Preventing IUU Fishing Using Sound Waves
Income Fish Co. (HGWA)

1. Executive Summary

SOREUS is a special buoy designed to both create and restrict fishing areas. Much like regular buoys, it detects the height of the waves and can be used as navigational markers; this can also be used as a hazard warning, alerting fishermen to avoid specific areas.

What makes this buoy special, however, is two unique functions: the ability to emit low-frequency sound waves and detect unregistered vessels. These low-frequency sounds are only heard by fish (lower than 160 to 200 Hz) that repels them from a set area[1]. Utilizing this technology, fish are notified through sound when unregistered vessels enter an illegal fishing area, which allows them to avoid being caught. This opposite is also true, in which the SOREUS can emit higher frequencies which attract them instead[2]. In addition, registered vessels are required to have GPS signals that let countries know where they are at the sea[3]. SOREUS has a motion sensor that, when not received with any GPS waves, activates low-frequencies that repels fish away from the vessel.

2. Mission Statement

The purpose of this product is to manipulate the movement of fishes that promotes legal fishing and discourage IUU fishing. By placing SOREUS into illegal fishing areas, fishes have an increased chance of not being fished. Therefore, recognizing IUU fishing is not profitable, the fishermen will return to registered areas thus reduce cases of IUU fishing. IUU fishing is mainly caused by the growing demand for fish and having not enough fishes in the legal fishing areas. SOREUS can also be used to attract fishes inside legal fishing areas and allow fishermen to nurture them and increase their population. This allows for the increase in fish population inside legal areas and prevents fishermen from IUU fishing.
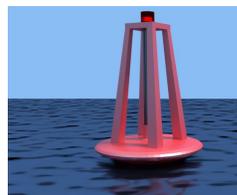

Figure 1. SOREUS   Figure 2. Inside SOREUS

3. Our Product

Our product is marketed towards fishermen and the government. The SOREUS provides merit towards fishermen because of its ability to attract fishes. Specifically, each buoy is equipped with a frequency generator that can emit both low and high frequencies. Since sound travels at the sea depends on the sea salinity[4], sea surface temperature, and the landscape underwater[5], calculating the velocity of sound using the data of the aquatic conditions in the Indian Ocean we can find that the velocity of sound is around 144.445～148.923 Hz[6]. Adding on to the fact that the waves are calm most of the time[7], we can see how the sounds do not affect the fish in a negative way. As stated before, IUU is caused by two factors: the increase in the demand for fish and the decrease in the population of fish. 50% of the fish caught are discarded due to its lack in size or value and are considered as "unwanted fish"[8]. SOREUS allows local fishermen to increase the numbers of wanted fish in their area effectively, through feeding "unwanted fish" they caught.

SOREUS provides merit towards the government because of its ability to repel fish in certain situations. IUU fishing is hard to prevent as fishermen have unregistered vessels in order to avoid detection or focus on areas where surveillance for registered vessels is poor. SOREUS, as all normal buoys, is equipped with a GPS receiver[9]. Using this, the buoy is able to detect unregistered vessels and emit low-frequency waves to prevent the vessel in question to catch much fish. Cleverly combining multiple buoys, the government will be able to restrict certain areas and maintain tight security around necessary fishing grounds without much supervision. SOREUS can be used as a security measure towards illegal fishing areas as it can prevent fishermen to make a profit from fishing in these areas and thus decrease IUU fishing.

[1] https://prezi.com/iwdxfudtusjw/the-effects-of-sound-waves-on-fish/

[2] https://biasproject.wordpress.com/news-from-the-ocean/fish-and-sound/

[3] http://www.fao.org/3/Y3554E/y3554e01.htm

[4] https://smap.jpl.nasa.gov/news/1265/smap-sees-sea-surface-salinity/

[5] https://www.britannica.com/place/Indian-Ocean

[6] https://keisan.casio.jp/exec/system/1257837588

[7] http://www.surfline.com/surfdata/chart_viewer/?chart=iowave&id=2950

[8] https://www.yokohama-maruuo.co.jp/food/今日は大漁！選ってみたら未利用魚が大変だ。/20170914.html

[9] https://buoybay.noaa.gov/about/about-buoy-technology

4. Marketing Strategy

SOREUS will first be used in East African regions, where one in four fish is still caught illegally, despite all efforts made to reduce the number inside the country[10].
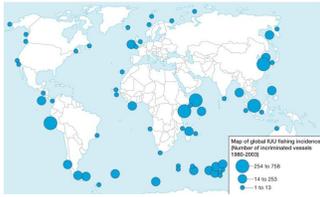

Figure 3. Map of global IUU fishing incidence
(Number of incriminated vessels 1980 - 2003)[11]

The figure above shows the number of incriminated vessels in different areas. Since East Africa has the largest number of illegal vessels, it is most efficient to start our business from this region to overcome IUU fishing on a larger scale. If the government installs such a system, it enables the country to prevent IUU fishing from other countries, and also allows the country to protect its national interest. Not only that but it enables local fishermen to catch more fish because there are no more IUU and will create profit.

Also, because it reuses "wasted fish" as food, it reduces waste which is eco-friendly to the earth. The main target audience of this product will be the government. In order to prove the efficiency of the system, we will create a demonstration video showing SOREUS operating and manipulating the fish, and provide the number of increasing profit the fish market can gain. As an appeal to the secondary target audience; local fisherman, since Africa has a low internet usage rate[12], we will set up advertisements on city walls if possible, and if not directly speak to the local fishermen to show the effect on the increase on fish gathered when taking in this technology.

5. Finance

Initially, our products will be tested in the Arabian sea near the Somalian coast where IUU has been a problem (see Figure 3). The price will be $400 for municipalities due to its dual system of sensing the entering of illegal boats into designated areas and letting fish escape. The price will be $150 for local fishermen due to its simpler design; it will be used to attract fish into one place. The testing period will comprise of 6 units for municipalities and 40 units for local fishermen.

Maintenance fees will occur in 3 month periods, this will create sustainable profit over time. For maintenance, we will be hiring technical employees who are specialized within its category. The maintenance will be occurring every 3 months, so the salary will be about $400 per maintenance. The testing period will end with a cash balance of $430. After the testing period is over, we will expand our market to the whole entire coast of Somalia. After two and a half years, we will expand our product market to Indonesia which also experiences IUU fishing problems. As we expand our business, more countries will be our target customers which will increase the revenue at an exponential rate.

	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Revenue												
Product (Municipalities)	2400	180	30000	2250	2250	2250	26250	4500	4500	4500	4500	4500
Units sold	6		75				60					
Price per unit	400		400				400					
Maintenance		180		2250	2250	2250	2250	4500	4500	4500	4500	4500
Product (Local fishermen)	2250	3750	15000	22500	45000	75000	97500	120000	150000	195000	240000	300000
Number sold	15	25	100	150	300	500	650	800	1000	1300	1600	2000
Price per product	150	150	150	150	150	150	150	150	150	150	150	150
Total Revenue	4650	3930	45000	24750	47250	77250	123750	124500	154500	199500	244500	304500
2. Expenses												
Production Cost	2955	3125	26000	18750	37500	62500	92050	100000	125000	162500	200000	250000
Cost per unit (Municipalities)	180		180				180					
Cost per unit (Local fishermen)	125	125	125	125	125	125	125	125	125	125	125	125
Sales and Marketing	1500	1500	3000	3000	3000	3000	4500	4500	4500	4500	4500	4500
Staff Salaries (Includes installation)	1200	1200	1500	1500	1500	1500	2000	2000	2000	2000	2000	2000
Maintenance			625	625	625	625	625	1250	1250	1250	1250	1250
Total Expenses	5655	5875	30550	23875	42625	67625	99175	107750	132750	170250	207750	257750
Profit/Loss Before Tax	-1005	-1945	14500	875	4625	9625	24575	16750	21750	29250	36750	46750
Income Tax			4350	262.5	1387.5	2887.5	7372.5	5025	6525	8775	11025	14025
Net Profit	-1005	-1945	10150	612.5	3237.5	6737.5	17202.5	11725	15225	20475	25725	32725
Start up cost	7000											
Capital Investment	6000											
Free Cash Flow	-13000	-1945	10150	612.5	3237.5	6737.5	17202.5	11725	15225	20475	25725	32725
Funding Required	14000											
Dividend for Shareholders			1015	61.25	323.75	673.75	1720.25	1172.5	1522.5	2047.5	2572.5	3272.5
Cash Balance	1000	-570	9135	551.25	2913.75	6063.75	15482.25	10552.5	13702.5	18427.5	23152.5	29452.5

Figure 4: Table of finance
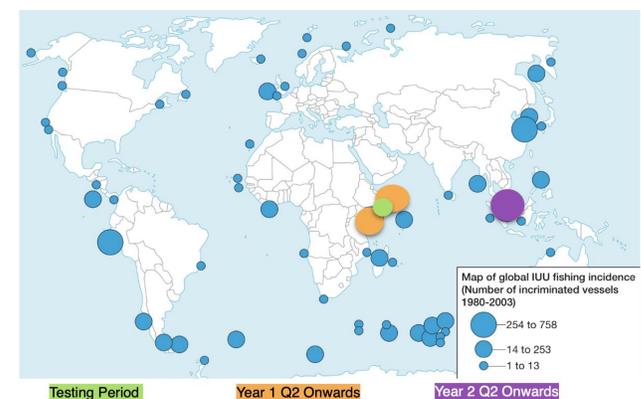Figure 5: Cash Balance

Figure 6: Gradual expansion of market area

6. Funding

We will be funded by venture funders and NGOs that are interested in our business. Considering that the initial cost and the capital investment will be summing up to $13000, the cost funded for backing us up will be approximately $14000. With this amount, we will be able to start our business with less tension. As gaining profit, we will produce a dividend for shareholders being about 10% of our total revenue.

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[10] https://www.seafoodsource.com/news/environment-sustainability/african-countries-fighting-back-against-illegal-fishing
[11] https://www.ejiltalk.org/first-global-treaty-against-illegal-unreported-and-unregulated-iuu-fishing-enters-into-force/
[12] https://www.internetworldstats.com/africa.htm