CHAPTER 11

Conceptual types of terminological metaphors in marine biology

An English-Spanish contrastive analysis from an experientialist perspective

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Metaphor can be analysed from a structural, functional, conceptual, or contrastive point of view. From a conceptual viewpoint, an experientialist account of conceptual metaphor includes: (i) mechanisms of metaphorization, (ii) image metaphors vs. multiple-correspondence metaphors, (iii) motivation for metaphorical transfer, and (iv) conceptual themes (Alexiev 2004). This chapter draws on Alexiev's parameters to analyse an inventory of metaphorical pairs in English and Spanish extracted from a bilingual corpus of specialized research articles and publications on marine biology. The results obtained point to the existence of cross-linguistic conceptual patterns in specialized discourse in the two languages studied. These findings and their implications are discussed in relation to some of the claims of Lakoff's (1993) Conceptual Metaphor Theory.

Keywords: image metaphors, metaphorical pairs, multiple-correspondence metaphors, cross-linguistic conceptual patterns

1. Introduction

Previous studies have shown that metaphor plays a pivotal role in the terminologization of lexical items in knowledge fields such as oncology (Faber and Márquez 2004, Tercedor 1999a,b, 2004), computer science (Meyer et al. 1997, Meyer and Foz 2001), and architecture (Caballero 2003a,b). This occurs because, apart from sometimes being just a matter of semantic extension, metaphorical analogy can also be a means of lexical creation both in general and specialized language. The research reported in this chapter provides evidence that metaphor is also pervasive in the domain of marine biology, thus reinforcing the claim that metaphor-induced terminologization is a widespread phenomenon that occurs to some extent in all specialized domains.

According to the Experientialist view of Conceptual Metaphor Theory (Lakoff 1993), metaphor is all around us, and underlies our conceptualization of reality. Not surprisingly, metaphor yields conceptualization patterns, which are believed to be shared by speakers across languages. Nevertheless, cognitivist studies of metaphor in general language also highlight the existence of cross-linguistic differences in this regard (see Al-Zoubi et al. 2006 for a contrastive study of English and Arabic lexical units used in politics and religion, or Kövecses 2002, 2005 for a contrastive study of everyday English, Hungarian, Chinese, and Spanish lexical units featuring bodily states). These differences seem to arise largely from cognitive and cultural aspects related to linguistic formalization.

According to Faber and Márquez (2004: 207), corpus data provide an empirical basis for research in specialized communication, and show that metaphor consistently occurs in specialized language texts in the field of oncology. The results of the present study show that this is also true for marine biology texts in which the same metaphors often occur in English and Spanish. However, at the same time, I also point out the existence of cross-linguistic differences in terminological metaphorization due to factors of a cognitive and cultural grounding, which give rise to subtle cross-linguistic differences in the domain of marine biology. This finding provides interesting insights into the nature of conceptual metaphor, showing that metaphorical thought is the result of neither nature nor nurture, but rather a combination of both.

2. Methodology

2.1 Text selection and corpus description

The texts analysed in the field of marine biology were: (i) research articles published in academic journals; (ii) (semi-)specialized books.

The *Journal Citation Reports* (JCR) website was used for the classification and quality evaluation of the journal articles.[1] The following factors were considered:

a. Citation index of the journal
b. Subject of the journals
c. Topic of the articles (only English-language articles)
d. Availability of complete on-line articles
e. Date of publication

All of the articles used in this study are complete articles published between 1994 and 2008. The JCR is an on-line service that provides a ranking of the most frequently cited journals published by over 3,000 publishers worldwide. Journals are ranked according to a citation index defined by the website itself.

1. http://www.scimagojr.com/index.php.

Apart from the citation index criterion, the English-language journals used were singled out for their subject matter with a view to making it as varied as possible, for the analysis of a range of journals dealing with different subtopics within marine biology should guarantee a more varied set of metaphorical terms. The Mexican journal *Ciencias Marinas* was also used because it publishes bilingual articles in English and Spanish, and this facilitated the comparison of correspondences between both these languages. Nevertheless, only two articles from this journal were chosen because of its low impact.

Unfortunately, this type of classification could not be applied to the Spanish-language journals because of their low JCR ranking. Only three journals appeared on the list, and all had very poor rankings. In fact, one of them ranked 0.00. Although the rest of the journals in the Spanish corpus are not on the JCR ranking list, they are considered quality publications. The journal *Boletín del Instituto Español de Oceanografía* is published by the Spanish Ministry of Science and Innovation. The rest are published

Table 1. English language journals

English language journal	JCR Citation Index	Number of articles
Fish and Fisheries	0.423	3
Microbial Ecology	0.255	1
Fish and Shellfish Immunology	0249	3
Marine Biology	0.123	9
Helgoland Marine Research	0.111	1
Environmental Biology of Fishes	0.078	2
Ciencias Marinas	0.049	2
Total		21

Table 2. Spanish language journals

Spanish language journal	JCR Citation Index	Number of articles
Revista de Biología Marina y Oceanografía	0.041	8
Ciencias Marinas	0.049	2
Investigaciones Marinas	0.00	2
Revista de Biología Tropical	–	4
Boletín de Investigaciones Marinas y Costeras	–	1
Boletín del Instituto Español de Oceanografía	–	1
Interciencia	–	1
Total		19

either on the *SciELO* (Scientific Electronic Library Online) or *Redalyc* (*Red de Revistas Científicas de América Latina, el Caribe, España y Portugal*) websites. These websites follow a number of strict norms, guidelines, and selection criteria that guarantee the quality of the scientific journal articles they host.[2]

Four (semi-)specialized books were also selected. All texts were published between 1997 and 2007, and are mainly addressed to biology students and readers with some previous knowledge of marine biodiversity.

2.2 Corpus processing

An initial list of terms instantiating conceptual metaphors were extracted from the bilingual corpus and analysed. Once I obtained a list of keywords, I used these patterns to search for other similar ones in the corpus. In other words, I looked for candidate metaphorical terms. This was done semi-automatically with Wordsmith Tools*tm*, a lexical analysis programme. For example, I resorted to basic marine biology entity names such as 'crab', 'shark', 'fish', and 'sea' to find English-Spanish metaphorical term pairs (e.g. 'hermit crab'/*cangrejo ermitaño*, 'sand tiger shark'/*tiburón toro*, 'swordfish'/*pez espada* and 'sea cucumber'/*pepino de mar*). This was done by using Wordsmith Tools to obtain collocates for 'crab'/*cangrejo*, 'shark'/*tiburón*, 'fish'/*pez*, 'sea'/*mar*, and so on. Many of these collocates clearly indicated the existence of metaphor, which had been used to designate specific types of crab and shark as well as plants that grow in the sea. Another example is the pair 'species'/*especie*, which turned out to be recurrent, yielding terminological units like 'cosmopolitan species'/*especie cosmopolita* and 'invasive exotic species'/*especie exótica invasora*. It was also possible to identify other pairs stemming from the same root. This was the case for 'colon*' ('colony'/*colonia*, 'colonize'/*colonizar*) and 'migra*' ('migratory'/*migratorio*, 'migrant'/*migrante*, 'migrate'/*migrar*).

Using the names of common marine organisms as keywords did not always help in finding metaphorical pairs in the two languages. In fact, an organism may be assigned a metaphorical name in one language and a different name in another language. In this case, to identify the interlinguistic equivalents, it was necessary to turn to the scientific names of organisms, which usually co-occur with their metaphorical alternatives. For example, by using Wordsmith Tools to examine the co-text of all occurrences of the scientific name *Isistius brasiliensis* in the English and Spanish texts, I found out that 'cookie-cutter shark', the metaphorical alternative name in English for this scientific name, pairs with *tiburón cigarro* in Spanish.

The distributional behaviour of linguistic metaphors also facilitated the identification of metaphorical terms in the same text because they tended to occur in close

2. The *SciELO* website's criteria for journal evaluation and selection can be accessed on http://www.scielo.org/php/level.php?lang=es&component=44&item=2. Last accessed on 5 May 2008. The *Redalyc* website's criteria for journal evaluation and selection can be accessed on http://redalyc.uaemex.mx/redalyc/src/proyecto/criterios.html. Last accessed on 5 May 2008.

proximity. Metaphor distribution across texts has been examined by various researchers interested in identifying systematicity in the use of metaphor in discourse (Cameron 2007, Martin 2007, *inter alia*). They have found that linguistic metaphors are not evenly distributed but occur in clusters (Cameron 2007: 121), and that the occurrence of a given metaphor increases the chances for this metaphor to be used again in the subsequent discourse (Martin 2007).

In line with this, my research encountered linguistic metaphors that tended to occur together in the same discourse contexts both in English and Spanish. This is the case of the semantically related terms 'nutrient cycle (flux)'/*ciclo* (*flujo*) *de nutrientes*, 'organic cycle'/*ciclo orgánico*, 'food chain'/*cadena trófica*, 'energy flux'/*flujo de energía* and 'organic matter recycling'/*reciclaje de materia orgánica*. The same applies to linguistic metaphors such as 'monopolize'/*monopolizar*, 'capitalize'/*capitalizar*, 'parental investment'/*inversion paternal*, '(primary, secondary) production'/*producción* (*primaria*, *secundaria*), and 'spend energy'/*gastar* (*invertir*) *energía*.

At the conceptual level, I was able to formulate generic, content-rich conceptual metaphors from linguistic evidence. For example, terms like 'elephant seal'/*elefante marino*, 'seahorse'/*caballito de mar* and 'sea lion'/*león marino* suggest that they could be subsumed by the cross-domain mapping SEA ANIMALS ARE LAND ANIMALS. I then introduced the names of a wide range of land animals in the Wordsmith Tools search option and found an extensive number of marine biology metaphors based on the names of land animals. These findings support Cameron's (2007: 127) theory of *systematic metaphors*: that is systematic metaphor as "a set of semantically-connected (vehicle) terms used across a discourse event or text to refer to a connected set of topics".

In short, it can be stated that, to identify and process marine biology terminological metaphor in a corpus of texts, I followed a methodology similar to that used by Charteris-Black (2004), inasmuch as he not only relies on keywords and candidate terms, but also formulates encompassing conceptual metaphors to give support to his findings in the linguistic structure.

3. Analysis

The metaphors extracted from the texts were analysed according to: (i) mechanisms of metaphorization, (ii) image metaphors vs. multiple correspondence metaphors, and (iii) motivation for metaphorical transfer. This was done with a view to identifying and analysing similarities and differences between English and Spanish marine biology texts.

3.1 Experientialism and metaphorization

Two main commitments of Experientialism are embodiment and the ecological nature of conceptualization (Johnson 1987, Lakoff 1987, 1993, Lakoff and Johnson 1980,

1999). They are considered to be the underpinnings of conceptualization in general and of metaphorization in particular. Embodiment is a form of categorization inherent to human reason insofar as it is "a reason inextricably tied to our bodies and the peculiarities of our brains" (Lakoff and Johnson 1999: 17). In other words, concepts are created in our minds through the projection of our bodily structure and sensory perception onto *realia*. Furthermore, embodied categorization means that we interact with one another and with our environment, i.e., concepts arise as a result of our ecological nature. "Ecological" should be understood here in terms of "human ecology", viz. "the branch of sociology concerned with the spacing and interdependence of people and institutions" (*American Heritage Dictionary* 2006). As Lakoff and Johnson (1980: 125) state, "concepts are not defined solely in terms of inherent properties; instead, they are defined primarily in terms of interactional properties".

It should be pointed out that embodiment and interaction are generic concepts that must be understood as multi-modal phenomena. I use the term "multi-modal" along the lines of Barsalou (1999), who argues that concepts – or as he calls them, "perceptual symbols" – are experienced as "multi-modal". This means that they emerge because we receive information from different sensory-perceptual inputs. For instance, we conceive the concept 'hammer' based on characteristics such as shape, weight, and texture, and from sensory-motor patterns derived from our experience of using a hammer. In this sense, embodiment is fleshed out by different perceptual facets or sensory-motor experiences.

Lakoff and Johnson (1999: 91) establish a direct link between conceptual metaphor and "embodied realism". They consider that conceptual metaphor also fleshes out embodied realism along with perceptual and motor inferences. In turn, Grady (1997, 1999) affirms that two cognitive operations that give rise to metaphorical conceptualization are resemblance and experiential correlation. Resemblance is a traditional prompt for metaphorical conceptualization in both general language and specialized communication (see Sager et al. 1980, *inter alia*). Experiential correlation consists of a strong conceptual link between two distinct events that iteratively co-occur. This phenomenon usually gives rise to conceptual metaphors because after repeated co-occurrences in our experience of the world, we come to conceive one event in terms of another.

Since resemblance and experiential correlations may be similar among speakers of different languages, the same conceptual metaphors are often used in English and Spanish to refer to specific concepts in specialized domains. These similarities are further accentuated by the fact that both English and Spanish belong to the Western culture, which guarantees an overlapping set of beliefs, values, cognitive schemas, and specialized concepts deriving from these schemas. For example, by virtue of the nature of our visual system, which can be regarded as one aspect of our physical embodiment, the species *Hermodice carunculata* is usually referred to as 'fireworm'/*gusano de fuego* because of the reddish colouring of its skin. This is a case of metaphorical conceptualization based on resemblance.

Experiential correlation is also grounded in our sensory-motor experience. For example, the metaphor MORE IS UP is based on the correlation between QUANTITY and HEIGHT, which is evidenced when we say that we pile *up* books on a table. This metaphorical process is related to what Lakoff and Johnson (1999: 216) call "epistemic causation", viz. "deducing the existence of causation in the world from evidence proceeds from knowledge of the effect". This cause-effect correlation can be experienced by our bodies through *direct* interaction with entities around us. Consequently, because we know the result of touching a wasp (physical interaction), the species *Chironex fleckeri* (a kind of jellyfish) is called 'sea wasp'/*avispa marina*. In other words, one entity resembles another on account of an experiential correlation.

As can be deduced from this last example, resemblance and experiential correlation can sometimes jointly contribute to the creation of metaphorical concepts. Both cognitive operations are not incompatible and can simultaneously be at work in the metaphorization of marine biology concepts. Correlation and resemblance work together so closely that correlation can be regarded as part of the resemblance process. This fact seems to soften Grady's (1999) claim that resemblance metaphors and correlational metaphors must be considered separately on the grounds that in correlational metaphors the two domains have no shared characteristics. For example, as Grady claims, no aspect of the target concept 'more' is shared by the source concept 'up'.

Although resemblance and experiential correlation are two different conceptual operations in most cases, I provide further examples that show that on some occasions resemblance and experiential correlation work very closely together in the metaphorization of marine biology concepts. In the view adopted here, these two cognitive operations are interdependent. In the case of the 'sea wasp'/*avispa marina* example, the experiential correlation is based on a resemblance in behaviour between the two entities and the resulting experience of pain felt by the attacker (i.e., a jellyfish *behaves* like a wasp insofar as both produce the same effect when they defend themselves against possible danger). This type of resemblance is at the same time contingent on the comparison between two pairs of correlational actions (the hand touching a wasp and the hand touching the jellyfish, both followed by the subsequent experience of pain). This evidence points to the close relationship between resemblance and experiential correlation in metaphorization.

Despite the fact that basic aspects of experience-based metaphorization are believed to be shared by speakers across languages, "universal embodiment *can be overridden* by either social-cultural context (experiences) or cognitive processes (cognitive preferences)" (Kövecses 2005: 293). Indeed, the results obtained in my study show that interactional metaphorical conceptualization also yields conceptual differences, which can be ascertained through the analysis of metaphorical terms. In addition, cross-linguistic differences are sometimes constrained by cultural aspects too, which affect metaphorical conceptualization and linguistic designation. Here, resemblance and experiential correlation are also the motivations for metaphorical transfer, and they can both be at work at the same time as well.

According to Kövecses (2005: 285), "[t]hree important systems [...] play an important role in an account of the universality and variation of metaphors. The systems are bodily experience (embodiment), social-cultural experience (context), and cognitive preferences and styles". These words are a claim for the existence of both experienced-based, universal patterns and cross-linguistic cognitive and cultural differences involved in metaphorization.

3.2 Image metaphors vs. multiple-correspondence metaphors

Lakoff and Turner (Lakoff 1992, 1993, Lakoff and Turner 1989) distinguish between image metaphors and conventional (structural-conceptual) metaphors. Image metaphors are conceptually simple, i.e., only one concept of the source domain maps onto the target domain. This single mapping results in one expression. In contrast, conceptual metaphors emerge from the entire projection of one domain of experience onto another (domain-to-domain mapping). They involve the mapping of "rich knowledge and rich inferential structure" (Lakoff and Turner 1989: 91), which gives rise to a more or less extensive number of linguistic expressions.

Much of the cognitivist research on terminological metaphor is based on this twofold distinction (Alexiev 2004: 190). In general language, Ruiz de Mendoza (1999) identifies multiple-correspondence metaphors, which correspond to Lakoff's structural-conceptual metaphors, and single-correspondence metaphors. Ruiz de Mendoza argues that "concrete" images (the term he uses instead of "image metaphors") are one type of single-correspondence metaphor because one very illustrative feature of the source concept serves as a mental picture, which generates the target concept. For the purpose of this study, reference is made to Lakoff's image metaphors and Ruiz de Mendoza's multiple-correspondence metaphors. The use of 'image' is a departure from Alexiev (2004: 203), who rejects this term for terminological analysis:

> The very concept "image TM" is inapplicable to a terminological analysis. It also is at variance with a basic assumption of "metaphorically structured concepts" in experientialism (Lakoff and Johnson 1980). We are aware of the fact that what Lakoff probably has in mind when speaking of "image (one-shot) metaphor" is something like a snapshot [...] Nevertheless, in view of observing the terminological principle of "precision of expression" we deem it necessary to replace the term "image metaphor" with the term "non-conventional metaphor". Thus we recognize two main types of TM: (a) *conventional TM* and (b) *non-conventional TM*.

Alexiev thus argues that by using the term "image metaphors" Lakoff seems not to regard these metaphors as concepts, which, as Alexiev explains, should not be the case. He concludes that since Lakoff views them as images or mental snapshots, these metaphors cannot be considered concepts from a terminological standpoint. As we shall see, this is not the case for marine biology image metaphors, which are specialized

concepts as well as *images*. Image metaphor is the type of metaphor that I pay closest attention to in the research reported here.

The boundaries between image metaphors and multiple-correspondence (structural-conceptual) metaphors are often fuzzy. Corpus-based studies conducted by Caballero (2003a, b) in the field of architecture and Deignan (2007) in general language show that there are many cases in which an image metaphor can be subsumed by a multiple-correspondence metaphor. In other words, "many expressions are both imagistic and realizations of structural-conceptual mappings" (Deignan 2007: 187). This contribution is very important because it challenges the traditional assumption of cognitive thinking that image metaphors are "second-class" metaphors because they do not organize thought. For example, Caballero (2003a: 151) illustrates this point with the metaphor 'weaving': "The decision to air-condition lower-floor public spaces required ingenious *weaving* of ductwork in the ceiling". Caballero argues that 'weaving' is an evident example of ARCHITECTURAL PRACTICE IS MAKING CLOTH, a recurrent multiple-correspondence metaphor in the architecture corpus analysed. From quite another perspective, this multiple-correspondence metaphor has a very visual quality, i.e., it evokes a very clear mental image. In marine biology I was also able to identify conceptual metaphors that combine a number of image metaphors (for example, SEA ANIMALS ARE LAND ANIMALS).

The term "image metaphor" is used by Lakoff (1993) and Lakoff and Turner (1989) to refer to those metaphors that arise as fleeting comparisons, never become stable, and consequently are not ultimately lexicalized in language. In this sense, they would correspond to what Ruiz de Mendoza (1999: 61) calls "situational metaphor". This idea of fleetingness also seems to be argued by Kövecses (2002: 38), who states that an image-to-image mapping is "of the *one-shot* kind that is generated by two images that are brought into correspondence by the superimposition of one image onto the other". A one-shot action implies that it is a one-off kind of action. However, as far as marine biology image metaphors are concerned, this would entail that they were one-off comparisons between two entities. As we shall see, this is not the case.

The term "conventional metaphor" is used by Lakoff to refer to well-entrenched metaphors that are frequently used. Therefore, they stand in stark contrast to Lakoff's notion of "image metaphor". As already explained, conventional metaphors also involve a rich system of correspondences. Thus, I consider the term "multiple-correspondence metaphor" to be more suitable than "conventional metaphor" because "multiple-correspondence metaphor" better explains the nature and number of cross-domain mappings that characterize this type of metaphor. To this it must be added that the dichotomy conventional metaphor vs. image metaphor cannot be applied to marine biology where image metaphors are also well-established, conventional expressions.

Finally, in my view, the term "conceptual metaphor" should not stand in opposition to "image metaphor". As Gibbs and Bogdanovich (1999: 43) write, "image metaphors are indeed understood via conceptual mappings – and thus are [conceptual]". In this

vein, marine biology image metaphors are conceptual (just like all other metaphors). Accordingly, the terminological metaphors analysed here are conceptual mappings.

3.2.1 *Image metaphors in marine biology*

In the study of marine biology image metaphors, I analysed terms designating organisms. In marine biology such organisms often have two types of designation: (i) a scientific name; (ii) a metaphorical name. Image metaphors are very transparent, something that facilitates the understanding and retrieval of concepts. These metaphors are rich in imagistic detail and function as mental snapshots of marine animals and plants. For this reason, they have a highly referential capacity, and can thus be called image metaphors.

3.2.1.1 Motivation for metaphorical transfer. Marine biology image metaphors fit the traditional categories for metaphorical motivation:

- Resemblance to inanimate entities (object-like): shape, colour, and function.
- Resemblance to animate entities (human-like, animal-like, plant-like): shape, colour, and habits/behaviour.

There are also cases in which resemblance and experiential correlation interact. In such cases, function and/or habits/behaviour are always the categories for metaphorical motivation. Habits/behaviour can sometimes combine with shape, but shape alone cannot combine effectively with correlation because it does not refer to (repeated) actions.

The image metaphors given as examples in the following sections were extracted from the marine biology corpus. They are representative of the following contrastive differences between image metaphors in English and Spanish:[3]

a. Exact pairs: the metaphorical motivation and the subsequent terminological naming are alike in both languages (e.g. 'lantern fish'/*pez linterna*; see Section 3.2.1.3. for further examples).
b. Partial pairs: the metaphorical motivation is the same, but named differently in each language depending on the degree of semantic specificity (e.g. 'Cooper's nutmeg'/*nuez de Cooper*; see Section 3.2.1.4. for further examples).
c. Separate pairs: the metaphorical motivation is not the same in both languages. In the analysis of these pairs, a number of conceptual differences rooted in cultural aspects were identified (e.g. 'cookie-cutter shark'/*tiburón cigarro*; see Section 3.2.1.5. for further examples).
d. Unbalanced pairs: just one term of the pair is metaphorical. Culture-derived conceptual differences were found as well (e.g. 'puffer'/*tamboril*; see Section 3.2.1.6. for further examples).

3. Examples of the four image metaphor types are given in Tables 3–6.

3.2.1.2 Previous experientialist considerations of image metaphors. Corpus data reveal that in marine biology there are many highly specialized concepts with basic-level category denominations. These categories belong either to the field of biology or to other related domains. For instance, bearing in mind that 'animals' and 'fire' are basic categories, it is hardly a coincidence that that individuals in the family Clariidae are often called 'catfish'/*pez gato* (exact pair) and the species Millepora dichotoma is usually referred to as 'fire coral'/*coral de fuego* (exact pair).

This fact is based on the Experientialist premise that "we have evolved to form at least one important class of categories that optimally fit our bodily experiences of entities and certain extremely important differences in the natural environment – what are called *basic-level categories*" (Lakoff and Johnson 1999: 27). Basic-level concepts form, along with spatial-relation concepts and event-structure concepts, the basis of our stable scientific knowledge (96). In fact, "we are better equipped to recognize plants and animals at the level of the genus, that is, at the basic level, than at lower biological levels" (90–91). For this reason, many of the image metaphors analysed in this study are basic-level categories. Accordingly, they adapt highly differential, specialized concepts to our experience with primary entities. Therefore, "the projection from basic-level categories to superordinate and subordinate categories" (Lakoff 1987: 268) occurs in both general language and specialized communication.

Lakoff and Johnson (1980: 52) state that "the metaphorical structuring of concepts is necessarily partial, and is reflected in the lexicon of the language, including the phrasal lexicon, which contains fixed-form expressions [...]". Likewise, Ungerer and Schmid (1997: 86) affirm that "subordinate categories are often expressed by compounds and other composite terms". Support for these statements can be found in marine biology discourse, where many of the image metaphors are lexicalized as multi-word structures with varying levels of fixedness or stability. Since image metaphor concepts are often basic-level concepts, greater specification is necessary to ensure accurate communication. Such conceptual specification is linguistically rendered in the form of complex designations, such as 'Portuguese man-of-war'/*galera portuguesa* (*Physalia physalis*), 'leatherback sea turtle'/*tortuga laúd* ['lute turtle'] (*Dermochelys coriacea*), and 'shamefaced crab'/*cangrejo real* ['king crab'] (*Calappa granulata*).

3.2.1.3 Exact pairs. As already mentioned, the corpus examined showed a high frequency of image metaphors. This seems to hold for marine biology as a whole. This confirms the existence of basic metaphorical conceptualization patterns grounded in our experience that permeate both general and specialized language. Given the status of English as the lingua franca for specialized communication, many English metaphorical terms are references for other languages. For these reasons, my corpus shows a high number of exact pairs.

Table 3. Exact pair: metaphor based on resemblance to an inanimate entity

English term	Spanish term	Taxonomic position and scientific name	Referent and metaphorical motivation
Lantern fish	*Pez linterna*	Family *Myctophidae*	Fish with light-producing organs with shoaling or courtship function (metaphorical motivation: function)
Sea-fan	*Abanico de mar*	Order *Gorgonacea*	Cnidarian whose polyps are one-lined arranged, so resembling a fan (metaphorical motivation: shape)
Lemon shark	*Tiburón limón*	Species *Negaprion brevirostris*	Shark named for its yellowish upper side (metaphorical motivation: colour)

Table 4. Exact pair: metaphor based on resemblance to a living entity

English term	Spanish term	Taxonomic position and scientific name	Referent and metaphorical motivation
Sea lettuce	*Lechuga de mar*	Species *Ulva lactuca*	Green alga that looks like a lettuce both in shape and colour (plant-like)
Seahorse	*Caballito de mar*	Genus *Hippocampus*	Fish with a horse-like head (animal-like)
Hermit crab	*Cangrejo ermitaño*	Super family *Paguroidea*	Crab with a vulnerable abdomen living inside a conch for protection. This animal behaves like a hermit (human-like) in that both live a solitary existence in their refuges

3.2.1.4 Partial pairs. Although not abundant in the marine biology corpus, partial image metaphors can reflect subtle cross-linguistic conceptual differences in specialized discourse on account of the degree of semantic specificity. Each language construes a partial metaphorical concept from the overall metaphor by focusing on a specific conceptual trait of the domains mapped.

It is sometimes necessary to consider basic-level categories when a cross-linguistic comparison is made between types of motivation for metaphorical transfer. When it comes to partial image metaphors, it is necessary to ascertain subcategories derived from basic-level categories. These subcategories are related to what Kövecses (2005: 154) calls "degree of specificity" in his research into the "cross-linguistic differences in the expression of the same conceptual metaphor". According to Kövecses, this degree of specificity involves a hierarchy of things or events, which is also found in the partial term pairs in the marine biology corpus. For instance, the coral *Alcyonium digitatum* is often called 'dead man's fingers' in English because of its finger-shaped branches. In

Spanish this designation usually alternates with *mano de muerto* ['dead man's hand'], which constitutes a clear case of meronymy.

Regarding the degree of semantic specificity in terminological metaphor, it is also useful to take into account Felber's (1984: 117–118) definition proposal for 'shape', which is perhaps the most frequent prompt for metaphorical conceptualization in marine biology. Felber conceives of shape as a set of "intrinsic features" included in a wide range of concepts, such as design, form, size, and type of material. In this sense, the conceptual difference between 'Hungarian capshell' and *sombrero húngaro* ['Hungarian hat'], which is a type of mollusc, arises from specific features mainly concerning the design and form of the objects referred to.

3.2.1.5 Separate pairs. While partial pairs are concept names with slightly different metaphorical nuances in English and Spanish, construal in separate pairs implies two entirely different metaphors. Of course, both metaphor and metaphor variation are manifestations of what Langacker (1987: 487–488) calls "construal". "Construal" refers to different ways of conceptualizing reality, and reflects "the relation between a speaker (or hearer) and the situation that he conceptualizes or portrays, involving focal adjustments and imagery". Conceptual metaphor is an example of construal: "Within Cognitive Linguistics, metaphor is a dimension of construal since it reflects a very general ability to conceive of and structure one entity against the background of another" (Faber and Márquez 2004: 202).

Table 5. Partial pair: metaphor based on resemblance to an inanimate entity

English term	Spanish term (literal English translation)	Taxonomic position and scientific name	Referent and metaphorical motivation	Conceptual difference
Cooper's nutmeg	*Nuez de Cooper* ('Cooper's nut')	Species *Cancellaria cooperi*	The colour of this snail's shell is orange with cream or brown strips, like the inner part of a nut(meg)	*Nut* is a generic concept. A nutmeg can be considered a type of nut (metaphorical motivation: colour)
Hungarian cap-shell	*Sombrero húngaro* ('Hungarian hat')	Species *Capulus ungaricus*	This mollusc looks like a head covering	The English term refers to a specific covering. The Spanish term refers to a generic one (metaphorical motivation: shape)
Triggerfish	*Pez ballesta* ('crossbow fish')	Family *Balistidae*	When threatened, this fish deploys two dorsal spines like a weapon	The English term refers to a part of a weapon. The Spanish term refers to the weapon itself (metaphorical motivation: functioning)

Table 6. Partial pair: metaphor based on resemblance to an animate entity

English term	Spanish term (literal English translation)	Taxonomic position and scientific name	Referent and metaphorical motivation	Conceptual difference
Croaker	*Corvina* ('raven-like')	Family *Sciaenidae*	Fish producing a croaking sound that resembles the sound of a raven's (habit/behaviour + animal-like)	The English term refers to the ravens' sound. The Spanish term refers to ravens in general
Dead man's fingers	*Mano de muerto* ('dead man's hand')	Species *Alcyonium digitatum*	Coral with finger-shaped branches	The Spanish term is a hyperonym of the English term (metaphorical motivation: shape)
By-the-wind sailor	*Velero* ('sailing boat')	Species *Velella spirans*	Polyp colony whose shape resembles the sail of a boat	The English term is a personification of the man steering the boat. The Spanish term refers to the boat itself

Lakoff and Johnson (1980: 52) also point out "the partial nature of metaphorical thinking" and affirm that such partiality is "reflected in the lexicon". Tables 7 and 8 give examples of metaphorical terms that show cross-linguistic differences in metaphorical construal.

Culturally derived differences between languages can also be transmitted in terms of basic-level categories. As Boyd (1993: 235) states, when talking about scientific communication: "we may explain this basic level dominance by the speakers' primary physical and cultural interactions with these categories". Cases of image metaphors in marine biology show that culture-bound factors may arise in the interactional projection from basic-level to subordinate categories.

For example, the popular name for *Carcharias taurus* is 'sand tiger shark' in English and *tiburón toro* ['bull shark'] in Spanish. While in English this shark is compared to a tiger because of the transversal, dark stripes on its back, in Spanish the qualities of aggressiveness and stoutness are highlighted. Thus, this shark is compared to a bull, which is a culturally prominent animal in Spain. As can be seen, the motivation for metaphorical conceptualization present in the scientific name (*Carcharias taurus*) is reinforced culturally in Spanish, which gives rise to a cross-linguistic culturally based cognitive difference.

The English term in Table 7 is a case of terminological metaphor based on both resemblance and experiential correlation. A cookie-cutter is a tool for cutting cookie dough into different shapes. When a cookie cutter is used, it leaves marks on the dough (repeated co-occurrences in experience). In a similar way, a shark resembles a cookie-cutter because when it bites its prey (cause), it leaves patterned marks on its flesh (effect). Here, function/behaviour and shape combine to give rise to a metaphorical concept.

Table 7. Separate pair: the English term is culturally motivated

English term	Spanish term (literal English translation)	Taxonomic position and scientific name	Referent and metaphorical motivation in English	Metaphorical motivation in Spanish
Cookie-cutter shark	*Tiburón cigarro* ['cigarette shark']	Species *Isistius brasiliensis*	This shark leaves cookie-shaped wounds on the bodies of its prey (behaviour and shape + object-like)	Elongated shark with a dark collar marking around its throat resembling a cigarette tip (shape + object-like)

Table 8. Separate pair: the Spanish term is culturally motivated

English term	Spanish term	Taxonomic position and scientific name	Referent and metaphorical motivation in English	Metaphorical motivation in Spanish
Bottlenose dolphin	*Delfín mular* ['mule-like dolphin']	Species *Tursiops truncatus*	The length of this dolphin's nose makes it resemble a bottle (shape + thing-like)	Dolphin as robust as a mule (offspring of male donkey and female horse frequently found in Spain) (shape + animal-like)

3.2.1.6 Unbalanced pairs. In the same way as separate pairs, the unbalanced pairs found in the marine biology corpus support the claim that cognitive and cultural aspects are major factors that model languages and yield cross-linguistic conceptual differences. As Kövecses (2005: 160) states, both cognitive and cultural elements are fused to make up speakers' conceptual schemas:

> Metaphor is not only cognitively but also culturally motivated. As characteristics of cultures change, so can the metaphor and its linguistic expression. In it, the cognitive and the cultural are fused into a single conceptual complex. In this sense, what we call conceptual metaphors are just as much cultural entities as they are cognitive ones.

Interaction with the entities around us is the basis for concept formation. If one entity is prominent in a certain culture, this entity is likely to be used for metaphorical conceptualization. In fact, "the interactional properties result from our interaction with our physical and cultural environment due to our cognitive abilities" (Alexiev 2004: 198). Table 9 and Table 10 show examples of unbalanced term pairs in English and Spanish.

The examples in Tables 9 and 10 show how cognitive and cultural factors in one language or another can constrain the formation of a specialized concept through

Table 9. Unbalanced pairs: only the English term is metaphorical

English term	Spanish term (literal English translation)	Taxonomic position and scientific name
Anglerfish	*Rape* (–)	Genus *Lophius*
Sea gooseberry	No common name associated	Species *Pleurobranchia bachei*

Table 10. Unbalanced pairs: only the Spanish term is metaphorical

English term	Spanish term (literal English translation)	Taxonomic position and scientific name
Brown shrimp	*Camarón café* ['coffee shrimp']	Species *Penaeus californiensis*
Puffer	*Tamboril* ['small drum']	Family *Tetraodontidae*

metaphorization. In Table 9 only the English terms are metaphorically conceptualized. 'Anglerfish' received its name because of the foremost spine of dorsal fin of this fish, which resembles a 'fishing rod' with fleshy 'bait' at its tip. This spinal 'fishing rod' is used as a lure for prey, which stray close enough for the anglerfish to swallow it. The motivations for metaphorical transfer are shape + object-like (spine like a fishing rod) as well as habit/behaviour + human-like (fish like an angler). 'Sea gooseberry' refers to a jellyfish that received its name on account of its roundish shape. The motivation for metaphorical transfer is thus shape + object-like.

In Table 10 it is the Spanish terms that are metaphorically conceptualized. While in English the species *Penaeus californiensis* is simply called 'brown shrimp', in Spanish the brownish colour of this shrimp is the metaphorical motivation for calling this animal 'coffee shrimp'. Concerning 'puffer' and *tamboril* in this table, a highly marked cultural factor is at work. In English, fish of the family *Tetraodontidae* are called 'puffers' because they acquire a roundish shape when they blow or puff themselves up to scare away predators. Thus, there is no metaphorical motivation operating here. The meaning of this term is literally 'an animal that puffs up instinctively'. In contrast, in Spanish this type of fish is referred to as *tamboril*, which is a typical round Spanish musical instrument. Therefore, the metaphorical motivation is shape + object-like. As can be seen, both languages exploit the same physical feature to conceptualize an entity: roundness. However, only Spanish brings metaphor and a cultural aspect to bear.

3.2.2 *Multiple-correspondence metaphor in marine biology*

According to Ruiz de Mendoza (1999), multiple correspondence metaphors are conceptual metaphors that arise from multiple mappings between two very rich and highly structured cognitive domains. These mappings are linguistically rendered by a set of metaphorical lexical units contingent on the conceptual metaphor at issue.

The corpus used in this study yielded a great number of multiple-correspondence metaphor terms both in English and Spanish. Furthermore, my analysis showed that most of these terms presented no cross-linguistic conceptual differences. The multiple-correspondence metaphors found are the following:

MARINE HABITATS ARE COMMUNITIES
LIFE/SURVIVAL IS WAR
VITAL ACTIVITIES ARE ECONOMIC ASPECTS
MARINE BIOLOGICAL PROCESSES ARE A CYCLICAL FLUX

In accordance with Lakoff's (1993) "inheritance hierarchies", general conceptual metaphors engender more specific ones. Likewise, according to Kövecses (1995), a specific metaphor can emerge from the interaction between two or more general ones. These theoretical premises lay the basis for the hierarchies I found in marine biology multiple-correspondence metaphors, represented in Figure 1.

Table 11 includes the aforementioned conceptual metaphors and a non-comprehensive list of English and Spanish terms found in the corpus that realize such conceptual metaphors:

Table 12 contains a number of fragments of texts extracted from the corpus. These contexts illustrate how the instantiations of certain multiple-correspondence metaphors call for the participation of instantiations of other conceptually related multiple-correspondence metaphors in discourse. Instantiations of these metaphors are bold-typed in the contexts. The contexts also reveal that the multiple-correspondence metaphors ascertained in this study are lexicalized in the same way in English and Spanish. The exact interlinguistic pairs are bold-typed and underlined.

The first pair of contexts in Table 12 is a good example. The Spanish context includes the metaphorical terms *comunidad* and *colonias* as well as *defender* and *ataques*, which belong to the multiple-correspondence metaphors MARINE HABITATS ARE COMMUNITIES and LIFE/SURVIVAL IS WAR, respectively. Thus, instantiations of MARINE HABITATS ARE COMMUNITIES prompt the participation of instantiations of LIFE/SURVIVAL IS WAR.

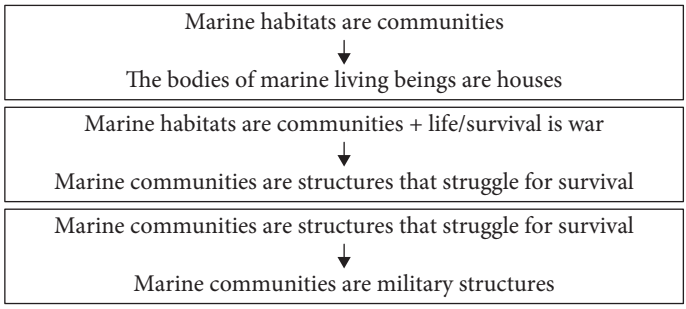

Figure 1. Multiple-correspondence metaphors in the domain of marine biology

Table 11. English/Spanish terms that realize the multiple correspondence metaphors

Multiple correspondence metaphor	English term/Spanish term
MARINE HABITATS ARE COMMUNITIES	community/*comunidad*, population/*población*, guild/*gremio*, association/*asociación*, family of organisms/*familia de organismos*, colony/*colonia*, settlement/*asentamiento*, individual/*individuo*, cosmopolitan species/*especie cosmopolita*, visitant species/*especie visitante*, tourist species/*especie turista*, resident species/*especie residente*, native species/*especie nativa*, indigenous species/*especie indígena* (*autóctona*), migrant/*migrante*, migratory route/*ruta migratoria*, peregrinate/*peregrinar*, solitary species/*especie solitaria*
THE BODIES OF MARINE LIVING BEINGS ARE HOUSES	host/*hospedador* (*huésped*), housing/*hospedaje*, inquiline/*inquilino*, commensal/*comensal*
MARINE COMMUNITIES ARE STRUCTURES THAT STRUGGLE FOR SURVIVAL (MARINE HABITATS ARE COMMUNITIES + LIFE/SURVIVAL IS WAR)	struggle/*lucha*, competitor/*competidor*, dominant species (competitive, dominant)/*especie dominante*, competitive exclusion Principle (Gause's Law)/*Principio de exclusión competitiva* (*Ley de Gause*), opportunistic species/*especie oportunista*, oust/*excluir*, associational resistance, gregarious species/*especie gregaria*, colonize/*colonizar*, refuge/*refugio*, alimentary strategy/*estrategia alimentaria*
MARINE COMMUNITIES ARE MILITARY STRUCTURES	Intrusion/*intrusión*, recruit/*recluta*(r), recruitment/*reclutamiento*, cohort/*cohorte*, sentry organism/*organismo centinela*, evolutionary arms race/*carrera armamentística/evolutiva*, deterrent/*elemento disuasorio*, equipped with/*equipado con*, defense/*defender*, line of defence/*línea de defensa*, attack/*atacar*, invasive exotic species/*especie exótica invasora*, invade/invadir, invasive species/*especie invasora*
VITAL ACTIVITIES ARE ECONOMIC ASPECTS	monopolize/*monopolizar*, capitalize/*capitalizar*, (offset energetic) costs/(*compensar*) *gastos* (*energéticos*), trade-off/*compensación*, reproductive effort/*esfuerzo reproductivo*, reproductive output/*rendimiento reproductivo*, parental investment/*inversión paternal*, (primary, secondary) production/*producción* (*primaria*, *secundaria*), energy demand/*demanda de energía*, spend energy/*gastar* (*invertir*) *energía*
MARINE BIOLOGICAL PROCESSES ARE A CYCLICAL FLUX	nutrient cycle (flux)/*ciclo* (*flujo*) *de nutrientes*, carbon cycle (flux)/*ciclo* (*flujo*) *del carbono*, nitrogen cycle (flux)/*ciclo* (*flujo*) *del nitrógeno*, organic cycle/*ciclo orgánico*, biogeochemical cycle/*ciclo biogeoquímico*, food chain/*cadena trófica*, energy flux/*flujo de energía*, organic matter recycling/*reciclaje de materia orgánica*, water flow/*flujo de agua*

The Spanish terms *comunidad* and *colonias* have 'community' and 'colony' as their interlinguistic correlates in the English context. This is hardly a coincidence, and shows that English and Spanish tend to conceptualize marine biology entities and processes in similar ways.

Table 12. Contexts of multiple-correspondence metaphors

Context in English		Context in Spanish
Single stranded conformation polymorphism (SSCP) and real time quantitative polymerase **chain** reaction (qPCR) analyses were used to examine the genetic diversity of the Symbiodinium **community** *in* ***hospite*** across an individual **colony** of *Acropora valida* at the spatial scale of single polyps.	⇨	*Entre estos vegetales y sobre ellos vive una compleja* ***comunidad*** *de peces, crustáceos y pequeños animales solitarios o en* ***colonias*** *que encuentran en la penumbra, creada por estas praderas, el refugio ideal para cuidar y* ***defender*** *a sus pequeñas crías de los* ***ataques*** *de las especies mayores.*
At the end of their larval stage, these fish **settle** on the reef and directly enter their echinoderm **host** where they undergo an important metamorphosis. The aim of this study was to get further insight on the type of symbiosis (**commensal** vs. parasite) between these fish and their **hosts**.	⇨	*La relación básica entre estos dos organismos puede ser de espacio, de sustrato,* ***defensa, protección****, transporte o alimento. Si la* ***asociación*** *es sólo de transporte pasivo del* ***comensal*** *por el* ***huésped*** *se le llama foresis.*
Species were classified as **native**, non-**invasive exotic** or **invasive exotic**. We found that sites without any disturbance did not support exotic plants. Physically disturbed sites on low fertility soils supported only one exotic species, suggesting that nutrient enrichment is a critical prerequisite for exotic species **invasion**.	⇨	*A. franciscana es una especie americana* ***autóctona****, distribuida ampliamente en Norte y Sudamérica y el Caribe. Se ha convertido en una* ***especie exótica invasiva*** *en expansión en el Viejo Mundo. Es hoy la especie de Artemia dominante en las salinas costeras atlánticas portuguesas, a lo largo de la costa mediterránea francesa y en la Bahía de Cádiz (SO de España), desplazando a las formas* ***nativas****.*
Evidence for unique genetic variation for each trait was also found, supporting an ongoing **evolutionary arms race** between **defense** and **offense**. Reproductive **conflict** between males can strongly influence female fitness.	⇨	*Existen otros mecanismos distintos de los consumidores y los recursos, que determinan el uso de la* ***producción primaria*** *[...] Todos estos mecanismos forman parte de la* ***carrera armamentista evolutiva*** *entre productores y consumidores que mantiene a la naturaleza en estado pulsátil.*
The **society** of blue-gilled wrasse is by no means the most complicated in sexual terms. Animal **societies** with up to three male genders and two female genders have been described. Even when only two genders exist, there are cases where male choice of females is the norm. For example, sea-horse males incubate the young in a special pouch and thus provide **parental investment** that is worth **competing** for in case of females.		*El estudio aborda la ecología reproductiva de las* ***sociedades*** *complejas de aves marinas dimórficas, en relación a las teorías de* ***inversión parental*** *y proporción de sexos en las nidadas.*
Sea ice contains the free-floating, aquatic plants (a **primary production** level of the arctic **food chain**). Through these plants, the sun's energy is converted, by the process of photosynthesis, from light energy to chemical energy that can be passed and utilized by animals in the **nutrient cycle**.	⇨ ⇨	*Mediante redes, mangas, tamices, etc., se pueden extraer de la masa de agua elementos pertenecientes a los* ***productores*** *y* ***consumidores primarios****, interrumpiendo la* ***cadena trófica*** *al disminuir la* ***población*** *de algunos nichos del ecosistema.*

4. Conclusions

As is the case of general language uses, in marine biology our categorization system is largely based on basic-level categories, which are highly metaphorical and subject to interactional properties. As Lakoff (1987: 8) affirms, categories arise in our minds from (i) interaction with our environment; (ii) cognitive phenomena that stem from our imagination, such as metaphor and metonymy, and that are linguistically rendered in the form of figurative language (imagery). In other words, there are common mechanisms of conceptualization through metaphor across languages, in the form of perceptual and motor inferences (i.e. embodiment). This also applies to specialized language, and concretely, to the discourse of marine biology.

Nevertheless, cognitive and cultural aspects can also constrain conceptualization through metaphorization, giving rise to cross-linguistic differences. This is the case of the image metaphors analysed in this chapter. Marine biology image metaphors present cognitive and cultural differences between English and Spanish. The features of image metaphors in both these languages can be summarized as follows:

1. Resemblance and experiential correlation are involved in the metaphorization of marine biology image metaphors in English and Spanish. They are compatible, which means that sometimes both cognitive operations work very closely together. In such a case, function and/or behaviour are necessary because they refer to (repeated) actions.
2. Comparison to an inanimate entity on account of resemblance in shape is the most recurrent pattern motivating the metaphors found in English and Spanish.
3. Spanish seems to have more culturally motivated metaphorical terms than English.
4. When it comes to invertebrates, it is easier to find image metaphor terms as alternatives to taxonomic designations in (semi-)specialized English texts than in Spanish. This seems to indicate a tendency in English to give (marine) organisms a metaphorical designation. However, this is not always true for Spanish. In fact, more often than not, the Spanish terms are literal translations of their corresponding English image metaphor (exact pairs). If they do have a separate metaphorical motivation in Spanish, this term often coexists with the literal translation, since English is currently the language of science discourse.

In contrast, the range of marine biology multiple-correspondence metaphors identified in this study presented no cognitive or cultural differences between both these languages. This strengthens the initial claim that metaphor yields common cross-linguistic conceptualization patterns. Thus, it should not come as a surprise that the multiple-correspondence metaphors studied in this work respond to the same conceptualization patterns in English and Spanish, these patterns involving not only marine biology entities (substantives), but also processes (verbs) and attributes (adjectives). This allows for the formulation of encompassing conceptual metaphors shared by both languages.

Finally, the results obtained in this corpus-based study shed light on two major assumptions in Conceptual Metaphor Theory, and have theoretical implications for metaphor research. Specifically, the analysis of marine biology metaphorical terms revealed that: (i) two different mechanisms – resemblance and correlation – are not incompatible, i.e. can both be at work in certain cognitive processes, giving rise to the conceptualization of marine biology entities; (ii) there is a need to rethink and relabel "image" metaphors, since some of them are specialized *concepts* as well as *images*. In other words, they are as imagistic as they are realizations of structural-conceptual mappings and have more in common with structural metaphors than acknowledged in the cognitivist literature so far. Thus, the boundaries between image metaphors and multiple-correspondence (structural-conceptual) metaphors are often fuzzy.

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