Going Fishin' in Malaysia

My Summer at The WorldFish Center

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1. Introduction

1.1 "I'm Mandy Larson, the World Food Prize intern."

I repeated these words countless times on my journey to the other side of the world. Being able to say those last four words is an achievement that I am proud of and will cherish for the rest of my life. The Borlaug-Ruan/World Food Prize Internship has helped me learn, grow, and mature as a person in just two months. Traveling overseas has opened my eyes and revealed to me a rawness of the world I would never encounter on a farm in Iowa. Living in Malaysia for merely two months made me realize how extremely fortunate I am to be able to live in the United States of America, and especially in Iowa. Even though I may not have seen the extreme poverty in Malaysia as I would have in other developing countries, I saw enough to know it is out there, and it is very real. Being a Borlaug-Ruan/World Food Prize Intern was an incredible experience that has found me many times at a loss for words, but in my eyes, you will see the pride, gravity, dignity, and honor that I uphold when I say, "I'm Mandy Larson, the World Food Prize intern."

1.2 Getting Started

Since I was in junior high, science has been a very interesting subject for me. When other subjects bored me in school, it was science that kept my attention. It was my high school science teacher who got me started on this extraordinary adventure. It's almost inconceivable to think that this whole experience started from a small conversation in a science lab after school. After writing my research paper for the 2004 World Food Prize Youth Institute about Haiti and how rice affects its economy, I really became aware of the devastating effects of poverty and starvation; I wanted to do something. Subsequently, I applied for the Borlaug-Ruan Internship, and little did I know how much that one decision would have an impact on my way of thinking, my emotions, my ambitions, and my entire life.

I was sent to The WorldFish Center in Penang, Malaysia because I had an interest in marine biology and also how fish could be a force in the fight against hunger. That is exactly what the motto is for their institute: *to reduce poverty and hunger by improving fisheries and aquaculture.*

"To reduce poverty and hunger by improving fisheries and aquaculture."

1.3 The WorldFish Center

The WorldFish Center has one common goal: to alleviate poverty and hunger. Although there are several different departments, groups, and projects occurring simultaneously at the center, they are all working towards the same noble cause. Their primary work deals with fisheries and aquaculture. Aquaculture is synonymous to "fish farming"; men and women who raise fish for food and income rather than fishing from wild stock. Just recently has this method become widely used in Southeast Asia by the poor, largely because of the work of 2005 World Food Prize laureate, Dr. Modadugu V. Gupta.

Although aquaculture has become such a widely used tactic, thousands of families still rely on fishing from wild stock. One of the biggest problems in wild fishing is faced by both large and small alike: over-fishing and the depletion of fish stocks. Because both large and small fishers are catching less fish, they have resorted to smaller mesh net, which catches smaller fish. Unfortunately, this means they are catching juveniles of larger, commercial fish. This is a very

unsustainable practice and may result in devastating effects in the future. In response to these events, The WorldFish Center has been researching alternatives to wild fishing, advanced aquaculture practices, how well boundaries on open waters are working for the increase of fish stock populations, and the effects of coral reef devastation on fish, among other research projects.

Boundaries are needed on open waters because of the heavy competition between small-scale and large-scale fishers. Large-scale trawlers use very large nets that haul in massive amounts of fish. Trawlers such as these rarely ever have a target species, so they catch more of what is called "trash fish." In most countries in Southeast Asia, trawlers are required to stay at least 15 km (9 mi) from the coastline. The smaller-scale fishermen and women use small boats and nets to provide for their livelihood. These boats usually catch smaller amounts of fish, but those of higher value. The smaller fishing boats are required to stay within the 15 km (9 mi) mark of the coastline when they fish. This is a good system in theory, but many times when countries or islands are close together, the 15 km mark becomes blurred and the large- and small- scale fisherman may disregard it.

Coral reef devastation is a big problem for many reasons. Coral reef destruction is not just the loss of a beautiful underwater habitat, but also the loss of several types of fish species. When coral reef habitats are destroyed, the fish that are dependent on those habitats die off as well. When there are less fish per catch, the fishers increase their effort to boost their catch. Unfortunately, this causes even more pressure on the already dwindling population of reef-associated fish. Also, this causes detrimental effects on the reef itself from the gear used to catch the fish. Each of these successive events results in a vicious cycle that seems to be unstoppable. This is a problem that has become very difficult to address and solve at The WorldFish Center, but they continue working for new answers.

Many problems may arise when new solutions are implemented, so it is necessary to know what the fishermen think and feel about the changes that are occurring. Managing fisheries and aquaculture would be impossible to achieve if input was not achieved from "the ground." If the men and women that are going out on the water, hauling in the nets, and selling the product on the market feel as though they are being restricted or being treated unfairly, they will not cooperate when new solutions are created. If they do not cooperate, how will the new solutions be applied? That is why communication is essential amongst all levels: fishers, scientists, researchers, government agencies, and leaders. The WorldFish Center tries to be a mediator amid all of these levels, which will eventually lead to the most efficient problem-solving efforts. The WorldFish Center may not be the most renowned of research centers in the world, but they work quietly in the background, ever-pushing for their goal: *to alleviate hunger and poverty!*

1.4 Penang, Malaysia

The WorldFish Center is located on Pulau Penang, Malaysia. Pulau Penang is an island in the state of Penang ("pulau" means island in Bahasa Malay). It is just off the west coast of Peninsular Malaysia. The first impression that I had of Malaysia was the weather. It was so hot! In Penang, I experienced very tropical weather. This includes high temperatures, high humidity, and high frequency of rainfall. It was uncanny, however, how a cool day in Penang was similar to a hot, sticky summer day in Iowa!

Despite the heat, there was a beautiful benefit of the tropical weather that I enjoyed everywhere in Penang: the scenery. There are not many climates that can support such a spectacular array of plants, trees, and flowers. Many delicate flowers and plants are capable of growing there because of the high temperatures and rainfall year-round, so I witnessed for the first time many new and

different kinds of plant life. The best thing about the plant life was its ability to grow anywhere and everywhere - in the most unusual places! The vibrant greens of the flora were never lacking throughout the entirety of the island.

And, of course, what would be beautiful flora without magnificent fauna? In Penang, they complement each other very well. The most amazing variety of animals in Penang would be the birds. Especially in the rural areas, all kinds of birdcalls ring out clearly over the countryside. Unfortunately, once I moved further into the metro areas, the only birdcall I could hear was the jeering "caw" of the crow. I was lucky enough to be able to visit several areas of the island that offered much of the wildlife a place to take refuge from the busy city life.

Ah, the city life. Malaysia is still considered a developing country, but it is quickly becoming industrialized. Penang is one of the centers for the new industrialization. There are many people, lots of cars, and new buildings going up constantly. Everyday was an adventure on my commute to work. Penang drivers are fearless, especially when they are in the rush hour, and this includes the many motorbike drivers. To be a motor bicyclist, it is required to be brave and courageous to get anywhere you want to go. If a motorbike driver maintains any qualms about driving, they may not survive in rush hour. Besides the driving, my first impression of the city life was the immense amount of people everywhere. Although I was told most Asian countries are very similar to Malaysia, it took me quite a while to adjust to the large concentration of humanity. I finally did adapt to this particular lifestyle, and I found it to be very charming and attractive in its own busy, indifferent sort of way. Penang is a big, busy, fast-paced new world that will always remain in the heart of this small-town, Iowan girl.

Introduction to Projects

My internship at the The WorldFish Center was a unique arrangement. Many of the interns at the other centers were given one project that they began when they arrived and tried feverishly to finish by the end of their internship. In my case, though, I was moved between four different areas of research. I began with the "trash fish" project, then I moved to the molecular genetics lab, that was followed by geographical information systems (GIS), and my final area was ReefBase. The center decided to arrange my internship in this fashion because of suggestions by previous B-R/WFP Interns. Being able to move from area to area gave me a great look at what the center is doing to reach their goal through the various research projects they are conducting. Moreover, through experiencing different areas of work, I increased my education in research, science, and humanities immensely. These projects really assisted in my decisions about my future education and career decisions.

2. "Trash Fish" Project

2.1 Summary

Dr. Ilona Stobutzki supervised the "trash fish" project, and its purpose was to evaluate what may be the future of several species of fish in the group commonly referred to as "trash fish." Although the term "trash fish" has a negative connotation attached to it, the fish in this group rarely, if ever, become actual trash. Almost everything caught by fishermen and women are utilized in some way. Whether it is livestock feed, aquaculture feed, fertilizer, or human consumption - the fish are used. Seldom do the fishers waste; this is their livelihood – how they put food on the table for their little ones. So, "trash fish" are not bad or useless fish, but just not commonly used in large, commercial operations.

Dr. Stobutzki was leading a group that was doing research for FAO (Food and Agriculture Organization) about “trash fish” and if it will be a sustainable resource or if precautions need to be implemented to help the species of “trash fish” to recover from heavy fishing. They were looking for what species make up “trash fish”, how those species are regressing now and in the future, how heavily they are being fished, trends in “trash fish” demand for the future, and several other factors.

2.2 Research

I began my work at The WorldFish Center at a computer. I was given the assignment to research everything I could find out about livestock production, proportions of fishmeal in livestock feed, species regressions of “trash fish” families, and projections of livestock production and the use of fishmeal for the future. For the first week, I combed the Internet and my available resources for information about these topics. I also used a database called FAOSTAT to look up statistics about livestock production. After compiling all of my data, I began to arrange them into line graphs. By doing this, I was facilitating the finishing touches that Dr. Stobutzki had left for her FAO paper.

Throughout my research, information I found helped me to comprehend why there needs to be an institution such as The WorldFish Center. The ocean is viewed as a “free-for-all” for anybody who wants to use its resources. The resources are thought to be very sustainable, but unfortunately, this is not necessarily the case. Fishers have been exploiting wild fisheries to their maximum, but regrettably, the fishers do not take these problems into account because it is not affecting their lifetime. Understandably, many of them are more worried about getting enough fish to achieve maximum profit. To help the reader understand the mind of the fisherman/woman, here is a good example: There is a village filled with families, and there is a river nearby that is teeming with fish. One man discovers the river, and he quickly has to make a decision. Should he exploit the river to its maximum capacity before anyone else discovers it or take enough fish for a few days, thus sustaining the stock of fish, and hope no one else finds it? Of course, he chooses the former, and the fish stock soon depletes and disappears. Perhaps it is now easier to understand how these poor, small-scale fishers think and feel.

When the fishers bring their catch in, they use every part of it possible. Livestock feed is one of those uses, hence the need to research livestock production. If livestock production increases in the next thirty years, it may be safe to also suggest that the demand for fish will also rise. It was found, however, to be the contrary. The amount of fish used in livestock feed is projected to decrease because of +new information about BSE (Bovine Spongiform Encephalopathy) and the risk of using animal by-products in livestock feed. Also, genetically improved plants have been found to contain healthier nutrients and the same amount of protein that fishmeal may provide. In the future, less and less fishmeal in livestock feed is to be expected. This is good news on the “trash fish” front, since it may mean less over-fishing within the next thirty years.

On the other hand, species of the “trash fish” families seem to continue to decrease. There are time periods where the species populations increased slightly, but the trend always maintained a downward slope. Using the species regressions graphs that I created, Dr. Stobutzki could try to determine what has been causing the regressions, what caused the short increases in population, and what is causing the continuing downward trend. She used this information in her final report for the FAO on “trash fish”.

2.3 Conclusion

Working on the "trash fish" project intensified my understanding about the plights of fishermen all over the world, and especially in Southeast Asia. When I first came to The WorldFish Center, I did not realize how much of a role fish and aquaculture had in the livelihoods of so many families across the globe. After working with Dr. Stobutzki on the "trash fish" project and doing research on the future of "trash fish", I saw the dramatic impact over-fishing will have on so many lives. It is a huge problem that needs to be addressed quickly, not an issue "for another person to deal with" while it is just swept under the rug. Many governmental organizations believe that over-fishing is not a problem and will resolve itself in the future. Unfortunately, this is not the case. Fish cannot be a sustainable resource if its reproductive patterns are being disrupted. Since fishers are using smaller mesh net, they are catching the younger generation of fish. This means there is not enough fish to produce a sustainable new generation. Inevitably, no more fish to catch. Since fishing is the livelihood of so many people, it should be easy to see why this is a problem that just cannot take care of itself. It needs action, now.

3. Genetics Lab

3.1 Introduction

I began work in the genetics laboratory on June 27 with Menchie Ablan and Amelia Goh. Ms. Ablan was my official supervisor, but Ms. Goh actually taught me everything I learned in the lab. A few of the purposes of the molecular genetics lab is to research the actual DNA and physical attributes of fish to discover if those characteristics are related to its habitat and migratory patterns. This is important, for example, because of new legislation being passed all over Southeast Asia to place boundaries on the open water. The reason for the boundaries is to decrease competition between small-scale and large-scale fishers. This is a good intention, but will it really work? That's one of the questions the genetics lab has been attempting to answer. Ms. Ablan has been working on a project that looks at where many of the fish that are targeted by fishers are living and if they migrate. She has found that many times, the fish do migrate. So the large-scale fishers are catching fish that are meant for the small-scale fishers to catch. The small-scale fishers are unable to complain when the large-scale fishers prove they caught those fish within their boundaries. The boundaries legislation may have just caused a bigger problem. The genetics lab also helps to answer questions about why fish size is decreasing in the catch, and what is causing it. So much of the research they do in the lab goes a very long way to improve understanding, even if it goes that long way unnoticed.

3.2 Research

I began my work in the lab reading some background materials about the work they do there, their purpose, and how many of the lab operations work. I learned about DNA extractions, gel electrophoresis, polymerase chain reactions, staining with ethidium bromide, and reading the results. After I finished the literature, I began work on morphometrics.

Morphometrics is the measure of the exact body contour of a fish. I used pictures of 145 samples accumulated by previous University of Malaysia interns. The samples were of three varieties of tilapia: feral, red, and the GIFT. The GIFT stands for Genetically Improved Farmed Tilapia. It was a breakthrough project conducted from 1988-1997. This tilapia variety was enhanced through selective breeding technology. It is a better variety of tilapia to farm because of its quick growth rate, its resistance to disease, and its larger size.

The pictures of the samples were transferred to a computer program, IPLab 3.5, where sixteen different parts of each sample were measured. I used visual landmarks on the fish including the snout, attachment points of fin membrane, and the caudal peduncle to draw the measurement lines. The information from these measurements were compiled onto a spreadsheet and transferred to the program Data Desk 6.0. In Data Desk 6.0, the data was used to create cluster analysis graphs, principal component analysis, and rotating scatter plots. From these different graphs and analysis, the different varieties of tilapia were to be identified. Owing to the lack of knowledge of the program, I never achieved this goal. Fortunately, Ms. Ablan later discovered how to assign a different color to each group. With this information, we observed that the feral tilapia was noticeably smaller than the GIFT and the red tilapia. Since feral tilapia samples were grown in the wild, and the other two varieties are grown in captivity, this new information shows that tilapia is capable of growing larger, but is not able to in the wild because of problems such as over-fishing.

The second week in the genetics laboratory, I began DNA extractions of red, feral, and the GIFT using a simple technique of cutting rather than grinding. Five samples of each were placed into test tubes, cut into small pieces, and rose buffer was added to each. They were set onto a hot plate at 90 °C for 20 minutes. They were then shaken at 90 °C for 20 minutes before being stored at –20 °C overnight. The following morning, I separated the liquid from the tissue by spinning the samples. I made an agarose gel, extracted the DNA from the samples, and mixed 2 μl of DNA with 3 μl of loading dye before inserting the mixture into the gel. Lambda ladder was put on either side of the gel for a reference. The voltage was turned on and run for approximately two hours. The gel was removed and stained with ethidium bromide for fifteen minutes. After fifteen minutes, the gel was viewed and photographed under a UV light and recorded on the computer. The data was evaluated and I found very little DNA lit up from my first agarose gel electrophoresis. The next day, I prepared the samples for a polymerase chain reaction (PCR). The DNA samples were diluted and added to ddH_20 before being added to the master mix of PCR Buffer 10x, MgC12, Primer (F), Primer (R), dNTP, and Taq polymerase. After preparation, the samples were placed in the PCR machine. The following day, the samples were sent through agarose gel electrophoresis, stained, viewed, and photographed. This time, five strains of DNA were seen distinctly under UV light: Two samples of red, two of feral, and one of GIFT. The volumes of those samples were increased and ran through another PCR and gel electrophoresis. After viewing the new, amplified versions of the five strains of DNA, only four of them noticeably lit up. The following day, I was supposed to prepare for purification of those four DNA strains, but unfortunately I was not feeling well, so I was unable to attend work.

The third and final week in the genetics laboratory began with some more background reading. I received some literature about microsatellites and polyacrylamide gel. I also ran the agarose gel electrophoresis of the purified DNA strains that Ms. Goh began the week before. Later in the week, I began work on a different type of DNA extraction: VIOGENE DNA extraction. This extraction uses a ready-made, manufactured kit. It required a more complicated method of grinding the samples with nitrogen—LN_2—rather than simply cutting them. It was essential in this procedure to first sterilize the mortars and pestles with flame and ethanol. Much caution was needed during this process as the nitrogen should not ever be in contact with the skin and, also, ethanol is also highly flammable. After extracting the DNA, the samples were run through an agarose gel scan to determine the quality of the DNA extraction. The quality was found to be very good, as all of the samples lit up under the UV light. The DNA samples were then diluted and prepared for PCR. New primers—UNH tilapia primers—were used to amplify the microsatellites. Microsatellites are sequences that repeat themselves over and over throughout a nuclear genome

of all higher life forms, but in almost all cases they are in the non-coding regions of the DNA. After doing the PCR, I did not have enough time to run the samples through polyacrylamide gel electrophoresis. This different type of electrophoresis is more sensitive than an agarose gel electrophoresis. Ms. Goh ran the samples through polyacrylamide gel electrophoresis the following Monday and so I was unable to view them.

3.3 Conclusion

The genetics laboratory occupied the majority of my internship. Being able to extract, amplify, and view the smallest unit of life was amazing. Many times, the work of the lab goes unnoticed and underappreciated. Several people do not understand the need to have a lab in a center whose main goal is to alleviate poverty and world hunger. It is difficult for some to see the link between such a minute concept such as DNA and the expansive devastation of world hunger, but at times, it is precisely what is needed. The research they do helps to answer questions about projects other parts of the center are doing. For example, why are smaller fish being caught? Will the boundaries on the open waters be beneficial to the small-scale fishers? So, for me, it is now easier to see why a genetics laboratory is important in a research center such as The WorldFish Center, and how much work they really do for the common goal.

4. Geographical Information Systems

4.1 Introduction

I began my work at GIS on July 18 and ended on July 22. My supervisors for that time were Monik Lal Bose and Suan Peng Kam, PESSD. In GIS, I learned how to create maps and use them to ask questions about the data that was collected. Maps can be very useful for any career or area of work. In my projected careers of marine biology or veterinary medicine, this type of program will be useful for many reasons. In marine biology, for example, I may need to know migratory patterns of certain kinds of fish; or in veterinary science, I may need to know how a certain infection or disease is spreading throughout an area. Therefore, mapping that data will be very useful and make it easier to observe. My primary supervisor, Monik Lal Bose, was very proficient in that he was always concerned about how well I understood a subject. If I did not understand the subject at hand immediately, then he would commence to explain it all very thoroughly. I learned quite a large amount of information about mapping in just the short week while I was involved with GIS.

4.2 Research

I began my work in GIS with data collected from Bangladesh between the years 1994 and 1997. The data collected ranged from the number of households in each district of Bangladesh to the catch obtained from rivers and estuaries, floodlands, and ponds. I acquired this data from the Bangladesh Bureau of Statistics.

The information was arranged onto an Excel spreadsheet in such a way as to facilitate linking to the GIS computer program, ArcMap. Using ArcMap, I could create a map of Bangladesh, and then used features such as normalizing the information, comparing the information among the different states, using the layout feature, and exporting the maps to use in other programs. Using these maps, it is easy to see what areas catch the most fish, possible reasons why, and many other details. Later in my week at GIS, I compared production of rivers and estuaries, ponds, and flood

lands between 1996 and 1997. From this new information, I created more maps to more easily analyze the data. After the creation of the maps was finished, I exported all of the maps so I could print them. Using the hard copies, I made observations and analyses.

Observing the maps enhanced information that I normally would not have been able to see or would have taken the time to observe. Being able to actually view a map gave me a quick and easy way to discern which district has the most of *x* catch and which district has the least of *x* catch. After that information is obtained, deciding factors for those observations can be evaluated. Questions can begin to be asked about the maps. For example: Why are shrimp only caught in certain areas? Why does Chittagong have such a large amount of households, but always seem to have small catch? Why did production decrease among many of the states between the years 1996 and 1997? These questions cannot necessarily be answered by the maps, but they are presented by the maps, and further research can perhaps reveal the answers. I was able to make many observations using the maps as my guide.

4.3 Conclusion

The geographical information systems (GIS) aspect of my internship was a short week of data and maps. I only had four and a half days with GIS. Both of my supervisors tried their best to teach me as much as possible in that short week. Maps are very important in data collecting. Using maps creates a picture that would otherwise go unseen if the data was only considered. Throughout the week, I used data to create maps, analyzed those maps, and experimented with the GIS computer program.

Since I was only in GIS for a few days, I only touched on the tip of the iceberg of mapping. I am sure there are many more potentials to be utilized from ArcMap and similar programs, but it was nearly impossible for me to explore them all. I enjoyed my time at GIS because it showed me yet another face of The WorldFish Center that I would otherwise not experience if I just remained in the lab.

5. ReefBase

5.1 Introduction

My final week at The WorldFish Center was with ReefBase and my supervisor, Marco Noordeloos. The goal of ReefBase is “to facilitate sustainable management of coral reefs and related coastal/marine environments, in order to benefit poor people in developing countries whose livelihoods depend on these natural resources.” (Oliver, 2005) ReefBase is a coral reef researching website catering to professors, scientists, and researchers. Recently, however, ReefBase has been attempting to reach out to a public and political audience. Fifty-eight percent of the world’s reefs are potentially threatened by human activity. (Bryant, 1998) This statistic is known by relatively few throughout the world, and even if known, the impact of it is not truly realized. Much of the world’s population does not know how important coral reefs are to the biodiversity of the oceans. Coral reefs are an important habitat for thousands of species of fish, and when the coral reefs are destroyed by humans, the species of fish are in turn destroyed. ReefBase’s purpose at The WorldFish Center is to increase awareness of this problem so steps can be taken to resolve it. One large obstacle in increasing awareness is how the data is presented. Its presentation caters to professors, scientists, and researchers, not for a public or political audience. An average person would not find much of the information provided by ReefBase interesting and therefore would in no way impact their views on coral reef. If an average person

or a politician cannot be reached through ReefBase's data, how would they be able to begin resolving coral reef problems? It would be nearly impossible! So recently, they have made steps forward to create easy-to-read and appealing graphs, presentations, and various other reports to extend to the public. If a graph is presented in an attractive, simple manner, it will draw in more people, and thus helping the average person to understand coral reef's distress even more.

5.2 Research

Part of my work with ReefBase dealt with creating easy-to-understand graphs and presentations for the public and political audience. So, I compared data ReefBase has collected, and tried to decide which data would be best to use to create graphs, presentations, etc. It is important to present information to the public that is appealing, since many people have a very short attention span. So collecting data that expresses the severity of the coral reef's widespread destruction and then creating eye-catching, appealing presentations may prove to be difficult, but it is vital. Since coral reefs are suffering degradation from threats such as coastal development, destructive fishing practices, inland pollution and erosion, and marine pollution. The "average person" definitely needs to know about this kind of information. Many times, "the average person" is the cause of the wreckage. Also, governments especially need this information so they can begin steps to protect the coral reefs in their jurisdiction. Without help from national, regional, and local governments, coral reefs can never recover from the devastation they are experiencing this very moment.

Also while I was at ReefBase, I evaluated their old website and gave suggestions for the new website they are currently creating. Their old website has not been updated for at least two years, and desperately needed help. The website needed more eye appeal that would attract the average person to explore the site. So I personally explored the site and took notes on what "an average person" would find more interesting if they were searching the site. I do not know if ReefBase used any of my suggestions, but I do know their new website looks incredible!

5.3 Conclusion

Working at ReefBase was one my favorite parts of the internship, even though it was so short. I enjoyed the people I was working around, the atmosphere of the workplace, and the amiable attitude of my supervisor. I was never short on work, and I genuinely enjoyed learning about coral reefs. I felt like I was given quite a bit of responsibility, which made me feel needed and appreciated. I thoroughly enjoyed working for Marco and working with the rest of the ReefBase team. After experiencing the ReefBase project, I have seriously taken into consideration coral reefs as part of my future.

Summary of Projects

Working in several different parts of The WorldFish Center gave me a much broader view of the effects of poverty and world hunger, and also heightened my comprehension on how fisheries and aquaculture are working towards alleviating such tragedies. Being a young, small-town Iowan girl, I would have never encountered anything like this until I was much older. Each project that I took on, I was compelled to consider new concepts, new ideas, and new types of work constantly. In addition, much was expected from me in each project. Many times, especially in the genetics lab, I was given assignments I would never come across until perhaps my junior or senior year in college. I was treated as a young woman instead of a high school girl. Such a treatment challenged me and ultimately caused me to develop and cultivate skills that will be essential in a

working environment. These include: maturity, adaptability, punctuality, resourcefulness, and patience. Effectively, I felt it was my responsibility to excel and surpass my supervisor's expectations in every aspect in my internship. I achieved immense, secret satisfaction when I saw the look of surprise on my supervisors' faces after completing my projects ahead of schedule. Working in The WorldFish Center over the summer has given me a sense of accomplishment and pride that I will undeniably carry with me throughout my life.

6. Living in Penang, Malaysia

6.1 My Host Families

Working over summer break so far away from my family would have been very difficult if it were not for the generosity and care I experienced from my wonderful host families. Host families is plural because I was moved around quite a bit. I began my internship with Dr. Ilona Stobutzki and her family, then I was moved to Ms. Menchie Ablan and her family, next, I lived with a local, Hooi Guan, for a week, and then a woman named Simone for the final week. Each home and family was a fantastic experience that enriched my stay in Penang, Malaysia.

6.1a Dr. Ilona Stobutzki and Family

Ilona's family is originally from Australia. She has a husband, Simon, a four-year old son, Lochlan, a dog, Cassie, and a Filipino housekeeper, Ruby. Towards the end of my first month in Malaysia, Ilona gave birth to a baby boy, Aiden. In effect, I was required to move to a new host family. They were a wonderful family, and each of them was quick to help me in any way possible to help facilitate my stay. They lived in suburb on the outside of Georgetown, Penang. The neighborhood was beautiful and came with very amiable neighbors. It was nice living out there because they had a spacious house, a big backyard and a large fruit tree plantation just past their yard. Waking up in the morning to the sounds of birds singing and an occasional monkey screech was fascinating! I really enjoyed being able to jog, play basketball, or play catch with Cassie outside without having to worry about being endangered. It was such a safe neighborhood!

Ilona's house was very large in comparison to many of the other houses in Penang. Having such roomy accommodations for the beginning of my internship was very nice. I kept telling Ilona that I might have been one of the more spoiled interns with such a great family, house, neighborhood, and workplace!

It was convenient having an English-speaking family to live with for the first few weeks, as it made easing into the culture not so much of a shock. When I was with them, I did not stand out as badly as I did later with my other host families. This convenience was fortunate since my first host family was excellent at taking me many places around Penang and Malaysia. They were proficient at making sure my stay in Malaysia was the best it could be.

Getting enough food to eat was never a problem with my first host family. They are a part of a local sports club, so we could go there to swim and eat dinner. They served Indian food, the local food, and even westernized Chinese food! They also took me to a lot of "hocker stalls" or markets in which I could choose whatever kind of seafood, meat, or side dish I wanted with rice or noodles. One time I even tried squid (just once!). The markets were very interesting. For example, once while I was ordering my dinner, I stood beside myself with disbelief as I watched a man carry a slaughtered pig past me! Those kinds of events really showed me the vast difference in cultures around the world.

One event I really enjoyed while I was with Ilona's family was the International Food and Fun Fair at Lochlan's school. The fair had foods from twenty different countries from all over the world, including the United States! The variety of food included German chocolate, Swiss ice cream, Italian spaghetti and meatballs, British cottage pie, Australian shepherd's pie, Irish coffee, and American corn on the cob. It was all very delicious. I know, because I tried everything!

6.1b Ms. Menchie Ablan and Family

Before Ilona had her baby, I moved in with Menchie and her family. They are originally from the Philippines. She has a husband, Gerry, a six-year old daughter, Kyla, and three hamsters. It was a joy living with them. They lived in Bayan Lepas, Penang—not too far away from The WorldFish Center. Their house was located in the heart of the city, so I was able to experience the city life of Penang, which was not necessarily the healthiest experience I've had. The air quality in Penang is quite bad. Occasionally we would have a sort of haze lingering over the island for a few days. Malaysian pollution and slash-and-burn fires from Indonesia were blamed. The haze would stay until a heavy rainfall would occur. Simultaneous with moving into Menchie's, I developed a very bad cold that stuck with me for a few weeks, which I blamed on the air quality. Also coincident with my move, the rest of my new host family developed colds. Unfortunately, this caused us to be recluses many times over the weekends so we could get our rest.

Since we stayed home a lot, we had many visitors. Menchie and her family have several friends who enjoy using her house for various types of dinners, parties, and get-togethers. The first weekend I was there, we had a big surprise birthday party for Menchie! It was fantastic! We also had a mini-potluck the following weekend where I experienced chili sauce and wasabi for the first time. Spicy! It was really neat being able to meet such a variety of people.

Moving from Ilona's roomy house in the suburbs to a smaller house in the city may not seem an improvement, but I loved it. The house and the family made my stay there very cozy and homey, especially since we cooked and baked all the time! Baking was one of my favorite pastimes on the weekends at Menchie's. While I stayed at her place I made chocolate chip cookies, sugar cookies, and a variety of other sweets. My parents had sent one of our church cookbooks to Malaysia as a gift for my host families, so I would flip through them once in a while and pick out something new to bake. It was always so much fun, particularly with Kyla as my co-pilot.

Close to Menchie's house, there is a large park where people go to jog, play soccer and basketball, or just to enjoy the outdoors. Visits to the park were always interesting since there was such a diverse array of people to see. I always enjoyed just observing, but I ultimately always ended up having conversations with many of my fellow park attendees. They were all very friendly and eager to have conversations. Many of the locals enjoyed teaching me Bahasa Malay, their native language. Terima Kasih! (Thank you!).

6.1c Hooi Guan

After only two and half weeks with my second host family, they had to head back home to the Philippines for a wedding. So they arranged for a friend, Hooi Guan, to live with me for one week and be my "babysitter". She is gregarious and very enthusiastic about life, so it was enjoyable living with her for the short six days. She was very organized and had my whole week planned out for me before she moved in. The first day she moved in, Hooi Guan took me to Little India. There, I discovered her hidden talent of bargaining! The second day, we went to the movies. The third day, they took me to Pizza Hut. It was really nice to finally have some pizza so far away

from home. The fourth, we went to a karaoke bar! Malaysians seem to take their karaoke very seriously. We went to a karaoke center called Red Box. At Red Box, we could rent a room just big enough for our party and then bring our food from a buffet that they provide into the room. The room provides a TV along with microphones. We then can choose whichever song we want to sing, and we only have to sing to each other instead of in front of a bunch of strangers. It was very interesting; I have never seen anything like it. On the fifth day, they helped a couple of their friends move from their house to an apartment while I went to Homework Helpers. Saturday night we had a poolside seafood BBQ! We had all kinds of food that I have never seen put on a grill before. On Sunday, we attended my last day at their church, so I said goodbye to many of my friends from there. Then Sunday evening I moved out and into my next home with Simone, a German Ph. D. student.

6.1d Simone

For the final week, I lived with a German PhD student, Simone, who is working at The WorldFish Center. Living with her made transportation much easier to and from work. I only lived with her Monday through Friday because Friday evening, I left with Chee Ling for Kuala Lumpur, the nation's capital. We stayed in KL until the following Monday, in which I came back to Menchie's and prepared for my long journey home.

Simone's house was amazing! She lives alone, but she has an expansive, magnificent house, especially for Malaysia. The second day that I moved in with Simone, another German that also will be working at The WorldFish Center moved in. Simone's house offered a very relaxed atmosphere and nothing was ever rushed. I really enjoyed my time there, especially after such a hectic week with Hooi Guan! Living with two white women really made me become aware of how much the "mat salleh" really stick out! Three white women walking around the markets do not really blend in with the general population. While I was at Simone's, I was really able to rest up for my last weekend at Kuala Lumpur. Although Simone took me to quite a few nice restaurants, and I did go out quite a bit throughout the week, the relaxed atmosphere she provided in her house helped me wind down a bit.

6.2 The Diversity

The diversity of Penang was enormous, overlooking the fact there seemed to be very little concentrations of Caucasians. Included in the diversity were the native Malay Malay, Malay Chinese, and the Malay Indian. Malay Malay is the majority in most of Malaysia, but interestingly in Penang, the majority is the Malay Chinese. In addition to the natives, there were many people who had moved in from other countries: i.e. my first two host families. The Islamic religion is the primary religion in Malaysia, but there is also an abundance of Buddhists and Christians, especially in Penang. Other parts of Malaysia are primarily Muslim. Bahasa Malay is the national language, but since there is such a majority of Chinese in Penang, Chinese dialects, such as Mandarin, are often heard and seen. The Indian language also makes up a small percentage. English is taught in the schools at a very young age, so I never encountered much of a language barrier, although I did find many of the accents were difficult to understand at times.

I spent much of time with my host families, so I never had much of a chance to meet anyone outside of the research center and their circle of friends. Occasionally I would chat with a person while I was on a jog. Many people were very eager to have conversations with me. Those little conversations were always very interesting as I learned something new about Penang each time I engaged in one. Life in Penang is very diverse, but even more when viewed through the eyes of others.

I was always impressed with the vast amounts of shops, malls, and stores available since there was such a diverse population. Along a stretch dubbed "Penang Road", I found Little India and China Town, in addition to many traditional Malaysian shops. In Georgetown, there were a couple malls that catered to Westerners, for example, Gurney Plaza. Many of the malls have stores that I would see in the United States. Grocery shopping was an interesting affair, also. Although many of the brands were ones that I'd find in the United States, i.e. Nestle, many of the packages were labeled with Bahasa or Chinese! I could usually tell what the product consisted of by its packaging, but sometimes the different languages made me look closer to find the small-printed English!

6.3 Food

The biggest diversity of Penang was definitely the food. It was amazing how educated my palate became while I was in Malaysia. And so cheaply, as well! Many times when I went out for lunch, I would only pay a little over $1 for a plateful. It was quite incredible how good such a cheap lunch could be.

Eating out for lunch was always a fun and exciting occurrence because of the hocker stalls. At first, I was a little hesitant about eating at these strange, outdoor markets, but once I grew accustomed to the loud, confusing, sometimes unsanitary-looking places, I loved it! Hocker stalls were usually covered by a canopy of some kind, with several different stalls or wagons people set up around a large assortment of tables and chairs. At each stall, I could order something different, and then pay for it on the spot. I would then watch as my chef would grab a chicken leg or hunk of pork from a hook, chop it up, and throw it into some rice. His assistant would pour on the sauce, bag some soup for me, and I would be on my way! If our group decided we wanted to sit down with our meal, my chef would then deliver the food right to me, and another person would come along and ask what I wanted to drink. It seems very confusing, and I thought it absolutely chaotic for the first few visits, but it soon became habitual for me.

Being an Iowan, I never really had the chance to truly enjoy seafood. Pulau Penang certainly gave me that exquisite joy. At first it was difficult to coax my taste buds to enjoy the new chow, but I soon grew accustomed to it, and then grew to adore it! I especially found the local sea bass particularly delicious. My favorite, however, was the "nasi ayam" or chicken rice, although it was not seafood. It took me a little while to get used discovering bones in my mouth while I was chewing, but I soon was familiar with that eating habit, also.

Since there is such a vast diversity of population, there is also a vast diversity of food. I enjoyed Indian, Chinese, and local Malaysian food. No matter which I tried, however, it was always spicy. Indeed, Malaysians would think Iowans very bland from the food we eat. I tried many different types of food from squid, to sushi, and to dishes that consisted of food I am still not sure about their names, much less their contents. Unfortunately, I soon discovered that although this new type of cooking was exceptionally yummy, it was also exceptionally fatty. The extra weight I gained did not impress me much.

Occasionally I would find a restaurant that served Western food: i.e. steak, chips (French fries), hamburger, etc. Even though enjoying my dinner at such places was a nice taste of home, it was quite a different taste of home. I would say it was not exactly the same cooking as I would find in Momma's kitchen! The restaurants of Penang aim to hit all groups, however, so that was an interesting aspect of eating there. I ate foods from around the world in Penang, Malaysia!

6.4 Seeing the Sights

Being in a new place always comes with the excitement of seeing the sights. While in Penang, however, I always had my internship in mind. Although I was able to see quite a few fantastic sights, my main focus was on my work at The WorldFish Center.

A few sights that I was able to see was Bukit Merah Lakeside Resort, the botanical gardens, the Butterfly Garden, the Dragon Boat Festival, Gurney Plaza, the Batu Ferringhi night markets, Little India, Kek Lok Si Temple, Penang Hill, several hocker markets, and Kuala Lumpar. Each of these new places of interest reinforced the idea of diversity in Penang as each place showed the different cultures of Penang. The Dragon Boat Festival and the Kek Lok Si Temple were very Chinese attractions, while the hocker and night markets were the local Malaysian appeals. Every time I visited an additional attraction, I was fascinated by the immense differences between my culture and this strange, new world.

One event that I will keep tucked away in my memory is the night markets. They were amazing! Mostly set up for tourists, stalls lined the streets of downtown Georgetown at night. I could wander around the different stalls and be bombarded by "Watches for you, Miss?" "A purse for you, Miss?". Once a certain trinket would catch my eye, the haggling session would commence. What a delight! Many of my friends coached me before I went to the night markets on how to haggle correctly, so many times I would get the price to half of its original value. A very extraordinary experience indeed!

Whenever I would visit an attraction, I always noticed the same thing: the massive amounts of people. It seems like every place I went, crowds and crowds of people were there, too. At times, it was difficult to truly enjoy what I was doing because the immense quantity of humanity all around me. I soon came to realize, though, that the mobs were just part of the charm and attraction of Asian life.

Although there seemed to always be large numbers of people everywhere I went, the beauty of each place I visited always impressed me. Penang people take pride in the cleanliness of their roads, sidewalks, and public places. They take very good care of their vegetation, but I do not think they really need to since the vegetation flourishes in every place possible. Every morning on my way to work, I would see workers along the road actually sweeping up the smallest of leaves and putting them in trash bags. It was so immaculate!

6.5 Homework Helpers

Homework Helpers was an incredible opportunity that presented itself to me through my second host family's church. Homework Helpers was a program that assisted local neighborhood kids with learning English. I helped Indian and Chinese children with English grammar in the three Saturdays that I participated in the program. It was very rewarding to actually see the children learning, however slowly, some parts of English grammar. Little did I realize how difficult something I knew my entire life could be to teach! I suppose I took for granted some rules of the English language that would seem very confusing to a person who know absolutely nothing about it. Before each Homework Helpers session, I would bake a batch of cookies, and it seemed as soon as I made them, they vanished! The children absolutely adored the sweets, and it was very amusing watching them come up time and again to take another cookie saying, "Thank you, auntie!" Auntie, I learned later, is a term of respect for older, usually married, women. Surely I'm

not old enough to be an auntie, yet! The whole program was very gratifying for me, and I am so pleased that I was able to take part in it.

6.6 Conclusion

All of these attributes and more made Penang appear very charming and appealing to me. Although it may have taken some time to get used to the busy hustle and bustle of the Asian people, I found it to be a part of their life, and in turn made it all the more delightful. I found that the Malaysian culture was so different from my own, but I could still take pleasure in its everyday life and fit in as well as a "mat salleh" (white person) can. Being so far away from home was hard at times, but the fascination and enchantment of this new world drew me away from my homesickness. I enjoyed everything I did while in Penang. The people were friendly, the sights were captivating, the food was delicious, and the experience was unforgettable.

7. Conclusion

7.1 The Time is Now!

Poverty, world hunger, malnutrition, desperation, starvation. These are all terrible words that we have seem too accustomed to hearing. Unfortunately, these problems are not just resolving themselves. Many people choose to ignore these tragedies since it does not affect them, but I say now: it will affect them. Even further: it does affect them! Other human beings are starving in the world, and we cannot just choose to ignore them! These people have needs, wants, desires of their own, and they have a right to pursue them. It is vital for people across the globe to come together and work for a better world for the future generations. Some may say, "What can I do? How will my small contribution help anybody?" Every contribution helps, even the most modest. The most important idea to remember is this: *The time is now!* Do not save your contribution or involvement for tomorrow or another day, do it now!

The Borlaug-Ruan/World Food Prize Internship that I participated in this summer stresses this same initiative. These people are sending youth to places all over the world, so we know that we can make a difference, however small. It is indeed a lofty goal to cure world hunger, but even an attempt is truly heroic. A research center such as The WorldFish Center is only but a cog in the machine that works to alleviate those appalling tragedies of lack of food and nutrition. Many organizations the world over work hard to aid these desperate people that feel as if their life will always be full of misery and pain. The Borlaug-Ruan Internship showed me all of this and more. I now know that an idea, person, group, or organization can make a world of difference to perhaps only *one* other person in this vast world… but I ask you: Isn't that worth it?

7.2 Gratitude

All of the "thank yous" in the world cannot ever repay what the Borlaug-Ruan Internship has done for my life. It has changed me in ways that I am still discovering. I now see the world through the same eyes, but with an entirely new perspective. I have greatly increased in maturity, confidence, and ability to adapt. Easing into college life seemed like a breeze after spending my summer in Malaysia. But the most important change that has occurred is within my more personal life. My appreciation for the life that I have lived thus far, for the privileges I have enjoyed, and for the wonderful family that I am apart of, is immeasurable and invaluable. Never again will I

take these wonderful gifts God has given me for granted. Once I took a long look at my life through this new perspective, I realized that all human beings should have the right to this. Every person in the world should be able to *know* the richness of food in their stomachs, the joy of laughter on their lips, and the inexpressible feeling of fullness that love can bring to their hearts. This summer journey showed me all of these things. Words are hardly enough to express the deep gratitude I have for all of the people who made this internship possible, facilitated it, and assisted me on my journey overseas. Thank you, a thousand times over.

7.3 Acknowledgements

As I previously stated, words are hardly enough for the gratitude I hold in my heart for all of the people that made this possible, but I will try to express it by a simple thank you.

Thank you:

To Dr. Norman Borlaug, Mr. John Ruan, and The World Food Prize Foundation: For having a dream for the youth of Iowa and the surrounding states. You have made possible an experience that has changed the lives of so many that go through your program. Thank you!

To The WorldFish Center: For allowing me to work as intern in your research center. You gave me the opportunity to see all parts and areas of your work. Thank you!

To Ilona and Menchie and their families, and Simone: For inviting me into your home and lives for a few weeks. Also for allowing me to bake, eat, and see the sights whenever I wanted to! Thank you!

To Hooi Guan and Friends: For taking care of me for that short week and showing me how the locals have fun! Also for taking me all the way to KL, you're fantastic! Thank you!

To Lisa Fleming: For being my "summer mom" and making sure I always took care of myself, especially when I was so sick for those two weeks. You truly are a super hero! Thank you!

To the other interns: For sharing all of the great stories throughout the entire summer. It was great to know so many other kids were in a similar position as I was, so it was great to be able to share our funny stories, our scary tales, our incredible adventures, and our homesickness. Thank you!

And last but most important, to my family and friends at home: For comforting me, being there for me, emailing me, praying for me, and other odds and ends too numerous to list. I love you all SO much! Thank you a thousand times!

8. Photo Album

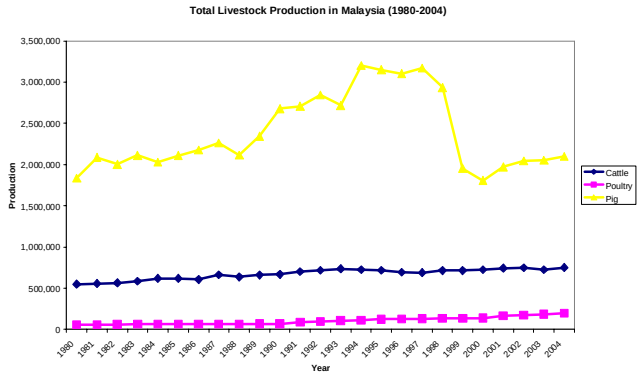

Figure 1 An example of a graph done on livestock production in Malaysia while with "Trash Fish" (June 15)

Figure 2 One of the Tilapia (feral) samples used for morphometrics (June 27)

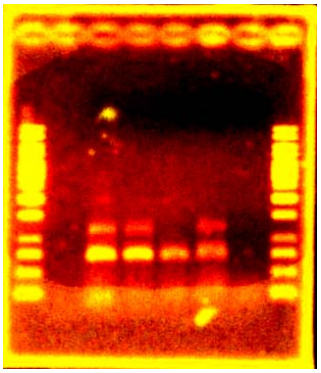

Figure 3 Five DNA samples that were viewed under a UV light after running them through agarose gel electrophoresis (July 7)

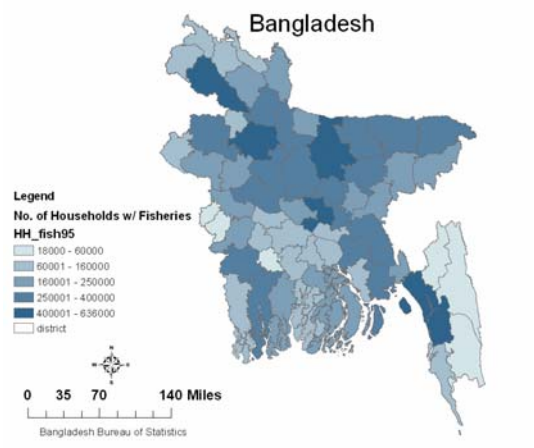

Figure 4 An example of a Bangladesh map done while with GIS (July 18)

Figure 5 Working in the lab with Ms. Ablan and Ms. Goh

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