“FISHING AND SUSTAINABLE DEVELOPMENT”

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1.Introduction.

My FCP is going to deal with fishing activity, the activity carried out in the aquaculture sub-sector and its relationship with sustainable development.
The fishing activity is an activity that is located in the fishing sector, a sector that, although small, has a crucial importance in the economy, not only at a national level but also at an international level. It is crucial that we pamper and care for the marine biodiversity, which we use and consume regularly. In reality, the problem that arises is that the population consumes, in many cases, in excess, too much of the living beings that inhabit marine ecosystems, which leads to the real situation of overfishing, which endangers the existence of the great variety of living beings that inhabit these marine ecosystems and that both current generations and future generations cannot continue using and consuming, which is vital for the very existence of mankind.
Therefore, it is very important to mix fishing activity and fishing activity in the aquaculture subsector itself with the concept of sustainable development, so that, with this, what is called sustainable fishing and sustainable aquaculture arises, that is, that fishing activity becomes sustainable to ensure that both present generations and future generations can continue to enjoy it and that the aquaculture subsector also becomes sustainable by improving and making sustainable the techniques developed in the activity in that subsector.
Therefore, we will further develop the fishing activity and the sector in which it is located: the fishing sector and we will also further develop the aquaculture sub-sector developed both globally and we will also introduce and develop what is meant by sustainable development. We will continue to develop the main problem of the FCP, and also in turn, the crucial challenge of mankind, which is sustainable fishing combined with sustainable aquaculture.
We will continue to include and describe the fishing policies at European and global level concerning sustainable fishing and sustainable aquaculture, in particular institutional aspects.
We will develop and explain a real case in which this combination between sustainable fishing and sustainable aquaculture is embodied.
And we will conclude by summarizing and highlighting the main parts of this FCP.

2. The fishing sector, its past and present situation and the introduction of the definition of fishing, the definition of aquaculture, their historical evolution, world fish trade and trade flows and the introduction in addition to the definition of sustainable development.

It is worth mentioning an activity that is located within resources of a non-inexhaustible nature and, although it belongs to a small part of the primary sector, it is no less important in the economy. We'd be talking about fishing.

Fishing is an activity based on the capture and extraction of fish and other aquatic species from their natural environment. We would be talking about invertebrates, crustaceans as well as mollusks, we would even be talking about mammals in the case of oriental cultures. It is one of the oldest economic activities of many peoples of the world. Moreover, it is one of the activities of the primary sector and, in turn, it is also one of the main primary activities most widespread throughout the world and, in addition, many populations have based their economy solely and exclusively on fishing. With all this, we know that fishing means catching and extracting fish from the water, but there is a difference. If the capture and extraction take place in fresh waters, we would be talking about fluvial or continental fishing and, on the other hand, if the capture and extraction of the fish takes place in salty waters, then we would be talking about maritime or sea fishing. Freshwater fishing is carried out in rivers, swamps, lakes or streams and is a much more selective fishing, which causes a smaller impact on the environment. What is more, the many fishermen who fish in river waters practice what is called non-death or return fishing, which, once the fish has been caught with the rod, returns it to the water causing as little damage as possible, thus providing an environmental balance and, in turn, practicing their favorite sport. This type of fishing is more and more widespread among sea fishermen, and they are more and more aware of the importance of taking care of the ecosystem, although, in reality, anglers normally carry out selective and sustainable fishing.

On the other hand, sea fishing is also known as oceanic fishing. This type of fishing can be separated into three zones or layers. The first zone refers to fishing carried out on the coast or on the shore, the second zone refers to deep-sea fishing, fishing carried out many miles from the coast with which it is possible to access a greater number of species susceptible to be fished although this requires a greater investment and the third and final zone includes the so-called pelagic fishing, fishing that is carried out at great distances from the coastal coast and fishermen need to spend many months at sea making the search for the appreciated catches.

Although there are many types and forms of fishing, the most common and common forms of fishing are angling or sport fishing (practiced specifically by recreational fishermen) and commercial fishing using nets (focused on industrial or artisanal fishing activity). Moreover, commercial fishing, whether industrial or artisanal, is one of the most important economic activities in the world.

Commercial or professional or capture fishing encompasses two types of activities: industrial type and artisanal type. If this commercial or professional or capture fishing is carried out in an industrial way, it is called industrial fishing and if this commercial or professional or capture fishing is carried out in an artisanal way, then it is called artisanal fishing. Industrial fishing aims to get as many fish as possible and is done with large fishing boats and are fully and perfectly prepared to spend many months at sea in search of those longed and dreamed catches and also have systems to unload the catches in the market port when they arrive and so on, On the other hand, artisanal fishing focuses on the use of elementary and artisanal techniques, so that this type of fishing is often focused exclusively on self-consumption, although in other cases, there are villages that commercialize part of their catches in small local businesses.

It must be said that although commercial fishing with nets is not totally bad, there is a technique used to carry it out that is called trawling. This technique consists of dragging large cloths of nets through the seabed to catch as many fish as possible, but causes great damage to the marine ecosystem, because it is not selective at all and drags all kinds of animal species, plants and seabed, those that are pursued (that have some commercial value) and those that are not (without any commercial value) This technique is completely prohibited almost in its entirety and the FAO (Food and Agriculture Organization of the United Nations) and other organizations worldwide fight hard to eradicate this type of fishing.

As we have said, fishing activity belongs to the primary sector. The primary sector is an economic sector, which includes all economic activities whose purpose is the exploitation of nature's resources and, obtaining from here, raw materials for direct consumption and, also in turn, those raw materials necessary to be transformed by the secondary sector for final consumption. Moreover, the primary sector would form one of the sectors in which the economy is disaggregated: primary sector, secondary sector, tertiary sector and quaternary sector.

The primary sector is of vital importance for human survival, since it is in charge of procuring the food necessary for human survival and also the food necessary for livestock survival.

Therefore, the activities that would make up, and into which the primary sector itself would be divided would be the following: agriculture (which would include all activities related to the cultivation of the land and whose purpose is to obtain vegetable products such as fruits, vegetables, grains or pastures), livestock (in which we would locate all those activities destined to the breeding of domestic livestock, for the exploitation and for the trade of food or furs), hunting (we would have here all activities linked to the hunting of wild animals for the consumption of food and furs), fishing and pisciculture (the activity in charge of the extraction of fish and other aquatic organisms is framed here), beekeeping (an activity dedicated to the breeding of bees to obtain honey and wax from them) and, finally, we would also have forestry or forest exploitation (the activities related to the cultivation of trees in the forest would be framed here for subsequent felling and thus obtaining wood from them).

Once the primary sector has been defined and the activities that make it up and are developed in it, we are going to focus attention on a specific activity that is

developed in the same primary sector and defined, in turn, at the beginning of this second point: fishing.

Fishing or fishing activity or fish production, as you might call it, is a very important economic activity both at European level and at world level, specifically for millions of people all over the world.

For millions of years, fishing has been one of the means of survival for thousands of people around the world.

According to the report by Francisco Canterla Martín entitled: "*Fishing activities in the ports of south-western Andalusia in the second half of the 15th century and fishing activities throughout history: evolution of catch systems"* (2018), we can say that we do not know exactly when this activity was born, but we do know, more or less, the period in which this activity began.

Fishing began in Prehistory, more specifically in the Paleolithic, and has been a means of survival for humans, to feed and survive, a main livelihood in itself.

Fishing served to meet the individual needs of man, but soon, motivated by the increase in production of this activity, led to the birth of a flourishing trade.

Little by little also, they were learning the preservative properties of salt. In fact, some 3000 years ago the trade in salted and dried fish was one of the most flourishing in the Mediterranean area. The Phoenicians, in particular, carried out a very active trade with this product.

The first instruments used to catch fish were flint, bone and wooden harpoons, the tip of which was hardened by fire and, later, hooks were also used; on the other hand, the Egyptians and Phoenicians also began to use what is known as the *volantín*, which emerged later, which is known as longline. Specifically, there are paintings of ancient Egypt, approximately 4000 years ago, where a fisherman appears with an angler. Also, in ancient Greece, we find Plato and Aristotle (Plato was a Greek philosopher, follower of Socrates and master of Aristotle and Aristotle himself was a Greek philosopher, polymer and scientist, Plato's pupil and father also with him, of Western philosophy) who name angling and also Plutarch (historian, biographer, and Greek moralist philosopher), who gives advice on fishing lines. Also, the Roman Claudius Aelian (A.D. 170-235) wrote about Macedonian trout fishermen, who used artificial flies or hooks with feathered bait.

In the same way, the Hebrew people were also very skillful in using so-called nets for fishing. This new technique had a very significant presence at that time. It developed very quickly on the Mediterranean shores, because they had high tonnage boats to carry it out; boats with more maneuverability and with increasingly improved means of orientation on board, which contributed to its progression. At that time, the capture of certain species such as herring, sardines and cod was strongly encouraged by the fact that the Church promoted and imposed, specifically, at the time of abstinence, a diet based on the same fish, and at the same time prohibited the ingestion of meat, eggs and dairy products which also stimulated and forced the consumption of fish, something which, at the same time, stimulated the fishing itself.

A few centuries later, specifically in 1940, the technique of sonar was incorporated into vessels to easily detect schools of fish and that could obtain the maximum possible catches, but not very beneficial and appropriate for

marine ecosystems; this technique can even lead to deplete the traditional fishing grounds.

With the passing of the years, of the centuries, besides considering fishing as a means to survive and to trade with it, it also began to be considered as a recreational activity; as an art in itself. Evolving also and beginning to consider it as a science in itself. The fishermen themselves know that apart from being able to enjoy the art of fishing (which leads us to a modality called sport fishing) and to be able to take advantage of trading with it (hence what we know as capture fishing), they must conserve the aquatic environments, the marine ecosystems themselves in order to continue existing with the passage of time. Even so, at present, there is a much greater predominance of being able to obtain a profit, a profit from the fishing activity, from the fishing activity, so that the fishing trade itself has a strong presence and dominion. We must also define and talk about aquaculture. We are going to treat it as a sub-sector attached to the fishing sector itself. Aquaculture is understood as the activity dedicated to the cultivation of aquatic organisms in both coastal and inland areas, which in turn involves targeted interventions in the breeding process to stimulate and increase the production of aquatic organisms. This activity is also known as aquaculture and is a group of techniques, breeding knowledge and activities aimed at breeding aquatic species in its most general aspect in itself. What's more, not only is it in charge of the fish found in the different waters, but also, we are talking about the breeding of all the animals that live in this environment and also, of all the plants that live at the same time in these ecosystems. There are many different systems for doing this, as well as many species that can be studied and cultivated in this method of aquaculture that is very different from capture fishing. Although their work may apparently coincide with that of capture fishing, we must bear in mind that they are based on very different concepts in reality. The aquaculture or aquaculture is treated and serves to breed species without impacting the ecosystem in the would live normally and, in addition, it is also about providing species with a fully monitored diet to ensure, at the same time, their proper and perfect growth and subsequent exploitation aimed at the sale and trade itself. This aquaculture activity has many different manifestations. It is really an activity that has existed for many years, but that has been developed little by little over time as the inhabitants of the world have been realizing that aquatic resources are not eternal; rather they are exhaustible resources, which is why, by keeping this very much in mind over the years, this aquaculture activity has been developed more and more over the years; in some countries there is even the fact that the same aquaculture subsector has even surpassed the fishing sector, the capture fishing itself and has positioned itself above it and is the economic engine of the country, thanks to the fact that it has taken advantage of the development of new technologies, the emergence of new methods and research in the aquaculture subsector itself. The aquaculture itself can be classified according to the purpose of the crop, so in this case we would have the aquaculture of resource use (benefits from the areas with the best conditions at the ecological level to use them for an activity of production), we also have the aquaculture of production and marketing (seeks to use its resources to procreate and commodify the most consumed species in the market) and, finally, we have the

integral culture (is carried out here.), in various installations, all the stages of the life cycle of the breeding of species, from breeding to fattening), and yet, if we classify the aquaculture sub-sector in terms of the waters in which they are carried out, then, therefore, we would have continental aquaculture (this activity would be carried out in fresh waters) and marine aquaculture (this activity is carried out in the sea, in salt waters and this activity would focus on the species that inhabit it). According to the report by José Luis González Serrano entitled: *"Historical evolution and current situation of aquaculture in the world and in Spain".* Subdirección General Caladeros Nacionales y Acuicultura. (2018), we can affirm that aquaculture itself dates from 2504 B.C., in Egypt, specifically, archaeological remains found there show this. There is also information that in ancient China oysters were grown in saltwater and also carp in swimming pools, and in turn, the Greeks and Romans had mollusk and fish vivars. Later, in the Indo-Pacific area, in 1400 B.C., there was also interest in taking care of fish farmers against the appearance of possible looters; moreover, it was already known, around the same era, the technique of oyster culture by both the Japanese and the Greeks and Romans. Later, in the year 475 B.C., carp farming continued in swimming pools, becoming the predominant culture, placing itself above the cultivation of other species in the beginning of the aquaculture itself, especially in China, which continued in time, specifically until the sixth century. Some time later, in 460 B.C., the first technique for the cultivation of mollusks appeared, specifically in China, which also cultivated oysters. On the other hand, in the Mediterranean and European areas, there are records of the beginnings of the aquaculture subsector already in the time of Aristotle, which shows in some of his works the different qualities of oysters, and also highlights the way of treating them which is very similar to the way used in modern aquaculture. Also, the Roman agronomic writer Lucio Moderato Columella, in his famous treatise "De re Rustica", assured that great potentates and patricians colonized artificial swimming pools and large lagoons with fry and, for this, they used eggs from marine species such as sea bass and sea bream that are capable of acclimatizing to a life of controlled breeding; moreover, at that time, techniques were developed for the feeding and treatment of possible diseases of these young and later artificially bred adult fish. Generally, fish were fed smaller fish, bread, apples and dried figs; more specifically, flatfish (we are talking about species such as flounder, sole and turbot) were fed soft foods such as salted fish intestines, ripe fruit and cheese and, when unfortunately they became ill, they were then fed special nutrients and moved to another pool with warm water until they healed. In that era, in Rome, aquaculture was a luxury of the great potentates and, specifically, mullets, pike, moray eels, lampreys, sea bass and sea bream were the most important aquaculture crops.

A few centuries later, already in the Middle Ages, the cultivation of fish such as carp was already well known and, also, the artificial reproduction of trout was perpetrated in France and, later, it was spread and transferred to the rest of European countries, being transferred later also to the rest of the world through the English colonies.

The beginning of aquaculture in the Iberian Peninsula can also be traced back to Roman times, centuries later, specifically in the twelfth century, in 1129, the

archbishop of Santiago left the order to form on the banks of the river Sar, trout nurseries and was the first of the Peninsula in addition. Later, in the 13th century, in 1258, King Alfonso X of Castile, called "the Wise One", legalized the production of immature fish.

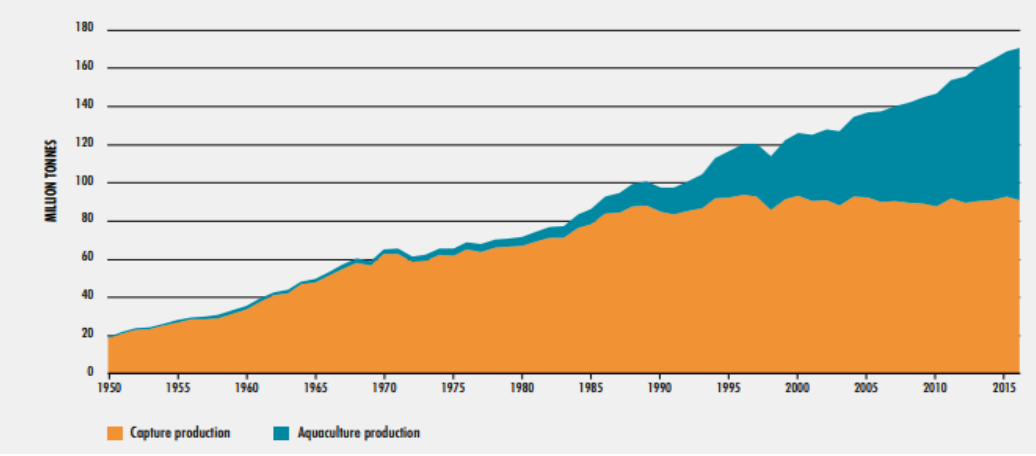
The aquaculture of marine fish has its origins in Spain, specifically, we have the estuaries of Cadiz, the *Albufera* of Valencia, the *Albufera* of the Balearic Islands and those also located in the salt flats of Murcia, in which, the floodgates of the same opened and closed to spaces of time continuously to let in species that inhabited the sea, and later to be fattening them little by little in the same confinement of the facilities. It can also be said that in the very lagoon of Valencia is such an ancient activity, that specifically since the thirteenth century, more specifically since 1238, there were laws regulating the work of the 1500 Moorish fishermen who devoted their time and efforts to the subsector of aquaculture at that time.

Having explained in detail both the definition of fishing and that of aquaculture as well as their historical evolution, let us now move on to analyze in detail both the fishing sector and the aquaculture sub-sector.

According to the *SOFIA Reports for 2014, 2016 and 2018 (FAO),* we can argue and detail that, precisely, both the fishing sector and the aquaculture sub-sector have evolved over time, over the years, with a great progression, strictly speaking.

We observe in the following graph, a progression in time what has happened and what is happening now with them.

FIGURE 1: PROGRESSION OF GLOBAL FISHING AND AQUACULTURE PRODUCTION OVER TIME.



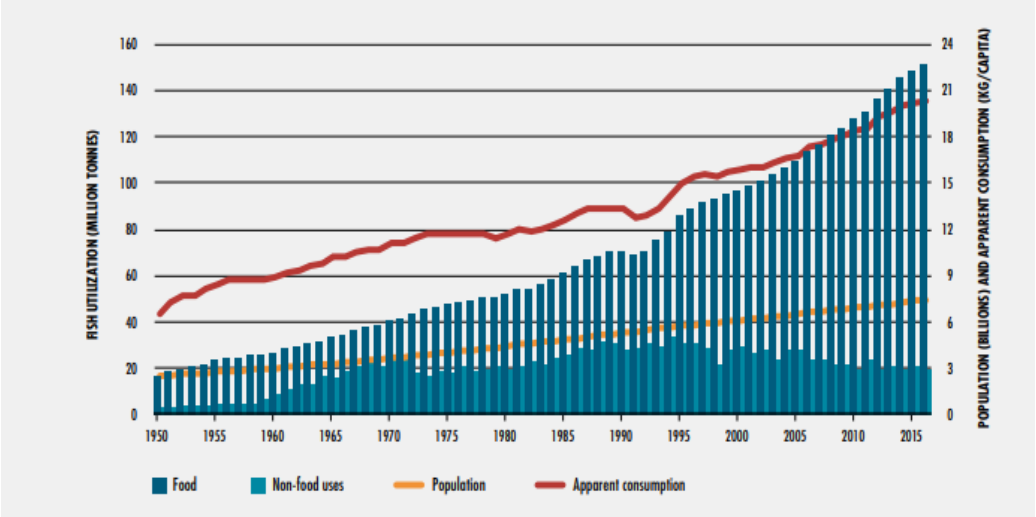
Source:"SOFIA Report 2018" (FAO).

We can clearly see that over the years, both the production of capture fishing and that of aquaculture production have increased very clearly and forcefully.

In the 1950s to 1960s, we can see that almost all fish production came from capture fishing and, in a very small proportion, was from aquaculture, yet growing in that fragment of years; indeed, increasing from 20 million tones of catches to almost 37 million tons of catches, with very little from fish farming.

From 1960 to 1965, a more marked growth of these catches, of this production of capture fishing, is produced, is uncovered, and at the same time, the contribution of aquaculture to this increase of production, of these catches, is gradually extended. Specifically, we are talking about moving from a production of 37 million tons of catches to 47 million tons of capture fishing production worldwide. In the following time period, specifically, from 1965 to 1975, continues to increase sharply these fish catches, and increasing more and more, the contribution of aquaculture, to that increase in production, and sustaining the same increase in production in a larger portion in the cultivation of fish worldwide, continuing in the same way the following 5 years to place us in the year 1980. From that temporary moment and throughout the 1980s, that is, from the temporary moment at the end of the 1980s, the impressive growth rate of the aquaculture sub-sector is uncovered, thus assuming a large part of that fishing production that previously came only from the fishing sector. What is more, aquaculture is now taking over much of that supply of fish for human consumption that used to come only from the fishing sector. Specifically, in 2016, world fish production reached a maximum of 172 million tons, of which the share belonging to aquaculture is 48% and would go from that share to 54% if we exclude fish for non-food uses (also considering here the reduction for the preparation of fishmeal and fish oil). A very important thing for mankind. In graph 2, we see it in a different way.

FIGURE 2: GLOBAL APPARENT USE AND CONSUMPTION OF FISH.



Source:"SOFIA Report 2018" (FAO).

Observing it cumulatively, in the period from 1961 to 2016, there is an average annual increase in world consumption of edible fish (this being 3.3%. We understand edible fish as fish intended for human consumption) and also surpassing the growth of the world population itself (this being 1.7%) and the own consumption of meat of all land animals as a whole (this being 2.9%). If we analyze it in per capita terms in a temporal progression from 1961 to 2016, the same consumption of edible fish per person worldwide increased from 10 kg of fish (in 1961) to 21 kg of fish (in 2017) and increasing

more until 2017, something impressive and striking at the same time. In the graph above, it can also be seen that it is a very important growth at all levels.

In 2017, fish itself accounted for 19% of the animal protein consumed by the entire world population and, in addition, the same protein provided 22% of the average per capita animal protein intake to the world's 3300 million people. A very curious thing is that despite constituting low levels of consumption of the same fish, the proportion of protein from that fish in the diet of people living in developing countries is much higher than the proportion of that protein in the diet of people living in developed countries. It's a very real fact. Consumption of fish per capita from the same fish is much higher in several developing island states (SIDS), specifically in Oceania, and such per capita fish consumption is strikingly much lower (we are talking about 2.2 kg per person) in Central Asia and other landlocked countries.

We understand apparent consumption as the consumption of fish by removing household waste.

In the following table, Table A, we see it all more specifically.

TABLE A: WORLDWIDE PRODUCTION AND USES OF FISHING AND AQUACULTURE (in millions of tons).

Category	2011	2012	2013	2014	2015	2016
Production						
Capture						
Inland	10.7	11.2	11.2	11.3	11.4	11.6
Marine	81.5	78.4	79.4	79.9	81.2	79.3
Total capture	**92.2**	**89.5**	**90.6**	**91.2**	**92.7**	**90.9**
Aquaculture						
Inland	38.6	42.0	44.8	46.9	48.6	51.4
Marine	23.2	24.4	25.4	26.8	27.5	28.7
Total aquaculture	**61.8**	**66.4**	**70.2**	**73.7**	**76.1**	**80.0**
Total world fisheries and aquaculture	**154.0**	**156.0**	**160.7**	**164.9**	**168.7**	**170.9**
Utilization[b]						
Human consumption	130.0	136.4	140.1	144.8	148.4	151.2
Non-food uses	24.0	19.6	20.6	20.0	20.3	19.7
Population (*billions*)[c]	7.0	7.1	7.2	7.3	7.3	7.4
Per capita apparent consumption (*kg*)	18.5	19.2	19.5	19.9	20.2	20.3

Source:"SOFIA Report 2018" (FAO).

Specifically, we see here in this graph, the total production of the fishing sector, specifically, capture, commercial or industrial fishing (this fishing can be carried out in continental waters (in rivers, streams, lakes, lagoons, torrents) or in marine waters (in seas or oceans) and the total production of the subsector of aquaculture (continental and marine).

We clearly observe that in 2016, the world production of capture amounted to about 90.9 million tons, which, at the same time we observe that it is a smaller amount than the two previous years (2014 and 2015 respectively) and at the same time, we also observe that world production of aquaculture increased to a

value of 80 million tons in 2016 (being the same production lower in previous years 2014-2015).

Concretely and also according to the report carried out by World Bank.2012. *"Hidden harvest: the global contribution of capture fishing. Washington, D.C.* World Bank, we can say that we also have that the production of marine fishing in 2016, catches of 79.3 million tons and catches or production of a continental nature in the same year also catches 11.6 million tons. The striking factor in this is that both catches or production from inland and marine fishing have been decreasing in magnitude. We are therefore talking about moving from catches from inland fishing in 2011 of 10.7 million tons to just 11.6 million tons (in this case there is a much smaller increase) and, in the case of marine fishing, in this case there is a significant reduction in catches from them. We are talking about moving from catches in 2011 of 81.5 million tons to 2016 with only 79.3 million tons. We can say it is very good news. To focus a little on which fish are usually caught in the two types of fishing, because in inland fishing we would have species such as tilapia, carp, barbels, etc. and, in the case of marine fishing, we would have species such as anchovy, Alaskan tail, tuna, Pacific cod, North Pacific hake, and so on.

Marine fishing would be practiced in areas of the Northwest Pacific, being this area currently also the most productive fishing area, with catches of 22.5 million tons in 2016, we would also have here temperate zones such as the Northeast Pacific where in the same year 2016 were substantial; we would also have here the southwest Atlantic and the southwest Pacific, in which, on the contrary, the catches have decreased considerably; in addition, here we would also have the tropical zones, which have experienced a substantial increase in both large catches (tuna) and small pelagic species.

Inland fishing would be carried out mainly in 16 countries, located in Asia, concentrating the same 82 % of production. In these countries, this production is in itself a basic source of food for many villages located in these 16 countries. Apart from these countries, they are also an important and basic source of food for the inhabitants of many African countries, and these would account for 23% of the world's inland catches.

On the other hand, we have the spectacular progress of the aquaculture sub-sector. Great news for people all over the world, because instead of sustaining that increase in fish consumption by the world's inhabitants with only catches from the fishing sector, you can also sustain that increase with fish from the aquaculture sub-sector. In this way, the aquaculture sub-sector is evolving very positively and rapidly, even more so than other key food manufacturing sectors. Moreover, the average annual growth rate was 5.9% in the period from 2001 to 2016, but in African countries the growth of the aquaculture sub-sector did increase in that period, specifically between 2007 and 2011. Even more forcefully, world aquaculture production was 81 million tons of edible fish, aquaculture production of aquatic plants was 31 million tons and world production of non-food products was 38,000 tons. More specifically, the cultivation of edible fish in terms of world production and fragmentation

according to species, since 55 million tons would correspond to finfish, 18 million tons would correspond to mollusks, 80 million tons to crustaceans, and about 899000 tons would correspond to other aquatic animals.

The main world producer dedicated in terms of cultivation of edible fish would be China in 2016, because, has been able to cultivate a quantity of edible fish, since 1991, and also year by year that has far exceeded the sum of the same fish cultivated by the other countries of the world. Quite an incredible thing. Also, Norway, Vietnam, Indonesia, Egypt, India and Bangladesh have been very important producers in 2016.

On the other hand, the leaders in terms of aquatic plant production in 2016 were Indonesia and China. Asian countries too. When we talk about aquatic plant culture we are referring to the cultivation of marine algae and also the cultivation of micro algae but, in this case, we would have a large production of marine algae and a very small production in the case of micro algae. Moreover, the aquatic animal species cultivated, their production, has surpassed by far and, very quickly, the production itself derived from the cultivation of non-food species, but, even so, the latter continues to grow and increase as well. We are talking about production figures from non-food species of 9 million tons (mainly from finfish, that is to say carp, and also from continental aquaculture). When we talk about unfeeding we mean that these species are fed by filtration. These species feed on plankton present in marine water) and, on the other hand, we would also have magnitudes coming from aquatic invertebrates this time, and would be 16 million tons.(We refer with these to marine bivalve mollusks that are cultivated in coastal pools, lakes and seas; and with marine bivalves and algae, we refer to and are treated many times as extractive species, species that can take advantage of their environment by suppressing wastes, having also the wastes that come from the cultivated and fed species, with which, a reduction of the load of nutrients in the water is provoked). Moreover, with the same growth of the aquaculture subsector itself it serves as a push to cultivate extractive species with species fed on the same marine culture site, such as a loop closure. More specifically, the production of these extractive species accounted for 50% of total global aquaculture production by 2016.

All this highlights and clarifies what we have been arguing since the beginning of the work. The marine resources coming from the fishing sector, many of the species of marine fish, are arriving or some of them have reached maximum situations, dangerous situations, that is to say, if the species continue to be fished without control, and we do not sustain this increase in the consumption of this protein with the cultivation of species coming from the aquaculture subsector, these same species may disappear completely. Therefore, to see exactly and in more detail than what we have argued and just said is reality, we will determine the fishing sector and the aquaculture sub-sector with more data and graphs.

We continue with the detailed explanation of the fishing sector, specifically, of the production derived from capture fishing carried out in continental waters (in

rivers, streams, lakes, lagoons, torrents) and of the production coming from capture fishing carried out in marine waters (in seas or oceans).

Also taking into account the report by Bell, J.D., Johnson, J.E., Ganachaud, A.S., Gehrke, P.C., Hobday, A.J., HoeghGuldberg, O., Le Borgne, R., Lehodey, P., Lough, J.M., Pickering, T., Pratchett, M.S., Waycott, M.., 2011 "*Vulnerability of tropical Pacific fishing and aquaculture to climate change: summary for Pacific Island countries and territories"* we can argue that marine capture fishing worldwide accounted for a total production of 82 million tons in 2015 and, even less so in 2016 with a production of 74 million tons, is a characteristic reduction. The fact is that many of the captures of the species have decreased due to being affected by phenomena such as the so-called "El Niño" - South Oscillation (this is a phenomenon, a recurrent climate pattern that causes changes both in the temperature of the waters of the Tropical Pacific, its central and eastern parts as well as in the structure of rainfall as affecting very strongly also the climate of other parts of the world. In fact, it assumes that the surface waters of the large strip of the Tropical Pacific Ocean are cooled or heated by temperatures ranging from 1ºC to 3ºC as opposed to the usual temperature. This behavior is named as ENSO cycle and "El Niño" and "La Niña" are the violent phases of the ENSO cycle) and causing the same reductions in anchovy catches in Peru and Chile, for example. These catches of anchovy are oscillating and their catches were reduced by 2 million tons. Apart from this example, there are also more in different countries of the world and in several outstanding species, as an example, in particular, we would have the cephalopods that saw their catches reduced between 2015 and 2016.

In the following table of data, we can carefully observe data referring to the production of marine capture fishing of the 25 main countries dedicated to it.

TABLE B. MAIN PRODUCING COUNTRIES IN TERMS OF MARINE CAPTURE FISHING PRODUCTION.

Country	Production (tonnes)		
	Average 2005–2014	2015	2016
China	13 189 273	15 314 000	15 246 234
Indonesia	5 074 932	6 216 777	6 109 783
United States of America	4 757 179	5 019 399	4 897 322
Russian Federation	3 601 031	4 172 073	4 466 503
Peru Total	6 438 839	4 786 551	3 774 887
Excluding anchoveta	989 918	1 016 631	919 847
India	3 218 050	3 497 284	3 599 693
Japan*	3 992 458	3 423 099	3 167 610
Viet Nam	2 081 551	2 607 214	2 678 406
Norway	2 348 154	2 293 462	2 033 560
Philippines	2 155 951	1 948 101	1 865 213
Malaysia	1 387 577	1 486 050	1 574 443
Chile Total	3 157 946	1 786 249	1 499 531
Excluding anchoveta	2 109 785	1 246 154	1 162 095
Morocco	1 074 063	1 349 937	1 431 518
Republic of Korea	1 746 579	1 640 669	1 377 343
Thailand	1 830 315	1 317 217	1 343 283
Mexico	1 401 294	1 315 851	1 311 089
Myanmar*	1 159 708	1 107 020	1 185 610
Iceland	1 281 597	1 318 916	1 067 015
Spain	939 384	967 240	905 638
Canada	914 371	823 155	831 614
Taiwan, Province of China	960 193	989 311	750 021
Argentina	879 839	795 415	736 337
Ecuador	493 858	643 176	715 357
United Kingdom	631 398	65 451 506	701 749
Denmark	735 966	868 892	670 207
Total 25 major countries	**65 451 506**	**66 391 560**	**63 939 966**
Total other 170 countries	**14 326 675**	**14 856 282**	**15 336 882**
World total	**79 778 181**	**81 247 842**	**79 276 848**
Share of 25 major countries	**82.0%**	**81.7%**	**80.7%**

Source:"SOFIA Report 2018" (FAO).

In this previous table, we can see how the previously explained decrease in catches for various reasons affected not only the 25 outstanding countries listed above (such as the United Kingdom, Denmark, Ecuador, Iceland, Mexico, etc.) in a significant way, but also the other 170 countries of the world were affected, something quite striking and important. This reduction affected all the countries in the world, to a greater or lesser extent between 2015 and 2016, from the main producer that would be China to the country that takes the least amount of catches in this marine capture fishing that, in this case, would be Denmark. All the countries in the world reduced their catches. One reason that would also be the cause of these reductions is the introduction of policies at national level of the countries to reduce these catches and to raise awareness and force the companies dedicated to this in each country to reduce these catches, because the resource of marine species is not inexhaustible and, therefore, can be exhausted and even disappear. In the specific case of China, for example, they have already implemented them. Specifically, in their case, they have launched the 13th National Five-Year Plan for the years 2016 - 2020 to achieve it.

Now in the following chart we can see all the species caught in the marine type capture fishery.

TABLE C: SPECIES AND MAIN GENERA IN TERMS OF PRODUCTION FROM MARINE CAPTURE FISHING.

Scientific name	FAO English name	Production (tonnes)		
		Average 2005–2014	2015	2016
Theragra chalcogramma	Alaska pollock (=walleye pollock)	2 952 134	3 372 752	3 476 149
Engraulis ringens	Anchoveta (=Peruvian anchovy)	6 522 544	4 310 015	3 192 476
Katsuwonus pelamis	Skipjack tuna	2 638 124	2 809 954	2 829 929
Sardinella spp.*	Sardinellas nei	2 281 285	2 238 903	2 289 830
Trachurus spp.*	Jack and horse mackerels nei	2 463 428	1 738 352	1 743 917
Clupea harengus	Atlantic herring	2 111 101	1 512 174	1 639 760
Scomber japonicus	Pacific chub mackerel	1 454 794	1 484 780	1 598 950
Thunnus albacares	Yellowfin tuna	1 219 326	1 356 883	1 462 540
Gadus morhua	Atlantic cod	995 853	1 303 726	1 329 450
Engraulis japonicus	Japanese anchovy	1 323 022	1 336 218	1 304 484
Decapterus spp.*	Scads nei	1 394 772	1 186 555	1 298 914
Sardina pilchardus	European pilchard (=sardine)	1 098 400	1 174 611	1 281 391
Trichiurus lepturus	Largehead hairtail	1 315 337	1 269 525	1 280 214
Micromesistius poutassou	Blue whiting (=poutassou)	1 054 918	1 414 131	1 190 282
Scomber scombrus	Atlantic mackerel	822 081	1 247 666	1 138 053
Scomberomorus spp.*	Seerfishes nei	889 840	903 632	918 967
Dosidicus gigas	Jumbo flying squid	855 602	1 003 774	747 010
Nemipterus spp.*	Threadfin breams nei	541 470	629 062	683 213
Brevoortia patronus	Gulf menhaden	464 165	536 129	618 719
Sprattus sprattus	European sprat	567 697	677 048	584 577
Portunus trituberculatus	Gazami crab	414 034	560 831	557 728
Acetes japonicus	Akiami paste shrimp	582 763	543 992	531 847
Sardinops melanostictus	Japanese pilchard	257 346	489 294	531 466
Scomber colias	Atlantic chub mackerel	314 380	467 796	511 618
Rastrelliger kanagurta	Indian mackerel	324 049	498 149	499 474
Total 25 major species and genera		**34 858 465**	**34 065 952**	**33 240 958**
Total other 1 566 species items		**44 919 716**	**47 181 890**	**46 035 890**
World total		**79 778 181**	**81 247 842**	**79 276 848**

Source:"SOFIA Report 2018" (FAO).

In the above, we can the evolution of the catches of that marine capture fishery, but, directly observing the catches of each species in particular. Between 2005 and 2016, there have been species that have effectively reduced their production, their catches, but, there have been other species that have not, which has happened quite the opposite: they have increased their catches, their production. Among the species that have increased their catches in those years have been, for example, Alaska collin, Atlantic cod, European sardine, Indian mackerel, and so on. Among the species that have reduced their productions have been, for example, the Peruvian anchoveta, and the high horse mackerel. Just these two in this case. The rest of the species, some have increased their catches and, subsequently, have reduced them and others the other way around. In this case, we would have Atlantic herring, sardines, Japanese anchovy, Atlantic mackerel, akiami shrimp, etc. In short, for various reasons, the catches, the productions of the species have evolved over the years.

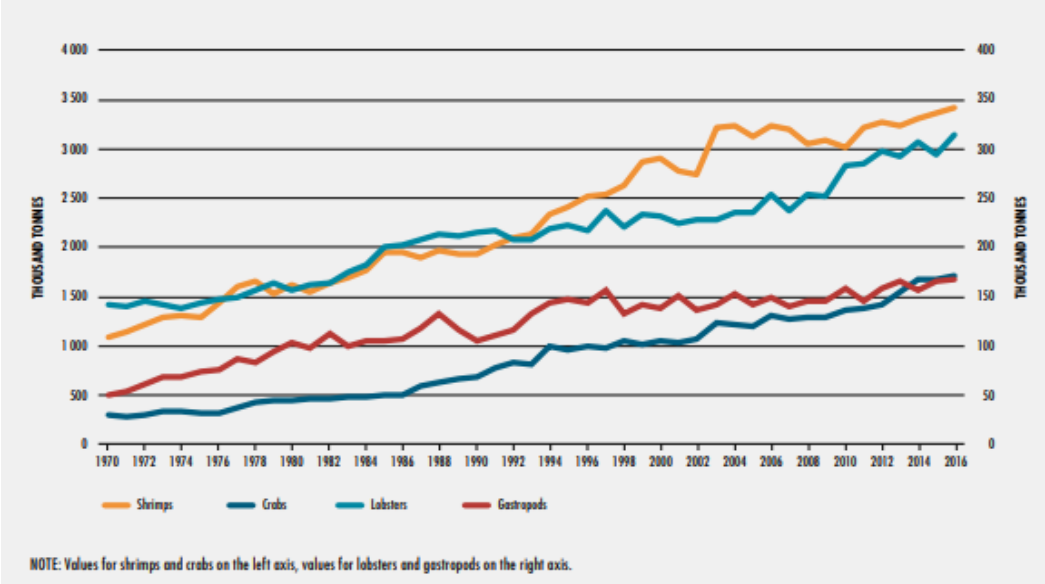
Also taking into account the report of the *Codex Alimentarius Commission (2016 and updated in 2016). "Code of Practice for Fish and Fishery Products" CAC/RCP 52-2003 ..... FAO AND WHO*. Rome and also the report by Hellebrandt, D. , Delaporte, A. and Allison, E.H. entitled "*Food Safety and Artisanal Fishing: Critical Analysis of Initiatives in Latin America*" (December 2014) , we can say that there are small pelagic species of

lesser appreciation, which in some developing countries are essential for their food security, but in other developed countries they are used simply to manufacture fishmeal and fish oil from them. Their catches have been altered over time.

In a striking way, it is that trend in the negative direction of the species referring to marine bivalves. This negative trend of these species could be caused by the existing pollution and dirt of marine habitats, as well as situations in which some species are found and which, in some way, facilitate aquaculture production.

With the following graph, we will be able to observe the trends in terms of catches of some species considered very valuable.

FIGURE 3: TRENDS IN CATCHES OF VALUABLE SPECIES



Source:"SOFIA Report 2018" (FAO).

In the previous graph, we can observe the trends of the catches, of the productions that are considered most valuable by humans and are grouped into three groups of species: shrimps, lobsters, crabs and gastropods (understanding gastropods as mollusks with asymmetrical body protected by a dorsal shell and the most common examples of these are slugs (marine mollusks), sea shells (some with shells and others without) and sea hares (live near the coasts of tropical and subtropical seas).

Over the years, specifically from 1970 to 2016, we can clearly see that the catches of these species have been clearly increasing (there are years that have decreased due to applications by countries to reduce these catches, and, on the other hand, other years have increased), with a very clear growing trend, reaching a very alarming situation in 2016, specifically. The 3 groups of species, their catches, have experienced a maximum in each of them. We are talking about an average value of each group of between € 3605.06 and € 8348.56, very high values of these productions.

What is not clearly determined is whether the reason for this growing and favorable trend is to focus and specialize in these parts of the sector or some other reason or whether this trend will be maintained and consolidated in the long term or whether policies will be implemented by different countries to force companies dedicated to these parts of the sector to decrease their catches and thus try to preserve the species. It is a thing that is unknown, but, the way of that part of the sector is directed to descend the catches of the species to preserve them.

We now turn to the production of inland capture fishing. To this end, we proceed to put together a table in which the world production of capture fishing in inland waters is shown, but only from the countries that are the main producers in this part of the sector.

TABLE D. THE MAIN PRODUCING COUNTRIES IN THE PRODUCTION OF CAPTURE FISHING IN INLAND WATERS

Country	Production (tonnes)		
	Average 2005–2014	2015	2016
China	2 252 368	2 277 299	2 318 046
India*	1 088 082	1 346 104	1 462 063
Bangladesh	1 018 987	1 023 991	1 048 242
Myanmar*	745 483	863 450	886 780
Cambodia	422 801	487 905	509 350
Indonesia	346 722	472 911	432 475
Uganda	417 016	396 205	389 244
Nigeria	287 937	337 874	377 632
United Republic of Tanzania	305 635	309 924	312 039
Russian Federation	243 337	285 065	292 828
Egypt	248 141	241 179	231 959
Democratic Republic of the Congo	224 263	227 700	229 300
Brazil*	243 213	225 000	225 000
Mexico	113 854	151 416	199 665
Thailand	211 927	184 101	187 300
Philippines	182 205	203 366	159 615
Total 16 major countries	**8 351 970**	**9 033 490**	**9 261 538**
Total other 136 countries	**2 172 222**	**2 374 585**	**2 371 482**
World total	**10 524 192**	**11 408 075**	**11 633 020**

Source:"SOFIA Report 2018" (FAO).

Having also the report by Balian, E.V., Segers, H., Leveque, C., and Martens, K. entitled "*The Freshwater Animal Diversity Assessment" in Balian, E.V., Segers, H., Leveque, C.., and Martens, K. eds "Freshwater Animal Diversity Assessment, pages 627 to 637. Developments in Hydrobiology, no. 198* , Dordrecht (Netherlands), Springer and with the above data, we can also see conclusively that in this part devoted to the production of capture fishing in inland waters this time, which over the years have also increased catches without measure. The 16 countries and main producers of this part, concentrate 79% of all catches in this part of the sector, seeing it individually from each of the 16 countries, as seeing it cumulatively with the world total. Catches in inland waters around the world have gone from an average of 10.5 million tons in 2005 to 2014 to catches in global inland waters of 11.6 million tons, a sharp increase in all respects, which in 2016 accounted for 13% of global capture fishing production. This means that in the same year 2016 catches increased by 1.7%

compared to 2015 and by 9.5% compared to the average for the period 2005-2014, which continues to confirm the above-mentioned increase in all respects. This increase, which we have been saying, comes above all from the Asian countries, where these catches from inland waters represent, for various regional societies, a primordial and principal nutrient. These, taken together, account for a large portion of all catches in world inland waters and are also listed as a nutrient that they access easily and sustainably over time in various African countries, assuming in this case.

Observing all this previous argumentation, but, from the point of view of the species caught in continental waters, we would have the group of "tilapias and other cichlids", which has increased its catches continuously and uninterruptedly over the years. If we observe the group of "carp, barbels and other cyprinids", at one time temporarily surpassed the previous group, but over time has become more constant catches, going between 0.5 and 0.6 million tons and, finally, we would have separate species of crustaceans and freshwater mollusks, had their peak between 1995 and 2005 and from those times, as they have remained more or less unchanged, fluctuating between the figures of 0.50 and 0.40 million tons.

Once we have seen the evolution of capture fishing in various ways, we will now look at it in a different way: we will now look at it through FAO's main fishing areas, which group together capture fishing areas in marine waters and capture fishing areas in inland waters. We can see it in the following table.

TABLE E. WORLD PRODUCTION OF CAPTURE FISHING IN TERMS OF FAO FISHING ZONES(in tonnes)

Fishing area code	Fishing area name	Production (tonnes)		
		Average 2005–2014	2015	2016
Inland				
01	Africa – inland waters	2 609 727	2 804 629	2 863 916
02	America, North – inland waters	178 896	207 153	260 785
03	America, South – inland waters	384 286	362 670	340 804
04	Asia – inland waters	6 959 783	7 584 414	7 708 776
05	Europe – inland waters	373 523	431 179	440 790
06	Oceania – inland waters	17 978	18 030	17 949
Marine				
21	Atlantic, Northwest	2 041 599	1 842 787	1 811 436
27	Atlantic, Northeast	8 654 911	9 139 199	8 313 901
31	Atlantic, Western Central	1 344 651	1 414 318	1 563 262
34	Atlantic, Eastern Central	4 086 427	4 362 180	4 795 171
37	Mediterranean and Black Sea	1 421 025	1 314 386	1 236 999
41	Atlantic, Southwest	2 082 248	2 427 872	1 563 957
47	Atlantic, Southeast	1 425 775	1 677 969	1 688 050
51	Indian Ocean, Western	4 379 053	4 688 848	4 931 124
57	Indian Ocean, Eastern	5 958 972	6 359 691	6 387 659
61	Pacific, Northwest	20 698 014	22 057 759	22 411 224
67	Pacific, Northeast	2 871 126	3 164 604	3 092 529
71	Pacific, Western Central	11 491 444	12 625 068	12 742 955
77	Pacific, Eastern Central	1 881 996	1 675 065	1 656 434
81	Pacific, Southwest	613 701	551 534	474 066
87	Pacific, Southeast	10 638 882	7 702 885	6 329 328
18, 48, 58, 88	Arctic and Antarctic areas	188 360	243 677	278 753
World total		**90 302 377**	**92 655 917**	**90 909 868**

Source:"SOFIA Report 2018" (FAO).

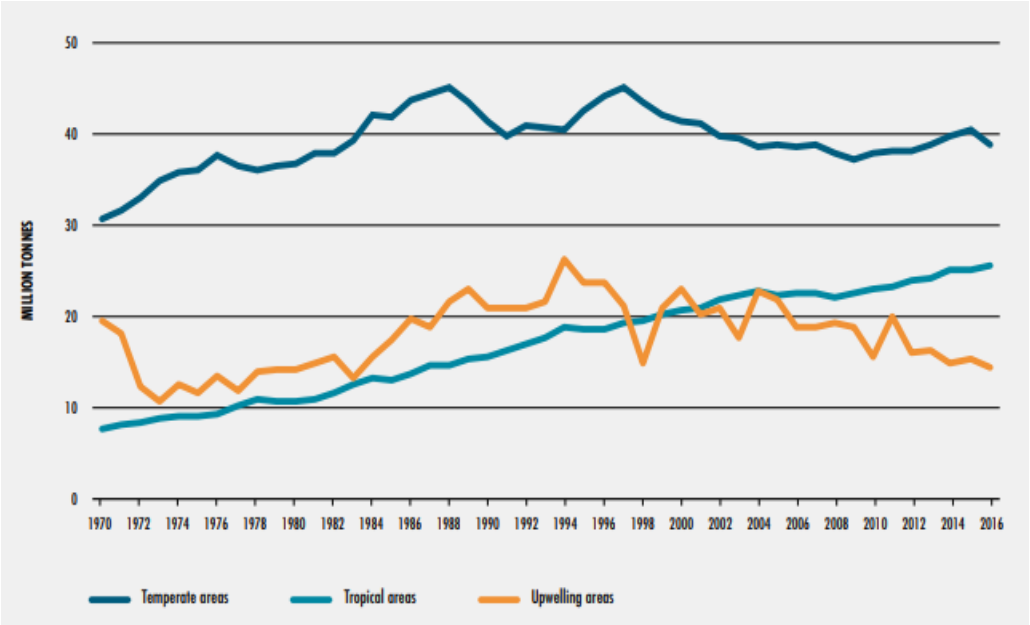
Also taking into account the bibliography of authors Dudgeon, D., Arthington, A.H., Gessner, M.O., Kawabata, Z.I., Knowler, D.J., Lévêque, C and Sullivan, C.A. 2006 entitled "*Freshwater biodiversity: importance, threats, status and conservation challenges. Biological Reviews*, 81 : 163-182 , and with this table, where it is observed in a concise and clear way that all fishing areas, both in inland waters and in marine waters that are grouped and distributed in fishing areas called FAO fishing areas, have greatly increased catches and are endangered the continuity of species in all areas. They are so called because these areas are observed and controlled by the Food and Agriculture Organization of the United Nations (FAO) and each of them is designated as fishing grounds and a code is imposed on each area, on each fishing ground, the fishing located in the zones in continental waters from numbers 1 to 6 and, on the other hand, the fishing located in the zones in marine waters with numbers 21,27,31,34,37,41,47,51,57,61,67,71,77,81 and 87 and the fishing in the Arctic and Antarctic zones with numbers 18,48,58,88.

In general terms, we can observe that both catches from fishing grounds located in continental waters and catches from fishing grounds located in marine waters experience an increase in the temporal space between 2005 and 2016. More specifically, if we grouped these fishing grounds into three zones according to their temperature and the movements of the waters, then we would

have them: **temperate zones** (fishing grounds 21 (north-west Atlantic), 27 (north-east Atlantic), 37 (Mediterranean Sea and Black Sea), 41 (south-east Atlantic), 61 (north-west Pacific), 67 (north-east Pacific) and 81 (south-west Pacific), **tropical zones** (fishing grounds 31 (central-west Atlantic), 51 (Indian Ocean - western), 57 (Indian Ocean - eastern) and 71 (Pacific Center - western), **upwelling areas** (they are called because the oceans grouped in them their bodies of water make vertical movements, from deep levels to the surface.), fishing 34 (Central-East Atlantic), 47 (South-East Atlantic), 77 (Central-East Pacific) and 87 (South-East Pacific) and the **Arctic and Antarctic areas** (fishing 18, 48, 58 and 88).

In the next, we see him represented:

GRAPH 4. TEMPORAL EVOLUTION OF THE 3 FAO FISHING ZONES IN TERMS OF TEMPERATURE AND WATER MOVEMENTS.



Source:"SOFIA Report 2018" (FAO).

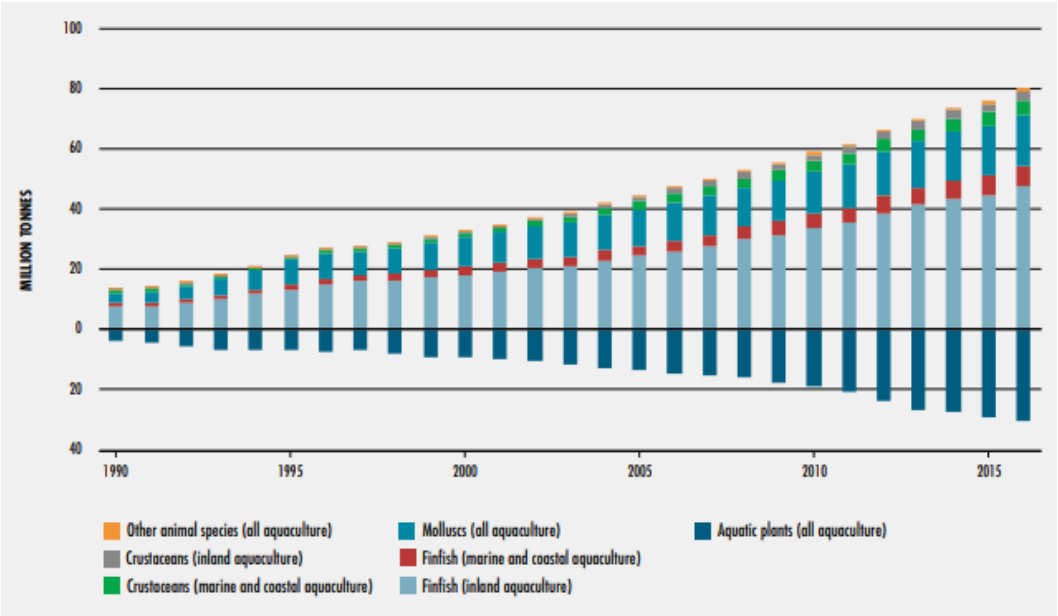
With this graph we can see that in **temperate zones**, the catches made in and from temperate zones have remained at very high levels and have even increased from 1970 to 2016, specifically from a production of 30 million tons to a production of 39 million tons, that is to say, a given increase during that space of time. Developed countries benefit from these waters. This increase comes from species such as Alaska Pollock, Pacific cod and North Pacific hake, but there is also a decrease in catches in the temporary stretch from 1996 to 2016, although they remain at levels. This decline would be determined by catches in the south-west Atlantic and south-west Pacific and also by the reduction in catches by the European Union's share, especially in 2016, of 7%. A very forceful increase is that it comes from the hand of the **tropical zones** given from the year 1970 to the year 2016. These areas benefit from the tropical territories. The production of capture fishing in the western and eastern Indian Ocean areas has increased sharply and would mainly be caused by increased

catches of both large pelagic species such as tuna and small pelagic species. There is also such an increase in the 31st zone of the western central Atlantic, namely 2 million tons, and two thirds of the total catch production in that zone would correspond to catches made by the US of the species of scaffold and chipeoid (used in the production of fishmeal and fish oil). In the rest of the waters in these tropical areas, there has also been a sharp increase in catches, both of small pelagic species, fish from the coasts there and shrimp from parts of the western and eastern Indian Oceans, and of large species such as tuna. As for the **upwelling areas**, their evolution is more volatile in the space of time described in the graph. This evolution is highly influenced by the catches coming from the southeastern Pacific, which are very affected by the El Niño phenomenon and which also have a great influence on the catches of the anchoveta. Wherever it is fished, wherever the catches come from in the waters located in these tropical areas, these catches have decreased significantly.

Finally, with respect to the **Arctic and Antarctic areas**, the catches taken from them have also increased significantly over the years, specifically from 1995 to 2016.The species taken from these waters with the greatest amount has been the Antarctic krill, which is continuously increasing. It is also subtracted from these waters the so-called *austromerluza.* At the end of the 1990s, the catches of hake were very high, because it was a highly valued species, it was even the object of the black market in the hake trade, but, with the effective action of the authorities, they managed to stop this and impose rules (applied by the Commission for the Conservation of Marine Resources (CCAMLR)) and therefore managed to reduce and stabilize the catches of hake, reducing them to 1400 tons. In addition, as the countries that fish in zone 18, they are : Canada, Denmark (Greenland), the United States of America, the Russian Federation, Norway, China, Iceland, Japan, the Republic of Korea and the European Union, seeing that this situation of large quantities of catches, decided at the end of 2017 to stop fishing in these areas so that ecologists could analyze the impact of all the large catches made there and their real consequences on the marine ecosystem.

We now proceed to extend the explanation previously given on the aquaculture subsector with more specific data on production in this sector and its trajectory.

GRAPH 5 . GLOBAL AQUACULTURE PRODUCTION OF AQUATIC PLANTS AND EDIBLE FISH



Source:"SOFIA Report 2018" (FAO).

In the previous graph, we can see that this sub-sector has had a very important and positive progression. Aquaculture itself and aquaculture's own share of global capture fishing production has increased steadily over the years to reach 50% by 2016, a large increase of 26% since 2001. This corroborates everything that is being argued in the FCP. The world population is coming to the conclusion that marine resources are eternal and are exhaustible, therefore, from that conclusion, from that general thought, comes the constant and positive progress of the aquaculture sub-sector, to turn that sub-sector into an ever stronger and larger one that partially sustains the increase in fish consumption by all the world's inhabitants. From a regional perspective, aquaculture itself accounts for less than 20% of total fish production in the EU, Africa and the Americas and 13% in Oceania, and its share in Asia is 50% by 2016. In fact, by 2016, there were 38 countries where production from aquaculture surpassed production from natural fishing, and these countries account for half of the world's human population. In the rest of the countries of the world, we are talking about 21 countries, representing 30% of national fish production. The total world production of aquaculture in 2016 meant 111 million tons with an economic value of 231008 million €. This production includes both edible fish (90 million tons with a value of € 219719 million) and aquatic plants (29 million tons with a value of € 11100 million). The culture of edible fish would have finfish (55 million tons with a value of 131395 million €), mollusks (16.9 million tons with a value of 27702 million €), crustaceans (58000 million tons with a value of 54171 million €) and other aquatic species such as sea urchins, frogs, turtles, sea cucumbers and jellyfish of edible character (939000 million tons with a value of 6451 million €). Aquatic plants cultivated among which would be mostly marine algae and a low percentage of microalgae. On the

other hand, we would also have non-food products such as ornamental pearls and shells.

Now, we are going to proceed to observe the production of total world aquaculture, but, in terms of the waters in which they are carried out, therefore, we would have continental aquaculture (this activity would be carried out in fresh waters) and marine aquaculture (this activity is carried out in the sea, in salt waters and this activity would focus on the species that inhabit it and also in function of each continent.

TABLE F. GLOBAL AQUACULTURE PRODUCTION OF THE MAIN GROUPS OF EDIBLE FISH SPECIES IN TERMS OF CONTINENT IN 2016 (IN THOUSANDS OF TONS).

Category	Africa	Americas	Asia	Europe	Oceania	World
Inland aquaculture						
Finfish	1 954	1 072	43 983	502	5	47 516
Crustacea	0	68	2 965	0	0	3 033
Molluscs			286			286
Other aquatic animals		1	531			531
Subtotal	1 954	1 140	47 765	502	5	51 367
Marine and coastal aquaculture						
Finfish	17	906	3 739	1 830	82	6 575
Crustacea	5	727	4 091	0	6	4 829
Molluscs	6	574	15 550	613	112	16 853
Other aquatic animals	0		402	0	5	407
Subtotal	28	2 207	23 781	2 443	205	28 664
All aquaculture						
Finfish	1 972	1 978	47 722	2 332	87	54 091
Crustacea	5	795	7 055	0	7	7 862
Molluscs	6	574	15 835	613	112	17 139
Other aquatic animals	0	1	933	0	5	939
Total	**1 982**	**3 348**	**71 546**	**2 945**	**210**	**80 031**

Source:"SOFIA Report 2018" (FAO).

With respect to continental aquaculture, there is a world production of edible fish out of a world total of 51637 thousand tons. The world's production of edible fish is increasingly sustained in continental aquaculture. In countries like China and Egypt. Based on the report by Halwart, M. and Gupta, M.V. eds 2004 entitled: "*Cultivation of fish in rice fields*". Rome, FAO and Penang (Malaysia), The WorldFishCenter, we can clearly say that in these countries, ponds are dug in the ideal places to do so, where this continental aquaculture is practiced. Around these ponds, rice is cultivated and linked at the same time and rice cultivation is combined with the cultivation of fish from continental aquaculture and this is also spreading throughout the rest of the Asian continent. In 2016, 63% of the world's edible fish production came from continental aquaculture and also in the same year, crustacean farming also experienced a significant growth.

With respect to marine and coastal aquaculture (understanding coastal aquaculture as that which is practiced in constructions made by people in areas

adjacent to the sea such as coastal ponds and lagoons with gates) we can say that finfish would be cultivated in both marine and coastal aquaculture and the largest production would come from the continents Oceania, Europe, Africa and the Americas. Production from marine and coastal aquaculture was 29 million tons and valued at € 63942380 million. Here, although finfish are the majority fish culture in both marine and coastal aquaculture, finfish production in continental aquaculture far exceeds it. Mollusks with shells (17 million tons) and crustaceans (5 million tons) are also grown in marine and coastal aquaculture. It is also true that the breeding of aquatic animal species has grown to such an extent that it has overtaken the breeding of non-food species in all of the world's aquaculture. The breeding of non-food species is also growing but at a slower rate, i.e. from a production of 25 million tons (9 million tons of finfish reared by filtration and bred in continental aquaculture that would be dominated by silver carp and bighead carp and 16 million tons of aquatic invertebrates that would also be dominated by marine bivalve mollusks bred in coastal ponds, lagoons and seas).In Latin America, Asia and Central and Eastern Europe, carp are filtered-fed and bred in multi-species polyculture systems, which push fish production using natural foods while increasing water quality in the same production system. Also, in recent years, a species has appeared, the spatula fish, which is also fed by filtration in the polyculture of some countries such as China.

On the other hand, marine bivalves extract organic matter for growth and marine algae that grow through photosynthesis taking advantage of dissolved nutrients are sometimes called extractive species. What happens is that when cultivated in the same area as the other species fed, these bring many benefits to the environment thanks to the elimination of waste from all species both those fed and those that are not fed and also to the reduction of the load of nutrients.

The following two tables show the main species produced worldwide in the aquaculture subsector as well as aquatic plants and marine algae.

TABLE G. SPECIES PRODUCED IN GLOBAL AQUACULTURE.

Species item	2010	2012	2014	2016	% of total, 2016
Finfish					
Grass carp, *Ctenopharyngodon idellus*	4 362	5 018	5 539	6 068	11
Silver carp, *Hypophthalmichthys molitrix*	4 100	4 193	4 968	5 301	10
Common carp, *Cyprinus carpio*	3 421	3 753	4 161	4 557	8
Nile tilapia, *Oreochromis niloticus*	2 537	3 260	3 677	4 200	8
Bighead carp, *Hypophthalmichthys nobilis*	2 587	2 901	3 255	3 527	7
Carassius spp.	2 216	2 451	2 769	3 006	6
Catla, *Catla catla*	2 977	2 761	2 770	2 961	6
Freshwater fishes nei, *Osteichthyes*	1 378	1 942	2 063	2 362	4
Atlantic salmon, *Salmo salar*	1 437	2 074	2 348	2 248	4
Roho labeo, *Labeo rohita*	1 133	1 566	1 670	1 843	3
Pangas catfishes nei, *Pangasius* spp.	1 307	1 575	1 616	1 741	3
Milkfish, *Chanos chanos*	809	943	1 041	1 188	2
Tilapias nei, *Oreochromis* (=*Tilapia*) spp.	628	876	1 163	1 177	2
Torpedo-shaped catfishes nei, *Clarias* spp.	353	554	809	979	2
Marine fishes nei, Osteichthyes	477	585	684	844	2
Wuchang bream, *Megalobrama amblycephala*	652	706	783	826	2
Rainbow trout, *Oncorhynchus mykiss*	752	883	796	814	2
Cyprinids nei, *Cyprinidae*	719	620	724	670	1
Black carp, *Mylopharyngodon piceus*	424	495	557	632	1
Snakehead, *Channa argus*	377	481	511	518	1
Other finfishes	5 849	6 815	7 774	8 629	16
Finfish total	38 494	44 453	49 679	54 091	100
Crustaceans					
Whiteleg shrimp, *Penaeus vannamei*	2 688	3 238	3 697	4 156	53
Red swamp crawfish, *Procambarus clarkii*	616	598	721	920	12
Chinese mitten crab, *Eriocheir sinensis*	593	714	797	812	10
Giant tiger prawn, *Penaeus monodon*	565	672	705	701	9
Oriental river prawn, *Macrobrachium nipponense*	226	237	258	273	4
Giant river prawn, *Macrobrachium rosenbergii*	198	211	216	234	3
Other crustaceans	700	606	654	767	10
Crustaceans total	5 586	6 277	7 047	7 862	100

Source:"SOFIA Report 2018" (FAO).

TABLE H. SPECIES PRODUCED IN GLOBAL AQUACULTURE. (CONTINUED).

Species item	2010	2012	2014	2016	% of total, 2016
Molluscs					
Cupped oysters nei, *Crassostrea* spp.	3 678	3 972	4 374	4 864	28
Japanese carpet shell, *Ruditapes philippinarum*	3 605	3 775	4 014	4 229	25
Scallops nei, *Pectinidae*	1 408	1 420	1 650	1 861	11
Marine molluscs nei, Mollusca	630	1 091	1 135	1 154	7
Sea mussels nei, Mytilidae	892	969	1 029	1 100	6
Constricted tagelus, *Sinonovacula constricta*	714	720	787	823	5
Pacific cupped oyster, *Crassostrea gigas*	641	609	624	574	3
Blood cockle, *Anadara granosa*	466	390	450	439	3
Chilean mussel, *Mytilus chilensis*	222	244	238	301	2
Other molluscs	1 808	1 683	1 748	1 795	11
Molluscs total	14 064	14 874	16 047	17 139	100
Other animals					
Chinese softshell turtle, *Trionyx sinensis*	270	336	345	348	37
Japanese sea cucumber, *Apostichopus japonicus*	130	171	202	205	22
Aquatic invertebrates nei, Invertebrata	223	128	111	97	10
Frogs, *Rana* spp.	82	86	97	96	10
Other miscellaneous animals	112	118	139	193	21
Other animals total	818	839	894	939	100

Source:"SOFIA Report 2018" (FAO).

TABLE I. AQUATIC PLANTS PRODUCED BY GLOBAL AQUACULTURE.

Species item	2005	2010	2011	2012	2013	2014	2015	2016
Eucheuma seaweeds nei, *Eucheuma* spp.	987	3 481	4 616	5 853	8 430	9 034	10 190	10 519
Japanese kelp, *Laminaria japonica*	4 371	5 147	5 257	5 682	5 942	7 699	8 027	8 219
Gracilaria seaweeds, *Gracilaria* spp.	933	1 691	2 171	2 763	3 460	3 751	3 881	4 150
Wakame, *Undaria pinnatifida*	2 440	1 537	1 755	2 139	2 079	2 359	2 297	2 070
Elkhorn sea moss, *Kappaphycus alvarezii*	1 285	1 888	1 957	1 963	1 726	1 711	1 754	1 527
Nori nei, *Porphyra* spp.	703	1 072	1 027	1 123	1 139	1 142	1 159	1 353
Seaweeds nei, Algae	1 844	3 126	2 889	2 815	2 864	449	775	1 049
Laver (nori), *Porphyra tenera*	584	564	609	691	722	674	686	710
Spiny eucheuma, *Eucheuma denticulatum*	172	259	266	288	233	241	274	214
Fusiform sargassum, *Sargassum fusiforme*	86	78	111	112	152	175	189	190
Spirulina nei, *Spirulina* spp.	48	97	73	80	82	86	89	89
Brown seaweeds, Phaeophyceae	30	23	28	17	16	19	30	34
Others	20	28	27	28	18	15	14	17
Total	**13 503**	**18 992**	**20 785**	**23 555**	**26 863**	**27 356**	**29 365**	**30 139**

Source:"SOFIA Report 2018" (FAO).

TABLE J. MAIN PRODUCERS OF CULTIVATED SEAWEED (IN THOUSANDS OF TONS)

Country	2005	2010	2011	2012	2013	2014	2015	2016	% of total, 2016
China	9 446	10 995	11 477	12 752	13 479	13 241	13 835	14 387	47.9
Indonesia	911	3 915	5 170	6 515	9 299	10 077	11 269	11 631	38.7
Philippines	1 339	1 801	1 841	1 751	1 558	1 550	1 566	1 405	4.7
Republic of Korea	621	902	992	1 022	1 131	1 087	1 197	1 351	4.5
Democratic People's Republic of Korea	444	444	444	444	444	489	489	489	1.6
Japan	508	433	350	441	418	374	400	391	1.3
Malaysia	40	208	240	332	269	245	261	206	0.7
Tanzania	77	132	137	157	117	140	179	119	0.4
Madagascar	1	4	2	1	4	7	15	17	0.1
Chile	16	12	15	4	13	13	12	15	0
Solomon Islands	3	7	7	7	12	12	12	11	0
Viet Nam	15	18	14	19	14	14	12	10	0
Papua New Guinea	0	0	0	1	3	3	4	4	0
Kiribati	5	5	4	8	2	4	4	4	0
India	1	4	5	5	5	3	3	3	0
Others	25	14	15	16	13	12	16	8	0
Total	**13 450**	**18 895**	**20 712**	**23 475**	**26 780**	**27 270**	**29 275**	**30 050**	

Source:"SOFIA Report 2018" (FAO).

We can say that the information provided by table G, in which it tells us that the main species produced in the sub-sector of world aquaculture are finfish with a significant progression from 2010 to 2016, coincides exactly with that described in table F, in which it showed us that both in continental aquaculture and in

marine and coastal aquaculture, the species that are mainly cultivated are finfish.

On the other hand, as far as crustaceans are concerned, there is also a quite important fact. The crustaceans that are most produced in the entire subsector of world aquaculture are shrimp, crab and prawns (in addition to other crustaceans) and this has an important coincidence and an important link with Figure 3, which showed us the growing and important increase over the years of the catches of some species that are considered very valuable and such species are: shrimp, crabs, prawns and also the so-called gastropods. Precisely, on observing this and also knowing that you cannot increase the catches of these species, because they can be exhausted and could even disappear these species in the sub-sector of global aquaculture, a part of it, dedicated to the cultivation of crustaceans, mostly cultivates shrimp, crabs and prawns.

As far as aquatic plants are concerned, there has been a sharp increase in the cultivation of these plants, which will reach 30.9 million tons by 2016. Within them, marine algae predominate. Indonesia contributed to the strong growth of seaweed cultivation and also to the increase in aquatic plant production in recent years by using seaweed as raw material used for the removal of carrageenan. Moreover, of all seaweed production, some species of seaweed are produced in East and South-East Asia and virtually all of their production is destined for human consumption. Also, we would have inside the marine algae, the so called microalgae being its production carried out in 11 countries in 2016 and being of 89000 tons and of these, almost its totality come from China. Microalgae are used for the production of food supplements for humans in addition to other uses and have a high commercial value as well.

Aquaculture production is dominated by only a few countries, both in terms of continental aquaculture and in terms of marine and coastal aquaculture. In terms of finfish, continental aquaculture is dominated by finfish production in developing countries and would also be the main production in marine aquaculture in developed countries. In terms of crustaceans, the majority production would come from the hand of marine shrimp in coastal aquaculture in several developing countries located in Latin America and Asia and constitute an important source of income for them. In terms of marine mollusks such as, for example, mussels and oysters, then, such production would be the majority in many regions of several countries including China.

The very characteristic factor that comes from China is that it has produced such an amount of edible fish that it far exceeds the entire annual world production of world aquaculture since 1991. Moreover, Chinese aquaculture production has increased so much that it has even surpassed the amount of edible fish caught in the wild, specifically, to reach that production from aquaculture 80% today. China's ability to feed its population with fish from aquaculture at the national level helps increase global food security and nutrition as a whole as well. This fact has materialized thanks to an action by parts of the authorities of the country for it to occur, as well as to influence

consumers and markets both inside the country and outside the country, which affects the entire value chain of production.

They are also increasing their attention to environmental responsibility, they have also increased the quality and diversity of products, as well as they have improved the techniques of their aquaculture sector. All this, what causes is that the aquaculture sub-sector is truly strengthened and truly grows.

We are now going to analyze one of the production factors that is the key to both the main fishing sector and the aquaculture sub-sector: the labor factor.

TABLE K. FISHERS AND AQUACULTORS EMPLOYED BY REGION AT WORLD LEVEL (in thousands)

Region	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016
Fisheries and aquaculture										
Africa	2 392	4 175	4 430	5 027	5 250	5 885	6 009	5 674	5 992	5 671
Asia	31 296	39 646	43 926	49 345	48 926	49 040	47 662	47 730	50 606	50 468
Europe	530	779	705	662	656	647	240	394	455	445
Latin America and the Caribbean	1 503	1 774	1 907	2 185	2 231	2 251	2 433	2 444	2 482	2 466
North America	382	346	329	324	324	323	325	325	220	218
Oceania	121	126	122	124	128	127	47	46	343	342
Total	**36 223**	**46 845**	**51 418**	**57 667**	**57 514**	**58 272**	**56 716**	**56 612**	**60 098**	**59 609**
Fisheries										
Africa	2 327	4 084	4 290	4 796	4 993	5 587	5 742	5 413	5 687	5 367
Asia	23 534	27 435	29 296	31 430	29 923	30 865	29 574	30 190	32 078	31 990
Europe	474	676	614	560	553	544	163	328	367	354
Latin America and the Caribbean	1 348	1 560	1 668	1 937	1 966	1 982	2 085	2 092	2 104	2 085
North America	376	340	319	315	315	314	316	316	211	209
Oceania	117	121	117	119	122	121	42	40	334	334
Total fishers	**28 176**	**34 216**	**36 304**	**39 157**	**37 872**	**39 411**	**37 922**	**38 379**	**40 781**	**40 339**
Aquaculture										
Africa	65	91	140	231	257	298	267	261	305	304
Asia	7 762	12 211	14 630	17 915	18 373	18 175	18 088	17 540	18 528	18 478
Europe	56	103	91	102	103	103	77	66	88	91
Latin America and the Caribbean	155	214	239	248	265	269	348	352	378	381
North America	6	6	10	9	9	9	9	9	9	9
Oceania	4	5	5	5	6	6	5	6	9	8
Total fish farmers	**8 049**	**12 632**	**15 115**	**18 512**	**19 015**	**18 861**	**18 794**	**18 235**	**19 316**	**19 271**

Source:"SOFIA Report 2018" (FAO).

The reality is that millions of people around the world find a source of income and also a means to make a living in both the global fishing sector and the global aquaculture sub-sector. In the box above, we can see all the people who are employed in those sectors, but specified according to the continent to which they belong. We can say that both the number of people employed in the fishing sector and in the aquaculture sub-sector have been increasing over the years, with small declines overall, that is, there is a decrease in the number of people employed in the fishing sector between 2010 and 2011 and at the same time an increase in the number of people employed in the aquaculture sector. It happens the other way around, in the space of time from 2011 to 2012, in which the number of people employed in the global fishing sector increases, while the

number of people employed in the aquaculture sector decreases. Progressions in the number of people employed in the main fishing sector and aquaculture subsector vary according to the region in which they are located. In Europe and North America there have been greater declines; in Africa and Asia, with larger population growth and more active populations in the primary sector, the increase in people working in the fishing sector and the aquaculture sub-sector has been very large, even more so in the aquaculture sub-sector; in the case of Latin America and the Caribbean, demographic growth and, moreover, an increase in the active population employed in both the main and the subsector has been characteristic and also shows that employment in both the main fishing sector and the aquaculture subsector has increased in a more contained manner, although, the aquaculture production has increased in a forceful and very high way, but, in many occasions not accompanied with an increase of the number of employed aquaculture workers, since, great part of this production is destined to very competitive foreign markets. The increase in production itself requires that the focus on efficiency and quality be made effective and, at the same time, that costs be reduced, not forgetting that all of this depends to a great extent on the technological advances made, rather than on the fact that more fish farmers are hired to make this great increase in production effective. In the case of Oceania, there was also a significant increase in the population employed in the main fishing sector rather than in the aquaculture sub-sector and, finally, in the case of China, the proportion of the population employed in the main fishing sector would be about 8.9 million people and in the aquaculture sub-sector would be about 4.9 million people from aquaculture, a significant part of the Chinese population is dedicated to them. To know data on the number of people employed in the main fishing sector as well as in the aquaculture sub-sector, as well as to know the remuneration (one of the main socio-economic indicators) that people employed in the main sector as in the sub-sector receive, the combination between the two, the key fact to understand the contribution of the main fishing sector and the aquaculture sub-sector to people's livelihoods.

We are now going to look at an activity that is key, crucial and essential to boosting fish consumption and achieving global food security by connecting producers to distant markets for which local supply would otherwise be insufficient. This refers to the **trade in fish and fishery products.**

On the one hand, it provides employment for people working in many industries and activities around the world and, on the other hand, it generates income for millions of people around the world. This would be especially the case in developing countries. Exports of fish and fishery products are crucial for the economies of many countries and coastal regions. For example, for Cape Verde, Greenland, Iceland, etc., such exports account for 40% of the total value of trade. Moreover, fish and fishery products are some of the world's most traded food products. It has continued to grow steadily from 1976 to the present day, now representing fish production and also representing 37% of all international trade. Such fish production is traded internationally for human consumption and also for non-food purposes. The proportion of fish and fishery

products intended for human consumption has continued to grow steadily from 1976 (12% this year) to the present day and continues to increase (30% now). Specifically, total exports of fish and fishery products represent some 62 million tons, and also represents a very significant increase of 245% from 1976 to the present. In this period, the world trade in fish and fishery products increased and grew a lot, we are talking about exports with a value of € 7590 million in 1976 to now be 135664 million €. An incredible increase.

Such a large increase during these years in the international trade of fish and fishery products has been due to the process of globalization. This process of globalization has involved a large-scale transformation of the world economy that has also been stimulated by the liberalization of international trade and technological progress. It is also characterized by the reduction and elimination, sometimes also, of obstacles to one's own international trade that impede and hinder one's own trade, i.e. preventing the free movement of goods, services, capital and labor. It also entails a proliferation of multinational companies seeking horizontal consolidation and vertical integration; there is also the fact that consumers' tastes, concerns and expectations are on the rise, as well as facilitating social and cultural integration in international terms, supported and forced also by the rise of information technology. This globalization process has made international trade an increasingly crucial and important factor for the world's own economic production.

Moreover, 80% of fish and fishery products are subject to the competition of international trade and the behavior of supply and demand of different species. Producers are becoming more and more established and, over time, are operating and supplying products to many countries, steadily increasing. As far as fish products are concerned, their processing is concentrated in countries where labor has a lower price. In some cases, what they do is export the fish for processing and then import it again for final sale and subsequent consumption. Knowing that demand for fish and fishery products is sensitive to consumer income levels, the progression and inclination of international trade itself is largely linked to the global economic environment.

It is also true that there are other important factors that influence national consumption, such as exchange rate trends, climatic events and also large-scale disease outbreaks. In general, the pace of trade growth has slowed down in recent years. According to the WTO (World Trade Organization), the increase in the volume of merchandise trade worldwide was only 1.4% in 2016, the lowest figure recorded since 2008.

Trade in fish and fishery products declined in 2009 after the economic crisis of 2008, followed by upturns and subsequent growth, to decline again by 10% in 2015. The reason for all this was the weakening of some major emerging markets, the decline in the prices of a number of important species, and the significant strengthening of the US dollar compared to a number of major currencies in 2015, which led to the value of one's own trade in certain currencies being relatively lower. In 2016, trade increased by 8%, and in 2017, that economic upturn of the previous year, intensified demand and, therefore,

prices rose, increasing the value of world exports and bringing them to a maximum of € 144202 million.

As a major exporter and importer of fish and fishery products, China has been the largest exporter of fish and fishery products since 2002 and is also the largest producer of fish, even though they account for only 2 per cent of its total merchandise trade. Moreover, in 2017, China's exports of fish and fish products reached a value of € 19448 million. China is also the third largest importer of fish and fish products in the world, caused in part by the large quantities of fish that are imported for processing and later re-exported for subsequent sale, and is also due to increased incomes and changes in consumption habits that in turn create markets for species that are not produced locally.

The next largest exporter of fish and fishery products below China is Norway. Norway has prospered an extensive salmon aquaculture sector, and its fishing fleet focuses on catches of cod, herring, mackerel and other species of white fish and small pelagic species. In 2016, Norway's exports increased and reached a value of €12 billion and continued to increase even more in 2017 due to the high prices of some of its main species, namely Atlantic salmon and cod.

In the case of Vietnam, this country is the third largest exporter in the world and much of its income comes from exports of a fish called Pangasius spp (better known as *Panga*) and shrimp grown in the subsector of aquaculture. It also has a quite remarkable trade in processed and re-exported products. The increase in income levels in the country has made the demand of consumers of imported fish and fishery products stronger and more or less expensive as is the case of salmon.

In the case of Thailand, this remains one of the main exporting countries of fish and fishery products during the last decades, although it is true that they have decreased in volume due to disease-related problems that have arisen in the shrimp farming industry, very important in Thailand. Thailand itself is a major processing and canning center for tuna catches.

Finally, we have the European Union. Since its establishment, this is the largest single market for fish and fishery products, with the United States and Japan behind it. The European Union together with the United States and Japan account for 65% of the total value of world imports of fish and fishery products and, in 2016 and 2017, all three increased imports of fish and fishery products, this increase being the common result of the main economic factors, with the added effect caused by the appreciation of the currency in the case of the United States. In developed countries, where large urban populations of high-income consumers are concentrated, the demand for fish and fishery products far exceeds domestic production and, therefore, consumption levels can only be sustained by establishing a high import dependency to achieve this.

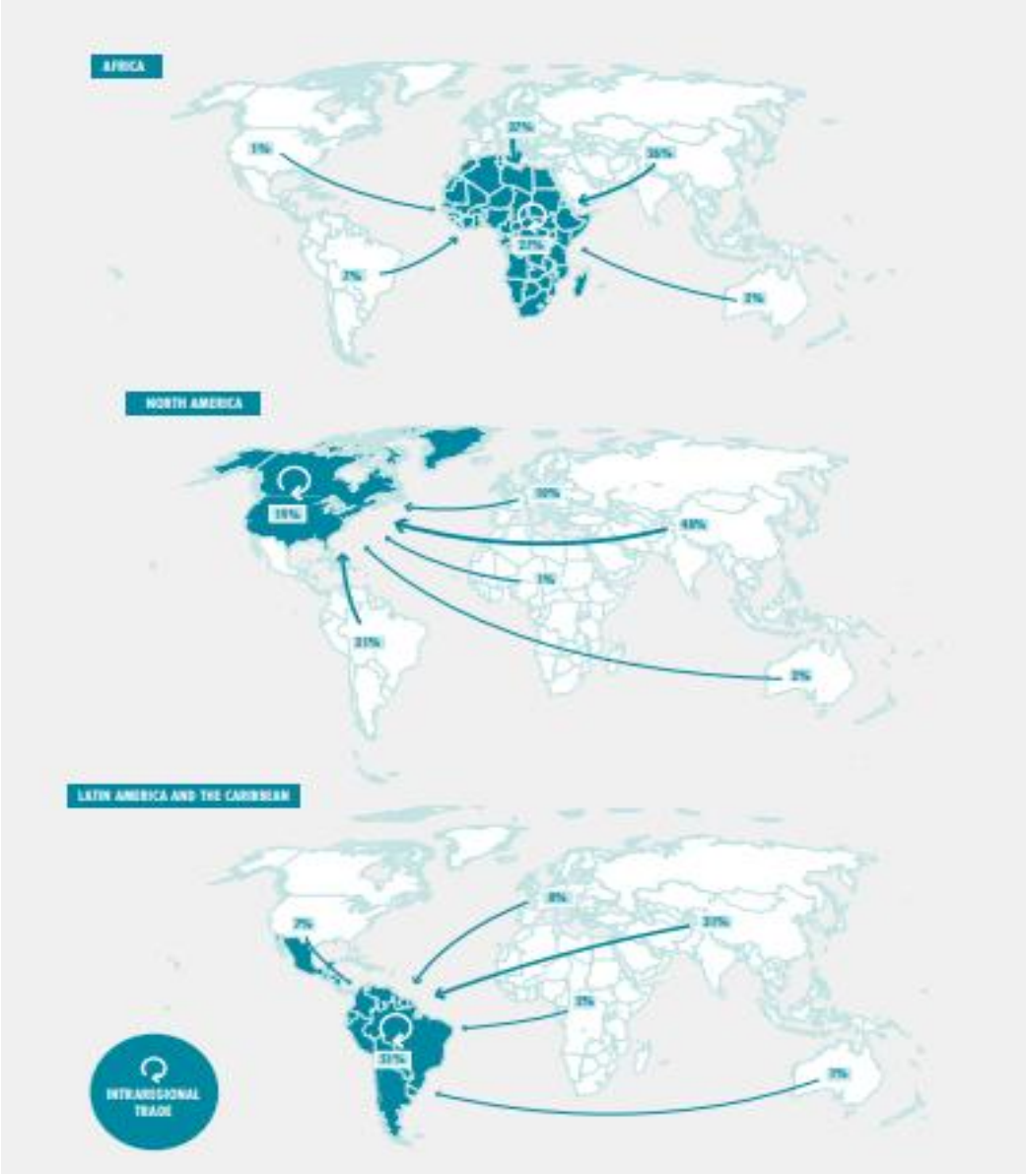
A very important event has been the very strong trade blockade that Russia has applied and exerted on certain countries since mid-2014, which has also had an impact on trade in fish and fishery products. Moreover, in 2017 the value of Russian imports fell by 44%. This blockade has not only led to the above, but

also to a general transformation in trade flows. The volumes obtained before from European producers such as Norway are now being imported from other producers such as Chile and the Faroe Islands, and in the case of countries subject to the blockade, they have been forced to find other new markets.

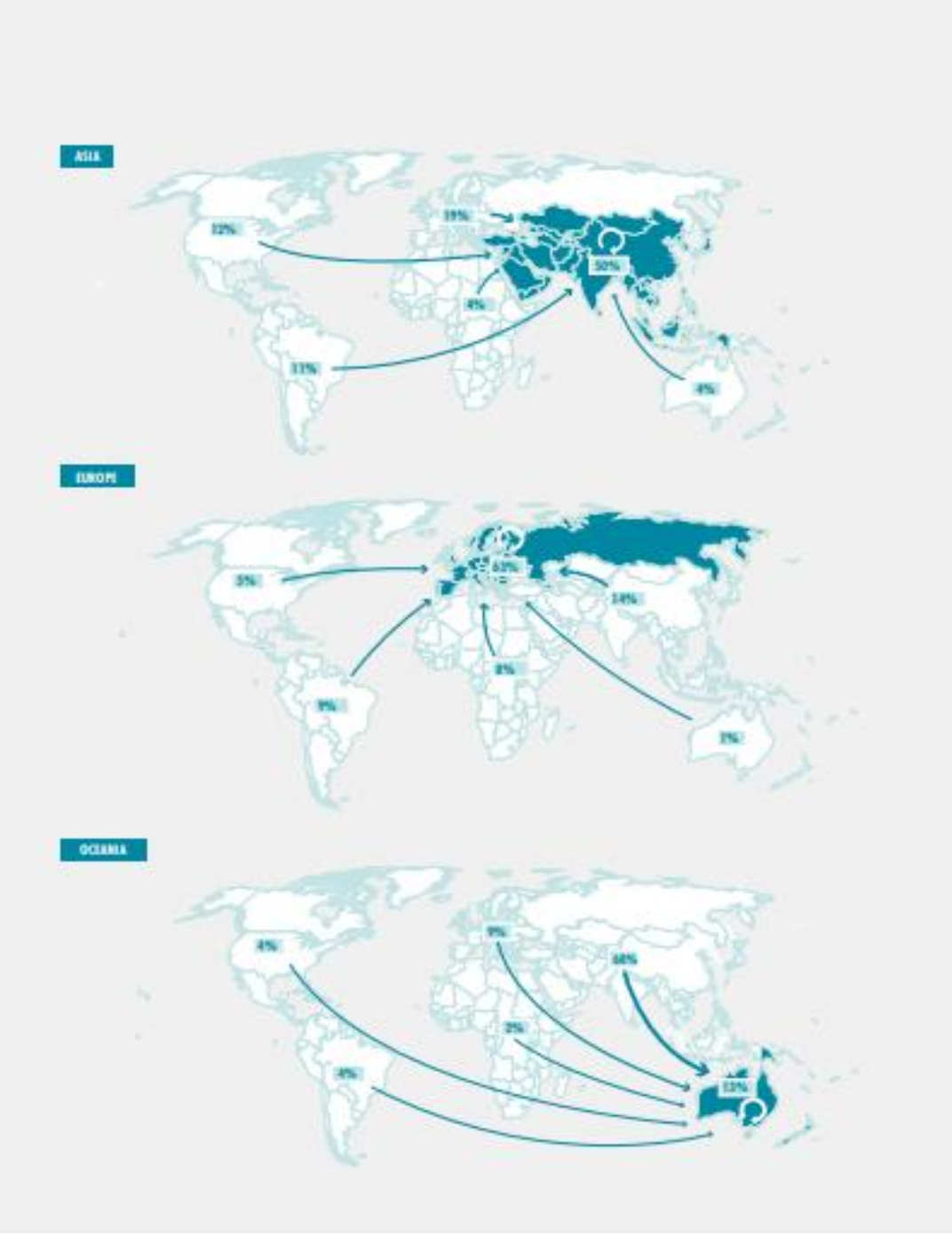
In addition, many emerging markets and exporters such as Brazil, Indonesia and India have emerged and become increasingly important, thanks in part to improved distribution systems and increased production.

Next, we are going to look at everything in terms of continents, that is, we are going to look at it with inter-regional flows.

GRAPH 6. TRADE FLOWS IN FISH AND FISHERY PRODUCTS IN CONTINENTAL TERMS IN 2016



Source:"SOFIA Report 2018" (FAO).



Source:"SOFIA Report 2018" (FAO).

Interregional flows are characteristic and valuable. Oceania, the developing countries of Asia and the region of Latin America and the Caribbean are important net exporters of fish. Exports from Latin America, which are mainly shrimp, salmon, tuna and fishmeal from Ecuador, Peru and Chile, increased in

2016 and increased again in 2017 due to a rise in tuna prices and higher production. We can also point out that Europe and North America are notable for the existence of a deficit in the fish trade.

A rather crucial and important factor is also tariffs. Tariffs with the most widely used trade policy instruments largely determine world trade flows. However, it is true that the same tariffs can be reduced or eliminated by being part of free trade agreements or also facilitate market access for developing countries through the application of preferential tariff regimes such as the Generalized System of Preferences. In developed countries, which depend entirely on imports to satisfy domestic consumption, the tariffs applied to fish are smaller, with some exceptions (value-added products and specific species). Developed countries can export to other developing countries, moreover, this accounted for 79% of developed countries' exports of fish and fishery products in 2016. In the case of developing countries, they can increase their exports by providing products to developed country markets without having to assume prohibitive tariffs.

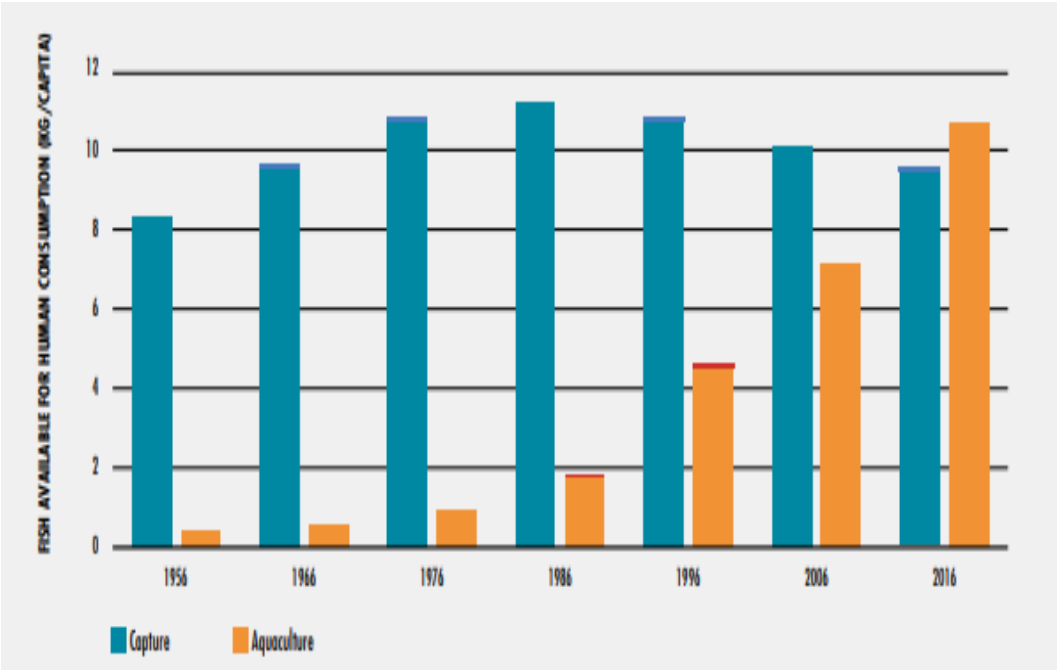
On the other hand, there are what are known as regional trade agreements, which are reciprocal trade agreements that stipulate preferential terms of trade between two or more trading partners in the same geographical region. They have themselves been very important factors in the expansion of world trade in recent decades and also apply to fish and fishery products. Moreover, it has also helped to increase the regionalization of fish trade since the 1990s. The situation is that as demand increases in neighboring countries, then exports formerly destined for developed markets are redirected to regional partners because of this.

It is also true that there are several factors that influence exporting countries' access to international markets. Structural problems in various countries can influence the quality of fishery products, thus influencing the loss of products or increasing the difficulty of marketing them.

More specifically, the world trade in fish and fishery products comes from capture fishing and a third is attributed to aquaculture and these are increasing. The world's population consumes more and more fish and fishery products from the fishing sector or the aquaculture sub-sector.

In the following graphs, we can see it very clearly.

GRAPH 7. RELATIVE PARTICIPATION OF AQUACULTURE AND CAPTURE FISHING TO FISH FOR HUMAN CONSUMPTION.

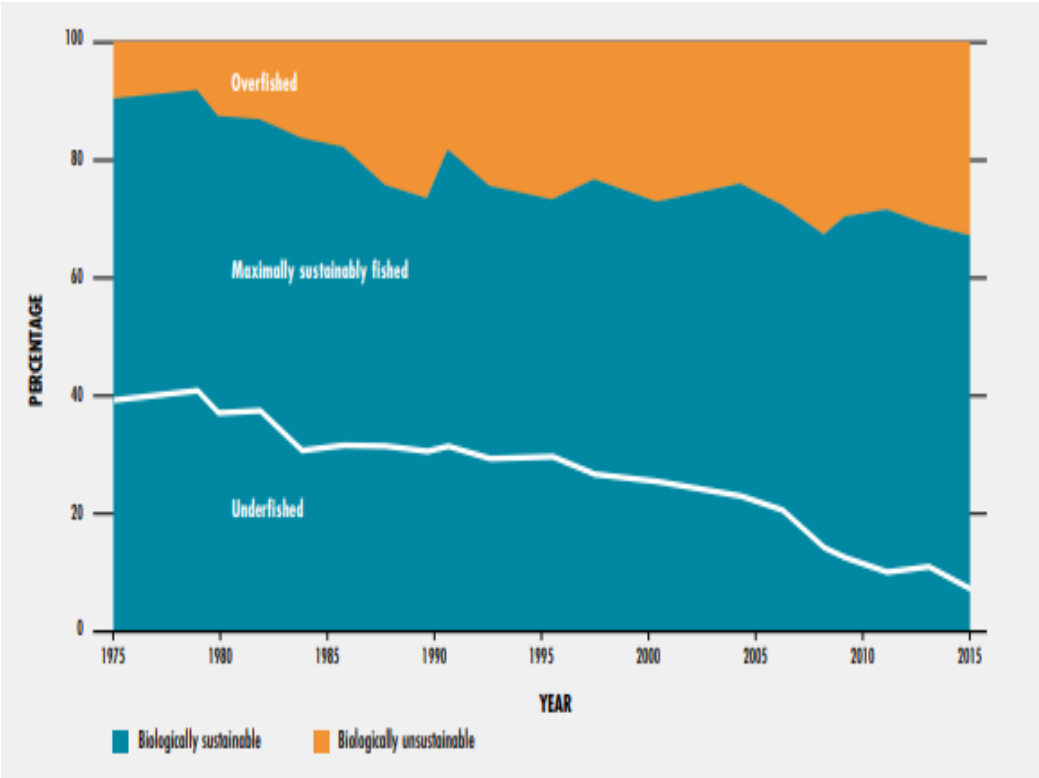


Source:"SOFIA Report 2018" (FAO).

In this graph we can see very good news for society, the fish available for human consumption from the subsector of aquaculture has gone in a steady and forceful increase since the mid-1980s, to surpass the catches, the fish available for human consumption from the fishing sector and continues to manifest today.

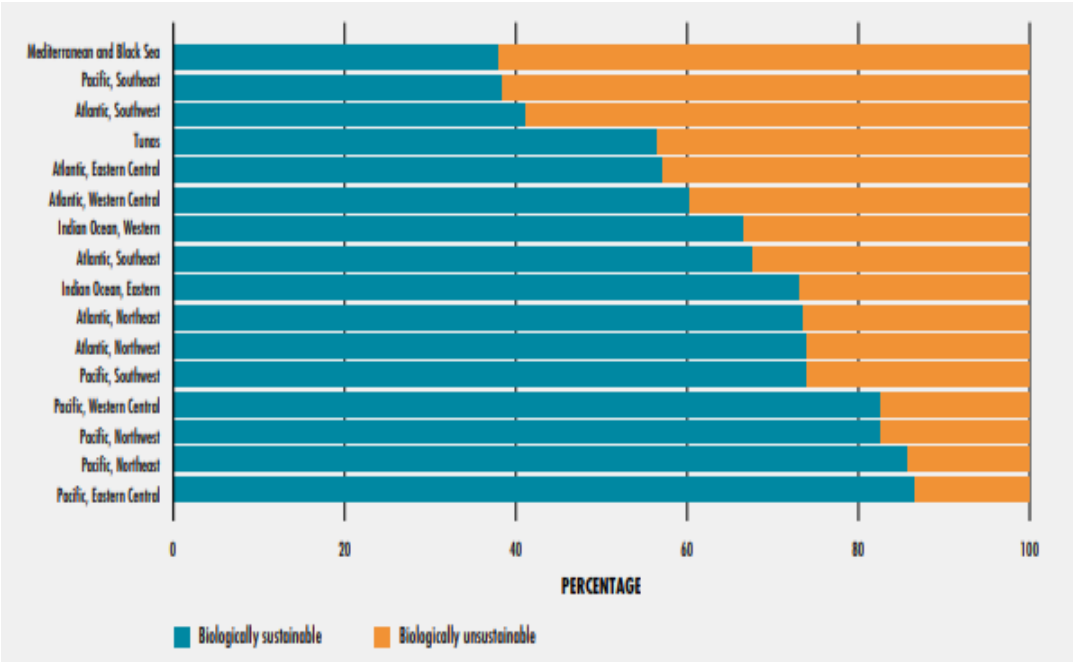
Once seen and analyzed the situation of the seas, marine species, we can say with forcefulness that all the inhabitants of the world are consuming more and more fish and other marine species and that the rate of growth of that consumption has surpassed and far surpasses the rate of growth of the species themselves in their natural habitat, and that on the other hand, the subsector of aquaculture is growing more and more in the face of this situation. What has been explained can be seen in the following two graphs.

FIGURE 8. GLOBAL TREND IN MARINE POPULATIONS.



Source:"SOFIA Report 2018" (FAO).

FIGURE 9. STOCKS EXPLOITED AT BIOLOGICALLY SUSTAINABLE AND UNSUSTAINABLE LEVELS IN FAO FISHING AREAS.



Source:"SOFIA Report 2018" (FAO).

Based also on the *SoMFI report (2018)* carried out by FAO and GFCM and with the previous graphs, we can observe the situation of the fishing vessels in terms of species and in terms of FAO fishing areas. Specifically, we are referring to marine fishing and the state of its marine resources.

Part of the fish stocks that are within the range, from biologically sustainable levels have been decreasing gradually and with a downward trend from 1974 to 2015 and even more so today, i.e. from 90% to 67%. A very positive change. On the other hand, in terms of the levels of exploited populations at biologically unsustainable levels, these levels increased by more than 20%, i.e. from 10% to 33%. In terms of stocks exploited at a maximum level of sustainability they accounted for 60% in 2015 and under-exploited stocks only accounted for 8% and, in addition, under-exploited stocks declined significantly and steadily between 1974 and 2015 and stocks exploited at a maximum level of sustainability declined for some time, but then increased significantly.

The graph showing exploited stocks at sustainable and unsustainable levels in FAO fishing areas highlights exactly the same, fragmented according to the seas and oceans located in the different FAO fishing areas.

In 2015, percentages of unsustainably exploited fish stocks were recorded in the various FAO fishing areas. Specifically, the Mediterranean and the Black Sea (Area 37) by 62%. We also have the southeastern Pacific (Area 87) with 61.7%. We have in the same way the southwest Atlantic (Area 41), this with 60%. These three areas concentrate the highest percentages of unsustainably exploited populations. On the other hand, we would have the central-eastern Pacific (Area 77), the northeastern Pacific (Area 67), the northwestern Pacific (Area 61), the central-western Pacific (Area 71) and the southwestern Pacific (Area 81), which would make up the block with the least percentages of fish populations exploited unsustainably. We're talking about percentages between 13% and 17%. The remaining FAO fishing areas would concentrate unsustainably exploited fish stocks of between 22 % and 43 %.

It should be determined and clarified that an upward trend in catches may indicate an improvement in the state of stocks or may also be due to an increase in fishing intensity, but on the other hand, a downward trend in the same catches could be an indication that the intensity of fishing is reduced or could also indicate the adoption of state policies aimed at protecting marine species or aimed at restoring the stocks concerned or could also be indicative of other factors such as environmental changes and market conditions which favor and contribute to the reduction of catches.

Looking at it from the perspective of marine species, the productivity and status of each species varies widely according to the species we observe. Among the marine species exploited at biologically sustainable levels that would be 78%, and that would concentrate the largest landings between 1974 and 2015, would be the anchoveta, Alaska tail, Atlantic herring, Atlantic cod, Pacific starling, Chilean horse mackerel, Japanese sardine, skipjack, South American sardine and capelin. Of all the species mentioned above, Chilean horse mackerel,

Atlantic cod and capelin (located in the north-western Pacific, central-eastern Pacific and north-eastern Atlantic), all three would concentrate the highest percentages than the average of the overexploited stocks themselves, i.e. they would actually be overexploited. Also, we have the tuna that has a great economic value, a large international trade and its demand in the market is high, would also be exploited in an unsustainable way. Overfishing would also affect species such as groupers and shrimp, Atlantic sardinella, Argentine hake, red mullet, sole, turbot, anchovy, sardine and corvina and also bivalve mollusks such as mussels (located in the northwest Atlantic), On the other hand we would have the Argentine squid, the Caribbean common lobster and the pink conch (located in the central-western Atlantic) bordering on unsustainability.

In the case of inland fishing, we would have a very similar situation there. The catches from it increase over time and there is also a situation of overfishing. Species that would be found in this situation would be trout and sturgeon, for example.

With all that has been said so far, we can clearly say that it is necessary to correct this situation of overfishing in all the oceans, seas, rivers and lakes of the world.

Something similar is also happening in the aquaculture sub-sector. This sector uses antibiotics and pesticides on many occasions to strengthen and expand the production of aquatic species, promoting their growth, moreover, medicines that could enter the sea and also affect the resistance of bacteria. It is also true that intensive aquaculture could revert the seabed with this excess food, cause the depletion of biological resources or even introduce invasive species in new habitats with all this.

It is therefore also necessary to reverse and correct these factors in the aquaculture sub-sector itself.

In short and with all that has been said, we see that it is necessary to introduce a new concept to this scenario occupied by the fishing sector and the aquaculture sub-sector. We are going to introduce a concept called sustainable development and mix it with the fishing sector and the aquaculture sub-sector and we will get the so-called sustainable fishing and sustainable aquaculture.

Sustainable development is that development that is capable of satisfying current needs without compromising the resources and possibilities of future generations. Put instinctively, a sustainable activity is an activity that can be conserved over time. For example: Cutting trees from a forest and still ensuring their subsequent repopulation.
Sustainable development as a concept first emerged in the 1987 Brundtland Report (prepared by different nations), which defined sustainable development as development that meets the needs of present generations without compromising the ability and ability of future generations to meet their needs. In the same report, it also warned of the negative consequences of economic development and globalization, which fully affect the environment and, of course, sustainable development. What is more, the drafting of this report

represented a very important change both at a social level, as well as at an environmental level, as well as at an economic level, and furthermore, it encouraged moral discussions on the environment that were not taken into account or debated up to the time the report was written. The Brundtland report marked a before and after on that subject.

Although it may seem that we are talking about the same thing, we must not confuse sustainable development with sustainability or sustainability. Sustainable development seeks to achieve sustainability or sustainability, so it is an objective of sustainable development itself, that is, this development aims to achieve an improvement in the environment and quality of life of people without jeopardizing the livelihood for the survival of subsequent generations and also the planet itself. Sustainability is the goal of sustainable development. Sustainable development is the way, the process followed to reach a goal: sustainability.

Based on the bibliography available on the website of the Spanish Government on the objectives of *Agenda 2030* http://www.exteriores.gob.es/Portal/es/PoliticaExteriorCooperacion/NacionesUnidas/Paginas/ObjetivosDeDesarrolloDelMilenio.aspx , we can say that the objectives of sustainable development are gathered in Agenda 2030 (approved in turn by the United Nations). This agenda includes both the objectives and the measures to ensure this development. Therefore, the objectives we would find here would be, for example, to guarantee a healthy life and well-being of people, to eliminate poverty and hunger, responsible production and consumption of resources, to take action in the face of existing climate change to protect and maintain underwater life and life in terrestrial ecosystems, etc. and, at the same time, sustainable development is made up of 3 central pillars, which in a certain way group together the aforementioned objectives: economic, social and environmental sustainability or protection of the environment. Economic sustainability would speak to us of the idea that economic growth develops in a way connected with natural resources without overloading the capacities of nature itself. Social sustainability would lead us towards imposing the idea of equality, through which every citizen of the world would be able to access a good quality of life and, finally, environmental sustainability or environmental protection would lead us towards the idea that nature's resources are not inexhaustible and, therefore, must be protected and dosed in their consumption. Therefore, the ultimate goal of sustainable development will be achieved, i.e. the state of sustainability will be achieved when the quality of life of all people in the world has been improved and also when the integrity of life sustainability systems (human and non-human) is effectively ensured. Once we have travelled the path of sustainable development, we will be able to reach our goal: sustainability.

3. Definition of the problem and issue to be addressed: sustainable fishing and sustainable aquaculture; procedures and challenges.

Once we have defined the previous concept, we are going to mix it with fishing, and we would obtain what is called **sustainable fishing**.
Also taking into account the report by ECESA Plus (Executive Committee on Economic and Social Affairs). 2017. 2017 HLPF thematic review of SDG14: "*Conserve and a sustainably use the oceans, seas and marine resources for sustainable development" and the bibliography prepared by H. and Sanders, J. (2016) entitled "Fishing livelihoods as key to marine protected areas: insights from the World Parks Congress. Aquatic Conservation: Marine and Freshwater Ecosystems*, 26 (Suppl. S2): 165-184, we can say that we have already understood that we have a great responsibility in the care of the biodiversity of our planet so that they continue to exist in the next generations, and in particular, we also have to take care and pamper the marine biodiversity, which we use and consume, in many cases too much. The marine ecosystems, speaking of seas and oceans, are multiple and very varied with a great variety of living beings that inhabit them, which means that this richness of the oceans is constantly threatened due to pollution, climate change and overfishing. In order to face this situation and fight against it and thus ensure the future of our seas, more and more techniques are being applied (creating more marine protected areas, etc., for example) and practices focused on materializing and making this sustainable fishing a reality. Sustainable fishing itself means bringing together a set of practices aimed at maintaining the population of marine species at optimum levels to ensure the survival of the natural environment while respecting it. Sustainable fishing is essential, motivated by the existence of overexploitation of the seas and the fishing and consumption of specimens without respecting the minimum sizes, and in many cases, fishing specimens with sizes below them. The FAO (Food and Agriculture Organization of the United Nations) is an organization that emphasizes the materialization and practice of sustainable fishing. It determines exactly, in its *Conduct for Responsible Fishing*, the guidelines for setting it in motion. Exactly, it determines that it is the States and the users of the living aquatic resources that must conserve the ecosystems and the right to fish entails making them in a responsible manner (leaving the complete life cycle to the species before capturing and extracting them), respecting and guaranteeing in turn the conservation and management of the living aquatic resources and , Moreover, the composition of the fishing areas, which are the fishing, should favor and enhance the maintenance of quality, diversity and availability of the resources of the fishing themselves, in such a way as to ensure for present and future generations in the contexts of food security, poverty alleviation and sustainable development. With all this, it can be seen that sustainable fishing is very important for FAO.
The techniques that are necessary to materialize and make sustainable fishing a reality are located in the fishing (that is why the FAO has them in its *Conduct for Sustainable Fishing*) (also understood as a wide range of fishing activities from the use of equipment and equal vessels for the capture, subsequent management, storage and transport of the catch to processing, distribution and

sale) and, therefore, there are some basic rules to understand that fishing are sustainable.

Firstly, sustainable fishing is directed by thinking about the ecosystem itself and also about the possible impact that fishing may have on the populations and the ecosystem itself.

Secondly, a sustainable fishery also helps to protect species and habitats that are sensitive, so that it can be seen in them that the activity has no negative impact on the fishing species and also by monitoring the populations of the ecosystem and also by protecting their breeding and breeding areas.

Thirdly, a fishery is healthy in the sense that it effectively maintains the populations of species at a healthy level (understanding healthy as the fact that surveillance is carried out on the activity to prevent the fish from disappearing).

Fourthly, sustainable fishing use selective fishing methods, reducing as much as possible the catches that they do not really want to make, and, in this way, they also adapt to the marine habitat.

Fifthly, a sustainable fishery also maintains biodiversity, causing the least impact on the fishing area.

Sixth, a sustainable fishery minimizes, in all its operations, the use of energy, chemicals and waste production.

Seventhly, in order to become a leader in the sustainable fishing process, existing legislation on sustainable fishing has to be complied with.

Eighth and last, a sustainable fishery always provides information on the origin of its fish, from the point of capture to the market (called traceability), making it a good system of labelling and identification to monitor all specimens from the time they are caught until they reach the table of consumers.

Therefore, if a fishery complies with and applies the above techniques, then it can be effectively called a sustainable fishery.

Consumers can also take action to make such sustainable fishing a reality. What they can do is not buy and consume, fish that are below what they call minimum sizes or also understood as not consuming fish that are below a size stipulated by the authorities. With this action, we are preserving the species so that they will continue to exist in the next generations and, on the other hand, the workplaces in the fishing will continue to exist and will continue to fight and travel the path aimed at improving people's health.

And now, we are going to mix the concept of sustainable development with aquaculture and we would obtain what is called **sustainable aquaculture**.

Also following the report by Hasan, M.R. and New, M.B. entitled: *"On-farm feeding and feed management in aquaculture". FAO Technical Paper on Fishing and Aquaculture No. 583.* Rome, FAO, we can say that, in this sense, sustainable aquaculture is understood as aquaculture that is capable of diversifying its own production and species raised through investments; improving animal health and welfare; improving aquaculture centers; improving the quality of the products obtained; and putting ponds or ponds back into operation; also that it is capable of encouraging aquaculture itself so that it minimizes its negative effects on the environment or the place where it is carried out; that it is capable of improving the use and quality of the water used for its activity; that it increases the quality of the flow of the water from the ponds and other places where the activity is carried out and, finally, that the

activity itself is capable of reducing water consumption by using closed-circuit recirculation systems for this purpose. If all this is achieved, the aquaculture activity, the aquaculture subsector itself will become sustainable.

We have already intermingled the concept of sustainable development with fishing and aquaculture and have obtained, on the one hand, sustainable fishing and, on the other hand, sustainable aquaculture and defined them.

In the light of the above, there is an urgent need to correct the situation of overfishing in all oceans, seas, rivers and lakes throughout the world, i.e. the global fishing sector and the global aquaculture sub-sector must become sustainable and, in the end, with their shift towards sustainability, continue on track to effectively meet the objectives clearly set out in Agenda 2030.

The key is to address this increase in fish consumption by all the world's inhabitants and, by which, the catches of aquatic species that have increased greatly over time, with production from aquaculture, i.e. species bred and cultivated by the aquaculture sub-sector and at the same time, make the fishing sector sustainable on the one hand and also make the very vital and increasingly necessary aquaculture sub-sector sustainable on the other.

4. Bibliographic review (reports and bibliography consulted on the topics to be dealt with)

a) Canterla Martín, Francisco (2018), "Actividades pesqueras en los puertos del suroeste andaluz en la segunda mitad del siglo XV y actividades pesqueras a lo largo de la Historia: evolución de los sistemas de captura" (report).

It explains the history of fishing, from the oldest civilizations to the 20th century.

(b) González Serrano, José Luis, 'Subdirección General Caladeros Nacionales y Acuicultura' (2018), *'Evolución histórica y situación actual de la acuicultura en el mundo y en España'.*

It explains the evolution throughout the history of aquaculture.

(c) *SOFIA Reports 2014, 2016 and 2018 (FAO).*

They carefully detail all the details about the fishing sector and the aquaculture sub-sector in the course of time until 2016, as well as the trade flows, the labour markets of both sectors, the safety of fishery products and the time forecasts of the fishing sector and the aquaculture sub-sector.

d) Banco Mundial.2012. :" *Hidden harvest: the global contribution of capture fishing. Washington,D.C.* Banco Mundial

It tells us about the contribution of both inland and marine capture fishing to the economies of countries, from the smallest to the largest, and thus specifying the importance of the fishing sector itself.

e) Bell, J.D., Johnson, J.E., Ganachaud, A.S., Gehrke, P.C., Hobday, A.J., HoeghGuldberg, O., Le Borgne, R., Lehodey, P., Lough, J.M., Pickering, T., Pratchett, M.S., Waycott, M., 2011."*Vulnerability of tropical Pacific fishing and aquaculture to climate change: summary for Pacific Island countries and territories"*

In this report, it specifies the very vulnerability of aquatic species to changes in climate, and to climate change itself in the Pacific in particular.

(f) *Codex Alimentarius Commission (2016 and updated 2016). "Code of Practice for Fish and Fishery Products" CAC/RCP 52-2003 .... FAO AND WHO*. Rome

Here it clearly lists the food safety conditions that must be met by fish and fishery products at both global level.

g) Hellebrandt, D. , Delaporte, A. y Allison, E.H. y titulado "*Food Safety and Artisanal Fishing : Critical Analysis of Initiatives in Latin America*" (December 2014)

It is also specified here in the concrete actions to ensure food security in Latin America.

h)Balian, E.V., Segers, H., Leveque, C., y Martens, K. y titulado "*The Freshwater Animal Diversity Assessment" in Balian, E.V., Segers, H., Leveque, C., y Martens, K. eds "Freshwater Animal Diversity Assessment, pages 627 to 637. Developments in Hydrobiology, nº 198* , Dordrecht (Países Bajos), Springer

In this bibliography, it tells us about the biodiversity of inland fishing, i.e., the Freshwater Animal Diversity Assessment and the distribution of Metazoa in the world's inland waters.

h) Dudgeon, D., Arthington, A.H., Gessner, M.O., Kawabata, Z.I., Knowler, D.J., Lévêque, C y Sullivan, C.A. 2006. y titulada " *Freshwater biodiversity: importance, threats, status and conservation challenges. Biological Reviews*, 81 : 163-182

In this bibliography, he tells us about the biodiversity of inland fishing, their situation and their complications in terms of overexploitation of their species.

(i) Halwart, M. and Gupta, M.V. eds 2004 and entitled: "*Cultivation of fish in rice fields"*. Rome, FAO and Penang (Malaysia), The WorldFishCenter

This report tells us about the positive consequences of fish farming next to fields where rice is grown. It is a concrete case located in the country of Malaysia.

(j) *SoMFI report (2018)* by FAO and GFCM

It specifies the specific situation of the Mediterranean Sea and the Black Sea and the situation of overexploitation of many of the aquatic species that inhabit them.

k) The objectives of Agenda 2030

http://www.exteriores.gob.es/Portal/es/PoliticaExteriorCooperacion/NacionesUnidas/Paginas/ObjetivosDeDesarrolloDelMilenio.aspx

On the website of the Spanish Ministry of Foreign Affairs, we find the objectives of Agenda 2030 to be met by all the countries of the world over time.

l) ECESA Plus (Executive Committee on Economic and Social Affairs). 2017. 2017 HLPF thematic review of SDG14: "*Conserve and a sustainably use the oceans, seas and marine resources for sustainable development" y la bibliografía realilizada por H. y Sanders, J. (2016) y titulada "Fishing livelihoods as key to marine protected areas: insights from the World Parks Congress. Aquatic Conservation: Marine and Freshwater Ecosystems*, 26 (Suppl. S2): 165-184.

It specifies the exact facts that must be developed to take care of the aquatic species and to make that sector of the fishing sustainable in the time.

(m) Hasan, M.R. and New, M.B. and entitled: *"On-farm feeding and feed management in aquaculture". FAO Technical Paper on Fishing and Aquaculture No. 583.* Rome, FAO

All the necessary guidelines to make the sustainable aquaculture sub-sector sustainable and to maintain and guarantee it over time.

n) Policies implemented by the EU to make the sustainable fishing sector a reality.

https://ec.europa.eu/fishing/cfp_en
We also have *REGULATION (EU) 2015/812*

And the sustainable aquaculture sub-sector

http://www.europarl.europa.eu/doceo/document/A-8-2018- 0186_EN.html?redirect

o) Apromar. (2015), *"Aquaculture in Spain".*

This report details real examples of the cultivation of species both in Spain and around the world, which are overexploited in the fishing sector worldwide.

5. EU fishing and aquaculture policy

Having explained all the above and also taking into account all the regulations in the fishing and aquaculture policies in the EU, https://ec.europa.eu/fishing/cfp_en , http://www.europarl.europa.eu/doceo/document/A-8-2018-0186_ES.html?redirect and also *REGULATION (EU) 2015/812* , we can clearly say that Europe is carrying out and implementing policies to make both the fishing sector and the aquaculture sub-sector sustainable. We must say that we only explain the policies carried out and implemented by the continent of Europe, due to the impossibility of knowing and explaining the policies carried out by each country in the world to make these sectors sustainable.
Therefore, EU fishing management and its actions to make both the fishing sector and the aquaculture sub-sector sustainable are based on the idea that stocks are renewable through the achievement of each stock's own life cycle, but are limited. With this, the EU countries have decided and implemented measures to return and ensure the sustainability of the European fishing sector and aquaculture sub-sector and thus prevent the size of species populations and also their productivity from being affected in the long term. Actually, what each EU country is implementing is a set of measures framed within what is

called the CFP (Common Fishing Policy). This policy was born in 1974 and has been updated several times, the last one being in force on 1 January 2014.
The objectives of this CFP are to ensure that both fishing and aquaculture are sustainable and continue to be so over time from the environmental, economic and social points of view, and are also a good source of food for all EU citizens. To this end, its purpose is to energize the fishing sector and thus ensure a fair standard of living for fishing communities. On the one hand, they consider it important to increase catches, but this does not mean that the unsustainable situation of many species is still worsening. It is therefore crucial to prevent fishing practices from preventing species from reproducing. Moreover, the current policy foresees that between 2015 and 2020, catch limits will be set that are sustainable and thus ensure the long-term continuity of the species. Although the impact of a fragile marine environment is currently not fully understood or truly assimilated, the CFP then takes a very cautious approach and recognizes the impact of human activity on the entire ecosystem. Moreover, it aims in this way to make the catches made by fishing fleets much more selective and to gradually adapt and eliminate the practice of discarding unwanted fish.
The latest reform of the CFP changes the way the CFP is managed and gives EU member countries the possibility to have greater control power at national and regional level.
Regarding the aquaculture sub-sector, the measures being implemented to make it more sustainable are the following: to exploit the potential of aquaculture to support the marine and inland fishing sector as a source of employment and as a driver of the Union's own economy, thus improving the productivity and quality of its areas and in turn increasing development, diversification and innovation by increasing the production of aquatic species and their competitiveness; also simplifying the administrative processes for setting up and managing businesses in this sub-sector; also promoting equity with interaction with other sectors , in order to avoid isolating the sub-sector from aquaculture and favoring the fishing sector and allowing fishing to continue unchecked; also adapting existing legislation to the needs of aquaculture ; to promote the competitiveness of EU aquaculture within and outside EU borders and thus protect European aquaculture products and oblige imported aquaculture products to meet environmental, socio-occupational, food safety and minimum human rights conditions; improvement of consumer information; ensuring animal welfare; availability of guaranteed and safe veterinary products; better communication and promotion campaigns; support for research and innovation in the aquaculture sub-sector; promotion of training and employment in the sub-sector; improve also the sustainability of the aquaculture sub-sector in the EU; ensure adequate funding of the sub-sector and, finally, promote a symbiosis between the fishing sector and the aquaculture sub-sector so that the two complement each other.

6. Study of real and concrete cases and their detailed explanation.

Based on Apromar's report. (2015), *"Aquaculture in Spain",* we can present some concrete and real cases in which we see that the success and increase of the crops of certain aquatic species coincides exactly with the situation of overexploitation of the same aquatic species in their natural environment, oceans, seas, rivers or lakes motivated and caused by the increase in consumption by the inhabitants of the world and also demonstrates the reality of what was proposed and presented as a central idea and also demonstrates the reality of the conclusion made at the end of the first part of this work specifically in point 3.
First we have the real example of the cultivation of turbot (a species considered to be overexploited worldwide).
Specifically, turbot is a fish, the species of which is considered to be overexploited. Its natural habitat is distributed in the Baltic Sea, North Sea, English Channel, North-East Atlantic to Morocco, Mediterranean Sea and Black Sea. Their breeding, their cultivation is carried out in very controlled hatcheries, and they are usually concrete and circular in shape and on the coast. They are fed with living organisms during the first month of life and then with natural feed.
Of all the existing turbot production, that from aquaculture accounts for 59.22% and the rest corresponds to marine capture fishing. According to the FAO (2013), China is the largest producer of turbot with 67000 tons and the second largest producer of turbot worldwide is Spain with 7808 tons.

Source: https://www.pescaderiascorunesas.es/pescados/rodaballo

It is clearly observed that the increased consumption of the species is served in great majority by the production of aquaculture and to a lesser extent by the production from marine capture fishing and thus allows the species to recover and complete its life cycle.

Secondly, we have the cultivation of corvina (a species also overexploited in marine capture fishing worldwide).

Corvina is another fish that is cultivated mainly in Mediterranean countries. This aquatic species is fed with living organisms in their first month of life and then they are fed with feed from natural ingredients. Their cultivation is carried out in nurseries floating in the sea as if they were ponds on land.

The first corvina producing country is Egypt with 4890 tons in 2013, decreasing slightly over time and the second producing country would be 1090 tons specifically. Production from marine capture fishing would be 48% and production from aquaculture would be 58%. In this case, it can also be seen

that the increase in consumption of the species is also mainly served by production from aquaculture and to a lesser extent by production from marine capture fishing.

Source: https://www.pescaderiascorunesas.es

Third, we have a marine bivalve mollusk called the mussel (a species also overexploited in marine capture fishing). The subsector of aquaculture stands out at world and European level in the breeding, cultivation of bivalve mollusks. The cultivation of mussels takes place exclusively in Spain, specifically in the 5 Galician estuaries (Galícia). It is cultivated by collecting mussel seeds from its natural environment and then strung in troughs between October and April or by using collecting ropes between March and June.

Its production from aquaculture is 240000 tons, more than double the production from marine capture fishing worldwide which would be 106383 tons (according to FAO data). We can also say that the increase in consumption of this species is attended more than fully by production from aquaculture and to a much lesser extent by production from marine capture fishing.

Source: https://www.vaiapeixe.com/index.php/es/mariscos/mejillon

As for the fourth place, we have the trout species (a species considered to be overexploited in inland fishing). It is grown in half the world. They are fed when they are juveniles of the reserve food provided by the gall bladder, and then they are fed with feed made with natural foods.

Its production from aquaculture is 814069 tons is much larger than the production from inland capture fishing which is 12000 tons. In this case, even more emphatically, we can say that the increase in consumption of aquatic species by the world population can be fully met with the production of trout from the subsector of aquaculture.

Source: https://www.pescaderiascorunesas.es/pescados/trucha

And finally, we have the sturgeon species (a species very overexploited in inland capture fishing).
It is a species that is very overexploited worldwide. at very high levels. According to the report *"Fishing and aquaculture in Europe*. *Nº56.Junio del 2012",* exposes that 85% of the sturgeon production corresponds to the aquaculture subsector and only 15% corresponds to the continental capture fishing sector and, with this, they let the species rest in its natural environment and complete its life cycle completely. Moreover, aquaculture production worldwide is 75767 tons, being the main producer China and followed by Russia. It is cultivated in fresh water. Therefore, in this case, the increase in consumption by the world's inhabitants is almost entirely met by the aquaculture subsector.

Source: https://www.pescaderiascorunesas.es/pescados/esturion

Therefore, once it has been demonstrated that the conclusion made at the end of point 3 of this work is real, we can affirm that the projections at world level are that the level of world catches of both marine and inland capture fishing will progressively decrease over time and that increase in consumption of aquatic species by all the inhabitants of the world will increasingly be met by the production of these same species from the subsector of aquaculture. To this end, it is also necessary to improve the aquaculture sub-sector more and more, making it more and more sustainable and, in exactly the same way, for the fishing sector and, in this way, to bring the two sectors together and make progress on the road that leads us to achieving the objectives of Agenda 2030.

7. Conclusion.

In this work, we have broadly defined both the fishing sector and the aquaculture subsector at all levels and we have also wanted to explain and deal with the problem that exists about marine resources or aquatic species and with this, we have come to the conclusion of the existence of overfishing in the fishing sector itself at both marine and continental level, and subsequently we have also defined what we understand by sustainable development and we have therefore come to the great conclusion that has been the central axis of work which is the need to make both the fishing sector and the aquaculture subsector sustainable. We have also reached a very important determination that the increase in consumption of aquatic species by the world's population must be met not only with the catches taken from their natural environment, but also to meet part of that increase in consumption of aquatic species with production of the same aquatic species from the aquaculture sub-sector. That's the key. We have also demonstrated this with real cases. It is also necessary to combine all of this with improvement and innovation in processes and, in this way, to be able to make both the fishing sector and the aquaculture sub-sector sustainable and to continue walking and advancing along the path that leads us to a specific end: to be able to make the objectives set by Agenda 2030 a reality.

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