2002 World Food Prize Internship at

The World Fish Center
Penang, Malaysia

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- Where ever you go it is important to have friends. Thanks to Sham and Menchie and her family I had a wonderful time in Malaysia. I appreciate all the effort they went through to make me feel at home.

- Thanks to all the Coastal Marine Resources and Research Program staff who made my time as an intern at The World Fish Center interesting and exciting.

- I would like to especially thank my family whose love, support, and help throughout this experience has made it one of the best ever.

I. Background

After being away for most of the summer, I returned to Carroll, Iowa a few weeks before the beginning of my senior year of high school. I was definitely going to make the most of what little time I had left at home. After all, this would probably be the last year I would be with all of my friends. It was about that same time that I was approached by my biology teacher. "Suzanne," he said, "how would you like to participate in the World Food Prize Youth Institute? It's a great experience and you'll have the opportunity

to meet world-renowned people. All you have to do is write a paper." It definitely sounded interesting, but the paper would require a lot of time and effort. I wasn't sure if I wanted to spend a good part of the beginning of my senior year working on a paper. I told my teacher that I would look at the information, discuss it with my parents, and get back to him. With cross country, debate, a full class schedule, college visits, and all the other activities I was involved in, neither I, nor my parents, thought it would be wise to take on another responsibility. However, I couldn't pass up an opportunity like this, so against my better judgment I told my teacher to go ahead and send in my name…

Even though I grew up in town, I was never more than a few minutes from the country. In fact, both of my grandparents lived on farms nearby. Holidays and weekends were spent on their farms. When I was eight, my dad quit his job in construction, and took over farming my grandpa's land. Instead of moving the family to the country, Dad decided to travel the short distance to the farm to work every day. As I got older, the time I spent on the farm increased. My summers were spent bean walking and doing other odd jobs for Dad out at the farm. Many of my free weekends were spent helping Dad. I enjoyed spending time with Dad, learning about different aspects of farm life. Then when I reached high school I had less and less time to help Dad. I became involved in school activities. Somehow, though, I still managed to find time to go out to the farm.

My busy schedule tells something about my personality: I like to do and try new things. That was the primary reason I attended the World Food Prize Youth Institute in 2001. That was also one of the reasons I decided to apply for an internship. Not only would I have the opportunity to travel, but I would also get to learn about a new culture and the difficulties everyone faces, especially the poor. My opportunities would not end there though; I would also become part of the solution. The work I would do would help others.

II. ICLARM –The World Fish Center Penang, Malaysia

Due to the political instability between India and Pakistan, I was unable to travel to the M. S. Swaminathan Research Center in Madras, India to study and work with the social issues affecting food insecurity as originally planned. Instead, thanks to a lot of hard work and last minute arrangements made by The World Food Prize Youth Institute Programs Director and The World Fish Center, I was given the opportunity to fly to Penang, Malaysia to work at ICLARM –The World Fish Center.

Started in 1973 by the Rockefeller Foundation and established as an international center in 1977,

ICLARM has just recently moved headquarters from the Philippines to Malaysia. Along with this relocation, came a name change. Previously know as ICLARM, the International Center for Living Aquatic Resources, this organization is now known as The World Fish Center. While my responsibilities at ICLARM -The World Fish Center were different, the purpose remains the same: "to help the rural poor increase their income, preserve their environment, and improve their lives." (6)

The World Fish Center became a member of CGIAR (Consultative Group on International Agricultural Research) in May of 1992. Although governed by an international Board of Trustees, polices are implemented by the Director General. Currently, ICLARM –The World Fish Center is the only international research center involved in research on fisheries and other living aquatic resources. (6)

III. PISCES II –Population Interdependencies in the South China Sea Ecosystems

ICLARM -The World Fish Center has many different programs all of which are involved in research on fisheries and other living aquatic resources. While I had minimal exposure to all of the groups, I was assigned to the lab where, among other tasks, I helped organize and clean the lab. My main project dealt with the length-weight relationship of two species found in the waters off the coast of West Malaysia: Nemipterus japonicus and Upeneus sulphureus. I also contributed some of my time to the PISCES II project (Population Interdependencies in the South China Sea Ecosystems) by testing the quality of DNA samples. This project required an understanding of different lab equipment such as the spectrophotometer.

My main interest of study is in the area of science, thus making working in the lab an ideal setting for getting a glimpse at what I am planning to do later in life. In addition, it was an opportunity for me to work semi-independently in a lab and to gain an understanding of what actual laboratory work entails.

IV. Goals

Beside the primary center in Malaysia, The World Fish Center has outreach sites in 9 countries: Bangladesh, Cameroon, Caribbean/Eastern Pacific, Egypt, Malawi, New Caledonia, the Philippines, Solomon Islands, and Vietnam. Research is done in 22 countries. This research is divided into five main

programs. Each of these programs is in charge of several different projects, all of which work towards ICLARM's goal of "promoting sustainable development and use of living aquatic resources based on environmentally sound management." (6) This goal is achieved by saving biodiversity, raising and sustaining the productivity of fisheries and aquaculture systems, and improving policies for sustainable development of aquatic resources. By working towards this goal, ICLARM is contributing to "food security and poverty eradication in developing countries".

The PISCES II project is actually supervised and supported by two of ICLARM's programs: Biodiversity and Genetic Resources Research Program (BGRRP) and Coastal and Marine Resources Research Program (CMRRP). PISCES II is investigating the degree of connectivity among selected reefs in certain parts of the South China Sea. The three species *Figure 1* that are currently being studied are:

1.) Dascyullus trimaculatus
2.) Caesio cuning
3.) Holothuria scabra.

These findings can then be used to apply some sort of management system for the coral reefs and waters of that area. Eventually, it is hoped that all of the species found in the South China Sea waters will be studied to determine their degree of connectivity.

V. Background of people

I had the opportunity to work with two extraordinary women, both of whom have many talents besides the ones they utilize in their jobs. Carman Ablan-Lagman, better know as Menchie, started working at The World Fish Center in 1996. She moved with the center from the Philippines to Malaysia in 1999 with her husband Gerri and daughter Kala. Mrs. Ablan's first job was as a lecturer in the laboratory classes for Marine Sciences at the University of the Philippines. She obtained her Masters in 1994. Due to conflicts, Mrs. Ablan changed the subject of her PHD dissertation from the PISCES project to Marine Protected Areas in the Central Philippines. If all goes according to schedule, Mrs. Ablan will finish her dissertation in 2003.

Shamala Palaniappan, also known as Sham, is Mrs. Ablan's research assistant She started working at The World Fish Center in the fall of 2001. Ms. Palaniappan just recently earned her Masters at the

University of Sans Malaysia. Her dissertation was on Population Genetics of anemone fish. Prior to her job at ICLARM, Shamala Palaniappan had been lecturing biology and management classes at the International College in Malaysia.

In addition to paper work, both of these women also have the opportunity to work in the laboratory and go out in the field. Their fieldwork consists of diving to observe the ocean life in different areas of the South China Sea and to obtain the different species needed for dissection. Procuring fish for study is accomplished in several ways. Either Mrs. Ablan or Ms. Palaniappan hire fishermen from the area to catch the species they are studying, visit the wet markets themselves, or catch the different species during their diving expeditions. The latter is rarely done, however, due to time constraints.

VI. Responsibilities

The first week or so of my internship was spent doing "odd jobs" in the laboratory, such as washing dishes or filling pipette tip containers. This was to help familiarize me with the laboratory setting. It was also a time for Ms. Palaniappan to get to know me better and to gain an understanding of my scientific knowledge and laboratory skills. I then began my project with Nemipterus Japonicus. Fish were bought at a local wet market and I started taking measurements.

Originally, I was to use truss morphometrics to determine the genetic composition of the fish. Truss morphometrics is the science of analyzing measurements of individual fish to identify the genetic composition makeup of the fish. The World Fish Center uses it to support the data found in the lab. Each fish was placed on graph paper and measurements were taken. Marks were made at the fish's mouth, gill, and where each fin started and stopped. F*igure 2*. The distance between the points was then measured and recorded.

Due to time constraints, however, modifications were made to my project. I ended up working with the length-weight relationship of this same species. *Table 1* I also obtained and worked with another species, Upeneus sulphureus. This species came from Lumut, Malaysia, a town south of Penang.

I researched both species determining their characteristics and other pertinent data that would contribute to my understanding of the two species of fish. Some of this information is as follows.

Nemipterus japonicus, also known as the Japanese threadfin bream, is a non-migratory species found in marine waters at a depth range of 5-80 meters. It lives in tropical waters from 30°N – 10°S.

Nemipterus japonicus is very abundant in coastal waters and is usually found in schools. Their diet includes that of small fishes, mollusks, polychaetes, and echinoderms.

Upeneus sulphureus, also known as the sulphur goatfish, is similar to Nemipterus japonicus in several ways. It, too, is found in tropical marine coastal waters at a depth range of 10 -90 meters and is also found in schools. Upeneus sulphureus, however, covers a larger area north and south (40°N - 30°S).

Distinctive characteristics of Nemipterus japonicus are that the body is as deep or deeper than the head. The head does not have spines and its anterior is scale less. It has a single dorsal fin. Distinctive characteristics of Upeneus sulphureus are an elongated, but rather deep body and a chin with two thin, short barbells. There are also teeth in both jaws and on the roof of the mouth. *Figure 3.*

During the last week of my stay in Malaysia, Mrs. Ablan and I started analyzing the data, using the equation W = a * L^b where W is the total weight (in g), L is the total length (in cm), a is the intercept of the curve, and b is the slope of the curve. However, we ran into some difficulties making it impossible for me to complete the project before my departure. As an alternative, Mrs. Ablan suggested that she would be more than willing to analyze my data, write a lecture, and send it to me via email. However, due to her busy schedule and recent trip to a conference in Florida, her plans to send the lecture have been postponed. After receiving the information, I plan to finish my analysis of the data and possibly write an article dealing with the length-weight relationship of Nemipterus japonicus and Upeneus sulphureus from the west coast of Malaysia for NAGA –The ICLARM Quarterly.

I also helped analyze DNA for the PISCES II project. I tested the quality of DNA that Shamala Palaniappan had extracted. This was done through the use of the spectrophotometer and running gels. Both of these were processes that I learned during my internship.

In order to run the spectrophotometer a blank is first placed into the machine and the wavelength is set at 260. Then one at a time, 10 mL of each sample is placed into the machine and the number is recorded. The cuvette must be rinsed between each use so the samples are not contaminated. This procedure is then repeated at a wavelength of 280. The quality of the DNA is found by taking the results recorded at 260 divided by the results recorded at 280.

In order to run the gels it was necessary to mix and pour the gel solution into a mold. Then combs were inserted into the solution so that as the gel solidified wells formed. After the solution hardened, the

DNA sample was mixed with dye and inserted into the wells. Ms. Palaniappan would then analyze the DNA bands using ultraviolet light.

The purpose of testing the DNA is to determine whether the quality is good enough to do a PCR (Polymers Chain Reaction). If the DNA is of good enough quality, it is then increased in quantity by the PCR method. After the PCR the DNA is put into a sequencer so that it can then be analyzed and compared.

VII. How these results helped improve food security

Over 50% of fully exploited or overexploited fish stocks are in developing countries. (2) These are countries where people's livelihoods and lives depend on whether or not there are fish available for them to sell and to eat. When you or your family is hungry your first and only concern is to find food. This leads to an increase in the number of fishermen. As a result, there are too many fishermen and not enough fish. In addition, most of these people are not educated about what will occur if over fishing continues.

The result is a vicious cycle. The lack of food leads more people to the waters to catch fish. This then causes a large decrease in the number of fish available. The decrease in the number of fish causes people to catch the younger stock and/or travel farther from home in order to catch the same amount. This then leads to an even larger decrease in the number of fish available, which, in turn, causes fishermen to catch even younger stock and/or travel farther from home. As a result, there is an increase in the exploitation of the waters of developing countries.

One approach to stock identification is the length-weight relationship. Often times, after making a catch, the fisherman will take the weight of all of the fish together. He will also be aware of the number of fish he caught. The fisherman will not, however, take the time to measure the length of each fish. That is where the length-weight relationship of each species of fish becomes important. Using the information available, the average weight of a catch can be found. Thus, using the relationship of the species, the fish's weight can be used to find the fish's length. Since length is one of the determining factors of the age of a fish, it is then possible to determine whether or not the fish caught were old enough to reproduce.

In order to increase the number and variety of genetic differences of fish in the sea, scientists as well as governments and other individuals, want to make sure that every fish has the opportunity to

reproduce and pass on its genes. After all, the first step to solving a problem is to identify what the problem is.

The PISCES II project, a continuation of the original PISCES project, uses a compilation of different studies to determine the degree of connectivity among selected reefs in the Thailand Bay. This composite of studies includes surface circulation, tagging experiments, genetic markers, and recruitment and life history strategies of selected species. (4) The information collected is designed to attain many different objectives including:

1.) The facilitation of the development of improved management strategies
2.) The expansion of information on genetic linkages to include commercial species
3.) The identification of key areas for conservation and management of coral reef resources in the region
4.) The investigation of the relationship of protected areas to genetic variability in select reefs and
5.) The strengthening of collaboration among scientists in the South China Sea area. (4)

By determining where a certain species lives during each part of its life, trans boundary management strategies can then be formulated and acted upon. *Figure 4* The results would be an increased concern among nations, as well as, an increased fish population. As Mrs. Ablan points out, "The bottom line" is that it is "difficult to predict how a stock is going to respond to a particular management regime if unit stocks are poorly defined and stock exchange is not estimated."

Identifying all of the different aquatic species in the South China Sea is a daunting task. As a result, it is necessary to start on a small level. Three species were chosen based on the following criteria:

1.) Their importance as a current or alternative source of food or livelihood for poor coastal inhabitants
2.) Their applicability as a model typical of species groups of interest to management of captured populations and
3.) If the species is particularly affected by stresses especially if they play a significant role in the ecology of a system (3)

People from the different countries that are participating in PISCES II made the decision collaboratively. These countries include: Malaysia, Vietnam, the Philippines, Indonesia, and Thailand. The species chosen by the PISCES II project were Dascyullus trimaculatus (threespot dascyllus), Caesio cuning (redbelly yellowtail fusilier), and Holothuria scabra (sea cucumber).

During my internship I had the opportunity to travel to Thailand and visit the wet markets. The poverty I saw there made it even clearer to me why it is so important not only to continue researching, but

also expand the amount of work being done to improve the availability of aquatic life in developing countries.

VIII. My personal growth and experience

Fish...that is not a food you hear a lot about in a landlocked state, such as Iowa. Sure, you may go fishing with your dad or grandpa once in a while, but it is not something you usually see on your dinner table. However, in a country like Malaysia, where the water is never more than a few hours away, fish is a very important resource. In addition to providing a source of food for a large part of the population, it also creates a livelihood for many people. Often when unable to find another job, people turn to fishing to try to meet the basic needs of their family.

My view of the world changed over this past year. I look at the world differently now than I did at the beginning of my senior year in high school. Yes, I liked to try new things and meet new people, but the world that I was living in was centered on me and what I could get out of life. The World Food Prize Youth Institute opened my eyes to the suffering that is occurring in this world because of the lack of basic necessities such as food and water.

Food is something that I have always taken for granted. When I missed a meal or had not eaten for a while, I would complain that I was "starving". Now I realize that I do not even have the faintest idea of how much pain actually occurs when you truly are starving. There are people who work a lot harder than I do, day in and day out, and do not even earn enough to satisfy their basic needs. Food security is a major concern in today's world that needs to be addressed.

This internship has given me more knowledge about the world and how it works then sitting in class on a college campus ever could. It has given me hands on experience working with problems that affect the poor of this world. It has instilled in me the desire to do something with my life that will help others.

To me the poor and hungry people are no longer numbers and statistics to be read about in the *Wall Street Journal* or heard about on CNN. Instead, they are the faces of people I pass on the street. People who look at me with a long painful gaze hoping against all hope that today they will find enough to eat.

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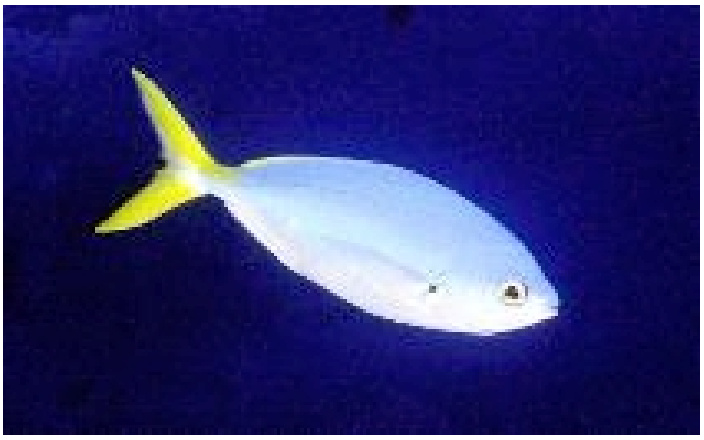
Dascyllus trimaculatus

Holothuria scabra



caesio cuning

Figure 1

Nemipterus japonicus

Upeneus sulphureus

Figure 2

Length-Weight Data for Nemipterus japonicus

		Standard length (mm)	Total length (mm)	Weight
6-Jun-02	M001	151	165.5	50
Penang Malaysia	M002	143	158	48
Nemipterus	M003	158.5	170	50
japonicus	M004	145.5	158.5	51
	M005	134	145	30
	M006	169.5	182	75
	M007	162	175.5	50
	M008	168	181	52
	M009	161.5	171.5	55
	M010	155	165	52
	M011	168.5	184.5	100
	M012	153	168	50
	M013	148.5	161	50
	M014	158.5	174	52
	M015	154.5	167	75
	M016	165.5	175	63
	M017	157.5	172	75
	M018	147.5	161.5	55
	M019	144.5	157	50
	M020	168.5	184.5	75
	M021	152.5	168	50
	M022	161.5	173.5	75
	M023	145	156	45
	M024	152.5	163	55

Table 1

Length-Weight Data for Nemipterus japonicus (Table 1 cont'd)

		Standard length (mm)	Total length (mm)	Weight
2-Jul-02	S001	139	151	55
Penang Malaysia	S002	150	162.5	75
(set 2)	S003	147.5	161	70
Nemipterus	S004	162	172.5	75
japonicus	S005	139	148.5	48
	S006	151	162.5	70
	S007	140	151	50
	S008	149.5	162.5	50
	S009	151.5	162	50
	S010	130	142.5	45
	S011	132	146	50
	S012	154	165.5	60
	S013	137	146.5	50
	S014	136.5	145.5	40
	S015	142	151.5	30
	S016	132.5	141	25
	S017	148.5	162.5	50
	S018	138.5	146	45
	S019	140	150.5	45
	S020	138	147	45
	S021	143	155	45
	S022	450	163.5	50
	S023	142	153.5	20
	S024	151	163	50
	S025	148	162	45
	S026	129	138	30
	S027	144	154	45
	S028	143.5	154.5	45
	S029	152	169.5	50
	S030	151.5	161	50
	S031	131.5	143	25
	S032	142	154.5	30
	S033	123	133.5	25
	S034	153	163.5	50
	S035	157	173.5	55
	S036	142.5	155	45
	S037	145	156.5	50

Length-Weight Data for Upeneus sulphureus

		Standard length (mm)	Total length (mm)	Weight
31-Jul-02	I001	115.5	128	40
Lumut Malaysia	I002	118	129.5	35
Upeneus	I003	116	130	40
sulphureus	I004	108.5	120	30
	I005	118.5	130.5	25
	I006	110.5	123.5	25
	I007	111	124	25
	I008	121	133.5	30
	I009	109.5	122	20
	I010	138	152.5	50
	I011	118	130.5	25
	I012	120	128	25
	I013	112	124	25
	I014	119	129.5	25
	I015	128.5	141	30
	I016	111.5	124.5	25
	I017	117.5	122	25
	I018	122	134	28
	I019	124	139	30
	I020	122	135.5	25
	I021	121.5	136	30
	I022	115.5	126	25
	I023	117	130	25
	I024	123	136.5	30
	I025	106.5	118.5	23
	I026	128.5	143	30
	I027	130	143.5	45
	I028	113.5	128.5	25
	I029	119	131	25
	I030	129	143.5	30
	I031	127.5	140	30
	I032	120.5	132.5	25
	I033	126	139.5	30
	I034	142	154.5	45
	I035	106.5	116	20
	I036	110	122	25

Table 2