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TRIP REPORT

USAID FISHERIES COOPERATIVE AGREEMENT

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ICMRD

October 19 - November 1, 1986

ECUADOR

This report is a summary of a two week visit to Ecuador made during the period of October 19 to November 1, 1986. The purpose of the visit was severalfold including:

1. To determine research-project potential and capabilities in the area of postharvest fishery losses.
2. Present several seminars at ESPOL in related areas of postharvest fishery losses.
3. To identify possible sources of funding for ICMRD projects in this field.

Summary

Although Ecuador ranks 30th in world fisheries in terms of volume, it has several unique features to the fishing industry that are not found in other Latin American countries. Its geographical location at the concurrence of the cold Humbolt current and warmer Pacific currents provide a rich fishing grounds that at this time may be underexploited in certain species. The periodic effects of El Nino is of world-wide scientific concern and can drastically alter the ecological parameters in the waters off Ecuador accompanied by substantial changes in the fisheries. Also, at present the Ecuadorians are the world leaders in terms of aquaculture shrimp and there has been an recent focus of several international institutions in aiding the country to develop research programs to continue the high level of productivity.

1).The area of postharvest fishery losses (PHFL) is an important one in Ecuador and one in which several areas of research could greatly benefit the country. My two week stay did not permit an extensive review of all aspects of the Ecuadorian fisheries but with the help of the Escuela Superiores Politecnica del Litoral (ESPOL), and especially the director of ocean sciences, Cristobal Mariscal, and professors Miguel Fierro and Bernardo Zapata considerable information was gathered. Regarding PHFL in terms of artesanal fisheries, several observations are immediately forthcoming. In general, there is much room for improvement in the handling of fish as human food throughout the distribution chain. However, it is one thing to teach correct handling methods and another to give the infrastructure so that these methods can be applied. At present there are several groups, national and international, working in Ecuador on artisanal fisheries. ICMRD has recently completed a project with ESPOL regarding artisanal fishery cooperatives. The Overseas Development Agency (ODA) of Great

Britain, principally through the Tropical Research Development Research Institute (TDRI) has been working in cooperation with the Instituto Nacional de Pesca (INP) of Ecuador in several fishery projects such as shrimp culture and the development of products from pelagic fish. Recently, IDRC of Canada is sponsoring a project with Centro de Planificacion y Estudios Sociales (CEPLACES) to do a socio-economic study of the artisanal fishermen and their families. What was obvious in talking to these groups was the fact that there was little communication between investigative agencies and institutions that were doing research in small-scale fisheries and PHFL in Ecuador. To facilitate communication and avoid the duplication of research in this area, it was suggested by myself and Ramon Montano of INP to have a in-country workshop on artisanal fisheries in Ecuador. This will be a small-scale workshop, in a retreat-like atmosphere on the coast for investigators and workers in fisheries to discuss what has been done in the past and what is currently being done now in related fields of small-scale fisheries. In addition to aiding the communication between groups, it is thought that a collective voice of institutions both national and international, will be more effective in obtaining available funds for the infrastructure that is needed to improve the economic situation of the artisanal fisherman in Ecuador. They would like to have the workshop in early February and are asking ICMRD if they can publish the proceedings.

2). One area that is not being investigated by other research groups and is very important in terms of PHFL and a food source for non-coastal people of Ecuador is the shrimp by-catch. There are several important differences in the shrimp by-catch in Ecuador than in several other Latin American countries. The first difference is that it is being used on a regular basis. Another difference is that it is fairly easy to assure freshness of the by-catch because it is being collected daily by smaller collector boats from the large shrimp boats that go out for twenty days at a time. Thirdly, the principle consumers of the by-catch appear to be people, including indigenous Indian groups, that live in the Andean mountain regions. After numerous conversations with owners of the collector boats, shrimp boats, buyers and transporters of the by-catch, the general picture of by-catch use is as follows. Previously, a portion of the by-catch was stored in "tinas" on board for up to ten days in the larger shrimp vessels. These tinas would have refrigerated sea water and the by-catch would be sold to either fish meal plants or fresh fish vendors when the shrimp vessel arrived to port. Between 3-5 years ago a system evolved on its own where smaller boats equipped with 55hp engines would travel out to the shrimp boats and purchase the by-catch from the crew. In Ecuador, it has been the tradition that the shrimp (or at least a large portion of the shrimp) is the property of the captain and owner of the vessel. The fish by-catch that is brought on board is divided among the crew. Therefore we have

a system by which the crew will be more careful of the by-catch in terms of handling it as a commodity with value and, since it is being collected every day, the freshness factor is good. There appears to be more of a tradition in the mountains of eating small fish and therefore the fish species of the by-catch has been more readily accepted than in other areas of Latin America. Furthermore, Ecuador is not a geographically extensive country and there are not many areas which are more than a 10-12 hour drive from the coast. There is much room for research here. What percentage of the catch is now being used, and what percentage is being used for human consumption? Can the distribution and the markets be expanded in the sierras? Furthermore, there are several possibilities in the area of processing, since we can assure ourselves of a reasonable fresh catch. Possible the development of frozen minces is a viable option for several species of the by-catch now captured in Ecuadorian waters.

3). ESPOL has a considerable interest in developing shrimp aquaculture diets. This is due to the importance of aquaculture shrimp to the economy of the country and the fact that they have received federal funding for various aquaculture projects as well as a nearly completed shrimp larval hatchery and laboratory facility. At present the larval artificial diet has a cost of approximately \$70/lb. and there is considerable interest to develop a non-imported diet with raw material from Ecuador. Along these lines I met with the people from NESTLE - Ecuador outside of Quito and in talking about various possibilities of collaboration, we thought that an aquaculture diet program may be possible. Essentially the research project would involve ESPOL and the use of their larval laboratory. ICMRD-URI Food Science department and their expertise in nutrition and biochemical analysis and NESTLE and the use of their pilot plant for studying the physical parameters of the diets, i.e. processing, dispersibility, floatability, pelletization, etc. A project proposal is being written now between ESPOL and ICMRD, requesting financial and technical assistance from NESTLE for the development of the diets.

Further activities included an agreement in the planning of experiments and giving of technical assistance to the ESPOL crab project in terms of processing the crab meat for exportation and domestic consumption. This is a section of the project developed by Joe De Alteris and Cathy Castro with ESPOL in the use of non-exploited natural resources. During my stay, I also presented two seminars, one entitled "The measurement of fish freshness" and the other "The utilization of the shrimp by-catch for human consumption". Attendance at the evaluation of ESPOL projects, various meetings with national and international organizations that have an interest in PHFL in Ecuador, and a meeting with the AID section-Quito was also done.

Trip Report

Michael T. Morrissey
Ecuador Oct.19 - Nov.1 1986

Monday - Oct 19

Eastern flight: Providence-Washington-Miami
Miami-Guayaquil

Essentially, entry into Ecuador is relatively easy, helped by good connecting flights on Eastern. Left Providence at 7:30 AM and had landed Guayaquil at 4:30 PM. On the flight was Steve Olsen from coastal management resources at URI who was traveling to Ecuador for a one year review of the CRM project funded by AID. Their project is a long range goal of setting up management of the coastal zone which is currently heavily exploited due to population centers and shrimp culture. Their short range goals are to improve the survival of post-larval shrimp after capture to assure adequate stocking of the ponds. It appears that the recent decline of the post-larval fisheries is due to a gradual loss of habitat in the mangrove area of Guayas Bay and the possibility of overfishing the larvae which would have a direct effect on the natural stock. Comments made by Steve Olsen included the shrimp by-catch as during the workshop that was held in Guayaquil last summer it was observed by him and others that the catch to effort ratio in terms of shrimp was very low and that there is a tradition of storing and selling the by-catch to help costs, especially in terms of crew payment.

Check in was at the Continental Hotel with a 30% AID discount. Meet that evening briefly with Chris Merschroud and Paul Maugle who are resident in Ecuador on the CRM project.

Monday

The morning hours were spent at orientating myself at ESPOL (Escuela Politecnica del Litoral) meeting with Cristobal Mariscal, director of the school of ocean sciences, Luis Miranda, the head of the food science and technology section and Eduardo Posligua, who is in charge of the handling and processing of crabs in the project with Joe De Alteris and Cathy Castro. The Food Science and Technology division is set up to give technological degree, not a bachelor's degree that we are familiar with in the U.S. Essentially they take three years for formal classroom and laboratory education and another year (taken in sections) of working in the industry. The program appears rigorous and thorough, but if there are weak points it is in the area of basic science to give the students a good background for the more advanced courses and for graduate school for those who wish to attend. At present there is no graduate program in food science at ESPOL which is true of the majority of the other departments as well. The

staff is dedicated and it appears equally split between full time contracted teachers and teachers that work part time given one course or more (in food science the breakdown was 4 full time, 2 half time, 2 parttime). I did not meet any teachers with doctoral degrees in the food sciences and I suspect that the majority of the teachers at ESPOL have bachelor degrees only. This is a critical area that must be addressed if the school is to develop graduate programs in several areas. At present, there are several students attending universities in Canada receiving their master's degree on a 50:50 basis that is, the Canadian government picks up half of the educational costs and ESPOL or Ecuadorian agencies finance the other half. It is strongly felt by several of the ESPOL faculty that if ICMRD-URI wants continued strong ties with ESPOL that some type of similar arrangement should be worked out in the future.

A tour of the facilities was done with Eduardo Posligua and he stated that they have received funding for the crab project, of 6 million sucres (approximately \$40,000) over a two year period through CONUEP a government organization that is in charge of projects at universities throughout the country. It was also stated that a Japanese and American firm have also contacted them about helping the project as they are interested in exportation of crab. I was given a tour of the new research vessel in which they are planning to leave at the end of November to do a biological capture survey in the Guayas Bay of crabs using traps designed by Joe De Alteris. They are equipping a pilot plant for which they receive government funds. At present the plant includes a plate freezer, various autoclave equipment, cold storage rooms (ready to be assembled). In this aspect, they have fairly good equipment to do processing studies on crab meat at ESPOL. To do more sophisticated experiments, especially in marine food processing a good debonner, cutter and basic vacuum packing equipment is needed. This has been asked for, but at present there is no assurance of funding for this equipment.

A possible project was discussed in detail with Bernardo Zapata concerning shrimp diets entitled "Fuentes alternativas de alimento para camarones productivas", for the purpose of producing an adequate diet for shrimp brood stock that they are currently using in the laboratory. What has happened is that ESPOL and Ecuador in general are becoming more and more dependent on foreign imports for their diets for shrimp mariculture which is very costly. There is abundant material in Ecuador to make good shrimp diets but what is lacking at present are investigators who are knowledgeable in shrimp nutrition and food scientist that can properly process the raw material into making high quality shrimp diets. There are good possibilities of research projects in this area.

Cristobal Mariscal has worked out a site visit along the

Ecuadorian coast to give me first hand knowledge of the area to look at possibilities in research in postharvest fishery losses.

Tuesday

Miguel Fierro of ESPOL took me to INP(Instituto Nacional de Pesca) to talk to people about PHFL and the shrimp by-catch. The two Ecuadorian scientists that work on the by-catch at INP had left on a 20 day survey cruise and will not be back by the time I have to leave. It is assumed that they have considerable information about the make-up of the by-catch and what is used and what is thrown overboard.

A meeting was arranged with Ramon Montano from INP who has a project about artesanal fisherman sponsored by CONACyT of Ecuador. In talking with him and Chris Wood from Mision Britanica, it became quickly obvious that various groups are doing research in Ecuador but there is little communication between the groups. During the talks Ramon and I discussed the possibility of having a in-country workshop to gather the various universities and institutions that have an interest in artesanal fisheries and PHFL in a retreat like atmosphere to present work on what has been done and discuss what needs to be done. The more we talked about the idea the more logical it seemed, if for only the purpose of helping communication and preventing the duplication of work. We agreed to follow up on this idea a week from Wednesday at ESPOL to see if we could get a general consensus on when, where and what should be discussed.

A meeting was held with Richard R. Coutts from the Mision Britanica who was aiding the Ecuadorian government as subsecretaria de recursos pesqueros. He was very helpful in giving me information of the history of the British Mission in Ecuador over the last five years and their current activities. Some examples of their past publications are as follows:

The Coastal Artesanal Fisheries of Ecuador and their catches 1982.

La produccion y mercado de pequenos pescados pelagicos salados para consumo en areas rurales.

A brief study of the Ecuadorian Shrimp Industry

Histamine in Dorado

Enriched crackers from fish protein for school aged children

Fishing and utilization of shark in Ecuador

Smoked fish in the Ecuadorian Market

There are also several others. They have done a lot of valuable work and were quite open about their current research activities. Chris Wood is currently developing products from pelagic species such as mackerel and Ian Goulding was attempting to set up a quality control system for the seafood processing industry. They expressed a willingness to participate in a workshop and recognized a need for collaboration rather than competition for research areas in Ecuador.

In the afternoon, I met with Fausto Maldonado, the Ecuador representative to AID, and we discussed the research, funding situation for Ecuador. It appears that there is some funding to be obtained here and there (it tends to free up at the end of the fiscal year in July), but a lot of the money is already projected into the CRM project for the next several years. Fausto was helpful in agreeing to make arrangements for meeting various people in Quito and using AID offices for my needs there. I met with Dr. Maldonado later that evening for supper at the Continental Hotel where we talked principally about the philosophy of education and investigation in Latin America. Dr. Maldonado feels and I concur that there is not a past history of investigative research in Latin America and consequently there is a certain lack of continuity of investigative research, whether this be due to the fact of too few people trying to do too much or lack of good research training for the investigators themselves. It's a complicated situation and one that will take time, dedication and a certain investment of money to accomplish.

Wednesday

In the morning I presented a seminar on "The measurement of fish freshness" for the students and faculty of Food Science and Technology. The seminar was well received and attended by 50-60 persons. A quick meeting was held at INP about the workshop and it was definitely decided to have a meeting at ESPOL when I returned from Quito, a week from today. Arrangements were made with two of the ESPOL faculty members Miguel Fierro and Bernardo Zapata for a four day tour of the coastal area between Playas and Manta to familiarize me with the Ecuadorian situation in fisheries. We left that afternoon at 2 PM.

The coastal area visited was the southwestern Pacific coast of Ecuador between the Gulf of Guayaquil and Manta, approximately 200-250 km of coastline in the provinces of Guayas and Manabi. There is a diverse fisheries with inshore fishing of high quality fish such as pargo, robalo and corvina as well as an established ocean shrimp fleet. Further to the north there appears to be more of a concentration of fisheries for picudo (marlin), dorado and shark. The areas visited were:

Playas	artisanal/shrimp/distribution	Weds. Oct. 22
Santa Rosa	artisanal/distribution	Thurs. Oct. 23
Santa Elena	escuela tecnica	
San Pedro	larval lab/fish processing	
Mangla Alta	escuela tecnica	
Puerta Lopez (PM)	artisanal/pampas/shrimp/distrib.	
Puerta Lopez (AM)	artisanal/distrib.	Fri. Oct. 24
Agua Blanca	archeological site	
Manta (PM)	shrimp/tuna/artisanal	
San Mateo	artisanal	
Manta (AM)	artisanal/processing	Sat. Oct. 25
Jaramijo	artisanal	

What I will do in the next section is give a brief description of each location.

Wednesday

At the port of Playas there is a variety of fishing types and crafts. The most primitive are the sailing balsa boats rafts from which fishermen go for pescado blanco with line and hook. It is very picturesque artisanal fisheries. They use three lines (one in each hand, and one tied around the ankle) and were fishing at this time for corvina, viejas and pargo. They are truly subsistence fishermen in the sense that their catch is never that great and at times is nonexistent. It is more a way of life for these fishermen, and one that will probably disappear with the economic advances that will come in the other fisheries. If there is a study here, one would think that it would be a socio-economic one in that sense that when changes occur of their own accord, it will be interesting to see if these fishermen and their families actually improve in their standard of living.

The local market on the beach consisted of small stands selling everything from large corvina and pargo to small by-catch. Ice was not being used in the selling of the fish and is probably never used even during their summer season when temperatures reach over 30 C. The evisceration of fish is variable with a tendency of the larger fish being eviscerated and the smaller ones (less than one kilo) not. One couldn't tell whether this was species, size, or vender specific in the treatment of the fish. The higher priced marketable fish that was being transported to Guayaquil was packed in ice, alternating layers of fish with layers of ice. The smaller fish which was said to be shrimp by-catch was randomly piled into the back of the truck about two feet deep and a layer of ice was placed on top. There was no attempt to separate the fish by species. The by-catch and the shrimp are unloaded by 0.5 meter high steel drums (appear to be oil-drum ends) which should certainly accelerate oxidative spoilage and cross contamination. These hold about 90 lbs. of fish per drum, a

little less for shrimp.

There is no ice plant in Playas and the majority of the ice that is used in transporting the fish is brought in from Guayaquil. In general, it is packed in sawdust for the trip out, then it is washed, and broken into irregular smaller pieces with a paddle. One obvious help would be to have an automatic ice chopper that would finely grind the ice and assure better distribution of the ice among the fish.

Thursday

In Santa Rosa we stopped at the pesca artisanal terminal, which was helped financed by FAO. There is a series of processing and selling stores that are nicely constructed but of varying cleanliness. At that time in the morning the shark fishermen had returned and were eviscerating in the small area by the sea wall. It was very unsanitary as there were dogs and a multitude of seabirds as well as eviscera from the previous days' catch. These fishermen were selling directly to middlemen who had their trucks parked along the road and not to smaller distributing houses. It would be interesting to see to what extent these distributing houses are being used to pretreat the fish, pack them in ice and sell the fish, or are they mainly non-functional and the fishermen primarily selling to "intermediarios" who come in their trucks. To me it was interesting in the sense that an attempt to build an infrastructure failed in the sense that the first important step in fish handling, that is when the boats get to the beach for evisceration of the fish is done in the most unasanitary conditions this author has seen in a while, which will greatly affect the quality of the fish all the way down the line of distribution. Santa Rosa needs a bit more infrastructure in terms of landing spots for boats and facilities that are used for evisceration and cleaning of the fish. We also observed unloading of sardine like fish (pincheguilla) and was fascinating from a sociological standpoint as there is a large number of people being employed transferring the fish from a collector boat to the truck. This fish is used primarily for fish meal.

A visit was made to Santa Elena a technical school set up for high school level education with a strong emphasis toward fisheries. Again we find a dedicated staff in a fairly modern facility but with little equipment for fisheries technology training. ESPOL should work closely with these schools to give assistance especially in "show and tell" workshops to give the students a hands on experience of fishery technology.

Tour of ESPOL larvae laboratory at San Pedro. An impressive facility and one where experiments on shrimp diets would be welcomed as they stated that the cost of the Belgium shrimp maturation diet is 10,000 sucres/lb. (\$70/lb.). Next door we visited a processing facility CESA, built by a Chilean

technology that dealt with processing fillets of fish by freezing in 5 kg. blocks. They do their freezing in cold storage rooms and not by separate equipment such as plate or blast freezers which would give better quality. They have three cold rooms of 80, 40 and 20 ton capacity and do all their freezing in plastic baskets. However, they were not processing any fish at the moment even though it was the middle of the dorado season and literally tons of dorado are being caught further up the coast near Manta. A good plant in an excellent location but not being used. The question is why not?

Visited a technical school in Mangla Alta which essentially has the same problems as the one in Santa Elena - need more technical assistance especially with fishery equipment.

Visited Puerto Lopez in the evening and the following morning. In the evening we visited the pampa of Hugo Gomez on the outskirts of Puerto Lopez. They make fish meal in very rudimentary conditions, cooking the fish in the open in halfed oil drums with charcoal fires and then drying the fish on cement floors exposed to the elements. In talking to the workers the drying could take one to seven days depending on the weather. The fish meal is stored in a shed and sprayed with an insecticide REDOX (don't know the ingredients). The majority of the fish meal is sold as balanceado-for chicken feed that is mixed with other protein sources. On the beach that evening, we talked with people who were bringing in the by-catch from boats that were 20 km off-shore. It was a common practice that they did 3-5 days a week and sold the by-catch to intermediarios on the beach. They had agreements with several boats and would meet at prearranged locations up to 20 miles off-shore. They had a good boat, were in their early 20's and looked satisfied with the business. In talking to a truck owner (40 ton truck), he would buy the by-catch 3-4 times a week in a canvass-covered truck, load the truck (this case about 1/3 full) throw in ice on top and his destination are specific mayero markets in the Sierras principally Quito and Riobamba. He uses ice for the 10-12 hour trip. The launches that bring in the catch from the shrimp boats apparently do not. He made a comment that when the market prices are low, the shrimpers store the best of the by-catch in tinajas, refrigerated sea water bins, on board for several days until the market adjusts itself.

Friday

The following morning there was artisanal catch of pargo, with buying and selling on the beach. All seemed amiable and there was several buyers around, including Hugo Gomez. He is a fish entrepreneur in that he has 3 sardine boats and several large trucks for transportation as well as his pampa fish meal operation. He says that his main complaint is trying to get loans from the banks to finance operations, they are reluctant to give loans to fishermen, even

successful one like him, and at times ask for a 10% cut for themselves in order to get the loan. He presented us with a 4 kilo pargo which we had prepared at a local restaurant-great Friday

After Puerto Lopez, we took a tour of the archeological site at Agua Blanca., shown to us by a doctoral thesis student from the University of Illinois (Collin McGowan from Scotland).

At Manta we ran into some interference with the feast day celebrations of the city. What this meant was that many fishermen were taking part in the activities of the festival and not fishing. A quick trip was made to San Mateo about 20 km south of Manta and the fishermen of this community (3-4000 inhabitants) were bringing in a haul of picudo (marlin), dorado, and sea turtle. Of the approximately 20 fishermen on the beach, there was 7-10 tons of fish. To me it looked like a very good catch and the size of the fish was impressive. There were marlin between 500-700 pounds in size and dorado up to eighty pounds. We estimated that there was 50-70 sea turtles slowly expiring in the back of a pick-up truck. Checking later in Guayaquil, the capture and processing of sea turtles is illegal in Ecuador. The processing of the larger fish took place on the beach, mainly evisceration and division of the marlin into 100 pound pieces. The majority of the marlin was transported in trucks, some with ice some without as was the dorado, but we also observed dorado being transported to Manta in the back of a municipal bus along with the luggage. The British have done a good study with the problem of mistreating dorado for export purposes in Ecuador concerning problems with high histamine counts.

In Manta the following morning the same scene was repeated with a very good catch of marlin, dorado, thresher shark and some tuna and turtles. Evisceration took place on the beach and it was interesting to note the division of labor for the hour that we were there. There were the fishermen that brought the fish in; cargadores who took the fish from the boats to the beach; A group of workers eviscerated the fish and young who boys scooped up the eviscera and piled it together 100 meters inland. This was later picked up by a municipal dump truck and the beaches were kept clean. Also the cargadores brought the large pieces of marlin and dorado to the trucks and finally we have the truck drivers themselves who may or may not be the truck owners. This division of labor is noted to call to mind that if recommendations are made for improvement of infrastructure, we need to be careful how this will effect the employment of several groups of people.

A final visit was made to Jaramijo, a small fishing community to the north of Manta. Because of the festivities the fishing activity was low. They had pulled in a haul of sardine that they were expertly filleting and salting done primarily to

use as bait for sharks, marlin and dorado. They were very efficient in this process and one couldn't help but wonder if a similar process couldn't be set up for sardine or mackerel for human consumption. A visit was also made to a modern processing plant, Empresa COMARSA, that dealt mainly with shrimp and larger varieties of fresh fish. All in all a very clean operation as they are dealing with products for export, although a good portion of the fish is sold locally. A good example of how a good processing plant can be run.

Sunday

Travel to Quito

Spent some time in the local market and there was selling of fish in the street. It seemed very expensive and was of poor quality. It was a smaller species of fish and appeared to be the by-catch. It would make an interesting study to see the consumption of fish in the the sierra region of Quito. In talking to taxi drivers , there was a greater consumption in the coastal area than in the mountainous area and the big reason seemed to be availability and price. Fish being more expensive than meat in the sierras and about the same price as meat in the coastal area. In general, one can say that in the coast there is a greater consumption and the tendency is to eat large fish of higher quality (corvina, robalo, pargo), while in the mountainous areas there is considerable less consumption of fish and it is more of the smaller species (by-catch, juveniles).

Monday

Visited with Fausto Maldonado of USAID and spent almost two hours discussing the Ecuadorian situation. Essentially USAID Mission of Ecuador is being cut in funds and it will be very difficult to secure funds for research projects this year. There may be some freeing up of some monies at the end of the fiscal year but the ideal thing would be to tie in several groups together to do a project.

Visited with Dra. Wilma Fviere of CONADE who is a part of the Secretaria de Salud. She is finishing up on a NSF grant on a health study in Ecuador with special emphasis on iron deficiencies. She reports that, although there does not appear to be any marked cases of iron deficiencies, there is a 50% incidence of less than adequate levels of iron in the blood in the 220 pregnant women studied. She was interested in the utilization of fish in order to increase the iron and protein in the diet for low income peoples in Ecuador. Would make available her data to help us write project proposals if we so wish.

Tuesday

Visited the NESTLE research laboratories and toured the facilities and talked with Christian Wahli about the possibility of doing research projects in cooperation. One possible project is the study of dietary habits of the people

in terms of fish and fishery products. It appears that NESTLE has done a large project in the dietary habits of Ecuadorians but has not looked into the role of fish in the diets. Another project that came up was the possible coordination of a shrimp diet project between ICMRD, ESPOL and NESLTE. Essentially, ICMRD would be given technical assistance in terms of shrimp nutrition and formulation, ESPOL would supply the laboratories facilities and expertise in evaluation diet-growth parameters and NESTLE be in charge of the physical parameters of the diets. Ideally, diets would be formulated for larval, fattening and reproduction stages of the shrimp life-cycle.

A meeting was held with CEPLAES (Centro de Planificacion y Estudios Sociales). They have recently received a grant from IDRC of Canada to do the socio-economic study of artisanal fishermen in Ecuador. They are a young and active group and are interested in attending whatever workshop we can set-up on artisanal fishermen and PHFL's

Wednesday

Early morning flight back to Guayaquil
Meeting with Cristobal Mariscal of ESPOL, Ramon Montano of IPN and Cris Wood of Mision Britanica concerning the possibility of the workshop. Essentially, everyone is in favor of the workshop and ESPOL has suggested that they use their coastal facility at Valdivia to have the workshop. What is wanted from ICMRD is funds to publish the workshop. I essentially told them that I would get back to them at the end of November concerning the funds for publication or we may be able to publish the proceedings here at ICMRD.

A schedule of presentations was worked out in the afternoon. It would be a four day conference: day one is socio-cultural effects; day 2 economic effects and day three would be technological aspects of artesanal fisheries. The final day would be set aside for developing guidelines for needed research or infrastructure requests.

Afternoon visit at ESPOL to visit the exposition of projects. Cathy and Joe's project about crab capture was well presented and had a lot of interest.

Thursday

Meeting with Bernado Zapata to discuss the shrimp diet project. It has a go for write from ESPOL. Meeting with the crab project people to talk about coordination of research regarding crab processing.

Presented seminar on the use of the shrimp by-catch for human consumption. It was a well attended seminar and there was considerable interest among the ESPOL faculty and students regarding possibilities of the by-catch for human consumption.

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Meeting with Cris Merschroud, CRM in country person. Just gave a general review of my two week stay. It appears to me that CRM is fairly wrapped up in their own project and there isn't much time or money in CRM to help ICMRD projects. They will help when they can, but they need to look to their own project first.

Evening dinner dance with ESPOL professors for the occasion of the anniversary of the school.

Friday

Visited the main fish market in Guayaquil and it is as bad as everyone says it is. It supposedly is the "modern" market, but it is one of the worse that I have seen. There is little use of ice (the ice that is used is for storing the unsold fish overnight), random evisceration and the contamination is at a high level. The stench is very strong and one has to think about throwing one's sneakers away as you can't get rid of the smell once you leave. It is amazing to one who has seen the potential of artisanal and commercial fisheries in Ecuador - a relatively healthy situation, to come across such a bottleneck in the sense that if there is a drastic fall in quality throughout the distribution line, one would have to think that it occurs here. An infrastructure of quality control is certainly lacking at important distribution links in Ecuador.

Final meetings with IPN and TDRI and ESPOL people to firm up workshop and research ideas developed in my stay in Ecuador.

Linkages

AID	Fausto Maldonado
ESPOL	Cristobal Mariscal Luis Miranda Miguel Fierro Bernado Zapata Eduardo Posligua
INP	Ramon Montano
Mision Britanica	Richard Coutts Cris Wood Ian Goulding
CEPLAES	Mercedes Prieto
CONADE	Dra. Wilma Fviere
NESTLE	Christian Wahli