6
Monterey Bay Aquarium - Seafood Watch (MBA – SW) http://www.seafoodwatch.org/about-us/our-standards								
MBA - SW helps consumers and businesses choose seafood that's fished or farmed in ways that support a healthy ocean, now and for future generations.	MBA - SW aims to improve traceability in the global seafood supply chain, end illegal, unreported and unregulated fishing and strengthen and advocate for fisheries managements.	Target group: businesses, conservation organizations, restaurant partners	Help consumers and businesses choose seafood that's fished or farmed in ways that support a healthy ocean, now and for future generations.	Standards & commitments Information & networking	S&C: SW partners make a time-bound commitment to sell only responsible seafood. I&N: SW advises on which fish to avoid/ buy and eco-labels.	Technical Advisory Committee, Multi-Stakeholder Group, and Expert Working Groups	CSO	3
Fisheries Transparency Initiative (FiTI) http://fisheriestransparency.org/about-the-initiative								
The FiTI has been developed as a unique effort that complements and supports other national, regional and global efforts for achieving responsible fisheries governance.	FiTI sees the public availability of credible information as essential in fighting IUU fishing.	Target group: countries	Increase transparency and participation in fisheries governance for the benefit of a more sustainable management of marine fisheries.	Standards & commitments Information & networking	The FiTI Standards agrees on what information on fisheries should be published by public authorities. These are mandatory requirements for those countries that participate.	Members and international board	State + Firm + CSO	7
World Economic Forum - Tuna 2020 Traceability Declaration (WEF - Tuna Declaration) https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market								
The WEF- Tuna Declaration is a non-legally binding declaration that grew out of a dialogue among governments, companies and civil society, spurred by The Ocean	The Tuna Declaration requires signees to work towards fully traceable supply chains, to commit to sourcing social and environmental responsible	Endorsers expected to act upon their commitment	Achieve the commitments outlined in the SDGs 14 and encourage businesses to	Standards & commitments	The Tuna Declaration requires endorsed entities to take concrete actions and partnerships to	Endorsers and supporters	State + Firm + CSO	7

	Conference in June 2017 at the UN that will focus on implementation of SDG 14.	seafood and to work together with governments to take action needed that support them.		integrate them in their strategies.		demonstrate their commitment.			
Friend of the Sea (FotS) http://www.friendofthesea.org/about-us.asp?ID=9									
	FotS is a non-profit, non-governmental organisation (NGO), whose mission is the conservation of the marine habitat.	Improve the sustainability of fisheries by assessing them against sustainable fishery criteria, which includes criteria on compliance with legal requirements.	Target group: fisheries	Contribute to the health of the oceans by leading fisheries to adopt selective fishing methods, reduce ecosystem impact and manage within maximum sustainable yield.	Standards & commitments	FotS develops certification schemes for wild and farmed seafood, as well as a Chain of Custody standard.	Advisory board and technical committee (no information available)	Firm + CSO	6
Aquaculture Stewardship Council (ASC) https://www.asc-aqua.org/about-us/about-the-asc/									
	The ASC is an independent, international non-profit organisation that manages a certification and labelling programme for responsible aquaculture.	The ASC Feed Standard defines due diligence requirements for marine ingredients to avoid IUU material to be used in feed for ASC certified aquaculture.	Target group: feed producers	Transform aquaculture towards environmental and social sustainability using efficient market mechanisms that create value across the chain.	Standards & commitments	ASC develops standards for feed made a.o. out of marine seafood.	Supervisory board (6), Technical Advisory Board (8) and Steering Committee on the Feed Standard (14)	Firm + CSO	6
Global G.A.P. (GGAP) https://www.globalgap.org/uk_en/who-we-are/about-us/									
	GGAP is a farm assurance program, translating consumer requirements into Good Agricultural Practice.	The GGAP Compound Feed Manufacturing standard includes anti-IUU and traceability requirements for marine ingredients in feed.	Target group: feed producers	Lay the foundation for the protection of scarce resources by the implementation of Good Agricultural Practices.	Standards & commitments	GGAP develops standards for feed made a.o. out of marine seafood.	Board, Aquaculture Technical Committee, Livestock Technical Committee	Firm	2
Global Aquaculture Alliance - Best Aquaculture Practices (GAA-BAP) https://www.bapcertification.org/About									
	GAA is a standard-setting organization that coordinates the development of the BAP certification standards for	The GAA - BAP Feed Mill Standard includes requirements on the development of a plan to	Target group: feed producers	Further responsible aquaculture to meet world food needs.	Standards & commitments	GAA - BAP develops standards for feed made a.o. out of marine seafood.	Board of directors, technical committee and	Firm + CSO	6

	seafood processing plants, farms, hatcheries and feed mills.	avoid IUU products in feed production.					standards oversight committee		
Fair Trade USA (FTUSA) https://www.fairtradecertified.org/who-we-are									
	FTUSA is a non-profit organization and a certifier of Fair Trade products in North America.	The FTUSA Capture Fisheries Standard includes requirements on an IUU enforcement strategy.	Target group: groups of fishermen engaged in marine wild capture fisheries.	Enable sustainable development and community empowerment by cultivating a more equitable global trade model that benefits farmers, workers, fishermen, consumers, industry, and the earth by certifying and promoting Fair Trade products.	Standards & commitments	FTUSA develops standards for marine capture fisheries.	Board and Advisory Council	Firm + CSO	6
Global Sustainable Seafood Initiative (GSSI) http://www.ourgssi.org/about-2/gssi-story/									
	GSSI is a global partnership that has established a benchmark for seafood certification schemes.	The GSSI Benchmarking tool requires eco-labelling schemes for marine products (both feed and wild catch) to include requirements on IUU fishing.	Target group: seafood certification schemes	Ensure confidence in the supply and promotion of certified seafood as well as to promote improvement in the seafood certification schemes.	Standards & commitments	GSSI operates a global benchmark tool for seafood certification schemes.	Steering Board, Partners	State + Firm + CSO	7
The Oceans and Fisheries Partnership (USAID Oceans) https://www.seafdec-oceanspartnership.org/									
	USAID Oceans is a USAID-funded activity, working in partnership with the Southeast Asian Fisheries Development Centre, the Coral Reefs, Fisheries, and Food Security, and a wide range of public and private sector partners at regional, national, and local levels, to combat IUU fishing,	USAID Oceans seeks to improve integrated and sustainable fisheries management through enhanced catch documentation and traceability, focusing on priority species that are vital for food security and economic growth and are	Target group: industry, regional, national, and local partners	Combat IUU fishing, enhancing fisheries management, and improving human welfare through enhanced catch documentation and traceability.	Information & networking Operational	Information & networking: USAID Oceans engages a variety of fisheries stakeholders and form new partnerships among governments, regional	Founding partners (3)	State	1

	promote sustainable fisheries and conserve marine biodiversity in the Asia-Pacific region.	under threat from IUU fishing and seafood fraud.				institutions, and the private sector. Operational: USAID Oceans designs, develops, implements, and tests an electronic CDT system.			
FISH-i Africa (FISH-i) https://fish-i-africa.org/about/why-fish-i-africa/									
	FISH-i unites eight East African coastal countries in taking action against illegal fishing in their EEZ's through the use of shared intelligence and information and coordinated analysis.	FISH-i aims to improve cooperation, information and intelligence sharing in order to take enforcement actions against illegal fishing operators.	Members: the national fisheries enforcement officers are required to work together and share information.	Improve cooperation, information and intelligence sharing in order to take enforcement actions against illegal fishing operators.	Operational	Operational: active in enforcement	Task force (8)	State	1
West Africa Task Force (WATF) https://stopillegalfishing.com/initiatives/watf/									
	WATF unites six member countries of the Fisheries Committee for the West Central Gulf of Guinea – Benin, Côte d'Ivoire, Ghana, Liberia, Nigeria and Togo – to tackle illegal fishing and fisheries crime in their EEZ's	The WATF is supporting regional cooperation in order to identify, track, gather evidence and mount enforcement and prosecution actions against illegal fishing operators.	Members: the national fisheries enforcement officers are required to work together and share information.	Support regional cooperation in order to identify, track, gather evidence and mount enforcement and prosecution actions against illegal fishing operators.	Operational	Operational: active in enforcement	Task force (6)	State	1
Coalition of Legal Toothfish Operators https://www.colto.org/about-us/background/									
	COLTO is founded by legal industry members to eliminate IUU fishing of Toothfish, and to ensure the long-term sustainability of Toothfish resources, and the rich and critical biodiversity of the southern oceans.	The COLTO was founded in 2003 by legal industry members to eliminate IUU fishing for toothfish.	Members: toothfish operators	Promote sustainable toothfish fisheries and facilitate its Members working together and with others.	Information & networking	COLTO provides assistance, support and surveillance information to Governments, managers and conservation groups in the fight against IUU fishing.	Members (50)	Firm	2

Appendix B. Overview of interactions between institutions

B.1 Matrix overview

	FAO - IPOA-IUU	FAO - PSMA	FAO - VGFSP	FAO - VGCDS	FAO - Common Oceans	FAO - Global Record	EU - IUU Regulation	IMO - CTA	ILO - C188	INTERPOL - GFE	ISSF	IFFO RS	STF	FishWise	CASS	GDST	MSC	SFP	HSA	WOC	Seafish - RFS	MBA - SW	FiTI	WEF - Tuna Declaration	FotS	ASC	GGAP	GAA - BAP	FTUSA	GSSI	USAID Oceans	FISH-i	WATF	COLTO
FAO - IPOA-IUU		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAO - PSMA	1		1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAO - VGFSP	1	1		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAO - VGCDS	1	1	1		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAO - Common Oceans	1	1	1	1		1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAO - Global Record	1	1	1	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EU - IUU Regulation	1	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IMO - CTA	0	1	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ILO - C188	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTERPOL - GFE	1	1	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ISSF	0	1	0	0	1	0	0	0	0	0		0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
IFFO RS	1	0	0	0	0	0	1	0	0	0	0		0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
STF	0	1	0	0	0	0	0	0	0	0	1	1		1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
FishWise	0	0	0	0	0	0	0	0	0	0	1	0	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
CASS	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	1	1	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0
GDST	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MSC	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0
SFP	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1		0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0
HSA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Seafish - RFS	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0		1	0	0	0	0	0	1	0	1	0	0	0	0	0

MBA - SW	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0		0	0	0	0	0	1	1	0	1	0	0	0
FiTI	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0
WEF - Tuna Declaration	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0		0	0	0	0	0	1	0	0	0	0
FotS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0
ASC	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0		1	1	0	1	0	0	0	0
GGAP	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1		1	0	1	0	0	0	0
GAA - BAP	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1		0	1	0	0	0	0
FTUSA	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	1	0	0	0	1	0	0	0	0	0	0		0	0	0	0	0
GSSI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	1	0		0	0	0	0
USAID Oceans	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0		0	0	0
FISH-i	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0
WATF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1			0
COLTO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

B.2 Sources used

Institution	Reference
FAO – IPOA-IUU	
FAO - PSMA	Same organization
FAO - VGFSP	Same organization
FAO - VGCDS	Same organization
FAO - Common Oceans	Same organization
FAO - Global Record	Same organization
FAO - PSMA	
FAO - IPOA-IUU	Same organization
FAO - VGFSP	Same organization
FAO - VGCDS	Same organization
FAO - Common Oceans	Same organization
FAO - Global Record	Same organization
FAO – VGFSP	
FAO - IPOA-IUU	Same organization
FAO – PSMA	Same organization
FAO – VGCDS	Same organization
FAO - Common Oceans	Same organization
FAO - Global Record	Same organization
FAO – VGCDS	
FAO - IPOA-IUU	Same organization
FAO - PSMA	Same organization

FAO – VGFSP	Same organization
FAO - Common Oceans	Same organization
FAO - Global Record	Same organization
FAO - Common Oceans	
FAO - IPOA-IUU	Same organization
FAO – PSMA	Same organization
FAO – VGFSP	Same organization
FAO – VGCDS	Same organization
FAO - Global Record	Same organization
ISSF	http://www.fao.org/in-action/commonoceans/partners/en/
MSC	http://www.fao.org/in-action/commonoceans/partners/en/
FAO - Global Record	
FAO - IPOA-IUU	Same organization
FAO – PSMA	Same organization
FAO – VGFSP	Same organization
FAO – VGCDS	Same organization
FAO - Common Oceans	Same organization
EU - IUU Regulation	
FAO - IPOA-IUU	http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02008R1005-20110309&from=EN
FAO – PSMA	http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02009R1010-20130917&from=EN
IMO – CTA	
FAO – PSMA	http://www.imo.org/en/MediaCentre/PressBriefings/Pages/27-Cape-Town-Agreement-.aspx
ILO - C188	http://www.imo.org/en/MediaCentre/PressBriefings/Pages/27-Cape-Town-Agreement-.aspx
INTERPOL - GFE	
FAO - IPOA-IUU	https://www.interpol.int/content/download/37251/475924/version/3/file/Guide%20to%20International%20Law%20Enforcement%20Cooperation%20-%202018.pdf
FAO – PSMA	https://www.interpol.int/content/download/37251/475924/version/3/file/Guide%20to%20International%20Law%20Enforcement%20Cooperation%20-%202018.pdf
IMO – CTA	https://www.interpol.int/content/download/37251/475924/version/3/file/Guide%20to%20International%20Law%20Enforcement%20Cooperation%20-%202018.pdf
ISSF	
FAO – PSMA	https://iss-foundation.org/conservation-priorities-in-the-western-central-pacific-3/
FAO - Common Oceans	https://iss-foundation.org/knowledge-tools/technical-and-meeting-reports/download-info/issf-2018-07-design-workshop-on-the-use-of-biodegradable-fish-aggregating-devices-in-ghanaian-purse-seine-and-pole-and-line-tuna-fleets/
FishWise	https://iss-foundation.org/who-we-are/governance/board-of-directors/ + https://iss-foundation.org/who-we-are/participantscommittes/committees/ + https://iss-foundation.org/who-we-are/participantscommittes/participating-companies/
MSC	https://iss-foundation.org/updated-report-measures-how-global-tuna-stocks-stack-up-against-the-msc-standard-2/
SFP	https://iss-foundation.org/who-we-are/governance/board-of-directors/ + https://iss-foundation.org/who-we-are/participantscommittes/committees/ + https://iss-foundation.org/who-we-are/participantscommittes/participating-companies/
Seafish – RFS	https://iss-foundation.org/who-we-are/governance/board-of-directors/ + https://iss-foundation.org/who-we-are/participantscommittes/committees/ + https://iss-foundation.org/who-we-are/participantscommittes/participating-companies/
IFFO RS	

FAO - IPOA-IUU	https://www.iffors.com/sites/iffors/files/2017-07/FINAL%20V2.0%20Standard%20for%20publication.pdf
EU - IUU Regulation	https://www.iffors.com/sites/iffors/files/2017-07/FINAL%20V2.0%20Standard%20for%20publication.pdf
MSC	https://www.iffors.com/sites/iffors/files/2017-07/FINAL%20V2.0%20Standard%20for%20publication.pdf
SFP	https://www.iffors.com/sites/iffors/files/2017-07/FINAL%20V2.0%20Standard%20for%20publication.pdf
ASC	https://www.iffors.com/iffo-rs-governance-board + https://www.iffors.com/technical-advisory-committee
GAA – BAP	https://www.iffors.com/iffo-rs-governance-board + https://www.iffors.com/technical-advisory-committee
STF	
FAO – PSMA	http://www.seafoodtaskforce.global/wp-content/uploads/2017/12/Seafood-Task-Force_-Multi-Stakeholder-Report_-Nov-2017.pdf
ISSF	http://www.seafoodtaskforce.global/about/current-members/
IFFO RS	http://www.seafoodtaskforce.global/about/current-members/
FishWise	http://www.seafoodtaskforce.global/about/current-members/
MSC	http://www.seafoodtaskforce.global/about/current-members/
SFP	http://www.seafoodtaskforce.global/about/current-members/
ASC	http://www.seafoodtaskforce.global/about/current-members/
GAA – BAP	http://www.seafoodtaskforce.global/about/current-members/
FishWise	
ISSF	https://fishwise.org/wp-content/uploads/2018/04/2018.02.22_Trace-WP_February-2018-Update-1.pdf
STF	https://fishwise.org/wp-content/uploads/2018/04/2018.02.22_Trace-WP_February-2018-Update-1.pdf
CASS	https://fishwise.org/wp-content/uploads/2018/04/2018.02.22_Trace-WP_February-2018-Update-1.pdf
FTUSA	https://fishwise.org/wp-content/uploads/2018/04/2018.02.22_Trace-WP_February-2018-Update-1.pdf
USAID Oceans	https://www.seafdec-oceanspartnership.org/news/usaid-oceans-and-fisheries-partnership-ignites-private-sector-interest-in-seafood-traceability-system/
CASS	
FishWise	http://solutionsforseafood.org/about/members/
MSC	http://solutionsforseafood.org/about/members/
SFP	http://solutionsforseafood.org/about/members/
MBA – SW	http://solutionsforseafood.org/about/members/
ASC	http://solutionsforseafood.org/about/members/
GGAP	http://solutionsforseafood.org/about/members/
GAA – BAP	http://solutionsforseafood.org/about/members/
FTUSA	http://solutionsforseafood.org/about/members/
GDST	
FAO – PSMA	https://traceability-dialogue.org/solutions/aligning-government-regulations/
EU - IUU Regulation	https://traceability-dialogue.org/solutions/aligning-government-regulations/
STF	https://traceability-dialogue.org/what-is-the-global-dialogue/why-is-a-global-dialogue-needed/
FishWise	https://traceability-dialogue.org/what-is-the-global-dialogue/background/expert-panel-background/
MSC	
FAO - IPOA-IUU	https://www.msc.org/documents/scheme-documents/fisheries-certification-scheme-documents/fisheries-standard-version-2.0
ISSF	https://www.msc.org/about-us/governance/structure/technical-advisory-board/whos-on-the-msc-tab
Seafish – RFS	https://www.msc.org/newsroom/news/partner-release-seafish-and-msc-unveil-first-of-their-kind-2018roadmaps2019-for-sustainable-fisheries-throughout-england
WEF - Tuna Declaration	https://www.msc.org/newsroom/news/global-declaration-sends-a-strong-message-of-solidarity-for-sustainable-tuna
ASC	https://www.msc.org/get-certified/supply-chain/chain-of-custody-partnerships-asc

GSSI	https://www.msc.org/about-us/credibility/how-we-meet-best-practice
SFP	
STF	http://www.seafoodtaskforce.global/about/current-members/
FishWise	https://www.sustainablefish.org/Media/Files/SR-Documents/Tuna-SRs/SFP-FW-Tuna-Procurement-Specs-April-2018
CASS	http://solutionsforseafood.org/about/members/
MSC	https://www.sustainablefish.org/News/SFP-Welcomes-MSC-Certification-Recommendation-for-Russian-Pollock-Fishery
Seafish – RFS	http://www.seafish.org/about-seafish/news-and-events/news/seafish-partnering-with-sfp-and-seafood-watch-to-develop-first-ever-risk-assessment-tool-for-social-responsibility-in-global-fisheries
MBA – SW	http://www.seafish.org/about-seafish/news-and-events/news/seafish-partnering-with-sfp-and-seafood-watch-to-develop-first-ever-risk-assessment-tool-for-social-responsibility-in-global-fisheries
FTUSA	https://www.fairtradecertified.org/why-fair-trade/strategic-alliances
WOC	
USAID Oceans	http://oceancouncil.org/wp-content/uploads/2016/12/WOC-News-Release-2016-12-14-WOC-and-USAID-Collaborate-on-Sustainable-Fisheries-FINAL.pdf
Seafish – RFS	
ILO - C188	Seafish RFS, 2018
MSC	Seafish RFS, 2018
SFP	http://www.seafish.org/about-seafish/news-and-events/news/seafish-partnering-with-sfp-and-seafood-watch-to-develop-first-ever-risk-assessment-tool-for-social-responsibility-in-global-fisheries
MBA – SW	http://www.seafish.org/about-seafish/news-and-events/news/seafish-partnering-with-sfp-and-seafood-watch-to-develop-first-ever-risk-assessment-tool-for-social-responsibility-in-global-fisheries
GAA – BAP	http://www.seafish.org/about-seafish/news-and-events/news/responsible-fishing-scheme-to-move-to-new-home-as-seafish-signs-memorandum-of-understanding-with-the-global-aquaculture-alliance-gaa-
GSSI	http://www.seafish.org/media/publications/FS_98_03__GSSI_Guidance_note_2.pdf
PAS 1550:2017	https://www.humanrightsatsea.org/new-seafood-supply-chain-code-of-practice-published/
MBA – SW	
ISSF	https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en
MSC	https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en
SFP	https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en
GAA – BAP	https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en
FTUSA	https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en
USAID Oceans	https://www.seafdec-oceanspartnership.org/partners/
FiTI	
FAO – PSMA	http://fisheriestransparency.org/wp-content/uploads/2016/08/EJF-Contribution-to-FiTI.pdf
FAO - Global Record	http://fisheriestransparency.org/wp-content/uploads/2016/08/EJF-Contribution-to-FiTI.pdf
EU - IUU Regulation	http://fisheriestransparency.org/wp-content/uploads/2016/08/EJF-Contribution-to-FiTI.pdf

WEF - Tuna Declaration	
FAO – PSMA	http://www3.weforum.org/docs/IUU_Tuna_2020_Traceability_Declaration.pdf
ISSF	https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/
FishWise	https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/
MSC	https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/
MBA – SW	http://www3.weforum.org/docs/IUU_Tuna_2020_Traceability_Declaration.pdf
GSSI	https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/
FotS	
GGAP	http://www.friendofthesea.org/global-gap.asp
ASC	
IFFO RS	https://www.asc-aqua.org/about-us/governance/
MSC	https://www.msc.org/get-certified/supply-chain/chain-of-custody-partnerships-asc
SFP	https://www.asc-aqua.org/about-us/governance/
GGAP	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GAA – BAP	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GSSI	https://www.asc-aqua.org/news/latest-news/completion-of-standards-review-gssi-benchmark-process-among-recent-developments-at-asc/
GGAP	
IFFO RS	https://www.globalgap.org/export/sites/default/.content/.galleries/documents/131108_Joint-statement-ASC-GAA-GLOBALG.A.P.-requirements-responsible-sourcing-fishmeal-oil.pdf
MSC	https://www.globalgap.org/export/sites/default/.content/.galleries/documents/131108_Joint-statement-ASC-GAA-GLOBALG.A.P.-requirements-responsible-sourcing-fishmeal-oil.pdf
FotS	https://www.globalgap.org/uk_en/media-events/news/articles/Friend-of-the-Sea-FOS-Aquaculture-Recognizes-GLOBALG.A.P.-Certificates--br/
ASC	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GAA – BAP	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GSSI	https://www.globalgap.org/uk_en/media-events/news/articles/The-Global-Sustainable-Seafood-Initiative-GSSI-Recognizes-The-GLOBALG.A.P.-Aquaculture-Certification-System/
GAA – BAP	
IFFO RS	Best Aquaculture Practices, 2017
MSC	Best Aquaculture Practices, 2017
SFP	Best Aquaculture Practices, 2017
ASC	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GGAP	https://www.asc-aqua.org/news/latest-news/joint-statement-responsibility-in-fish-feed-production/
GSSI	http://www.ourgssi.org/benchmarking/recognized-schemes/global-aquaculture-alliance-best-aquaculture-practices/
FTUSA	
ILO - C188	Fair Trade, 2017
FishWise	https://www.fairtradecertified.org/why-fair-trade/strategic-alliances
CASS	https://www.fairtradecertified.org/why-fair-trade/strategic-alliances
MSC	Fair Trade, 2017
SFP	https://www.fairtradecertified.org/why-fair-trade/strategic-alliances
MBA – SW	Fair Trade, 2017
GSSI	
FAO - IPOA-IUU	http://www.ourgssi.org/assets/GSSI-Benchmarking-Tool/GSSI-Global-Benchmark-Tool-V.1-October-2015.pdf

MSC	https://www.msc.org/newsroom/news/msc-is-the-first-global-seafood-certification-to-achieve-gssi-recognition
Seafish – RFS	http://www.ourgssi.org/about-2/steering-board/ + http://www.ourgssi.org/partnership/partners/
ASC	http://www.ourgssi.org/benchmarking/benchmark-report-consultation/
GGAP	http://www.ourgssi.org/benchmarking/recognized-schemes/
GAA – BAP	http://www.ourgssi.org/benchmarking/recognized-schemes/
USAID Oceans	
FAO - IPOA-IUU	https://www.seafdec-oceanspartnership.org/wp-content/uploads/USAID-Oceans_CDT-201_Technical-Overview-and-Specifications_December-2017.pdf
ISSF	https://www.seafdec-oceanspartnership.org/partners/
FishWise	https://www.seafdec-oceanspartnership.org/partners/
GDST	https://www.seafdec-oceanspartnership.org/partners/
MSC	https://www.seafdec-oceanspartnership.org/partners/
WOC	https://www.seafdec-oceanspartnership.org/partners/
MBA – SW	https://www.seafdec-oceanspartnership.org/partners/
FISH-i	
FAO – PSMA	https://www.fish-i-africa.org/wp-content/uploads/2017/09/FISH-i_Africa_Our_future_WEB.pdf
FAO – VGFSP	https://www.fish-i-africa.org/wp-content/uploads/2017/09/FISH-i_Africa_Our_future_WEB.pdf
WATF	https://www.fish-i-africa.org/wp-content/uploads/2016/07/FISH-i_Impacts_report_second_edition_20022017_COMPLETE_WEB-1.pdf
WATF	
FISH-i	https://docs.wixstatic.com/ugd/1ae030_8da0fa0c6da142b09e83d3ed59e177ab.pdf

Appendix C. Sources used for member and partner data per institution

Source used for membership data	Source used for partnership data
FAO – IPOA-IUU	
N/A	N/A
FAO – PSMA	
http://www.fao.org/fishery/psm/agreement/parties/en	N/A
FAO - VGFSP	
N/A	N/A
FAO - VGCDS	
N/A	N/A
FAO – Common Oceans	
http://www.fao.org/in-action/commonoceans/partners/en/	N/A
FAO – Global Record	
http://www.fao.org/global-record/partners/en/	N/A
EU – IUU Regulation	
N/A	N/A
IMO - CTA	
http://www.imo.org/en/MediaCentre/PressBriefings/Pages/27-Cape-Town-Agreement-.aspx	N/A
ILO – C188	
http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO:11300:P11300_`INSTRUMENT_ID:312333:NO	N/A
INTERPOL – GFE	
N/A	https://www.interpol.int/Crime-areas/Environmental-crime/Projects/Project-Scale + https://www.interpol.int/Crime-areas/Environmental-crime/Committee-and-Working-Groups/Fisheries-Crime-Working-Group
ISSF	
https://iss-foundation.org/who-we-are/governance/board-of-directors/ + https://iss-foundation.org/who-we-are/participantscommittes/committees/ + https://iss-foundation.org/who-we-are/participantscommittes/participating-companies/	N/A
IFFO RS	
https://www.iffors.com/iffo-rs-governance-board + https://www.iffors.com/technical-advisory-committee	N/A
STF	
http://www.seafoodtaskforce.global/about/current-members/	N/A
FishWise	

N/A	https://fishwise.org/our-work/business-engagement/our-business-partners/
CASS	
http://solutionsforseafood.org/about/members/ +	http://solutionsforseafood.org/business-commitments/
GDST	
https://traceability-dialogue.org/what-is-the-global-dialogue/whos-involved-2/	https://traceability-dialogue.org/what-is-the-global-dialogue/background/expert-panel-background/
MSC	
	N/A
SFP	
N/A	https://www.sustainablefish.org/Programs/Industry-Partnerships
HSA	
http://highseasalliance.org/member-info	N/A
WOC	
https://www.oceancouncil.org/memberships/meet-our-members/	https://www.oceancouncil.org/about-us/accreditations/
Seafish - RFS	
http://www.seafish.org/rfs/index.php/about/governance-structure/	http://www.seafish.org/rfs/index.php/supply-chain-support-for-the-rfs/
MBA - SW	
https://www.seafoodwatch.org/-/m/sfw/pdf/standard%20revision%20reference/how%20it%20works/technical%20advisory%20committee%20and%20multi-stakeholder%20group%20members.pdf?la=en	
FiTI	
http://fisheriestransparency.org/fiti-association	No information available
WEF - Tuna Declaration	
https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/	N/A
FotS	
No information available	No information available
ASC	
https://www.asc-aqua.org/about-us/governance/	https://www.asc-aqua.org/about-us/partners-and-supporters/
GGAP	
https://www.globalgap.org/uk_en/who-we-are/governance/board/	https://www.globalgap.org/uk_en/who-we-are/members/
GAA - BAP	
https://www.aquaculturealliance.org/who-we-are/leadership/	https://bapcertification.org/Marketplace
FTUSA	
https://www.fairtradecertified.org/why-fair-trade/about-us/leadership/board	https://www.fairtradecertified.org/why-fair-trade/strategic-alliances
GSSI	

http://www.ourgssi.org/about-2/steering-board/ + http://www.ourgssi.org/partnership/partners/	N/A
USAID Oceans	
https://www.seafdec-oceanspartnership.org/about/	https://www.seafdec-oceanspartnership.org/partners/
FISH-i	
https://fish-i-africa.org/about/our-task-force/	https://fish-i-africa.org/about/our-partners/
WATF	
https://stopillegalfishing.com/initiatives/watf/	https://stopillegalfishing.com/initiatives/watf/
COLTO	
https://www.colto.org/about-us/members/	N/A