# 2021 年臺灣國際科學展覽會
# 優勝作品專輯

作品編號　**200027**

參展科別　**環境工程**

作品名稱　**The Waves Fish Controller**

得獎獎項　**大會獎 四等獎**


國　　家　**Tunisia**

就讀學校　**ATAST - The Tunisian Association For the future of Sciences and Technlogy**

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關鍵詞　**Random Fishing - Controle - Wave – Save**

# 作者照片


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# 1-Abstract:

Our oceans, coasts, and estuaries are home to diverse living things. These organisms take many forms, from the tiniest single-celled plankton to the largest animal on Earth, the blue whale. Understanding the life cycles, habits, habitats, and inter-relationships of marine life contributes to our understanding of the planet as a whole. Human influence and reliance on these species, as well as changing environmental conditions, will determine the future health of these marine inhabitants

Humans influence the whole environment even if they don't notice , the growth of men and our increasing reproduction over the years results to an over consumption of nutritious products , which makes us exploit the wildlife more and more and in the same time take parts of its habitats for us to life in and throwing our non-needed materials in what's left of the world.

And that's a big problem because the Eco-System was just fine before we started over exploiting it in a greedy and unreasonable manner, and since the ecosystem's parts are related altogether in an ongoing circle , the absence or the destruction of one part of It may lead to the unbalance and even destruction of the whole organized system.

And that's why as humans, it is our first duty to take care of nature generally and both fauna and flora specifically, not because of a moral code of some kind; but to protect Humanity from ourselves, and to preserve the human kind from destruction and extinction.

And that's the main goal of our project, that's to help us organize our fishing exploitative activities with how much can the environment handle from it.

# 2-Introduction:

The environment has been exposed to many dangers in the past few decades, man's desire for improvement often leaves him blinded from the negative effects he has on our planet.

The sea is one of man’s many victims and its state has been deteriorating for a long time.The sea life is being poisoned by increasing pollution levels, which has put many sea creatures in danger.

Also, the over exploitative activities of humans are harming the sea world and all its components in a very bad way

And we know for sure that the question how much would we survive on this planet is directly related to the time we can keep the Environment safe, for that we should be protecting all of its parts and components (the fauna and flora) to save the whole structure of it so we can keep surviving on this planet.

To do so, we are developing through science and technology many machines and devices to help us overcome the bad habits that we’ve developed through the years and are influencing in a very bad way the environment surrounding us.

We can only hope for a better world by developing it in the right direction and try to make positive initiatives to help the earth survive by the laws we’ve been discovering since we’ve started to develop the world around us.

# 3-Problematic:

Sea creatures are endangered and becoming extinct because of human selfishness and his desire for a better life without caring about other creatures which affects in a bad way the nature.

In fact, human needs are increasing especially food which is the main reason for random fishing, life is in constant evolution what leads to an increasing in the quantity of rubbish thrown in sea which causes sea pollution.

And these increasing needs present themselves in the overfishing humans have been doing every day for very long period of time, which has many disasters behind it on the long term.

So, we have to find a way to protect them from all these dangers and regulate fishing boats to respect rules and apply the law for us not to lose our marine treasure , because if it happens and we continue to harm it , it will turn against us in a very bad way.


Fig-1: Future Dangers

# 4-Hypothesis:

We can find a way to protect sea creatures from random fishing through installing a device on fishing boats.

- We can oblige fisher to put this device in every boat so we ensure fish protection.
- We can control fish from distance by sound waves.
- We can affect fish through either harmless chemicals, light, electric chock or sound waves underwater.

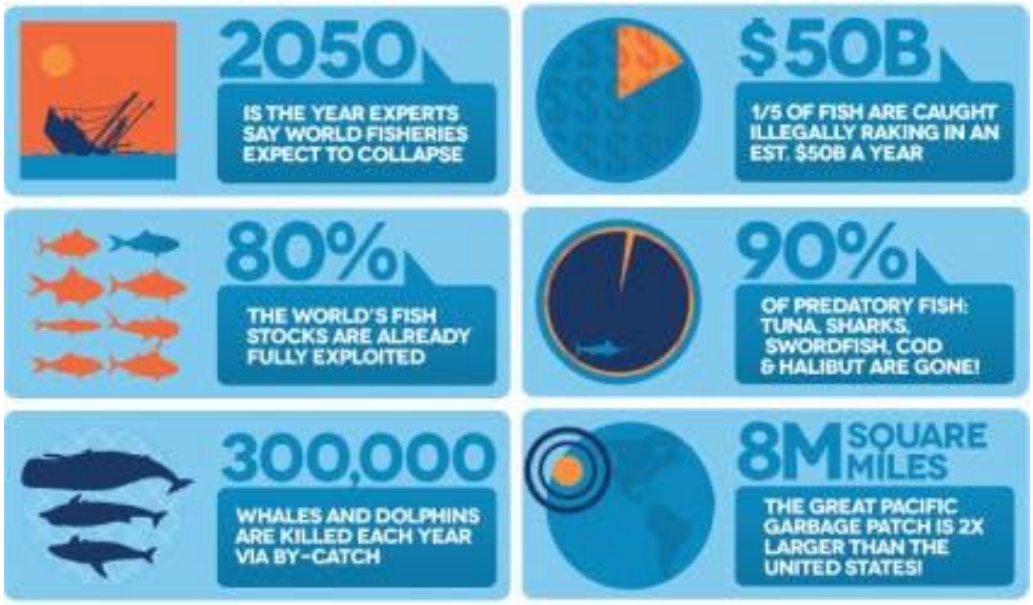



Fig-2 :Consequences of fish exploitation

# 5- Background Research:

In order to create a system and make sure it fully fulfills its purpose, we had to do an extensive research on various subjects to make sure we're following the right track.

## 5.1. Problems Faced

Obviously the first thing we researched was the level of danger the sea life is truly facing, and the results were staggering.

Random fishing consists of over exploiting water resources and endangering many sea species, unfortunately, random fishing is completely legal, and if it continues at this rate, in 2048 there will be no more sea life.

80% of the world's biodiversity is in the waters. The oceans cover more than 2/3 of tour planet. The FAO (Food and Agriculture Organization) evaluated that in 2003, all fish types worldwide were being exploited at 52 %, 16% were being endangered, and 8 % were already extinct.

## 5.2 Possible Solutions

This only strengthened our will to complete our project, and thus research began, we had to know everything there is to know about the type of fish we were protecting, in order to figure out the best way to move on.

As we see, it's important to find a safe way to protect fish from human intervention by controlling them so we could affect their behavior. How could we do this?

The most effective way to control fish from long distance is through signals.

# A- Chemical/Light Signals

*Chemicals signals constitute a main part in communication of sea life such as feeding, mating and habitats. But it has effects on fish's behavior, structure and function and it causes diseases. And it crosses water slowly and may degrade rapidly so its affects aren't efficient.

* Besides, light could also scare fish but every color has his own depth penetration in water. Red and yellow couldn't pass 15 m in typical condition, green 25 m and blue at maximum 35 m while many fish live at big depth. Also, light in dirty water don't cross it quickly.

There are fish living in almost all of the world's marine and aquatic habitats we can find some environments that are constantly pitch dark, such as the deep-sea and caves, some of them have extremely clear waters such as tropical coral reefs whereas others are muddy such as some rivers. There are also fish species that can't see because they don't have eyes and others are with reduced abilities to see, as they live in waters where there is no light or very limited amount of light.

# B-Sound Waves

We discovered that fish has an amazing hearing capacity, as they are able to hear between 10HZ and 10KHZ, this leads us to the question: **how fish are affected by sound?**

And thus this lead us to the next part of the research: effects of sound on fish: research has shown us that fisherman all around the world use devices that utilize sound to draw fish in order to make fishing easier, we discovered that fish are drawn to high frequencies, and while it was apparent that these devices did not harm fish directly with the sound they emit, but fisherman could abuse this device to extensively fish outside of legal seasons.

Fish call is a device made by Jeff and jack father and his son. Their purpose was to find the best solution to catch fish easily and quickly, so they made this device which works with sound and vibrations to attract the biggest possible quantity of fish.


Fig-3: Fish Call device

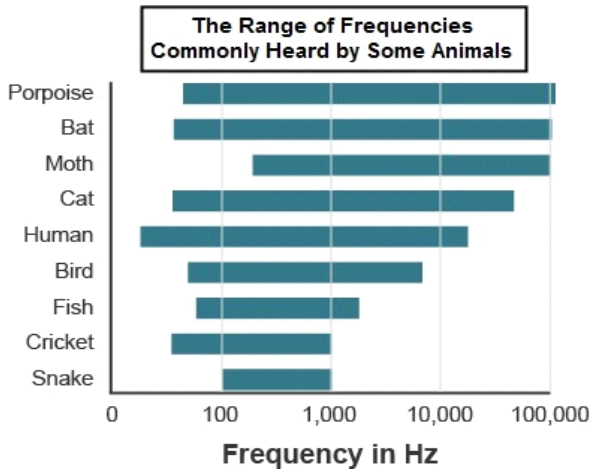
Research also leads us to the fact that every type of fish has his own hearing range including a frequency that is unique to them and that will affect only them, which is extremely helpful considering the fact that each type of fish has their own reproduction season (the mating season of bream is September).

# C-The Best Solution

This confirmed that sound was one of the best possible solutions when it comes to dealing with fish , firstly because of its non-harmful yet efficient effects on fish , and secondly because of its high travel speed in water which can cover large areas in very low amounts of time 1550m/s .Sound speed increases with depth .

We also proved that low frequency sound which is between 20HZ and 200HZ causes avoidance.

Fish is extremely sensitive to low frequency vibrations, below some 10s of HZ. If the sound source is sufficiently intense, fish usually responds by swimming away from the source. The reason for this is probably that low frequency sounds usually indicates an approaching predator.




Graph1 : Frequency Heard By some Animals including fish.

Low frequency sounds from shipping and construction work may cause avoidance reactions.

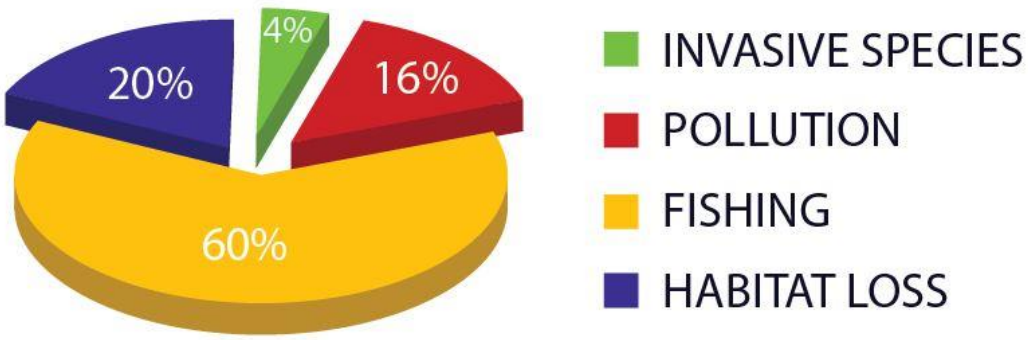
| Type of fish | Low frequency | Period |
|---|---|---|
| Catfish | 50 HZ | March => august |
| Sardine | 100 HZ | May => october |
| Salemaporgy | 100 HZ | July => september |
| Pataclet | 100 HZ | February => June |
| Thun | 500 HZ | Jult = > may |

# 6- Survey:

| | | | |
|---|---|---|---|
| Do you realize the dangers of fish extinction | Yes | No | I don't care |
| Do you think random fishing is the principal reason for fish extinction | Of course | Maybe | No its not |
| Does sea pollution caused by boats have a huge effect on fish | Yes | Partially | No |
| Do you think that fish extinction has an effect on human life | Yes it does | maybe | No |
| Are you interested in protecting the environment | Yes I do | Sometimes | I don't care |

| | | | |
|---|---|---|---|
| Do you find rare species when you fish | Always | Sometimes | Never |
| If you do find rare species what do you do | Take it | Throw it back in water | |
| How often do you apply rules and respect laws | Always | Sometimes | Never |
| Do you realize the dangers of fish extinction | Yes | No | I don't care |
| Do you realize the dangers of fish extinction | Yes | No | I don't care |

# 7- Graphs and Data Analyses:

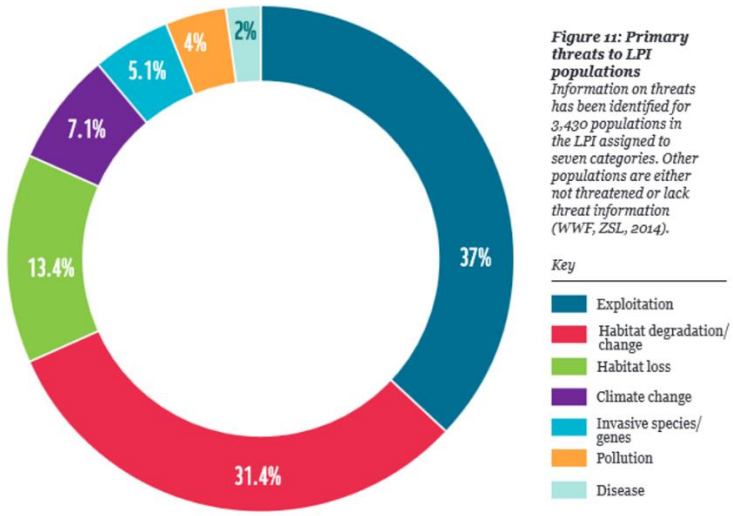



Graph-2:Reasons for Fish Extinction

When researching for the reasons causing fish to extinct we assumed that pollution would be a major issue but strangely it was not as this graph shows, only 16 % of pollution caused by boats has an effect on fish, which is a big number and means a lot while talking about the marine life but compared to the percentage which is coming from fishing and especially overfishing , it seems little.

According to this graph, the major reason for fish extinction is actually Fishing, which means that the human exploitation of the sea is the main reason for the destruction it may cause 30 years later.

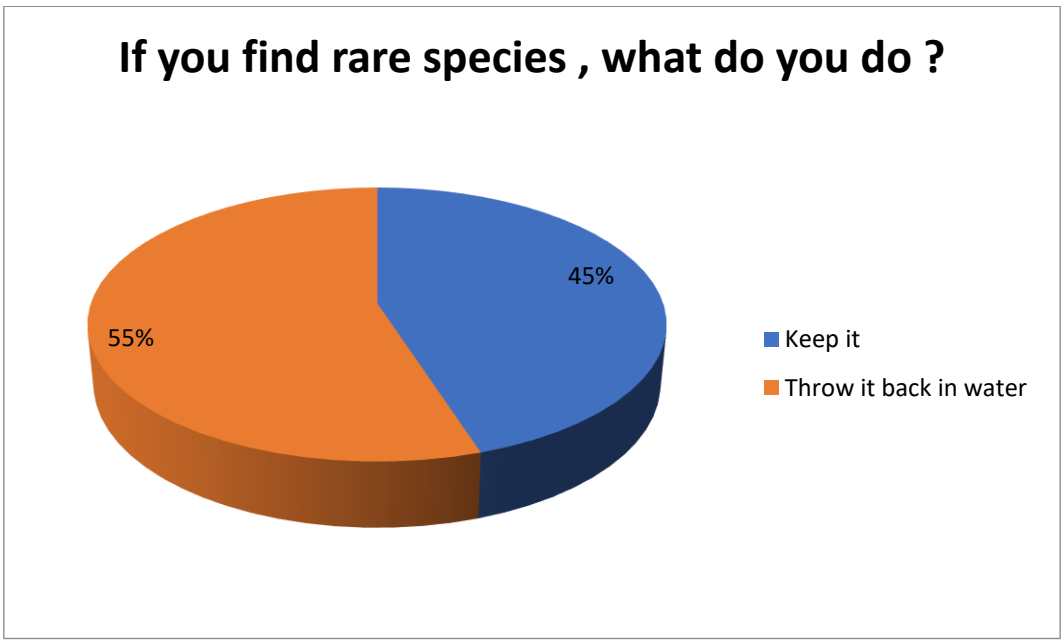
The Other reasons are just habitual loss which may be a consequence of fishing and pollution,and some natural negligibleelements such as invasive species, which shows the difference between the damage that human does and what nature does to itself.




WWF Living Planet Report 2014 page 20

Graph-3- : Primary threats to the marine world according to LPI ( Living Planet Index)

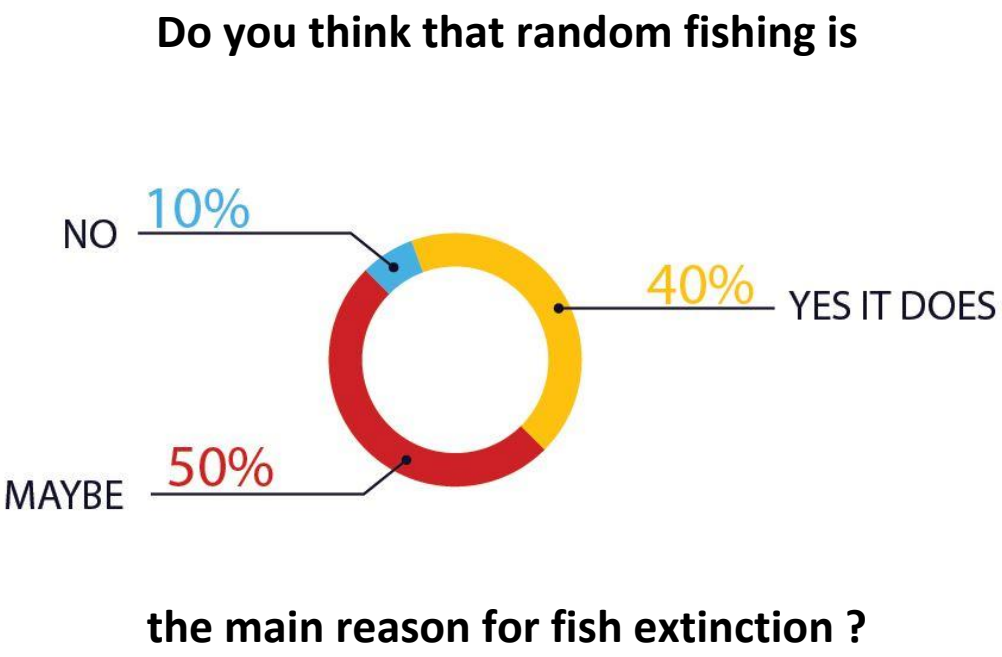
This Graph shows that Exploitation is the main threat to the fish world according to scientists.




Graph-4: People's Choice when they find a rare fish species

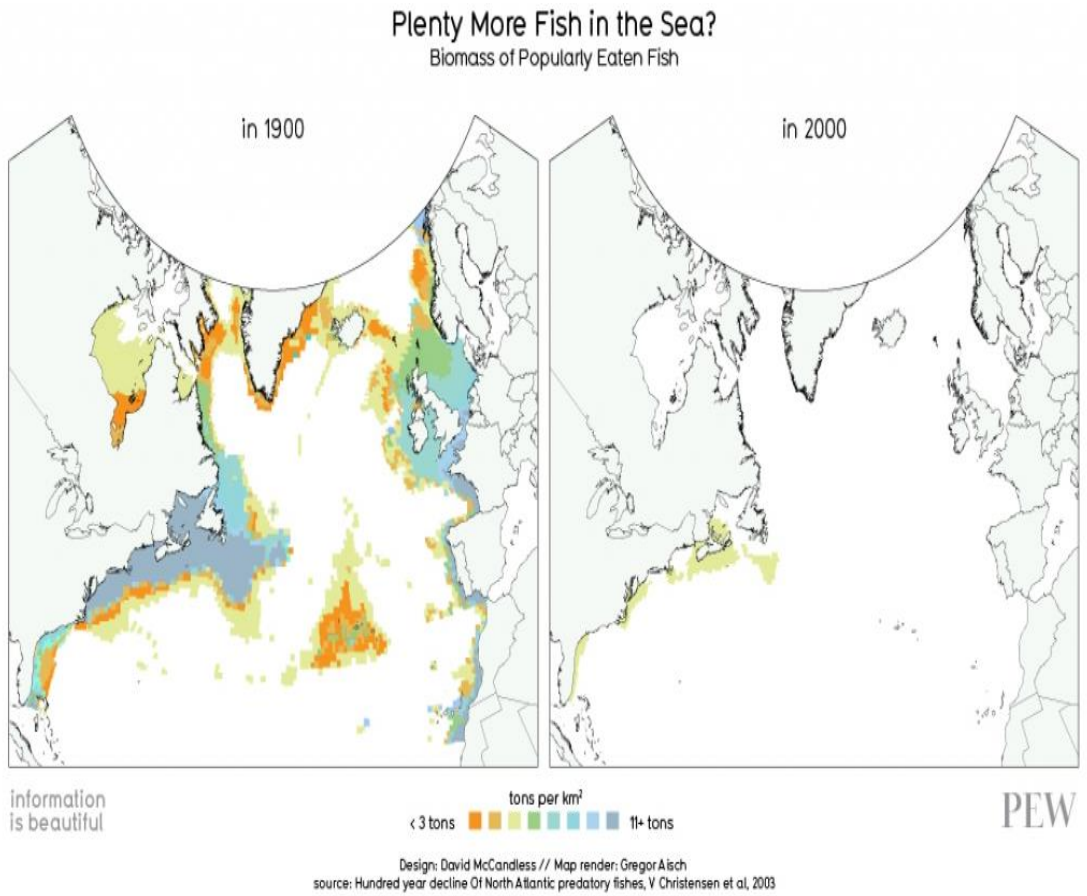
We found that 55 % if they found a rare species they keep it which may cause the extinction of these species because people don't realize how this could affect all the marine life and we found that 45 % throw it back in water some because they were scared of it and some said they were scared that it will be extinct.


Graph-5 : Frequency Scale for certain types of fish



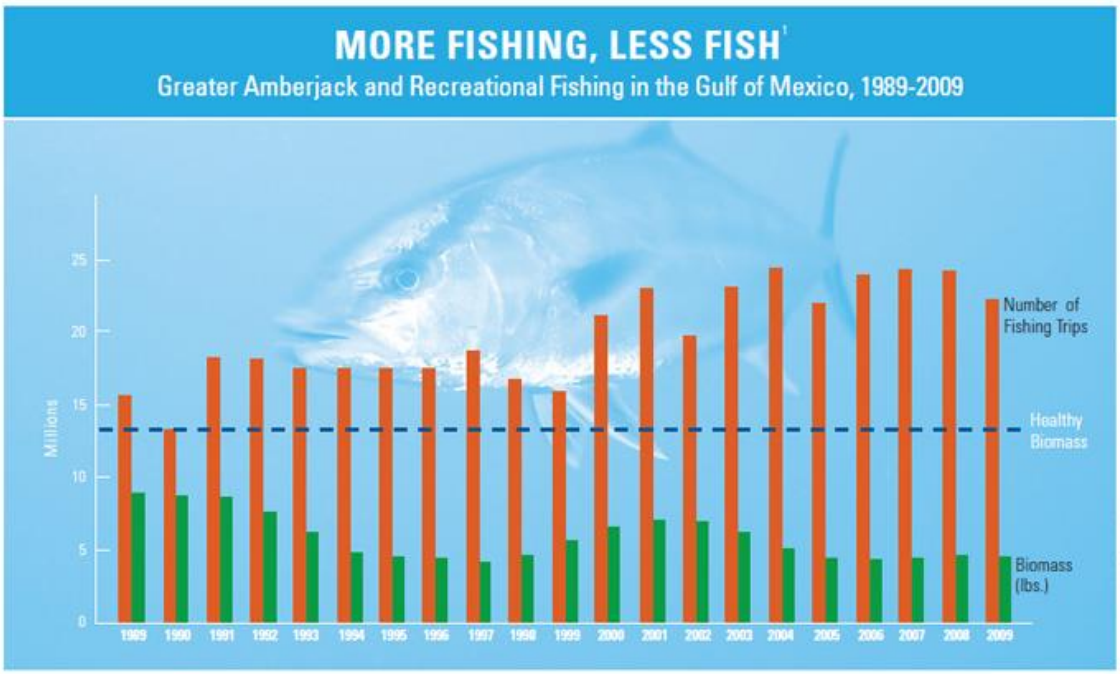

Graph-6: People's opinion on non-organized fishing

According to this graph , most people believe that Random fishing has a strong influence on the dangers fish all around the world are facing these days such as extinction , Over 50% admit that there's a strong relation between random fishing and fish extinction and the 40% of them are quite sure of it , which allows us to say that it's quite common that people believe that It's well known that men intervention is the main cause for marine world disappearing.




Graph7-The variation of Fish biomass through the years.

This Graph shows that the biomass of eaten fish has increased significantly in one century of time, which raises the bars of danger About the whole marine life situation.



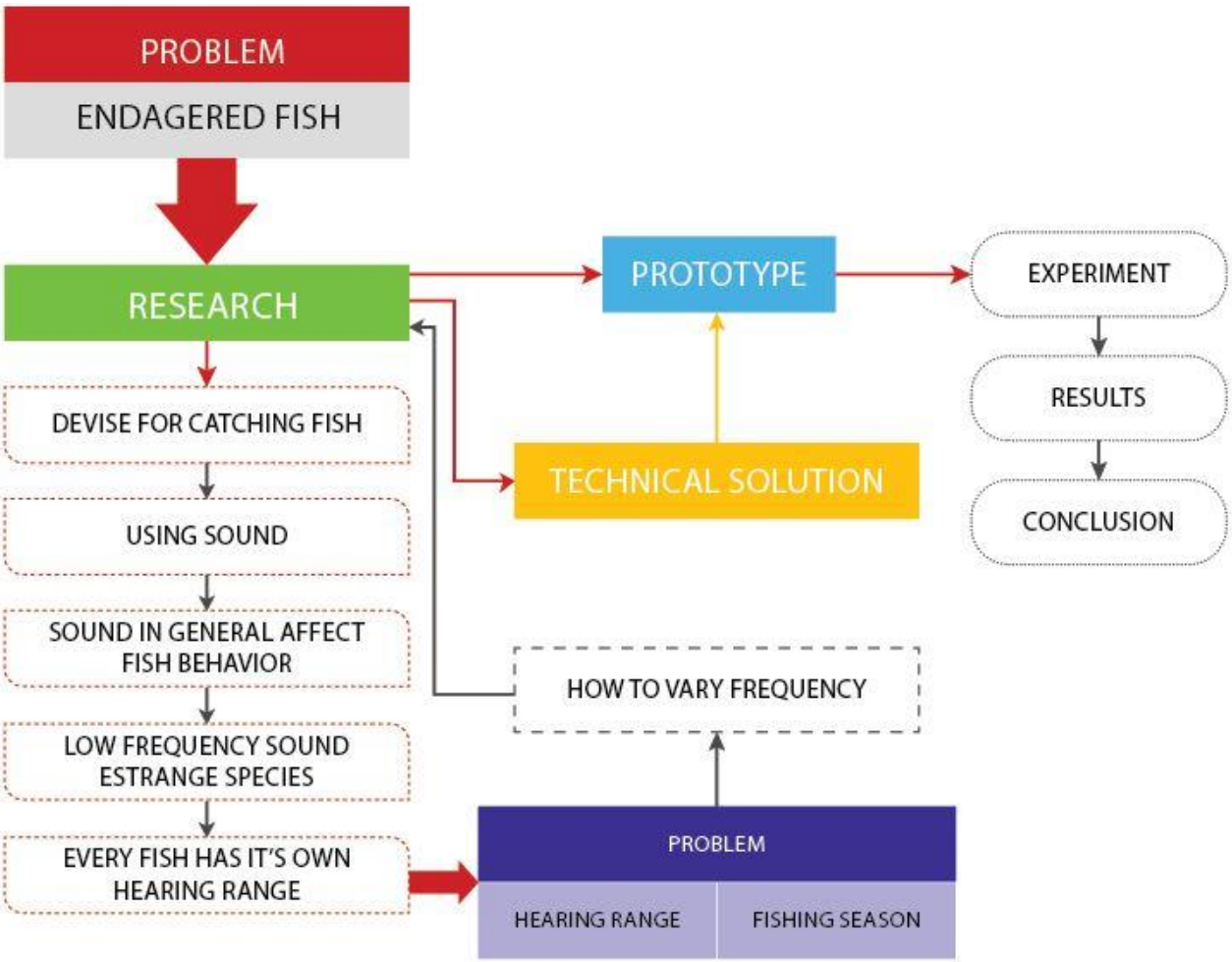

Graph-8 : Number of fishing tripsis  influencing the biomass of fish

This Graph shows over the years, the number of fishing trips is increasing (as the humanity consummation increases) and the fish biomass is decreasing.

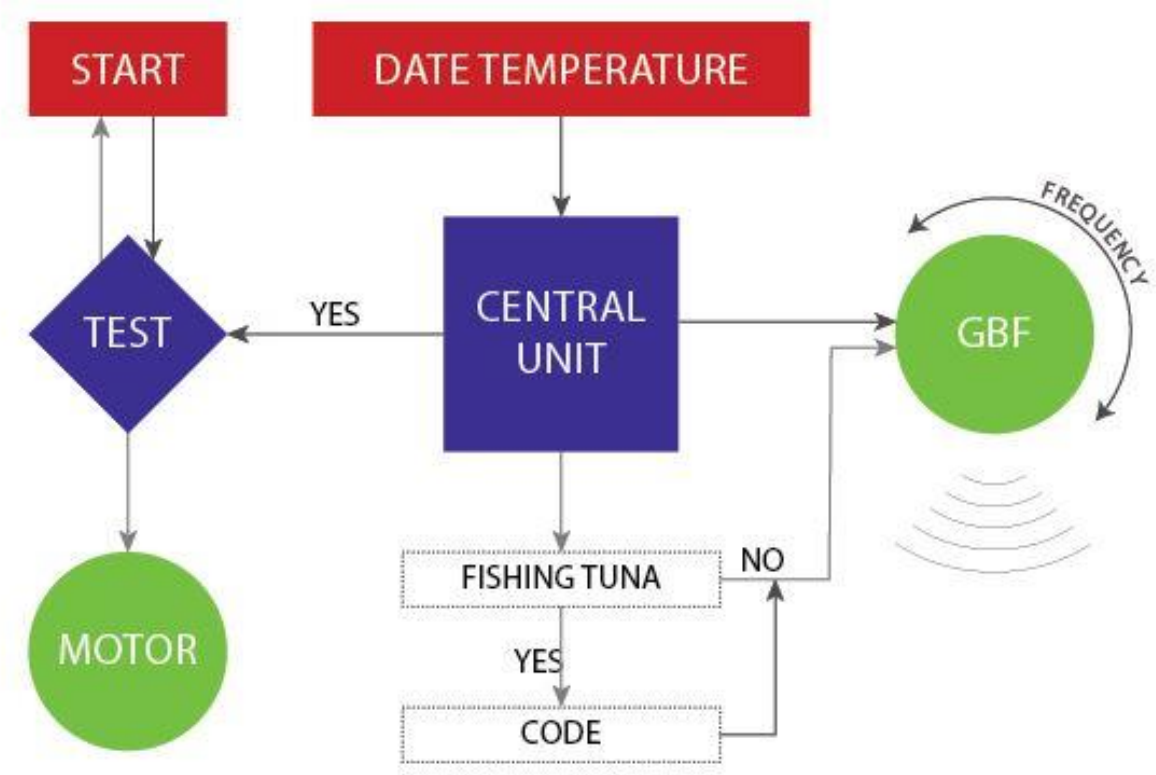
The more we fish, the Less there's fish.

# 8-Technical Part :

## 8.1 General process :



# 8.2- Technical Solution

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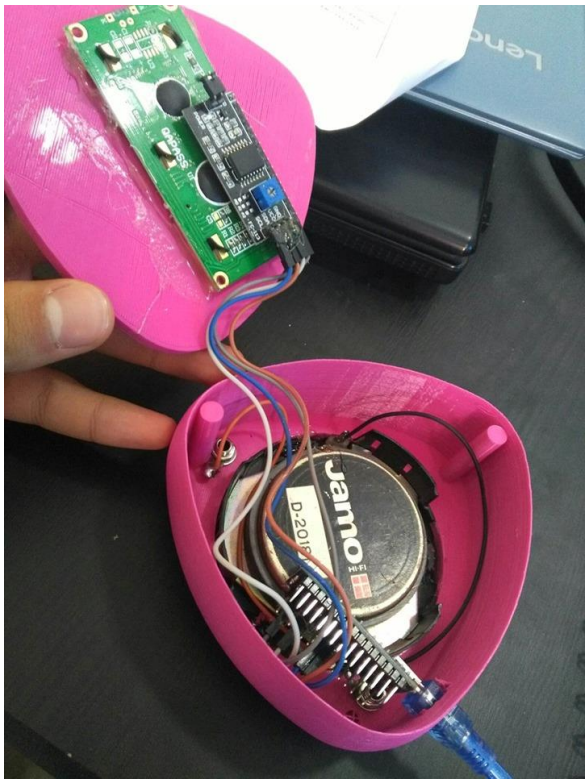
The functional diagram explains roughly how our system will work.

First the system will check for the presence and well installation of an Arduino card , then , depending on the exact date , it will determine which fishing season it is working in and it will distinguish the different types of fish it had to drive away . Before starting it sends the sounds that affect the sea creatures, the system will check if the fisherman is fishing Tuna and whether or not he has the proper license, after which the system will begin to produce the sounds. If the fisherman is not after Tuna then the system will proceed to function normally without performing any other checks.

# 9-Prototype Pictures:


# 10- System’s 3D design:

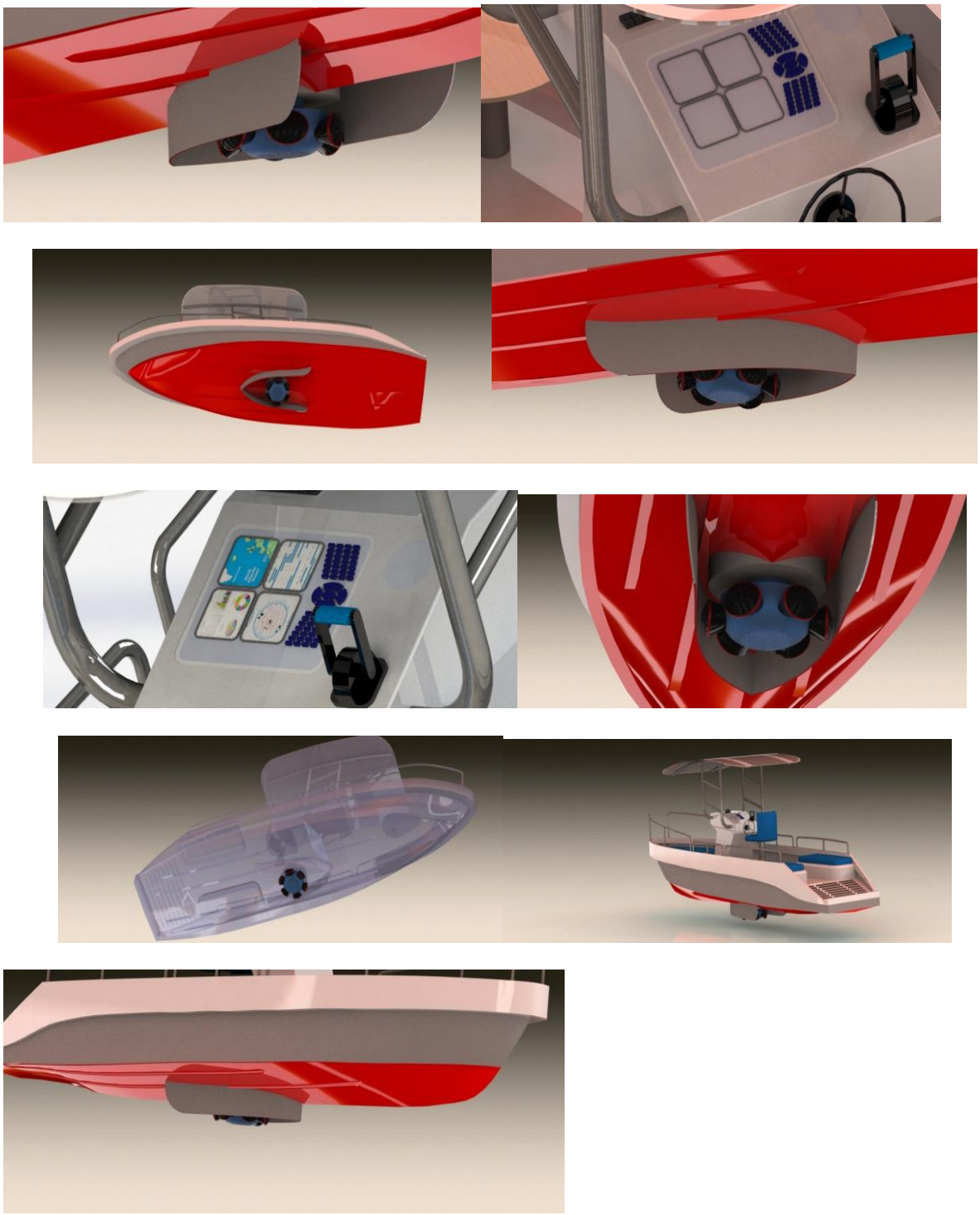
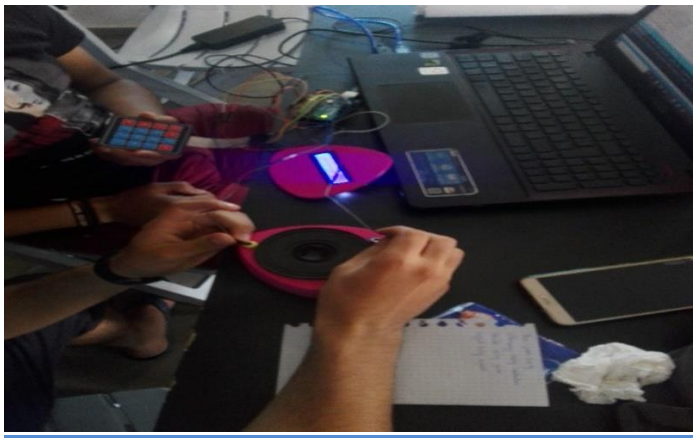


Fig-5 : Solidworks conception

# 11- Project development:

```
 noTone(speaker);
 lcd.clear();
lcd.setCursor(0,0);
lcd.print("Month:May");
lcd.setCursor(0,1);
lcd.print("Fish:Sardine");
delay(5000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Frequency:100Hz");
tone(speaker,100);
delay(5000);
}
if (key == 'B'){
noTone(speaker);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Atlantic Ocean");
lcd.setCursor(0,1);
lcd.print("Please Wait...");
delay(4000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Select Period : ");
lcd.setCursor(0,1);
lcd.print("Please Wait...");
delay(4000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("4:April | 6:June");
lcd.setCursor(0,1);
lcd.print("8:August| 9:Sept");
  }
  if (key == '4'){
 noTone(speaker);
 lcd.clear();
lcd.setCursor(0,0);
```



# 12- Results:

The system appears to be functional as it was able to successfully perform it tasks. It was meant to perform.
The system functioned when you pass the ocean you're working on and then the month number you want to see what fish are prohibited to catch in.
It had successfully sent Sound waves based on predetermined frequency which is special for every type of fish.
We've tried our waves fish controller on sardines and the fish responded as we desired to the sound waves, it went away from the source at 50hz and went close to it at 100Hz.
So, we can control fish behavior to a certain degree with Waves Fish Controller.

# 13-Conclusion:

After performing several tests and taking notes we are able to conclude that our system is indeed efficient as it is able to attract or repulse fish, reminds us of the prohibited kind of fishes to catch in the region surrounding us and in the period of time we choose.
Finally, sea life is as precious as our lives and WAVES FISH CONTROLLER SYSTEM is a new addition to the many attempts that try to reduce the dangers to the environment by solving the problem of fishing without giving much attention which leads to over exploitation and save planet resources of fish.
So, we have to stand together by making this project works to save the environment.

''Save animals …save planet.

Save planet…Save life.''

# 14-Future work:

Despite the success achieved by this system, it is actually far from perfection, as it only repulses fish to a certain degree.
Waves Fish Controller is an idea that sounded enough among the public as well as the miniature in Tunisia. But the project is currently in is not the final phase and we will continue to work on it and upgrade it until it can be absolutely rid us of the dangerous of overfishing. On feature we're going to work on in the future is the ability to send sound frequency continually according to the real time period without regulating it from before.

# 15- References:


Fig-1:https://www.nationalgeographic.com/animals/2006/11/seafood-biodiversity/

Fig-2:

http://nofishnodish.weebly.com

Fig-3:

http://www.thefishcall.com/how.html

Fig-4: Solidworks conception

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| | References |
|---|---|
| **Graph-1** | https://brainly.com/question/10685264 |
| **Graph-2** | https://www.google.com/search?client=opera-gx&q=reasons+for+fish+extinction&sourceid=opera&ie=UTF-8&oe=UTF-8 |
| **Graph-3** | https://asiamedia.lmu.edu/2019/03/28/indonesia-fisheries-regulation-and-sustainability-urgently-needed/ |
| **Graph-4** | Taken from our own survey. |
| **Graph-5** | Taken from our own survey. |
| **Graph-6** | Taken from our own survey. |
| **Graph-7** | https://www.diveconcepts.com/blog/32-Bali+Bali+Diving+climate+change+marine+life+pollution+world+oceans.php |
| **Graph-8** | https://www.google.com/search?tbs=sbi:AMhZZivdJdxlei6hNBgADd0q9C3t4TDUdnzvJrIObeyvRnSQMXekwsFrPMo9maXnrTjQ1KDNEoBeplQg4AFNybRW5BOzQgqw-IGK6InDprHP4LjzlAbbxGuTVYZ2kyMDC-V2CW2w_1AWXHwg5Hlv5s6MrlSYxbzw9ekz0f_1620mwMkjnceoOS9yun59xU5ISoMo4qAtzp4uND8TIf5gUyLqi31nXbvO9pr1g9ItL5z61QJqB8rDnM_1ePLkKZdzfLsxfuljc5a0yit32wEfGRD4OdCgtTh7_1wgFeYBdDgF89LTaB8wHlGjZjpxVFneM8neh1_1QiEyo3r&btnG=Recherche%20par%20image&hl=fr-TN |

## 【評語】200027

Sound wave was used for the fish protection in the ocean. A prototype was made and also installed with Arduino card. The system will produce sound wave to prevent the fish damage near by the fishing boat. This is a quite interesting idea but more experimental data is needed for future.