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Ecology Final Project
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Project Summary

Throughout this course, we frequently have considered the problem of human consumption taking a toll on the planet and that we are now in danger of using up our resources. One of the most personal and individual-affecting sources of this problem is the rise in food consumption as the world grows in population and in average wealth. I chose to focus particularly on seafood because of its dire consequences and the not uncommon perception of the “inexhaustible sea”.

As human population grows, so does the need for food to sustain it, and the only means of hunting most of the world readily relies on today is fishing. Overfishing has become a problem due to advances in fishing technology and the resulting practices that are hauling in more catch than ever and that destroy habitats or other species in the process. Problems include the catching of slow growing species (which happen to be the most popular), the killing other species such as turtles in bycatch, trawling sea mounts which destroys coral habitats, and seafood farming that more often than not harms the environment rather than help (McCosker March 2012). Though it is globally agreed that humans are depleting our ocean services, solving the problem is trickier since it is difficult to obtain specific data on such a vast number of causes. Even with often frowned upon “fishing down the food web” strategy (in which catches move from apex predators to lower fish species as the previous one runs out), it is true that many of the most expensive seafood on the market are primary consumers such as clams and oysters (Orcutt December 21, 2010). Fishing is a means of living for many, particularly in poorer countries which means the fewer fish there are, the more fisherman will have to catch in order to make a living. This also means the price of fish is increasing and the upsurge of the world’s interest in seafood makes it evermore in demand and expensive. Bluefin tuna for example is on the list of endangered species can auction for thousands of dollars in Japan, where sushi and sashimi are eaten practically for every meal (Clover 2006). There has also been a rise in fisheries and fish farms in response to demand. They seem sustainable but actually are not if the fish are being fed on fishmeal or other product made from wild fish. To think if the majority of all the world’s fisheries are not fed on plant-based food, the amount of wild fish and primary production needed to sustain them all is staggering (Swartz December 2, 2010). According to a study, the trophic levels of fisheries are declining without the actual landing increasing substantially and if present practices continue, fisheries are due to widespread collapse regardless of top-down control (Pauly 1998).

For my project, I decided to illustrate the concept of overfishing with an infographic depicting the effects of feeding on fish higher on the food chain and on which trophic level are sustainable fish and non-sustainable fish to eat (the latter taken from John E. McCosker’s article “Good Fish, Bad Fish”). The more we fish for apex predators, the more of lower trophic level species are required to feed it, resulting in the more tonnage of fish and producers used up. Even in catching more primary consumers such, as clams, if done unsustainably would result in less food for higher predators from the loss of habitat or loss of food resources.

Annotated Bibliography

1. McCosker, John E. California Academy of Sciences, "Good Fish, Bad Fish." Last modified March 2012. <http://research.calacademy.org/aquatic/seafood/>.

This article lays out how overfishing and unsustainable means of catching have greatly depleted the ocean's seafood supply. It goes into detail about specific problems, but also mentions sustainable solutions and processes, along with which fish species are good for catching/eating and which are not.

2. Orcutt, Mike. Scientific American, "What's the Catch? Researchers Wrangle Over How to Measure Commercial Fishing's Impact on Ocean Biodiversity." Last modified December 21, 2010.

<http://www.scientificamerican.com/article.cfm?id=commercial-fisheries-impact>.

This article does a good job in highlighting the different causes and effects of overfishing. It also provided an interesting counterpoint to my understanding of the topic, with the concept of "fishing down the food web" and conflicting opinions on data.

3. Swartz, Wilf, Enric Sala, Sean Tracey, Reg Watson, and Daniel Pauly. PLOS ONE, "The Spatial Expansion and Ecological Footprint of Fisheries (1950 to Present)." Last modified December 2, 2010.

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0015143>.

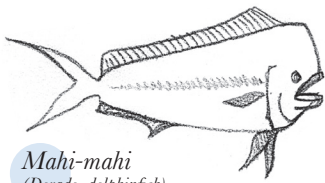
This article displays a number of data graphs that illustrate the recent rise in fishery exploitation around the globe. The graphs show the increase of primary producers needed to sustain fisheries, the rise of surface area fished, and the increasing rate of expansion of fisheries.

4. Pauly, Daniel. "Fishing down marine food webs," *Science*, 279, no. 5352 (1998): 860. http://go.galegroup.com/ps/i.do?id=GALE%7CA20302603&v=2.1&u=nysl_me_pml&it=r&p=AONE&sw=w.

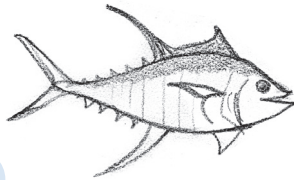
This article provides data on how trophic levels of fisheries have dropped in the past few decades and evidence that continuation of present fisheries management and fishing-down-the-food-web strategy will lead to the collapse of the world's fish population.

5. Clover, Charles. *The End of the Line: How Overfishing is Changing the World and What We Eat*. Berkley: University of California Press, 2006.

This book provides a fascinating account on overfishing with personal details from fishermen, fish markets, and scientists that describe unsustainable processes, how the fishing industry has suffered, the exploitation of Bluefin tuna, and how it effects the world's seafood industry.



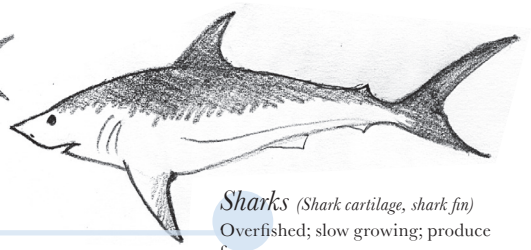
Mahi-mahi
(Dorado, dolphinfish)
Fast-growing; mature quickly



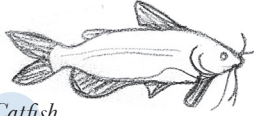
Tuna
Yellowfin (*Ahi*) - Abundant; fairly well-managed fishery; "dolphin safe" labeling and monitoring reduces dolphin kills
Pacific albacore (*Tombo tuna*) - Well regulated fishery causes little or no bycatch



Bluefin Tuna (*Maguro*)
Overfished



Sharks (*Shark cartilage, shark fin*)
Overfished; slow growing; produce few young



Catfish
Farmed; fast-growing; abundant

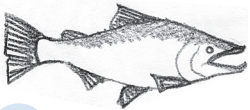
Cod (*Atlantic*)
Abundant; well-regulated fishery



Halibut (*Pacific, Alaskan*)
Abundant; well-regulated fishery



Striped Bass
Farmed; inland ponds have little environmental impact



Salmon (*Alaskan, Californian*)
Wild; many stocks sensibly managed



Bluefish (*Atlantic*)
Fast-growing; abundant



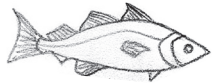
Trout
Farmed; raised in fresh-water ponds with little environmental impact



Mackerel Fast-growing



Anchovies
Fast-growing; abundant



Pollock (*surimi, krab*)
Pacific; not overfished



Herring & Sardine
Abundant in certain seas



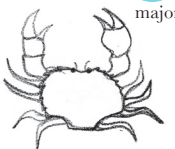
Tilapia
Farmed; fast-growing; herbivore;



Squid (*calamari*)
Abundant; short lifespan



Crayfish (*crawfish, crawdad*)
Appropriately farmed



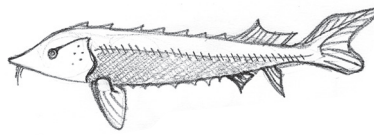
Mussels
Farmed; can be done so without major environmental impact



Dungeness Crabs
Well-regulated fishery



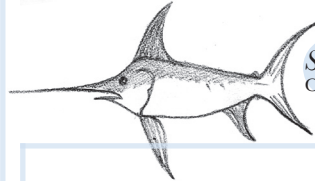
Shrimp & Prawns
Atlantic northern pink shrimp - abundant; captured without environmental damage
California spotted prawns - captured by trapping; no bycatch



Sturgeon
Beluga sturgeon (Beluga Caviar), overfished. Wild species endangered by habitat loss and overfishing



Orange Roughy (*Slimehead*)
Overfished; slow to mature



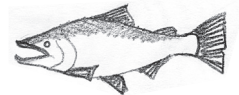
Swordfish (*Atlantic & Pacific*)
Overfished



Groupers
Overfished; large adults (ones caught) mostly male



Chilean Seabass (*Patagonian toothfish*)
Slow to mature; long-ling fishing methods lead to death of thousands of albatrosses as bycatch



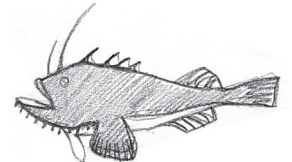
Salmon (*Atlantic*)
Wild stocks overfished; farmed escapees dilute gene pool; farms pollute oceans; wild fish used as feed for farmed fish



Lingcod
Overfished off West Coast; okay if from Alaska



Rockfish (*Pacific red snapper, rock cod*)
Overfished; slow-growing



Monkfish Overfished



Oysters
Dredged; harvest methods destroys habitats



Scallops
Dredged; harvest methods destroys habitats



Clams
Dredged; harvest methods destroys habitats



Shrimp & Prawns
Farmed - farming destroys mangrove forests, antibiotics and waste pollute environment, and wild fish used as feed
Trawled - trawling damages seabed; massive bycatch

TO FISH

NOT TO FISH

1 pound of
APEX
PREDATOR

= 10 pounds of
SECONDARY
PREDATOR

or 100 pounds of
PRIMARY CONSUMER

or 1,000 pounds of
PRIMARY PRODUCER