Université de Montréal

# Analysis of conceptual relations found in corpora and dictionaries for terminological definition writing: *An application to the field of sustainable fisheries*

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*Ce mémoire intitulé*

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*Présenté par*
**Luz de Maria Montalvan Ayala**

*A été évalué(e) par un jury composé des personnes suivantes*

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# Résumé

L'objet de notre recherche sont les relations conceptuelles exprimées dans les définitions des dictionnaires et celles exprimées dans un corpus spécialisé. Nous avons pour but d'analyser et comparer ces relations pour identifier les relations les plus communes d'un domaine spécialisé et déterminer où ces relations se trouvent plus fréquemment. Notre approche considère que ces relations se trouvent plus souvent dans les corpus et qu'on pourrait enrichir les définitions terminologiques en incorporant ces relations conceptuelles extraites des textes spécialisés.

Le domaine choisi pour cette étude est celui de la pêche durable dont nous analysons la terminologie en anglais. Les termes analysés sont extraits d'un corpus de textes de ce domaine construit pour notre étude et qui comporte des articles scientifiques et des comptes rendus d'organismes spécialisés dans le domaine de la pêche. Pour l'analyse de définitions, trois dictionnaires spécialisés en pêche ont été sélectionnés dans l'étude. L'échantillon final de termes analysés inclut 20 noms (dont 12 termes dénotent des entités et 8 termes dénotent des activités). Ces termes sont les plus spécifiques extraits du corpus avec l'extracteur TermoStat (Drouin, 2003) et définis dans au moins deux des dictionnaires choisis.

Les *unités lexicales* du corpus sont repérées de façon semi-automatique à l'aide de la fonctionnalité word sketch, « an automatic corpus-derived summary of a word's grammatical and collocational behavior » (Kilgarriff et al., 2010, p. 372) dans la plateforme de gestion de corpus Sketch Engine (Kilgarriff et al., 2014). Nous travaillons avec deux types de word sketches: le word sketch conventionnel fourni par défaut par Sketch Engine et l'EcoLexicon Semantic Sketch Grammar (ESSG; León Araúz & San Martín, 2018).

Seules les unités lexicales les plus fréquentes sont sélectionnées de tous les résultats de l'interrogation du corpus. L'analyse des définitions se penche sur toutes les unités lexicales reliées directement au terme analysé. Nous utilisons des paraphrases dans les analyses pour identifier et valider les relations entre le terme analysé et chaque unité reliée. À la suite de l'identification des relations, nous compilons une liste de relations et nous faisons une comparaison entre les résultats du corpus et des définitions.

La comparaison des types de relations repérées dans chaque source montre qu'il y a plus de types de relations dans le corpus que dans les définitions pour 70 % de l'échantillon de termes. Lorsque la comparaison examine séparément des termes dénotant des entités et des activités, plus de types de relations se trouvent dans le corpus que dans les définitions pour 83 % des entités et pour 50 % des activités.

Les résultats montrent également que 54 % des types de relations repérées sont identifiés pour plus de termes dans le corpus que dans les dictionnaires. Par ailleurs, seulement 16,7 % des relations repérées sont identifiées pour plus de termes dans les dictionnaires que dans le corpus. La recherche a également identifié quels types de relations se trouvent plus souvent dans le corpus, dans le dictionnaire ou dans les deux sources pour le même terme. Ce constat a permis de classifier les types de relations dans trois groupes: les relations qui se trouvent la plupart du temps dans les dictionnaires, celles plus souvent présentes dans le corpus ou celles présentes dans les deux sources.

**Mots-clés**: terminologie, définition, analyse de corpus, relations conceptuelles, paraphrases, pêche durable, word sketch, corpus spécialisé.

# Abstract

The object of our study are the conceptual relations expressed in dictionary definitions and those expressed in a specialized corpus. Our goal is to analyze and compare these relations to identify the most common relations of a specialized subject field and determine where these relations are more frequently found. Our approach considers that these relations are more often found in the corpus and that we could enrich terminological definitions if we include the conceptual relations extracted from specialized texts.

The subject field chosen for this study is sustainable fisheries from which we analyze the terminology in English. The terms analyzed were extracted from a corpus of texts belonging to this subject field and built for the study. The corpus includes scientific articles and reports issued by specialized organizations in the field of fisheries. For the analysis of definitions, three specialized dictionaries were selected for the study. The final sample of terms analyzed includes 20 nouns (12 terms designating entities and 8 terms designating activities). These terms are the most specific terms extracted from our corpus using the term extractor TermoStat (Drouin, 2003) and defined in at least two of the selected dictionaries.

The *lexical units* from the corpus were extracted semiautomatically using the function word sketch, "an automatic corpus-derived summary of a word's grammatical and collocational behavior" (Kilgarriff et al., 2010, p. 372) in the corpus management platform Sketch Engine (Kilgarriff et al., 2014). We worked with two types of word sketches: the conventional word sketch provided by default in Sketch Engine and the Ecolexicon Semantic Sketch Grammar (ESSG; León Araúz & San Martín, 2018).

Only the most frequent lexical units were selected from all the results of the corpus interrogation. The analysis of definitions included all the related lexical units directly linked to the analyzed term. Paraphrases were used in the analysis to identify and validate the relation between the analyzed terms and the related lexical units. Once all the relations were identified, a list of relation types was compiled, and a comparison was made between results from the corpus and the dictionaries.

The comparison of the relation types found in each source shows that there are more relation types in the corpus than in the definitions for 70% of the sample. When the comparison focuses separately on entity and activity terms, more relation types were found in the corpus than in the definitions for 83% of entity terms and 50% of activity terms.

Results also show that 54% of the relation types are associated with more terms in the corpus and only 16.7% are associated with more terms in the dictionaries. Additionally, the study identified which relation types are more often found in the corpus, in the dictionaries or in both sources. These findings allowed us to classify the relation types in three scenarios: relation types mostly found in the dictionaries, those more often found in the corpus and the group of relation types which are mostly found in both sources for each term.

**Keywords**: terminology, analysis, corpus analysis, conceptual relations, paraphrases, sustainable fisheries, word sketches, specialized corpus.

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# List of symbols and abbreviations

FAO: Food and Agriculture Organization of the United Nations

LU: Lexical Unit

IMARPE: Institute of Marine Sciences of Peru

ISO: International Organization for Standardization

MSC: Marine Stewardship Council

NOAA: National Oceanographic and Atmospheric Administration

OLST: Observatoire de linguistique Sens-Texte

SFP: Sustainable Fisheries Partnership

VOICES: National Marine Sanctuaries glossary

# Typographical conventions

- Terms: italics plus (E) for entities and (A) for activities if they are polysemous terms
- Concepts or notions: quotation marks
- Realization of paraphrases referred to in the text: italics
- Name of the dictionaries selected for the study: capital letters
- Name of relations: name surrounded by <>

*To Alberto, Emilia and Avril*

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# Introduction

The concept of sustainable fisheries refers to a type of fishing that provides seafood for the present generation while preserving fishing resources for future generations with a social and an ecological perspective (Hilborn et al., 2015). Over the last few decades, sustainable fisheries have gained importance for the world's food security and economy and have generated a great deal of exchange in the fields of public policy, international trade, environmental sciences, and academic research.

The concern for fisheries sustainability was linked to the collapse of many fish stocks around the globe in the late 80s (Food and Agriculture Organization of the United Nations [FAO], 2020, p. 92). In 1995, FAO members adopted the *Code of Conduct for Responsible Fisheries*, which provided "a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment" (FAO, 1995, p. vi). The Code has been the reference for fisheries regulations and instruments around the world, which have incorporated the principles of sustainable fisheries and aquaculture (FAO, 2020, p. 96).

The civil society and the private sector have also been very active in implementing initiatives towards sustainability. For example, the NGO WWF and the company Unilever launched the Marine Stewardship Council (MSC) in 1997, motivated by the collapse of the cod fishery in Canada in 1995. The MSC today is one of the most well-known eco-certification companies of sustainable fishing products. According to the MSC (2022), the total volume of seafood sold with their certification of sustainability in 2022 was 1.25 million tonnes.

The widespread objective to improve the sustainability of resources has led to a significant increase in the number of conservation organizations, research institutes and private eco-certification organizations around the world. All actors play a role in the process towards improvement. Governments adopt policies to regulate fishing activities and make them more sustainable. Scientists obtain scientific evidence that support new conservation public policy. Non-profit organizations work with different actors in initiatives to improve seafood supply chains. Fishers and seafood processors apply best practices and new technology to respond to

the new needs of the market; and international buyers demand sustainable production and certification of fishing products.

A great deal of exchange takes place in this process and in numerous cases it implies multilingual communication. As a result, there has been an increasing demand for interpretation and translation services in the field of fisheries. Although the specialization of interpreters or translators in the field is not well known by the general public, we are mediators in highly specialized communicational situations involving the use of scientific, technical, legal and commercial terminology that belongs exclusively to the sustainable fisheries domain.

As an interpreter I have had the opportunity to be part of these exchanges during 12 years in the context of international conferences on fisheries sustainability, field visits to fishing ports and high-level meetings between member states of a regional fisheries management organization. This experience has led me to prepare the terminology that will be used in each interpretation assignment, and to work with fisheries experts, scientists, and fishers from all over the world.

Interpreters and translators use specialized dictionaries to understand concepts designated by terms. However, we very often achieve a wider understanding of concepts from the discussions or texts developed by experts in a subject field. A possible reason for this is that discussions among experts provide more elements that are conceptually related to terms and that are useful to understand their meaning.

Although studies were carried out on different aspects of definitions such as the definition types, principles to write adequate definitions, definitional elements and the templates to organize content, there is no consensus on a methodology to account for terminological relations accurately in definitions. Furthermore, to our knowledge, definitions of sustainable fisheries terminology have not been studied, and according to experts in the fisheries field, there is a lack of terminological resources providing complete definitions.

Our approach considers that understanding which relations are commonly used in sustainable fisheries and where they are usually found could contribute to improving definition writing, since they would include conceptual relations that reflect the use of terms in specialized texts. This may help interpreters and translators to better deal with specialized assignments.

This study has three main objectives. First, it aims to analyze and compare the conceptual relations found in specialized dictionary definitions and in a corpus of fisheries sustainability. Second, it aims to identify where the relation types often used in the subdomain are mainly found (dictionaries or corpus). Third, it seeks to provide methodological guidelines to enrich terminological definitions in the field of sustainable fisheries.

A 624,120-word English corpus was built for this study including 15 technical reports by specialized fisheries organizations and 12 scientific articles written by experts in the field. As for the analysis of definitions, three specialized fisheries dictionaries were chosen. We classified terms in conceptual categories following Sager (1990) and selected our final sample comprising 12 entity terms and 8 activity terms in order of specificity according to results extracted by TermoStat (Drouin, 2003).

For each term of the final sample, we carried out an analysis of relations identified in dictionary definitions and the corpus. To identify the relations, we extracted from the corpus the lexical units related to the terms of the sample. In this process we used two types of word sketches: the conventional word sketch (Kilgarriff et al., 2010), which comes by default in Sketch Engine (Kilgarriff et al., 2014), and the ESSG (León Araúz & San Martín, 2018).

From the word sketch results we selected the most frequent lexical units identified and compared the number of relations found in the corpus and in the dictionaries. We also identified the number of terms associated with each relation in each source. Subsequently, we identified for each term which relations are found in the corpus, in the dictionaries or in both. This led to a classification of relations in three scenarios. *Scenario 1* refers to the relations identified only in the dictionaries for a given term, *scenario 2* includes the relations found only in the corpus and *scenario 3* presents the relations found in both sources. Based on the number of terms in which each scenario occurs, we obtained the relations that appeared most frequently in each scenario.

Our dissertation is divided in three chapters. The first chapter presents the fundamental concepts for our study such as the types of definitions, the characteristics of a terminological definition and the attributes of an adequate terminological definition. The same chapter provides a selection of previous research focusing on the criteria to determine the elements that should be included in

definitions. Additionally, it presents the templates suggested in previous work to organize the content of definitions.

The second chapter describes the methodology applied in this study including the compilation of the corpus, the extraction and selection of terms, the choice of dictionaries, the analysis of relations in the dictionaries and the corpus and finally the steps for the compilation of the relations list.

The third chapter presents the final lists of terms and relations and discusses the results of the analysis. It includes the types of relations found for each term and where they were found. In addition to that, it presents for how many terms each relation type was identified. Finally, the chapter identifies the relations classified in the three scenarios mentioned above according to their presence in the corpus, the dictionaries or both sources. The conclusion of our study suggests methodological guidelines derived from our analysis that could be used to improve definition writing in the field of sustainable fisheries.

# Chapter 1 – Basic concepts and state of the art

This chapter focuses on two aspects of definitions: basic concepts and a selection of previous studies on methods to write definitions. Section 1.1 provides a review of the fundamental concepts around definitions. Section 1.2. describes previous work focusing on the elements to be included in terminological definitions. Finally, Section 1.3. presents different models proposed to organize definition content and guide the writing of terminological definitions.

## 1.1. Fundamental concepts

### 1.1.1. Concept of "definition" and three different kinds of definitions

According to Sager (1990), the definition is a "linguistic description of a concept, based on the listing of a number of characteristics, which conveys the meaning of a concept" (p. 39). The author also refers to it, following a previous description, as "an equation of an unknown term and the sum of its constituent meaning elements" (p. 39).

The definition has also been defined as the "representation of a concept by an expression that describes it and differentiates it from related concepts" (International Organization for Standardization [ISO], 2019). This and the definition by Sager share the same view of a definition as an expression that describes or represents a concept.

The concept of "definition" has traditionally been explained by establishing a contrast between three types of definitions: the lexicographic definition (also called *linguistic definition, définition linguistique* in Cabré, 1998), the encyclopedic definition (also called *ontological definition, définition ontologique* in Cabré, 1998), and the terminological definition.

Lexicographic definitions are those usually found in general language dictionaries. They include the traits that distinguish concepts within the language system (Cabré, 1998, p. 182). In this type of definition, concepts are explained using other concepts, synonyms, paraphrases, and enumerations in addition to the classical Aristotelian definition (Sager & Kdi-Kimbi, 1995, p. 83).

With regards to the encyclopedic definition, Sager (1990) states that it provides a complete description of a concept including "all its functions in the respective subject fields in which it occurs" (p. 39). According to Sager and Ndi-Kimbi (1995), the encyclopedic definition provides a general description of concepts with a didactic tone. Encyclopedic definitions are usually restricted to material and abstract entities (p. 83). For Cabré (1998), this definition describes concepts including all the aspects that define them as a class or not (p. 182).

The terminological definition has been traditionally defined as "a necessary and sufficient identification of a concept inside the confines of a particular subject field" (Sager & Ndi-Kimbi, 1995, p. 84). The difference between the lexicographic and the terminological definition, following Cabré (1998), lies in the fact that the lexicographic definition describes a concept with reference to the language system, whereas in Terminology, the definition refers to a specific subject field (p. 182). We present a more detailed description of terminological definitions in section 1.1.2.

Sager (1990) considers that natural language words acquire different meanings depending on the context of use. In contrast, terms only acquire meaning in their respective subject field and "for the purpose of definition, they are considered to be context-free" (p. 41). This means that when a term is defined, the concept being designated by the term remains the same regardless of the context in which the term is used. In this approach, terminological definitions can describe terms using other elated concepts of their specific subject fields.

Definitions in Figures 1 and 2 and 3 illustrate the different types of definitions mentioned above. The lexicographic definition in Figure 1 includes four different definitions, each one corresponding to a different sense in the whole language system; thus, they are all general language definitions. Hypernyms such as *place*, *business*, or *legal right are used* to categorize each sense. In Figure 2, the terminological definition describes *fishery* exclusively in the fisheries domain including three senses: *fishery* as an activity, *fishery* as a unit, and *fishery* as a combination of two elements. It can be observed that each sense in Figure 2 includes only one concept, eliminating any other additional contexts of use. Instead, other related terms in the same domain are included in the

definition of each sense [e.g., harvesting and raising for senses (1) and (2); fish, fishers, gear types for sense (3)].

**fishery**

Word Frequency

**in American English**

('fɪʃəri)

**NOUN**

**Word forms:** plural 'fisheries

1. the business of catching, packing, or selling fish, or lobsters, shrimp, etc.
2. a place where fish, etc. are caught; fishing ground
3. the legal right to catch fish in certain waters or at certain times
4. a place where fish are bred



Figure 1.- Lexicographic definition by Webster New Word College Dictionary (Houghton Mifflin Harcourt, 2010)

**Fishery**

1. Generally, a fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture; 2. A unit determined by an authority or other entity that is engaged in raising or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats, and purpose of the activities;[5] 3. The combination of fish and fishers in a region, the latter fishing for similar or the same species with similar or the same gear types.[12]

Figure 2.- Terminological definition by NOAA Fisheries Glossary (National Oceanic and Atmospheric Administration [NOAA], 2006)

**Fishery**, harvesting of fish, shellfish, and sea mammals as a commercial enterprise, or the location or season of commercial fishing. Fisheries range from small family operations relying on traditional fishing methods to large corporations using large fleets and the most advanced technology. Small-scale fishery is ordinarily conducted in waters relatively close to a home port, but factory ships that are equipped to process the catch on board often go thousands of miles from home. *See* commercial fishing.

Figure 3.- Encyclopedic definition by Britannica (n.d.)

According to Sager and Ndi-Kimbi (1995), the terminological definition does not provide an exhaustive description, as the encyclopedic definition does (p. 84). We notice that the encyclopedic definition in Figure 3 provides additional details to the definition in Figure 2 about *fishery* (the entities that are harvested, the entities that may be called *fisheries*). In this definition, we also notice that complementary characteristics have been included such as the place where small-scale fishery is conducted, or the detail about factory ships. The description 1 of *fishery* as an activity in Figure 2 only informs us that there are two ways of developing the activity (capture and aquaculture).

This section focused on an attempt to distinguish three kinds of definitions. However, not all authors agree with the distinction between lexicographic, terminological, and encyclopedic definitions. In that respect, Cabré (1998), argues that the distinction is more evident in theory than in practice. Moreover, according to the author, there is a trend among lexicographers to use a mixed process including definitional elements from the three types of definitions (p. 182).

San Martín (2016) also disagrees with the traditional distinction between terminological and lexicographic definitions. In his view, these distinctions imply that terminological definitions define terms whereas lexicographic definitions focus on general language words. For the author, this implication transfers the problem to the fuzzy distinction between words and terms, given that natural language words gain specialized status depending on the subject field in which the description occurs (Cabré, 1999, p. 123). Regarding the distinction between encyclopedic and terminological definitions, the author considers that the latter can be as exhaustive as it needs to

be depending on the characteristics of the terminological resource where it is described (p. 145). We will present more views beyond the traditional classification of definitions in 1.2.

### 1.1.2. Characteristics of a "terminological definition"

According to the works consulted for this study, the terminological definition has the following characteristics:

- It defines concepts with exclusive reference in a specialized subject field and not to the language system (Cabré, 1998, p. 182).
- It defines lexical units in terminological resources (San Martín, 2016, pp. 144-145).
- It defines terms considering that they are context-free (Sager, 1990, p. 41).
- It identifies the necessary and sufficient characteristics of a concept in its respective subject field (Sager & Ndi-Kimbi, 1995, p. 83; L'Homme, 2020a, p. 85).
- It is limited to denotative meanings (Sager & Ndi-Kimbi, 1995, p. 84).
- It presupposes that the reader understands concepts used in the description of terms (Sager, 1990, p. 40).

The following definition of *fish* by the FAO glossary illustrates some of the characteristics of the list:

> **Fish**
>
> Literally, a cold-blooded lower vertebrate that has fins, gills and scales (usually), and lives in water.
>
> (FAO, n.d.)

As can be seen, the definition describes the concept within the fisheries domain. It does not provide contexts and it presupposes that the reader is familiar with the concept of "lower vertebrate" used in the description since there is no explanation referring to it.

One of the most important principles traditionally considered in terminological definitions consists of including necessary and sufficient characteristics of concepts in definitions. It implies formulating definitions in a way that they "include all members of a class and only those

members" (L'Homme, 2020a, p. 85). This condition is closely related to the intension and extension criteria that characterize concepts. The extension refers to all the objects that can be included in a concept (Sager & Ndi-Kimbi, 1995, p. 64). The intension consists of listing all the characteristics that distinguish a concept from other concepts. The sufficient and necessary traits are considered subgroups within the intension and extension of a concept (Sager & Ndi-Kimbi, 1995, p. 64).

L'Homme (2020a) points out that considering meaning as sufficient and necessary traits implies assuming that it is possible to define concepts through "a finite list of characteristics" that apply to all the members of a class. The author considers that "this list exhausts their contents, distinguishes them from one another and assigns them to a precise position in a conceptual structure" (p. 85). According to the author, these assumptions pose difficulties when defining many different concepts.

In the definition of *fish* cited above, these elements include concepts such as "fins", "gills", "scales", "animal that lives in water". This list excludes vertebrates that do not possess fins but are still considered "fish" (e.g., *hagfish*). However, if we remove some characteristics such as "fins", "gills" and "scales", other species such as marine turtles, which are not usually considered to be "fish", would be included in the concept of "fish". Apart from that, if we add more characteristics to the description, such as the shape or the color, many fish with shapes or colors different from the description will be excluded. For these reasons, L'Homme (2020a) states that "making a list of necessary and sufficient conditions for all the members of a class is quite a difficult task and perhaps even an impossible one for certain concepts" (p. 85).

Finally, there is an assumption that the reader possesses previous knowledge of the concepts used in term description. For this reason, no further explanation is given, and this may pose a problem regarding the levels of subject knowledge required to understand the definition (Sager, 1990, p. 40). In the definition of *fish*, we observe that concepts such as "lower vertebrates", "fins" or "scales" are considered already understood by the reader, so no explanation is provided for them.

The characteristics described in this section correspond to the ones found in the analytical definition, the most common type in specialized resources (L'Homme, 2020a; San Martín, 2016). The structure of the analytical definition is presented in section 1.1.2.1. and other types of definitions are presented in 1.1.2.2.

#### 1.1.2.1. Structure of the analytical definition

The structure of definitions is usually represented as "an equation in which the right side paraphrases the meaning of the left side" (Sager & L'Homme, 1994, p. 352). The left side corresponds to the *definiendum*, which is the term to be defined, and the right side is the *definiens*, which is the paraphrase used to define the *definiendum*.

The *definiens* in the analytical definition comprises the *genus*, which is the superordinate of the defined term, and the *differentiae*, one or more conceptual features that distinguish the *definiendum* from other elements of the same category. Valero (2014, p. 99) reproduces the structure of an analytical definition proposed by Felber (1984) as shown in Figure 4, where the generic concept corresponds to the *genus* and the distinctive characteristics correspond to the *differentiae*.

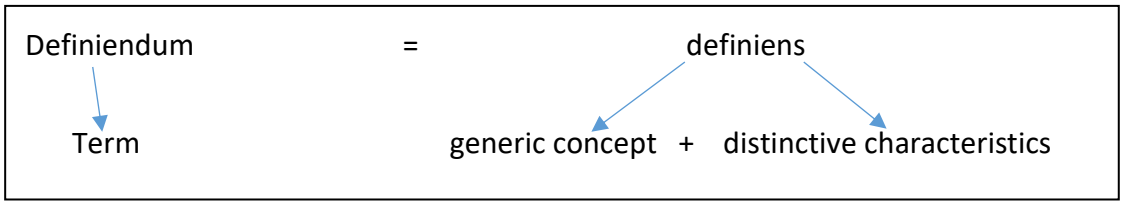



Figure 4.- Structure of the analytical definition (adapted from Felber 1984 cited in Valero, 2014, p. 99)

If we apply the structure to the definition of *longline* by the Voices of the Bay glossary, we obtain the following:

**Longline**

Fishing gear made up of a long main line attached to which are a large number of short branch lines.

(National Marine Sanctuaries [VOICES], n.d.)

- Definiendum: longline
- Genus: fishing gear
- Diferentiae: made up of a long main line attached to which are a large number of short branch lines.

The *genus* or generic concept is based on a statement that is generally known as true, whereas the distinctive features may vary, because they are based on the experience and knowledge about the subject (Sager & Ndi-Kimbi, 1995, p. 63). The following definitions illustrate this qualitative difference in the attribution of the *genus* and *differentiae*:

**Ecosystem**

A functioning, interacting system composed of living organisms and their environment.

(FAO, n.d.)

**Ecosystem**

A geographically specified system of organisms, the environment, and the processes that control its dynamics.

(NOAA, 2006)

In both examples the *genus* of ecosystem is *system*, which is considered universally true given that most people would consider an ecosystem a type of system. However, the descriptive characteristics used in both definitions differ: authors in NOAA have considered that the processes that control an ecosystem's dynamics should be included in the necessary and sufficient characteristics that describe "ecosystem" while authors in FAO have not consider that characteristic. Sager and Ndi-Kimbi (1995) state that the choice and number of descriptive characteristics of a concept are not prescribed and that the varying perception of the necessary and sufficient characteristics explains the existence of a diversity of definitions (p. 62).

#### 1.1.2.2. Other definitions in Terminology

Although the analytical format is the most common in terminological resources, there are other types of definitions used in lexicographical and terminological resources. Sager (1990, pp. 42-44) includes the definition types presented in the following list. The different types below are

illustrated either with our own examples (when no source appears next to the example) or with examples taken from the dictionaries selected for this study:

- **Definition by synonyms.** This definition uses a synonym or equivalent name of the term to describe the concept.

  *vessel* = ship.

  *leatherback turtle* = Dermochelys coriacea.

- **Definition by paraphrase.** This definition uses a phrase that is equivalent to the term being described.

  *management* = the action of managing something.

  *closure* = the state of a fishery of being closed.

- **Definition by synthesis.** This definition describes a concept by identifying or describing a relation it holds with other concepts.

  *selectivity* = in stock assessment, conventionally expressed as a relationship between retention and size with no reference to survival after escapement. (NOAA, 2006)

- **Definition by implication.** This definition provides an explicative context to illustrate the use of a concept.

  *scale* = scales cover the skin of most bony and cartilaginous fish. (VOICES, n.d.)

  *overfish* = a fishery overfishes a stock when the fishing effort surpasses the optimum level.

- **Definition by denotation.** This definition lists examples of the elements that can be included in a concept (the extension of a concept).

  *crustaceans* = some examples of crustaceans are shrimps, crabs, and lobsters.

  *gear* = gear includes trawl, longline, purse seine, gillnet, handline, among others.

- **Definition by demonstration.** This definition points out, provides a reference, or exhibits elements included in a concept (ostensive definition).

  *situational reference* = the chart shown in the slide.

  *pointing out a vessel* = this is an artisanal fishing vessel.

Some terminological definitions result from the combination of two types. The following is an example of a definition which follows the analytical model and adds a description:

*Processor*: The entities that conduct the processing associated with fish and fish products between the time fish are caught or harvested, and the time the final product is delivered to the customer. Fish processors can be divided into two categories: primary and secondary. (VOICES, n.d.)

analytical definition description

With regards to selecting a definition type to describe concepts in Terminology, Dubuc (2002) posits that there is not a unique appropriate model for all situations. The choices depend on the main characteristics of the term, the needs of the user and the level of specialization of the source where the term is defined (pp. 99-100).

So far, we presented the characteristics and types of definitions used in Terminology. Section 1.1.3. summarizes the criteria to be followed to write a good terminological definition, according to the review of the literature.

## 1.1.3. Guidelines to elaborate a good terminological definition

### 1.1.3.1. Definitional principles

The tendency in terminological works on definitions has been to suggest principles to comply with for producing an adequate terminological definition. Among these principles we can find:

**1. Clarity**. Ambiguity should be avoided to prevent confusion or misinterpretation of the definition (Dubuc, 2002, p. 96; Vézina et al., 2009. p. 12). The following definition lacks clarity due to its formulation in the negative form:

Example 1 (Dubuc, 2002, p. 96)

*amateur* (racquetball*).* Toute personne qui ne tire pas sa subsistance ou ne s'occupe pas du racquetball à titre lucratif.

**2. Adequacy.** The definition should refer exclusively to the concept to be defined and only to that concept (Dubuc, 2002, p. 96; Vézina et al., 2009, p. 13). To verify if a definition is adequate, Vézina

et al. propose a test including two questions. If the answer to both questions is positive, then the definition is considered to be adequate. The following example illustrates that verification:

Example 2 and verification questions (Vézina et al., 2009, p. 13)

*cheval.* Mammifère de la famille des équidés.

Question 1. Est-ce que tous les chevaux sont des mammifères de la famille des équidés ? Oui.

Question 2. Est-ce que tous les mammifères de la famille des équidés sont des chevaux ? Non, il y a aussi l'âne, le zèbre, etc.

The definition in example 2 is not adequate because it is too broad and includes other concepts apart from the term to be defined.

**3. Concision.** According to this principle, definitions should limit their scope to provide the essential characteristics of a concept, while the encyclopedic information should be placed outside the definition (Dubuc, 2002, p. 96; Vézina et al., 2009, p. 12).

Example 3 (Vézina et al., 2009, p. 12)

*clafoutis* (alimentation). Gâteau cuit au four fait de farine, de lait, d'œufs ou d'un mélange à base de pain, de brioches trempées et de fruits, qui est typique du Limousin et que l'on sert en entremets.

According to Vézina et al., the underlined text in example 3 represents non-essential characteristics and should be placed in a note rather than included in the definition. For Dubuc (2002), definitions should be written only in one sentence as much as possible (p. 96).

**4. Substitution**. According to this principle, a definition is acceptable if the definition and the term to be defined can replace each other without altering the meaning or the syntax of the sentences (Vézina et al., 2009, p. 14). This characteristic is known as *reciprocity,* and it can be used to validate definitions as in the following example:

Example 4 (NOAA, 2006)

*fisher*. A gender-neutral name for a person (male or female) participating in a fishery.

The following sentence is a concordance of the term *fisher* in the corpus built for this study:

*To remedy this requires capacity building among government organizations and empowerment of small-scale fishers so they can actively participate in DRR decision-making processes.*

If we replace the term by the definition in example 4, we obtain the following statement:

*To remedy this requires capacity building among government organizations and empowerment of small-scale gender-neutral names for a person (male or female) participating in a fishery so they can actively participate in DRR decision-making processes.*

The substitution shows that the definition is not appropriate in this case because the sense of the original sentence is not the same.

**5. Non-tautology**. Tautology occurs when the definition includes the defined term, a term of the same family or an equivalent term, not adding any information to the defined term. This phenomenon should be avoided when writing terminological definitions (Dubuc, 2002, p. 97; Vézina et al., 2009, p. 39). The definition in example 5 is tautological:

Example 5 (Vézina et al., 2009, p. 39)

*remise en état* (industrie automobile). Action de remettre en état.

**6. Adaptation to target groups.** According to Vézina et al. (2009), definitions should be adapted to the needs and knowledge of their target readers. Thus, definitional elements will be selected based on the characteristics of the audience (p. 15). Furthermore, definitions should include terms that are known by the target group (p. 18). Consider example 6:

Example 6 (NOAA, 2006)

*Landings*. […] 2. The part of the catch that is selected and kept during the sorting procedures on board vessels and successively discharged at dockside.

In example 6, it is assumed that the readers know the concept 'catch', probably because the definition appears in a terminological resource addressing an audience with intermediate or advanced knowledge of the domain.

It is worth noticing that what is considered in this point is not the context of use of terms but the readers of the definitions being written. As seen in section 1.1.1., terminological definitions do not consider the context of terms because the concepts do not change with contexts within a subject field.

**7. Non-circularity**. According to Dubuc (2002), this phenomenon occurs when one term is defined by a concept that leads the reader back to the concept being defined (p. 97). We observe that in example 7, the definition of "calendrer" is given by a concept that represents the same concept of "calendrer".

Example 7 (Dubuc, 2002, p. 97)

c*alendrer*. Lustrer.

*lustrer*. Calendrer.

**8. Non-negativity**. Definitions should describe what a concept is and avoid stating what is not (Dubuc, 2002, p. 97).

Example 8 (NOAA, 2006)

*fishing*. Any activity, other than scientific research conducted by a scientific research vessel, that involves the catching, taking, or harvesting of fish; or any attempt to do so; or any activity that can reasonably be expected to result in the catching, taking, or harvesting of fish and any operations at sea in support of it.

In example 8, the underlined phrase is a negative phrase and Dubuc recommends that these sorts of phrases should be avoided.

#### 1.1.3.2. Definitional rules

Vézina et al. (2009) propose a set of rules for the preparation of terminological definitions in four categories: general rules, rules concerning the subject field, rules concerning the genus and rules concerning definitional traits to be included in definitions. From these categories, the one

concerning definitional traits is more closely related to our study, because the information found in the corpus in the form of conceptual relations corresponds mostly to the definitional traits. Therefore, we will focus on that category, in which we can find among others, the following rules:

1. A definition should not include words implicitly included in the genus:

   Example 9 (Vézina et al., 2009, p. 27)

   *épeautre*. Variété de blé de la famille des graminées, aux épillets espacés et aux grains adhérant fortement à la balle.

   The underlined phrase should not be included in the definition because the genus *blé* is defined as *plante de la famille des graminées du genre Triticum*.

2. Every characteristic should be mentioned only once, avoiding meaning equivalences or phrases such as *that is to say, in other words, be it.*

   Example 10 (Vézina et al., 2009, p. 17)

   *abandon* (informatique). Action de se défaire du matériel ou du logiciel qui est jugé désuet, c'est-à-dire qui n'est plus en usage.

   The underlined phrase should not be used in the definition according to this rule, because it provides an equivalent of the characteristic *désuet* for the second time. If equivalent phrases are used in a definition, it would not comply with the principle of concision seen in section 1.1.3.1. and the text might be redundant.

3. A definition should include all the essential traits to be understood, avoiding open formulations such as *etc*.

   Example 11 (FAO, n.d.)

   *gear*. A fishing gear is a tool used to catch fish, such as hook and line, trawl, gill net, trap, spear, etc*.*

   According to this rule, *etc.* should not be included in the definition in example 11.

4. A definition should not include traits that may change over time or concern stereotypes or are not applicable to all the objects belonging to the defined concept.

   Example 12 (Vézina et al., 2009, p. 29)

   *dessin cachemire* (textile). Motif en forme de gouttes et de feuilles stylisées, très populaire, utilisé pour les cravates d'homme et les vêtements de femme.

   If we analyze example 12, we observe that the underlined text expresses characteristics that may not be true for all the objects designated by the term. Indeed, there may be cassimere designs that are not popular in some places or cultures.

5. The use of parenthesis should be limited, and they should not include essential traits of the defined concept. In example 13, the information in parenthesis is essential which means that the use of parenthesis in this case should be avoided.

   Example 13 (VOICES, n.d.)

   *exploitable biomass*. The biomass that is available to a unit of fishing effort. Defined as the sum of the population biomass at age (calculated as the mean within the fishing year) multiplied by the age-specific availability to the fishery.

6. A definition of a concrete object should include intrinsic traits (shape, dimensions, composition) and not only extrinsic traits (destination, place, function, origin, use) of concepts.

   Exemple 14 (Vézina et al., 2009, p. 30)

   *machine à écrire* (bureau). Machine permettant de remplacer l'écriture manuscrite par une écriture gravée comme en typographie.

   This definition does not include information about the intrinsic characteristics of the concept "machine à écrire"; therefore, it would be difficult for the reader to imagine this machine as opposed to other similar tools.

## 1.2. Selection of elements to be included in definitions

This section provides a review of previous work on methods to establish the elements that should be included in definitions. Various authors have focused on providing guidance as to what kind of information should be included under the model of the analytical definition. Therefore, our review focuses on selecting elements for this type of definition.

### 1.2.1. Definitional elements generally present in definitions

Sager and L'Homme (1994) proposed a model encoding seven elements that are usually part of analytical definitions and form the semantic characterization of a concept. The study provides a description of rules for writing terminological definitions by systematizing its content. Table 1 presents these elements and a summary of the description made by the authors (pp. 355-356).

Table 1.- Definition elements (Sager & L'Homme, 1994, p. 357)

Melanin: in biology (1), any of a group of (5) polymers (3), derived from the amino acid tyrosine (6, origin), that cause pigmentation of eyes, skin, and hair in vertebrates (7, use, function)

1. The subject-field attribution: the domain in which the term is described.
2. The concept class or category of the *definiendum (e.g.,* material entity, abstract entity, activity, etc.) In the example: melanin is a material entity.
3. The defining concept or genus (in this article the genus is also called *definiens*): a term closely related to the *definiendum*. It consists of a generic concept or another related concept.
4. The concept class of the genus (similar to 2. But applied to the genus). In the example, polymer is a material entity.
5. The relationship between the *definiendum* and the *genus.*
6. The characteristics that differentiate the term from related concepts belonging to the same class.
7. Any nonessential characteristic: this section is optional and may include restrictions of the application of the definition.

By organizing definition elements, the authors intended to improve the management of terminological databases, as well as data collection, storage and the retrieval of information. The model also points out other relations in the form of semantic features that distinguish the *definiendum* from other terms (e.g., composition, property, quality, origin, change of state, use, function, location, time, similarity). These relations could be used to search for relevant characteristics of concepts and systematize terminological definitions (Sager & L'Homme, 1994, p. 366).

### 1.2.2. Definitional elements based on feature relevance

Seppälä (2009) studied the criteria to establish feature relevance with a view to including them in definitions. As preliminary work which would later be developed in her thesis (Seppälä, 2012; see Section 1.2.3.), she established a classification of the types of features that concepts may present. Among the features, the author distinguishes the following types (Seppälä, 2009, pp. 47-49):

- Latent features, which can be applied to an entire category of objects or may be part of the general knowledge about a concept but are not included in terminological definitions.
- Salient features, which are of interest for the domain and represent the main functions of an object within the conceptual system.
- Potentially relevant features, which could be relevant to define a concept, but they are not necessarily included in the definition.
- Relevant features, which are part of the definition and are selected from a wider group of potentially relevant features.

In this systematization of possible definitional features, each set is seen as being included in the next one as shown in the diagram proposed by the author in Figure 5.

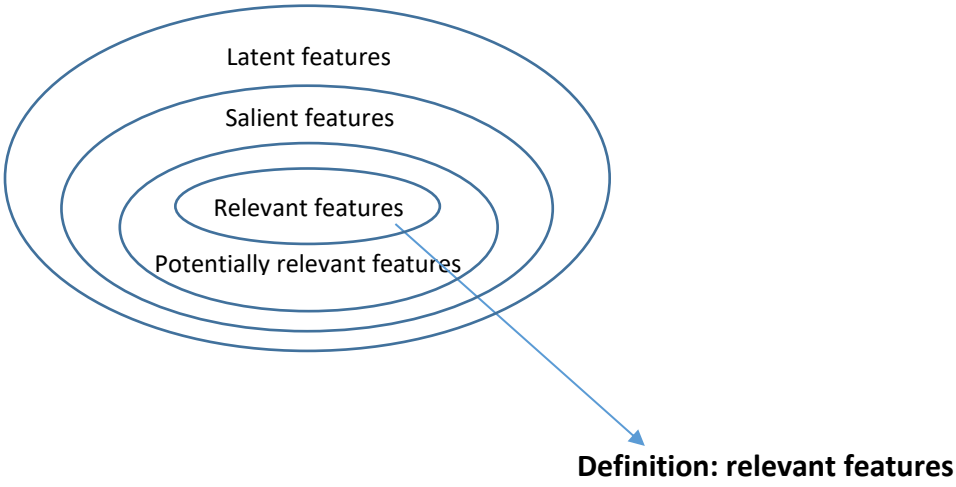



Figure 5.- Classification of features (adapted from Seppälä 2009, p. 49)

Seppälä raises two research questions that she aimed to answer with her study focusing on the evaluation of information for definitions.

Question 1: What kind of information is relevant and why?

Question 2: What are the relevance conditions?

According to Seppälä (2009), there is no general rule to determine what kind of information is relevant for the definition of a concept. In her view, the task consists of assessing what is relevant in specific cases. Thus, her work provides insights on the aspects that should be considered when evaluating the relevance of possible definitional information.

### 1.2.3. Definitional elements based on ontological categories

As seen in Seppälä (2009), terminological definitions should include the relevant characteristics of the defined term. This implies a selection of specific characteristics among a wider set of other elements with different degrees of relevance. According to Seppälä (2012), the selection of relevant traits depends on different factors in three dimensions: the extensional dimension, the contextual dimension, and the communicative dimension (pp. 141-166).

The extensional dimension comprises the ontological factor and the extensional factor. The ontological factor includes the conceptual class of the term (entities, qualities, relations, among others applicable to all subject fields and all languages) and the nature of the object expressed by the term. This nature may consist of a particular entity if it is expressed by a proper name, or a type of entity, if it is expressed by a common name (Seppälä, 2012, p. 35). The extensional factor defines whether the extension of the defined concept comprises homogeneous or heterogeneous objects. The extension is heterogeneous when it includes objects sharing properties such as the function or the origin but not physical similarities (Seppälä, 2012, p. 149). The author mentions the term *déchet valorisable* as an example of heterogeneous extension since the objects included in this concept class comprises paper, aluminium, glass, and other kinds of materials that do not share physical properties.

The contextual dimension includes the selection criteria based on the usage of terms by experts in a specific context (systemic factor) and the previous knowledge of the user about the domain

(individual factor). Finally, the communicative dimension refers to the choice of relevant traits considering the specific needs of the user (functional factor) and the communicative situation in which the definition is created (situational factor).

Focusing her work on the definitions of entities, Seppälä (2012) considered that the relations used to define a concept depend on the type of entity to be defined (p. 167). To prove this, she elaborated templates called *relational models.* These templates contain the relations used to define different types of entities in a high-level ontology, the Basic Formal Ontology (BFO, Spear 2006). These entity types belong to different scientific domains and include objects, processes, qualities, dispositions, roles, abstract entities, sites, events, among others. For instance, the relational model for the category *abstract entity* includes the relations is a_entity, bearer of_quality, created by_event, depends on_object, has_no_part_physical, and has_no_part_temporal (Seppälä, 2012, p. 280). According to this approach, these are the pertinent relations to describe an abstract entity.

The author compared the relational models built for each type of entity in the ontology to the internal structure of 240 terminological dictionary definitions extracted from an annotated corpus in many different domains. With this comparison, Seppälä aimed to show that the relevant relations to be included in the definitions depend on the type of entity to be defined. She found that 75% of the relations present in the definitions matched those present in the relational models from the ontology.

These findings show that the relevance of the information to be included in definitions depends on the type of entity being defined (Seppälä, 2012, p. 242). As a result, the author proposed a model that predicts which relations should be included in the definition of the type of entities identified in her study.

### 1.2.4. Definitional elements based on contextual variation

A slightly different approach with regards to the selection of definitional information was presented in San Martín (2016). The author created some principles to guide definition writing considering contextual variation and the associated conceptual phenomena.

Contextual variation occurs when a concept does not always activate the same traits in different subdomains and the relevance of those traits varies accordingly (San Martín, 2016, p. 27). The author's work focuses on thematic constraints as one of the factors that determine definitional elements. These types of constraints limit meaning based on the topic and the perspective in a specific communicative act (San Martín, 2016, p. 26). His study sought to analyze the effects of contextual variation and provide guidelines on how to represent the resulting conceptual phenomena in definitions.

San Martín identified terms that require a flexible definition because they activate different conceptual traits in different environmental subdomains. This was achieved through term extraction from a set of corpora of different subdomains and a selection of the terms that were used in at least three subdomains (San Martín, 2016, pp. 272-275).

After establishing the methodology, the author modeled the elaboration of flexible definitions for two terms of the environment domain: *pollutant* and *chlorine*, explaining step by step all the process from the extraction of relevant information to the final drafting of the flexible definitions. The flexible definition includes a definition for the general environmental domain and three other definitions. These new definitions are specific to the subdomains in which the terms are mostly defined according to the sources analyzed in the study. For instance, the contextual domains in which the term *pollutant* is defined according to the author's analysis are Air quality management, Waste management and Water treatment and supply. Thus, the flexible definition includes definitions in these three domains.

To select the definition elements that should be included in flexible definitions, San Martín used the methodology of the frame-based terminology (Faber, 2014) for the extraction of contexts. This methodology combines the analysis of definitions from other terminological resources with corpus analysis.

To extract candidates for the genus or superordinate concepts, the author used knowledge-rich contexts extracted with word sketches (See section 2.7.2.) specifically created for the study (San Martín, 2016, p. 266). The selection of other relevant traits for definitions was done by identifying *contextonyms* or lexical units that appear in the linguistic context of the defined terms. The

analysis of contextonyms was done separately for each contextual domain, and the author identified the most relevant units from each list. For example, for the term *pollution*, the contextonyms that ranked highest in the list in the domain of Air quality management were *air*, *atmospheric* and *atmosphere*.

So far, we have seen previous work on the type of information that researchers propose to include in definitions. In the following section we will see how this information should be obtained, organized, and placed to guide the writing of definitions. Nevertheless, when we review the literature on definitions, we realize that many authors have proposed models including both definition content and structure (e.g., Faber, 2002a; Valero, 2014; San Martín, 2016).

## 1.3. Definitional templates

In Terminology there is a tendency to establish semantic structures that guide the description of all concepts belonging to the same category (Valero, 2014, p. 228). These structures can take the form of definitional models including the conceptual elements to be considered in a definition.

In this section, we study different definitional templates that have been proposed in Terminology to represent the structure of concepts and definitions. We present a summary of the most salient models labeled under the authors' names. In this way, we expect to account for the evolution and application of definitional templates to the formulation of terminological definitions.

### 1.3.1. Martin (1998)

This model is presented as a scheme to represent the meaning of terms focusing on both definition form and content. Martin's frames were inspired by Frame Semantics proposed by Fillmore (1977) and from artificial intelligence frames proposed by Minsky (1975).

As explained by Martin (1998), both the linguistic and artificial intelligence *frames* account for background, implicit, stereotyped knowledge that is necessary to understand concepts and meanings (p. 91). He is mainly guided by the approach of artificial intelligence in which frames take the format of *slots* and *fillers*.

*Slots* can be understood as general traits or categories that represent the background knowledge such as features, dimensions, questions, etc. When applied to lexical units, those traits become specified by *fillers* which are the corresponding values of the *slots*. The information about the species Atlantic sturgeon, taken from the data sets at NOAA Species Directory (NOAA, n.d.) can be placed in the slots and fillers format as shown in Table 2.

Table 2.- Example of slots and fillers to describe *Atlantic Sturgeon* (NOAA, n.d.)

| Slots | Fillers |
|---|---|
| Weight | Up to 800 pounds |
| Life Span | 60 years |
| Length | Up to 14 feet |
| Threats | Entanglement in fishing gear, Habitat impediments, Habitat degradation, Vessel strikes |
| Region | New England/Mid-Atlantic, Southeast |

Martin (1994) considered that frame representations can be used as the base for the elaboration of dictionary definitions. In the author's approach, conceptual frames are specific to a certain class of lexical unit, but they can be used to describe both general concepts denoting a class, or specific concepts, denoting the members of that class. *Slots* are considered maximum expectation patterns, which are expected to be specified but are not necessarily specified when applied to a specific concept (Martin, 1994, p. 245). An example set by the author is the *animal* frame applied to *rabbit* in Table 3.

Table 3.- Content of *animal* frame and *rabbit* frame (Martin, 1994, pp. 248-250)

| Animal frame | Animal frame applied to *rabbit* |
|---|---|
| **Zoocentric slots:** | **Zoocentric slots** |
| - subtype<br>- sex<br>- size<br>- shape<br>- skin<br>- design<br>- colour<br>- age<br>- has-qual<br>- has-parts<br>- typ. action<br>- typ. ability<br>- move<br>- sound<br>- lives off<br>- birth<br>- habitat-geo<br>- habitat-eco | - subtype: rodent<br>- size: small<br>- skin: furry<br>- has-qual: quick<br>- has-parts: long ears<br>- move: jump (on hind legs)<br>- habitat-eco: rabbit hole/rabbit hutch |
| **Anthropomorphic slots:** | **Anthropomorphic slots:** |
| - has stereotypical qual<br>- function man:<br>- human activity related to this animal<br>- a part of this animal related to human activity<br>- similar to | - has stereotypical qual: shy/impatient<br>- function man:<br>- human activity related to this animal: hunting/breeding<br>- a part of this animal related to human activity: meat/fur<br>- similar to: hare |

According to the author, from frames "one can select/specify slots/features differing in their degree of necessity" (Martin, 1998, p. 209). This explains why not all the slots from the *animal* frame in Table 3 have been filled in the *rabbit* frame on the right side of the table. This means that only the most important features for the description of *rabbit* have been selected and filled in the *rabbit* frame from all the slots for *animal*.

The possibility of defining concepts by selecting features that vary in their degree of necessity represents a shift from the traditional conception of definitions, i.e., definitions viewed as lists of necessary and sufficient characteristics that distinguish concepts from one another. In this new approach, characteristics do not have the same importance as some are more necessary than others. Hence, one can select features accordingly. Some features can be criterial (implied in the meaning), others expected (the more specific a term is, the more slots are needed), and others are just possible. (Martin, 1998, pp. 209-210).

It is worth noticing that Martin applied frames first to general language definitions in his article in 1994 and subsequently, to Terminology in his study in 1998. When referring to the implications of expressing conceptual knowledge through frames in Terminology, the author points out that meaning is no longer divided into unrelated senses. Instead, "frames, as organized and structured clusters, exhibit both a holistic (forming one whole) and a relational (showing different, related aspects/slots) character" (Martin, 1998, p. 206). He adds that "for terminology/terminography this means that knowledge clusters associated with terms are taken to be the objects of description".

Martin (1998) also mentions that the use of frames in terminological definitions contradicts traditional Terminology in the sense that there is no need to have a structured conceptual system to be able to define (p. 207). In his view, types or categories do not form a taxonomy but a relational structure and that is enough to elaborate definitions. The explanation for this is that a frame of a term is the same as the frame for the concept type of that term. As exemplified by the author, *disease* is the concept type of *flu*, *aids*, *arthritis*, etc.

Another implication of the frame-based approach for Terminology according to Martin (1998), is that the construction of frames is based on the way terms are used in texts (p.208). This means that the knowledge about a concept comes from the language users and is widespread among them. In this regard, Martin adds that in Terminography, the construction of frames can be a repetitive procedure, where one frame can be taken from a text and used as a reference to explore other texts (p.209). In our view, this is particularly relevant for the formulation of definitions: a frame used in the definition of one term can be used as a starting point for the definition of another term because the meaning associated with that frame is the same and is generally known by the users of specialized language in a particular domain.

For Martin (1998, pp. 210-212), at the level of concept representation, the advantages of writing terminological definitions following the frames model are:

- The model leads to greater consistency since the same frame applies to terms of the same category.

- There is flexibility to select slots according to the user needs and based on that, one can show different angles of a concept, selecting elements from the same set of slots.
- Frame-based definitions consist of many more relations than the classical definitions due to the degrees of necessity associated with each characteristic.

### 1.3.2. Temmerman (2000)

This model applies the principles of socio-cognitive terminology (Temmerman, 2000) to definitions. Using the traditional model of analytical definitions (genus and differentiae), the author analyses different types of concepts requiring definitions to see if traditional rules are suitable for all the types analyzed.

To explain how concepts can be described according to concept types, Temmerman calls *units of understanding* the cognitive units through which people understand the world, including sets of properties describing both the perceivable and conceivable objects. Units of understanding include two types: *concepts* and *categories*. For the author, *concepts* are items that can be described by indicating a superordinate unit and the necessary and sufficient traits that distinguish the unit from others, for example the term *intron* uses the superordinate of "sequence" referring to a genetic sequence (Temmerman, 2000, p. 80).

As opposed to concepts, *categories* are units of understanding that cannot be defined according to the principles of traditional Terminology because it is not possible to find a suitable superordinate nor a limited number of characteristics to define them. That is the case of the term *biotechnology* analyzed in Temmerman (2000), for which there are different possible subordinates such as *life sciences* or *technology*, but they are too general to define the term in a meaningful way (p. 84). Likewise, it is not possible to delimitate the characteristics of *biotechnology* since "it covers a wide spectrum of activities and their results" (p. 86).

For the author, the information about categories is not ontologically or logically structured. Thus, other cognitive principles are required in the description of categories, such as aspects related to time, facets, the relation with other units of understanding and the intention of the sender of the message (Temmerman, 2000, p. 74).

In the description of categories, a template is needed as an alternative to the structure of the analytical definition. The concept of "template" in this view is a blank document which contains predetermined elements with a prototypical structure. These elements represent essential information for understanding the meaning of the category to be defined. In the templates, the criteria of necessary and sufficient characteristics are not relevant. Instead, the information is considered more essential or less essential, according to the situation in which the category is used. For example, to describe activities, successive steps are given as essential information; to describe umbrella categories, the history can be essential (Temmerman, 2000, pp. 122-123).

The information contained in templates is a list of possible encyclopedic elements that should be included in the definitions of all the units of understanding. Table 4 reproduces the template proposed by the author for the categories that she studied (entities, activities, and collective categories).

Table 4.- Template for definitions of units of understanding (Temmerman, 2000, p. 122)

| |
|---|
| CATEGORY/TERM:<br>TYPE OF CATEGORY<br>a) Entity<br>b) Activity<br>c) Collective category<br>d) Etc.<br>CORE DEFINITION:<br>……<br>INTRACATEGORIAL INFORMATION<br>a) Is a part of<br>b) Consists of<br>c) Is a type of<br>d) Has the following types<br>e) Aims<br>f) Use<br>g) Application<br>h) …. etc.<br>INTERCATEGORIAL INFORMATION<br>a) Perspective<br>b) Domains<br>c) Intentions<br>d) HISTORICAL INFORMATION |

Temmerman's view is similar to some of the views expressed by Martin (1998). For both authors, a structured conceptual system or a taxonomy are not necessary to define categories (even though categories concern concepts in general for Martin). Also in both views, a relational structure is needed to write definitions. Martin's frames are similar to Temmerman's templates in that they both include essential information to define a category and the template used to write definitions is the same for the members of that category. Furthermore, for both authors, as well as for Seppälä (2009), definitional elements can vary in terms of their relevance (necessity, according to Martin and essential information, according to Temmerman) and one can select the most relevant/necessary/essential traits in each situation.

### 1.3.3. Faber (2002a)

Research on definition content was carried out during the development of OncoTerm (2002; Faber, 2002b), a bilingual terminological database in the field of oncology. In this project, the team of researchers considered terminological definitions as "the natural language translation of the conceptual structure of the domain" (Faber, 2002a, p. 343). Consequently, they paid attention to the coherence of definitions regarding their micro- and macrostructure since, according to Faber (2002a), such coherence can only be achieved through the analysis of textual data (p. 343).

OncoTerm researchers extracted information from a specialized corpus and from medical dictionaries to build definitions for the database. The information obtained was first used to build a list of conceptual categories under which terms were organized. Some examples of the conceptual categories obtained through this work include *diagnostic procedure*, *body part, tumor, treatment, instrument, specialist*.

The internal structure of each category and the knowledge parameters which define that structure were obtained from the corpus and were used as models to elaborate the definition of all terms belonging to that category (Faber, 2002a, p. 246). The way these parameters were organized was represented by a set of conceptual relations placed in a template showing all the definitional elements required for that category. Table 5 presents an example of the relations required for a definition of the terms referring to "treatment".

Table 5.- Elements required to define concepts belonging to the category *treatment* (Faber, 2002a, p. 348)

| Conceptual category | Conceptual relation |
|---|---|
| treatment | is-a |
| | uses-instrument |
| | has-function |
| | has-location |

The template is not only valid for other terms of the same category but can also be used for subordinate concepts. However, in the case of subordinate concepts, more specific values are generated. Table 6 shows the relations for *radiation therapy*, a subordinate of *treatment*. The relations are placed on the left and the related terms on the right.

Table 6.- Category template for *radiation therapy* (Faber, 2002a, p. 349)

| Radiation therapy | |
|---|---|
| is a | treatment |
| uses-instrument | high-energy rays |
| has-function | elimination of cancer cells |
| affects | body part |

The template used by Faber (2002a) was also used by León Araúz et al. (2012) to describe terms in EcoLexicon (LexiCon Research Group, n.d.; Faber et al., 2016), a terminological knowledge base of environmental science. In both cases, the structure and layout of the template were based in Martin's (1998) frames, which we presented in section 1.3.1.

León Araúz et al. (2012) developed a language-independent methodology to represent concept structure, obtain an inventory of conceptual relations and produce definitions in English and Spanish. This methodology used in EcoLexicon is based on Frame-based terminology (Faber, 2014).

Definitional templates in this work represent the definitional structure shared by all concepts belonging to the same category (León Araúz et al., 2012, p. 190). Definitional elements here are also obtained from specialized corpora and from dictionaries. This approach also distances itself

from the necessary and sufficient characteristics model since, in this case, definitional elements are provided as a set of relations structured in the template.

In this template, relations appear on the left column and the related concepts in the right column. Table 7 shows the template for the category *movement* and Table 8 shows the same template applied to the term *diffusion*, which belongs to the *movement* category.

Table 7.- Definitional template for *movement* (León Araúz et al.,2012, p. 189)

| Movement | |
|---|---|
| Agent | Initiator of the movement (when relevant) |
| Type-of | Type of movement |
| Path | Direction/shape of movement |
| Affects | Entities participating of movement |
| Result | Result of movement |

Table 8.- Definitional template for *diffusion* (León Araúz et al.,2012, p. 189)

| Diffusion | |
|---|---|
| Agent | ------ |
| Type-of | Movement |
| Path | From an area of higher concentration to an area of lower concentration |
| Affects | Particles (molecules or iron) |
| Result | More uniform distribution |

### 1.3.4. Valero (2014)

Based on a conceptual approach, this study aimed to systematize the elaboration of terminological definitions in the field of ceramics. As other works presented above, this approach considers that the selection of definitional elements depends on the conceptual category of terms and the needs of users (Valero, 2014, p. 379).

Valero (2014) rules out including only sufficient and necessary characteristics in definitions since the idea is not applicable to all concepts. Thus, the only criterion used by the author to select elements for definitions is the recurrence of the characteristics in the contexts, as she considers relevant what specialists say repeatedly in their explanations (p. 245). Additionally, the study uses

terminological resources such as a database and various dictionaries to identify the conceptual characteristics of term categories (p. 276).

Based on the analysis of a corpus and various dictionaries, the author produced definitional templates or *patterns*, as she named them, containing the relevant traits for definitions. Her goal was to advance towards the automated management of definitions. Elements in these templates include essential and complementary characteristics of terms and semantic information aimed at guiding the user on the combinations of terms.

To reach her research goals, Valero identified nine conceptual categories specific to the field of ceramics. These categories correspond to conceptual classes such as entities (defects, instruments, additives and raw materials), processes (production, physical and chemical processes) and properties (instrument and raw material properties). Then, the conceptual analysis of terms for each category allowed the author to identify a list of definitional traits to describe concepts. Some of these traits can be found in other domains, for example *objective*, *function*, *consequence*, among others.

The definitional patterns produced in this work are different for each conceptual category. Thus, each category has a conceptual structure expressed via relations with other concepts and placed in a definitional pattern. Table 9 shows the definitional patterns for the Additives category in Spanish. The left column includes the definitional traits and the right column shows the values for each trait.

Table 9.- Definitional pattern for the category *Aditivo* (Valero, 2014, p. 314 and my translation)

| Término<br>Term | Estabilizador de red<br>Grid stabilizer |
|---|---|
| DESCRIPTOR<br>DESCRIPTOR | aditivo<br>additive |
| EFECTO<br><br>EFFECT | Proporciona estabilidad a la estructura amorfa evitando que se convierta en cristalina<br>Provides stability to the amorphous structure, avoiding crystallization |
| RECEPTOR<br>RECEPTOR | vidriado<br>glazing |
| FASE<br>PHASE | mezcla de materias primas<br>mixture of raw material |
| EJEMPLO TÍPICO<br>TYPICAL EXAMPLE | óxido de calcio<br>calcium oxide |

We can observe some similarities between the works of Valero (2014) and Faber (2002a). First, both studies use corpora and dictionaries to obtain information about the conceptual categories specific to their domains of study. Second, based on that information, they build models that will be used for the definition of concepts belonging to the same conceptual category. Third, these models include conceptual relations placed in a template that will be filled and used for the definition of terms. The idea of models containing relevant relations for definition writing is also present in Seppälä (2012); however, the latter author takes the relations from a formal ontology and not from specialized texts or definitions of a specific domain.

## 1.4. Conclusion

In this chapter, we reviewed a series of works on the selection of elements that should be included in definitions and how to organize that information.

Most works reviewed in sections 1.2 and 1.3 do not limit the search of definitional elements to sufficient and necessary characteristics of concepts. Seppälä (2009; 2012) shows that definitional elements depend on feature relevance and relational models, Leon Araúz et al. (2012), Faber (2002a) and Valero (2014) look for definitional information in corpora and dictionary definitions. San Martín (2016) posits that definitional elements vary based on the context and subdomains. Additionally, Temmerman (2000) shows that it is not possible to establish sufficient and necessary features for the description of *categories*, for which some traits are more essential than others depending on a set of factors.

We also believe that the sufficient and necessary conditions are not appropriate for the description of concepts. Faber (2002a), León Araúz et al. (2012), San Martín (2016) and Valero (2014) suggest locating the conceptual relations to be included in definitions in corpora and dictionary definitions, focusing on the frequency of elements in both sources as a criterion in the selection of definitional information. Templates are also considered to be important to place and structure conceptual relations. All these elements are also part of our study: we will look for the most frequent definitional information in the corpus and dictionary definitions to identify which relations are mainly found in each source.

Sager and L'Homme (1994) do not take as much distance as the other studies from the analytical definition. Nevertheless, their proposal for systematizing definitional elements has contributed to our study providing us with relevant insights on semantic relations, their typology, and their linguistic realizations. This is particularly useful for our analysis and comparison of relation types in definitions and the corpus.

Martin (1998), Seppälä (2009; 2012), León Araúz et al. (2012), Faber (2002a), and Valero (2014) consider that relevance of relations for definitions depend on conceptual types or categories. These authors try to establish a structured list of relations for the description of all terms belonging to the same category. In our analysis, we will not look for relations according to conceptual categories from the start. Instead, we will treat all terms equally, selecting relation types from the corpus based on their frequency, and taking all the relations we find in the dictionaries. Subsequently, we will identify which relations are most found for terms belonging to each conceptual category selected for our study (entities and activities).

Our review includes authors who organize definitional elements in templates. Most templates take the frame structure of artificial intelligence as *slots* and *fillers*, on which Martin's frames were based (Martin, 1994). This model has provided us with insights on how definitions are structured and organized. Martin (1998) and Leon Araúz et al. (2012) have inspired us to create new templates for the analysis of relations in definitions and the corpus. The difference with our work is that these authors use templates to write definitions whereas we analyze existing relations in the corpus and the dictionaries. Another difference is that we did not have a predetermined list of relations before analyzing conceptual relations. In our analysis, we use two empty templates that reproduce the idea of slots and fillers, but these elements are exclusively taken from the corpus and the dictionaries without considering concept typology at the stage of the analysis.

For Martin (1998), a term can be described differently, selecting different *slots*, depending on the needs of the user. In our study, we aim to enrich terminological definitions addressed to interpreters and translators working in the fisheries domain. In line with the user's needs, the selection of elements based on frequency of use in the corpus seems to be an appropriate choice.

The explanation for this is that the most frequent terms are more likely to appear in expert communication.

From the work of San Martín (2016) we adopt the use of semantic word sketches which complement the conventional word sketches in Sketch Engine to identify lexical units related to the terms analyzed. Additionally, we take from León Araúz et al. (2012) various names of conceptual relations of the environment, and we were inspired by their template to create our own templates for the analysis of relation types in the dictionaries and the corpus.

We aim to enrich previous work that exploits corpus data to find relations to complement terminological definitions. Instead of identifying relevant, necessary, or sufficient characteristics for definitions, our goal is to identify which related units are most frequently used by experts when referring to a term, which relations are most likely to appear in the corpus and which relations in the dictionaries and provide methodological guidelines to write enriched definitions.

# Chapter 2 Methodology

This chapter describes the methodological steps of this study. We start by outlining the selected subject field in Section 2.1. Next, we provide details about the criteria we used to compile the corpus for our research in 2.2. We explain how we proceeded to extract term candidates for the analysis in 2.3. Subsequently, we present our first sample of terms in 2.4. and we provide details on the dictionaries selected for the analysis in 2.5. Section 2.6 includes information on how terms were selected for the analysis, and section 2.7 explains the steps taken to analyze conceptual relations in the definitions and the corpus.

## 2.1. Subject field

As explained in the introduction, this study focuses on the terminology of the fisheries domain. Within this area of knowledge, the texts of the corpus are all related to sustainable fisheries.

According to the Marine Stewardship Council, "Sustainable fishing means leaving enough fish in the ocean, respecting habitats and ensuring people who depend on fishing can maintain their livelihoods" (MSC, 2020). This implies that the activities conducted to achieve sustainability within the fisheries sector are all aimed at preserving the fish stocks, minimizing the impacts of the fishing practices on the environment, and improving the management of fishing operations so that they are adapted to environmental circumstances (MSC, 2020).

In my experience as an interpreter and in my multiple conversations with fisheries experts, I have noticed that there are few reference works on fisheries terminology. Those that exist do not include the new terms created over the last few decades such as *AIS* (*automatic identification systems*), *electronic logbook* or *blockchain* which are technologies used in fisheries (Girard & Du Payrat, 2017); thus, definitions are apparently not well adapted to the current reality of the domain. Moreover, when terms are defined in dictionaries, definitions do not present all the concepts likely to appear in context when experts refer to the term being defined.

Another aspect identified during my professional experience in the field is that specialized fisheries dictionaries are only partly helpful to understand the terminology because they do not

provide enough information about terms. When preparing my interpretation assignments, I have noticed that most of my understanding of fisheries terminology comes from consultation with experts in this domain. Incomplete definitions might be a difficulty for many other interpreters and translators when they look for terms in dictionaries.

In addition to the above reasons, most of the fisheries specialists I have worked with think that there is a lack of appropriate terminological resources for non-experts in the field of fisheries.

## 2.2. The compilation of the corpus

For this research we compiled a corpus of texts in English written by experts. In the following sections, we will describe the criteria used to include a text in the corpus (2.2.1.), the formatting of texts (2.2.2.), and the corpus size and composition (2.2.3.).

### 2.2.1. Criteria for including a text in the corpus

We based the stages for building a corpus on the criteria provided by L'Homme (2020b, pp. 140 - 144) for this purpose. We describe each criterion considered in the following sections.

#### 2.2.1.1. The subject of the texts

The first criterion for including a text in the corpus was its correspondence with the subject field of sustainable fisheries. To determine if the text belongs to the area, we used the principles of fisheries sustainability established by the MSC, which grants the most widely used certification of sustainable fisheries in the world. In the process of assessing fisheries pursuing the MSC certification of sustainable fisheries, the MSC uses the principles described in Figure 6 (MSC, 2020).

**Principle 1: Sustainable target fish stocks**
A fishery must be conducted in a manner that does not lead to overfishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

**Principle 2: Environmental impact of fishing**
Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

**Principle 3: Effective management**
The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Figure 6.- MSC fisheries sustainability principles (MSC, 2020)

To include a text in the corpus, the main topic of the text should match one of the topics included in the description of the MSC Sustainability principles. For example, the following statement appears in the summary of the article by Alfaro et al. (2011)[1]:

*From 2000 to 2007, we used both shore-based and onboard observer programs from three SSF ports in Peru to assess the impact on marine turtles of small-scale longline, bottom set nets and driftnet fisheries.*

The article deals with the environmental impacts of fishing, a topic that falls under MSC principle 2. Therefore, we included the text in the corpus. We used all the topics included in the principles to look for articles and technical reports to complete the corpus. The parts of the documents that were considered more representative of the topics were the titles, the introductions and the conclusions of the articles and technical reports.

#### 2.2.1.2. Authorship of the texts and level of expertise

Given our aim to study the potential of a corpus to provide useful elements to enrich definitions, the texts had to be written by experts. To that end, we searched for information about the authors of the texts, their fields of interest within the fisheries sector, the institutions where they work and their publications.

As for the articles, we considered that they were written by an expert if the article was published by a research institution specialized in fisheries or by another unit focusing on research in the

[1] The full reference appears in Appendix 2: references of texts in the corpus

field. Most of the authors come from research institutes and universities around the world where there is a special research unit for fisheries. For example, we gathered articles written by researchers from the Institute of the Peruvian Sea, which is the body in charge of producing scientific data for the Peruvian government. In this case, the fact that these experts are not native English speakers was not considered a problem because they often publish articles in English. Other texts were produced by renowned researchers of the University of British Columbia in Canada, a worldwide reference in fisheries research.

Likewise, as for the technical reports selected, we included texts issued by institutions which possess a specialized fishery research unit. Additionally, these institutions are very active and play an important role in the compilation of fisheries data in the world. That is the case of the National Oceanic and Atmospheric Administration of the United States (NOAA), which produces reports directly to the US Congress about the status of the stocks. In fact, we included two of these reports in our corpus. Other reports selected for our corpus were issued by the Marine Stewardship Council, the Sustainable Fisheries Partnership, an international non-profit organization applying standards similar to those used to obtain a sustainable fisheries certification, and the Food and Agriculture Organization (FAO), who conducted studies in 2018 and 2019 about fisheries sustainability in the context of climate change.

#### 2.2.1.3. Textual genres

We decided to work with scientific articles and technical reports because they are produced by experts, according to the criterion described in section 2.2.1.2.

Text structure and the journals or websites where they were published were used to identify textual genres and their level of specialization. For instance, some of the articles in the corpus were published in journals such as *Marine Policy* or the *Journal of Applied Ecology,* two well-known journals in ocean policy studies and environmental sciences, respectively. We chose to work with technical reports because this is the way large organizations collaborate with governments in the fisheries field, by providing technical data to promote fisheries public policies that improve the fisheries management. Moreover, fishery units of large organizations such as FAO or NOAA hire experts to produce reports following their widely known high standards.

#### 2.2.1.4. Publication of the texts

We tried as much as possible to collect texts issued over the last ten years because sustainability has been a prevalent topic on the international agenda during that period. This may be due to the countries' international commitments to regulate the use of natural resources in the framework of the Sustainable Development Goals established by the United Nations in 2015. Consequently, the selected texts were published between 2010 and 2020. However, we have also included in the corpus two texts published in 2008, prioritizing the subject field and the reputation of the author.

### 2.2.2. Text formats

The texts of the corpus were obtained in .pdf format and converted to .docx format using a pdf convertor. Once in .docx, we removed the references and subsequently saved each text in .txt format, which is the only format accepted by TermoStat Web (Drouin, 2003), the term extractor used for this research.

Images and charts included in word documents were automatically deleted when files were saved in .txt, whereas the content of tables remains in the document as text after the conversion. TermoStat requires the entire corpus to be submitted as a single file, therefore, we merged all the texts in one file.

As for the corpus compilation in Sketch Engine (see Section 2.2.3.), the texts were submitted also in .txt format because it is one of the various formats accepted by this software; however, in this case, each text was submitted individually.

### 2.2.3. Corpus size and composition

According to the Sketch Engine count, the corpus totals 624,120 words. It comprises 27 documents: 15 scientific articles and 12 technical reports issued by governmental fisheries organizations, private sector environmental entities and civil society organizations. Table 10 provides an overview of the corpus composition including the authors, the number of words, the topics and the genre of the texts.

By looking of the number of occurrences of each text, we observe that there is a large difference between the size of some of the texts. However, this did not have an impact on our results because all the texts belong to the subdomain of Fisheries Sustainability. Furthermore, the texts extracted for analysis are the most specific of the corpus and the related elements taken from the corpus results are the most frequent ones. For a detailed description of each text see Appendix 1.

Table 10.- General overview of corpus composition

| | **Topics** | **Author** | **Occurrences** |
|---|---|---|---|
| **Scientific articles** | biodiversity | Alder & Pauly | 35,778 |
| | marine turtles | Alfaro Shigetto et al. | 4,646 |
| | small scale fisheries | Alfaro Shigetto et al | 6,622 |
| | evolution anchoveta | Arias Shreiber | 9,082 |
| | sustainability anchoveta | Arias Shreiber & Halliday | 8,024 |
| | sustainability | Arias Shreiber et al. | 7,408 |
| | Humboldt current | Bertrand et al. | 7,622 |
| | harvest strategies | Pascoe et al. | 7,276 |
| | deep sea fisheries | Norse et al. | 9,906 |
| | MSC certification | Christian et al. | 6,423 |
| | Humboldt large marine ecosystem | Gutierrez et al. | 10,634 |
| | fish and fisheries | Hill et al. | 5,824 |
| | conservation rules | Oyadenel et al. | 3,490 |
| | protecting mariculture diversity | Oyinlola et al. | 6,764 |
| | Illicit trade | Sumaila | 5,899 |
| **Technical reports** | Review of FIPs | CEA consulting | 57,772 |
| | El Niño impacts | FAO | 76,277 |
| | management performance | FAO | 138,729 |
| | Sustainable small-scale practices | FAO | 82,060 |
| | wild blue mussels | MSC | 20,910 |
| | Peruvian hake | MSC | 15,432 |
| | status of stocks | NOAA | 2,545 |
| | fisheries management | NOAA | 38,316 |
| | aquaculture best practices | Bone et al. (SFP) | 14,623 |
| | ETP interactions | SPF | 20,059 |
| | reduction fisheries | SPF | 15,194 |
| | Mahi mahi value chain | WWF | 8,663 |

## 2.3. Extraction of term candidates by TermoStat 3.0

TermoStat is a term extractor developed by Drouin (2003) at the Observatoire de linguistique Sens-Texte of the University of Montreal. The software extracts terminology from a corpus submitted by the user by comparing the frequency of lemmas with another corpus, typically a corpus of general language called the *reference corpus* (Drouin, 2003). As a result, TermoStat provides the user with a list of term candidates ordered by frequency, specificity, or predefined syntactical chains (Drouin, 2010).

In TermoStat, term extraction comprises three stages: first, it tags texts in terms of parts of speech using TreeTagger (Schmid, 1995), then it extracts predefined syntactical structures, and finally, it selects the term candidates according to specificity scores, frequency of use and syntactical structure (Drouin, 2010).

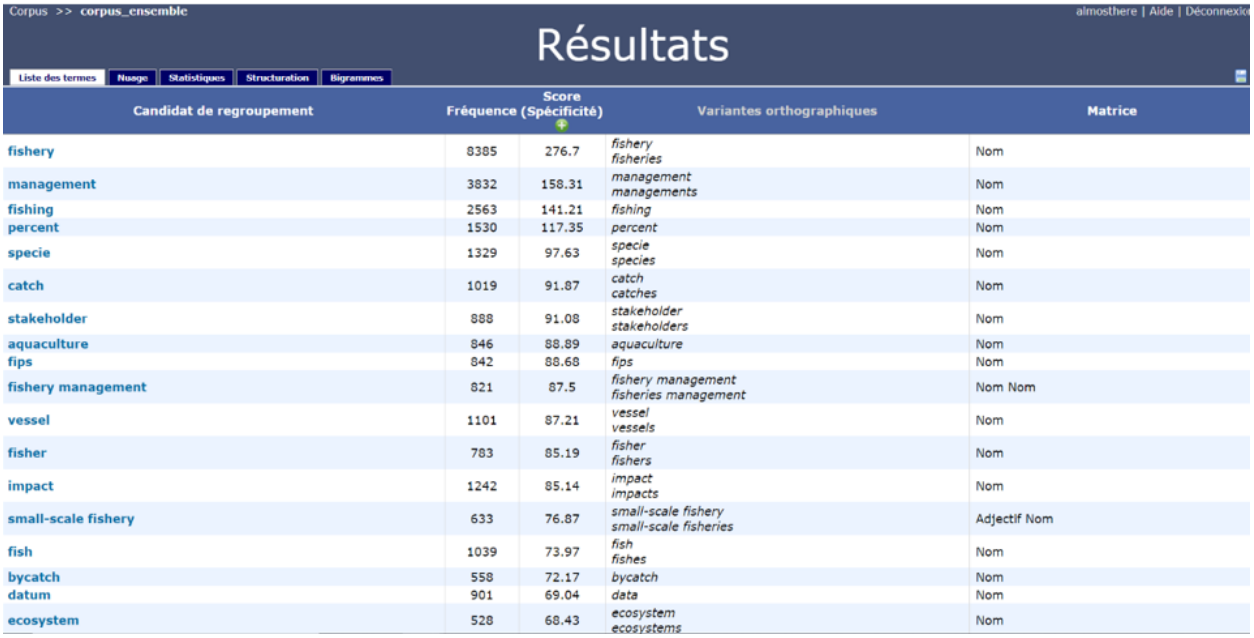
To obtain the list of term candidates from our corpus, we submitted all the texts in a single file to TermoStat 3.0, selecting *English* in the language options. We chose single-word terms and multi-word terms in the extraction menu. As for single-word terms, it is possible to choose the parts of speech of candidate terms. We decided to focus on nouns because most of the entries in the specialized dictionaries selected for this research belong to this category.

## 2.4. Selecting the first sample of terms

Our aim when processing term candidates was to obtain a sample of representative terms and compare their use in the corpus with their definitions in dictionaries. Therefore, we needed a list of terms present in the corpus and the chosen dictionaries. We then decided to establish the first sample of 200 term candidates in the order in which they appear in the list automatically generated by TermoStat, which is in order of specificity and some candidate terms on this list were filtered out in later stages of the research.

The specificity score differentiates the term candidates that are specific to the corpus of analysis. This is done by comparing the behavior of the candidate terms found in the corpus of analysis to their behavior in a reference corpus (Drouin, 2010). In this section, we explain how we established our first 200-lexical-unit list for the analysis. The complete list is reproduced in Appendix 2.

Figure 7 shows a screenshot of the first term candidates proposed by TermoStat, sorted by specificity score. The columns from left to right show: 1. the term candidates, 2. their frequency in the corpus, 3. the specificity score, 4. the orthographic variants, and, finally, 5. the part of speech or structure for each candidate.


Corpus >> corpus_ensemble

almosthere | Aide | Déconnexio

Résultats

Liste des termes | Nuage | Statistiques | Structuration | Bigrammes

| Candidat de regroupement | Fréquence | Score (Spécificité) | Variantes orthographiques | Matrice |
|---|---|---|---|---|
| fishery | 8385 | 276.7 | fishery<br>fisheries | Nom |
| management | 3832 | 158.31 | management<br>managements | Nom |
| fishing | 2563 | 141.21 | fishing | Nom |
| percent | 1530 | 117.35 | percent | Nom |
| specie | 1329 | 97.63 | specie<br>species | Nom |
| catch | 1019 | 91.87 | catch<br>catches | Nom |
| stakeholder | 888 | 91.08 | stakeholder<br>stakeholders | Nom |
| aquaculture | 846 | 88.89 | aquaculture | Nom |
| fips | 842 | 88.68 | fips | Nom |
| fishery management | 821 | 87.5 | fishery management<br>fisheries management | Nom Nom |
| vessel | 1101 | 87.21 | vessel<br>vessels | Nom |
| fisher | 783 | 85.19 | fisher<br>fishers | Nom |
| impact | 1242 | 85.14 | impact<br>impacts | Nom |
| small-scale fishery | 633 | 76.87 | small-scale fishery<br>small-scale fisheries | Adjectif Nom |
| fish | 1039 | 73.97 | fish<br>fishes | Nom |
| bycatch | 558 | 72.17 | bycatch | Nom |
| datum | 901 | 69.04 | data | Nom |
| ecosystem | 528 | 68.43 | ecosystem<br>ecosystems | Nom |

Figure 7.- Screenshot of the first term candidates proposed by TermoStat

### 2.4.1. Eliminating errors from the list of candidate terms

The first step was to eliminate errors from the TermoStat list of results. We retrieved units that do not constitute lexical units (LUs) in English. We found very few errors of this type when we looked at the first 200 elements of the list. Thus, errors such as *nei, sh* and *n*, were removed from the analysis at this stage.

### 2.4.2. The transdisciplinary scientific lexicon units

A second step was to eliminate non-term candidates. We started with the *transdisciplinary scientific lexicon* (*TSL*; Drouin, 2007). Following Drouin (2007), these units coexist with terms in scientific discourse and are common to many different disciplines. As opposed to terminology, TSLs do not only occur in scientific texts, but also in general language (p. 45). The LUs *theory*,

*hypothesis,* and *postulate,* for example, belong to this category and express scientific knowledge even though they are not usually considered specialized lexicon.

LexiTrans (Observatoire de linguistique Sens-Text [OLST], 2012) is a database designed and compiled at the Observatoire de linguistique Sens-Texte. The database lists and describes the TSL units and is accessible to the general public. From the 200-term candidates provided by TermoStat, we eliminated the units that are listed as TSL because they are not considered to be terms.

For the polysemous term candidates of our list, we verified their sense of use in the corpus and in their description in LexiTrans. If units were listed as TSL in the same sense as in the corpus, we eliminated the term candidate because that was an indication of non-term status for those units. Conversely, when the sense of the term candidate in the corpus differed from the one described in LexiTrans, we could not eliminate the term candidate from our list because the one described as a TSL is a different lexical unit.

As we removed *TSL* units, we took new *LUs* from the TermoStat list to compensate for the units removed, until completing 200 items. The list of *TSL* units that we found and removed from the list of candidates provided by TermoStat is presented in Table 11.

Table 11.- List of transdisciplinary scientific lexicon units removed from the list of candidates

| **List of transdisciplinary scientific lexicon units excluded from the sample** | | | | | |
|---|---|---|---|---|---|
| percent | implementation | level | conflict | area | scale |
| species | indicator | event | framework | analyses | progress |
| impact | regulation | activity | tool | type | trend |
| datum | process | information | program | status | dynamics |
| production | objective | region/subregion | category | condition | risk |
| measure | restriction | strategy | approach | variable | |

After excluding errors and the transdisciplinary lexicon from the list of candidate terms, the next stage was to analyze the presence of the units in the dictionaries.

## 2.5. The dictionaries

In this section, we present the dictionaries chosen with a view to comparing definitions with the way experts refer to terms in the texts.

Among the criteria for selecting a dictionary for our study we considered: first, that they should be dictionaries specialized in fisheries, and second, they should be produced by a recognized institution in the field. Although we work with texts dealing with fisheries sustainability, the terms belonging to this subdomain are mostly defined in specialized dictionaries of the broader domain of fisheries. This explains our selection of three dictionaries of the broader domain.

All the dictionaries selected for this study were written by institutions that possess a technical fisheries unit: The Food and Agriculture Organization (FAO), the National Oceanic and Atmospheric Administration of the United States (NOAA), and the US Office of Marine Sanctuaries (NMS), which also belongs to NOAA. We list the dictionaries' references in Table 13. Text in bold indicates how we named each dictionary in our analysis.

Table 12.- Dictionaries selected for the study

| |
|---|
| **VOICES**<br>National Marine Sanctuaries (n.d.). *Fisheries Glossary Voices of the Bay*. National Oceanic and Atmospheric Administration.<br>https://sanctuaries.noaa.gov/education/voicesofthebay/glossary.html# |
| **NOAA**<br>National Oceanographic and Atmospheric Administration (2006). *NOAA Fisheries Glossary*<br>https://repository.library.noaa.gov/view/noaa/12856 |
| **FAO**<br>Food and Agriculture Organization of the United Nations. (n.d.). *FAO Fisheries Glossary*.<br>http://www.fao.org/faoterm/en/?defaultCollId=21. |

We decided to work with three dictionaries instead of one because it allows us to have a representative sample of definitions. However, we will see in the analysis of definitions that in various cases, the definitions of these are identical or similar in two or more dictionaries.

### 2.5.1. Term candidates defined in the dictionaries: the analysis

We checked if term candidates of our 200-sample were recorded in each of the three dictionaries (see Appendix 2). Through this step, we identified how many of them are present in one, two, or the three dictionaries of the study. The results of this analysis are shown in section 2.5.2.

When identifying the term candidates recorded in each dictionary, we did not consider polysemy. This was done at a later stage. However, formal resemblance was taken into consideration; therefore, if simple terms also appeared as parts of complex terms in the TermoStat list, we treated them as different terms although one part had already been included in the analysis. For example, we included *effort* and *fishing effort* in the 200-term sample, treating them as two different terms.

### 2.5.2. Candidates defined in the dictionaries: the results

From this stage onwards, we considered term candidates to be terms because they are defined in specialized dictionaries. The results of this analysis are shown in Table 13 and Table 14. Table 13 shows how many terms are defined and not defined in each dictionary and the percentage of the sample covered and not covered by each dictionary. Table 14 shows the number of terms defined in one, two, three, or none of the dictionaries. Additionally, Figure 8 illustrates the percentages over the total analyzed sample.

Table 13.- Coverage of terms in each dictionary selected for the study

| **Resource** | Number of terms defined in each dictionary | The percentage covered over 200 terms | Number of terms not defined in each dictionary | Percentage of terms not covered over 200 terms |
|---|---|---|---|---|
| Voices glossary | 33 | 16.5% | 167 | 83.5% |
| NOAA fisheries glossary | 61 | 30.5% | 139 | 69.5% |
| FAO fisheries terminology | 65 | 32.5% | 135 | 67.5% |

Table 14.- Number of terms defined in one, two, three or none of the dictionaries

| Number of dictionaries | Number of terms/terms candidates |
|---|---|
| Number of candidates not defined in any of the dictionaries | 119 |
| Terms defined in only one of the dictionaries | 25 |
| Terms defined in only two of the dictionaries | 33 |
| Terms defined in the three dictionaries | 23 |

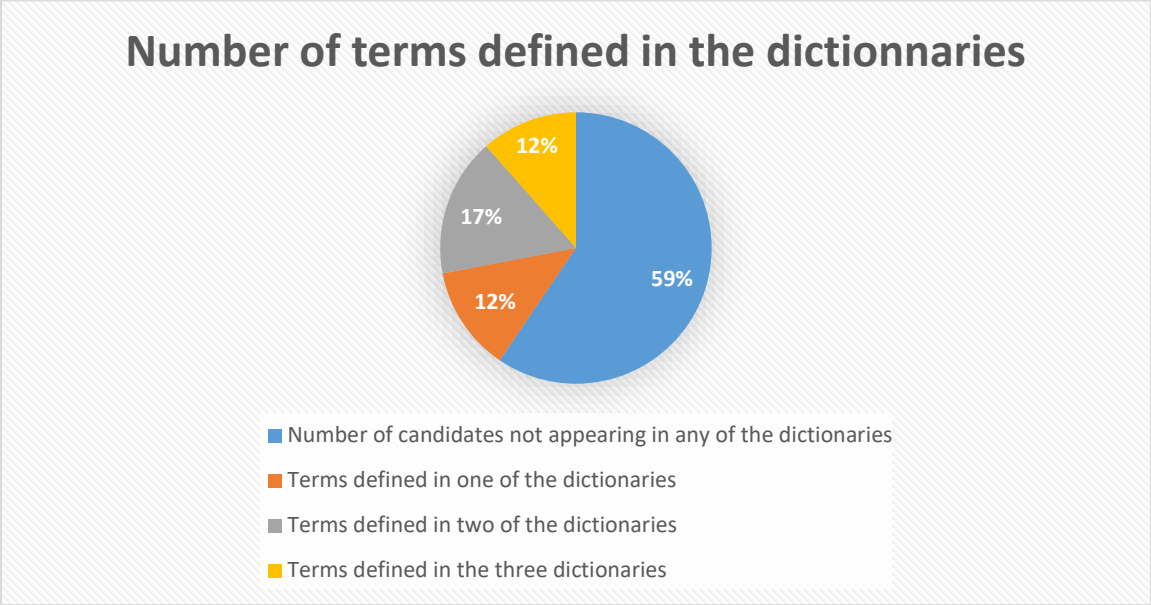



Figure 8.- Presence of terms in dictionaries

According to the results of this preliminary analysis, the number of terms contained in the corpus and extracted by TermoStat that are recorded in the dictionaries is very low: from the 200-term sample, only 41% of terms are defined in at least one dictionary, 17% are defined in two, and only 12% are defined in the three dictionaries. This may confirm what was mentioned in Section 2.1 of this chapter, that dictionaries do not include the new terms currently used in the domain.

## 2.6. Term selection

Pursuing our aim to compare the relations present in the dictionaries to those present in the corpus, we focused on a sample of terms present in at least two dictionaries and in the corpus. Following these criteria, the second sample was selected from the first sample defined in 2.4 and

includes 56 terms belonging to the subdomain of sustainable fisheries e.g., *FIP*, *sustainability*, *bycatch*, *management* (see Appendix 3).

According to Sager (1990), terms can be divided into concept categories: (a) *entities* which refer to material or abstract objects, (b) *activities*, or actions performed by entities, (c) *qualities* that differentiate *entities* from other *entities*, and (d) *relations* which are established between *entities*.

After classifying the terms of the sample under Sager's conceptual categories, we obtained the results presented in Table 15. The terms that comply with the selection criteria are highlighted in green.

Table 15.- Sample of terms classified in conceptual categories

| Terms Sorted by specificity | Categories | | | |
|---|---|---|---|---|
| | Entities | Activities | Qualities | Relations |
| *fishery* | x | x | | |
| *management* | | x | | |
| *fishing* | | x | | |
| *catch* | x | x | | |
| *stakeholder* | x | | | |
| *aquaculture* | | x | | |
| *fisher* | x | | | |
| *Fish* | x | | | |
| *bycatch* | x | x | | |
| *ecosystem* | x | | | |
| *monitoring* | | x | | |
| *landings* | x | | | |
| *stock* | x | | | |
| *sustainability* | | | x | |
| *recreational fishery* | x | x | | |
| *capacity* | | | | x |
| *governance* | x | x | | |
| *habitat* | x | | | |
| *effort* | | | | x |
| *fishing effort* | | | | x |
| *harvest* | x | x | | |

| Terms Sorted by specificity | Categories | | | |
|---|---|---|---|---|
| | Entities | Activities | Qualities | Relations |
| *quota* | | | | x |
| *assessment* | | x | | |
| *biomass* | | | | x |
| *fishing community* | x | | | |
| *overfishing* | | x | | |
| *mariculture* | | x | | |
| *longline* | x | x | | |
| *fishing capacity* | | | | x |
| *mortality* | | | | x |
| *trawl* | x | | | |
| *reef* | x | | | |
| *yield* | | | | x |
| *observer* | x | | | |
| *fishery resource* | x | | | |
| *license* | x | | | |
| *stock assessment* | | x | | |
| *finfish* | x | | | |
| *protected area* | x | | | |
| *community* | x | | | |
| *abundance* | | | | x |
| *food security* | | | x | |
| *fishmeal* | x | | | |
| *management objective* | x | | | |
| *user* | x | | | |
| *fishing gear* | x | | | |
| *reference point* | | | | x |
| *overcapacity* | | | | x |
| *high seas* | x | | | |
| *artisanal fishery* | x | x | | |
| *resilience* | | | x | |
| *discard* | x | | | |
| *dredge* | x | | | |
| *population* | x | | | |
| *limited entry* | | | x | |
| *marine protected area* | x | | | |

As shown in Table 15, some of the terms belong to more than one conceptual category. This fact is due to their polysemous nature. For these cases, we analyzed each sense of the polysemous term as a separate term and selected only those senses that were expressed in the corpus and defined in at least two dictionaries.

The term *bycatch* exemplifies how we treated polysemy. We assigned numbers to each meaning: *bycatch 1*: entity; *bycatch 2*: activity. As each sense corresponds to a different *LU*, we analyzed them separately. We noticed that *bycatch 2*: activity is only defined in one dictionary; therefore, we did not include that sense of the term in the analysis. Likewise, we labeled *longline 1*: entity, *longline 2*: activity. Again, we did not analyze *longline* 2 because it is only defined in one dictionary. The only polysemous term that was kept as an entity and activity is *fishery* because both senses met the selection criteria to be part of our final list. This term is referred to as *fishery (E)* for *entity*, and *fishery (A)* for *activity*.

From the list of terms in Table 15, we decided that our final working list for the analysis would include only simple terms denoting entities and activities because most of the terms in our sample met those criteria. Furthermore, relevant relations depend on term categories. Therefore, the relevant relations to describe a term of the same category are likely to share some similarities.

## 2.7. Analysis of conceptual relations

We carried out the analysis of relations without a previously determined list. Instead, we discovered the relations as we progressed in the analysis and refined the list of relations based on what we found in our data. In Table 16, we provide a first overview of the list of relations found in our study.

As for the analysis of relations, section 2.7.1 describes the analysis of relations in definitions, section 2.7.2 details the analysis of relations in the corpus and finally, section 2.7.3 summarizes the steps followed in compiling the list of relations found in both sources.

Table 16.- List of relations found in the dictionaries and the corpus

| Relation name | Realization | Direction |
|---|---|---|
| generic <-> specific | *fish(E) < is a > lower vertebrate* | ← |
| agent <-> patient | *fishery(E) < is managed by > authority* | ← |
| patient <-> activity | *aquaculture (A) < affects > rearing process* | ← |
| agent <-> activity | *management(A) < is led by > agency* | ← |
| part <-> whole | *fish(E) < is comprised of > fins* | ← |
| entity <-> place | *landings(E) < are placed at > site* | → |
| entity <-> method | *fishery(E) < follows the stages of > method* | → |
| entity <-> instrument | *longline(E) < is used by > fishery (E)* | ← |
| entity <-> purpose | *fisher(E) < has the purpose of > recreational* | → |
| entity <-> characteristic | *fish(E) < has a specific temperature > cold-blooded* | → |
| activity <-> result | *fishing(A) < results in > catching* | → |
| entity <-> indicator | *catch(E) < is quantified through > total* | → |
| entity <-> time | *bycatch(E) < is caught in a period of > annual* | → |
| cause <-> effect | *overfishing(A) < is caused by > fishing effort* | ← |
| entity <-> environment | *ecosystem(E) < has as environment > marine* | → |
| activity <-> characteristic | *assessment(A) < is done in a specific mode > comparative* | → |
| *activity <-> purpose* | *fishing(A) < has the purpose of > commercial* | → |
| activity <-> time | *overfishing(A) < lasts for a period of > season* | → |
| activity <-> instrument | *management(A) < requires the use of > plan* | → |
| activity <-> place | *aquaculture(A) < takes place in > coastal* | → |
| activity <-> indicator | *mariculture(A) < is quantified through > production* | → |
| activity <-> environment | aquaculture(A) < has as environment > freshwater | → |
| activity <-> destination | assessment(A) < is done for > policymaker | → |
| activity <-> reference | overfishing(A) < is referenced through > list | → |

The column of realizations in Table 16 includes examples found in the dictionaries or in the corpus where the relations are expressed. Each realization starts naming the term analyzed with an indication of the conceptual category to which it belongs: *(E)* for entities and *(A)* for activities. Then, a paraphrase expressing the relation and the related lexical unit is given.

The arrows in the third column indicate the direction of the relation. If the arrow indicates the direction from left to right, the elements of the relation's name are placed in the same order as in the paraphrase. For instance, for the relation activity <-> indicator, the arrow → indicates that the order of the elements is the same in the name and the realization. Thus, in the realization *mariculture(A) < is quantified through > production*, *mariculture* is the activity and *production* is the indicator.

Likewise, in the relation cause <-> effect, in *overfishing(A) < is caused by > fishing effort,* the direction ← indicates that the elements of the name are placed in the opposite direction as in the paraphrase. This means that the effect is what appears on the left of the paraphrase and the cause appears on the right side. Therefore, *overfishing* is the effect and *fishing effort* is the cause.

### 2.7.1. Analysis of conceptual relations in definitions

This section and the next subsections specify how we carried out the analysis of relations found in definitions, which elements we excluded, and how we identified a correspondence between the relations found and the related terms.

#### 2.7.1.1. Excluding unnecessary elements

In the dictionary analysis, we considered all the conceptual relations that directly concerned the analyzed term. The definition by FAO of 'longline' illustrates how relations were identified in the definitions.

***Longline:*** *a fishing gear in which short lines carrying hooks are attached to a longer main line at regular intervals. Longlines are laid on the bottom or suspended horizontally at a predetermined depth with the help of surface floats. The main lines* can be as long as 150 km and have several thousand hooks (e.g., in tuna fisheries).

We did not consider relations that do not directly concern the concept being described, but another concept to which it is related. Thus, in the example of *longline,* the sentence in grey was excluded because it refers to only one part of a 'longline' - the 'main lines' - and not ´longline´ as a whole entity.

Other elements not considered in the analysis are phrases that do not represent a relation but are part of the definition. That is the case of metalinguistic phrases such as *a common term to define…* found in the following definition:

**Finfish:** *A common term to define fish as separate from shellfish.* (VOICES)

#### 2.7.1.2. Correspondence between relations and related concepts

To describe the relations found in definitions, we first identified all the lexical units (LUs) related to the analyzed term by reading the definition and highlighting those lexical units that are directly related to the term. Second, we created a paraphrase that expresses the relation between the reference concept and each related concept identified in the first step. Third, we classified each paraphrase under the name of the relation it expresses.

Table 17 contains all the relations found in the definition of *fish* by FAO. After the definition line, the first column on the left contains the paraphrase expressing the relation between the term *fish* and the related LUs. The second column from left to right contains the related LUs for each paraphrase, the third column shows the relation that corresponds to the paraphrase, and the last column states the direction in which the elements of the relation's name should be understood in the paraphrase.

For the analysis of definitions, we created a specific template which differs from the one we used for the analysis of corpus results. Table 17 reproduces the part of the template corresponding to the definitions of *fish* by FAO. To underline the correspondence between relations and related concepts, we used colors in this example. The complete analysis is presented in Appendix 4 containing the information from the dictionaries and the corpus for each term analyzed in the study.

Table 17.- Definition of fish by FAO

| Literally, a cold-blooded lower vertebrate that has fins, gills and scales (usually), and lives in water. Used as a collective term it includes fish, mollusks, crustaceans and any aquatic animal which is harvested. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| < is a type of > | lower vertebrate | generic <-> specific | ← |
| < has a specific temperature > | cold-blooded | entity <-> characteristic | → |
| < is comprised of > | fins, gills, scales | part <-> whole | ← |
| < has as environment > | water | entity <-> environment | → |
| < is the generic of > | mollusks, crustacean, aquatic animals | generic <-> specific | → |
| < undergoes > | harvest | patient <-> activity | → |

It is worth noticing that different paraphrases can express the same relation. For example, the paraphrases *is a type of* and *is the generic of* express the relation generic <-> specific. However, the direction is different in *specific < is a type of > generic* and *generic < is the generic of > specific.*

As seen in 2.7., the direction of a relation is represented in our analysis with an arrow. In the example, *fish < is the generic of > mollusks,* the relation generic <-> specific should be interpreted in the direction from left to right (→) because 'fish' is generic and 'mollusks' is specific. In the case of *fish <is comprised of > fins*, the relation part <-> whole should be interpreted from right to left (←), where 'fish' is the whole and 'fins' is the part.

Finally, the same paraphrase may link the term with more than one related concept as *fish < is comprised of > fins, gills, scales*. In these cases, all related terms were labeled under the same relation, as shown in Table 17.

### 2.7.2. Analysis of conceptual relations in the corpus

In this analysis, we followed a similar process as in the study of definitions, using paraphrases to identify and validate how the analyzed term relates to other LUs and then classifying all paraphrases and related LUs under the name of each relation.

In contrast with definitions, identifying relevant related LUs in the corpus requires a previous extraction of the contexts containing those LUs. To achieve that, we used Sketch Engine (Kilgarriff et al., 2014), a corpus building and management tool that includes different functions to extract different kinds of information about terms and other LUs identified in the corpus.

Among these functions, Sketch Engine includes the word sketch, which is "a one-page summary of a word's grammatical and collocational behavior" (Kilgarriff et al., 2014, p. 9). The word sketch shows all the recurring patterns which relate to the term being analyzed. The information obtained though these patterns includes idioms, set phrases, meanings, and phrasal verbs, among others (Kilgarriff et al., 2014, pp. 9-10). The results of a search in the word sketches are organized in columns according to the grammatical functions of the related patterns. Modifiers and verbs with the term as object are examples of word sketches of this type.

Word sketches are available for use with any corpus in English that the user uploads to Sketch Engine. We used this function to extract relevant contexts and LUs related to each term of the sample. After identifying the related LUs, we analyzed the conceptual relations that linked the terms to those related LUs, following the same steps as in the analysis of definitions.

In addition to the conventional sketch grammar in word sketch, we used the Ecolexicon Semantic Sketch Grammar (León Araúz & San Martín, 2018), a particular version designed to extract *knowledge-rich contexts*, which are contexts containing domain-specific information useful for conceptual analysis (Meyer, 2001). This extraction is done using knowledge patterns, which include linguistic and paralinguistic information regarding a specific semantic relation in a text.

Semantic word sketches extract semantically related LUs directly from the text by identifying knowledge patterns. The conventional word sketches extract linguistic relations by identifying syntactical and collocational patterns associated with the analyzed term. From those linguistic patterns, terminologists can identify the LUs that are semantically related to the analyzed term.

In this study we took all the units exactly as they appeared in the corpus without changing their grammatical category. Then, we built paraphrases that led us to identify conceptual relations from the corpus that may be relevant for definitions.

Figures 9 and 10 show the first results of conventional and semantic word sketches for the term *catch*.

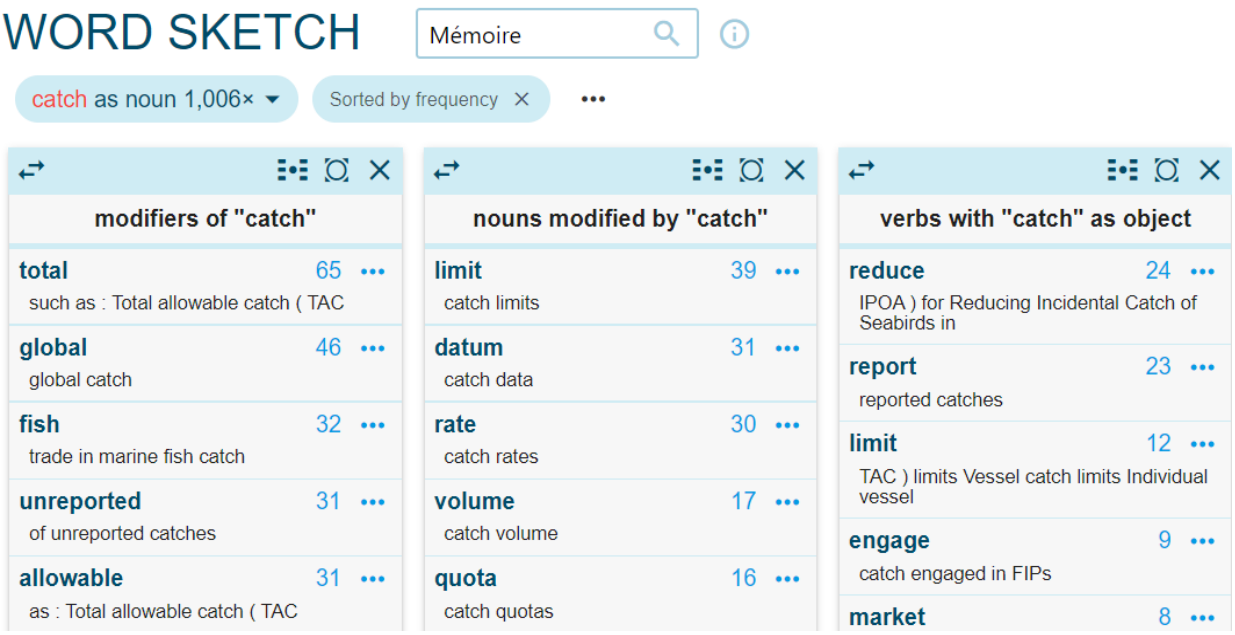



Figure 9.- Results of three conventional word sketches for the term *catch*

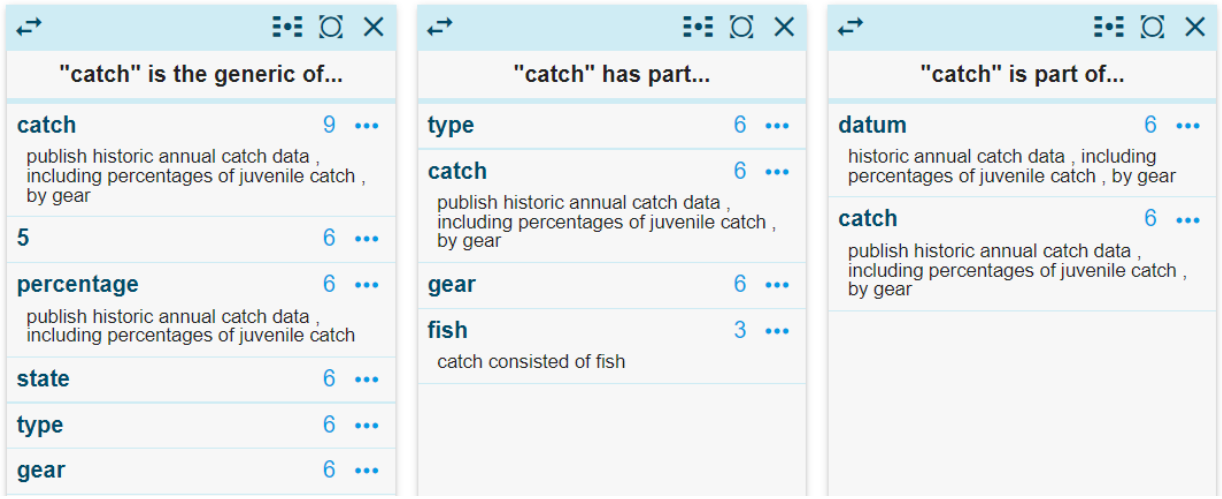



Figure 10.- Results three semantic word sketches for the term *catch*

The head of each column shows the name used by Sketch Engine to label the relation. In the word sketch screen, each line in blue shows the related LUs, and each line in black, when there is one, shows that corresponding LU in context. Table 18 shows the conventional and semantic word sketches found in the Sketch Engine results for our corpus.

Table 18.- Word sketch columns found in the corpus results

| **Conventional word sketch** | **EcoLexicon Semantic Sketch Grammar (ESSG)** |
|---|---|
| Modifiers of X | X is a type of |
| Nouns modified by X | X is the generic of |
| Verbs with X as object | X is the function of |
| Verbs with X as subject | X has function |
| X and/or … | X is located at |
| X is a | X is location of |
| … is a X | X is part of |
| Possessors of X | X has part |
| X's | X is the cause of |
| | X is caused by |

2.7.2.1. Word sketches providing most useful results

Among the word sketch columns, we identified the following columns as the most useful to extract the most relevant relations that can be used to define a term:

- *Modifiers of X*: various relations were found within this word sketch as the modifiers can hold a broader range of relations with the analyzed terms. For example, in the analysis of *fishery* (E), we found the related LU *small-scale* as in *small-scale fishery*. The paraphrase assigned is *fishery < has a specific size > small-scale* and the corresponding relation is entity <-> characteristic (→) where *fishery* is the entity and *small-scale* is the characteristic. Another relation often found in this column is patient <-> activity (→). As mentioned in Section 2.7.2., we used concepts in the same grammatical category as we found them in the corpus. For this reason, the activity in this relation could be a verb or a noun. For instance, we found the modifier *observed* in *observed bycatch*. The paraphrase assigned is *bycatch < undergoes > observe*, where *bycatch* is the patient and verb *observe*, the activity.
- *Nouns modified by X*: this column lists nouns often modified by the analyzed term, sometimes to form complex terms. The semantic relations between the analyzed term and the noun it modifies are also diverse. For example, in the analysis of *longline*, we found the term *longline fishery* paraphrased as *longline < is used by > fishery*. The corresponding relation is entity <-> instrument (←). In the same column, we found the relation between the terms l*ongline* and

*gear* as in *longline gear.* The paraphrase used is *longline < is a type of > gear* and it corresponds to the relation generic <-> specific (←), where longline is the specific and gear is the generic.

- *Verbs with X as object*: this word sketch informs us about the activities related to the terms often through the relation patient <-> activity, where the patient is the term and the activity is a verb or a noun denoting an activity. The elements in this column represent the actions or activities that the concept usually undergoes in the domain. For instance, in the analysis of *bycatch* we found *reduce bycatch*, *mitigate bycatch*, *minimize bycatch*. This relation is paraphrased as *bycatch < undergoes > reduce, minimize, address.* The relation between bycatch and the related LUs is patient <-> activity (→) where *bycatch* is the patient and the LUs *reduce*, *minimize* and *address* are the activities that *bycatch* usually undergoes in the domain of sustainable fisheries.
- *Verbs with X as subject*: through this word sketch, we can learn the activity associated with the analyzed term as a subject. For example, in the most frequent results for *fisher* (E) corresponding to this word sketch, we found the related LUs *operate* and *comply*. We assigned the paraphrase *fisher < is the actor of > operate, comply* understood as actions performed by *fisher* in the domain. The relation in this case is agent <-> activity (→) where *fisher* is the agent and *operate* and *comply* are the activities. In this column we have also found the relation patient <-> activity (→), where the analyzed term is the patient, and it is also the subject of the verbs. For example, for the term *catch*, we found the related units *increase* and *enter*. In this case, the paraphrase assigned was *catch < undergoes > increase*, *enter*. The relation corresponding to this paraphrase is patient <-> activity (→), where *catch* is the patient and subject of the verbs *increase* and *enter,* and those verbs are the activities.
- *X is a type of* (semantic word sketch): this column lists potential hypernyms of terms. For instance, in the analysis of the term *fisher*, this word sketch provided the related LU *stakeholder* in the concordance "fishers and other stakeholders*".* The relation generic <-> specific has been identified through the paraphrase *fisher < is a type of > stakeholder*, with the direction right to left (←), where *fisher* is the specific and *stakeholder* is the generic LU.
- X is the generic of (semantic word sketch): here we obtain potential hyponyms of the term being analyzed. In the analysis of *fish,* we found the related LU *tuna* in the concordance

"nearshore pelagic fish such as tuna and fish". The paraphrase used is *fish (E) < is the generic of > tuna* which corresponds to the relation generic <-> specific. As opposed to the word sketch *is a type of,* the direction in this case goes from left to right (→), therefore *fish* is the generic and *tuna* is the specific.

2.7.2.2. Columns excluded from the analysis

In the corpus analysis, we did not consider columns where contexts did not include concepts directly related to the analyzed term or the relation was considered not useful for our study.

- *Prepositional Phrases*: This column lists prepositions used before or after the analyzed term. Although the column provides access to LUs that are linked to the analyzed term through the prepositions, there is no useful conceptual relation between the analyzed term and the prepositions themselves. Because this methodology looks to identify the LUs that are directly linked to the analyzed terms, we ignored this part of the word sketch. The following example illustrates that there is no relation between *of* and *aquaculture*:

  *Many policymakers promote the expansion **of aquaculture** for improving the economies of developing countries, including the creation of employment opportunities. (doc 03)*

- *Adjective predicates:* we did not find any useful relation in this column for most of the terms analyzed. For almost half the sample, the column does not appear in the Sketch Engine results (e.g., *management*, *fishing*, *bycatch*, *monitoring*, etc.). For other terms, we only found grammatical words such as *such* or *other.* There are a few terms where we found the phrases: *available assessment*, *open fishery*, *weak landings*. However, we had already found the same relations in the *modifiers* column.

  For the term *habitat*, this column provided the following example in which there is no relation between the analyzed term and the word *such*:

  *Mussels are commonly found along rocky shores, and soft bottom **habitats such** as mud/sand environs. (doc 10)*

- *X and/or:* This word sketch includes LUs related to the terms in many different ways such as the terms' cohyponyms, synonyms, antonyms among many other relations. Despite that, we

have excluded this column because when we looked at the result lists, we realized that these conjunctions and/or the comas could link pairs of concepts that could hold many different relations or no semantic relation with the term. In a column where relations vary to a great extent, it is not possible to establish patterns and frequencies, because relations change all the time. For instance, in the analysis of *fisher*, we found *fisher and community*, *fisher and vessel*, *fisher and fishworker*, *fisher and farmer.* We observe that *fisher* relates to the lexical units in different ways (part-whole, cohyponyms, instrument).

2.7.2.3. Parts of columns excluded from the results

We excluded the following elements from each column of word sketch results:

- Errors: when there was no relation between the term and the LUs appearing among the results. One candidate given by the word sketch *modifiers of X,* in the corpus analysis of *bycatch* was *fishing*.

  We checked the concordance, and we found the following sentence:

  *"*The MSRA and SCA added specific authorities and responsibilities to assist in reducing or eliminating IUU **fishing, bycatch** of PLMRs and certain shark fishing practices*"*. (doc 16)

  We realized that *fishing* does not modify *bycatch* in the sentence since there is a coma between the two terms. Therefore, this result was considered an error and not a relation for analysis.

- From the word sketch *Verbs with X as subject* and *Verbs with X as object*, we excluded verbs that are too general to express a conceptual relation with the analyzed terms: *bycatch is considered to be*, *deep-sea fishes have*, *to ask fishers*, *to consider fishers*.
- Expressions where the analyzed term is not the head of the noun phrase: for example, in the corpus results for *longline*, the expression "longline vessels may or are known to **interact** with sea turtles", we have not considered *interact* as a verb related to *longline* because it refers to *longline vessels*, not to *longline*.

#### 2.7.2.4. Selection of lexical units from the corpus

This section describes the methodological criteria for selecting the LUs related to each term from the word sketch results once the elements mentioned in the previous section were removed. The aim of this step was to identify the LUs most frequently mentioned by experts when they refer to each term analyzed. Therefore, we selected the most frequent LUs from all elements associated with each term in the corpus results.

Each line in the word sketch columns contains an LU related to the analyzed term. For each word sketch column selected for the analysis according to section 2.7.2.1., we selected a maximum number of three relations in order of frequency in the corpus results. Besides that, for each relation selected, we retained for the analysis a maximum number of three LUs related to the term analyzed. In this selection, validation was constantly needed since some word sketches (conventional or semantic) may not provide useful results or may contain errors.

To select a sample from corpus results, first we sorted the elements in each column by order of frequency. Then, we identified the most frequent related LU in each column and determined what paraphrase expresses the relation it holds with the term analyzed. The next step was to identify the relation that corresponded to the paraphrase according to the procedure in section 2.7.1.2. For the term *fishery (E)*, Figure 11 shows the results obtained in the column *modifiers,* which is usually the first column of results in the conventional word sketch. We took the most frequent related LU *small-scale* and identified its relation with *fishery* using the paraphrase *fishery < has a specific size > small-scale*. The relation held is entity <-> characteristic in the direction left to right (→).


Figure 11.- Results of the column *modifiers of fishery*(E)

The next step in the process was to search for other LUs holding the same relation with the analyzed term in the same column until completing a maximum of three. As we discovered the elements, we placed them in a template that we created specifically for the analysis of the corpus results. In the example of *fishery* in Figure 11, we looked for other LUs in the same column linked to *fishery* through the relation entity <-> characteristics. The LUs identified were *major* and *industrial,* therefore, we placed them in the template as shown in Table 19. We labeled the concept "industrial" under the paraphrase *fishery < has a specific size > industrial* because in the fisheries domain, what determines the label "industrial" is the size of operations of a fishery.

Table 19.- Results of the *modifiers* word sketch for *fishery* (first relation)

**Fishery (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific size | small-scale (637) | entity <-> characteristic | → | modifiers of X |
| | major (476) | | | |
| | industrial (103) | | | |
| **Realization**<br>fishery < has a specific size > small-scale, major, industrial | | | | |
| **Concordance**<br>Small-scale **fisheries** are mostly defined by smaller sizes of vessels and tonnage capacity and minimal level of mechanization. (doc. 5) | | | | |

We repeated the same procedure in all the selected columns. When we found no valid relations in a column, we did not include that column in the sample. As a result of this procedure, we completed the three LUs linked to *fishery* through the relation entity <-> characteristic: *small-scale, major and industrial,* as seen in Table 19. We included an arrow showing the direction of the relation as we did in the analysis of definitions. In the corpus analysis template, we added the realization of the paraphrase and one concordance for each relation's name.

Once we obtained the three LUs for the relation entity <-> characteristic, we looked for the next relation in the *modifiers* column. To that end, we analyzed the next LU in order of frequency in Figure 11, in this case, *commercial*. We established that the paraphrase expressing the relation between *commercial* and *fishery* is *fishery < has the purpose of > commercial*. We identified the corresponding relation as entity <-> purpose and subsequently looked for other LUs related to *fishery* through the same relation, such as *recreational* (Figure 11). We placed the elements in the template as shown in Table 20. The detailed analysis of definitions and the corpus for each term is presented in Appendix 4.

Table 20.- Results of the *modifiers* word sketch for *fishery* (second and third relation)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has the purpose of | commercial (349)<br>recreational (309) | Entity <-> purpose | → | modifiers of X |
| **Realization**<br>fishery < has the purpose of > commercial, recreational | | | | |
| **Concordance**<br>The major commercial **fisheries** were much more likely to provide the sole source of income for their participants. (doc 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| operates in | inland (56)<br>coastal (44) | Entity <-> place | → | modifiers of X |
| **Realization**<br>fishery < operates in > inland, coastal | | | | |
| **Concordance**<br>El Niño conditions have the potential to shock inland **fisheries** production in the key countries supporting inland fisheries. (doc. 12) | | | | |

The next related LUs expressing a different relation are *inland,* and *coastal*, linked to *fishery* by the paraphrase *fishery < operates in > inland, coastal* which express the relation entity <-> place.

We followed the same steps when analyzing the related LUs in each column of the conventional and the semantic word sketches to select a valid sample of three relations per column. In Tables 19 and 20, each block represents a different relation. Each relation includes the most frequently related LUs from all the possible LUs provided by the corpus.

## 2.7.3. Compiling the final list of paraphrases and conceptual relations

This section describes the compilation of the list of relations held between the terms and other lexical units (LUs) in the corpus and the dictionaries.

As we carried out the analysis of corpus results and dictionary definitions, we compiled the final list of conceptual relations. This allowed us to refine our analysis since the task helped us to verify the coherence in the correspondence between terms, related terms, paraphrases, and relations.

The paraphrases in our study consist of linguistic expressions of the relations between the analyzed terms and the related LUs found in the corpus and the dictionaries. From a methodological standpoint, they were essential to validate relations identified in the text

surrounding the linguistic expressions that were linked through them. In addition to that, paraphrases contributed to simplifying the process of classifying and naming types of relations.

When revising our preliminary list of paraphrases, we encountered different paraphrases expressing the same relation in the analysis of different terms. Furthermore, in many cases, the same paraphrase appeared various times in the analysis of the same term or in different analyses. We thus proceeded to systematize the list of paraphrases and their corresponding relations.

To that end, we grouped paraphrases expressing similar relations under the same name of relation or family of relations. Thus, each paraphrase could be considered a subtype of relation within the same family. Likewise, we used the same paraphrase for concepts linked through similar relations. For example, in the analysis of *fisher,* we established the paraphrase *fisher (E) < is a > stakeholder*. However, in the group of paraphrases established for the relation generic <-> specific, we already had the paraphrase *is a type of*. Because both paraphrases express the same relation in the same direction (←, *specific < is a type of > generic*), we decided to use only one of them, in this case we chose *is a type of* for all the pairs expressing this subtype of relation. Thus, we kept *fisher < is a type of > stakeholder* instead of *fisher < is a > stakeholder*.

When there was a difference in the subtype of relation expressed by two different paraphrases, we kept both paraphrases and added them to the same relation's name because the subtype of relation between the concepts, or the direction was different. For example, the paraphrases *fishery (A) < affects > ETP species* and *fishery (A) < acts on > fish* do not express the same subtype of relation: the activity *fishery* acts directly on fish since its main goal is to harvest fish. The goal of the activity is not to fish *ETP species*, but it may affect the reproduction or the food of *ETP species*. As there is a difference between the subtypes of relations, we kept both paraphrases in the list corresponding to the relation patient <-> activity.

In the examples *landings < are obtained by > fishery (E)* and *fisher < obtains > profit*, we also needed to keep both paraphrases because the direction they express is different and we always start a paraphrase with the term being analyzed. The corresponding relation is agent <-> patient for both paraphrases. Nevertheless, the direction is right to left (←) for *landings < are obtained*

*by > fishery* (with *landings* as patient and *fishery* as agent), and it is left to right (→) in the case of *fisher < obtains > profit*, where *fisher* is the agent and *profit* is the patient.

As a result of the process presented in the section, we obtained a list of 24 relation types and their paraphrases. Table 21 shows some examples of paraphrases and their corresponding relations.

Table 21.- Examples of paraphrases used to compile the list of relation types

| Relation name | Paraphrases | Examples | Direction |
|---|---|---|---|
| part <-> whole | *is comprised of*<br>*consists of*<br>*is part of*<br>*has as part* | *fish (E) < is comprised of > fins*<br>*management (A) < consists of > influencing*<br>*fish (E) < is part of > stock*<br>*longline (E) < has as part > shortline* | ←<br>←<br>→<br>← |
| patient <-> activity | *undergoes*<br>*acts on*<br>*affects* | *catch (E) < undergoes > limit*<br>*fishery (A) < acts on > fish*<br>*aquaculture (A) < affects > rearing process* | →<br>←<br>← |
| agent <-> patient | *is affected by*<br>*is managed by*<br>*acts on*<br>*is obtained by* | *stakeholder < is affected by > institution*<br>*fishery (E) < is managed by > authority*<br>*fishery (E) < acts on > fish*<br>*landing (E) < is obtained by > fishery* | ←<br>←<br>→<br>← |
| entity <-> indicator | *is quantified through*<br>*is assessed through* | *catch (E) < is quantified through > total*<br>*stock (E) < is assessed through > status* | →<br>→ |
| activity <-> time | *occurs in a period of*<br>*is done in a specific moment* | *management (A) < occurs every period of > daily*<br>*assessment (A) < is done in a specific moment > preliminary* | →<br>→ |
| entity <-> characteristic | *has a specific size*<br>*has a specific resilience* | *fishery (E) < has a specific size > small-scale*<br>*ecosystem < has a specific resilience > vulnerable* | →<br>→ |
| activity <-> characteristic | *has a specific environmental status*<br>*is done in a specific mode* | *fishing < has a specific environmental status > sustainable*<br>*monitoring < is done in a specific mode > effective* | →<br>→ |

Attributes were classified under the relations entity <-> characteristic or activity <-> characteristic, with different paraphrases expressing the idea of "size," "environmental status," "mode," among others.

To name the relations, we were inspired by the labels in the literature (Sager, 1990; Sager & L'Homme, 1994, León Araúz et al., 2012). However, we provided a name where we did not find one in the literature. The complete list of paraphrases is presented in chapter 3.

# Chapter 3: Analysis and discussion of results

## 3.1. Data obtained after the analysis

### 3.1.1. The final working list of terms

In section 2.6. we classified the 56 terms present in at least two dictionaries and the corpus (Table 15) into the conceptual categories proposed by Sager (1990).

After applying the term selection criteria described in section 2.6. (selecting simple terms denoting entities or activities), we obtained a final working list which is reproduced in Table 22. In the process, we selected terms in the order in which they appeared in *TermoStat* sorted by specificity. The final working list[2] includes 8 terms denoting activities and 12 terms denoting entities. As explained in Section 2.6., we only included the sense of polysemous terms that appeared in the corpus and were defined in at least two dictionaries. Therefore, various polysemous LUs were eliminated at earlier stages from our sample. In Table 22, an *E* and an *A* indicate which of the two senses was selected for the polysemous terms that could designate an entity and an activity.

Table 22.- The final list of terms for the analysis of relations in corpus and dictionaries

| | | | | | | |
|---|---|---|---|---|---|---|
| Entities | fishery (E) | catch (E) | stakeholder | fisher | fish (E) | bycatch (E) |
| | ecosystem | landing (E) | stock (E) | habitat | harvest (E) | longline (E) |
| Activities | fishery (A) | management (A) | fishing | aquaculture | | |
| | monitoring | assessment (A) | overfishing | mariculture | | |

[2] After we carried out the analysis of terms in the dictionaries and the corpus, we noticed that we could have kept the term *governance,* which is ranked higher than the terms *habitat, harvest* and *longline*. However, we decided not to revise the list to include this term and we kept the terms already analyzed because there are still the most representative of our sample and we had other representative terms in the Activity group.

### 3.1.2. The final list of relations

This section presents the complete list of relations and paraphrases identified after analyzing relations in the dictionaries and the corpus.

Table 23 presents the relations identified during the analysis of relations. It includes 24 relation types, the realization of paraphrases for each relation type, the direction of elements in the paraphrase, and the word sketch columns or dictionaries where they were found. The first element appearing in the realization column is the term analyzed, the next element is the paraphrase surrounded by <> and finally the related LU is given.

Table 23.- Final list of relation types and paraphrases found in the study

| **Relation type** | **Realization of paraphrases** | **Direction** | **Word sketch/dictionary** |
|---|---|---|---|
| generic <-> specific | *fishery(E) < is a type of > unit* | ← | NOAA/FAO |
| | *fish (E) < is the generic of > mollusk* | → | FAO |
| agent <-> patient | *stakeholder < is affected by > institution* | ← | NOAA |
| | *fishery(E) < is managed by > authority* | ← | NOAA/FAO |
| | *fishery(E) < acts on > species* | → | NOAA/FAO/VOICES |
| | *landing (E) < is obtained by > fishery (E)* | ← | Modifiers of X |
| | *fisher < obtains > profit* | → | Nouns modified by x |
| patient <-> activity | *stakeholder < is affected by > activity* | → | FAO |
| | *aquaculture < affects > rearing process* | ← | NOAA |
| | *catch(E) < undergoes > limit* | → | Nouns modified by X |
| | *fishery (A) < acts on > fish* | ← | NOAA/FAO |
| agent <-> activity | *management (A) < is led by > agency* | ← | X caused by (semantic WS) |
| | *stakeholder < affects > activity* | → | FAO |
| | *fishery (E) < is an actor of > catch(A)* | → | Verbs with X as subject |
| | *fishery (A) < is done by > stakeholder* | ← | Nouns modified by X |
| | *stakeholder < takes part in > decision making* | → | Is part of (semantic WS) |
| part <-> whole | *fishery(E) < includes > raising* | ← | NOAA/FAO/VOICES |
| | *fish (E) < is comprised of > fins* | ← | FAO |
| | *fisher < is a member of > community* | → | Nouns modified by X |
| | *fisher < does not include > processors* | ← | FAO |
| | *management (A) < consists of > influencing* | ← | FAO |
| | *fish (E) < is part of > stock (E)* | → | Nouns modified by X |
| | *assessment (A) < involves > communication* | ← | FAO |
| | | ← | |

| | | | |
|---|---|---|---|
| | *longline (E) < has part > branch line* | → | VOICES |
| | *fishing < is excluded from > scientific research* | ← | NOAA/FAO/VOICES |
| | *catch (E) < is a group of > fish (E)* | | NOAA/FAO/VOICES |
| entity <-> place | *landing (E) < is placed at > site* | → | Nouns modified by X |
| | *catch (E) < comes from > global* | → | Modifiers of X |
| | *fishery (E) < operates in > inland* | → | Modifiers of X |
| | *catch (E) < is located at > area* | → | VOICES |
| entity <-> method | *fishery(E) < follows the stages of > method* | → | NOAA/FAO |
| entity <-> instrument | *longline (E) < is used by > fishery (E)* | ← | Nouns modified by X |
| | *fishery(E) < makes use of > boats* | → | NOAA/FAO |
| entity <-> purpose | *fisher < has the purpose of > recreational* | → | Modifiers of X |
| | *fish (E) < is used as > forage* | → | Modifiers of X |
| entity <-> characteristic | *fish (E) < has a specific temperature > cold-blooded* | → | FAO |
| | *fishery (E) < has a specific size > small-scale* | → | Modifiers of X |
| | *habitat < has a specific resilience > sensitive* | → | Modifiers of X |
| | *stakeholder < has a specific relevance > key* | → | Modifiers of X |
| | *longline (E) < has specific state > fixed* | → | Verbs with X as objects |
| | *stock (E) < has specific patterns > migration patterns* | → | NOAA |
| | *bycatch (E) < is caught in a specific mode > incidental* | → | NOAA |
| | *bycatch (E) < has a specific probability > estimated* | → | Modifiers of X |
| | *bycatch (E) < has a specific degree > high* | → | Modifiers of X |
| activity <-> result | *fishing < results in > catching* | → | NOAA/FAO/VOICES |
| | *catch (E) < is a result of > fishing* | ← | NOAA |
| entity <-> indicator | *catch (E) < is quantified through > weight* | → | NOAA/VOICES |
| | *ecosystem < is assessed through > health* | → | Nouns modified by X |
| entity <-> time | *bycatch (E) < is caught in a period of > annual* | → | Modifiers of X |
| cause <-> effect | *overfishing < is caused by > fishing effort* | ← | FAO |
| | *overfishing < is the cause of > decline* | → | X is the cause of |
| entity <-> environment | *ecosystem < has as environment > marine* | → | Modifiers of X |
| | *habitat < is the environment for > fish* | ← | NOAA |
| activity <-> characteristic | *assessment (A) < is done in a specific mode > comparative* | → | Modifiers of X |
| | *fishing < has a specific environmental status > sustainable* | → | Modifiers of X |
| | *fishing < has a specific legal status > IUU (illegal, unreported and unregulated fishing)* | → | Modifiers of X |
| activity <-> purpose | *fishing < has the purpose of > commercial* | → | Modifiers of X |
| | | → | NOAA/VOICES |

| | | | |
|---|---|---|---|
| | *management (A) < is aimed at > maximizing production* | | |
| activity <-> time | *overfishing < lasts for a period of > season*<br>*assessment (A) < is done in a specific moment > latest*<br>*management (A) < occurs every period of > daily* | →<br>→<br>→ | VOICES<br>Modifiers of X<br>Modifiers |
| activity <-> instrument | *monitoring < requires the use of > system* | → | Nouns modified by X |
| activity <-> place | *aquaculture < takes place in/at > coastal* | → | *Modifiers of X* |
| activity <-> indicator | *mariculture < is quantified through > production*<br>*fishing < is measured through > effort* | →<br>→ | *Nouns modified by X*<br>*Nouns modified by X* |
| activity <-> environment | *aquaculture < has as environment > freshwater* | → | *Modifiers of X* |
| activity <-> destination | *assessment (A) < is done for > policymaker* | → | *FAO* |
| activity <-> reference | *overfishing < is referenced through > list* | → | *Nouns modified by X* |

Each selected column in the word sketch provided specific relations; for instance, most concepts expressing the idea of "patient" were found in column *Verbs with X as object*. Most of the concepts describing an "agent" appeared in the column *Verbs with X as subject,* and the attributes were mostly listed in the *modifiers* word sketch.

We realize that, for this study in particular, the usefulness of the traditional and semantic word sketches is significantly different. The word sketch that provided most of the relations was the conventional one, while those provided by the semantic word sketch were very few (See Appendix 4). A possible explanation for this could be that the semantic word sketch needs a much larger corpus for the extraction of useful results (San Martín & Trekker, 2021, p. 68). The semantic word sketches were created for the EcoLexicon English Corpus, which includes 59 million words (León Araúz et al., 2016) while our corpus has 624,120 words.

## 3.2. Results of the analysis of relations

This section presents our findings after analyzing the relations present in the corpus and the dictionaries. In section 3.2.1. we compare the number of different relation types found in the analysis of each term in the corpus and the dictionaries. In section 3.2.2. we present the number of terms associated with each relation type. In section 3.2.3., we discuss the identification of relations in the analysis of each term in three scenarios according to the sources where relations

were found. Finally, section 3.2.4. presents a summary of the relations mainly found in each scenario.

### 3.2.1. Types of relations per term in the corpus and in the dictionaries

This section compares the number of relation types found in the corpus and the dictionaries for each term. This comparison aims to provide a general overview of the types of relations included in our corpus and the dictionaries analyzed in our study. It will also help us identify in which source we can find a wider variety of relation types.

These figures were obtained by counting the number of relation types found in the analysis of definitions and the corpus for each term. In this calculation, since the aim was to compare dictionaries to corpus content, we considered the number of relations appearing in the dictionaries together. In other words, we considered that a relation is present in the dictionaries if it was found in at least one of them.

We illustrate how we counted the different relation types for each term with the example of the term *landing* in Table 24. We can see the different relation types found in the corpus and the dictionaries for this term (the term is not defined in FAO dictionary; therefore, the column corresponding to that dictionary is empty). The relation type activity <-> result in NOAA is counted as one relation in the dictionaries even if it only appears in NOAA. The relation type patient <-> activity is present in NOAA, VOICES, and the corpus, therefore it counts as one relation type present in the dictionaries and one relation type present in the corpus. If we count all the different relation types found in the analysis of *landing*, we obtain 7 relation types in the corpus and 5 in the dictionaries. The tables showing all the relations for each term of the sample can be found in Appendix 5.

Table 24.- Relation types found in the analysis of the term *landing*

| landing (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| agent <-> patient | | | agent <-> patient |
| patient <-> activity | patient <-> activity | | patient <-> activity |
| agent <-> activity | | | |
| part <-> whole | part <-> whole | | part <-> whole |
| entity <-> place | entity <-> place | | entity <-> place |
| | activity <-> result | | |
| entity <-> indicator | | | |
| entity <-> time | | | |

We followed the same counting procedure for all the terms of the sample. Figure 12 summarizes the number of relation types found in the analysis of each term in the dictionaries and the corpus. We can see that there are more types of relations in the corpus than in the dictionaries in 70% of the sample (in 14 out of 20 terms) and this given that a selection was made from the list of possible relations expressed in the corpus (see Section 2.7.2.4). The number of relation types is higher in the dictionaries than in the corpus in only 20% of the sample (4 out of 20 terms). In 10% of the sample (2 out of 20 terms), no difference can be observed between the number of relation types in the corpus and the dictionaries.

A higher number of relation types identified in the corpus than in the dictionaries for most terms suggests that there are some relation types that are only found in the corpus and not in the dictionaries. This is particularly interesting because if we can identify those relation types, it would be possible to assess their relevance to include them in definitions. This aligns with our objectives of identifying where relations are found and our aim for providing methodological guidelines to enrich definitions.

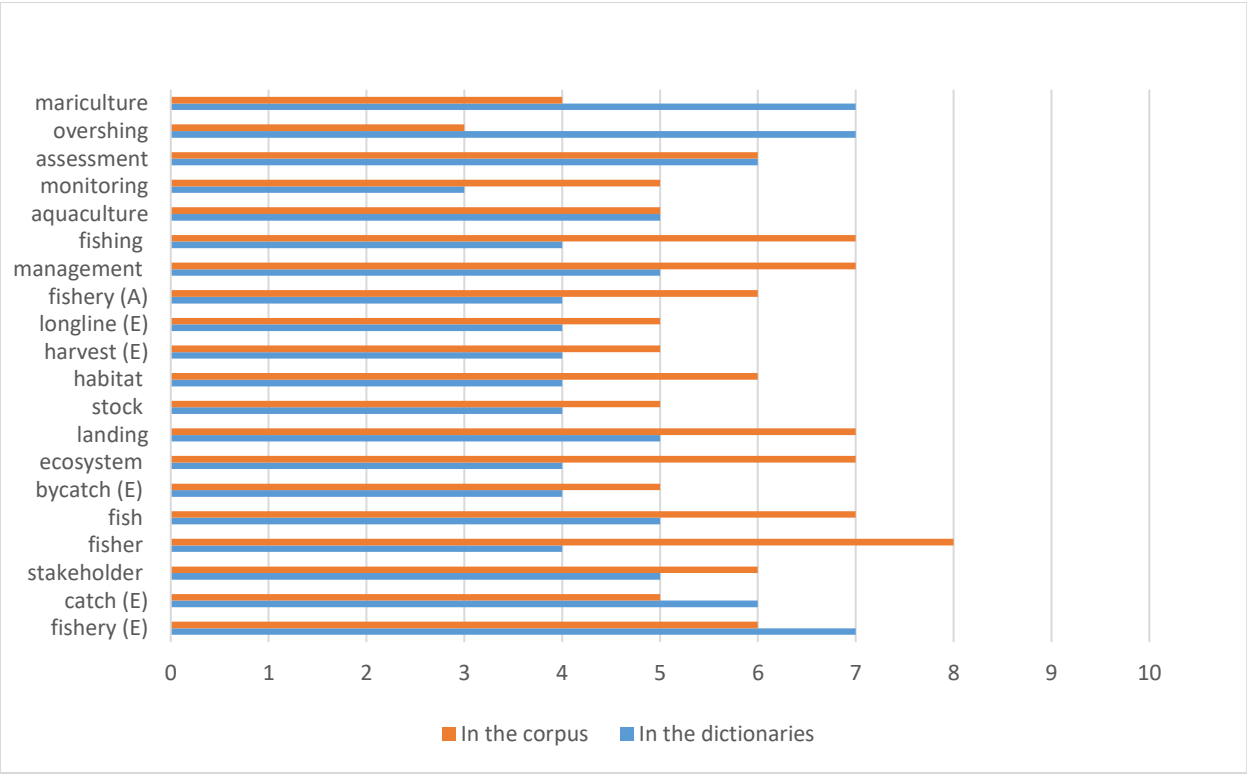



Figure 12.- Number of relation types per term

The terms associated with the highest number of relation types in the corpus compared to the dictionaries are *fisher* (8 relation types in the corpus and 4 in the dictionaries), *ecosystem* and *fishing* (7 relation types in the corpus and 4 in the dictionaries). This means that for these terms, there are more relations from the corpus that are not included in the dictionaries. In contrast, the salient terms presenting more relation types in the dictionaries than the corpus are *overfishing* (7 relation types in the dictionaries and 3 in the corpus) and *mariculture* (7 relation types in the dictionaries and 4 in the corpus). These results suggest that for these two terms there are more relations in the dictionaries that are not included in the corpus.

If we consider the sample by conceptual categories, 83% of the entities (10 out of 12 terms) and 50% of the activities (4 out of 8 terms) are associated with more relation types in the corpus than in the dictionaries. In addition to that, only 16.6% of the entities (2 out of 12 terms) and 25% of the activities (2 out of 8 terms) were associated with a higher number of relation types in the

dictionaries than in the corpus. These figures suggest that the relation types found only in the corpus are more numerous for entity terms than for activity terms.

Finding more relation types for most terms in the corpus than in the dictionaries is not a surprising result. The corpus includes texts focusing on a variety of topics in the subdomain of sustainable fisheries written by experts, explaining processes or ideas to other experts. Terms are naturally related to other lexical units in these explanations; therefore, we expected to find more relations in the corpus than in the dictionaries. However, the corpus results presented in this chapter show only the most frequent relations from all the corpus results and, despite that, some of those relations are not found in dictionaries.

The fact that there are more relation types in the dictionaries than in the corpus for some terms seems surprising to us due to the characteristics of the corpus mentioned in the previous paragraph. Although this occurs only in a few cases, we did not expect to find more relations in the dictionaries than in the corpus for any of the terms studied.

### 3.2.2. Number of terms per relation type

This section discusses the number of times a relation type was associated with a term in our sample in the corpus and the dictionaries. In this analysis, each dictionary is considered separately to reflect the differences between dictionaries in the comparison with the corpus and explore results when these differences are considered.

We considered that the association between a term and a relation type exists if that relation type is identified in the analysis of that term. Results are shown first for the whole sample in Figure 13, and subsequently, they are separated in two graphs: Figure 14 for entity terms and Figure 15 for activity terms. As in previous calculations, when a relation appears more than once in a dictionary or in the corpus, it is counted as only one relation.

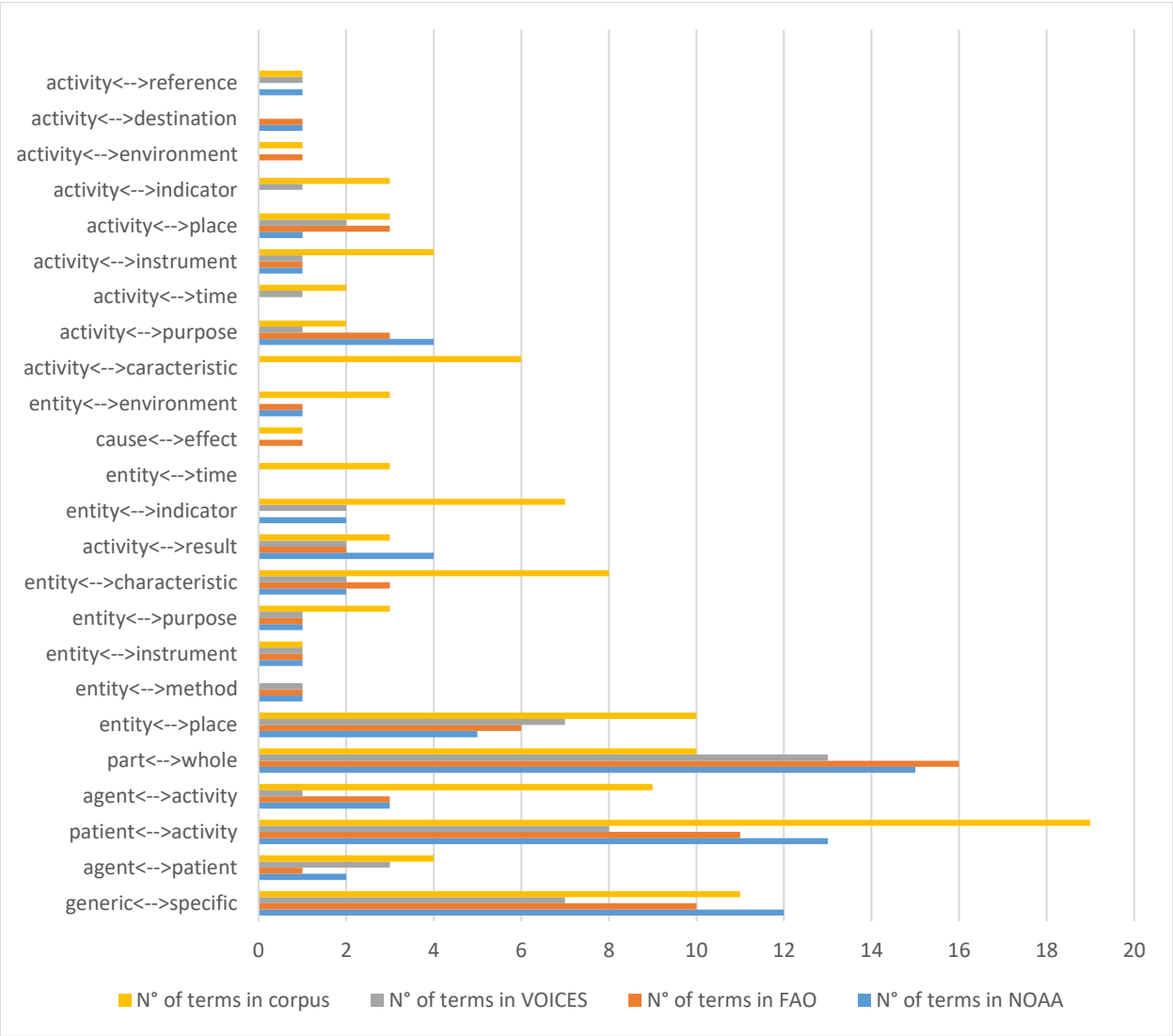



Figure 13.- Number of terms associated with each relation

The graph shows that 54% of the relation types were associated with more terms in the corpus than in the dictionaries (13 out of 24 relation types). In contrast, only 16.7% of the relation types were associated with more terms in the dictionaries than in the corpus (4 out of 24 relation types). This means that more than half the relations identified are associated with more terms in the corpus than in the dictionaries. This also indicates that there are terms for which these relations appear only in the corpus and are absent from the dictionaries. Let us discuss some specific relations where we observe the most significant differences between the corpus and the dictionaries.

In the corpus, the relation type patient <-> activity is associated with 19 out of 20 terms, which makes it the relation type most often identified. Additionally, this relation type occurs for many more terms in the corpus than in the dictionaries (it was identified in the dictionaries in 8 to 13 definitions depending on the dictionary). For example, this relation type was identified in the corpus analysis of the term *ecosystem* paraphrased as *ecosystem < undergoes > manage, protect, support*. This relation type was not associated with *ecosystem* in any of the dictionaries; however, it could be useful for a non-expert user of the dictionaries to know which actions an ecosystem usually undergoes in the field of fisheries sustainability.

The relations agent <-> activity, entity <-> characteristic, and entity <-> indicator also stand out among the relations found in the corpus for more terms than in the dictionaries. The agent <-> activity relation type was recorded for 9 terms in the corpus and from 1 to 3 terms in the dictionaries. The entity <-> characteristic type was found for 8 terms in the corpus and from 2 to 3 terms in the dictionaries. The entity <-> indicator relation type was found for 7 terms in the corpus and for 2 terms in the dictionaries.

The relation types entity <-> time and activity <-> characteristic were not found for any term in the dictionaries. However, in the corpus entity <-> time was identified for 3 terms and activity <-> characteristic was recorded for 6 terms. For instance, entity <-> time was identified in the analysis of the term *bycatch (e.g., bycatch < is caught in a period of > annual).* Furthermore, the relation type activity <-> characteristic was identified in the analysis of the term *management* (e.g., *management (A) < has a specific environmental status > sustainable*).

These results indicate that there are terms for which these relations appear only in the corpus and are absent in the dictionaries. These relations may complement dictionary information for those terms, since they are among the most frequent relations appearing in specialized texts. This is particularly interesting because it gives us an idea of which relations could complement dictionary information.

As for the relations more often found in the dictionaries than the corpus, part <-> whole stands out as the relation type identified for the highest number of terms in the dictionaries (it was identified from 13 to 16 terms depending on the dictionary vs. 10 terms in the corpus). This

information tells us that this relation does not belong to the set of relations identified in the corpus and missing in dictionaries for most terms.

Another relation type more often found in the dictionaries than in the corpus is the generic <-> specific relation type (found for 7 to 12 terms depending on the dictionary vs. 11 terms in the corpus). This relation type was identified, for example in NOAA for the term *stock*, and was paraphrased as *stock < is the generic of > spawning stock.* The relation type activity <-> purpose also belongs to this set (found in definitions from 1 to 4 terms depending on the dictionary vs. 2 terms in the corpus). This relation type appears for example in the FAO definition of *assessment* paraphrased as *assessment < is aimed at > informing.*

The relation types activity <-> destination and entity <-> method were not identified for any term in the corpus, but they were found for one term in the dictionaries. For example, the activity <-> destination was found in the NOAA and FAO dictionaries associated with the term *assessment*. In the definition of *assessment* by NOAA, this relation type was paraphrased as *assessment < is done for > management authority*. The relation type entity <-> method was found in the three dictionaries for the term *fishery* (E), paraphrased as *fishery (E) < follows the stages of > method*.

The fact of identifying relations associated with more terms in the dictionaries than in the corpus suggests that there are terms for which these relations are only identified in the dictionaries and do not appear in the corpus results. However, these are only a few terms given the small difference between the number of terms associated with these relations in the corpus and the dictionaries. These results are interesting because they indicate that not all the information for definitions is provided exclusively by the corpus. This might also be an indication of the presence of these relations in both the corpus and dictionaries for the same term. The identification of relations in both sources for each term in Section 3.2.3. will tell us with more precision if these relations will be found more often only in dictionaries or in both sources.

Until now, we have discussed the association between relations and terms in the whole sample. In the following paragraphs, we examine this association according to the categories of terms that are part of our sample: entities and activities. The aim here is to find out if the trends are different for each conceptual category. Figure 14 shows the number of entity terms associated with each

relation type and Figure 15 shows these results for activity terms. The graphs consider the information from the three dictionaries together and compare that information to the corpus results. Once again, a relation is counted as identified in the dictionaries if it is found in at least one dictionary.

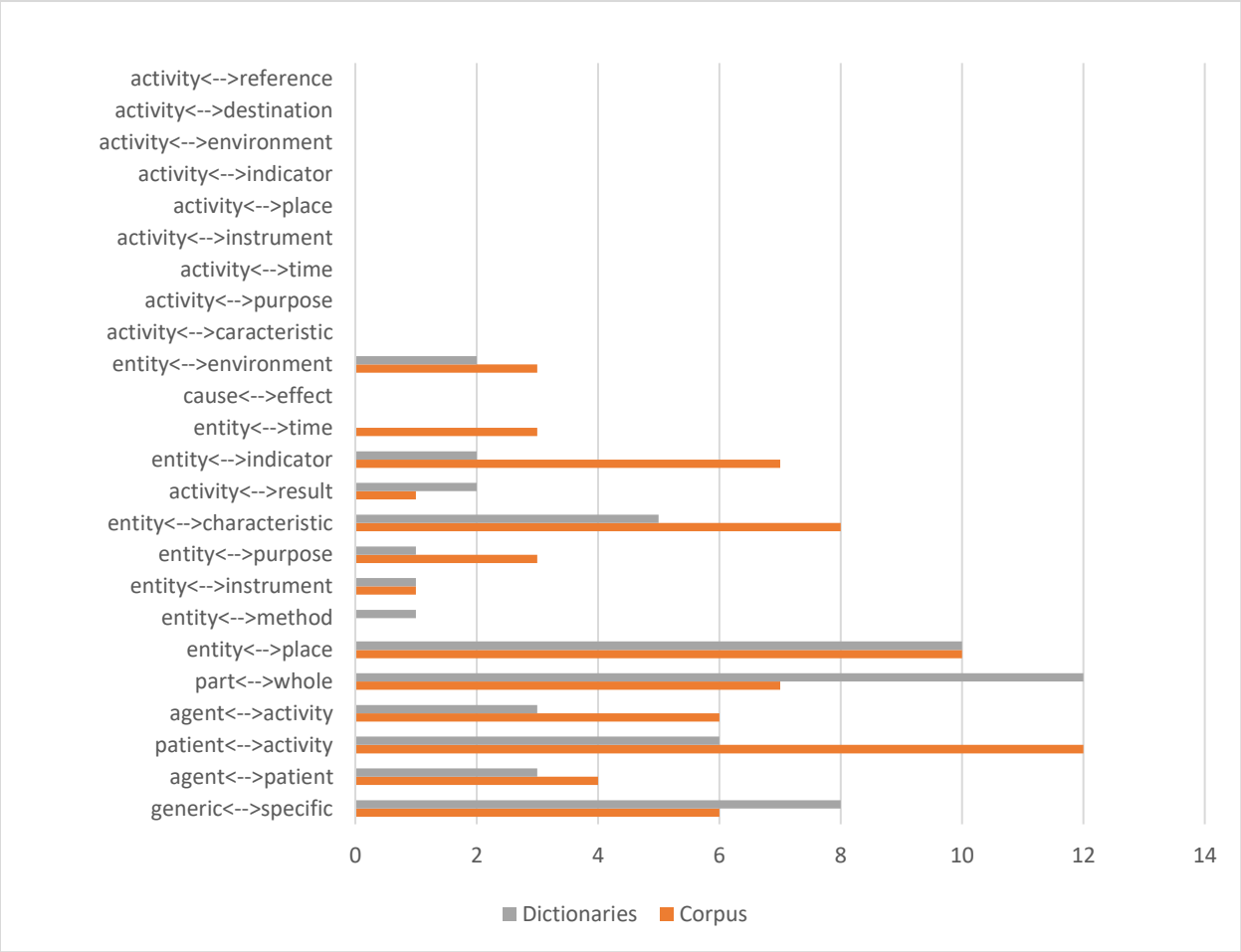



Figure 14.- Number of entity terms associated with each relation

When comparing the number of entity terms associated with each relation in the dictionaries to those in the corpus, the relations that stand out in the corpus are: patient <-> activity (found for 12 terms in the corpus vs. 6 terms in the dictionaries), entity <-> characteristic (found for 8 terms in the corpus vs. 5 terms in the dictionaries) and entity <-> indicator (found for 7 terms in the corpus vs. 2 terms in the dictionaries). These relation types are associated with more entity terms

in the corpus than in the dictionaries, which means that there are entity terms associated with these relations only in the corpus.

The relation types part <-> whole and generic <-> specific are associated with more entity terms in the dictionaries than in the corpus. The relation type part <-> whole was found for 12 terms in the dictionaries vs. 7 terms in the corpus, while the relation type generic <-> specific was found for 8 terms in the dictionaries vs. 6 in the corpus. This informs us that there are entity terms with which the relation types part <-> whole and generic <-> specific are associated only in the dictionaries.

Results are slightly different for activity terms. In Figure 15, we see the relations associated with activity terms in the corpus and in the dictionaries. The most salient relation type associated with more terms in the corpus than in the dictionaries is activity <-> characteristic (found in the corpus for 6 terms vs. no terms in the dictionaries). The next most salient relation types are activity <-> instrument (identified in the corpus for 4 terms vs. 2 terms in the dictionaries) and activity <-> indicator (found in the corpus for 3 terms vs. 1 term in the dictionaries). These findings suggest that there are activity terms for which these relations are identified only in the corpus.

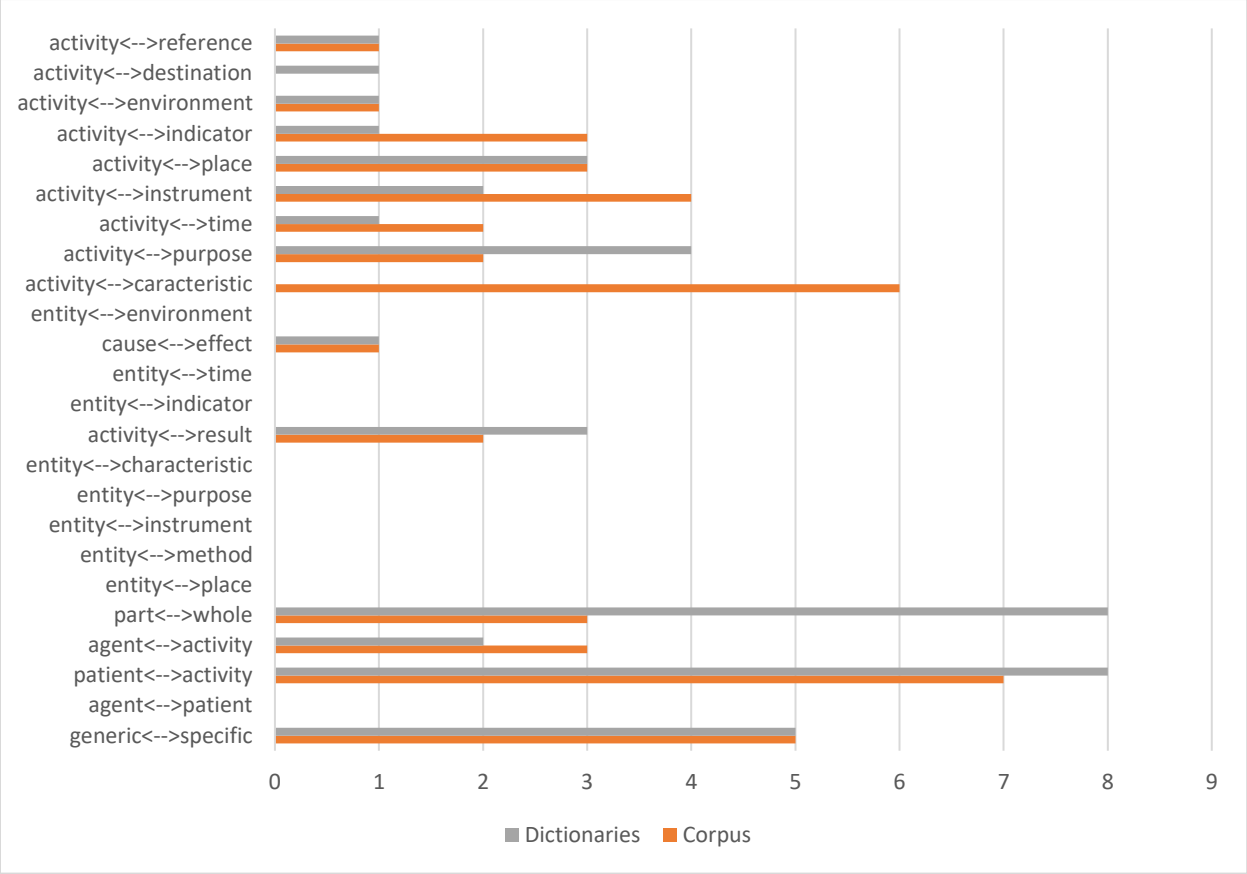



Figure 15.- Relations found for activity terms

Among the relation types associated with the highest number of activity terms in the dictionaries compared to the corpus, part <-> whole remains the most salient relation (identified for the 8 activity terms included in the sample). As it can be observed in Figure 15, the number of terms associated with this relation in the dictionaries is more than twice as high as the number of terms in the corpus (8 terms in the dictionaries vs. 3 in the corpus). We found this relation for example, in the definitions of the terms *monitoring* (*monitoring < consists of > information collection*) and *fishing* (*fishing < is excluded from > scientific research*) by NOAA.

The second most salient relation type in the dictionaries compared to the corpus for activity terms is activity <-> purpose (identified for 4 terms in the dictionaries vs. 2 terms in the corpus). It was identified, for example, in the FAO definition of *aquaculture*, paraphrased as *aquaculture < has the purpose of > enhance production.* Finally, the relation activity <-> destination is only present

in the NOAA and FAO dictionaries for the term *assessment,* and it was paraphrased as *assessment < is done for > management authority.*

The relation type patient <-> activity was also identified for more activity terms in the dictionaries than in the corpus (8 terms in the dictionaries vs. 7 in the corpus). This relation was identified for all the activity terms analyzed. However, the difference between the number of terms associated with this relation in the dictionaries and the corpus is not significant. It was found in the definition of *overfishing*, as *overfishing < acts on > stock*, for example.

We observe that some entity and activity terms are associated with specific relations more often in the corpus, and for other terms, this association occurs more often in the dictionaries. This observation is similar to the results obtained when we treated terms as a whole sample. The implications of these results are that there are terms associated with specific relations only in the corpus and other terms associated with specific relations only in the dictionaries. The first implication was not surprising to us, given the amount of related lexical units found in our corpus results. The second implication was unexpected to us, because we believed that all the conceptual relations that concepts hold with other concepts are present in the corpus.

In Section 3.2.3. we present the results that compare the presence of each relation in each source for each term. This will allow us to learn more precisely where relation types are more often found.

### 3.2.3. Identification of relations: three scenarios

In this section, we identify the presence or absence of each relation type in the dictionaries and/or the corpus for each term with a view to discovering in which source each relation is mainly found.

While processing the data obtained from the analysis of relations in the two sources, we identified three scenarios:

- *Scenario 1* refers to the relations identified only in the dictionaries in the analysis of each term.
- *Scenario 2* refers to the relations identified only in the corpus in the analysis of each term.

- Scenario 3 refers to the relations identified in the dictionaries and the corpus in the analysis of each term.

Table 25 illustrates the results of the analysis per term. It shows the three scenarios in different colors for the term *aquaculture*. The relations in orange correspond to *scenario 1*, the relations in yellow occur in *scenario 2* and the relations in green correspond to scenario 3.

Table 25.- Scenarios in the analysis of aquaculture

| **aquaculture (activity)** | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | | | |
| patient <-> activity | patient <-> activity | patient <-> activity | patient <-> activity |
| | part <-> whole | part <-> whole | part <-> whole |
| | activity <-> purpose | activity <-> purpose | |
| | | | activity <-> instrument |
| activity <-> place | | activity <-> place | |
| activity <-> indicator | | | |
| activity <-> environment | | | |

As part of our analysis, we identified, for each relation, which scenarios apply and the number of terms in which they occur. In addition, we looked for trends that may help terminologists look for relations in specific sources and be aware of the relations that may complement definitions.

To illustrate the distribution of scenarios per relation type, Table 26 contains the terms for which each scenario occurs for the relation part <-> whole. As can be seen, scenario 2 (yellow color, relation types identified only in the corpus) does not occur for this relation.

Table 26.- Occurrence of the three scenarios for the relation part <-> whole

| part <-> whole | | | | |
|---|---|---|---|---|
| **Term** | **NOAA** | **FAO** | **VOICES** | **corpus** |
| fishery (E) | x | x | x | |
| catch | x | x | x | x |
| stakeholder | | x | | x |
| fisher | | x | | x |
| fish | | x | | x |
| bycatch | x | x | | x |
| ecosystem | x | x | x | x |
| landings | x | | x | x |
| stock | x | x | x | x |
| habitat | x | | x | |
| harvest | x | | x | |
| longline | | x | x | |

The following sections discuss the occurrence of each scenario for each relation type associated with the terms of our sample. Section 3.2.3.1. discusses the occurrence of each scenario for entity terms and section 3.2.3.2. discusses those results for activity terms.

#### 3.2.3.1. Identification of relations in entity terms

This section discusses the prevalence of each scenario described in section 3.2.3 with respect to the entity terms of our sample.

Figure 16 shows all the relations and the number of entity terms associated with them in each scenario in different colors. When there are no bars for a relation, none of the scenarios occur for any of the entity terms in the sample. Likewise, when there is one bar missing in the chart, the corresponding scenario does not occur for any term. In the graph in Figure 16, the orange bars represent the relations identified only in the dictionaries for each term *(scenario 1)*, the yellow bars correspond to the relations identified only in the corpus for each term *(scenario 2)*, and the green bars represent the relations found in both the corpus and the dictionaries for each term *(scenario 3).*

The scenario that applies to a higher number of entity terms is scenario 3 (identified for a maximum of 8 out of 12 entity terms), followed by scenario 2 (identified for a maximum of 6 out

of 12 entity terms). The lowest number of terms corresponds to scenario 1 (identified for a maximum of 5 out of 12 entity terms). Let us look at the most salient relations in each scenario.

The most salient relation type in scenario 3 for the entity terms is entity <-> place. This relation type occurs in scenario 3 for 66.7% of the entity terms (8 out of 12 terms). In addition, it is found in scenario 1 and 2 in 16.7% of the sample (2 out of 12 terms). These results show that for most terms, this relation type is found in both corpora and dictionaries. This type can also be described only in corpora or only in dictionaries for a few entity terms.

The second most salient relation type in scenario 3 for entity terms is part <-> whole, which occurs in scenario 3 for 58.3% of the entity terms (7 out of 12 terms) and in scenario 1 for 41.7% of the sample (5 out of 12 terms). This relation type does not occur in scenario 2 for any of the entity terms of the sample. These results show that for most entity terms, the part <-> whole relation type is described in both corpora and dictionaries. It can also be found only in dictionaries, and it is not likely to be described only in corpora.

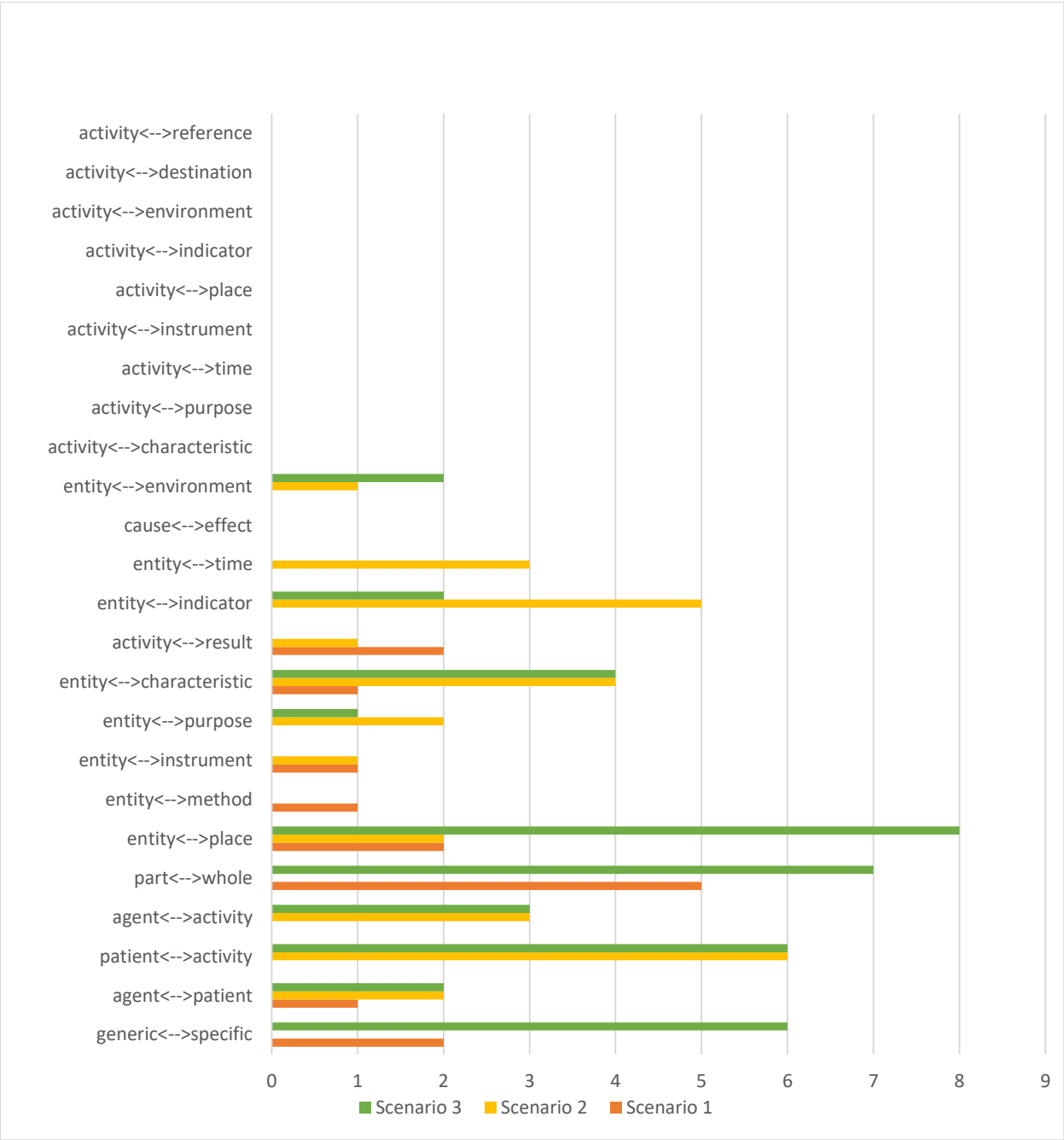



Figure 16.- Scenarios for each relation in entity terms

Other relation types that stand out in scenario 3 are patient <-> activity and generic <-> specific. The patient <-> activity relation type occurs in scenarios 2 and 3 in 50% of the entity terms (6 out of 12 terms). Nevertheless, there are no terms for which this relation occurs in scenario 1. These results show that the patient <-> activity relation type can be found in both corpora and the

dictionaries or only in corpora; however, the relation is not likely to be described exclusively in the dictionaries.

The relation type generic <-> specific occurs in scenario 3 for 50% of the sample (6 out of 12 entity terms) and in scenario 1 for 16.7% of it (2 out of 12 entity terms). This relation type does not occur in scenario 2 for any entity term of the sample. These findings suggest that this relation type can be found in both corpora and dictionaries. It can also be found only in dictionaries; however, it is not likely to be found only in corpora.

Patient <-> activity is the most relevant relation type in scenario 2 for entity terms, apart from being a relevant relation for scenario 3, as seen in previous paragraphs. The second most relevant relation type in scenario 2 is entity <-> indicator, which occurs in this scenario for 41.7% of the terms (5 out of 12 entity terms) and in scenario 3 for 16.7% of them (2 out of 12 entity terms). This relation does not occur in scenario 1 for any entity term. These results show that the entity <-> indicator type can be found mainly in corpora, it can also be described in both corpora and dictionaries, and it is not likely to be described only in dictionaries.

The next salient relation type in scenario 2 is entity <-> characteristic which is equally identified in scenarios 2 and 3 for 33.3% of entity terms (4 out of 12 terms) and in scenario 1 for 8.3% of the sample (1 out of 12 entity terms). This means that the relation type entity <-> characteristic occurs mainly in the corpus or in both the corpus and the dictionaries. The relation is found only in dictionaries for a small number of terms. The relation type entity <-> time occurs in scenario 2 for 25% of the sample (3 out of 12 entity terms). It is worth noticing that this is the only scenario identified for this relation for entity terms. These results suggest that the relation entity <-> time is described only in the corpus.

The relation with the highest number of terms in scenario 1 is part <-> whole, which occurs in this scenario for 41.6% of the sample (5 out of 12 entity terms). However, the number of terms in scenario 3 for this relation (7 out of 12 entity terms) is higher than the number of terms in scenario 1. This shows that even though for most terms the relation type part <-> whole is described both in dictionaries and corpora, it is also the most relevant among the relations described only in dictionaries.

The relation types activity <-> result, entity <-> place and generic <-> specific occupy the second position in number of terms in scenario 1. Nevertheless, these relations occur in this scenario for only 16.7% of the sample (2 out of 12 terms). This means that it is possible to find these relations as being described only in dictionaries but the number of terms for which this occurs is very low. In fact, the relations entity <-> place and generic <-> specific are mainly found in both corpora and dictionaries.

The relation types for which scenario 1 is more prevalent than the other two scenarios are activity <-> result and entity <-> method. As mentioned before, the relation type activity <-> result occurs in scenario 1 for 16.7% of the entity terms (2 out of 12 terms) and it is found in scenario 2 for 8.3% of the sample (1 out of 12 entity terms). Scenario 3 does not apply for this relation in entity terms. These findings show a tendency for this relation type to be described in dictionaries more than in a corpus. They also show that the relation is not likely to be found in both corpora and dictionaries for the same term.

Scenario 1 is the only scenario for the relation type entity <-> method with an occurrence of 8.3% of the sample (1 out of 12 entity terms). This means that the relation is identified for very few terms and tends to be described only in the dictionaries. Once again, these results show that the number of relations occurring exclusively in the dictionaries is very low.

#### 3.2.3.2. Identification of relations for activity terms

This section compares the different scenarios for each relation associated with the activity terms of the sample. The information is presented in a similar way as for the entity terms.

In this category, the scenario occurring for the highest number of terms is also scenario 3 (identified for a maximum of 7 out of 8 activity terms), followed by scenario 2 (identified for a maximum of 6 out of 8 activity terms), and the lowest figures correspond to the relations in scenario 1, (found for a maximum of 5 out of 8 activity terms). Results are shown in Figure 17.

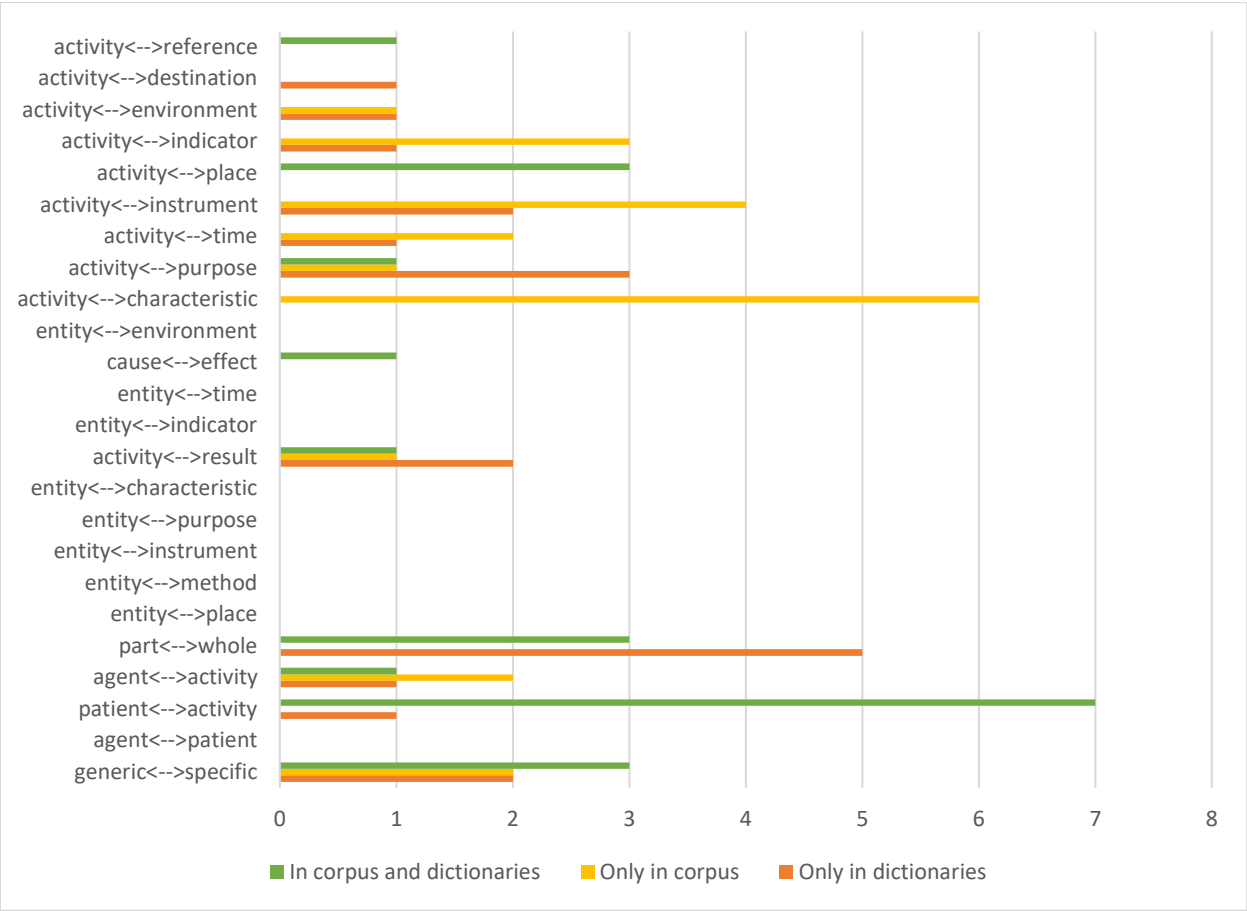



Figure 17.- Comparative scenarios per relation in activity terms

For the activity terms of our sample, the relation patient <-> activity is the most salient relation type occurring in scenario 3, identified for 87.5% of the terms (7 out of 8 activity terms). There is a significant difference between this figure and the number of terms identified for this relation in scenario 1, which accounts for 12.5% of the terms (1 out of 8 activity terms). Furthermore, there are no terms associated with this relation in scenario 2. These findings show that for most activity terms, the relation type patient <-> activity is mainly found both in corpora and the dictionaries. Additionally, in very few cases it is possible to find this relation only in dictionaries and there are no cases in which the relation type is only described in corpora.

The next prevalent relation types for the activity terms in scenario 3 are generic <-> specific, activity <-> place and part <-> whole, all of them identified in the dictionaries and the corpus for 37.5% of the sample (3 out of 8 activity terms). For the relations generic <-> specific and activity

<-> place, scenario 3 is the most common. The generic <-> specific type is identified in scenario 2 and scenario 1 for 25% of the sample (2 out of 8 activity terms). This shows that for activity terms, there is a tendency for this relation type to be described in both corpora and dictionaries. However, although in very few cases, it is possible to find this relation type described only in corpora or in dictionaries.

The relation type activity <-> place only occurs in scenario 3 for the sample of activity terms. This suggests that this relation type tends to be found both in corpora and dictionaries for the associated. The same applies for the relation types activity <-> reference and cause <-> effect; however, the number of terms associated with these two latter relations in scenario 3 is only 12.5% of the sample (1 out of 8 activity terms). This means that the relation types activity <-> reference and cause <-> effect are associated with very few activity terms and, when that is the case, they tend to be found in both corpora and the dictionaries for the same term.

The most prominent relation type for scenario 2 in activity terms is activity <-> characteristic, found for 75% of the sample (6 out of 8 terms). This relation occurs only in scenario 2, which means that it tends to be described exclusively in the corpus. Other prominent relations in scenario 2 are activity <-> instrument, identified in this scenario for 50% of the sample (4 out of 8 activity terms) and activity <-> indicator, found in this scenario for 37.5% of the terms (3 out of 8 activity terms).

The relation type activity <-> instrument occurs in scenario 1 for 25% of the sample (2 out of 8 activity terms) and does not occur in scenario 3 for any of the terms. A similar trend is observed for the relation type activity <-> indicator, which occurs in scenario 1 for 12.5% of the terms and does not occur in scenario 3 for any term either. These figures show that both relation types are found mainly in corpora and in some other cases, they can be described only in the dictionaries where they are associated with activity terms. Furthermore, these relation types are not likely to be found in both corpora and dictionaries for the same term.

The relation type part <-> whole is the most prominent in scenario 1, identified for 62.5% of the activity terms (5 out of 8 terms). As previously seen, this relation occurs in scenario 3 for 37.5% of the sample (3 out of 8 activity terms) and there are no terms associated with this relation in

scenario 2. This means that for activity terms, the part <-> whole type is found mainly in dictionaries, it can be found in both corpora and dictionaries for a few terms, and it is not likely to be described exclusively in the corpus.

Activity <-> purpose is the second most salient relation in scenario 1 for activity terms. However, its occurrence is relatively low compared to the other relations, e.g.,37.5% of the activity terms (3 out of 8 terms). The other two scenarios in which this relation occurs are even lower, e.g.,12.5% for both scenario 2 and scenario 3 (1 out of 8 terms). This shows that this relation type is described mainly in dictionaries. In very few cases it can be found in both corpora and dictionaries or only in corpora.

Another relation for which scenario 1 is the most significant is activity <-> result, identified in this scenario for 25% of the activity terms (2 out of 8 terms), and in scenarios 2 and 3 for 12.5% of the sample (1 out of 8 activity terms). Although this relation type is identified for only a few terms of our sample, these results show a tendency for this relation to be described in dictionaries rather than in corpora or in both sources. The relation activity <-> destination occurs only in scenario 1 and it is associated with 12.5% of the sample (1 out of 8 activity terms). This figure suggests that that this relation type can only be found in the dictionaries, it is associated with very few terms and will probably not occur in the corpus or in both sources for the same term.

It is worth noting that the sources where relation types are most often found vary from one relation to another. This fact prevented us from predicting what relation types would be found more often in the dictionaries, in the corpus or in both sources after analyzing the results from Section 3.2.2. and Section 3.2.1.

### 3.2.4. Summary and discussion of prominent relations in each scenario

In this section we present a summary of the most prominent relations for each scenario (Table 27) followed by the possible reasons why specific relations may occur in specific scenarios.

The purpose of this part is to find common trends that will allow us to draw methodological guidelines to write enriched dictionary definitions.

Table 27.- Prominent relations in each scenario

| **Term category** | ***Scenario 1***: relations present only in the dictionaries | ***Scenario 2***: relations present only in the corpus | ***Scenario 3***: relations present in dictionaries and corpus |
|---|---|---|---|
| Entities | part <-> whole<br>activity <-> result<br>entity <-> method | patient <-> activity<br>entity <-> indicator<br>entity <-> characteristic<br>entity <-> time | entity <-> place<br>part <-> whole<br>patient <-> activity<br>generic <-> specific |
| Activities | part <-> whole<br>activity <-> purpose<br>activity <-> result<br>activity <-> destination | activity <-> characteristic<br>activity <-> instrument<br>activity <-> indicator | patient <-> activity<br>generic <-> specific<br>activity <-> place<br>activity <-> reference<br>cause <-> effect |

To identify possible reasons why specific relations are found in the dictionaries and not in the corpus (Scenario 1), we examine a few examples taken from our sample. We will then compare these examples with terms where the same relation appears in the corpus. For this part, we take examples featuring some of the most prominent relations where scenario 1 occurs.

The relation type activity <-> result appears in the definition of *catch* by NOAA. Table 28 shows the corresponding definition analysis for this term. The line concerning this relation has been highlighted in blue.

Table 28.- Definition of *catch* by NOAA

**catch (entity)**

**NOAA**

| The total number (or weight) of fish **caught by fishing operations**. Catch should include all fish killed by the act of fishing, not just those landed. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of | fish | part <-> whole | ← |
| is quantified as | number, weight | entity <-> indicator | → |
| is the result of | fishing(A) | activity <-> result | ← |
| undegoes | catch | patient <-> activity | → |
| | kill | | |
| includes | landings | part <-> whole | ← |

The relation type activity <-> result in the definition of *catch* is paraphrased as *catch (E) < is the result of > fishing*. The idea that *catch* is the result of the fishing activity applies to all the entities designated by *catch*, which means that, according to this definition, it is a necessary trait for fish to be considered "catch". The same relation does not appear as one of the most frequent relations identified for this term in our corpus. If we look at the other relation types identified in Table 28, we find that they all express traits that apply to all the elements considered "catch". For example, "catch" is a group of fish, it is quantified through a number of fish, or their weight and it has undergone the action of kill.

Let us now see the corpus analysis of the term *fishery (A)*, an example where the relation activity <-> result does appear in the corpus. Table 29 shows the part of the corpus analysis for *fishery (A)* concerning this relation.

Table 29.- Relation activity <-> result in the corpus analysis of *fishery (A)*

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| results in | production (134)<br>landings (34) | activity <-> result | → | nouns modified by X |
| **Realization**<br>fishery (A) < results in > production, landings | | | | |
| **Concordance**<br>In Chapter 9, we follow a similar approach and examine potential effects of ENSO on inland **fisheries** production at a number of different levels, including global, subregional and national levels, as well as at the level of the most commonly captured species. (doc. 12) | | | | |

In the analysis reproduced in Table 29, we observe the paraphrase *fishery (A) < results in > production, landings*. In this case, *fishery* modifies production to specify that the text refers to the production resulting from the activity of fishery and not to any other activity. This means that in this example, the relation type activity <-> result expresses a specification of a possible trait of the concept "fishery" (the activity at the origin of the production or landing). This is probably the reason why the relation appears in our corpus results for the term *fishery*.

Going back to the analysis of the term *catch* for which the relation type activity <-> result was not found in the corpus, let us see some examples of relation types found in our corpus results for

this term. Table 30 contains the corpus results found in the *modifiers* column for *catch* and Table 31 contains results from the column of nouns modified by the term.

Table 30.- *Modifiers* column of corpus results for *catch*

**catch (entity)**

**Traditional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is quantified through | total (65)<br>total allowable (31) | entity <-> indicator | → | modifiers of X |
| **Realization**<br>catch (E) < is quantified through > total, total allowable | | | | |
| **Concordance**<br>The New Zealand fishery has dominated global catches and is the only one that has persisted over time with total **catches** of more than a few thousand tonnes. (doc. 10) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| comes from | global (46) | entity <-> place | → | modifiers of X |
| **Realization**<br>catch (E) < comes from > all over the word | | | | |
| **Concordance**<br>Since the last FIP review, MSC-certified catch has grown to 13% of global **catch**, and the share of catch engaged in FIPs has also grown. (doc.25) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a group of | fish (32) | part <-> whole | ← | modifiers of X |
| **Realization**<br>catch (E) < is a group of > fish | | | | |
| **Concordance**<br>The repetition of strong El Niño events in a warmer ocean, and the resulting loss of productive habitat, will likely diminish fish **catches** for coastal communities and reduce protection from storms and rising seas, putting coastal communities in peril. (doc. 12) | | | | |

Table 31.- Nouns modified by x column of corpus results for *catch*

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | limit (39) | patient <-> activity | → | nouns modified by X |
| | restriction (6) | | | |
| **Realization**<br>catch (E) < undergoes > limit, restriction | | | | |
| **Concordance**<br>Science-informed management: If **catch** limits are established by non- scientific processes, overexploitation is more likely to persist. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is assessed through | data (31) | entity <-> indicator | → | nouns modified by X |
| is quantified through | rate (30) | | | |
| | volume (17) | | | |
| **Realization**<br>catch (E) < is assessed through > data | | | | |
| **Concordance**<br>Most deep-sea fishes have life histories giving them far less population resilience/productivity than shallow-water fishes, and could be fished sustainably only at very low **catch** rates if population resilience were the sole consideration. (doc. 10) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | supply (3) | agent <-> activity | → | nouns modified by x |
| **Realization**<br>catch (E) < is the actor of > supply | | | | |
| **Concordance**<br>Southeast Asian fisheries that are used principally for reduction (mainly from "trash fish" fisheries, but also from fisheries targeting small pelagics) are also very relevant to the global **catch** supply for fishmeal, fish oil, and agriculture fertilizers, but are not included in this report.(doc 21) | | | | |

In Table 30 the relation type entity <-> indicator was identified in the corpus as *catch (E) < is quantified through > total, total allowable*. Since these traits do not apply to all the elements considered catch, experts seem to use these relations to specify the amount of catch they refer to: the *total catch* (the total number of fish caught) or the *total allowable catch* (only the amount that fishers are allowed to catch according to regulations). Thus, the relation in this case specifies a possible trait of the concept “catch”.

We observe a similar trend for the corpus relation type entity <-> place in *catch (E) < comes from > global*, since *global* specifies the place where the fish were caught (all over the world). This trait

may change if the catch comes from a region (*regional catches*) or a city's coastline (*local catches*). This relation type in the corpus also specifies a trait of the concept that may change depending on the place where the catch comes from.

We can see in Table 31 other relations identified in the corpus such as patient <-> activity in *catch (E) < undergoes > limit, restrictions,* and agent <-> activity in *catch (E) < is the actor of > supply*. In the case of patient <-> activity, *catch* specifies the type of *limit*, or *restriction* that the author of the text refers to (as in the concordance "if catch limits are established"). The relation type agent <-> activity in Table 31 states that *catch (E) < is the actor of > supply* for fishmeal, fish oil and agricultural fertilizers as we see in the concordance for this relation. In this case, *catch* specifies the type of supply needed for the fabrication of those products. Once again, we observe two relation types taken from the corpus that specify possible traits of the concept "catch".

None of the relations specifying possible traits of "catch" were found in the dictionary definition of this term. However, various relation types of this sort were found in the corpus, which means that experts mention possible traits when they refer to the concept of "catch" in specialized texts. Nevertheless, among the corpus relations for *catch*, we also find information that applies to all the entities considered to be "catch", such as part <-> whole in *catch (E) < is a group of > fish* in Table 30 and entity <-> indicator in *catch (E) < is quantified through > data, rate and volume* in Table 31.

Considering the examples above, we see that in the corpus we can find relation types specifying possible traits of concepts on the one hand and traits that apply to all elements of a category on the other hand ("necessary" traits). Dictionaries seem to include only the latter sort of traits as conceptual information. The relation type activity <-> result identified in the definition by NOAA for the term *catch* is probably not among our corpus results because the information it expresses (being the result of fishing) applies to all catches and is already understood by experts when they mention the concept.

The most prominent in scenario 2 for terms denoting activities is activity <-> characteristic, which is found in our corpus results for most activity terms (6 out of 8 terms) and does not appear in

any dictionary definition of the entire sample. Table 32 shows this relation identified in the corpus analysis of *management*.

Table 32.- Part of the corpus analysis for the term *management* (A)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has a specific environmental status | sustainable (33) | activity <-> characteristic | → | modifiers of X |
| is done in a specific mode | effective (27), ecosystem-based (25) | | | |
| **Realization**<br>management (A) < has a specific environmental status > sustainable | | | | |
| **Concordance**<br>Participating in meetings with NGOs and/or other sustainable seafood advisors (e.g., SFP Supplier Roundtables) Sourcing products that are certified, rated, or engaged in FIPs A public advocate for more sustainable fisheries **management** and responsible business practices. (doc. 1) | | | | |

The concordance reproduced in Table 32 shows that *sustainable* modifies *management* and indicates that in this case management is performed in an environmentally friendly mode. The trait of being sustainable does not apply to all activities considered to be "management", therefore, when experts mention the status of being sustainable through the relation type activity <-> characteristic, they specify a possible trait of "management". This could explain the reason why this relation type was not found in any of the dictionary definition of *management* and of any other term of the sample.

Table 33 shows the relation types identified in the dictionaries for *management*. The VOICES dictionary has the same definition as NOAA.

Table 33.- Dictionary analysis for the term *management*

**management (activity)**

**NOAA**

| The art of taking actions that affect a resource and its exploitation with a view to achieve certain objectives, such as maximizing the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons. Managers are those who practice management. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | art | generic <-> specific | ← |
| includes | taking actions | part <-> whole | ← |
| acts on | resource | patient <-> activity | ← |
| | exploitation | | |
| is aimed at | maximizing production | activity <-> purpose | → |
| includes | fishery regulations | part <-> whole | ← |
| | catch quota | | |
| | closed season | | |
| is done by | manager | agent <-> activity | ← |

**FAO**

| The act of influencing, directing, or controlling the use of a resource. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | act | generic <-> specific | ← |
| consists of | influencing | part <-> whole | ← |
| | directing | | |
| | controlling | | |

It can be noted that all the relations reproduced in Table 33 refer to traits of the concept that apply to all the activities considered to be "management" in the domain of fisheries. For example, management is considered to be an art and an act, it implies taking action, it affects the resources and its exploitation, its purpose is maximizing production, it includes regulations, and it consists of influencing, directing and controlling resources.

Among the most prominent relations in scenario 3, the relation type part <-> whole was identified in the dictionaries and in the corpus for the term *stock*. Table 34 shows this relation found in the definition of *stock* by VOICES and Table 35 shows the same relation identified in the corpus analysis of this term.

Table 34.- Definition of *stock* (E) by VOICES

**Voices**

| A grouping of fish usually based on genetic relationship, geographic distribution, and movement patterns. Also a managed unit of fish. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of | fish | part <-> whole | ← |
| has specific patterns | geographic distribution | entity <-> characteristics | → |
| | genetic relation | | |
| | movement patterns | | |
| is a type of | unit | generic <-> specific | ← |

Table 35.- Relation part <-> whole in the corpus analysis for stock

**stock (entity)**

**Traditional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is a group of | fish (68) | part <-> whole | ← | modifiers of X |
| | anchovy (23) | | | |
| | clam (5) | | | |
| **Realization**<br>stock < is a group of > fish | | | | |
| **Concordance**<br>Each year, assessments of various fish **stocks** and stock complexes are conducted to determine their status. (doc. 0) | | | | |

In the dictionary definition reproduced in Table 34, we see that the relation part <-> whole explains a condition that is required for an entity to be considered "stock", e.g. being a group of fish. In the corpus, the related term *fish* in Table 35 indicates that expert may refer to all sorts of fish as in the concordance shown in the same table, or to specific species such as *anchovies* or *clams*. We notice that the relation has been included in the dictionary as a necessary trait and in the corpus as a possible specification of a trait of the concept (the species that are part of the stock). Table 36 includes another example of part <-> whole, appearing in the corpus analysis for the term *bycatch*.

Table 36.- Part of the corpus analysis for *bycatch*

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a group of | shark (3)<br>loggerhead (2) | part <-> whole | ← | is the generic of |
| **Realization**<br>bycatch < is a group of > shark, loggerhead | | | | |
| **Concordance**<br>The most important actions so far have included implementation of a NPOA on sharks, rays and chimaeras; national implementation of regional/international measures for minimizing impacts on **bycatch** species such as sharks and turtles; prohibition of shark finning; adoption of measures to manage and limit fishing capacity in key fisheries; and improved port management controls. (doc. 19) | | | | |

In the concordance in Table 36, we realize that the partitive relation associated with *bycatch* gives examples of what species can be part of bycatch *(e.g., sharks* and *turtles)*. This means that the relation type part <-> whole specifies the possible the elements that are part of "bycatch". The terms *shark* and *loggerhead* (a type of marine turtle that is usually victim of bycatch) are found among the corpus results probably because they specify that the speaker refers to "shark bycatch" and "loggerhead bycatch" and not to the bycatch of any other species.

Considering the various examples in this section, we observe that the relations identified in dictionaries tend to express traits that apply to all elements designated by the term. These traits are probably considered necessary by the dictionaries for a concept to correspond to the term being defined. This is not surprising because the dictionaries apparently follow the model of necessary and sufficient conditions that we saw in Section 1.1.2. Conversely, the relations found in the corpus tend to explain possible specifications of a trait of the concept. In some cases, the corpus also provides necessary traits of concepts when they help to specify possible conceptual traits.

Due to the objectives of our study to enrich definitions, it is of interest to identify those relations that may be useful to improve or complement definitions. To that end, the three scenarios found in the study provide information that terminologists may consider relevant for writing definitions.

Relations in *scenario 1* may provide traits that are relevant to define a term and that experts do not mention in specialized texts because these texts are targeted at readers with expert-level

knowledge of the subjects and who are already familiar with the concepts. For example, the relation type part <-> whole was identified in scenario 1 for the term *aquaculture* as *aquaculture < consists of > farming*. All experts know that aquaculture consists of farming fish because they know that this condition is implied in the meaning of aquaculture. For a terminologist, however, it may be useful to include this relation in the definition of the concept because the relation can help a non-expert to understand the concept.

Relations found mainly in *scenario 2* could complement dictionary information to produce enriched definitions considering that those relation types are the most frequent ones from all the relation types appearing in the corpus. The relation type entity <-> indicator, for example, occurs in the corpus for the terms *ecosystem*, *landing*, *stock* and *habitat.* The paraphrases and respective frequencies are *ecosystem < is assessed through > health* (12), *landing* (E) *< is assessed through > size* (17), *stock* (E) *< is assessed through > status* (34), and *habitat < is assessed through > structure* (9). None of these relation types and related terms are included in existing definitions in the dictionaries. Given their frequencies of use in the corpus, the related terms seem to be relevant for the description of concepts, even if the traits they explain are possible traits of the concepts.

Relations in scenario 3 may also contribute to writing enriched definitions. Since the information from the corpus is usually different from the one given in the dictionaries, elements from both sources may be complementary. For instance, the relation type patient <-> activity was identified for the term *management* in the dictionaries as *management* (A) *< acts on > resource*. The corpus presents the same relation type as *management* (A) *< acts on > fishery* with a frequency of 443. We can see that the related terms are different, and we believe that both pieces of information are relevant for definitions.

In the latter example, given the high frequency of the related term *fishery* in the corpus, it seems relevant for a definition of “management”. The information given by the dictionary is also useful since it would help the non-expert reader of the new definition learn that the objects that are usually managed in the fisheries field are the resources. The new definition would inform the reader that *management* acts on a *fishery* (the geographical and administrative structure where fishing takes place) apart from acting on *resources*.

## 3.3. Methodological guidelines to produce enriched dictionary definitions

This section includes the methodological guidelines derived from our analysis for definition writing in the field of sustainable fisheries.

Based on the findings of this study, we suggest that terminologists consider these points when writing definitions in the field of sustainable fisheries. These new enriched definitions would respond to the needs of non-expert professionals, in particular interpreters and translators specialized in the field.

**Building a corpus of specialized texts** can be a useful step for selecting definitional elements because they contain information that can complement information usually considered in dictionary definitions. In particular, corpora include relation types expressing possible specifications of concept traits that are not included in dictionary definitions. This information can help the non-expert user get familiar with related concepts that frequently appear in discussions about those concepts.

**Term and context extraction** are also important steps in the production of definitions. Term extraction is useful to identify the terms to be defined in a dictionary. Context extraction from the corpus helps identify relations from the corpus that may complement dictionary information to write enriched definitions. Furthermore, the use of corpus analysis tools such as Sketch Engine and the extraction of contexts from corpora through word sketches have proven essential tools in identifying the most frequent relations from the corpus.

**Selection of relations with higher frequencies in the corpus.** At this stage the use of paraphrases can help identify the relations held between the term being defined and the related terms appearing in the corpus results. Section 3.1.2. shows the different paraphrases that could be used to identify each relation to facilitate this task. Terminologists may decide on the number of relations they select from each column in the corpus results considering the highest frequencies of use.

**Identification of relations occurring in each source**. Once relations from the dictionary and the corpus have been identified, terminologists can verify for each term if those relations are found

only in the dictionaries (scenario 1), only in the corpus (scenario 2) or in both sources (scenario 3). Table 27 contains the most prominent relations for each scenario that we identified in our sample and can be used as a guide to identify where each relation is mainly found.

**Assessing relations in scenario 2**. Terminologists can assess the frequency and the information expressed by relations and related terms in the corpus. Then, they can decide whether to include the relation from the corpus in the definition being produced. It is important to notice that relations in this scenario refer to the most frequent specifications of possible traits of concepts that are not usually found in dictionaries. The higher the frequency of the relation type in the corpus, the higher the probability of finding the related terms in specialized texts.

**Assessing relations in scenario 3**. Terminologists may compare relation types found in dictionaries to those identified in the corpus. If the information found in each source is different, terminologists can assess the relevance of information in both sources and decide to include elements from the two sources or from one of them. The frequency of relation types in the corpus and the level of knowledge of prospective users of the new definitions are factors to consider in this process of selecting information for definitions.

**Assessing relations in scenario 1**. Scenario 1 shows the relations that appear only in dictionaries. Despite their occurrence in a lower number of terms than the other scenarios, these relations express traits that apply to all the entities or activities designated by the term. Terminologists can assess the traits that these relations express and decide on their relevance for definitions based on the needs of the user of the new definition.

# Conclusion

The objectives of this study were to analyze and compare the conceptual relations included in dictionary definitions and in a corpus of fisheries sustainability, identify in which source the relation types used in the field are mainly found and provide methodological guidelines to enrich terminological definitions in the field.

To achieve our research objectives, we built an English corpus of specialized texts on fisheries sustainability. The corpus was composed of scientific articles and reports totaling 624,120 words. The term extractor TermoStat (Drouin, 2003) allowed us to extract the most specific terms of the corpus placed in the list of results in order of specificity. From that list we kept a final sample of the first 20 single nouns designating entities or activities and defined in at least two of the three dictionaries selected for the study.

For each term of the sample, we analyzed all the relation types found in their dictionary definitions and the corpus. We were able to obtain the most frequent related units from the corpus thanks to the conventional and the ESSG (León Araúz & San Martín, 2018) word sketches in Sketch Engine (Kilgarriff et al., 2014). The use of paraphrases allowed us to identify which relation was held between the term and the related units both from the dictionaries and the corpus.

The analysis of relations identified in the corpus and the dictionaries allowed us to compile a list of 24 relation types used in the subdomain of fisheries sustainability and the respective paraphrases we used to identify them. After completing the analysis, we were able to record and compare the relation types found in the dictionaries and in the corpus. This allowed us to calculate for how many terms each relation type occurs and to identify in which source they are mainly found (corpus, dictionaries, or both). As a result, we obtained the relation types that are mainly found in the dictionaries (scenario 1), in the corpus (scenario 2) and in both sources (scenario 3).

We found that for entity and activity terms, the most frequent scenario considering the number of terms with which relations are associated is scenario 3, followed by scenario 2 and the least frequent scenario is scenario 1. In addition to that, we provided a summary of the most prominent

relation types occurring in each scenario and various examples to illustrate the way those relations are found. Our results also show that both dictionaries and corpora provide relevant relations for definitions, given that both sources contain relations that appear only in that source and are absent from the other source for specific terms. Furthermore, we believe that the three scenarios identified in our study should be considered when selecting relation types for definitions.

Relations in scenario 1 express information that applies to all the elements designated by a given term that can be useful for a non-expert reader to understand the concept. Relations occurring in scenario 2 express frequent specifications of possible traits of concepts that can be added to the elements found in dictionaries to create enriched definitions. This suggests that corpora and dictionaries are complementary sources for definitions. We believe that using possible traits in definitions could be particularly useful for interpreters to become familiar with terms and related concepts likely to appear in specialized texts or discussions. Relation types occurring in scenario 3 can also be relevant for the selection of definitional content. When a relation is found in both the corpus and the dictionaries, we have seen that the same relation expresses different kinds of information in each source, and both may contain relevant information for definitions.

Our study faced various constraints related to the unavailability of dictionaries specialized in sustainable fisheries and the corpus size. Unfortunately, we were not able to find specialized dictionaries focusing on the subdomain of fisheries sustainability. This implied that many of the specific terms of our corpus provided by TermoStat were not described in the dictionaries selected for the study. We selected three dictionaries specialized on the wider fisheries field and we analyzed the candidate terms described in at least two of them. Although it would have been ideal to compare dictionaries and corpus from the same subdomain, it was important to focus the research on the most recent one, which is sustainable fisheries. The reason for this is that conferences interpreted and translated nowadays are likely to include the most recent topics of the field.

A second limitation encountered is that some of the definitions were identical or very similar in two or three dictionaries. This limited the analysis to the content of one of the dictionaries in

some cases. The availability of a wider variety of dictionaries would probably have led us to find dictionary relations associated with more terms. Finally, our corpus was not large enough as to obtain more relations from the corpus using the semantic word sketches. This is probably the reason why we obtained most of the relation types with the conventional word sketch. A larger corpus might have provided more relations from the corpus with the semantic word sketch.

In future studies, we could request access to glossaries used internally by organizations working specifically on fisheries sustainability for research purposes. Furthermore, we could build a larger corpus to obtain more corpus results from using the semantic word sketch. The methodology for obtaining relations typical of this domain could be applied to other domains or subdomains outside the fisheries field. Finally, we could conduct a similar study for definitions and corpora in other languages such as Spanish and French.

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# Appendix 1

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| **Name in text** | **File name** | |
| doc. 0 | 2018 Status of Stocks RtC_FINAL_508.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 2,545 | July 2019 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References, charts, and images removed | An official report to the Government of the United States on the status of fish stocks during the year 2018. | From pdf to word and from word to plain text (txt) |

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| **Name in text** | **File name** | |
| doc. 1 | 2020-Global-Landscape-Review-of-FIPs.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 57,772 | March 25, 2020 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References, charts, and images removed | A research report on fishery improvement projects around the world | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
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| **Name in text** | **File name** | |
| doc. 2 | 2020Hill_et_al-Fish_and_Fisheries.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 5,824 | January 6, 2020 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References, charts and images removed | Article on safe ecological limits for predators to consider when regulating fishing activities | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Alder, J., & Pauly, D. (2008). *A comparative assessment of biodiversity, fisheries, and aquaculture in 53 countries' Exclusive Economic Zones. Fisheries Centre Research Reports* (16.7). Fisheries Centre, University of British Columbia. http://www.seaaroundus.org/doc/publications/books-and-reports/2008/Alder-and-Pauly-comparative-assessment-of-biodiversity-fisheries-and-aquaculture-53-countries-EEZ.pdf (retrieved on January 20, 2021) | | |
| **Name in text** | **File name** | |
| doc. 3 | Alder Pauly 2008 Assess 53 countries.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 35,778 | August 2008 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References, charts, and images removed | An assessment on how 53 maritime countries manage their fishing resources | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Alfaro-Shigueto, J., Mangel, J., Pajuelo, M., Dutton, P., Seminoff, J., & Godley, B. (2010). Where small can have a large impact: Structure and characterization of small-scale fisheries in Peru. *Fisheries Research, 106*(1), 8-17. https://doi.org/10.1016/j.fishres.2010.06.004 (retrieved on September 14, 2020) | | |
| **Name in text** | **File name** | |
| doc. 4 | Alfaro2010.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 6,622 | October 2010 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References, charts, and images removed | A review of the evoluation of small-scale fisheries in Peru from 1995 to 2005 to provide orientations on fishing geras and operations. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Alfaro-Shigueto, J., Mangel, J., Bernedo, F., Dutton, P., Seminoff, J., & Godley, B. (2011). Small-scale fisheries of Peru: a major sink for marine turtles in the Pacific. *Journal of Applied Ecology, 48*(6), 1432-1440. https://doi.org/10.1111/j.1365-2664.2011.02040.x (retrieved on July 20, 2020) | | |
| **Name in text** | **File name** | |
| doc. 5 | Alfaro-Shigueto et al. 2011, japplecol.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 4,646 | December 2011 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | Article on the impacts of small-scale fisheries on marine turtles | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Arias Shreiber, M. (2012). The evolution of legal instruments and the sustainability of the Peruvian anchovy fishery. *Marine Policy, 36*(1), 78-89. https://doi.org/10.1016/j.marpol.2011.03.010 (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 6 | Arias-Schreiber-2011 evoluition legal frame anchoveta.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 9,082 | January 2012 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | Article on the evolution of the legal sytem that supports the sustainability of the anchoveta fishery in Peru | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Arias Schreiber, M., & Halliday, A. (2013). Uncommon among the commons? Disentangling the sustainability of the Peruvian anchovy fishery. *Ecology and Society, 18*(2), 12. http://dx.doi.org/10.5751/ES-05319-180212 (retrieved on June 13, 2020) | | |
| **Name in text** | **File name** | |
| doc. 7 | Arias-Schreiber-Halliday-2013.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 8,024 | June 2013 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | The article assesses the institutional characteristics of the anchoveta fishery and associates them to the sustainability principales for resource management | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Arias Schreiber, M., Ñiquen, M., & Bouchon, M. (2011). Coping Strategies to Deal with Environmental Variability and Extreme Climatic Events in the Peruvian Anchovy Fishery. *Sustainability*, *3*(6), 823-846. https://doi.org/10.3390/su3060823 (retrieved on November 14, 2020) | | |
| **Name in text** | **File name** | |
| doc. 8 | Arrias Schereiber-Niquen-Boucho 2011 sustainability.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 7,408 | June 16, 2011 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | The article examines the strategies to deal with the El Niño Southern Oscillation (ENSO) climate conditions to reduce climatic impacts on the anchoveta fisheries. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Bertrand, S., Dewitte, B., Tam, J., Díaz, E., & Bertrand, A. (2008). Impacts of Kelvin wave forcing in the Peru Humboldt Current system: Scenarios of spatial reorganizations from physics to fishers. *Progress in Oceanography*, 79(2–4), 278-289. https://doi.org/10.1016/j.pocean.2008.10.017 (retrieved on November 14, 2020) | | |
| **Name in text** | **File name** | |
| doc. 9 | Bertrand-S-et-al-Kelvin-2008.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 7,622 | October-December 2008 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An article on the effects of Kelvin waves in the Humboldt Current system on the spacial distribution of organisms. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Norse, E., Brooke, S., Cheung, W., Clark, M., Ekeland, I., Froese, R., Gjerde, K., Haedrich, R., Heppell, S., Morato, T., Morgan, L., Pauly, D., Sumaila, R., & Watson, R. (2012). Sustainability of deep-sea fisheries. *Marine Policy, 36*(2), 307-320. https://doi.org/10.1016/j.marpol.2011.06.008 (retrieved on November 15, 2020) | | |
| **Name in text** | **File name** | |
| doc. 10 | Cheung Sustainability of deep sea fisheries.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 9,906 | March 2012 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An assessment of key aspects of deep-sea species and their sustainability | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Christian, C., Ainley, D., Bailey, M., Dayton, P., Hocevar, J., LeVine, M., Nikoloyuk, J., Nouvian, C., Velarde, E., Werner, R., & Jacquet, J. (2013). A review of formal objections to Marine Stewardship Council fisheries certifications. *Biological Conservation*, *161*, 10-17. https://doi.org/10.1016/j.biocon.2013.01.002 (retrieved on October 6, 2020) | | |
| **Name in text** | **File name** | |
| doc. 11 | Christian et al 2013 MSC claim.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 6,423 | May 2013 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A summary of the formal objections to Marine Stewardship Concil certifications | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Bertrand, A., Lengaigne, M., Takahashi, K., Avadi, A., Poulain, F., & Harrod, C. (2020). *El Niño Southern Oscillation (ENSO) effects on fisheries and aquaculture* (Vol. 660). Food & Agriculture Organization. https://reliefweb.int/report/world/el-ni-o-southern-oscillation-enso-effects-fisheries-and-aquaculture (retrieved on October 7, 2020) | | |
| **Name in text** | **File name** | |
| doc. 12 | FAO IRD 2020 El Nino impacts fisheries aquaculture.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 76,277 | April 22, 2020 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A report explaining the impacts of El Niño on the fisheries and aquaculture sectors all over the world | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Gutiérrez, M., Castillo, J., Naranjo, L., & Akester, M. (2017). Current state of goods, services and governance of the Humboldt Current Large Marine Ecosystem in the context of climate change. *Environmental Development, 22*, 175-190. https://doi.org/10.1016/j.envdev.2017.02.006 (retrieved on October 6, 2020) | | |
| **Name in text** | **File name** | |
| doc. 13 | Gutierrez et al 2017 state of G&S Humboldt LME.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 8776 | June 2017 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A description of the state of goods and services provided by the marine ecosystem area of the Humboldt Current in Peru and Chile. | From pdf to word and from word to plain text (txt) |

| Reference | | |
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| Bureau Veritas. (2010). *Pre-assessment report for the Peruvian Hake trawl fishery.* MSC Fisheries. *https://www.iss-foundation.org/fishery-goals-and-resources/the-marine-stewardship-council-standard/marine-stewardship-council-msc-fishery-certification/* (retrieved on October 7, 2020) | | |
| **Name in text** | **File name** | |
| doc. 14 | MSC_Peruvian Hake_Pre-assessment report_2010-07 BV.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 15,432 | July 30, 2010 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An assessment to find out if the Peruvian hake trawl fishery meets the sustainability principles of the MSC certification. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Sai Global.(2017). *Marine Stewardship Council Pre-Assessmemnt Final Report for the Maine Wild Blue Mussel Dredge Fishery*. (Form 12, issue 3). https://saiassurance.ca/audit-and-certification (retrieved on November 13, 2020) | | |
| **Name in text** | **File name** | |
| doc. 15 | MSC Pre-Assessment_Wild Blue Mussels_August 2017-final | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 20,910 | August 17, 2017 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An assessment to find out if the Maine wild blue mussel dredge fishery meets the sustainability principles of the MSC certification. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Department of Commerce United States of America. (2019). *Improving International Fisheries Management 2019 Report to Congress.* National Oceanographic and Atmospheric Administration. https://media.fisheries.noaa.gov/dam-migration/improvingintlfisheriesmgmt_2019_report_final.pdf (retrieved on October 6, 2020) | | |
| **Name in text** | **File name** | |
| doc. 16 | NOAA ImprovingIntlFisheriesMgmt 2019 report final.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 38,316 | September 2019 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An official report to the Government of the United States on the measures to improve fishers and resource management in 2019. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Pascoe, S., Cannard, T., Dowling, N., Dichmont, C., Breen, S., Roberts, T., Pears, R., Leigh, G. ( 2019). Developing Harvest Strategies to Achieve Ecological, Economic and Social Sustainability in Multi-Sector Fisheries. *Sustainability*, 11(3), 644. https://doi.org/10.3390/su11030644 (retrieved on November 10, 2020) | | |
| **Name in text** | **File name** | |
| doc. 17 | Nuevo 1.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 7,276 | January 26, 2019 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An article on harvest strategies to achieve ecological, economic and social sustainability objectives. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Oyinlola, M., Reygondeau, G., Wabnitz, C., & Cheung, W. (2020). Projecting global mariculture diversity under climate change. *Global Change Biology*, *26*(4), 2134-2148. https://doi.org/10.1111/gcb.14974 (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 18 | Nuevo 2.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 6,764 | April 2020 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An article on the climate change impacts on marine aquaculture and the opportunities for climate adaptation. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Singh-Renton, S., & McIvor, I. (2015). *Review of current fisheries management performance and conservation measures in the WECAFC area. FAO Fisheries and Aquaculture Technical Paper (587).* Food and Agriculture Organization of the United Nations. *https://www.fao.org/3/i4255e/i4255e.pdf* (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 19 | Nuevo 3 FAO fisheries management performance.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 138,729 | April 2015 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A report on the legal, administrative and management frameworks currently used to regulate fisheries in the Western Central Atlantic region. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Westlund, L., & Zelasney, J. (2019). *Securing sustainable small-scale fisheries: sharing good practices from around the world. FAO Fisheries and Aquaculture Technical Paper* (644). Food and Agriculture Organization of the United Nations. https://www.fao.org/3/CA3041EN/ca3041en.pdf (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 20 | Nuevo 4 FAO sustainable small scale practices.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 82,060 | July 2019 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A series of case studies from different regions of the world implementing good practices for sustainability of small-scale fisheries. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Sustainable Fisheries Partnership. (2019). *Reduction Fisheries: SFP Fisheries Sustainability Overview 2019.* *https://s3.amazonaws.com/sfpcms.sustainablefish.org/historical-assets/story24/2019_reduction_fisheries_report_FINAL.pdf* (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 21 | Nuevo 5 2019_reduction fisheries_report_FINAL (1).tx | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 15,194 | October 2019 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An analysis of reduction fisheries from 26 different stocks worldwide with a focus on the sustainability of the management systems. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Amorós, S., Gozzer, R., Melgar, V., & Rovegno, N. (2017). *Peruvian mahi mahi fishery (Coryphaena hippurus): characterization and analysis of the supply chain.* WWF Marine Program of WWF-Peru. https://wwfeu.awsassets.panda.org/downloads/mahi_mahi_value_chain_en.pdf (retrieved on November 13, 2020) | | |
| **Name in text** | **File name** | |
| doc. 22 | Nuevo 6 WWF mahi_mahi_value_chain_en.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 8,663 | March 2017 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An assessment of the mahi-mahi supply chain in Peru and the opportunities for improving its sustainability and management. | From pdf to word and from word to plain text (txt) |

| Reference | | |
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| Oyanedel, R., Gelcich, S., & Milner-Gulland, E.J. (2020). *Motivations for (non-)compliance with conservation rules by small-scale resource users. Conservation letters, 13*(5). https://doi.org/10.1111/conl.12725 (retrieved on November 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 23 | Oyadenel et al 2020 motivations for non compliance conservation rules.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 3,490 | April 29, 2020 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An assessment of compliance with management regulations in a small-scale fishery in Chile with a view to improve resource management policies. | From pdf to word and from word to plain text (txt) |

| Reference | | |
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| Bone, J., Clavelle, T., Ferreira, J., Grant, J., Ladner, I., Immink, A., Stoner, J., & Taylor, N. (2018). *Best Practices for Aquaculture Management. Guidance for implementing the ecosystem approach in Indonesia and beyond*. https://sustainablefish.org/wp-content/uploads/2021/09/Aquaculture-Best-Practices-Guide-Nov-9-web-1.pdf (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 24 | SFP Aquaculture Best Practices Guide Nov 9 web.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 14,623 | October 2018 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A summary of key scientific and technical guidelines to address aquaculture challenges. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Sustainable Fisheries Partnership (2018). *Reducing Bycatch of Endangered, Threatened, and Protected Species in Key Fisheries. https://s3.amazonaws.com/sfpcms.sustainablefish.org/historical-assets/publication_13/BAND_report_on_ETP_interactions_in_FIPs_final.pdf* (retrieved on October 6, 2020) | | |
| **Name in text** | **File name** | |
| doc. 25 | SFP report on ETP interactions in FIPs_final.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 20,059 | April 24, 2018 | technical report |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | A study that explores the adequacy of fishery improvement projects to address bycatch of endangered, threatened and protected species. | From pdf to word and from word to plain text (txt) |

| Reference | | |
|---|---|---|
| Sumalia, U., Seller, D., Hood, L., Palomares, M., Li, Y., & Pauly, D. (2020). Illicit trade in marine fish catch and its effects on ecosystems and people worldwide. *Science Advances*, *6*(9). DOI: 10.1126/sciadv.aaz3801 (retrieved on September 9, 2020) | | |
| **Name in text** | **File name** | |
| doc. 26 | Sumaila Illicit trade.txt | |
| **Occurrences** | **Date of publication** | **Textual genre** |
| 5,899 | February 26, 2020 | scientific article |
| **Removals** | **Subject** | **Conversion** |
| References and images removed | An article on the economic cost of illicit trade of marine catches of the world. | From pdf to word and from word to plain text (txt) |

# Appendix 2

## Terms validated for the study and their presence as entries in the dictionaries.

| Candidate | VOICES | NOAA | FAO |
|---|---|---|---|
| fishery | yes | yes | yes |
| management | yes | yes | yes |
| fishing | yes | yes | yes |
| catch | yes | yes | yes |
| stakeholder | yes | yes | yes |
| aquaculture | yes | yes | no |
| fip | no | no | no |
| fishery management | no | no | yes |
| vessel | no | no | no |
| fisher | no | yes | yes |
| small-scale fishery | no | no | yes |
| fish | no | yes | yes |
| bycatch | yes | yes | yes |
| ecosystem | yes | yes | yes |
| anomaly | no | no | no |
| shark | no | no | no |
| monitoring | no | yes | yes |
| tonne | yes | no | no |
| resource | no | yes | no |
| landing | yes | yes | yes |
| enforcement | no | no | no |
| stock | yes | yes | yes |
| sustainability | yes | yes | yes |
| turtle | no | no | no |
| capture | no | no | no |
| legislation | no | no | no |
| anchovy | no | no | no |
| gear | no | no | yes |
| commercial fishery | no | yes | no |
| recreational fishery | no | yes | yes |
| participant | no | no | no |
| compliance | no | no | no |
| shrimp | no | no | no |
| mussel | no | no | no |
| management process | no | no | no |
| seafood | no | no | no |

| | | | |
|---|---|---|---|
| capacity | no | yes | yes |
| co-management | no | no | yes |
| capture fishery | no | no | yes |
| country | no | no | no |
| tuna | no | no | no |
| sea | no | no | no |
| lobster | no | no | no |
| governance | no | yes | yes |
| habitat | yes | yes | yes |
| seabird | no | no | no |
| effort | yes | yes | no |
| sea turtle | no | no | no |
| certification | no | no | yes |
| inland fishery | no | no | no |
| major fishery | no | no | no |
| fishing effort | no | yes | yes |
| harvest | yes | yes | no |
| marine capture | no | no | no |
| quota | yes | yes | yes |
| climate | no | no | no |
| management plan | no | no | no |
| production anomaly | no | no | no |
| aquaculture production | no | no | no |
| management measure | no | no | no |
| assessment | no | yes | yes |
| supply chain | no | no | no |
| mahi mahi | no | no | no |
| participatory | no | no | no |
| climate change | no | no | no |
| biomass | yes | yes | yes |
| mitigation | no | no | yes |
| conservation | no | no | yes |
| fleet | no | no | yes |
| fishing community | yes | yes | no |
| participation | no | no | no |
| marine mammal | no | yes | no |
| fishing vessel | no | no | yes |
| overfishing | yes | yes | yes |
| sardine | no | no | no |
| implementer | no | no | no |
| mariculture | yes | yes | yes |
| longline | yes | yes | yes |
| fishing capacity(80) | no | yes | yes |
| mortality | no | yes | yes |
| management system | no | no | no |

| | | | |
|---|---|---|---|
| trawl | yes | no | yes |
| livelihood | no | no | yes |
| mammal | no | no | no |
| score | no | no | no |
| reef | no | yes | yes |
| fishery production | no | no | no |
| program | no | no | yes |
| hake | no | no | no |
| case study | no | no | no |
| blue mussel | no | no | no |
| sector | no | no | no |
| yield | yes | yes | yes |
| fishing activity | no | no | no |
| observer | sí | yes | yes |
| fishery resource | no | yes | yes |
| interaction | no | no | yes |
| closure | no | no | no |
| license | no | yes | yes |
| harvest strategy | no | no | no |
| cooperative | no | no | no |
| shrimp fishery | no | no | no |
| ocean | no | no | no |
| stock assessment | yes | yes | yes |
| fisherfolk n | no | no | no |
| non-compliance | no | no | no |
| deep-sea n | no | no | no |
| finfish | yes | yes | no |
| management cost | no | no | no |
| protected area | no | yes | yes |
| management tool | no | no | no |
| lobster fishery | no | no | no |
| community | yes | yes | yes |
| coast | no | no | yes |
| protocol | no | no | no |
| abundance | no | yes | yes |
| gender | no | no | no |
| food security | no | yes | yes |
| fishmeal | yes | yes | yes |
| management objective | no | yes | yes |
| biodiversity | no | yes | no |
| local level | no | no | no |
| clam | no | no | no |
| user | no | yes | yes |
| anchoveta | no | no | no |
| decision-making | no | no | no |

| | | | |
|---|---|---|---|
| precipitation | no | no | no |
| spiny lobster | no | no | no |
| chain (130) | no | no | no |
| variability | no | no | no |
| national level | no | no | no |
| small-scale fishery | no | no | yes |
| conflict management | no | no | no |
| predator | yes | no | no |
| marine resource | no | no | no |
| major commercial fishery | no | no | no |
| multispecies adj | no | no | no |
| key informant | no | no | no |
| fishing gear | no | yes | yes |
| reduction | no | no | yes |
| reference point | no | yes | yes |
| transparency | no | yes | no |
| engagement | no | no | no |
| precautionary approach | no | yes | no |
| annual production | no | no | no |
| fishery sector | no | no | no |
| national fishery | no | no | no |
| marine fishery | no | no | no |
| fishery legislation | no | no | no |
| sustainable fishery | no | no | no |
| disaster risk | no | no | no |
| mackerel | no | no | no |
| distribution | no | no | no |
| site visit | no | no | no |
| overcapacity | yes | yes | yes |
| informant | no | no | no |
| provision | no | no | no |
| illicit trade | no | no | no |
| freshwater | no | no | no |
| seine | no | no | no |
| high seas | yes | yes | no |
| disaster | no | no | no |
| resolution | no | no | no |
| specific management | no | no | no |
| fishery participant | no | no | no |
| well-being | no | no | no |
| participatory process | no | no | no |
| fishing operation | no | no | no |
| at-sea (170) | no | no | no |
| yellow clam | no | no | no |
| seabob | no | no | no |

| | | | |
|---|---|---|---|
| peruvian anchovy | no | no | no |
| subsector | no | no | no |
| artisanal fishery | no | yes | yes |
| tuna fishery | no | no | no |
| resilience | no | yes | yes |
| industrial fishery | no | yes | no |
| marine capture fishery | no | no | no |
| grouper | no | no | no |
| discard | no | yes | yes |
| ocean condition | no | no | no |
| improvement | no | no | no |
| peruvian hake | no | no | no |
| dredge | yes | no | yes |
| octopus | no | no | no |
| stakeholder involvement | no | no | no |
| reporting | no | no | no |
| inland fishery production | no | no | no |
| anchovy fishery | no | no | no |
| event type | no | no | no |
| guideline | no | no | no |
| recovery | no | no | no |
| population | yes | yes | yes |
| limited entry | yes | yes | no |
| extreme event | no | no | no |
| marine protected area | yes | yes | yes |
| taxon | no | no | no |
| sustainable seafood | no | no | no |
| small-scale-fisher | no | no | no |
| use | no | no | no |

# Appendix 3

## Terms present in at least two dictionaries and the corpus.

| Candidat | Marine sanctuary | NOAA | FAO |
|---|---|---|---|
| fishery | yes | yes | yes |
| management | yes | yes | yes |
| fishing | yes | yes | yes |
| catch | yes | yes | yes |
| stakeholder | yes | yes | yes |
| aquaculture | yes | yes | no |
| fisher | no | yes | yes |
| fish | no | yes | yes |
| bycatch | yes | yes | yes |
| ecosystem | yes | yes | yes |
| monitoring | no | yes | yes |
| landing | yes | yes | yes |
| stock | yes | yes | yes |
| sustainability | yes | yes | yes |
| recreational fishery | no | yes | yes |
| capacity | no | yes | yes |
| governance | no | yes | yes |
| habitat | yes | yes | yes |
| effort | yes | yes | no |
| fishing effort | no | yes | yes |
| harvest | yes | yes | no |
| quota | yes | yes | yes |
| assessment | no | yes | yes |
| biomass | yes | yes | yes |
| fishing community (70) | yes | yes | no |
| overfishing | yes | yes | yes |
| mariculture | yes | yes | yes |
| longline | yes | yes | yes |
| fishing capacity (80) | no | yes | yes |
| mortality | no | yes | yes |
| trawl | yes | no | yes |
| reef | no | yes | yes |
| yield | yes | yes | yes |
| observer | sí | yes | yes |
| fishery resource | no | yes | yes |
| license | no | yes | yes |
| stock assessment | yes | yes | yes |
| finfish | yes | yes | no |

| | | | |
|---|---|---|---|
| protected area | no | yes | yes |
| community | yes | yes | yes |
| abundance | no | yes | yes |
| food security | no | yes | yes |
| fishmeal | yes | yes | yes |
| management objective | no | yes | yes |
| user | no | yes | yes |
| fishing gear | no | yes | yes |
| reference point | no | yes | yes |
| overcapacity | yes | yes | yes |
| high seas | yes | yes | no |
| artisanal fishery | no | yes | yes |
| resilience | no | yes | yes |
| discard | no | yes | yes |
| dredge | yes | no | yes |
| population | yes | yes | yes |
| limited entry | yes | yes | no |
| marine protected area | yes | yes | yes |

# Appendix 4

## Analysis of relations per term

### 1. Bycatch (E) in the dictionaries

**bycatch (entity)**

**NOAA**

| Fish other than the primary target species that are caught incidental to the harvest of the primary species. Bycatch may be retained or discarded. Discards may occur for regulatory or economic reasons. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of | fish | part <--> whole | <-- |
| does not include | primary target species | part <--> whole | <-- |
| undergoes | catch (v.) | patient <--> activity | --> |
| is caught in a specific mode | incidental | entity <--> characteristic | --> |
| undergoes | retain | patient <--> activity | --> |
| | discard | | |

**FAO**

| Fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of | fish | part <--> whole | <-- |
| undergoes | harvest (v.) | patient <--> activity | --> |
| is located in | fishery | entity <--> place | --> |
| does not undergo | sell | part <--> whole | <-- |
| | keep | | |
| | release alive | | |
| includes | economic discards | part <--> whole | <-- |
| | regulatory discards | | |

**Voices**

| Not defined as entity. |
|---|

### 2. Bycatch (E) in the corpus

**bycatch (entity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has a specific probability | potential (4) | entity <--> characteristic | --> | modifiers of X |
| | estimated (3) | | | |
| has a specific degree | high (3) | | | |
| **Realization**<br>bycatch (E) < has a specific probability > potential, estimated | | | | |
| **Concordance**<br>Given that mussel dredges are very selective in nature during operations on mussel beds, overall impacts on potential **bycatch** on secondary species should be negligible. (doc. 15) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is caught in a period of | annual (3) | entity <--> time | --> | modifiers of X |
| **Realization**<br>bycatch (E) < is caught in a period of > annual | | | | |
| **Concordance**<br>Table 2 shows the estimated average annual **bycatch** of turtles over the years sampled for our study harbours and fisheries. (doc. 5) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| undergoes | observe (3) | patient <--> activity | --> | modifiers of X |
| | lower (v.) ( 2) | | | |
| **Realization**<br>bycatch (E) < undergoes > observe, lower | | | | |

**Concordance**
Observed seabird **bycatch** in the Convention Area is near zero in the legal fishery outside of the French EEZ. (doc. 16)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | mitigation (14) | patient <--> activity | --> | nouns modified by X |
| | monitoring (6) | | | |
| | management (5) | | | |

**Realization**
bycatch (E) < undergoes > mitigation

**Concordance**
Train skippers and crew members in best practices for **bycatch** mitigation, handling, and release of ETP species. (doc. 25)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is quantified through | rate (14) | entity <--> indicator | --> | nouns modified by X |
| is assessed through | data (9) | | | |

**Realization**
bycatch (E) < is measured through > rate, data

**Concordance**
Furthermore, **bycatch** rates are often hard to assess due to the nature of the SSF itself, i.e. diffuse effort, remote landing sites and marginalization. (doc. 4)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is part of | population (2) | part <--> whole | --> | nouns modified by X |

**Realization**
bycatch (E) < is part of > population

**Concordance**
There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to **bycatch** populations. (doc. 14)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | reduce (33) | patient <--> activity | --> | verbs with X as object |
| | minimize (11) | | | |
| | address (5) | | | |

**Realization**
bycatch (E) < undergoes > reduce, minimize, address

**Concordance**
In the Gulf of Mexico, shrimpers are voluntarily reducing drift net set times, which reduces **bycatch**, improves product quality, and helps shrimpers sell their product at a premium. (doc. 1)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | remain (3) | patient <--> activity | --> | verbs with X as subject |

**Realization**
bycatch (E) < undergoes > remain

**Concordance**
The directed fisheries that target small pelagic species are potentially more discerning in catch composition, although the actual levels of **bycatch** remain uncharacterized. (doc. 21)

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a group of | shark (3) | part <--> whole | <-- | is the generic of |
| | loggerhead (2) | | | |

**Realization**
bycatch (E) < is a group of > shark, loggerhead

**Concordance**
The most important actions so far have included implementation of a NPOA on sharks, rays and chimaeras; national implementation of regional/international measures for minimizing impacts on **bycatch** species such as sharks and turtles; prohibition of shark finning; adoption of measures to manage and limit fishing capacity in key fisheries; and improved port management controls. (doc. 19)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is part of | catch (3) | part <--> whole | --> | is a type of |

**Realization**
bycatch (E) < is part of > catch

**Concordance**
For the purposes of this report, SFP defines **bycatch** as "the catch of non-target species, whether retained and sold or discarded" (Lezama-Ochoa et al., 2016).(doc. 25)

## 3. Catch (E) in the dictionaries

**catch (entity)**

**NOAA**

| The total number (or weight) of fish **caught by fishing operations**. Catch should include all fish killed by the act of fishing, not just those landed. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of | fish | part <--> whole | <-- |
| is quantified as | number, weight | entity <--> indicator | --> |
| is the result of | fishing(A) | activity <--> result | <-- |
| undegoes | catch | patient <--> activity | --> |
| | kill | | |
| includes | landings | part <--> whole | <-- |

**FAO**

| The component of fish encountering fishing gear which is retained by the gear. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a group of fish | fish | part <--> whole | <-- |
| is actor of | encounter | agent <--> activity | --> |
| undergoes | gear, retain | patient <--> activity | --> |

**Voices**

| The total number or poundage of fish captured from an area over some period of time. The catch may take place in an area different from where the fish are landed. Note that catch, harvest, and landings have different definitions. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is quantified as | number, weight | entity <--> indicator | --> |
| is a group of | fish | part <--> whole | <-- |
| undegoes | capture | patient <--> activity | --> |
| is located in | area | entity <--> place | --> |

## 4. Catch (E) in the corpus

**catch (entity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is quantified through | total (65) | entity <--> indicator | --> | modifiers of X |
| | total allowable (31) | | | |
| **Realization**<br>catch (E) < is quantified through > total, total allowable | | | | |
| **Concordance**<br>The New Zealand fishery has dominated global catches, and is the only one that has persisted over time with total **catches** of more than a few thousand tonnes. (doc. 10) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| comes from | global (46) | entity <--> place | --> | modifiers of X |
| **Realization**<br>catch (E) < comes from > all over the word | | | | |
| **Concordance**<br>Since the last FIP review, MSC-certified catch has grown to 13% of global **catch**, and the share of catch engaged in FIPs has also grown. (doc.25) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is a group of | fish (32) | part <--> whole | <-- | modifiers of X |
| **Realization**<br>catch (E) < is a group of > fish | | | | |
| **Concordance**<br>The repetition of strong El Niño events in a warmer ocean, and the resulting loss of productive habitat, will likely diminish fish **catches** for coastal communities and reduce protection from storms and rising seas, putting coastal communities in peril. (doc. 12) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| undergoes | limit (39) | patient <--> activity | --> | nouns modified by X |
| | quota (16) | | | |
| | restriction(6) | | | |
| **Realization**<br>catch (E) < undergoes > limit, quota, restriction | | | | |

| **Concordance** |
|---|
| Science-informed management: If catch limits are established by non- scientific processes, overexploitation is more likely to persist. (doc. 1) |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is assessed through | data (31) | entity <--> indicator | --> | nouns modified by X |
| is quantified through | rate (30) | | | |
| | volume (17) | | | |
| **Realization**<br>catch (E) < is assessed through > data | | | | |
| **Concordance**<br>Most deep-sea fishes have life histories giving them far less population resilience/productivity than shallow-water fishes, and could be fished sustainably only at very low catch **rates** if population resilience were the sole consideration. (doc. 10) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is the actor of | supply (3) | agent <--> activity | --> | nouns modified by x |
| **Realization**<br>catch (E) < is the actor of > supply | | | | |
| **Concordance**<br>Southeast Asian fisheries that are used principally for reduction (mainly from "trash fish" fisheries, but also from fisheries targeting small pelagics) are also very relevant to the global **catch** supply for fishmeal, fish oil, and agriculture fertilizers, but are not included in this report.(doc 21) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| undergoes | reduce (24) | patient <--> activity | --> | verbs with X as object |
| | report (23) | | | |
| | engage (9) | | | |
| **Realization**<br>catch (E) < undergoes>reduce, report, engage | | | | |
| **Concordance**<br>This establishes mitigation measures for reducing the incidental catch of seabirds by fishing vessels using pelagic longline authorized to operate in waters under Brazilian jurisdiction, south of latitude 20oS. (doc. 19) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| undergoes | increase (5) | patient <--> activity | --> | verbs with X as subject |
| | enter (4) | | | |
| **Realization**<br>catch (E) < undergoes > increase, enter | | | | |
| **Concordance**<br>Conversely, Bangladesh saw the greatest production anomaly during extreme El Niño, where **catch** increased by a mean of +38 000 tonnes, an equivalent of +3.6 percent of Bangladeshi inland fishery production during 2016, or +6.9 percent of national long-term mean annual capture. (doc. 12) | | | | |

## 5. Ecosystem in the dictionaries

**ecosystem (entity)**

**NOAA**

| A geographically specified system of organisms, the environment, and the processes that control its dynamics. Humans are an integral part of an ecosystem. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is located at | specific place | entity <--> place | --> |
| is a type of | system | generic <--> specific | <-- |
| includes | organisms | part <--> whole | <-- |
| | environment | | |
| | process | | |
| | humans | | |

**FAO**

| A functioning, interacting system composed of living organisms and their environment. The concept is applicable at any scale, from the planet as an ecosystem to a microscopic colony of organisms and its immediate surroundings. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | system | generic <--> specific | <-- |
| has a specific state | functioning, interacting | entity <--> characteristic | --> |
| includes | living organisms | part <--> whole | <-- |
| | environment | | |
| is the generic of | colony | generic <--> specific | --> |

**Voices**

| A geographically specified system of organisms, including humans, the environment, and the processes that control the dynamics of the system. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is located in | specific place | entity <--> place | --> |
| is a type of | system | generic <--> specific | <-- |
| includes | organisms | part <--> whole | <-- |
| | environment, process | | |

## 6. Ecosystem in the corpus

**ecosystem (entity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has as environment | marine (47) | entity <--> environment | --> | modifiers of X |
| | freshwater (9) | | | |
| | aquatic (6) | | | |

**Realization**
ecosystem < has as environment > marine, coastal, freshwater

**Concordance**
These approaches are comprehensive in assessing capture fisheries and their collateral impacts on marine **ecosystems**, as well as the social and economic implications of fishing activities. (doc. 3)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has a specific resilience | vulnerable (6) | entity <--> characteristic | --> | modifiers of X |

**Realization**
ecosystem < has a specific resilience > vulnerable

**Concordance**
Despite the imprecision of available data, the FAO considers IUU fishing a serious threat to high-value fisheries that are already overfished; to marine habitats, including vulnerable marine **ecosystems** (VMEs); and to food security and the economies of developing countries. (doc. 16)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is located at | coastal (20) | entity <--> place | --> | modifiers of X |
| | deep-sea (3) | | | |

**Realization**
ecosystem< is located at > coastal, deep-sea

**Concordance**
The purpose of this paper is to define ecological scenarios for the Peruvian coastal **ecosystem** under varying oceanic equatorial KW forcing. (doc. 09)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| undergoes | impact (11) | patient <--> activity | --> | nouns modified by X |

**Realization**
ecosystem < undergoes > impact

**Concordance**
Moreover, for many bycatch species (and other types of ecosystem impacts), including the sharks commonly caught in the Canadian fishery, researchers have not fully determined the extent to which individual fisheries are responsible. (doc. 11)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| includes | dynamics (13) | part <--> whole | <-- | nouns modified by X |
| | goods (12) | | | |

**Realization**
ecosystem < includes > dynamics

**Concordance**
Correlations were explored between the 18 metrics describing the KW forcing and the 10 metrics describing the Peruvian coastal **ecosystem** dynamics, these being lagged either 1–4 or 1–6 months lags for the eastern and western KW forcing, respectively. (doc. 9)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is assessed through | health (12) | entity <--> indicator | --> | nouns modified by X |
| | structure (11) | | | |

**Realization**
ecosystem < is assessed through > health

**Concordance**
This policy on which it is based has been developed in recognition of the importance of sensitive benthic coastal areas to overall aquatic **ecosystem** health in Maine. (doc. 15)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | manage (4) | patient <--> activity | --> | verbs with X as object |
| | protect (3) | | | |
| | support (2) | | | |
| **Realization**<br>ecosystem < undergoes > manage, protect, support | | | | |
| **Concordance**<br>These studies provided key information on managing **ecosystems**, and on criteria upon which the indicators can be selected, i.e.: A. . (doc. 3) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located at | world (2) | entity <--> place | --> | possessors of X |
| **Realization**<br>ecosystem < is located at > world | | | | |
| **Concordance**<br>It covers 344,400 km2 of the world's largest coral reef **ecosystem**, and includes some 3000 coral reefs, 600 continental islands, 300 coral cays and about 150 inshore mangrove islands. (doc. 17) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the generic of | seagrass beds (2) | generic <--> specific | --> | is the generic of |
| | mangrove (2) | | | |
| **Realization**<br>ecosystem < is the generic of > seagrass, mangrove | | | | |
| **Concordance**<br>Coral reefs and their surrounding **ecosystems**, including mangroves and seagrass beds that provide important fish habitat and support coastal fisheries in the WIO region, are already facing unprecedented stress from warming and rising seas, acidification and storms. (doc. 12) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| includes | predator (2) | part <--> whole | <-- | is the generic of |
| **Realization**<br>ecosystem < includes > predator | | | | |
| **Concordance**<br>This has been accompanied by support for ecosystem-based management, which aims to incorporate objectives for other parts of the **ecosystem**, including predators of fished stocks. (doc. 2) | | | | |

## 7. Fish (E) in the dictionaries

**Fish (entity)**

**NOAA**

| Used as a collective term, includes mollusks, crustaceans and any aquatic animal which is harvested. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is the generic of | mollusks | generic <--> specific | --> |
| | crustaceans | | |
| undergoes | harvest (A) | patient <--> activity | --> |

**FAO**

| Literally, a cold-blooded lower vertebrate that has fins, gills and scales (usually), and lives in water. Used as a collective term it includes fish, molluscs, crustaceans and any aquatic animal which is harvested. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a | lower vertebrate | generic <--> specific | <-- |
| has a specific temperature | cold-blooded | entity <--> characteristic | --> |
| is comprised of | fins | part <--> whole | <-- |
| | gills | | |
| | scales | | |
| has as environment | water | entity <--> environment | --> |
| is the generic of | fish | generic <--> specific | --> |
| | molluscs | | |
| | crustacean | | |
| | aquatic animals | | |
| undergoes | harvest (A) | patient <--> activity | --> |

**Voices**

| Not defined |
|---|

## 8. Fish (E) in the corpus

**Fish (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located at | pelagic (44) | entity <--> place | --> | modifiers of X |
| | deep-sea(29) | | | |
| | demersal (12) | | | |
| **Realization**<br>fish (E) < is located at > pelagic, deep-sea, demersal | | | | |
| **Concordance**<br>The Peruvian anchovy is a small, short-lived, fast growing pelagic **fish** widely distributed along the coast of South America.(doc. 6) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has as environment | reef (20) | entity <--> environment | --> | modifiers of X |
| | freshwater(10) | | | |
| **Realization**<br>fish (E) < has as environment > reef, freshwater | | | | |
| **Concordance**<br>In addition to direct or indirect effects of ENSO on reef **fishes**, positive correlations have been observed between the annual incidence of ciguatera fish poisoning and local increases in SST in PICTs that experience warming during El Niño conditions. (doc. 12) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is used as | forage (17) | entity <--> purpose | --> | modifiers of X |
| **Realization**<br>fish (E) < is used as > forage | | | | |
| **Concordance**<br>A recent report (Pikitch et al., 2012) recommended cutting catches of forage fish in half in many ecosystems, thereby doubling the minimum biomass of forage **fish** that must be left in the water. (doc. 11) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is part of | stock (68) | part <--> whole | --> | nouns modified by X |
| | population (28) | | | |
| | catch (entity; 32) | | | |
| **Realization**<br>fish (E) < is part of > stock, population, catch | | | | |
| **Concordance**<br>There are programs that assess the sustainability of **fish** stocks (MSC, 2002) and there are guidelines on how to sustainably manage fisheries (FAO, 1995).(doc. 3) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | specie (44) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>fish (E) < is a type of > specie | | | | |
| **Concordance**<br>Like most pelagic fisheries, since its establishment, the anchovy fishery has been highly vulnerable to drastic natural stock fluctuations, due to the sensitivity of these **fish** species to ocean-climate variability. (doc. 06) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | production (30) | patient <--> activity | --> | nouns modified by X |
| **Realization**<br>fish (E) < undergoes > production | | | | |
| **Concordance**<br>**Fish** production and value for reef fish, lobster, and conch are the top three small-scale fisheries in terms of landings, with the current annual production levels reported to be 300–450, 100 –150, and 30–60 tonnes, respectively. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | catch (v) (14) | patient <--> activity | --> | verbs with X as object |
| | harvest (v) (9) | | | |
| | export (7) | | | |
| **Realization**<br>fish (E) < undergoes > catch, harvest, export | | | | |
| **Concordance**<br>The type of fishing gear used to catch **fish** is obviously the key factor determining the amount of fuel consumed. (doc. 3) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | show (4) | agent <--> activity | --> | verbs with X as subject |

| |
|---|
| **Realization**<br>fish (E) < is actor of > show |
| **Concordance**<br>Generally, **fish** showed the least variation in production anomalies across the different ENSO categories and El Niño event types. . (doc. 12) |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the generic of | tuna (6) | generic <--> specific | --> | is the generic of |
| **Realization**<br>fish (E) < is the generic of > tuna | | | | |
| **Concordance**<br>Our archetypal market survey respondent was a large North American- based processor that sourced its **fish** (primarily tuna, salmon, and whitefish) from Southeast Asia and North America. (doc. 1) | | | | |

## 9. Fisher in the dictionaries

**Fisher (entity)**

**NOAA**

| A gender-neutral name for a person (male or female) participating in a fishery. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a | person | generic <--> specific | <-- |
| is actor of | fishery(A) | agent <--> activity | --> |

**FAO**

| A gender-neutral name for a person (male or female) participating in a fishing activity. An individual who takes part in fishing conducted from a fishing vessel, a floating or fixed platform, or from shore. Does not include fish processors or traders. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is actor of | fishing (A) | agent <--> activity | --> |
| is located on | vessel | entity <--> place | --> |
| | platform | | |
| | shore | | |
| does not include | processors, traders | part <--> whole | <-- |

**Voices**

| Not defined |
|---|

## 10.Fisher in the corpus

**Fisher (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| conducts operations of a specific size | small-scale (59) | entity <--> characteristic | --> | modifiers of X |
| | industrial (6) | | | |
| **Realization**<br>fisher < conducts operations of a specific size > small scale, industrial | | | | |
| **Concordance**<br>To remedy this requires capacity building among government organizations and empowerment of small-scale **fishers** so they can actively participate in DRR decision-making processes. (doc. 20) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has the purpose of | recreational (22) | entity <--> purpose | --> | modifiers of X |
| | commercial (7) | | | |
| **Realization**<br>fisher < has the purpose of > recreational, commercial | | | | |
| **Concordance**<br>The vessels are also subject to trip limits based on the number of recreational **fishers** onboard and the length of the trip, i.e., the number of recreational fishers multiplied by the individual fisher's recreational possession limits. (doc. 17) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located at | local (12) | entity <--> place | --> | modifiers of X |
| | coastal (9) | | | |

| | |
|---|---|
| **Realization**<br>fisher < is located at > local, coastal | |
| **Concordance**<br>The Ngaparou CLP facilitated the surveys by providing use of its offices and by inviting the local **fishers** and fishery businesses to attend and play an active part. (doc. 20) | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a member of | community (9) | part <--> whole | --> | nouns modified by X |
| **Realization**<br>fisher < is member of > community | | | | |
| **Concordance**<br>Another benefit of building physical infrastructure is that it has enhanced the mobility of **fisher** communities and created secondary job opportunities (e.g. labour for building embankments). (doc. 20) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| obtains | profit (4) | agent <--> patient | --> | nouns modified by X |
| **Realization**<br>fisher < obtains > profit | | | | |
| **Concordance**<br>The vast majority of CEA's key informant interviews and site visits, however, provided no evidence of increases in **fisher** profit or revenue as a result of FIP participation. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | participation (4) | agent <--> activity | --> | nouns modified by X |
| **Realization**<br>fisher < is the actor of > participation | | | | |
| **Concordance**<br>The management process has not included consideration, at any level (national, regional, local), of traditional rules or customs that affect the harvest of marine fisheries, although local fora, with **fishers'** participation, has defined key issues, based on traditional knowledge, to support goals aimed at managing major coastal fisheries. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | interview (6) | patient <--> activity | --> | verbs with X as object |
| | engage (6) | | | |
| | involve (6) | | | |
| **Realization**<br>fisher < undergoes > interview, engage, involve | | | | |
| **Concordance**<br>The **fishers** who were interviewed complained that boat owners often force fishers to continue even when the weather is unfit for fishing.(doc. 20) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | operate (7) | agent <--> activity | --> | verbs with X as subject |
| | comply (6) | | | |
| | believe (5) | | | |
| **Realization**<br>fisher < is the actor of > operate, comply, believe | | | | |
| **Concordance**<br>While the shark fishery is separate, it is operated by the same **fishers**, and thus it is important to note that interactions with seabirds are much greater in that fishery and that it uses dolphin meat as bait for sharks.(doc. 25) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a member of | organization (8) | part <--> whole | --> | X's |
| | committee (5) | | | |
| | assembly (3) | | | |
| **Realization**<br>fisher < is a member of > organization, committee, assembly | | | | |
| **Concordance**<br>The group of stakeholders is noted to include, for both small-scale and large-scale capture fisheries: **fishers**' organizations (fishers guilds, unions and associations); other fishing organizations (ship owners' or sportfishing unions); postharvest organizations (processing industry and commerce); and non- governmental organizations. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | stakeholder (3) | generic <--> specific | <-- | X Is a type of |
| **Realization**<br>fisher < is a type of > stakeholder | | | | |

**Concordance**
Throughout the scoping process, it is imperative that this task force consult closely with relevant stakeholders, including government officials, policy makers, scientists, farmers, **fishers**, and other competing marine environment users, to ensure a balanced and successful planning process. (doc. 24)

## 11.Fishery (E) in the dictionaries

**Fishery (entity)**

**NOAA**

A unit determined by an authority or other entity that is engaged in raising or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats, and purpose of the activities.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | unit | generic <--> specific | <-- |
| includes | raising | part <-> whole | <-- |
| | harvesting | | |
| is managed by | authority, entity | agent <--> patient | <-- |
| acts on | fish | agent <--> patient | --> |
| is managed by | people involved | agent <--> patient | <-- |
| acts on | species | agent <--> patient | --> |
| operates in | area of water | entity <--> place | --> |
| follows the stages of | method | entity <--> method | --> |
| makes use of | boats | entity <--> instrument | --> |
| has the purpose of | purpose of the activities | entity <--> purpose | --> |

**FAO**

A unit determined by an authority or other entity that is engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem NOAA | | | |

**Voices**

The people involved, species or type of fish, area of water, method of fishing, class of boats, purpose of the activities, or a combination of all of the above, engaged in raising or harvesting seafood.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is managed by | people | agent <--> patient | <-- |
| acts on | species | agent <--> patient | --> |
| operates in | area of water | entity <--> place | --> |
| follows the stages of | method | entity <--> method | --> |
| makes use of | boats | entity <--> instrument | --> |
| has the purpose of | purpose of the activities | entity <--> purpose | --> |
| includes | raising | part <--> whole | <-- |
| | harvesting | | |
| acts on | seafood | agent <--> patient | --> |

## 12.Fishery (E) in the corpus

**Fishery (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific size | small-scale (637) | entity <--> characteristic | --> | modifiers of X |
| | major (476) | | | |
| | industrial (103) | | | |

**Realization**
fishery (E) < has a specific size > small-scale, major, industrial

**Concordance**
Small-scale **fisheries** are mostly defined by smaller sizes of vessels and tonnage capacity and minimal level of mechanization. (doc. 5)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has the purpose of | commercial (349) | entity <--> purpose | --> | modifiers of X |
| | recreational (309) | | | |

**Realization**
fishery (E) < has the purpose of > commercial, recreational

**Concordance**
The major commercial **fisheries** were much more likely to provide the sole source of income for their participants. (doc. 19)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| operates in | inland (56) | entity <--> place | --> | modifiers of X |
| | coastal (44) | | | |

**Realization**
fishery (E) < operates in > inland, coastal

**Concordance**
El Niño conditions have the potential to shock inland **fisheries** production in the key countries supporting inland fisheries. (doc. 12)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | management (443) | patient <--> activity | --> | nouns modified by X |
| | regulation (101) | | | |
| | legislation (101) | | | |

**Realization**
fishery (E) < undergoes > management, regulation, legislation

**Concordance**
The uncertainty surrounding fishery-predator interactions and the adversarial nature of much debate about fishery impacts on predators leads to a situation in which any evidence that predators are not within safe ecological limits can be seen as a failure of **fishery** management. (doc. 2)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| acts on | resources (118) | agent <--> patient | --> | nouns modified by X |

**Realization**
fishery (E) < acts on > resource

**Concordance**
In any case, it would be a useful expense, given present trends of degrading **fisheries** resources and marine biodiversity. (doc. 3)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | identify (95) | patient <--> activity | --> | verbs with X as object |
| | engage (23) | | | |
| | support (18) | | | |

**Realization**
fishery (E) < undergoes > identify, engage, support

**Concordance**
Informant perspectives and the success of the limited cohort of celebratory **fisheries** identified in 2015 supports the theory that these fisheries will improve more quickly. (doc. 1)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | catch (A) (34) | agent <--> activity | --> | verbs with X as subject |
| | operate (23) | | | |
| | provide (22) | | | |

**Realization**
fishery (E) < is actor of > catch(A), operate, provide

**Concordance**
Sharks are commonly caught by the **fishery**, and the same fleet also targets sharks. (doc. 25)

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located in | the world (9) | entity <--> place | --> | possessors of fishery |
| | a country (7) | | | |

**Realization**
fishery (E) < is located in > the world, a country

**Concordance**
Despite the considerable scientific attention devoted to marine resource management, many of the world's **fisheries** are still in a deplorable state. (doc. 7)

## 13.Habitat in the dictionaries

**habitat (entity)**

**NOAA**

| The environment in which the fish live, including everything that surrounds and affects its life, e.g., water quality, bottom, vegetation, associated species (including food supplies). | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | environment | generic <--> specific | <-- |
| is the environment for | fish | entity <--> environment | <-- |
| includes | surroundings | part <--> whole | <-- |
| | factors | | |
| | water quality | | |
| | bottom | | |
| | vegetation | | |
| | associated species | | |
| | food supplies | | |

**FAO**

| The place where an organism lives or the place one would go to find it. The habitat is the organisms address, and the ecological niche its profession, biologically speaking. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | place | generic <--> specific | <-- |
| is the location for | organisms to live | entity <--> place | <-- |

**Voices**

| The place and its associated environmental conditions where an organism naturally lives, grows, and reproduces; such conditions include characteristics of the substrate, water, and biological community. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | place | generic <--> specific | <-- |
| is the location for | organisms | entity <--> place | <-- |
| includes | characteristics of substrate water | part <--> whole | <-- |
| | water | | |
| | biological community | | |

## 14.Habitat in the corpus

**habitat (entity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has as environment | marine (14) | entity <--> environment | --> | modifiers of X |
| | shallow water (5) | | | |
| | freshwater (3) | | | |
| **Realization**<br>habitat < has as environment > marine, shallow water, freshwater | | | | |
| **Concordance**<br>The purpose of this policy is to help DMR in mitigating impacts of dredging on sensitive benthic habitats and avoiding impacts of mussel dredging activities that are likely to cause serious or irreversible harm to sensitive marine **habitats**, communities and species.(doc. 15) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is located at | benthic (12) | entity <--> place | --> | modifiers of X |
| | bottom (12) | | | |
| | coastal (8) | | | |
| **Realization**<br>habitat < is located at > benthic, bottom, coastal | | | | |
| **Concordance**<br>Support the work of scientists and managers to improve reporting of catches, discards, bycatch, and ETP incidental captures, including the expansion of the observer program, as well as define the scale of interactions with benthic **habitats**. (doc. 21) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has a specific resilience | sensitive (9) | entity <--> characteristic | --> | modifiers of X |
| **Realization**<br>habitat < has a specific resilience > sensitive | | | | |

**Concordance**
However, new operations need guidance to limit conflicts with the tourism sector and conservation efforts, as well as direct ecological impacts on sensitive **habitats** such as coral reefs and mangroves. (doc. 24)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | degradation (14) | patient <--> activity | --> | nouns modified by X |
| | loss (4) | | | |
| | destruction (2) | | | |

**Realization**
habitat < undergoes > degradation, loss, destruction

**Concordance**
Environmental change, **habitat** degradation, and international fishing contributed to the status of the eight new overfished stocks. (doc. 0)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is assessed through | structure (9) | entity <--> indicator | --> | nouns modified by X |

**Realization**
habitat < is assessed through > structure

**Concordance**
The fishery is unlikely to reduce **habitat** structure and function to a point where there would be serious or irreversible harm. (doc. 14)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | encounter (5) | patient <--> activity | --> | verbs with X as object |
| | provide (5) | | | |
| | protect (4) | | | |

**Realization**
habitat < undergoes > encountered, provided

**Concordance**
Given that there is no information of the mussel dredge footprint on the most common **habitats** encountered on the fishing area, it is recommended to use RBF to score this performance indicator. (doc. 15)

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the generic of | coral reef (4) | generic <--> specific | --> | X is the generic of |
| | seagrass (3) | | | |
| | eelgrass (2) | | | |

**Realization**
habitat < is the generic of > reef, seagrass, eelgrass

**Concordance**
However, new operations need guidance to limit conflicts with the tourism sector and conservation efforts, as well as direct ecological impacts on sensitive **habitats** such as coral reefs and mangroves. (doc. 24)

## 15.Harvest (E) in the dictionaries

**harvest (entity)**

**NOAA**

The total number or weight of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is quantified as | total number, total weight | entity <--> indicator | --> |
| is a group of | fish | part <--> whole | <-- |
| undergoes | catch, keep | patient <--> activity | --> |
| comes from | area | entity <--> place | --> |

**FAO**

Term not defined.

**Voices**

The total number or poundage of fish caught and kept from an area over a period of time. Note that harvest, catch and landings have different definitions.

| Paraphrase | Related concept | Relation | Relation |
|---|---|---|---|
| Idem NOAA | | | |

## 16.Harvest (E) in the corpus

**harvest (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is caught in a period of | annual (4) | entity <--> time | --> | modifiers of X |
| **Realization**<br>harvest (E) < caught in a period of > annual | | | | |
| **Concordance**<br>The three most important commercial fisheries by weight are: (i) a fishery targeting a variety of snappers, and which harvested 2 401 tons according to statistics collected in 2010; (ii) a fishery for groupers, with an annual **harvest** of about 1 583 tons; and (iii) a spiny lobster fishery with an annual harvest of 1 001 tons. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a result of | fishery (A)(2) | activity <--> result | <-- | modifiers of X |
| **Realization**<br>harvest (E) < is the result of > fishery (A) | | | | |
| **Concordance**<br>The harvest levels decreased significantly between ten and five years ago, after which the snapper fishery **harvests** increased again recently. (doc. 21) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is affected by | harvest control rule (52) | agent <--> patient | <-- | nouns modified by X |
| **Realization**<br>harvest (E) < is affected by > harvest control rules | | | | |
| **Concordance**<br>Work with managers to develop and agree on long-term objectives for the fishery, and develop a management plan, including biological reference points, a harvest strategy, and a **harvest** control rule for each stock. (doc. 21) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is assessed through | level (6) | entity <--> indicator | --> | nouns modified by X |
| is quantified through | rate (3) | | | |
| **Realization**<br>harvest (E) < is assessed through > level, rate | | | | |
| **Concordance**<br>While overcapacity is believed to be a problem for these 4 fisheries mentioned, recent regulations in the last two to three years have not focused on reducing fishing effort and/or reducing the **harvest** levels. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | reduce (18) | patient <--> activity | --> | verbs with X as object |
| | affect (10) | | | |
| | market (2) | | | |
| **Realization**<br>harvest (E) < undergoes > reduce, affect, market | | | | |
| **Concordance**<br>In view of this, the regulations for the coastal finfish fishery in the last two to three years have focused on reducing fishing effort and/or reducing the **harvest** by limiting the number of boats.(doc. 19) | | | | |

## 17.Landings (E) in the dictionaries

**landings (entity)**

**NOAA**

The part of the catch that is selected and kept during the sorting procedures on board vessels and successively discharged at dockside.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is part of | catch | part <--> whole | --> |
| undergoes | select, keep | patient <--> activity | --> |
| is result of | sorting procedure | activity <--> result | <-- |
| is located at | vessels, dockside | entity <--> place | --> |

**FAO**

Term not defined.

**Voices**

The amount of fish (usually in pounds though sometimes as number of fish) caught be fishermen and delivered at the docks, then sold for profit or kept for personal consumption. Landings are reported at the points at which fish are brought to shore. Note that harvest, catch, and landings have different definitions.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| obtained by | fisherman | agent <--> patient | <-- |
| is a group of | fish | part <--> whole | <-- |
| undergoes | catch (v), sell, keep, report | patient <--> activity | --> |
| in located at | dock, shore | entity <--> place | --> |

## 18.Landings (E) in the corpus

**landing (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| are obtained by | fishery (E) (34) | agent <--> patient | <-- | modifiers of X |
| **Realization**<br>landing (E) < is obtained by > fishery (E) | | | | |
| **Concordance**<br>To explore the paraphrase between the developments of legal instruments and the fishery transition towards sustainability, the enactment of fisheries acts was plotted against fishery **landings** and the occurrence of strong ENSO events. (doc. 6) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a group of | anchovy (22) | part <--> whole | <-- | modifiers of X |
| | fish (10) | | | |
| | mahi (5) | | | |
| **Realization**<br>landing (E) < is a group of > anchovy, fish, mahi | | | | |
| **Concordance**<br>Results show that General Fisheries Acts were enacted independently of failures to sustain anchovy **landings**. (doc. 6) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| are caught in a period of | annual (21) | entity <--> time | --> | modifiers of X |
| **Realization**<br>landing (E) < is caught in a period of > annual | | | | |
| **Concordance**<br>Over the study period the two main centres of landings were Piura and Ancash which accounted for between 56 and 89% of total annual **landings**. (doc. 4) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is placed at | site (46) | entity <--> place | --> | nouns modified by |
| | point (4) | | | |
| | facility (3) | | | |
| **Realization**<br>landing (E) < takes place in > site, point, facility | | | | |
| **Concordance**<br>SmartFish worked with two fishing cooperatives in Mexico's robalo fishery to apply for funds from the Mexican government to upgrade landing site facilities and secure access to the **landing** site. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is assessed through | size (17) | entity <--> indicator | --> | nouns modified by X |
| | data (11) | | | |
| is quantified through | statistics (3) | | | |
| **Realization**<br>landing (E) < is assessed through > size, data | | | | |
| **Concordance**<br>These relationships (among many other factors) contributed to national policy changes in 2016 that established a minimum **landing** size of 10 cm, banned mini-trawls, and banned landing berried females. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergo | monitoring (3) | patient <--> activity | --> | nouns modified by X |
| **Realization**<br>landing (E) < undergoes > monitoring | | | | |

**Concordance**
Catch is monitored through trip reports and landings **monitoring**, and several experiments with different devices and mesh sizes have been performed. (doc. 25)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergo | report (12) | patient <--> activity | --> | verbs with X as object |
| | check (11) | | | |
| | prohibit (4) | | | |

**Realization**
landing (E) < undergoes > report, record, prohibit

**Concordance**
The 64 countries assessed here include the 53 evaluated in Alder and Pauly (this volume) and jointly account for more than 95% of global reported marine fish **landings**; these same countries account for more than 95% of the world's mariculture production. (doc. 3)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | show (4) | agent <--> activity | --> | verbs with X as subject |

**Realization**
landing (E) < is the actor of > show

**Concordance**
However, with the increase in their demand, the fishing seasons began increasingly early (winter months) and the **landings** showed a percentage of juveniles greater than the established tolerance. (doc. 22)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | increase (4) | patient <--> activity | --> | verbs with X as subject |
| | fluctuate (2) | | | |
| | decrease (2) | | | |

**Realization**
landing (E) < undergoes > increase, fluctuate

**Concordance**
Although sardine **landings** increased steadily from 2002 to 2010, the overall gross value of this fishery has continually decreased. (doc.19)

## 19.Longline (E) in the dictionaries

**longline (entity)**

**NOAA**

Term not defined

**FAO**

A fishing gear in which short lines carrying hooks are attached to a longer main line at regular intervals. Longlines are laid on the bottom or suspended horizontally at a predetermined depth with the help of surface floats. The main lines can be as long as 150 km and have several thousand hooks (e.g., in tuna fisheries).

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | gear | generic <--> specific | <-- |
| has as part | short lines, hooks, longer main line, surface floats | part <--> whole | <-- |
| is located at | bottom, predetermined depth | entity <--> place | --> |

**Voices**

Fishing gear made up of a long main line attached to which are a large number of short branch lines. At the end of each branch line is a baited hook. When catching groundfish, longlines are laid on the seafloor. When catching fish in the water column, the longlines are buoyed near the surface. Longlines can be 20+ miles long. They are also called setlines.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | gear | generic <--> specific | <-- |
| has as part | a long main line, branch lines, baited hook | part <--> whole | <-- |
| is located at | seafloor, surface | entity <--> place | --> |
| has a specific size | more than 20 miles long | entity <--> characteristic | --> |

## 20.Longline (E) in the corpus

**longline (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located at | pelagic (4)<br>bottom (2) | entity <--> place | --> | modifiers of X |
| **Realization**<br>longline (E) < is located at > pelagic, bottom | | | | |
| **Concordance**<br>Taiwan reported to the WCPFC Scientific Committee that the forms and protocols used by its tuna longline observer program conform with WCPFC standards, and observer coverage 22 IUCN near threatened blue sharks (Prionace glauca) are incidentally captured by pelagic **longlines** in the West and Central Pacific Ocean. (doc. 25) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific size | small scale (2) | entity <--> characteristic | --> | modifiers of X |
| **Realization**<br>longline (E) < has a specific size > small-scale | | | | |
| **Concordance**<br>This bycatch rate was lower than those reported by other studies in small-scale **longlines** for the eastern Pacific (e.g., Ecuador: Largacha et al. 2005; Baja California: Peckham et al. 2007). (doc. 5) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is used by | fishery (E) (53)<br>vessel (27)<br>fleet (9) | entity <--> instrument | <-- | nouns modified by X |
| **Realization**<br>**l**ongline (E) < is used by > fishery, vessel, fleet | | | | |
| **Concordance**<br>On the other hand, we observed that **longline** fisheries have increased, especially in the Northern and Southern ports of Paita and Ilo. (doc. 4) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | gear (5)<br>trip (4) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>longline (E) < is a type of > gear, trip | | | | |
| **Concordance**<br>The United States provided a number of recommendations, such as Secretariat monitoring of fishing activity that may occur in VME Risk Areas, a review of VME-related conservation measures more broadly, and review of the accuracy of fishing effort reporting concerning start and end coordinates for setting **longline** gear. (doc 16.) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | set (3) | patient <--> activity | --> | nouns modified by X |
| **Realization**<br>longline (E) < undergoes > set | | | | |
| **Concordance**<br>By weight, bycatch species–including retained and discarded, non-target species– account for ~7 percent of catch on purse-seine sets in the Indian Ocean, whereas bycatch accounts for 25-60 percent of catch in longline sets, varying with the depth of sets. (doc. 25) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has specific state | fixed (2) | entity <--> characteristic | --> | verbs with X as object |
| **Realization**<br>longline (E) < has a specific state ><br>fixed | | | | |
| **Concordance**<br>However, the legislation prohibits the use of surface and mid-water drifting or fixed **longlines** having over 100 hooks or 5 km in length, in certain fishing areas, and this tends to reduce the incidental catch of seabirds. (doc. 19) | | | | |

## 21.Stakeholder in the dictionaries

**stakeholder (entity)**

**NOAA**

An actor having a stake or interest in a physical resource, ecosystem service, institution, or social system, or someone who is or may be affected by a public policy.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | actor | generic <--> specific | <-- |
| is affected by | physical resource | agent <--> patient | <-- |
| | ecosystem service | | |
| | institution | | |
| | social system | | |
| | policy | | |

**FAO**

Someone affected (positively or negatively) by an activity, or someone who can influence the process of impact of an activity. Broadly defined, stakeholders in fishery regimes include fishermen, the fishing industry and institutions involved in the management system, all those who rely on fishery habitats for a living, and those interested in conservation of fishery resources and habitats.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is affected by | activity | patient <--> activity | --> |
| affects | activity | agent <--> activity | --> |
| includes | fishermen | part <--> whole | <-- |
| | the fishing industry | | |
| | institutions | | |
| | people relying on habitats | | |
| | people interested in conservation of habitats | | |

**Voices**

A person or organization that has a stake in a particular entity or resource such as a business, natural resource, or community.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | person | generic <--> specific | <-- |
| | organization | | |
| is affected by | entity | agent <--> patient | <-- |
| | resource | | |
| | business | | |

## 22.Stakeholder in the corpus

**stakeholder (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is an actor of | fishery (A) (72) | agent <--> activity | --> | modifiers of X |
| | management (25) | | | |
| **Realization**<br>stakeholder < is an actor of > fishery (A), management | | | | |
| **Concordance**<br>In theory, increasing benefits would encourage fisheries **stakeholders** to progress along a performance standard. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific relevance | key (19) | entity <--> characteristic | --> | modifiers of X |
| **Realization**<br>stakeholder < has a specific relevance > key | | | | |
| **Concordance**<br>This pre-assessment provides a provisional assessment of the fishery based on quite limited information available and augmented with consultation from key **stakeholders.** (doc. 15) | | | | |

| Relation | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| comes from | local | entity <--> place | --> | modifiers of X |
| **Realization**<br>stakeholder < comes from > local | | | | |

**Concordance**
The artificial reefs were built by local **stakeholders** using local materials. (doc. 20)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | involvement (59) | agent <--> activity | --> | nouns modified by X |
| | support (40) | | | |
| | participation (26) | | | |

**Realization**
stakeholder < is the actor of > involvement, support, cooperation

**Concordance**
In the southern subregion, the performance levels for **stakeholder** involvement were usually less than the levels indicated for all subregions combined (overall regional levels), except for stakeholder identification performance in respect of the major commercial fisheries, where it was the same. (doc. 19)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a member of | group(17) | part <--> whole | --> | nouns modified by X |

**Realization**
stakeholder < is a member of > group

**Concordance**
The analysis identified which frameworks were preferred by different **stakeholder** groups and why, taking into account the different objective priorities and tradeoffs in outcomes. (doc. 17)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | consult (36) | patient <--> activity | --> | verbs with X as object |
| | identify (24) | | | |
| | engage (7) | | | |

**Realization**
stakeholder < undergoes > consult, identify, engage

**Concordance**
Consultative management, in which **stakeholders** were consulted but had no management responsibility, was most commonly practised (81 percent of 16 countries). (doc 19)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the actor of | share(5) | agent <--> activity | --> | verbs with X as subject |
| | work (4) | | | |
| | participate (3) | | | |

**Realization**
stakeholder < is actor of > share, work, participate

**Concordance**
In these fisheries, the management process, as it relates to stakeholders, involves a co-management arrangement, with the fishery s**takeholders** sharing some management responsibility. (doc. 19)

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the generic of | participant (33) | generic <--> specific | <-- | is the generic of |
| | scientists (3) | | | |
| | manager (3) | | | |

**Realization**
stakeholder < is the generic of > participant, scientist, manager

**Concordance**
hile almost all 16 countries (94 percent) confirmed that opportunities were provided for fishery participants and other **stakeholders** to contribute to the decision-making process, only about 50 percent (8 countries) stated that management information was clearly documented and easily available to the public. (doc. 19)

| Relation | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| takes part in | decision-making ( 8) | agent <--> activity | --> | is part of |

**Realization**
stakeholder < takes part in > decision-making

**Concordance**
However, where **stakeholders** are part of the fisheries management decision-making process, the management measures have resulted in stable stock levels over the last five years.(doc 19)

## 23.Stock (E) in the dictionaries

**stock (entity)**

**NOAA**

A part of a fish population usually with a particular migration pattern, specific spawning grounds, and subject to a distinct fishery. A fish stock may be treated as a total or a spawning stock. Total stock refers to both juveniles and adults, either in numbers or by weight, while spawning stock refers to the numbers or weight of individuals that are old enough to reproduce.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is part of | fish population, fishery | part <--> whole | --> |
| is located at | spawning grounds | entity <--> place | --> |
| has specific patterns | migration patterns | entity <--> characteristic | --> |
| is the generic of | total stock | generic <--> specific | --> |
| | spawning stock | | |

**FAO**

A group of individuals in a species occupying a well-defined spatial range independent of other stocks of the same species. Random dispersal and directed migrations due to seasonal or reproductive activity can occur. Such a group can be regarded as an entity for management or assessment purposes. Some species form a single stock (e.g. southern bluefin tuna) while others are composed of several stocks (e.g. albacore tuna in the Pacific Ocean comprises separate Northern and Southern stocks). The impact of fishing on a species cannot be determined without knowledge of this stock structure.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a group of | individuals, species | part <--> whole | <-- |
| is located at | defined spatial range, random location, one area, two different areas | entity <--> place | --> |
| has specific patterns | directed migration | entity <--> characteristic | --> |
| is a type of | entity | generic <--> specific | <-- |
| is the generic of | Southern bluefin tuna, albacore tuna | generic <--> specific | --> |

**Voices**

A grouping of fish usually based on genetic relationship, geographic distribution, and movement patterns. Also a managed unit of fish.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a group of | fish | part <--> whole | <-- |
| has specific patterns | geographic distribution | entity <--> characteristics | --> |
| | genetic relation | | |
| | movement patterns | | |
| is a type of | unit | generic <--> specific | <-- |

## 24.Stock (E) in the corpus

**stock (entity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a group of | fish (68) | part <--> whole | <-- | modifiers of X |
| | anchovy (23) | | | |
| | clam (5) | | | |
| **Realization**<br>stock (E) < is a group of > fish | | | | |
| **Concordance**<br>Each year, assessments of various fish **stocks** and stock complexes are conducted to determine their status. (doc. 0) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is located at | Southern (16) | entity <--> place | --> | modifiers of X |
| | Northern-central (4) | | | |
| | transboundary (3) | | | |
| **Realization**<br>stock (E) < is located at > Southern, Northern-central, transboudary | | | | |

**Concordance**
The government applies two different management schemes for the northern-central and the Southern **stock**, the latter being exploited simultaneously by Peru and Chile. (doc. 6)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific state | overfished (8) | entity <--> characteristic | --> | modifiers of X |
| | overexploited (3) | | | |

**Realization**
stock (E) < has indicator > overfished, overexploited

**Concordance**
The catches documented aboard the apprehended vessels included red snapper, which the United States determined to be an overfished stock as of September 30, 2016. (doc. 16)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | assessment (95) | patient <--> activity | --> | nouns modified by X |
| | enhancement (9) | | | |

**Realization**
stock (E) < undergoes > assessment

**Concordance**
The additions are the result of **stock** assessments or data showing catch was too high. (doc. 0)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is assessed through | status (34) | entity <--> indicator | --> | nouns modified by X |
| | structure (21) | | | |
| | health (16) | | | |

**Realization**
stock (E) < is assessed through > status, structure, health

**Concordance**
The assessment estimates **stock** status relative to reference points.(doc. 14)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is part of | complex (4) | part <--> whole | --> | nouns modified by X |

**Realization**
stock (E) < is part of > complex

**Concordance**
Each year, assessments of various fish stocks and **stock** complexes are conducted to determine their status. (doc. 0)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | fish (v.)(27) | patient <--> activity | --> | verbs with X as object |
| | rebuild (12) | | | |
| | deplete (12) | | | |
| | cover (12) | | | |

**Realization**
stock (E) < undergoes > fish, rebuild, deplete, cover

**Concordance**
Impacts on predators of the fished **stock** are within safe ecological limits con- tains six essential components. (doc. 2)

## 25.Aquaculture in the dictionaries

**aquaculture (activity)**

**NOAA**

The farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| consists of | farming | part <--> whole | <-- |
| acts on | aquatic organisms | patient <--> activity | <-- |
| | fish | | |
| | mollusks | | |
| | crustaceans | | |
| | aquatic plants | | |
| affects | rearing process | patient <--> activity | <-- |
| | regular stocking | | |
| | feeding | | |
| | protection | | |

| | | | |
|---|---|---|---|
| has the purpose of | enhance production | activity <--> purpose | --> |
| involves | ownership of the stock | part <--> whole | <-- |

**FAO**

| The farming of aquatic organisms in inland and coastal areas, involving intervention in the rearing process to enhance production and the individual or corporate ownership of the stock being cultivated. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| consists of | farming | part <--> whole | <-- |
| acts on | aquatic organisms | patient <--> activity | <-- |
| takes place in | inland | activity <--> place | --> |
| | coast | | |
| affects | rearing process | patient <--> activity | <-- |
| has the purpose of | enhance production | activity <--> purpose | --> |
| involves | ownership of the stock | part <--> whole | <-- |

**Voices**

| The raising of fish or shellfish under some controls. Feed and ponds, pens, tanks, or other containers may be used. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| consists of | raising | part <--> whole | <-- |
| acts on | fish | patient <--> activity | <-- |
| | shellfish | | |
| involves | controls | part <--> whole | <-- |
| makes use of | feed | activity <--> instrument | --> |
| | ponds | | |
| | pens | | |
| | tanks | | |

## 26.Aquaculture in the corpus

**aquaculture (activity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| acts on | shrimp (16) | patient <--> activity | <-- | modifiers of X |
| | salmon (4) | | | |

**Realization**
aquaculture < acts on > shrimp, salmon

**Concordance**
It was from the farm labour sector in Nagapattinam that a strong movement arose against shrimp **aquaculture** that would make a major impact, both locally and nationally. (doc. 20)

| **Relation** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has as environment | brackish (13) | activity <--> environment | --> | modifiers of X |
| | freshwater (3) | | | |
| | marine (3) | | | |

**Realization**
aquaculture < has as environment > brackish, freshwater, marine

**Concordance**
In 2016, marine (52.3 million tonnes, 48.4 percent) and freshwater (47.1 million tonnes; 43.5 percent) aquaculture dominated global aquaculture production, with brackish water **aquaculture** producing a relatively (8.1 percent) small contribution (8.7 million tonnes). (doc. 12)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| takes place in | global (10) | activity <--> place | --> | modifiers of X |
| | coastal (6) | | | |

**Realization**
aquaculture < takes place in > global, coastal

**Concordance**
As such, it is possible that these factors work together to dampen any apparent signal of ENSO-derived effects on global **aquaculture**, and further analyses are required (e.g. at the level of geographical region, country, species or even individual aquaculture operator) to ensure that absence of evidence is not absence of an effect. (doc. 12)

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is quantified as | production (181) | activity <--> indicator | --> | nouns modified by X |
| | yield (20) | | | |

**Realization**
aquaculture < is quantified as > production, yield

**Concordance**
Campbell and Alder (2006) also report that data on fishmeal consumption by the aquaculture sector are scarce, and that this consumption is usually estimated based on **aquaculture** production. (doc. 3)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | sector(41) | generic <--> specific | <-- | nouns modified by X |
| | industry(26) | | | |

**Realization**
aquaculture < is a type of > sector, industry

**Concordance**
Campbell and Alder (2006) also report that data on fishmeal consumption by the **aquaculture** sector are scarce, and that this consumption is usually estimated based on aquaculture production. (doc. 3)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | development (13) | patient <--> activity | --> | nouns modified by X |

**Realization**
aquaculture < undergoes > development

**Concordance**
As the world's second-largest aquaculture producer, but also a country with high marine biodiversity, Indonesia is anticipating rapid expansion of the aquaculture sector over the next five years through creation of a comprehensive national medium-term development plan (RPJMN) that should fully integrate ecosystem-based approaches to **aquaculture** development. (doc. 24).

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | impact (v) (4) | patient <--> activity | --> | verbs with X as object |
| | affect (4) | | | |
| | manage (4) | | | |

**Realization**
aquaculture < undergoes > impact

**Concordance**
**Aquaculture** is directly impacted by upstream users and directly impacts downstream users through the release of waste products into the surrounding environment. (doc. 24)

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | source of fish (3) | generic <--> specific | <-- | is a |

**Realization**
aquaculture < is a type of > source of fish

**Concordance**
**Aquaculture** is currently the principal source of fish and seafood for human consumption, with global production first surpassing that of capture fisheries in 2014. (doc. 12)

## 27.Assessment (A) in the dictionaries

**assessment (activity)**

**NOAA**

A judgment made by a scientist or scientific body on the state of a resource, such as a fish stock (e.g., size of the stock, potential yield, on whether it is over or underexploited), usually for the purpose of passing advice to a management authority.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a | a judgment | generic <--> specific | <-- |
| is done by | scientist | agent <--> activity | <-- |
| acts on | state of resource | patient <--> activity | <-- |
| | fish stock | | |
| | size of stock | | |
| | potential yield | | |
| has the purpose of | advice | activity <--> purpose | --> |
| is done for | management authority | activity <--> destination | --> |

**FAO**

A process that connects knowledge and action regarding a problem. Review and analysis of information derived from research for the purpose of informing the decision-making process. It may not require new research and involves assembling, organizing, summarizing, interpreting and reconciling existing knowledge, and communicating it to the policy-maker or other actors concerned by the problem.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | process | generic <--> specific | <-- |

| | | | |
|---|---|---|---|
| consists of | connecting knowledge and action | part <--> whole | <-- |
| | review and analysis | | |
| acts on | information, knowledge | patient <--> activity | <-- |
| has the purpose of | inform | activity <--> purpose | --> |
| does not involve | research | part <--> whole | <-- |
| is aimed at | informing policy-maker | activity <--> purpose | --> |
| is done for | policy-maker | activity <--> destination | --> |
| involves | organizing, sumarising, reconciling, communication, research | part <--> whole | <-- |

**Voices**

| |
|---|
| Not defined |

## 28.Assessment (A) in the corpus

**assessment (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| acts on | stock (95) | patient <--> activity | <-- | modifiers of X |
| | fishery (9) | | | |
| | impact (8) | | | |

**Realization**
assessment (A) < acts on > stock, fishery, impact

**Concordance**
If a stock **assessment** is used, due to timing of the next stock assessment, several years may pass before we are able to determine if catch limits successfully ended overfishing. (doc. 0)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is done in a specific mode | full (46) | activity <--> characteristic | --> | modifiers of X |
| | comparative(22) | | | |
| | stardardized (6) | | | |

**Realization**
assessment (A) < is done in a specific mode > full, comparative, standardized

**Concordance**
The mahi longline FIP has entered MSC full **assessment** after 10 years and is likely to pass with conditions. (doc. 1)

| Papaphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is done at a specific moment | preliminary (4) | activity <--> time | --> | modifiers of X |
| | latest (3) | | | |

**Realization**
assessment (A) < is done in a specific moment > preliminary

**Concordance**
There is no information on biological reference points, or proxies, and no formal stock **assessments** to tell if the stock is overfished or overfishing is occurring. (doc. 15)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| requires the use of | model (9) | activity <--> instrument | --> | nouns modified by |
| | tree (6) | | | |

**Realization**
assessment (A) < requires the use of > model, tree

**Concordance**
Work with scientists to understand the uncertainties in the stock assessment and improve the different **assessment** models and input data (catches, discards, biological data) to reduce the level of uncertainty in the assessment and to work toward resolving the differences between the models. (doc. 21)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| results in | report (6) | activity <--> result | --> | nouns modified by X |
| | result(3) | | | |

**Realization**
assessment (A) < results in > report, result

**Concordance**
The scores are each calculated on a scale from zero to ten, with information obtained from stock **assessment** reports and from management measures adopted in the fishery. (doc. 21)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | process (5) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>assessment (A) < is a type of > process | | | | |
| **Concordance**<br>Stock assessments are the backbone of effective fisheries management and this road map incorporates new scientific tools, such as incorporation of more ecosystem and socioeconomic factors, increasing the use of innovative data collection and analysis techniques, and creating timelier stock **assessment** processes. (doc. 0) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | conduct (10) | patient <--> activity | --> | verbs with X as object |
| | publish (7) | | | |
| | make (6) | | | |
| **Realization**<br>assessment (A) < undergoes > conduct, publish, make | | | | |
| **Concordance**<br>A stock **assessment** conducted by the International Commission for the Conservation of Atlantic Tunas (ICCAT) Standing Committee on Research and Statistics (SCRS) in July 2018 found Atlantic bigeye tuna to be overfished and subject to overfishing. (doc. 16) | | | | |

## 29.Fishery (A) in the dictionaries

**Fishery (activity)**

**NOAA**

Generally, a fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | activity | generic <--> specific | <-- |
| results in | harvesting | activity <--> result | --> |
| acts on | fish | patient <--> activity | <-- |
| includes | capture of wild fish | part <--> whole | <-- |
| | raising of fish | | |

**FAO**

Generally, a fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem NOAA | | | |

**Voices**

Not defined

## 30.Fishery (A) in the corpus

**Fishery (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| includes | capture (183) | part <--> whole | <-- | modifiers of X |
| **Realization**<br>fishery (A) < includes > capture | | | | |
| **Concordance**<br>These approaches are comprehensive in assessing capture **fisheries** and their collateral impacts on marine ecosystems, as well as the social and economic implications of fishing activities. (doc. 3) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| acts on | mahi-mahi (131) | patient <--> activity | <-- | modifiers of X |
| | shrimp (128) | | | |
| | loabster (99) | | | |
| **Realization**<br>fishery (A) < acts on > mahi-mahi, shrimp, loabster | | | | |
| **Concordance**<br>Future of Fish is working to provide on-boat flash-freezing technology in mahi-mahi **fisheries** in Peru. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific environmental status | sustainable (70) | activity <--> characteristic | --> | modifiers of X |
| **Realization**<br>fishery (A ) < has a specific environmental status > sustainable | | | | |
| **Concordance**<br>The drive for healthy and sustainable **fisheries** persists as the dominant, long-term motivation for the sustainable seafood movement, and stakeholders at every level of the value chain point to this shared vision as the goal of these collective efforts. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is done by | stakeholder (72)<br>participant (67) | agent <--> activity | <-- | nouns modified by X |
| **Realization**<br>fishery (A) < is done by > stakeholder**,** participant | | | | |
| **Concordance**<br>Commercial fisheries In all three major commercial fisheries, efforts have been made to identify the stakeholders who have an interest in the use and management of the resources, and in the case of the small pelagic fishery, the **fishery** stakeholders are organized into distinct groups. (doc 19). | | | | |

| Paraphrase | Relate concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | sector (94)<br>activity (30) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>fishery (A) < is a type of > sector, activity | | | | |
| **Concordance**<br>For the purpose of this study, a 'sustainable fisheries indicator' is defined as a number which quantifies an aspect of the state of a country's fisheries or marine ecosystems, and/or reflects how well or poorly a country manages its **fisheries** sector. | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| results in | production (134)<br>landings (34) | activity <--> result | --> | nouns modified by X |
| Realization<br>fishery (A) < results in > production, landings | | | | |
| **Concordance**<br>In Chapter 9, we follow a similar approach and examine potential effects of ENSO on inland **fisheries** production at a number of different levels, including global, subregional and national levels, as well as at the level of the most commonly captured species. (doc. 12) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | manage (109)<br>regulate (15)<br>certify (10) | patient <--> activity | --> | verbs with X as object |
| **Realization**<br>fishery (A) < undergoes > manage, regulate, certify | | | | |
| **Concordance**<br>For example, empirical analysis, expert opinion, and site visits all suggest governmental capacity to manage **fisheries** is a primary determinant of a FIP's time to completion. (doc 1) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| affects | ETP species (5) | patient <--> activity | <-- | X's |
| **Realization**<br>fishery (A) < affects > ETP species | | | | |
| **Concordance**<br>There is a strategy in place for managing the **fishery's i**mpact on ETP species, including measures to minimise mortality, that is designed to be highly likely to achieve national and international requirements for the protection of ETP species. (doc 14) | | | | |

## 31.Fishing in the dictionaries

**fishing (activity)**

**NOAA**

Any activity, other than scientific research conducted by a scientific research vessel, that involves the catching, taking, or harvesting of fish; or any attempt to do so; or any activity that can reasonably be expected to result in the catching, taking, or harvesting of fish and any operations at sea in support of it.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is excluded from | scientific research | part <--> whole | --> |

| | | | |
|---|---|---|---|
| involves | catching<br>taking<br>harvesting | part <--> whole | <-- |
| results in | catching<br>taking<br>harvesting | activity <--> result | --> |
| acts on | fish | patient <--> activity | <-- |
| takes place at | at sea | activity <--> place | --> |

**FAO**

Any activity, other than scientific research conducted by a scientific research vessel, that involves the catching, taking, or harvesting of fish; or any attempt to do so; or any activity that can reasonably be expected to result in the catching, taking, or harvesting of fish and any operations at sea in support of it.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem NOAA | | | |

**Voices**

The catching, taking, or harvesting of fish; the attempted catching, taking, or harvesting of fish; any other activity that can reasonably be expected to result in the catching, taking, or harvesting of fish; any operations at sea in support of, or in preparation for, any of these activities.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem NOAA | | | |

## 32.Fishing in the corpus

**fishing (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific legal status | IUU (illegal, unreported and unregulated (131) | activity <--> characteristic | --> | modifiers of X |
| | illegal (30) | | | |
| has a specific environmental status | sutanibale (10) | | | |

**Realization**
fishing < has a specific legal status > IUU (illegal, unreported and unregulated)

**Concordance**
In its 2017 Report to Congress, NMFS identified two countries, Ecuador, and the Russian Federation, as having been engaged in IUU **fishing** based on reported violations of international conservation and management measures during 2014, 2015, or 2016. (doc. 16)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has the purpose of | commercial (23) | activity <--> purpose | --> | modifiers of X |
| | recreational (17) | | | |
| | sport (8) | | | |

**Realization**
fishing < has the purpose of > commercial, recreational

**Concordance**
Even less well understood are the impacts of natural driven inter-decadal regime shifts which were first reported by scientists only after 50 years of commercial **fishing.** (doc. 6)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| takes place at | bottom (8) | activity <--> place | --> | modifiers of X |

**Realization**
fishing < takes place at > bottom

**Concordance**
The FAO maintains a list of vessels authorized for bottom **fishing** on the high seas; States can voluntarily upload information about where and with which gear vessels are authorized to fish. (doc.16)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is measured through | effort (205) | activity <--> indicator | --> | nouns modified by X |
| | capacity (122) | | | |

**Realization**
fishing < is measured through > effort**,** capacity

**Concordance**
This includes standardization of data collection across schemes and recording such items as **fishing** effort and observer effort (e.g. the number and proportion of fishing events specifically monitored for ETP interactions). (doc. 25)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| requires the use of | vessel (169) | activity <--> instrument | --> | nouns modified by X |
| | fleet (45) | | | |
| **Realization**<br>fishing < requires the use of > vessel, fleet | | | | |
| **Concordance**<br>Licenses for new **fishing** vessels are authorized only to replace broken-up units, taking care that total holding capacity remains the same. (doc. 6) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is done by | community (157) | agent <--> activity | <-- | nouns modified by X |
| | village (34) | | | |
| | population (15) | | | |
| **Realization**<br>fishing < is done by > community, village, population | | | | |
| **Concordance**<br>There is palpable fear among fishers and **fishing** communities interviewed that they will be excluded if quotas are established for new fisheries. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | prohibit (32) | patient <--> activity | --> | verbs with X as object |
| | allow (29) | | | |
| | combat (20) | | | |
| **Realization**<br>fishing < undergoes > prohibit, allow, combat | | | | |
| **Concordance**<br>Previously, CCAMLR was unable to track the full scope of research fishing, which includes activities involving the catch of hundreds of tons of toothfish in areas where **fishing** is generally prohibited. (doc. 16) | | | | |

## 33.Management (A) in the dictionaries

**management (activity)**

**NOAA**

The art of taking actions that affect a resource and its exploitation with a view to achieve certain objectives, such as maximizing the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons. Managers are those who practice management.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | art | generic <--> specific | <-- |
| includes | taking actions | part <--> whole | <-- |
| acts on | resource | patient <--> activity | <-- |
| | exploitation | | |
| is aimed at | maximizing production | activity <--> purpose | --> |
| includes | fishery regulations | part <--> whole | <-- |
| | catch quota | | |
| | closed season | | |
| is done by | manager | agent <--> activity | <-- |

**FAO**

The act of influencing, directing, or controlling the use of a resource.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | act | generic <--> specific | <-- |
| consists of | influencing | part <--> whole | <-- |
| | directing | | |
| | controlling | | |

**Voices**

The art of taking actions that affect a resource and its exploitation with a view to achieve certain objectives, such as maximizing the production of that resource (e.g., fishery regulations such as catch quotas or closed seasons). Managers are those who practice management.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem to NOAA | | | |

## 34.Management (A) in the corpus

**management (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| acts on | fisheries (443) | patient <--> activity | <-- | modifiers of X |
| | resource (48) | | | |
| | conflict (53) | | | |
| **Realization**<br>management (A) < acts on > fishery, conflict, resource | | | | |
| **Concordance**<br>Effective fisheries **management** of forage species fisheries is imperative to protecting stocks and ensuring long-term sustainable access to the resource. (doc. 24) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has a specific environmental status | sustainable (33) | activity <--> characteristic | --> | modifiers of X |
| is done in a specific mode | effective (27), ecosystem-based (25) | | | |
| **Realization**<br>management (A) < has a specific environmental status>sustainable | | | | |
| **Concordance**<br>Participating in meetings with NGOs and/or other sustainable seafood advisors (e.g., SFP Supplier Roundtables) Sourcing products that are certified, rated, or engaged in FIPs A public advocate for more sustainable fisheries **management** and responsible business practices. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| occurs every period of | daily (15) | activity <--> time | --> | modifiers of X |
| **Realization**<br>management (A) < occurs every period of > daily | | | | |
| **Concordance**<br>At present the government funding pays for fisheries management activities related to: research and development, monitoring and enforcement and daily **management**. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | | Column name |
|---|---|---|---|---|
| is a type of | process (376) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>management (A) < is a type of > process | | | | |
| **Concordance**<br>There is a large body of evidence that points to incorporating people in planning and **management** processes as a key success factor for marine resource management, depending on the context. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| requires the use of | plan (269) | activity <--> instrument | --> | nouns modified by X |
| | measure (191) | | | |
| | system (146) | | | |
| **Realization**<br>management (A) < requires the use of > plan, measure | | | | |
| **Concordance**<br>This law requires that a **management** plan for each fishery should be applied in accordance with principles of long-term sustainable use and maximum economic and social benefits. (doc. 8) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| involves | cost (117) | part <--> whole | <-- | nouns modified by X |
| | objectives (112) | | | |
| | regulation (64) | | | |
| **Realization**<br>management (A) < involves > cost, responsibility, decisions | | | | |
| **Concordance**<br>This helps to ensure a steady income to cover fishery **management** costs, even during periods of drastic environmental change. (doc. 8) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | improve (46) | patient <--> activity | --> | verbs with X as object |
| | support (18) | | | |
| | affect (24) | | | |
| **Realization**<br>management (A) < undergoes > improve, support, affect | | | | |
| **Concordance**<br>There are a few of examples of FIP reforms improving the **management** of non-target fisheries, but in general these reforms only directly benefit the fisheries or species engaged by the project. (doc. 1) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | remain (9) | patient <--> activity | --> | verbs with X as subject |
| **Realization**<br>management (A) < undergoes > remain | | | | |
| **Concordance**<br>Over the past ten years, the budget for fisheries management has remained unchanged for both the major commercial and small-scale fisheries. (doc. 19) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| includes | harvest control (15) | part <--> whole | <-- | is the generic of |
| | biological reference points (8) | | | |
| | monitoring (6) | | | |
| **Realization**<br>management (A) < includes > harvest control rules, biological reference points, monitoring | | | | |
| **Concordance**<br>Work with managers to develop and agree on long-term objectives for the fishery, and develop a **management** plan, including biological reference points, a harvest strategy, and a harvest control rule for each stock.(doc. 21) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| involves | dispute resolution (20) | part <--> whole | <-- | has-part |
| | conflict management (20) | | | |
| **Direction**<br>management (A) < involves > dispute resolution, conflict management | | | | |
| **Concordance**<br>Dispute resolution and conflict **management** processes are part of the fisheries management process for the three fisheries mentioned. (doc. 19). | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is led by | stakeholder (13) | agent <--> activity | <-- | X caused by |
| | agency (5) | | | |
| **Direction**<br>management (A) < is led by > agency | | | | |
| **Concordance**<br>The lead agency legally responsible for marine capture fisheries **management** is the Fisheries Division for local, national and international activities, while at the regional level some activities are led by the CRFM. (doc. 19). | | | | |

## 35.Monitoring in the dictionaries

**monitoring (activity)**

**NOAA**

The collection of information for the purpose of assessment of the progress and success of a plan. Monitoring is used for the purpose of assessing performance of a management plan or compliance scheme and revising them, or to gather experience for future plans.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| consists of | information collection | part <--> whole | <-- |
| has the purpose of | assessment, revising, gathering experience | activity <--> purpose | --> |
| acts on | plan, scheme | patient <--> activity | <-- |

**FAO**

The collection of information for the purpose of assessment of the progress and success of a land-use plan. Monitoring is used for the purpose of assessing performance of a management plan or compliance scheme and revising them or to gather experience for future plans.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| Idem NOAA | | | |

**Voices**

Not defined

## 36.Monitoring in the corpus

**monitoring (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| has the purpose of | scientific (33) | activity <--> purpose | --> | modifiers of X |
| **Realization**<br>monitoring < has the purpose of > scientific | | | | |
| **Concordance**<br>Furthermore, for the fisheries that are regulated, more than 67 percent of regulations have been established based on scientific **monitoring** and evaluation at the national and regional levels (only <33 percent at the local level). (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| that is done in a specific mode | effective (9) | activity <--> characteristic | --> | modifiers of X |
| | participatory (6) | | | |
| | collaborative (5) | | | |
| **Realization**<br>monitoring < is done in a specific mode > effective | | | | |
| **Concordance**<br>Work with scientists to research the environmental impacts of the fishery, especially with regard to effective **monitoring** of the incidental capture of endangered, threatened, and protected species. (doc. 21) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| acts on | bycatch (6) | patient <--> activity | <-- | modifiers of X |
| **Realization**<br>monitoring < acts on > bycatch | | | | |
| **Concordance**<br>The import provisions establish two possible tracks for receiving a comparability finding: one requiring population abundance estimates, bycatch **monitoring** and estimation, and calculation of a bycatch limit; and the other, requiring measures comparable in effectiveness. (doc. 16) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| requires the use of | system (25) | activity <--> instrument | --> | nouns modified by X |
| | program (18) | | | |
| **Realization**<br>monitoring < requires the use of > system, program | | | | |
| **Concordance**<br>This index is derived from a Lévy random walk modelling of the fishing trip trajectories as observed by a satellite vessel **monitoring** system (VMS). (doc. 9) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | requirement (23) | generic <--> specific | <-- | nouns modified by X |
| **Realization**<br>monitoring < is a type of > requirement | | | | |
| **Concordance**<br>The increase in management costs is associated with increased **monitoring** requirements and increased enforcement activities. (doc. 19) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | improve (18) | patient <--> activity | --> | verbs with X as object |
| | facilitate (4) | | | |
| | ensure (4) | | | |
| **Realization**<br>monitoring < undergoes > improve, facilitate, ensure | | | | |
| **Concordance**<br>Institutionalizing participatory governance systems, promoting dedicated scientific studies and improving **monitoring** would increase the adaptive capacity of SSF to cope with ENSO. (doc. 12) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is a type of | management tool (6) | generic <--> specific | <-- | is a type of |
| **Realization**<br>monitoring < is a type of > management tool | | | | |
| **Concordance**<br>Improve the scope and coverage of area-based management tools, including **monitoring**, habitat maps, economic valuations, and others. (doc. 12) | | | | |

## 37.Mariculture in the dictionaries

**mariculture (activity)**

**NOAA**

| The raising of marine finfish or shellfish under some controls. Ponds, pens, tanks, or other containers may be used, and feed is often used. A hatchery is also mariculture but the fish are released before harvest size is reached. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| consists of | raising | part <--> whole | <-- |
| acts on | marine finfish, shellfish | patient <--> activity | <-- |
| involves | controls, feed | part <--> whole | <-- |
| requires the use of | ponds, pens, tanks, other containers | activity <--> instrument | --> |
| is the generic of | hatchery | generic <--> specific | --> |

**FAO**

| Cultivation, management and harvesting of marine organisms in the sea, in specially constructed rearing facilities e.g. cages, pens and long-lines. For the purpose of FAO statistics, mariculture refers to cultivation of the end product in seawater even though earlier stages in the life cycle of the concerned aquatic organisms may be cultured in brackish water or freshwater or captured from the wild. | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| consists of | cultivation, management, harvesting | part <--> whole | <-- |
| involves | captured fish | | |
| acts on | marine organisms | patient <--> activity | <-- |
| takes place at | sea | activity <--> place | --> |
| requires the use of | cages, pens, long-lines | activity <--> instrument | --> |
| has as environment | seawater, brackish water, freshwater | activity <--> environment | --> |

**VOICES**

| A specialized branch of aquaculture involving the cultivation of marine organisms for food and other products in the open ocean or an enclosed section of the ocean (e.g., Prawns, Oysters, Seaweed, Abalone). | | | |
|---|---|---|---|
| **Paraphrase** | **Related concept** | **Relation** | **Direction** |
| is a type of | aquaculture | generic <--> specific | <-- |
| consists of | cultivation | part <--> whole | <-- |
| acts on | marine organisms, prawns, oysters, seaweed, abalone | patient <--> activity | <-- |
| results in | food and other products | activity <--> result | --> |
| takes place in | open ocean | activity <--> place | --> |

## 38.Mariculture in the corpus

**mariculture (activity)**

**Conventional word sketch**

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| has a specific environmental status | sustainable (3) | activity <--> characteristic | --> | modifiers of X |
| **Realization**<br>mariculture < has a specific environmental status > sustainable | | | | |
| **Concordance**<br>The highest-ranking countries for sustainable **mariculture** are Germany, the Netherlands, Spain, Japan and South Korea. (doc. 3) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| takes place at | global (2) | activity <--> place | --> | modifiers of X |
| **Realization**<br>mariculture < takes place at > global | | | | |
| **Concordance**<br>However, our findings highlight the uncertainties associated with the future development of global **mariculture** (both marine and brackish aquaculture). (doc. 18) | | | | |

| **Paraphrase** | **Related concept** | **Relation** | **Direction** | **Column name** |
|---|---|---|---|---|
| is quantified through | production (10) | activity <--> indicator | --> | nouns modified by X |
| **Realization**<br>mariculture < is quantified through > production | | | | |

**Concordance**
The datasets selected were for species that are commercially produced and make up approximately 95% of total global **mariculture** production; hence, they do not include species with very low production levels. (doc. 3)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| takes place in | area (7) | activity <--> place | --> | nouns modified by X |

**Realization**
mariculture < takes place in > area

**Concordance**
Although the impact on climate change on potentially suitable **mariculture** areas for the 85 species studied in this paper was projected to be small, some farmed species and associated farming areas were projected to be particularly affected by climate change. (doc 18)

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| involves | activity (6)<br>operation (5) | part <--> whole | <-- | nouns modified by X |

**Realization**
mariculture < involves > activity, operations

**Concordance**
El Niño triggered mass-bleaching events (zooxanthellae expulsion) and led to an 18 to 50 percent mortality rate of giant clam (Tridacna maxima) populations in atolls of French Polynesia where artisanal extraction and small-scale clam **mariculture** activities take place. (doc. 12)

## 39.Overfishing in the dictionaries

**overfishing (activity)**

**NOAA**

In general, the action of exerting fishing pressure (fishing intensity) beyond the agreed optimum level. A reduction of fishing pressure would, in the medium term, lead to an increase in the total catch.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | action | generic <--> specific | <-- |
| involves | exerting fishing pressure | part <--> whole | <-- |
| is referenced through | optimum level | activity <--> reference | --> |
| affects | total catch | patient <--> activity | <-- |

**FAO**

A generic term used to refer to the state of a stock subject to a level of fishing effort or fishing mortality such that a reduction of effort would, in the medium term, lead to an increase in the total catch. Often referred to as overexploitation and equated to biological overfishing, it results from a combination of growth overfishing and recruitment overfishing and occurs often together with ecosystem overfishing and economic overfishing.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| is a type of | state | generic <--> specific | <-- |
| acts on | stock | patient <--> activity | <-- |
| is caused by | fishing effort, fishing mortality | cause<--> effect | <-- |
| affects | total catch | patient <--> activity | <-- |
| is the generic of | growth overfishing, recruitment overfishing, ecosystem overfishing, economic overfishing | generic <--> specific | --> |

**Voices**

Harvesting a fish population (stock) at a rate greater than which will meet the management goal within a particular year or season.

| Paraphrase | Related concept | Relation | Direction |
|---|---|---|---|
| consists of | harvesting | part <--> whole | <-- |
| acts on | stock | patient <--> activity | <-- |
| is quantified as | rate | activity <--> indicator | --> |
| is referenced through | management goal | activity <--> reference | --> |
| lasts for a period of | year, season | activity <--> time | --> |

## 40.Overfishing in the corpus

**overfishing (activity)**

**Conventional word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is referenced through | list (3) | activity <--> reference | --> | nouns modified by X |
| **Realization**<br>overfishing < is referenced through > list | | | | |
| **Concordance**<br>Based on assessments conducted by the end of 2018, seven stocks were removed from the **overfishing** list and five were added, one of whose status was previously unknown. (doc. 0) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | end (6) | patient <--> activity | --> | verbs with X as object |
| | eliminate (4) | | | |
| | prevent (3) | | | |
| **Realization**<br>overfishing < undergoes > end, eliminate, prevent | | | | |
| **Concordance**<br>In 2017, the United States proposed a two-phase program to end **overfishing** of North Atlantic shortfin mako and rebuild the stock, but consensus could not be reached. (doc. 16) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| undergoes | occur (11) | patient <--> activity | --> | verbs with X as subject |
| | exist (4) | | | |
| | appear (2) | | | |
| **Realization**<br>overfishing < undergoes > occur, exist, appear | | | | |
| **Concordance**<br>Based on evidence from fishery assessments completed by the National Fisheries Institute, **overfishing** occurs in fisheries with formal management, but the estimated percentage is variable. (doc. 19) | | | | |

**Semantic word sketch**

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is caused by | subsidy (2) | cause <--> effect | <-- | X caused by… |
| | actions (2) | | | |
| **Realization**<br>overfishing < is caused by > subsidy, actions | | | | |
| **Concordance**<br>These countries are in the position not to repeat the mistakes of other countries, i.e., by overcapitalizing fisheries and establishing subsidy schemes that contribute to destructive fishing practices or **overfishing**. (doc. 3) | | | | |

| Paraphrase | Related concept | Relation | Direction | Column name |
|---|---|---|---|---|
| is the cause of | decline (2) | cause <--> effect | --> | X is the cause of |
| **Realization**<br>overfishing < is the cause of > decline | | | | |
| **Concordance**<br>These forage species are important in the diets of seabirds, marine mammals, and larger finfish and therefore the **overfishing** of forage fish can lead to declines in their predators. (doc. 11) | | | | |

# Appendix 5

## Distribution of relations per term

### 1. Bycatch (E)

| bycatch (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| patient <-> activity | patient <-> activity | patient <-> activity | |
| part <-> whole | part <-> whole | part <-> whole | |
| | | entity <-> place | |
| entity <-> characteristic | entity <-> characteristic | | |
| entity <-> indicator | | | |
| entity <-> time | | | |

### 2. Catch (E)

| catch (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| patient <-> activity | patient <-> activity | patient <-> activity | patient <-> activity |
| agent <-> activity | | agent <-> activity | |
| part <-> whole | part <-> whole | part <-> whole | part <-> whole |
| entity <-> place | | | entity <-> place |
| | activity <-> result | | |
| entity <-> indicator | entity <-> indicator | | entity <-> indicator |

### 3. Ecosystem

| ecosystem (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | generic <-> specific |
| patient <-> activity | | | |
| part <-> whole | part <-> whole | part <-> whole | part <-> whole |
| entity <-> place | entity <-> place | | entity <-> place |
| entity <-> characteristic | | entity <-> characteristic | |
| entity <-> indicator | | | |
| entity <-> environment | | | |

## 4. Fish (E)

| fish (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | |
| patient <-> activity | patient <-> activity | patient <-> activity | |
| agent <-> activity | | | |
| part <-> whole | | part <-> whole | |
| entity <-> place | | | |
| entity <-> purpose | | | |
| | | entity <-> characteristic | |
| entity <-> environment | | entity <-> environment | |

## 5. Fisher

| fisher (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | | |
| agent <-> patient | | | |
| patient <-> activity | | | |
| agent <-> activity | agent <-> activity | agent <-> activity | |
| part <-> whole | | part <-> whole | |
| entity <-> place | | entity <-> place | |
| entity <-> purpose | | | |
| entity <-> characteristic | | | |

## 6. Fishery (E)

| fishery (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| | generic <-> specific | generic <-> specific | |
| agent <-> patient | agent <-> patient | agent <-> patient | agent <-> patient |
| patient <-> activity | | | |
| agent <-> activity | | | |
| | part <-> whole | part <-> whole | part <-> whole |
| entity <-> place | entity <-> place | entity <-> place | entity <-> place |
| | entity <-> method | entity <-> method | entity <-> method |
| | entity <-> instrument | entity <-> instrument | entity <-> instrument |
| entity <-> purpose | entity <-> purpose | entity <-> purpose | entity <-> purpose |
| entity <-> characteristic | | | |

## 7. Habitat

| habitat (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | generic <-> specific |
| patient <-> activity | | | |
| | part <-> whole | | part <-> whole |
| entity <-> place | | entity <-> place | entity <-> place |
| entity <-> characteristic | | | |
| entity <-> indicator | | | |
| entity <-> environment | entity <-> environment | | |

## 8. Harvest (E)

| harvest (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| agent <-> patient | | | |
| patient <-> activity | patient <-> activity | | patient <-> activity |
| | part <-> whole | | part <-> whole |
| | entity <-> place | | entity <-> place |
| activity <-> result | | | |
| entity <-> indicator | entity <-> indicator | | entity <-> indicator |
| entity <-> time | | | |

## 9. Landings (E)

| landings (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| agent <-> patient | | | agent <-> patient |
| patient <-> activity | patient <-> activity | | patient <-> activity |
| agent <-> activity | | | |
| part <-> whole | part <-> whole | | part <-> whole |
| entity <-> place | entity <-> place | | entity <-> place |
| | activity <-> result | | |
| entity <-> indicator | | | |
| entity <-> time | | | |

## 10.Longline (E)

| longline (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | | generic <-> specific | generic <-> specific |
| patient <-> activity | | | |
| | | part <-> whole | part <-> whole |
| entity <-> place | | entity <-> place | entity <-> place |
| entity <-> instrument | | | |
| entity <-> characteristic | | | entity <-> characteristic |

## 11.Stakeholder

| stakeholder (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | | generic <-> specific |
| | agent <-> patient | | agent <-> patient |
| patient <-> activity | | patient <-> activity | |
| agent <-> activity | | agent <-> activity | |
| | | part <-> whole | |
| entity <-> place | | | |
| entity <-> characteristic | | | |

## 12.Stock (E)

| Stock (entity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| | generic <-> specific | generic <-> specific | generic <-> specific |
| patient <-> activity | | | |
| part <-> whole | part <-> whole | part <-> whole | part <-> whole |
| entity <-> place | entity <-> place | entity <-> place | |
| entity <-> characteristic | entity <-> characteristic | entity <-> characteristic | entity <-> characteristic |
| entity <-> indicator | | | |

## 13.Aquaculture

| aquaculture (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | | | |
| patient <-> activity | patient <-> activity | patient <-> activity | patient <-> activity |
| | part <-> whole | part <-> whole | part <-> whole |
| | activity <-> purpose | activity <-> purpose | |
| | | | activity <-> instrument |
| activity <-> place | | activity <-> place | |
| activity <-> indicator | | | |
| activity <-> environment | | | |

## 14.Assessment (A)

| assessment (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | |
| patient <-> activity | patient <-> activity | patient <-> activity | |
| | agent <-> activity | | |
| | | part <-> whole | |
| activity <-> result | | | |
| activity <-> characteristic | | | |
| | activity <-> purpose | activity <-> purpose | |
| activity <-> time | | | |
| activity <-> instrument | | | |
| | activity <-> destination | activity <-> destination | |

## 15.Fishery (A)

| fishery (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | |
| | | | |
| patient <-> activity | patient <-> activity | patient <-> activity | |
| agent <-> activity | | | |
| part <-> whole | part <-> whole | part <-> whole | |
| activity <-> result | activity <-> result | activity <-> result | |
| activity <-> characteristic | | | |

## 16.Fishing

| fishing (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| patient <-> activity | patient <-> activity | patient <-> activity | patient <-> activity |
| agent <-> activity | | | |
| | part <-> whole | part <-> whole | part <-> whole |
| | activity <-> result | activity <-> result | activity <-> result |
| activity <-> characteristic | | | |
| activity <-> purpose | | | |
| activity <-> instrument | | | |
| activity <-> place | activity <-> place | activity <-> place | activity <-> place |
| activity <-> indicator | | | |

## 17.Management (A)

| management (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | generic <-> specific | generic <-> specific | generic <-> specific |
| | | | |
| patient <-> activity | patient <-> activity | | patient <-> activity |
| agent <-> activity | agent <-> activity | | agent <-> activity |
| part <-> whole | part <-> whole | part <-> whole | part <-> whole |
| activity <-> characteristic | | | |
| | activity <-> purpose | | activity <-> purpose |
| activity <-> time | | | |
| activity <-> instrument | | | |

## 18.Monitoring

| monitoring (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| generic <-> specific | | | |
| patient <-> activity | patient <-> activity | patient <-> activity | |
| | part <-> whole | part <-> whole | |
| activity <-> characteristic | | | |
| activity <-> purpose | activity <-> purpose | activity <-> purpose | |
| activity <-> instrument | | | |

## 19.Mariculture

| mariculture (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| | generic <-> specific | | generic <-> specific |
| | patient <-> activity | patient <-> activity | patient <-> activity |
| part <-> whole | part <-> whole | part <-> whole | part <-> whole |
| | | | activity <-> result |
| activity <-> characteristic | | | |
| | activity <-> instrument | activity <-> instrument | |
| activity <-> place | | activity <-> place | activity <-> place |
| activity <-> indicator | | | |
| | | activity <-> environment | |

## 20.Overfishing

| overfishing (activity) | | | |
|---|---|---|---|
| **CORPUS** | **NOAA** | **FAO** | **VOICES** |
| | generic <-> specific | generic <-> specific | |
| patient <-> activity | patient <-> activity | patient <-> activity | patient <-> activity |
| | part <-> whole | | part <-> whole |
| cause <-> effect | | cause <-> effect | |
| | | | activity <-> time |
| | | | activity <-> indicator |
| activity <-> reference | activity <-> reference | | activity <-> reference |