UNIT 2
"THE EXPLOITATION OF FISHING RESOURCES: FISHING AND AQUACULTURE"

TEACHERS' GUIDELINES

Unit map

Topics		
Fishing techniques, fishing gears, species caught.		
Management measures for fishing activities.		
Aquaculture: types and considerations on farming of fishing resources.		
Goals		
Become acquainted with the main fishing methods and with the differences between small-scale and large-scale fishing.		
Highlight the need and the importance of a correct management of the fishing activities to avoid the excessive exploitation of the fishing resources.		
Learn the main aspects of the aquaculture activity.		
Make the students reflect on the environmental impacts arising from the aquaculture and fishing activities.		
Inserts		
1. Fishing techniques.		
2. The management of resources through the protection of species.		
3. Aquaculture.		
Subjects		
Ecology, law, nature conservation and management.		
Didactic factsheets		
Type	**Title**	**Activity**
S - Survey	1. "Fishing resources"	Class survey.
R - Research	2. "About fishing"	Research in class.
	5. "About aquaculture"	
E – Experience/ processing	3. "The floor to the fishermen"	Visit of a fishing port/interviews to the fishermen.
	4. "Fisheries law"	Visit and interview to the Harbour Master's Office.
	6. "How to farm fish?"	Visit of an aquaculture facility.
V - Test	7. "And how to catch this fish?"	Test in class.
	8. "The floor to you!"	
Basic concepts to understand the topics of the Mr.Goodfish Campaign		
Environmental impacts arising from the aquaculture and fishing activities. Sustainable management of fishing resources.		

Educational path

In this unit, after examining the marine ecosystem and defining how and how much the fishing resources represent an important food resource for Humans, we take in consideration the various methods used to exploit and manage these resources.

Hence, main topics of this work are:
- the fishing activity;
- the fishing resources management;
- the aquaculture activity.

The aim is to train the young students not only in the knowledge, but also and above all in the awareness of the importance of a correct management of the natural heritage, our prime source of life.

For the development of this unit the following field outings are advised:
- interview to a fisherman;
- interview to the Harbour Master's Office;
- visit of an aquaculture facility.

In this unit it advised to perform the research factsheets (R) in class, or as exercise to be performed at home, and to use the experience/processing factsheets (E) in the field outings.

The work, as usual, starts with the didactic factsheet focused on the pre-knowledge of the students (**didactic factsheet S 1**), in this case concerning the fishing resources, fishing and aquaculture.

The **didactic factsheet R 2** proposes a research work, in preparation for the following activities in the field; the students are invited to approach the subject of fishing by acquiring information about the different techniques used to catch the various species, also in relation to the different environments where they are caught.

The **didactic factsheet E 3** consists of a practical activity intended to deepen knowledge about fishing techniques and gears of the local area. By interviewing the fishermen, the fishing reality of the study area can be fully understood; furthermore, both difficulties and harshness of working in the sea by observing the equipment and discovering the needs dictated by their use and maintenance will be figured out. There is no doubt that the direct protagonists' voice and passion will be the best ambassador in the interests of the youths in examining in depth the knowledge of these aspects, essential for the survival of the local cultural and economic small organizations.

Furthermore, by proposing the in-depth knowledge of the various types of fishing, both small- and large-scale, the students will be able to understand the effects of the technological development on the depletion of resources and will be able to contribute to the discussion on the necessary measures to control and manage the inevitable progress in the sector (topic treated in insert 2).

For the development of the didactic factsheets on fishing, it is advised the reading of **insert 1** in which we provide a synthetic overview of the fishing systems more generally used, inviting you to encourage your students to examine in depth the specificities of the local marine, with any possible adaptations and small-scale versions of the various systems mentioned here. Indeed, it should be always remembered the importance of the local economic organizations, as essential driving forces of the global market. In this way, one of the main founding principles

of the various local Agendas 21 will be applied, the programmatic documents of the actions to be taken in the twenty-first century for the protection of natural resources and environments: **think globally, act locally.**

The **didactic factsheet E 4** proposes an investigation and analysis activity (in the form of interview) on the existing management measures of fishing, by suggesting a meeting with the operators of these important State Bodies such as the Harbour Master's Offices. The topics raised in this didactic factsheet make reference to lots of those initiatives that are taken to guarantee the economic result to the operators and the continuous supply of the fishing product to the market. **Insert 2** is focused on the management measures of fishing and allows to understand how every rule has its specific justification, to protect the maintenance of the resource generally based on the biological characteristics of the target species.
At the end of the activities on fishing and management of fishing resources, there will be a test (**didactic factsheet V 7**) that, in the form of quiz, reproposes some key concepts such as the various fishing gears and the relevant target species, the concept of selectivity and respect of the minimum catch sizes.

The **didactic factsheet R 5** proposes a research work, in preparation for the following activity in the field. The students are invited to find information on the origins of aquaculture, on species that can be farmed, on various types of facilities, on possible environmental impacts of this activity, etc.

The **didactic factsheet E 6** proposes, consequently, the visit of an aquaculture facility.

To this purpose, it is provided a trace for the collection of the main information concerning technology, but also the management and environmental problems related to the conduction of these business activities.
The visit of a facility will encourage the students' curiosity for this type of activity leading them to reflect also on the related limits and potentialities.
For the development of the activities on aquaculture we suggest the reading of **insert 3** that proposes a synthetic overview of the farming activity and introduces some interesting data to think about.

As a conclusion of this topic, and of the whole unit, the students are invited to write a text (**didactic factsheet V 8**) in which they should express their impressions and considerations on the aquaculture and fishing activities.
In this way, in the light of the "lived" experiences, the students can express themselves freely and hence many different aspects can emerge, both subjective and "objective" topics such as fishing, fishing resources management and aquaculture. Aspects that can be treated through comparisons in the classroom.

Before concluding, we cannot omit the fact that, as all the anthropic activities, also fishing and aquaculture generate forms of environmental pollution that go beyond the problem of the depletion of fishing resources. This topic, even if it is not considered here, could represent an interesting in-depth analysis.

INSERT 1

"FISHING TECHNIQUES"

Since the ancient times, the humans have developed different tools allowing them to catch products from the seabeds, in their vicinity and in the whole water column. The history of fishing is actually written in the evolution of gears and various professions. The catch methods are, on the one side, the outcome of a deep knowledge of the biological characteristics of the animals and, on the other side, of the technological innovation.

Different types of fishing can be identified such as:
*- **active and passive**, in relation to the method of catch;*
*- **pelagic and coastal,** in relation to the type of environment in which it is carried out and consequently the type of domain (planktonic or benthic) to which the target species belongs;*
*- **large-scale and small-scale,** in relation to the quantities fished and the sizes of the gears used (the small-scale fishing uses vessels under 10 gross tons).*

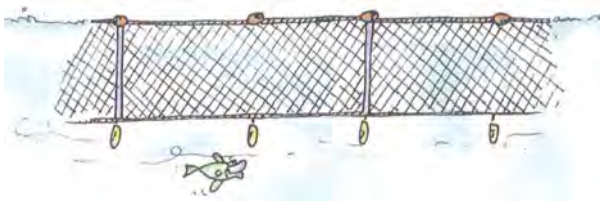
The main fishing methods, in relation to the methods of catch, and the respective gears and environments in which they are used as well as the respective target species and other fun facts are illustrated and described here below.

Passive methods

Among the various fishing systems, that of big pelagic fishes (Scombridae and swordfishes, in particular) represents one of the main activities of the large-scale fishing at world level.

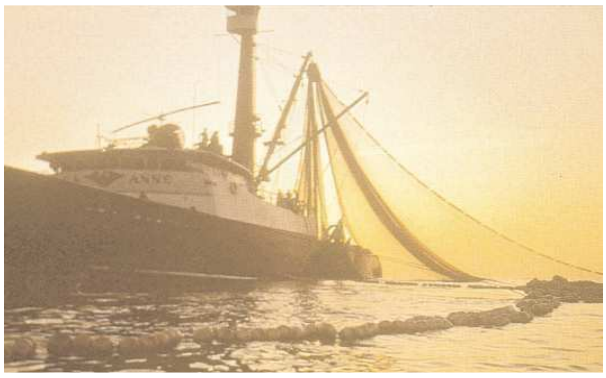
The fishing of these species was performed, until 2001, mainly through the use of **pelagic driftingnets** whose origins are very old: Oppian mentions the existence of the nets to catch swordfish already in 177 b.C.

The length of these nets varied depending on the type of fishing that, in the case of "sapdara" nets and longlines (fishing systems for the catch of Tuna varieties and other big pelagic fishes), achieved also 40 linear kilometres (average length 12-15km) and a height of 35m (average height 28-32m).



The pelagic driftnets consist of long non-fixed nets (with variable mesh sizes depending on the target species), left adrift and floating through a system of peaks to which weights (on the groundline of the net) and floats (on the headline of the net) are attached.

From the end of the Eighties, this technique went through various judicial and administrative vicissitudes, which led to subsequent opening and closures of the activities and to a high conflict between fishermen in charge and environmental associations.



An industrial fishing boat retrieves a large pelagic driftnet, today forbidden. On board of the fishing boat it can be noted a helicopter, typically used for the activity of sighting of schools of big pelagic fishes.

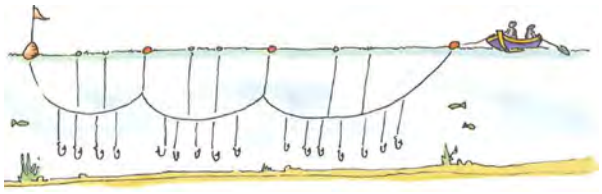
Among the trawl nets, the driftnets have been absolutely the most studied in our seas, both due to their diffusion, and for the problems they cause to cetaceans and sailing. From a strictly quantitative point of view, the small delphinids are those suffering the most from the impact of these nets; the number of deaths can be only estimated.

Furthermore, invaluable damages are caused by the huge quantity of nets and their parts that over the time have been scattered in the sea, continuing inevitably their activity of catching fishes, cetaceans, turtles and other organisms, out of any possible control or remedy.

That is why the fishing with driftnets was forbidden first by the United Nations (resolution 44/225 of December 1989), then by the European Union, which in '91 declared illegal the use of trawl nets longer than 2,5km (EEC regulation no.345/92). In '92 it ordered its outright ban as of the 1st January 2002, *"to ensure the protection of biological marine resources as well as a balanced exploitation of the* fishing resources, in compliance with the interest of both fishermen and consumers" (regulation 894 of 29th April 1997).
Unfortunately, although the ban, this type of fishing keeps, even though in a limited way, being illegally carried out.

The **ferrettara** (Drift net) are trawl nets that the Italian government has declared legally valid for catching small pelagic fishes and different demersal species. Actually, the mesh side of 18 cm and the distance of 10 miles from the coast, authorized by the Italian Government, entail the catch of species prohibited by the EU, such as tuna and swordfish, and the accidental catch of protected species, such as cetaceans and marine turtles.

The gears currently used in the large-scale fishing to catch pelagic species are **longlines or pelagic longlines**: systems of hooks and lines, whose branch lines, called snoods, are attached to a horizontal main line, where there are also the floats. The length of the main line is correlated to the number of hooks used and to the distance between the snoods and can achieve many kilometres of length, variable in relation to the target species.



The longlines (or pelagic longlines) consist of a long and solid line (main line) with baited hooks attached at intervals by means of branch lines called snoods. A snood is a short length of line, attached to the main line using a clip or swivel, with the hook at the other end. The diameter of main line and snoods, intervals of distribution of snoods on the main line, dimension

of hooks used, choice of lure and moment of drop and retrieve are the variables that allow to address the fishing activity to the target species with a certain selectivity. Typically, this fishing technique allows catching basses, giltheads and Diplodus fishes (when carried out on the sea floor) or swordfishes, tunas and other big pelagic fishes (when carried out in pelagic environment).

The **set nets** are dropped and anchored to the sea floor and are in turn divided into trammel nets and gill nets; the **trammel nets** consist of three layers of netting, a small mesh inner panel of netting sandwiched between two outer layers of netting with larger mesh size, while the **gill nets** have only one panel of netting.

A fisherman selects the species caught with a trammel net.

The **tuna-fishing net** is a fishing system using fixed nets (or system of nets), anchored to the seabed according to a specific scheme to ensure that the fish, once entered into the net through the mouth, is in a one-way path without escape, which will lead it to the inner chamber (called “death chamber”), where it will be caught. The species typically caught with this technique are: tunas, basses, herrings and salmons. The selectivity of the tuna-fishing net depends on the mesh size of the nets. This technique allows to reject alive at sea non-target species.

The **pots** are typical gears for the small-scale fishing, widespread all over the world. They are substantially traps into which the lures are introduced to attract preys; they are built with different materials, such as wicker, reed or nets, mounted on fixed wood or iron frames, but there are others made of plastic or synthetic material.

The pots are used to catch fishes, crustaceans and seabed molluscs. In lagoon areas they can be replaced by other types of traps, called **coghill nets**.

The pot is a fishing system that, besides allowing the species caught to stay alive until the time they are pulled out of the water, allows to reject alive at sea the non-target species that accidentally enter into the trap.

Active methods

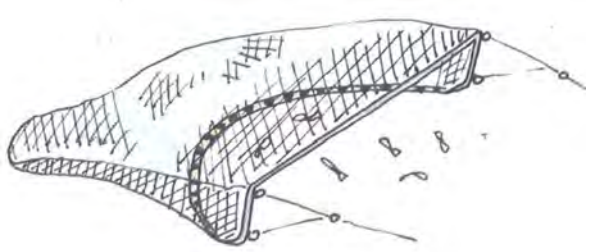
Seine nets are used to catch anchovies, sardines and mackerels, but more recently (as of the Sixties)

also to catch the bluefin tuna. These nets can achieve 1 km of length and more than 300 m of height and are steered by vessels that exceed 30 tons.
The net is held on the surface by the floatline and is lowered in order to surround the school of fish; thus, a cable connected to the footrope is quickly pulled; this operation creates a kind of bag preventing the fish from escaping. The catch with seine nets can be simplified by the use of fishing light attractors or other light sources, located on small supporting vessels.

The purse seines (or ciancioli) are typically used for catching species which school close the surface of the sea, such as: sardines, anchovies, herrings and tunas.

The **ring nets** are used for fishing anchovies, sardines, mackerels and garfishes, they are operated by a single or a pair of vessels in the midwater or along the seabed.

The trawling is a method of fishing that involves pulling a fishing net and is very widespread in both coastal and pelagic areas. The big net “plows” on the seabed, pulled by the fishing boat; the mouth is kept open by the corkline and by two particular structures (the otter boards) which tend to broaden in respect of the rectilinear motion imposed to the net by the vessel. In the bottom of the net there is the “bag” which collects the catches, generally consisting of sea bottom fishes, but also crustaceans and molluscs of various kind.



The trawling nets are generally funnel-shaped with two wings of varying length to extend the net opening horizontally and ending in a codend where the catch accumulates. Usually, on each side of the mouth there are two long triangular-shaped strips of net with functions of “invitation” which take the name of wings kept opened by the otter boards.
Trawls are towed on the bottom in the midwater, depending on the species that shall be caught.
This fishing is carried out on both small and large scale, hence the size of either means and nets can be really diversified.

Trawling is necessarily carried out on sandy or muddy seabeds (rocky seabeds would irremediably damage the nets); but this type of fishing remains very damaging, in the Mediterranean Sea, for the meadows of *Posidonia oceanica*, which in the second half of ‘900 were seriously damaged for the senseless use of these gears.

Hence, the Posidonia meadows suffered a huge step backwards and, for the safeguard of these ecosystems essential for the natural balance of coasts, today there exist strict regulations governing severely the exercise of trawling.

Two fishermen retrieve the trawling net on board of a bottom trawling boat.

In particular, the recent EU regulation no. 23/2010 imposes for trawling in the Mediterranean Sea, nets with larger meshes (40 mm for squared nets, or 50 mm, for diamond meshed nets) and the prohibition of fishing within 3 miles from the coast.

Moreover, as further prevention measure, in respect of possible damages arising from trawling, in the recent past artificial underwater barriers have been realized; they are constructions carried out through the sink of solid bodies on seabeds in order to protect them, to achieve at least two goals: prevent the mechanised fishing and the illegal trawling and to increase the presence of organisms, with particular regard to those subject of fishing

The **dragnet** is a net that is towed and retrieved, usually, by hand; it can be a beach seine or a boat dragnet. The first one is lowered from a small boat in a circular shape then drawn ashore by two rows of fishermen from both ends. The boat dragnet is used when there are high or dry coasts far from the banks; the boat is anchored and from board the fishermen pull the net.

Finally, we shall mention the fishing of bivalve molluscs, which uses specific gears such as **hydraulic dredges, rakes and various small towed gears.**

*These techniques explained above are characterized by a certain degree of "**selectivity**", or rather the ability to avoid undersized individuals. This property mainly depends on the opening of meshes, in the case of the fishing techniques entailing the use of nets, and on the dimension of hooks, in the event of longlines.*
It is intuitive to think that a larger opening of net meshes shall allow smaller individuals to escape.

Nonetheless, there are other factors that can determine the selectivity of a gear, such as the design of the net used or the speed of fishing. Except for spearfishing, not technique can be really 100% selective.

Hence it results clear the importance of the definition of degree of selectivity, in particular for management purposes intended to limit the catch of younger individuals, as well as to ward off the catch of protected non-target species, such as cetaceans, various species of sharks and marine turtles.

INSERT 2

"THE MANAGEMENT OF RESOURCES THROUGH THE PROTECTION OF SPECIES"

Over the last century, anthropic pressure, climate changes and environmental pollution phenomena have triggered a quick transformation of habitats, above all of those along the coasts.
Also an increase in the fishing related activities has contributed to this process, through the growth of the fishing fleet and the application of cutting edge technologies.

But the excessive exploitation of marine resources of the world's seas, has led to their drastic impoverishment.

As concerns the Mediterranean Sea, the variety and richness of organisms populating it is unique because our sea is substantially a closed basin; thus, the isolation from the other seas has fostered the development of species geographically limited to this area of the planet.
A particular situation that, along with the abundance of resources, has fostered the development of anthropic installations, turning the Mediterranean coasts into one of the most densely populated areas and, consequently, the Mediterranean Sea into one of the most exploited seas.

Not only there has been too much fishing, but unfortunately and for a long time the organisms were fished before they reached maturity; this meant, based on terms borrowed from economy, squander our available capital.

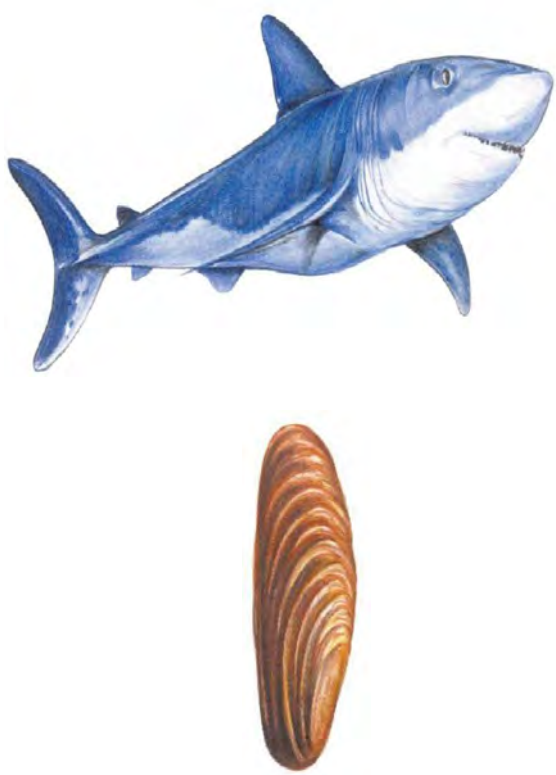
Basically, we have extracted more than what the fishing populations were able to guarantee, not recognizing the importance to allow each individual a chance to reproduce.
Hence, in order to guarantee the sustainable exploitation of resources, it is essential to plan the fishing activity on the basis of the biological cycles of target species, to ensure the maintenance of stocks in the various fishing areas.
In order to materially solve the problem, the necessary rules to maintain the balance between quantity of fish caught and the ability of species to reproduce have been studied.
Among the most relevant rules we remind those incentivizing the use of ***selective fishing techniques****, such as the net mesh sizes, those limiting number and power of vessels and their work period, for instance the* ***biological rest period*** *(suspension of activities during the period of reproduction of target species) and those setting out the* ***minimum catch sizes****.*

Furthermore, for some sotcks such as those of the North East Atlantic Ocean, North Sea, Baltic Sea, or for some species, it was declared the **Total Allowable Catch (TAC)**, or rather a catch limit set for a particular fishery.

Some areas of particular naturalistic interest and of reproduction and growth have been identified, which will become **protected marine reserves**, where fishing is strictly regulated or even forbidden. There are also areas identified as **off-limits for certain types of fishing**, such as the coastal zone (within 3 miles from the coast) where the trawling is forbidden. For the latter it was also forbidden the use of nets with meshes smaller than 40mm/50mm (depending on the shape of trawling), which can entail serious damages for the environment. In particular, the most harmful aspect concerns the destruction of juveniles of marine organisms and breeders, besides the destruction of the Posidonia meadows and other coastal biocenoses. From this point of view, also the fishing of Bivalve cockles could be particularly important in some coastal areas.

Again, in favour of the coastal environment, severe **measures to protect the date mussel** prohibiting its caught has been implemented; this bivalve mollusc, considered a very precious food, lives inside cavities dig by it in a rocky sea shore and its extraction entails the total destruction of the rocky seabed, with serious damages not only for the survival of this species but for the whole benthic community populating the same environment.

Also the fishing of big pelagic fishes is regulated, and in some cases forbidden, for the **safeguard of protected species**, such as turtles, cetaceans and big fishes such as sharks. Indeed, the latter for their biological characteristics are seriously threatened by extinction: on the contrary of bony fishes, cartilaginous fishes has not a high rate of reproduction; they make a few pups that are born fully formed and independent and this requires a long period of embryonic development.



Two examples of protected species: the white shark (Charcarodon charcarias) *and the date mussel* (Litophaga litophaga).

Once again, we wish to insist on the fact that for the **environmental protection the commitment of each of us is essential**, because we have all a crucial role in the exploitation of natural resources.

Of course, the legislations are essential for a correct regulation of the activities of extracting natural resources but it is likewise important to guarantee the respect of rules, in order to ensure the efficacy of the measures taken; in the marine context this task is mainly performed by the Harbour Master's Office and the Italian Financial Police.
But for the defence of protected marine species the control of fishing, even though very important, is not enough; it is necessary that the consumers do not feed the market with their purchase and their consumption.

INSERT 3

"AQUACULTURE"

The circular 815 of FAO sets out that, *"**Aquaculture** is the farming of aquatic organisms (fishes, molluscs, crustaceans and aquatic plants). Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms which are exploitable by the public as a common property resource, with or without appropriate licences, are the harvest of capture fisheries.*

The contribution of aquaculture to the satisfaction of the continuous increase in food demand is steadily growing; as of the Eighties the production has more than doubled and has achieved **almost 52 million tons** at world level, according to data of FAO, representing almost **47%** of the global fishing production.

The farming of aquatic species can also have purposes other than nutritional ones; thus, there exists aquaculture for human consumption, repopulation, aquariophily, sport fishing, but here we are going to talk about that for human consumption.

Nowadays, the reproductive cycle of over two hundred species is controlled worldwide, with a continuous technological development allowing constant improvements in the production yield. The definition of species that can be farmed is significantly affected, at local level, by climate factors and water temperature.

The classification traditionally made in aquatic productions takes into account:
- environments,
- species farmed,
- degree of intervention/control of the system by humans.

For instance, depending on the type of farming environment, aquaculture can be divided into two groups **marine aquaculture** and continental (or fresh water) aquaculture.

From the point of view of the farmed species, different classifications can be made. The farming of molluscs is defined with the name of **shellfish farming**, which in turn can be divided into **mussel farming**, **oyster farming** and **clam farming**. In the farming of fishing species, **fish farming**, it is possible to distinguish **eel farming**, **cyprinid farming** and **salmon farming**. The farming of algae is called **seaweed farming**, and the farming of crustaceans is defined **crustacean farming**. The farming of different species in the same environment is defined **polyculture**, the farming of one species, **monoculture**.

Two examples of aquaculture activities: fish farming (above) and shellfish farming (below).

Depending on the capacity of control of some environmental parameters and also on the basis of the role performed by humans towards the farmed species, it is possible to discern the following productive practices: **extensive, semi-extensive** and **intensive farming**

Extensive aquaculture means any form of farming which does not require high contributions of additional energy to obtain the product increase.

In other words, the necessary trophic energy is totally at the expense of the environment. This type of activity is typically performed on large spaces, in natural or seminatural environments. The human intervention is only intended to realize hydraulic works (canal systems, banks, sluices, etc.). The productions are in the order of kilograms per hectare.

Semi-extensive aquaculture represents the development of the extensive system and requires the administration of additional foods in respect of those already naturally present in the system (namely supplementary feeding). This productive practice can entail the fertilization of waters, which allows the growth of phytoplankton fostering accordingly the production of zooplankton ad benthic organisms, increasing the availability of natural food for farmed organisms.
The surfaces used in this type of farming are smaller than those of the extensive system and usually consist of land-based ponds or bordered coastal areas. The productions are measured in tons per hectare.

Finally, the **intensive aquaculture** is characterized by high densities of biomass farmed per unit of surface and volume. The whole food is administered from the outside. This type of activity entails the control of the environment to operate with high stocking densities. This farming requires high water supplies and specific mechanisms of aeration and oxygenation. The facilities of this system occupy smaller surface areas compared to the extensive and

semi-extensive systems. The tanks cover relatively reduced surfaces ranging from a few tens to some thousands of square metre. In the sea farming, the typical facility of the intensive system is characterized by both floating and underwater cages. The productions are measured from a few to more than 100 kilograms per square (or cubic) metre.

If on the one side, the aquaculture activity represents a possible way to satisfy the increasing food demand of the population, on the other side, it represents a controversial activity in relation to its possible consequences on both environment and fishing economy.

The aquaculture facilities are indeed often contested for the **risk of environmental pollution they can cause due to the dispersion of animal feed, supplements, drugs possible dissemination of pathogens,** without considering the **environmental and biological hazard arisen from the accidental introduction in natural environments of non-native species**, namely coming from other geographical areas.

Another aspect to take into consideration is that related to the sustainability of farming of carnivorous species, whose rearing requires huge quantities of food, represented by wild species caught. **Among the carnivorous species farmed raising the most serious problems there are codfish, gilthead, brill, sturgeon, salmon, trout and bluefin tuna,** species largely consumed in Western Europe. In these cases, to produce 1 kg of carnivorous fish farmed it is necessary to provide food almost equal to 2,5 kg of wild fish in the most "performing" farms, passing often to 4 kg up to 20 kg to rear a bluefin tuna.
The problem becomes bigger taking into account that the available quantities of wild fish are very limited.

The scientific community is still wondering about these aspects and is trying to understand which effects could have this activity on the natural balances.

In parallel, from an economic point of view, the main risk of this activity is represented by the speed of growth of production, which could create problems to the economic system connected to it for an excessive offer. This can also entail in turn the risk of a reduction in the product quality put on the market.
Hence, from these considerations it emerges the importance of foreseeing a constant attention in order that this activity is performed in the safest way possible for health of humans and natural environments by ensuring at the same time the guarantee of a quality product.

Among the initiatives taken to this end, we mention the **FAO Code of conduct for responsible fisheries**, whose article 9 is specifically dedicated to the responsible development of aquaculture.

Didactic factsheet S 1
"FISHING RESOURCES"

Answer the following questions.

Do you know the meaning of "natural resource"?

☐ Yes ☐ No

If so, how would you define it?.....

.....

.....

Hence, how would you define the term "fishing resource"?.....

.....

.....

Have you ever fished? If so, where? How and what did you fish?

.....

.....

.....

Do you know some protected marine species?

.....

.....

Do you know the meaning of "environmental impact"?

.....

.....

Do you think it is possible to farm fishing resources? If so, how?

.....

.....

.....

Didactic factsheet R 2
"ABOUT FISHING"

Look for the following information on the subject of fisheries.

Which are the main fishing techniques?

……

……

……

Which is the difference between large-scale fishing and small-scale fishing?

……

……

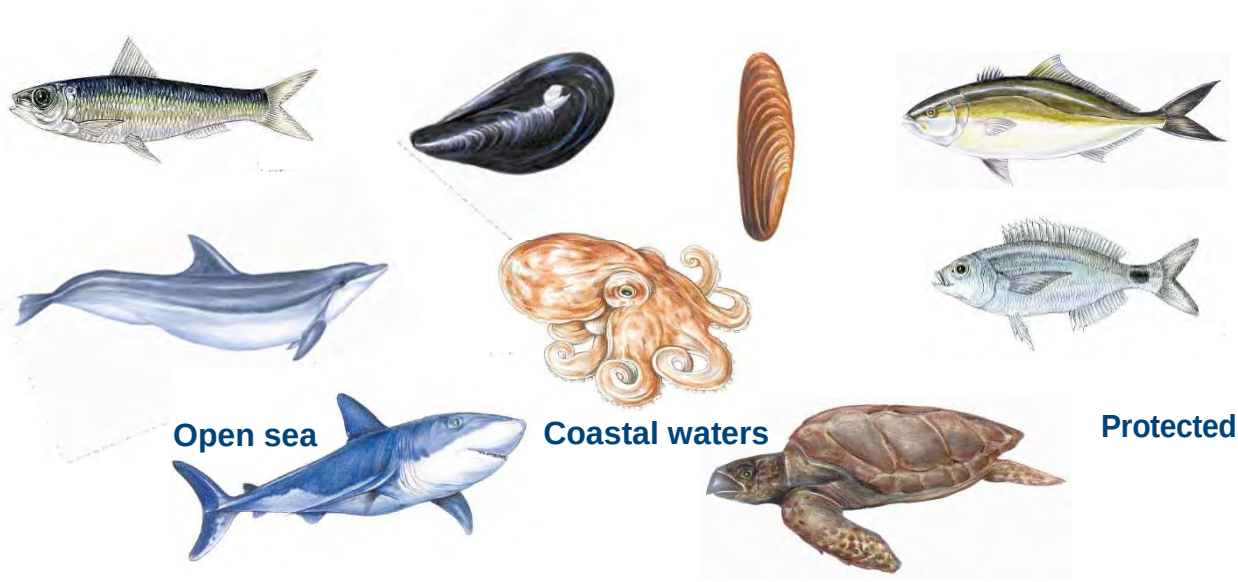
……

Which was the evolution over the time of fishing means and gears?

……

……Among these organisms which are:

Caught in the open sea? **Caught in coastal waters?** **Protected?**



Open sea **Coastal waters** **Protected**

Didactic factsheet E 3 “THE FLOOR TO THE FISHERMEN”

Before proceeding with the interview to the fishermen, identify in the environment where you are the fishing vessels reported below.

Number of:

Large-scale fishing vessels…. Small-scale fishing vessels….

Which ones prevail?……

Now, following the questions, interview one or more fishermen:

1) **How long have you been fishing?**
2) **Do you do it for work or pleasure?**
3) **What do you fish?**
4) **Which techniques do you use?**
5) **Which fishes do you catch in this season?**
6) **Which are the most common fishes in this area?**
7) **Has your way of fishing changed over the time?**
8) **How is your workday organized?**
9) **……**

Make a draw of the fishing gears used by the fisherman you interviewed.

Didactic factsheet E 4
"FISHERIES LAW"

Make a research on the main law regulating fisheries at local (regional) and national level. Complete the work by interviewing the competent Authorities (Financial Police and Harbour Master's Office)

Follows the questions:

1) **Are there regulations on the use of fishing gears?**
2) **Are there rules on the size of fishes that can be caught?**
3) **Is there any limit in the quantities of fish that can be caught?**
4) **Are there periods of the year in which the fishing is limited or forbidden?**
5) **Are there sea areas in which the fishing is limited or forbidden?**
6) **Are there protected species, which cannot be caught?**
7) **……**

Indicate the reasons and the main effects of these rules.

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Who guarantees their respect?

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If you could make up a law for the protection of fishing resources, what would you set out? Why?

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Didactic factsheet R 5
"ABOUT AQUACULTURE"

Look for the following information on the subject of aquaculture.

Which are the main types of aquaculture?

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Which marine organisms can be farmed for food use?

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Who invented aquaculture? When?

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What kind of impacts on the environment can aquaculture have?

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How are the organisms farmed fed?

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Is it "easier" to farm herbivorous or carnivorous organisms? Why?

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Discuss and compare with your mates the data collected.

Didactic factsheet E 6
"HOW TO FARM FISH?"

Collect the following information during the visit of an aquaculture facility.

Which species are farmed? What type of food do they eat? Are they herbivorous or carnivorous species?

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How long does their life cycle take to be completed?

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How many tanks are necessary for farming? ……..

Draw in a schematic way the aquaculture facility you visited.

How is water treated? Which prevention measures are used to avoid the environment pollution?

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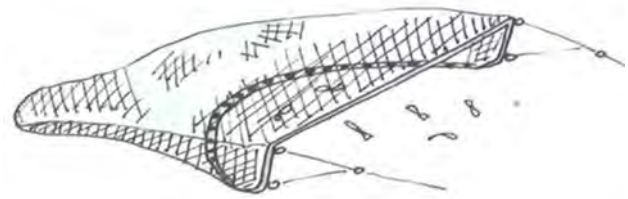
Didactic factsheet V 7
"AND HOW TO CATCH THIS FISH?"

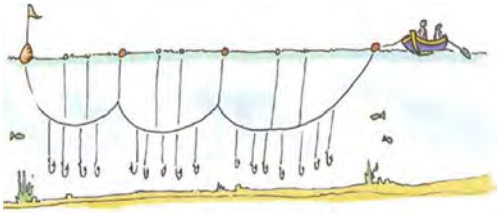
What can you catch with the following gears? Connect with some arrows, the various fishing methods with the respective target species.

Purse seine

Trawling net



Longlines



Pot

Amberjack

Crab

Mackerel

Anchovy

Octopus

Turbot

Didactic factsheet V 8
"THE FLOOR TO YOU!"

With the information collected from the various interviews and from the visit of the aquaculture facility, write an essay highlighting advantages and disadvantages, for animals and humans, of both fishing practices and aquaculture.
Finally write your impressions or make a draw of what struck you the most during the various experiences.

Title.....

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Share your essay with your mates.