



Aquaculture and Genetics

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Personal introduction

My sophomore year in high school, I felt lost—I had no idea what I wanted to do with my life. I figured I would head into a common career. I didn't have any burning passions. Farthest on my agenda was a career in natural science. A few amazing teachers and one incredible organization changed that.

My biology teacher, Ms. Reese, assigned the World Food Prize research paper to all her students. Some were more excited than others. I was inexperienced. Living in a suburb close to Columbus, Ohio, I had had no practical exposure to agriculture or extreme poverty, and all that these subjects truly entailed. However, I began researching common farming practices, and the problems associated with the occupation as a whole.

More research led to a complete fascination. The importance of the topic became immediately apparent, and I was intrigued thinking about the complexities of where *my* food came from. Further, I was emotional and deeply moved by the realization that I had never struggled with hunger, or even thought about the effect my food may have on other people.

How many lives are involved in bringing my meal to the table? This would be the question that would drive my most prominent passion to this day.

World Food Prize youth programs

The 2013 Global Youth Institute was a week full of fond memories. My mind was open to the complex discussions in the Borlaug Dialogue, and I contemplated ideas I never thought I would. Along with the intense stimulation of my brain, I made incredible friendships in Iowa. There were more young people in one room that were passionate about ending hunger than I ever knew existed. I returned from the Global Youth Institute inspired by my peers, motivated to contribute to the fight against hunger, poverty, and injustice, and determined to be an international intern.

After hearing the news that I had, in fact, become a Borlaug-Ruan intern, life seemed to move at 100 miles per hour and as slowly as a tortoise all at the same time. I could barely stand the long wait; I was so eager to leave. However, with AP tests, finals, and graduation, the day of departure quickly approached. There was nothing I could do to fully prepare myself for the two months that laid ahead: the most extraordinary adventure of my life.

First impressions

Flying from Toronto, Canada to Hong Kong, China, I was fortunate to be sitting next to an incredibly kind woman. Although she didn't speak much English, Linda showed patience and grace every time I needed to stand up and stretch my legs (which was a lot on that 15 hour flight). In addition, she shared every food item she packed and had been to Penang once before, so she recommended some local favorite dishes to try. This was a great introduction to the kindness and hospitality I would encounter consistently throughout my journey in Malaysia.

When I landed in Penang, I was picked up by Maniam and Vasanthi who own a private taxi service and work with employees at WorldFish. Through frequent rides, Maniam became a great friend to me. He is one of the most intelligent and kind-hearted people I have ever met. One aspect of life in Penang that was introduced to me on that first taxi ride was the chaos on the road. Although much more controlled than other places in Southeast Asia, the driving culture in Penang is not like the United States. There are more motorbikes on the road than cars, and the lanes are shared constantly. There was always a worry that a motorbike would get too close. This was a feature that took some getting used to.

I was admittedly extremely nervous about the start of the whole journey, but Maniam spoke so fondly of WorldFish and my first host family that I started to feel more excitement and anticipation than nervousness.

Life at the Dalsgaard's—a much needed family

At the beginning of my trip, I was still quite shy and not used to talking a lot. Staying with the Dalsgaard family, my first hosts, helped break me out of my shell—in the best possible way.

Jens Peter, originally from Denmark, works as the leader for WorldFish's Research Program on Livestock and Fish. Our daily drives to and from work were an occurrence I always looked forward to. Without fail, Jens Peter made me feel comfortable and welcome to discuss anything on my mind. Not only would we discuss any of my struggles at work, but my gracious host father would help in any way he could. I am forever thankful for the times Jens Peter could tell I needed help when I could not find the words to ask.

Mae, my host mother, is originally from the Philippines. I loved when Mae told stories about Philippino culture and her life before moving away. I could have listened to this family's incredible travel anecdotes all day and night. When the Dalsgaard's and I went to the Batu Ferringhi night markets once the whole family returned from their summer trip, it was awesome to see Mae's incredible bargaining skill my host sisters frequently mentioned!

Jens Peter and Mae have four great children: Jasmin (16), Jens Christian (15), Julieanne (13), and Johanne (10). Each of the kids made me feel welcome in their home and included me as part of the family. Having lived in many different countries and cultures throughout their lives, they are each extremely mature for their age. However, I took great joy in being silly with them all after long days at work. One of my favorite memories with Jasmin was baking cakes one afternoon when the neighbors were coming over for tea. We could have sworn we followed the recipe exactly, but it looked like our cheesecake was going to have too much filling and not enough crust. We put all of the filling on top anyway, and anxiously watched as it continually rose in the oven. It almost reached the top of the pan! Both of us warned everyone in the house: 'we added too much filling so it probably won't taste very good!' To our surprise, after letting it cool, it was perfect! It tasted so much better than our perfect-looking white cake with sprinkles! This day was full of laughs.

There aren't words to explain the significance of this first host placement. With long days at WorldFish doing a lot of beginning background reading, my mind had plenty of time to wander and eventually land on the subject of missing my family in the United States. Having such a large host family to go home to was important; there was always someone to talk to when I was missing home. I knew that if I just walked downstairs into the living room or kitchen, I would get involved in an interesting or funny conversation and come out feeling refreshed. The situation was perfect—it was just what I needed to adjust to life on my own. I am so grateful for their generosity.

Michelle's apartment—a place of peace and critical thinking

On July 2, I moved into another home. For about three weeks, I stayed with Michelle Rice, who works in the Department of Policy, Economics, and Social Sciences (PESS) at WorldFish. Michelle is married, but her husband lives in Australia, where she is from. This was obviously a big difference compared to living with a family of six, but it could not have worked out better. Almost fully acclimated and feeling independent by this point, I had no problem adjusting to life at Michelle's apartment. The first night after I moved, we discussed our lives over delicious Indian vegetarian dishes. I was immediately comfortable talking to Michelle about anything—a small reflection of personal growth, but mostly of our amazing relationship that would be to come.

Not only was this a time of personal growth, but I learned much about Penang's culture when staying here. We enjoyed taking walks around George Town after eating dinner at a local stall. The culture surrounding food is often the most important in many countries; this stands for Penang as well.

A moment I will always remember took place the first weekend at Michelle's. We walked around George Town, and stopped into a local coffeeshop for what we intended to be quick cappuccinos. Instead, we spent hours in the shop discussing everything two people could possibly discuss. This is a perfect representation of my time with Michelle. I wrote this passage in my journal that night:

I find myself being more inquisitive about my journey, and my life as a whole, here at Michelle's than previously. I am learning about my present self, and making immense strides in learning about who I want to be. Deep interests are developing. Goals are prioritizing. Values are becoming clearer with every new day.

Time with Luca and Diep—Busy, unique, amazing

My final host family consisted of Luca and Diep. Luca Micciche works as an Aquaculture Consultant for the WorldFish Incubator Program and is originally from Italy. Diep is from Vietnam. One of the many things I learned about Vietnamese culture is that they eat bread daily. The combination of the two food cultures in the apartment was incredible. Sitting around the dinner table each night was something I looked forward to every day. Not only was the food amazing, but the stories told were fascinating. Particularly, I learned about Diep's life in

Vietnam. I loved hearing about the differences in styles of living and culture in the places she has lived or visited.

Work was much busier when I was staying with my last host family than before. Most of my time was spent in my room working, but it was great talking with them over dinner and watching movies. I am thankful for the times they could see that I was putting too much pressure on myself and accordingly pulled me out of my room to calm down by watching a movie together. I was shown great hospitality and kindness by Luca and Diep.

WorldFish

WorldFish has a beautiful campus in Penang. With great green spaces and a large pond in the middle, it was always a pleasure walking from the aquaculture and genetics building to another. Every person I met at the center, no matter their position, showed me genuine kindness and made me feel welcome. Despite being exhausted from early risings each morning, going to work and first saying hello to Claire and Yeong Yeong heightened my day consistently. I enjoyed the days Eibhlin and Maeve, fellow interns, worked in the office. Maeve is a Marine Biology graduate student at Cork University originally from Ireland. Eibhlin has lived in Penang her whole life, so it was great to talk to someone that was my age from Malaysia.

WorldFish's mission is "to reduce poverty and hunger by improving fisheries and aquaculture." This mission is carried out through multiple different research areas: sustainable aquaculture, climate change, gender and equity, nutrition and health, policies and practices for resilience, and value chains.

The organization does not undergo field work in Malaysia, which, honestly, came as a shock to me when I arrived. The Penang center is the headquarters, so it has offices and a few small labs. The organization has other centers where field work is completed, including Bangladesh, Cambodia, Egypt, Philippines, Solomon Islands, and Zambia.

Over the period of eight weeks, I worked with two teams on two very different projects.

Aquaculture Futures Indonesia

Introduction

Within WorldFish Incubator, a new project is taking root called Aquaculture Futures Indonesia, coordinated by my supervisor, Sharon Suri, with a great team, including Mike Phillips and Chadag Vishnumurthy Mohan. Incubator connects small and medium scale aquaculture farms with investors committed to the seafood industry in order to "help the aquaculture sector deliver on its promise to meet the growing demand for fish whilst ensuring equitable supplies access for the poor." ("WorldFish Incubator", 2013). In partnership with the Indonesian Ministry of Marine Affairs and Fisheries (MMAF), Aquaculture Futures Indonesia hosts workshops to determine key drivers of change and develop narratives around the drivers to, in combination with the AsiaFish model and Life Cycle Assessments (LCA), identify policy consequences and investments

pathways which influence the investment climate and enabling environment in which Small and Medium Enterprises (SMEs) work.

Explorative scenarios allow people in a variety of different positions within the scope of aquaculture to “assess environmental trade-offs among different growth options and develop public policies and investments to create economic opportunity for sustainable aquaculture growth that mitigates impacts to ecosystems” (Aquaculture Futures Indonesia, 2014). In other words, creatively thinking about the future of aquaculture allows involved members to prioritize their goals realistically and work together to make these common goals a reality. Ideally, with trade-offs assessed, these priorities would include environmentally sustainable aquaculture development that is fair, productive, and healthy.

At the first workshops, participants reflected upon the last 10 years of their job, and recalled significant factors that changed their field. Using this knowledge, the contributors then explored which factors may change their field again in the future. The members then rated each factor based on their impact and certainty. Impact indicates the severity the change would cause on aquaculture or fisheries if it were to occur. This rating differs between each occupation. Certainty is a combination of the likelihood that the factor will occur (e.g. ocean acidification in relation to the Environment/Climate Change driver) and how predictable the factor is, in terms of which extreme results (e.g. how confident we are in saying that the future holds a degraded environment rather than a clean environment). The average score of each factor is calculated and plotted on a scatter plot. The two drivers with the highest impact and lowest certainty are considered ‘critical drivers’ and are used to develop the scenario logic. In creating the scenarios, each critical driver is explored as if the extreme were to occur. For example, the environment in a scenario is either degraded or pristine. Narratives of the state of life in each future scenario are developed and detailed (Phillips M et al., 2015). After three previous workshops held at both the national and provincial levels, a detailed feedback form seemed prudent at the final workshop in order to capture the success of the program as a whole.

I looked extensively at the feedback from the previous workshops, trying to determine what it was that participants reacted negatively toward. After lots of analyzing and reviewing the schedule, it was clear to me: the participants didn’t feel they were getting anything in return for their work at the conferences. They gave WorldFish lots of input from their point of view, but didn’t get any results of the scenarios they created. Under the impression that this conference was going to be the same format as the others, I created a more detailed feedback form in order to hone in on said problems. I was after one idea: did the activities at the workshop make more practical sense to one sector than another?

National Conference—Jakarta, Indonesia

However, this conference answered all the participants’ questions and concerns. At the workshop I attended, held in Jakarta, Indonesia, stakeholders did not participate in creating the scenarios. Instead, the WorldFish team took the information from previous conferences and created four detailed scenarios, which we gave to all participants. The stakeholders participated

in evaluating and critiquing the scenarios created. They were prompted to answer the following questions: Are these situations really possible? And what does that mean for you if they are possible? What can we change in the field to either see these dreams become reality, or do whatever it takes to not let these ever happen? This conference was much more specific and centralized around the stakeholders' involvement. In addition, the AsiaFish Model, run by U-Primo Rodriguez, Nhuong Van Tran, and Chin Yee Chan, was used to partly quantify the scenarios. It was used to project the price, consumption, production, and demand patterns of aquaculture and fisheries in each scenario. This was satisfying for participants, as they got to see real values. They were able to think about the advantages or consequences to their livelihoods given the scenarios came true.

Patrik Henriksson conducted a Life Cycle Assessment, which tracked the production of fish feed until farm gate. This showed how many resources it takes to start production of different kinds of farmed fish in Indonesia, including tilapia, various shrimps, grouper, etc. The numbers are incredibly large, and do not even include the energy used to sustain the fish (for example, disposal of waste) or processing. In a follow-up presentation, Patrik showed the projections of what those values (eutrophication levels, acidification, GHGs produced) would look like in the four possible future scenarios. Not surprisingly, if the country as a whole continues the current trend, there will be huge destruction of available resources.

After each presentation given by our team, participants were given 4-5 questions to discuss within their table and then present to the conference. This is where I took the most notes—their opinions and expertise is what WorldFish needs to prioritize. One of the main reasons this workshop was held was to start more detailed discussions that are needed between sectors to physically create change. And it worked—once everyone had been officially dismissed after closing remarks, few people actually left. The vast majority stayed for a while to discuss the ideas further and exchange contact information.

Reflections—importance for food security

This was amazing for me to see. I am so inspired by their commitment to investigate and work on this more. It affects them so directly, and it was incredible (though not surprising) to see them prioritize the issue of sustainability of Indonesia's fisheries and aquaculture.

Watching participants interact with each other was by far my favorite part of the conference. Their commitment and passion to their field was obviously visible. The prompted discussions weren't foreign concepts to them. Each situation we talked about could affect them directly.

In addition, this event opened my eyes to the importance of a holistic approach to these complex issues. At the beginning of my time in Penang, I was admittedly bummed that I would not be completing any lab or field work. (At this point, my genetics project was not assigned to me.) I wanted to get my hands dirty. I was excited about the conference, but was not aware of the importance of the implications of the event. In other words, I wasn't sure how it would help the situation of aquaculture in Indonesia. I was ignorant this way.

Participating in the conference changed my life. I could see, right in front of me, how science only goes so far. The lab and field work mean nothing unless the people involved actually access the information, understand it, and apply it.

It is incredible to think that, because of that conference, the stakeholders are consciously making a change in their lives and the way they do their jobs. Brainstorming innovative feed alternatives, creating new policies, seeking grants to improve personal sustainability, reaching out to more small-scale farmers to give those grants. This idea inspires me so much. It fills me with renewed motivation for the fight against hunger. I plan on applying this idea of a holistic approach to my career path.

Hierarchical Consumption Patterns, GIFT Tilapia

Introduction

About three weeks into my internship, I was assigned a project within the genetics unit, including my supervisors John Benzie and Hugues De Verdaal. During this time, I collected data that aimed to answer a question posed by the work of a previous intern. Maeve O'Connell, a graduate student at University College Cork, conducted a study questioning the relationship between the physiology of fish (color around the eye) and levels of dominance or aggression. In other words, she was determining if the intensity of the color around the eyes of a fish relates to their hierarchical status in a group.

My data intended to explore the following question: Does behavioral hierarchy have an effect on the order in which fish eat? Phrased in a simpler way, does the dominant fish eat first every meal? Does the most subordinate fish eat last every meal? I predicted that if there is a defined hierarchy, then the feeding order will follow the same pattern. The dominant fish (consistently male in this study) has control of the group, and through his aggression, I predicted, would also have priority to feed. If we found that there was a cause-and-effect relationship between behavioral hierarchy and time to feed, then the hypothesis would be proven.

In total, I studied 120 fish, coming from four genetically different families. There were two aquariums per family; 15 fish per tank. The species of fish was Nile tilapia, *Oreochromis niloticus*, and more specifically, the genetically improved WorldFish strain GIFT (Genetically Improved Farmed Tilapia). This strain of tilapia has undergone years of selective breeding, meaning the parents of the next generation were chosen so as to “result in improved performance for certain traits considered to be important during production and marketing” (GIFT, 2015). The GIFT strain results in faster growth and the ability to survive in a variety of environments, which is beneficial, as the strain has been safely introduced in a few different continents.

Data Collection

In order to answer the research question, I watched 152 recorded videos of the fish during feeding. The time the first fish in the tank ate a pellet was marked as the starting point, and the remaining times for each fish were recorded as the difference between the time of the respective

pellet consumption and the starting point. For example, if fish number four ate first at 10280 milliseconds and fish number two ate at 14560 milliseconds, number four's time would be recorded as 0.00, and number two's time would be recorded as 4280.00.

Analysis

As analyzation began, four clear outliers appeared that made the data skew right. For some statistical analyses, it is necessary to have a normal distribution of data. For this reason, the outliers were removed from the data set and a square root transformation was performed. (Taking out outliers is acceptable if you have few outliers and a large data set—in this case, it was 4 out of 110 pieces of data.) Following this transformation, the ideal bell shaped curve of a normal distribution was reached.

First, the average time of all fish to reach a pellet was compared to a number of variables to seek out any correlations that existed.

Correlations								
			Initial weight	Initial length	Final weight	Final length	Behav rank	average time. sec
Spearman's rho	Initial weight	Correlation Coefficient	1.000	.956**	.947**	.934**	-.298**	.140
		Sig. (2-tailed)	.	.000	.000	.000	.002	.143
		N	110	110	106	106	110	110
	Initial length	Correlation Coefficient	.956**	1.000	.897**	.944**	-.324**	.037
		Sig. (2-tailed)	.000	.	.000	.000	.001	.702
		N	110	110	106	106	110	110
	Final weight	Correlation Coefficient	.947**	.897**	1.000	.953**	-.271**	.132
		Sig. (2-tailed)	.000	.000	.	.000	.005	.177
		N	106	106	106	106	106	106
	Final length	Correlation Coefficient	.934**	.944**	.953**	1.000	-.252**	.055
		Sig. (2-tailed)	.000	.000	.000	.	.009	.575
		N	106	106	106	106	106	106
	Behav rank	Correlation Coefficient	-.298**	-.324**	-.271**	-.252**	1.000	.254**
		Sig. (2-tailed)	.002	.001	.005	.009	.	.007
		N	110	110	106	106	111	110
	average time. sec	Correlation Coefficient	.140	.037	.132	.055	.254**	1.000
		Sig. (2-tailed)	.143	.702	.177	.575	.007	.
		N	110	110	106	106	110	110

** . Correlation is significant at the 0.01 level (2-tailed).

Shown in the above table, there is no correlation between average time and initial weight, initial height, final weight, or final height. However, there is a correlation between average time and behavioral rank as recorded by Maeve. The association is not strong, but it is in fact significant; seen in the table, the correlation is .254, and has a significance of .007. However, this

relationship does not tell us that one directly affects the other. Correlation simply tells us that these two factors are related in some way. It does not fully answer the question.

In order to determine if behavioral rank is indeed the cause of time taken for the fish to feed, an Analysis of Variance, or ANOVA, was conducted. Effects included in the test were sex, family, aquarium, initial body weight, and eventually behavioral rank.

Analysis of variance (ANOVA)

Type III Tests of Fixed Effects^a

Source	Numerator df	Denominator df	F	Sig.
SEX	1	90	2.729	.102
FAMILY	3	90	14.695	.000
AQUARIUM(FAMILY)	4	90	.928	.451
BW_150616	1	90	3.483	.065

a. Dependent Variable: sqr of time.

Conclusively, the behavioral rank had no significant effect on average time to feed. This reveals valuable information: behavioral rank is not the primary factor in determining the opportunity of an individual to feed at a given time. In other words, the dominant male is not always first to feed and the most subordinate is not always last to feed. Ultimately, average time taken to feed is strongly influenced by one or several alternative variables, which may not have been tested in this study.

As seen in the ANOVA, both sex and aquarium have no cause on average time. In contrast, family clearly has the greatest impact. The difference in average time between the families is quite high. For example, Family 27 had an average time of 14.56 seconds, while Family 7 averaged 24.40 seconds. Even more deviant, Family 4 took, on average, 35.95 seconds to feed. This wide gap interestingly shows that the most significant explanation for average time taken to feed is genetic.

Follow up experiments will be necessary to gain the ability to say this decisively. I suggest a study wherein fish of different families are housed in the same aquariums. Data would be

collected with the same methods, and factors controlled in this experiment would again be controlled. If fish from one family consistently fed first, it could be determined that family has a significant impact.

Reflections

Few difficulties arose while working on this project. I felt confident in what I was doing the majority of the time. However, the whole team, including me, underestimated how much time the project would take. When discussing the task at the beginning, marking down the time the fish ate sounded fairly simple. Then I watched the first video.

In the first few videos for each tank, all fifteen fish looked exactly the same, since dominance had not yet been established. Getting to the last videos for each tank, some fish were much darker than others, as stress causes tilapias' color to change. The similarity of the fish was definitely a challenge. Each fish had a tag on them, but with the tape at full speed, it was difficult to fully see the tag.

Speed was also a source of frustration while collecting the data. Once a pellet started dropping in the tank, it was a frenzy. In most cases, every fish ate within the first 30 seconds or so. With fifteen fish, this meant data collection about every two seconds. Thankfully, I had the chance to use a company computer with a software that slowed down videos. This allowed me to get a more accurate look at feeding order.

Given the amount of work needed, I felt I was on a time crunch for most of the project. However, it turned out I was putting too much pressure on myself. After one of many very late nights attempting to finish the videos, I decided it was time to talk to John and Hugues. I admitted to them that I was quite overwhelmed and unable to finish the videos by the time they had assigned. Looking back, I did not hide my emotions as well as I thought. I was flustered and exhausted, and it showed. However, it turned out this is the best thing I could have done. John and Hugues showed complete understanding and kindness to my situation. In fact, they admitted that they had also underestimated the work load.

This was a learning moment for me: no matter who your supervisor, they have been there at one point or another. They're human too! And experiencing genuine emotion shows passion and determination for your project.

Another lesson was learned through this project: do not sit on your ideas. Ask questions and make suggestions. From the start, I thought that the fish's distance from the food would have the greatest impact on which fish feeds first. Simply, whichever fish is closest to the pellet when it drops will most likely be the one to eat it. I thought about this a lot, but figured that John and Hugues had already taken this into account. However, when I mentioned this weeks later during analysis, I found out that they had not thought about this factor much. My supervisors jokingly called me 'sneaky' for hiding a hypothesis from them. They told me that it would have been a

great addition to the project. Even if I thought that John and Hugues had controlled for distance, I should have asked anyway.

Overall reflections—in and out of the office

The brilliant Ambassador Kenneth Quinn, at the Borlaug-Ruan Intern Orientation, said that we would change immensely on our trip. “Parents, make sure you have a conversation with your child before they leave,” he said, “because they will be a different person when you see them again.” This was a tear jerker for my whole family. This proved to be just the case.

I found that this growth came most when I was not conscious of it. In the first few weeks in Penang, I was reflecting too much. I came home from work each day and tried to think of all the ways I had grown that day. I was confused; I couldn’t obviously see the ways I had changed. However, when my projects began to pick up at work, I didn’t have that same amount of time during the day to think about myself. I spent most of my time working, and when I wasn’t, I wanted to be with my host families or out in the city.

It wasn’t until the last week in Penang that I realized how much I had grown, in a diversity of aspects in my life.

The language barrier

Malaysia, especially Penang, has a large population of ethnic Chinese and Indian people. There are many different languages spoken in the country because of this. Most people speak two or three languages to accommodate. These include their first tongue (commonly Mandarin or another form of Chinese, Tamil, or Hindi), Malay (the national language of Malaysia, also known as Bahasa Malaysia), and many know at least a few words of English.

In this way, the language barrier was not a big problem most of the time. However, I came to grow very fond of the struggles that did come with language. I was forced to communicate through creative forms, such as body language and facial expression. I had to be extremely intentional with my words and expressions. Even if it was a brief interaction like ordering food, my mind was challenged, which was an incredible feeling. It was an added bonus if the other person understood my struggle and was partly struggling the same as me!

Dr. Jane Goodall, in her book, *Reason for Hope*, explains this concept perfectly: “Once we have labeled the things around us we do not bother to look at them so carefully. Words are part of our rational selves, and to abandon them for a while is to give freer reign to our intuitive selves.” This is exactly how I felt in these situations. Connecting with a somewhat more primitive version of myself was exhilarating and exceptionally valuable. Dr. Goodall adds, “It is all but impossible to describe the new awareness that comes when words are abandoned.”

Love is not just a verb

I feel extraordinarily, overwhelmingly lucky to have met the people I did. Each and every interaction I had was one of growth, interest, and value. I learned an immense amount through

my supervisors, host families, and friends. There were times when all I could feel was love. It wasn't necessarily me loving people, it was a state of being. It was all around me. These were the times where I would whole-heartedly and vulnerably smile at people I did not know. Almost every time, I did not realize I was doing this until I received a genuine smile back. The woman on the back of a motorbike, the school girl sitting on the bus. These smiles filled me with so much hope. They intensified my love for travel. A simple smile truly did, at many points, change my life.

I felt love and connection not only with people. I wrote this passage in my journal on July 9:

I've just had one of those experiences you don't forget for the rest of a lifetime. As the rain began to fall, I sat on the balcony. The wind pushed the light mist onto my body. All at once, I felt my heart beat faster as it does when I feel spirituality all around me. Suddenly, humankind was everywhere. The Earth was everything I could see, and nature was omnipresent. The sound of rain is universal. The smell doesn't change greatly between countries, or even different sides of the world. It is something everyone knows deeply and sincerely. It does not ask anything of them, or they it. It just *is*. And in that moment, so was I.

A career path forming

I learned so much about myself through my internship. Arguably the biggest difference in my life since returning from Penang is my career path. My priorities have changed.

Before my two months in Malaysia, I thought about a sort of 'glory' that would come with solving food insecurity. It was simple: I would think of some amazing idea that would be applicable to every hungry environment. Just like that, it would solve everything. I was going to be a world-renowned hunger fighter.

However, throughout my internship, and since my return, I have changed my thinking. I know that this 'glory' is not what I want. My passion for this issue is no longer about me. It is about the millions of men, women, and children that are affected by hunger every single day. Some whom I have met, many I will never meet.

Either way, I know that the biggest change made must come from within, and must apply to only me. I cannot expect the world to conform to my own ideals. Instead, I will take the lessons learned on this adventure and apply them in the rest of my life. I must be flexible, creative, and patient; these skills have vastly improved since the day I left for my trip. I am prepared, excited, and incredibly happy to spend the rest of my life truly being part of the fight against hunger and poverty, along side everyone I met in Penang, Malaysia.

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