CONFLICTING AGENDAS FOR MANGROVE WETLANDS IN YUCATÁN, MEXICO

Working Paper

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INTRODUCTION

Complex environmental and natural resources, such as the Yucatán's mangrove wetlands, represent substantial sources of cultural, intergenerational, environmental, and economic wealth (Aylward and Barbier 1992). The failure to properly account for the total value of environmental and natural resources results in socially undesirable overexploitation and degradation of complex ecosystems such as mangrove wetlands (Clark 1996). Nonmarket valuation methods, including contingent valuation, provide promising means for accounting for economic values associated with environmental and natural resources. However, the availability of valuation methods for determining relative economic values associated with natural resources is insufficient alone for resolving conflicting resource management agendas.

This paper reports on some conflicting resource agendas learned by researchers in the coastal mangrove ecosystem known as the Yucalpetén Estuary or Chelém Lagoon (See **Error! Reference source not found.** and **Error! Reference source not found.**). These conflicting uses and visions for the shared wetland were not readily apparent during initial key person interviews with regional leaders, community members, and academics. The reported findings highlight the benefits of using qualitative methods for learning from local beneficiaries how they use, perceive, and value environmental and natural resources. The data also point out that focus groups result in researchers learning different and often complementary information to that learned using individual interviews.

The reported research was undertaken as part of a process to evaluate the usefulness of qualitative research methods for investigating the viability and appropriateness of nonmarket valuation studies in developing countries. The project collected data on how local beneficiaries use, view, and value a local, shared mangrove ecosystem using key person interviews, structured group discussions (focus groups), and individual qualitative interviews (in-depth interviews).

The research design employed by the researchers enabled them to compare and analyze the data collected across both methods and communities (See **Error! Reference source not found.**). The work builds upon recommendations made by the National Oceanic and Atmospheric Administration (NOAA) panel on the contingent valuation method (Arrow et al. 1993) and used the two qualitative research methods as a priori evaluation tools of respondents' (1) familiarity with the environmental goods and services being investigated and (2) ability to make budget-constrained choices. The researcher was originally intended to help assess whether local beneficiaries could: (1) meaningfully participate in a nonmarket valuation study; (2) specify and describe those mangrove resource services that were important to them; and (3) help researchers identify important valuation study specification and design elements.

The researchers conducted focus groups and individual interviews using an interview/discussion guide based, in part, on economic theory, scientific information about mangrove ecosystems, and the NOAA panel recommendations. In keeping with accepted qualitative research practice, researchers used pauses and non-directive probes to encourage respondents to elaborate and further discuss their uses, perceptions, and understanding of the mangrove ecosystem. More than 500 pages of transcripts were collected from 12 group discussions and 19 individual interviews conducted in the villages of Chelém and Chuburná.

The data analysis process involved several steps of coding and analysis (See **Error! Reference source not found.**). After the qualitative data were collected and transcribed, the transcripts were systematically coded using an iterative, grounded-theory approach (Strauss and

Corbin 1990). The coded transcripts were then statistically analyzed (Krippendorff 1980). The coding and statistical analysis of the data allowed researchers to test various working and research hypotheses. An analysis of the frequencies of various codes and their cross-tabulations demonstrates that, among other things, (1) using qualitative research methods can reveal important information for designing and implementing nonmarket valuation studies; (2) the group discussions and individual interviews appear to yield complementary, not substitute, sets of information; and (3) that resource agendas for the shared environmental asset differed within and among local beneficiaries.

A report on the study's findings of particular relevance to resource economists, including the usefulness of adopting a total valuation framework for valuation study design, was recently presented at the World Congress of Environmental and Resource Economists in Venice, Italy (Kaplowitz and Hoehn 1998). This paper focuses on some insights into existing socio-economic conflicts over the shared Yucatecan mangrove ecosystem that were learned using the two qualitative methods.

BACKGROUND & FRAMEWORK

RESEARCH SITE

Mexico's Yucatán peninsula supports abundant biological diversity and a predominantly Maya population. Areas throughout the peninsula have been designated as archeological and ecological parks, including several Special Biosphere Reserves (Pronatura - Peninsula de Yucatán 1991-1994; Pronatura-Peninsula de Yucatán 1994). The United Nations Educational, Scientific, and Cultural Organization [UNESCO] designates Special Biosphere Reserves to protect natural areas and to accommodate local inhabitants (Clark 1996). Two such reserves— Celestún and Rio Lagartos—have been established in the State of Yucatán in an attempt to preserve the characteristic transition zone between land and sea, and to protect endangered and diverse species.

However, most of the Yucatán Peninsula's coastal resources and inhabitants are not part of a systematic state, federal, or non-governmental environmental protection or resource management scheme. This is not unusual, for probably less than 1% of the world's mangrove resources have official protection status (Hamilton and Snedaker 1984). Like elsewhere, the Yucatán's coastal environmental and natural resources are increasingly relied upon and exploited by local populations for subsistence, by business interests for commercial activity, by various groups for garbage dumps, and by developers for building sites.

YUCALPETÉN ESTUARY

Chelém Lagoon [*Laguna de Chelém*] is one of many names for part of the coastal mangrove ecosystem that Mexican geological maps label as the Yucalpetén Estuary [*Estero Yucalpetén*] (See **Error! Reference source not found.**). The Yucalpetén Estuary ecosystem extends westerly from the port city of Progresso in Yucatán. Three year-round communities are located along the approximately 15 kilometer stretch of coastline that borders Chelém Lagoon— Chuburná, Chelém, and Progresso. Chelém and Chuburná are small fishing communities with about 400 and 200 households respectively, while Progresso is a medium-sized port city with approximately 5000 households (Instituto Nacional de Estadística 1992).

Fishing seems to dominate the local economies. Progresso's economic base rests on commercial fishing, fish processing, and other activities centered on the Gulf of Mexico and the city's deep water wharf (Paré and Fraga. 1994). Chelém and Chuburná are on the coastal fringe, on one side of the fringe there is the Gulf of Mexico and on the other side is the lagoon or wetland. Traditionally, these communities have relied upon a combination of activities for their subsistence and economic gain. These communities have been able to survive long periods (November to March) of seasonal bad weather [*nortes*] by developing a multiple use and activity strategy of combining fishing in the sea and lagoons, small scale salt extraction, agriculture, and tourism activities (Paré and Fraga. 1994).

The study focused on the year-round mangrove wetland resource beneficiaries of Chelém and Chuburná. These communities share similar socioeconomic compositions and they both have close relationships with the use and enjoyment of the coastal mangrove ecosystem. Both these villages have a history of relying on nature resources for their livelihood. They have also adapted to successive changes in their natural resource base over time.

CHANGES IN CHELÉM LAGOON

At one time, Chelém was a fishing village that looked to the Gulf of Mexico as its primary source of living while the people of Chuburná focused on a thriving salt extraction business that relied upon the creation of man-made saltwater ponds in the Yucalpetén Estuary. Beginning in the 1970s, the Yucatecan coast began to receive attention as one avenue for Mexican economic development. The coastal resources were seen as a way to absorb excess labor from the interior of the state and as a good place for national investment (Paré and Fraga. 1994). A five step stragety was adopted by the Mexican government: (1) construction of Yucalpetén's safe (sheltered) harbor [*puerto de abrigo*], (2) development of a seafood industry infrastructure, (3) construction of a paved network of roadways, (4) construction of an industrial corridor between Mérida and Progresso, and (5) the development of tourism. These projects substantially modified the coast's population and ecological dynamics.

The first major change was the Mexican government's dredgeding out a *puerto de abrigo* in Chelém Lagoon in the early 1970s. The harbor was designed to protect and promote commercial fishing fleets as well as house an outpost of the Mexican Navy. The construction of the harbor did however result in the loss of the wetland as a salt extraction site. In reaction to these changes, the people of Chuburná, like Chelém, increasingly turned to and relied upon fishing in the Gulf, weather permitting, for their livelihood.

In 1988, Hurricane Gilbert [*Gilberto*] opened a break in the coastal fringe near Chuburná that allowed seawater, marine life, fish fry, and larvae to circulate throughout Chelém Lagoon. The sudden inundation of seawater into the area further flooded the former salt flats and low lands. After an initial period of biological adaptation, one result of the hurricane's puncture of the coastal barrier was a dramatic increase in the estuary of marine life. People from both villages, as well as the city of Progresso, increasingly turned to fishing and shellfish collection in the lagoon for their livelihood and subsistence.

The construction of a Ducks Unlimited of Mexico, America, and Canada [DUMAC] dike project [*bordo*] to preserve duck habitat in the mid-1990s once again changed the region's natural resource conditions. The DUMAC project, designed to preserve duck habitat for wintering migratory species, built a dike at the Hurricane Gilbert created coastal break near Chuburná. The dike effectively cut off seawater incursion into the lagoon and the circulatory

flow of marine life in the lagoon. The DUMAC project has been blamed for the diminished the vitality of the lagoon as a fishing resource.

The villagers of both Chelém and Chuburná as well as many people in Progresso now face the dual difficulty of increasing fishing pressure in their coastal fishery and a diminution of the viability of the lagoon fishery. For not only are more people trying to provide for their families with nearshore coastal fishing, but there has also been an increase in commercial trawler fleet [*rastreros*] activity in the near-by waters of the Gulf of Mexico (Dr. Eduardo Batllori San Pedro, conversation with author, Mérida, Mex., 11 July 1996). These ecological and human changes have directly and indirectly impacted the use, productivity, and health of Chelém's mangrove wetland.

Increased off-shore fishing pressure has made it increasingly difficult for the villagers of Chelém and Chuburná to provide for their families from their traditional use of artesanal fishing (i.e., seasonal, small boat, nearshore fishing). These villages have, when possible, begun to heavily rely upon Chelém Lagoon as a primary source of subsistence activities. Unfortunately, the lagoon does not seem easily capable of accommodating the recent changes and increasing demands. Villagers, researchers, and government officials alike report the decreasing levels of fish and shellfish populations in Chelém Lagoon (e.g. Batllori San Pedro 1996; Euán 1997) and (Municipality President Raul Lada, personal conversation, Progresso, Mex., July 1996)

Another change in Chelém's coastal land use patterns is the growth of seasonal inhabitants. According to Paré and Fraga (1994) there are increasing numbers of people who migrate to the coast to fish during the lucrative fishing seasons, increasing numbers of people who move to the coast out of a year-round subsistence strategy, and finally an increasing population of seasonal vacationers. Increasingly, middle and upper-class families from the state capital of Mérida and elsewhere are buying, building, and renting homes along the Chelém coastline for use during July and August. These seasonal inhabitants, whether categorized as tourists or not, seem primarily attracted to and interested in homes and activities oriented towards the Gulf of Mexico. That is, they build homes, consume seafood, and throw away their garbage apparently with little knowledge of and regard for Chelém Lagoon, the mangrove ecosystem, and the local year-round

Lack of Alternatives

Socioeconomic pressures in Mexico have, among other things, resulted in increasing numbers of people migrating to Progresso in search of work and a way to feed their families (Paré and Fraga. 1994). The inhabitants of the Chelém Lagoon area have experienced the fallout of the downfall of Mexico's henequen industry, governmental efforts to promote coastal migration and commercial fishing, and various infrastructure projects. Most of the families that have moved from the interior of the country to the Yucatecan coast have settled in Progresso. The population growth in Progresso has resulted in an expanding urban fringe. Despite an absence of municipal water and sewer services and the constant threat of flooding, families are choosing to build cardboard and corrugated metal homes on land "reclaimed" from the mangrove wetland. One of the reasons for this unhealthy and damaging (to the ecosystem) phenomenon is Mexico's property rights law. People believe that by "squatting" and building on untitled land that they will one day be able to claim title to "their" property.

Those families that have migrated to the villages of Chelém and Chuburná appear to have been welcomed and easily accommodated. There seems to be an understanding and acceptance in these communities that these newcomers are simply seeking means to feed their families. At

the same time, middle and upper class people from Mérida and elsewhere are buying, building, and renting beachfront vacation houses along the Progresso area coastline in and around Chelém and Chuburná for use during July and August. Unfortunately, Chelém Lagoon's mangrove ecosystem does not seem capable of accommodating and sustaining the increasing demands on it (Batllori San Pedro 1996; Euán 1997) and (Municipality President Raul Lada, personal conversation, Progresso, Mex., July 1996).

Alternative economic opportunities, those not based upon local natural resources, are limited for the villagers of Chelém and Chuburná. While residents of Progresso have easier access to factory work in Progresso and Mérida. Individuals from the coastal villages face time consuming and unreliable public transportation to factory jobs many kilometers away. Often, these jobs are not available, are not steady, and only pay a minimum wage of 15 pesos per day (about $2). Furthermore, factory employees must pay for the cost of their own transportation as well as their meals.

Because this coastal area is also a seasonal resort area for primarily Mexican vacationers from Mérida, there is some seasonal, tourist-related work. The villagers in Chelém and Chuburná can and do supplement their livelihoods by working in restaurants and servicing tourists' homes during the one to two months of the vacation season (July and August). However, the two villages, by and large, still rely upon their natural resource base for their subsistence. The Chelém Lagoon has been and remains a central part of the economic, cultural, and social fabric of these two villages. Community members annually participate in religious boat processions around the lagoon. Villagers regularly admire the flamingoes and endangered turtles that occasionally inhabit the mangrove wetland. And, these two communities increasingly rely upon the lagoon's bounty to feed their families.

MANGROVE WETLANDS

The term mangrove refers to a number of tree species capable of living in saltwater or salty soils. Mangroves and their ecosystems are found in intertidal areas of sheltered coastlines called lagoons and estuaries. Ecologically, mangrove wetlands maintain high levels of biological productivity; export nutrients to outside waters; and provide habitat for valuable plant and animal species (Clark 1996). Mangrove ecosystems are also important to the subsistence livelihood of tropical coastal communities (Hamilton, Dixon, and Owen Miller 1989). Mangrove ecosystems provide an array of important services—prevention of storm damage, flood and water control, support of fisheries, waste absorption, recreation, and transport. Furthermore, they can also be directly exploited for goods such as fish, agriculture, wildlife, wood, and fresh water (Aylward and Barbier 1992).

Wetland ecosystems, like the mangroves of Chelém, account for about 6% of the global land area and are among the most threatened of all environmental resources (Turner 1991). The tropical wetland resources of developing countries are undergoing increasing change as a result of improved access to wetland zones and the pressures of population growth and economic development. Overuse including overfishing and overgrazing degrades developing and newly industrialized countries' wetlands. Recent studies across the developing regions of the world have suggested that healthy tropical wetland systems have a crucial role to play in these regions' economic development (Barbier 1994). There is a growing awareness that wetlands in developing countries are more valuable economic resources when retained in their natural or semi-natural state rather then they are converted or degraded. Conversion or degradation of such natural assets often does not represent an efficient and wise use of such limited resources.

Researchers have calculated that 80-90% of the commercial fisheries in the Gulf of Mexico are dependent on mangrove ecosystems (Hamilton, Dixon, and Owen Miller 1989). Coastal waters and their fisheries are enriched by the export of decomposable organic material and its decomposition. Mangrove wetlands are the primary source of the raw, organic material that becomes the critical food base for the crustaceans, mollusks, and fish of the coastal waters and fisheries. The coastal zone, its mangrove wetlands and salt marshes, is the site of important physicochemical reactions between saltwater and freshwater flows. Such a zone is an area of the "highest biological productivity" (Turner 1991 , 61).

ECONOMIC VALUE OF MANGROVES

Mangrove resource beneficiaries may derive direct consumptive benefits from fishing and wood collection; they may derive nonconsumptive benefits from birdwatching and tourism; they may benefit indirectly from the flow of ecological services from mangroves such as fishery support; and they may derive nonuse benefits from the continued existence and biodiversity of the mangrove resource (Hamilton, Dixon, and Owen Miller 1989). Natural resources such as mangrove wetlands represent a significant portion of Mexico's and other developing countries' cultural, intergenerational, environmental, and economic wealth (Munasinghe 1993). Additionally, the Yucatán's mangrove wetlands, like those worldwide, tend to be open access, common property resources that do not lend themselves to straightforward traditional regulatory, management, and market-based analysis (Clark 1996).

As Smith (1993) points out, it is no wonder that the increasing loss of environmental and natural resources makes those remaining resources even more valuable.

> [I]ndustrialized societies, as well as developing economies, are transforming regional environments on an unprecedented scale. Environmental resources are increasingly recognized as assets providing services that are no longer readily available. Indeed, demands to measure their values and incorporate them into our decisions is precisely what we would expect as their scarcity increases. (Smith 1993, 1)

The economic value of wetland ecosystems is a function of the connections between the ecosystem and people (Costanza, Farber, and Maxwell. 1989; Costanza et al. 1998). The economic value of ecosystems is connected to their physical, chemical, and biological role in the overall system, whether the public fully recognizes that role or not. However, in their study of the economic value of wetlands, Costanza, Farber, and Maxwell estimate values for the resource's commercial fishing, recreation, storm protection, and waste treatment benefits. They do not as part of their analysis place values on nonuse values such as the existence and option value of the wetlands. The importance of mangroves as supportive of fisheries and as per se fish habitats is becoming well established in some regions of the world, including Mexico and the Caribbean (Yáñez-Arancibia and Day 1988).

While some of the economic value of mangrove ecosystems may be measured in terms of marketed products, the "free" or nonmarket goods and services provided by mangrove ecosystems are more difficult to measure. As a result, governmental and other decision-making processes which do not account for all of the values associated with mangrove resources significantly understate mangrove resources' total value (Hamilton and Snedaker 1984; Clark 1996). The complexity of mangrove resources and the absence of well-defined and readily available markets for mangrove resource benefits necessitate the use of nonmarket valuation

methods for approximating their economic value. Mangrove wetlands provide individuals and groups with a range of benefits and services. Some of these benefits include: (1) extractive benefits of natural resources such as fishing and hunting, (2) indirect benefits like fishery support, and (3) non-extractive benefits such as birdwatching, hiking, and tourism. Accurate valuation of mangrove ecosystems depends on adequately accounting for all the sources of social benefits of and flowing from the resource—total economic value (See **Error! Reference source not found.**). Some form of nonmarket economic valuation is required to help make consistent choices between mangrove wetland conservation, preservation, and development decisions (Barbier 1994).

The valuation of the noncommercial uses of the wetlands by local populations is critical in determining the economic value of developing and newly industrialized country tropical wetlands. The failure to account for all sources of wetland value explains policy decisions that result in the overexploitation or excessive degradation of tropical wetland systems. Barbier (1994) asserts that when properly measuring the total economic value of a wetland's ecological functions, its services and its resources often exceed the gains of converting the area to an alternative use.

MEXICAN MANGROVE RESEARCH

Researchers in Mexico have begun to study the dynamics of the Yucatán's coastal resources and communities (e.g. Yáñez-Arancibia and Day 1988; Batllori San Pedro 1996; Euán 1997). Some researchers assert that the ongoing deterioration of the Yucatán's coastal mangrove resources are a result of: (1) market failures for the ecosystem's assets and services; (2) the failure to properly value the costs and benefits associated with mangrove resource goods and services; (3) the open access nature of the resource; and (4) the high costs of information and enforcement (Seijo et al. 1995). Researchers increasingly recognize the need to properly estimate and account for the economic values of the Yucatán's coastal resources. Furthermore, they recognize the important role that nonmarket valuation, including contingent valuation, may play in helping to derive accurate estimates of the value that mangrove wetlands represent.

Paré and Fraga, in their work 1994 entitled *La Costa de Yucatán: Desarrollo y Vulnerabilidad Ambiental* [The Yucatecan Coast: Development and Environmental Vulnerability], investigate two lines of research to analyze the social impacts and uses of the Yucatecan coastal resources. They look at the history of the region as well as the nature and structure of the resource use conflicts of the area. Their anthropological approach tries to develop an understanding of the relations and the dynamics of the various stakeholders, policymakers, and others in the area. Paré and Fraga (1994) ultimately offer a reference mark for other researchers studying this area. They leave unanswered the question of how to meet the goal of the compatible development of tourism, fishing, urbanization and industrialization of the Yucatán's tropical coast and its complex ecosystems.

In an effort to protect coastal resources and promote sustainable development, Mexico's environmental protection agency—Secretaría del Medio Ambiente, Recursos Naturales, y Pesca [SEMARNAP]—has begun a process to systematically evaluate the peninsula's coastal communities (Hernandez-Flores 1995). A SEMARNAP project to systematically evaluate the peninsula's coastal communities and resources by Mexico's environmental protection agency has been designed to:

> assess the total economic value of resources associated to the communities, considering that nature [sic] value is divided into three categories: use value,

existence value, and ecological service value....[and use the] contingent
valuation method to determine "willingness to pay" from fishermen and other
people from the community. (Hernandez-Flores 1995, 5).

Because of the absence of well-functioning markets for coastal resources, Mexican
researchers have begun to incorporate nonmarket valuation methods in their studies of Yucatecan
coastal resources. Researchers at CINVESTAV, the research institute and graduate school of
México's Instituto Politécnico Nacional's [IPN], recently conducted a pilot project examining
the economic value of Campeche's coastal mangrove wetlands(Seijo et al. 1995). Seijo et al.
administered a questionnaire including a WTP question to inhabitants of Isla del Carmen in
Campeche. Despite some difficulties, including problems associated with asking poor people
about monetary values and a distrust of governmental programs, Seijo et al.'s work helped to
generate some measure of mangrove ecosystem nonmarket economic value (Juan Carlos Seijo,
Jorge Eúan, Miguel Cabrera, and Eduardo Perez, personal conversations, Nov. 1995 and Jan.
1996). The challenge remains to incorporate and validate the methodological advances typified
by NOAA (1993), Hoehn and Krieger (1995), and Carson et al. (1994) in CV studies in
developing countries.

QUALITATIVE METHODS AND NONMARKET VALUATION

Design procedures of nonmarket valuation studies, including contingent valuation, are as varied
and divergent as the practitioners conducting such studies. Valuation study design efforts range
from visiting research sites with instruments that have been constructed elsewhere to intensive
(and expensive) iterative use of site visits, key-person interviews, focus groups, debriefing
questions, pretests, instrument rewrites, and retests (e.g., Carson et al. 1994a; Hoehn and Krieger
1994). Largely, the process of nonmarket valuation problem conceptualization, questionnaire
design, and study implementation remains a function of the creativity, individuality, and
judgement of practitioners.

The development and use of useful tools for conceptualizing and designing nonmarket
studies can lead to better, more transparent, and, hopefully, less expensive research. Qualitative
research methods offer a promising set of tools for designing better nonmarket valuation studies.
As V. Kerry Smith pointed out that,

studies highlight…how important qualitative analysis of people's perceptions
of the problem can be to the framing of the commodity…. [U]nderstanding
how people perceive environmental commodities is essential for obtaining
plausible responses to any questions asked of them. (1993 17-18).

Economic literature and valuation reports occasionally refer to the use of focus group interviews
and other qualitative methods for help framing resource issues, defining terms, and drafting
questionnaires (e.g., Arrow et al. 1993; Boyle et al. 1994; Carson et al. 1994a). Increasingly,
social scientists in diverse fields of study use qualitative methods as comprehensive research
tools and as important components in designing and implementing reliable research studies (e.g.,
Krueger 1994; Weiss 1994; Sudman and Schwarz. 1996; Morgan 1997; Schwarz 1997).
Mitchell and Carson (1989) specifically directed researchers to consider using focus group
interviews and tape-recorded individual interviews in CV pretesting and development. (Mitchell
and Carson 1989). Yet few resource economists have incorporated multiple qualitative research
components into preliminary and later phases of their nonmarket valuation studies.

Focus Groups

A focus group is a qualitative research method that allows researchers to learn about issues, concerns, and perceptions from a group discussion lead by a moderator. Focus groups rely on the dynamics of group interactions to reveal participants' similarities and differences of opinion (Krueger 1994; Morgan 1997). While qualitative researchers view focus groups as a superset of group interviews, many economists think of focus groups as tightly constrained market or product analyses conducted by market researchers. To highlight the open-ended nature of the focus groups used in the reported research and to differentiate the group discussions used from narrow market research tests, this paper interchangeably refers to the group interviews as focus groups, directed group discussions, and focused group discussions.

Some practitioners use and have specifically called for the use of focus groups in early stages of nonmarket valuation studies. For example, in their contribution to the debate on evidence of embedding effects in valuation studies, Loomis, Lockwood, and DeLacy (1993) used two focus groups "to test comprehension of terms." Bennett and Carter (1993) asserted that, "The complexity of the communication aspects of a CVM questionnaire requires the in-depth analysis afforded by focus groups" (91). Many recent CV studies mention their use of focus groups in the early stages of the research (e.g.,Carson et al. 1994a; Carson et al. 1994b; Hoehn and Krieger 1994).

Individual Interviews

While focus groups have become part of some valuation researchers' study design process, there has also been an increase in the use of one-on-one interviews to draft valuation survey questionnaires. Individual interviews collect in-depth information from respondents and require the analyst to make comparisons with other interviews to determine similarities and differences (Weiss 1994). Typically, one-on-one interviews center on learning from respondents about their answers in order to help researchers draft survey instruments (Oppenheim 1992). Debriefing questions, answers to open-ended questions, and, sometimes, some form of content analysis have been used in some researchers' attempts to facilitate an examination of various aspects of the efficacy of valuation questions and study designs (e.g., Carson et al. 1994a; Hoehn and Krieger 1994).

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While the importance of valuation study design has been long recognized (e.g., Mitchell and Carson 1989), generally accepted and externally verifiable design and pretesting procedures remain to be agreed upon. Boyle et al. (1994) concluded that CV survey design needs "formal investigation and should not be relegated to subjective pretesting decisions for each new application" (Boyle et al. 1994 81). Schkade and Payne (1994) suggested that qualitative methods (including content analysis) may play an important role in valuation questionnaire design and evaluation. (See also Carson and Mitchell 1993). However, only recently have researchers begun to analytically test qualitative research in regards to economic theory.

Hutchinson, Chilton, and Davis (1995) tested the hypothesis that the adoption of focus groups and verbal reports by resource valuation practitioners would increase the reliability and the scope of nonmarket valuation applications. Hutchinson, Chilton, and Davis asserted that the use of qualitative research techniques "should result in a more informed survey instrument which places respondents in a much stronger position to construct meaningful values" (1995 108). More recently, Sue Chilton presented preliminary findings of a qualitative examination of

preference reversals using grounded theory and content analysis at the first World Congress of Environmental and Resource Economists (Chilton et al. 1998).

Neither the use of focus groups nor one-on-one pretests has been universally accepted or applied by nonmarket valuation practitioners. It remains unclear which qualitative research methods, if any, should be used in developing valuation questionnaires. The relative strength and weakness of particular qualitative methods "has been more the subject of speculation than systematic research" (Morgan 1997, 13). There may be differences in the information gathered by focus groups and individual interviews (Kitzinger 1994a; 1994b). However, differences detected between the data gathered by the two methods might be attributed to context, that people act and response differently in a group than individually (Kitzinger 1994a; 1994b).

Recent work by cognitive psychologists and survey method researchers has underscored the value of focus group research in helping researchers develop a better understanding of respondents' understanding and responses (Sudman and Schwarz. 1996; Schwarz 1997). However, these same researchers emphasized that focus groups alone are insufficient, in and of themselves, for helping researchers design understandable and otherwise valid valuation questionnaires. Sudman, Bradburn, and Schwarz (1996) stressed their view that both individual and group interviews are necessary for understanding how respondents understand and answer questions (See also Schwarz 1997). Interestingly, these researchers do not point to empirical or substantive studies supporting their assertions.

The reported research collected qualitative data on natural resource values associated with a mangrove wetland using both focus groups and individual interviews. The systematic coding and quantitative analysis of the data attempted to empirically test whether focus groups generated substantially similar information to the information learned using individual interviews. The results of the analysis supports the notion that the use of both research methods is useful and that the two qualitative methods help researchers learn different but complementary sets of information.

METHOD AND ANALYSIS

Data collection for the reported research took place in phases (See **Error! Reference source not found.** and **Error! Reference source not found.**). In addition to preliminary fieldwork, follow-up research, and data analysis, there were two periods of focus group interviews and one period of individual interviews. Data were collected using field notes, investigator debriefing, and audiotape recordings. All focus group and individual interviews were tape-recorded and subsequently transcribed. The transcriptions were then coded. The coded data were used for cross-case and cross-method analyses that looked at frequency and cross-tabulation tables of selected codes.

RESEARCH DESIGN

The research project collected data using both structured group discussions and individual qualitative interviews with respondents from two villages that border a common mangrove ecosystem. (See **Error! Reference source not found.** and **Error! Reference source not found.**). The research design allowed for the comparison of data across both methods and communities. It was hypothesized that: (1) qualitative research methods could reveal evidence of respondents' ability to meaningfully participate in a nonmarket valuation study; (2) that information learned using qualitative research could help specify and design appropriate

valuation studies; and (3) that information learned using focus groups would be substantially similar to that learned using individual interviews.

POPULATION AND SAMPLE

The villages of Chelém and Chuburná have approximately 400 and 200 households respectively. Census data from 1990 indicates that populations for these communities are approximately 2180 and 1244 with there being slightly fewer women than men (Instituto Nacional de Estadística 1992). As the census and other data shows, the socio-economic characterisitics of the two villages (Chelém and Chuburná) are much more alike than those of the inhabitants of Progresso (See **Error! Reference source not found.**). Few families in the research area have telephones, and other information, such as land title, car registrations, and fishing licenses, is neither available nor appropriate for the subject populations. Likewise residents' homes are not clearly numbered in a way that would permit a systematic random selection process. Making matters more difficult, there are no accurate street maps of this area. In short, there are no readily available and reliable lists from which to draw random samples of the two populations.

Therefore, it was decided to use a purposeful sampling strategy. In order to control for differences in gender and community experiences, it was decided to recruit participants for focus groups that would be same-sexed and from the same community. Initially, efforts were made to also further control for socioeconomic status but this proved too difficult. Most villagers and their homes displayed no obvious indicators of differentiable socioeconomic status.

Research assistants canvassed randomly selected sections of the target communities at staggered times to recruit participants. Participants were told that a university-sponsored project was seeking their opinions and input on the area and its natural resources. They were also told that their participation was voluntary and that there would be complete confidentiality. Because of different cultural norms and expectations, inducements were not offered to focus group participants as is done elsewhere (e.g., the United States).

Overall, 12 focus groups and 19 individual interviews were conducted in Chelém and Chuburná. **Error! Reference source not found.** shows a breakdown of the interviews by type, locale, and gender. Altogether, 97 people were interviewed individually or in groups. Each focus group was comprised of between 4 and 7 respondents of the same gender. Because of the qualitative nature of the study and the inability to collect a random sample of participants together with their socioeconomic data, no attempt is made to generalize findings to different populations based upon the substance of the interviews.

PROCEDURES

As described above, the research program consisted of a series of field research components and the systematic analysis of the qualitative data obtained from focus group and individual interviews. An attempt was made to purposefully recruit participants who represented a cross-section of members from the communities to facilitate learning about the various attitudes, perceptions, and concerns regarding the mangrove ecosystem.

Focus Groups

The focus group interviews ranged in size from 4 to 7 participants and were conducted by a Mexican professional focus group moderator. The researchers assisted with conducting the group interviews. The focus groups were held in participants' homes, local eating establishments, and a centrally located home that was rented for use by the researchers. All

participants were told of the voluntary nature of their participation as well as the strict confidentially of their participation and their responses. Tape recording did not begin until participants consented to the audio recording of the interviews. Furthermore, participants did not receive compensation for their participation.

While discussion guides were developed and continuously modified, the actual interviews and question orders did not follow a strict pattern. Every attempt was made to inquire, in several ways, about the participants' uses, perceptions, opinions, and experiences vis-à-vis Chelém Lagoon and its environs. Likewise, attempts were made to include all participants and their opinions in the discussions. The focus group interviews lasted on average about one hour with the shortest lasting only 40 minutes and the longest almost 2 hours. The community setting presented interesting challenges and the researchers needed to adapt as circumstance required. At the conclusion of each focus group, participants were thanked and given the name, address, and telephone number of a nearby Mexican collaborator should they need or desire to contact the researchers in the future.

Individual Interviews

Nineteen individual qualitative interviews were conducted with community members from Chelém and Chuburná. The individual qualitative interviews, while initially conceived of as a means for validating the finding and conclusions drawn from the focus groups, evolved into part of an effort to compare and contrast the strengths and weaknesses of two qualitative research methods in a newly industrialized country setting.

Individual interviewees were recruited by canvassing randomly selected sections of the communities. Interview participants were told that the study was sponsored by a university, that their participation was voluntary, and that their identity and responses would be kept confidential. Respondents were then asked if their interviews could be tape-recorded.

The interviews were generally 30 minutes long and not highly structured. Like the focus group interviews, a script with several key research questions and topics was used. However, the free flowing nature of qualitative interviewing required interviewers to introduce discussion topics as they were able to. The individual interviews were structured to encourage informants to freely volunteer information. Interviewers were instructed to avoid asking for responses to closed-ended or leading questions. At the end of the interview, respondents were thanked for their participation and instructed how to contact the researchers if they had additional questions or comments.

It should be noted that none of the respondents were in both focus group and individual interviews. This was done to control for information and other bias. While, it would be quite interesting to compare the differences and similarities of information revealed by respondents in individual qualitative interviews after they have participated in focus groups, this was beyond the scope of the reported research.

DATA ANALYSIS

The qualitative data collected (more than 500 pages of transcripts) were systematically coded using an iterative, grounded-theory approach (Strauss and Corbin 1990), and then statistically analyzed (Krippendorff 1980). See **Error! Reference source not found.**. Analysis of the frequencies and the cross-tabulations of the coded data was intended to test the research hypotheses.

Coding

The goal of qualitative research is not to produce simple counts of things, but to "fracture" the data and rearrange it into categories that facilitate understanding the data and comparing the data within and between categories (Strauss and Corbin 1990; Maxwell 1996). The initial step in qualitative data analysis is reading the interview transcripts. After that, the analyst has several options including: memos (researcher's notes and observations), categorizing strategies (such as coding and thematic analysis), and contextualizing strategies (such as narrative analysis, individual case studies, and ethnographic microanalysis). The reported research is based on coding transcripts, the most common categorizing strategy in qualitative research.

Open Coding

To initiate the coding process, a subset of transcripts were randomly selected for open coding. With open coding, almost every word of the transcripts is labeled with a thematic or summary description (code) without any structure to the codes themselves. While theoretical and practical design considerations can provide theoretical frameworks for codes and coding schemes, the open coding process used no fixed, prearranged codes or schemes. Respondents' words, ideas, issues, and contributions were coded using terms that accurately described them or placed them in a like group of similar utterances. Review of the codes created during the open coding process permitted the beginning of the reorganization of data using the codes/categories. Such reorganization, the key to axial coding, began to reflect the conditions, context, interactions, strategies, and consequences revealed by the transcripts and open codes.

Axial Coding

The next step in the coding of the data, after open coding had been accomplished for a sufficient number of transcripts, was the development and use of axial codes for all of the transcripts. In axial coding, the analytical focus turned towards putting codes together in ways that make connections between categories. To accomplish this, a coding paradigm was developed and utilized that involved accounting for conditions, context, action, strategies, and consequences (Strauss and Corbin 1990). Subcategories or properties of phenomena or conditions were grouped accordingly during axial coding. That is, open codes were linked together to help the researchers with theme analysis and concept development.

Selective Coding

After the qualitative data were axial coded, researchers developed a selective coding scheme that systematically related axial codes as well as fit the literature. "This final integration is not much different than axial coding. It is just done at a higher more abstract level of analysis" (Strauss and Corbin 1990, 117). The axial codes were used to construct a final set of "selective" codes. The selective coding scheme focused on testing research questions or hypotheses. Because information relative to economic valuation of natural resources was one of the reported research's primary objectives, the final selective coding scheme focused on resource beneficiaries' use, value, understanding, control, and valuation scenario acceptance regarding the mangrove wetlands.

ANALYTICAL FRAMEWORK

Key elements should underlie any analysis of qualitative data regardless of the analytical method selected (Krueger 1994). The strength of qualitative data analysis is that the analytical framework allows for the examination of underlying phenomena. Analysis of qualitative data

allows researchers to: (1) discover themes, (2) consider the choice and meaning of words, (3) consider the context(s) of qualitative data collection, and (4) consider the consistency of responses.

Themes

"Big ideas" or themes emerge (become apparent) as researchers examine and work with multiple data sources and identify convergence of ideas and issues among several groups and/or participants. These themes may or may not be specifically recognized by the participants and they may or may not be specifically addressed by every group or participant. However, qualitative data analysis allows and even requires researchers to extract and derive the major ideas and themes of respondents stemming from the topic(s) of discussion (Krueger 1994; Weiss 1994).

Words and Meaning

Qualitative data analysis also allows researchers to consider the words and language that participants choose to discuss the various issues and themes. That is, researchers may focus on the language, meaning, and manner respondents use to communicate. Such research foci may be aimed at both everyday language use as well as language use as it relates to a specific topic or subject of interest to researchers.

Context and Consistency

Qualitative data analysis can also inquire into the extent to which participants' comments were influenced by the context in which they were made. That is, the analysis of qualitative data needs to account for the extent to which responses appear to vary across interviews, methods, and locations (Vaughn, Schumm, and Sinagub. 1996).

Framework Adopted

The analysis of the reported research's qualitative data attempted to (1) develop an understanding of several themes (e.g., "how people live here," "problems here," "wetland value(s)," and "resource management"); (2) learn about the words and meanings of respondents (e.g., "names for the wetland"); and (3) evaluate the context effects and consistency of responses. See **Error! Reference source not found.**.

S TATISTICAL A NALYSIS

While many qualitative researchers do not undertake statistical analysis of their data, Krippendorff (1980) and others have demonstrated that statistical analysis of such data is possible and helpful. For example, content analysis often relies on statistical analysis of qualitative data. While for some qualitative researchers, summary reports of their findings (e.g., preferences among brands of a product) are sufficient, many researchers rigorously test their research hypotheses with a statistical analysis of the collected data.

One problem when using statistical analysis with coded qualitative data is that the codes and categories are not necessarily mutually exclusive. That is, there may well be more than one response to a "question" or more than one issue, idea, or concern raised by respondents when discussing a particular theme. As a result, the coding of qualitative data, if true to the nature of the data itself, does not usually allow for organization of "responses" into discrete categories. Despite this limitation, it is possible to capture qualitative data and codes as multiple response or categorical variables. Defining thematic or selective codes in this way allowed the qualitative data to be entered into a database and did not require further data reduction or loss. The multiple

response variable approach accommodated the sometimes wide-range of responses of the focused group discussions and individual interviews without limiting the number of responses that could be attributed to a single case or a particular theme.

Because many standard statistical tests should not be performed with variables that violate the necessary assumptions underlying such tests, multiple response variables are not tested using standard tests such as chi-squared analysis. However, multiple response variables can and were systematically studied by examining various counts and percentages. In other words, frequency and cross-tabulation analysis of multiple response variables do not violate analytical assumptions. The reported research analyzed the underlying phenomena represented by the coded dating using frequency and cross-tabulation analysis. Such types of analyses are displayed in tabular form.

RESULTS

It is fair to say that more than 500 pages of transcripts can be coded in a variety of ways. The reported effort is admittedly but one means for trying to understand the significance of what was learned during the focus groups and individual interviews. The analysis of the data focused on exploring the relative strengths and weaknesses of using qualitative research methods to design a nonmarket valuation study in Mexico, a newly industrialized country. The initial stages of data analysis computed aggregate frequency data for the response categories for the multiple response and other variables. This level of analysis showed the number of interviews or group discussions that raised a particular response category (i.e., issue, concern, response) in the context of a particular thematic variable or selective code (e.g., problems people face here). The next step of the data analysis used cross-tabulation analysis to further explore selected "theme" and "word choice" variables. The cross-tabulation analysis allowed for an examination of the data across locales (i.e., Chelém, Chuburná), across gender, and across methods (i.e., focus groups and individual interviews).

To illustrate the data analysis process and its results, this report focuses on one of the "Themes" to emerge from the data—"Problems in the Area". Respondents' comments touching on the problems, difficulties, and challenges that they or others in the area faced were iteratively coded and became "responses" to one or more selective codes (variables) (e.g., problem, fewfish, dumac). Eventually, various several selective code variables were grouped under a unifying theme, in this case "Problems in the Area." For example, the "problem" variable captured responses in six categories—coastal fishing down, lagoon fishing down, people coming here to live, DUMAC project, unemployment, and no more salt extraction.

Error! Reference source not found. illustrates the result of the general response frequency analysis of the problem variable. As **Error! Reference source not found.** shows, most of the individual interviews and group discussions (70-84%) talked about how bad the fishing had gotten in both the sea and the lagoon. The next most frequent references to problems were of people moving to the coast and to the DUMAC dike (33 and 29% respectively).

Error! Reference source not found. and **Error! Reference source not found.** show the frequencies for two other "Problems Here" variables, "Why Few Fish" and "Problems with DUMAC." As those tables illustrate, The overwhelming reason people gave for there being too few fish was "too many fishers." Increased trawler activity and the absence of effective regulations were the new most frequent reason for the difficulties of decreased catch rates. The

problems caused by the DUMAC project overwhelmingly concerned the adverse impact of the dike on the viability of the wetland.

The next step in trying to understand the data was cross-tabulation analysis. The aggregate frequency data of the thematic variable were analyzed across communities, across qualitative research method, and across gender. Continuing with our illustration with the selective code variable "problem," **Error! Reference source not found.** and **Error! Reference source not found.** show cross-tabulations of the response categories by community and by qualitative method. In general, the responses addressing general the areas general problems are fairly consistent across communities and methods with the following exceptions. The loss of salt extraction opportunities was only raised in Chuburná (the location of the now defunct practice) and the DUMAC project being problematic was only raised in individual interviews.

GENDER DIFFERENCES

As previously discussed the research was designed to account for possible differences in the perspectives and realities of men and women in the study area. This was accomplished by composing the focus groups of people from the same village and people of the same gender as well as individually interviewing both men and women. The study's preliminary findings and the debriefing sessions with the focus group moderator and research assistants led to a consensus that the women's groups were yielding information substantially similar to that found in the male groups. Therefore, in light of the overall difficulty of recruiting participants of the study, the decision was made to relax the strict necessity of equal numbers of male and female groups and interviews.

The systematic analysis of the focus group and individual interview data that was collected on possible gender differences was undertaken. The limitations of cross-tabulation analysis of multiple response data only allowed for a code (variable) to be examined in the context of no more than two other variables. The data only permitted two codes ($CNAME and $PROBLEM) to be selected for examination regarding possible gender differences. This analysis is not meant to be dispositive of the presence or lack thereof of substantial gender differences. However, it does demonstrate that some differences may (may not) be present and that this sort of layered analysis of data may be helpful in identifying some of those differences.

Names for Wetland by Gender

It seems as though the men and women of Chelém differ in their choice of names for the mangrove more than the men and women of Chuburná. That is, men in Chelém referred to the wetland as ponds (*charcos*) while the women there did not use that term. The data suggests that the men and women of Chuburná use the same terms for the wetland in roughly the same amounts. The range and frequencies of responses regarding the names used for the mangrove wetland were substantially similar when the data were examined by gender for each of the two qualitative research methods.

Problems by Gender

An investigation into possible differences between how men and women of the research area perceive of the mangrove ecosystem was undertaken with cross-tabulation analysis of the "problem" variable. The small sample size makes it difficult to reach many conclusions. However, it does seem that there were some differences based on gender. Women of Chelém seem to be more concerned about the level of unemployment then the men of Chelém. While in Chuburná, the men had a larger list of problems facing the wetland ecosystem and communities

then the problems raised by the women there. The women in Chuburná only mentioned three problem areas. The interview type did not seem to reveal gender differences. The focus groups of men and women each addressed the same categories in roughly the same frequencies. While, the individual interviews showed more diversity of responses for male then female responses, it can be said the responses for men and women from Chelém and Chuburná were substantially similar within each method of qualitative data collection.

COMPARISON OF RESULTS

Altogether more than 20 frequency tables and 40 cross-tabulation tables were examined for four thematic areas and one word choice ("wetlands") of interest to researchers. To better understand the results of such an unwieldy amount of information, a system of analysis result reduction and comparison, together with some uniform decision-making rules were developed. Data comparison tables were developed that both summarized and highlighted the results of the frequency and cross-tabulation analyses for each principle thematic variable (See **Error! Reference source not found.**). These comparison tables allowed for easier comparisons of the results by locale, interview method, and range of response categories.

The decision to segregate range of response rates into three categories (>50%, <50%, and no response) for data comparison was based on the understanding that well-regarded qualitative researchers and research often use relatively few interviews (less than 4) to derive their data and findings (Weiss 1994: Krueger, 1994 #80; Morgan 1997). Therefore, significant differences in the responses among the interviews are all that can reasonably used for comparison. Whether an item was discussed at all during an interview is significantly different from interviews that make no mention of that idea. Likewise, if an item is mentioned in a majority of interviews (i.e., >50%), it probably can be differentiated from those items mentioned in other interviews but to a lesser extent (i.e., <50%). The goal here was not to decide which items were necessarily more important but rather to differentiate the level and breadth of information learned using the two methods.

The results of this comparative data analysis scheme may be demonstrated by continuing with the data for "problem." As **Error! Reference source not found.** illustrates, the majority of responses concerning the problems faced by people in the Chelém Lagoon area concerned the decline in fishing catch rates. However, **Error! Reference source not found.** highlights some differences and similarities between the methods and the communities. In Chelém, for example, it seems that both qualitative methods resulted in the most frequent responses with similar frequency. However, in Chuburná and Chelém, the individual interviews addressed a wider range of responses than the focus groups. Interestingly, the individual interviews referred to people coming to the area more often than the focus groups and that problem was mentioned more often in Chelém than in Chuburná.

Error! Reference source not found. addresses those reasons given by respondents for the decline in fish populations. There appear to be differences in the information, the reasons given for the fall of in fish populations, in the focus groups held in Chelém and those held in Chuburná. Those groups in Chelém blame the increased fishing activity while the groups in Chuburná raise pollution and weather. Interestingly, the individual interviews, especially those in Chuburná, all raise manmade reasons for the poor fishing with the DUMAC project being raised in more than 80% of individual interviews in Chuburná.

Error! Reference source not found. is a summary of some results of the data analysis regarding the similarity or dissimilarity of information sets collected by the two methods on the

four selected themes and the one word choice variable. As **Error! Reference source not found.** illustrates, the data do not seem to support the hypothesis that focus group discussions yield substantially similar information as individual interviews. However, the data do seem to support the hypothesis that focus groups in substantially similar communities do yield substantially similar sets of information about a shared resource. This does not seem to be true for the information learned using individual interviews in similar but distinct communities.

DISCUSSION

The focus group and individual interviews revealed much about how local beneficiaries use, perceive, understand, and refer to their mangrove ecosystem. Certain themes were readily apparent after only a few focus group sessions; these included concern with the decrease in fishing productivity, a general distrust of the national and local governments, and a need for jobs. The findings show that eighty percent of respondents rely on the mangrove wetland for inshore fishing. The most important lagoon fishing species reported was a small shellfish called chivita (*Melongena melongena*). As one respondent put it, "Chivita are the source of livelihood for the village…They are the only thing that sustains people and families." Other use values associated with the mangrove ecosystem mentioned by respondents include the protection of boats from storms and the collection of bait for offshore fishing. There was little evidence of the nonuse values theorized to be associated with the mangrove wetlands. A few respondents did mention the beauty of the wetland and 71% of respondents referred to the flamingoes that occasionally frequent the area. However, the overwhelming sentiment of respondents was their view of the mangrove wetland as a social safety net. Respondents referred to the wetland as: "providing for the village," "a way of life," "the life we all do," and "a way for people to feed themselves."

PROBLEMS HERE

To address the differences and similarities in the information learned using the two methods concerning the problems people see affecting themselves and the mangrove ecosystem, further investigation and comparison of the results for the "problem" and "fewfish" variables was undertaken. **Error! Reference source not found.** illustrates the comparison of response rates for the various categories of problems cited by respondents. The range of problems mentioned in both communities in the focus groups and in the individual interviews was the same within methods. That is, focus groups (individual interviews) addressed the same three (four) issues with the same frequency in both Chelém and Chuburná. The differences made clear in **Error! Reference source not found.** are that individual interviews revealed more information (about a controversial project) than did focus groups.

Further analysis of the "problems here" theme was undertaken looking at respondents' beliefs and ideas about why there are fewer fish to catch. **Error! Reference source not found.** illustrates how when it came to respondents offering suggestions as to the reason or reasons behind the fall-off in fishing productivity, the different communities had different ideas and that the different methods also were associated with different responses. It seems that the focus groups elicited many fewer reasons for fishing productivity and that these reasons were discussed by a majority of the groups from that community. On the other hand, individual interviews addressed wider ranges of reasons for fishing declines. For example, the absence of fishing regulations was not addressed as a possible reason for poor fishing in the focus groups of

either community. Yet, regulations were discussed in almost half of the interviews in Chuburná and over two-thirds of the interviews in Chelém.

Typical Comments

> Now, you can't make a profit more than 2-3 months from fishing, that's why we do carpentry, mason work, etc.….The same problem is also happening in the estuary, it used to be that you could take all the crab, chivita you wanted. Now only the small ones are around. (ID# 18)

> En Rio Lagartos [a distant coastal biosphere reserve] they have plenty of fish and lobsters, they don't even collect their chivita….Here is close and easy for people, not like there which is hidden….They have conservation, here everything can be taken….Unlike Rio Lagartos, there is much demand and competition here. (ID# 23)

> We have problems with experts….the DUMAC project, they said, would maintain the flow of water and fish, but they closed the flow of water and fish off. Now there are no fish, no chivita, no wetland….we need to open the DUMAC dike so we can live, live from the wetland. We must undo what DUMAC has done. (ID#29)

> DUMAC built a flood-gate (dike) and told the village that it would function well, but no, it doesn't work….Because of DUMAC, the wetland's water is too low, too hot, and the mud is too hot. All the chivita and crab are killed. (ID# 34)

> Too many people are coming from other villages to live and survive here….Too many people go fishing and take even the small fish, and grouper during their breeding season, they kill females and sell the eggs instead of letting them reproduce….Now there are too many boats…there used to be 50-70 boats here, now there are times when there are 1000-1200. (ID# .36)

> Overexploitation, too many people are catching fish at night and during the day, they exploit these animals at night, in the afternoon, and in the morning, the animal are beginning to pay the price, like the story says, all rivers run dry….People have closed of the only way water can pass into the wetland under the bridges. They put many nets there and the fish cannot pass in and out….The overexploitation, they take every fish! (ID# 39)

ECONOMIC VALUE OF MANGROVES

The data and findings of the reported research appear to support those total economic value frameworks that describe the theoretically possible sources of economic use and nonuse value associated with healthy mangrove ecosystems (See **Error! Reference source not found.**) (Turner 1991; Aylward and Barbier 1992; Barbier 1994; Carson 1998; Costanza et al. 1998).

Using focus groups and individual qualitative interviews, the researchers learned about some of those use and nonuse values that local beneficiaries derived from Chelém Lagoon. However, the relative unimportance of nonuse values to resource beneficiaries was unexpected.

Almost 80 percent of the focus groups and individual interviews referred to local reliance on the mangrove wetland for fishing. Furthermore, 80 percent of the cases reported the wetland to be a source of living for the communities. Despite the initial tendency of local inhabitants to refer to themselves and think of themselves as coastal fishers, the species of "fish" most often mentioned in the cases was chivita, a lagoon species of shellfish. More than 70 percent of the cases mentioned collecting or fishing for chivita. It is fair to say that the collection of chivita represents a significant consumptive use value associated with Chelém Lagoon. As one respondent put it,

> Chivita are the source of livelihood for the village, if they are taken away or disappear, how are people going to live? They are the only thing that sustains some people and families. (ID# 37).

There was also evidence of other types of direct use values associated with the wetlands by local beneficiaries. These other use values include trapping crab for use as bait during the 2 to 4 month octopus season and occasional fishing for lagoon dwelling fish such as shrimp, mullet, and mojarra. Likewise, some respondents mentioned collecting firewood. Some information on fishing effort, catch rates, and market prices for chivita was readily apparent in the data. However there was little to no information provided on fishing effort, catch rates, and market prices for other lagoon species. It appeared to researchers that but for crab, respondents viewed these other species of tertiary import for providing food and a living. As a respondent put it,

> We fish in the sea for octopus….When the season is over or there is bad weather or there are no fish, we fish in the wetland….Now, most of the time, we fish for chivita in the wetland. (ID# 17).

One nonconsumptive use value was raised in three focus groups. Two of these groups were in Chelém. It seems that the wetland was viewed as able to provide storm protection for the fishing boats during severe weather. This benefit seems however to only applicable to the members of Chelém. As one respondent explained,

> Unlike in Chuburná, here the wetland is deep enough to allow for boats.
> During storms we can bring out boats into the lagoon for protection. (ID# 32)

Although theoretically possible to attribute economic value to the a wetland's biological support of a coastal fishery (e.g., nutrients, breeding grounds), no respondents mentioned such a connection, directly or indirectly. However, respondents did mention the ecological relationship of the sea being able to provide shrimp larvae, fish, and fishfry for the lagoon fishery at times. Interestingly, these comments were made in context of local complaints about the adverse consequences of a non-governmental organization's duck habitat restoration plan under way near Chuburná.

An important point that came out of this research was the discovery of the widely held belief that the wetland represented a social safety net for the communities. Virtually every case mentioned that the wetland provided a function as a place where inhabitants turned and could turn to to provide for themselves and their families. Such a role many be thought of as a direct

use value but it may also be viewed as an option value. That is, people in these communities may value the continued availability of the mangrove wetland for possible use at some needed time in the future.

One general class of nonuse value apparent from the qualitative research was an appreciation for the scenic beauty of the mangroves by respondents. Respondents commented on how much they "liked" the wetland, how "beautiful" they thought the wetland ways, and how they liked having flamingoes, heron, and the occasional crocodile (all nonmarket, nonuse species) living in the mangrove ecosystem. Flamingoes were mentioned in 71 percent of the cases; herons and other seabirds mentioned in a third of the cases; and the overall beauty of the wetland was discussed in all of the focus groups. As one respondent put it,

> The wetland is pretty….We sometimes picnic there but it is not that common anymore….When we have a visitor we take them for a boat ride to see it. (ID# 9).

Another reported,

> The flamingoes always come and go….They are very pretty and the people here like to see them during the month or two they are here. (ID# 11).

ESTIMATE OF ECONOMIC USE VALUE

As the foregoing discussion of the data reveals, people of Chelém and Chuburná articulated some use and nonuse values they associate with the ecosystem. Equally clear were peoples' apprehension about the health of their fisheries and their economic circumstances. This was evidenced by the predominance of responses identifying the increasing difficulties in both coastal and lagoon fishing. A recurring theme among beneficiaries was the view of the wetland as a social safety net and a source of livelihood for the coastal inhabitants. To develop some measure of the magnitude of the economic value of the mangrove wetland, further analysis of the data was undertaken.

Qualitative Economic Data

Focus groups and qualitative interviews can produce data that is consistent with survey research data (Vaughn, Schumm, and Sinagub. 1996). Focus groups can be used to collect data that are as reliable and valid as data collected using traditional survey questionnaires. One study found that there was a 97% correspondence in findings of the surveys and the findings of the focus groups with focus groups more accurately revealing (predicting) respondents future actions than the survey answers (Reynolds and Johnson. 1978).

After reviewing the transcripts and the coded data therein, it became apparent that respondents had volunteered catch rates and prices associated with the collection of the lagoon shellfish, chivita. Using this data, a partial estimate was made of the economic value of chivita collection in the mangrove resource. **Error! Reference source not found.** summarizes some of the "economic" data concerning chivita collection revealed by respondents during focus groups and individual interviews. It should be noted here that the potentially lucrative octopus season runs from mid-August through late-November. While chivita and other lagoon species continue to be collected during octopus season, most men focus on octopus fishing, if they can. This is not true for the women of the area who report collecting chivita year-round to sustain their families while their husbands, if they are married. In any event, one can assume that the lagoon is heavily relied upon for at least 8 months of the year. While chivita are not the only species

harvested from the lagoon, it was assumed that chivita represents a significant portion of the lagoon's direct consumptive use value.

Of course, the productivity of chivita collection may have cycles. However, no one, including scientists at Mexico's CINVESTAV research institute who study chivita, has a good idea of chivita breeding activity, productive zones, or other life cycle data. Therefore, it was assumed that the current levels of chivita collection remain at their current rates. **Error! Reference source not found.** illustrates the rough estimates of the use value of chivita collection for two communities bordering Chelém Lagoon. It appears that the communities of Chelém and Chuburná derive use benefits associated with chivita of approximately $230,000 to $350,000 dollars annually. That is, a family relying on the lagoon for chivita collection year-round can earn more than $580 dollars annually or $390 dollars per year from chivita if they devote the other 4 months entirely to octopus fishing. These findings are significant, when compared to the Mexican minimum wage of $2 dollars (14 pesos) per day paid at factories in Progresso and Mérida. Working 6 day a week, every week of the year, a factory worker would earn about $576.

It appears that the use of qualitative research methods can do more than help outsiders learn important data about how and why local research beneficiaries use, understand, refer to, and value environmental and natural resources. Focus groups and individual qualitative interviews were able to reveal some baseline economic data that could be useful itself or in conjunction with other policy making and economic valuation efforts.

IDENTIFYING DESIGN ISSUES

Preliminary use of qualitative methods may help valuation researchers select a method and design a study that is likely to reveal better estimates of economic values associated with environmental and natural resources. This may result from qualitative research data leading researchers towards a better understanding of the range and character of services provided by environmental and natural resources to local beneficiaries. The qualitative data may also provide researchers with insights into study design suggestions and obstacles.

Prior to conducting the reported research, the authors were told by regional researchers, local officials, and even local residents that the inhabitants of Chelém and Chuburná relied upon fishing in the sea for their livelihood. The mangrove wetland was initially characterized as a place for flamingoes on occasion. Individuals who fished in the Gulf of Mexico individually or as part of a crew on a commercial fishing vessel, individuals who fished exclusively in the lagoon, and individuals who did not fish for a living all articulated their characterization of themselves as fishers. That is to say that even individuals who subsequently reported earning their livelihood as factory workers, masons, and restaurant employees initially referred to themselves as fishers. However, the focus groups and individual interviews revealed that despite their being a wide-spread self-image of the two communities as coastal fishing villages, the villagers' primary economic activity was the collection of chivita from the wetland. In fact, the qualitative research revealed the strongly held belief by local beneficiaries that the wetland was an economic and subsistence safety net vital to their survival.

Such "discoveries" revealed by preliminary qualitative research helped researchers identify the appropriate frame for undertaking a valuation study of the mangrove resource but it also provided valuable insight into how to design such a valuation study. The better understanding afforded by qualitative research methods of respondents' circumstances, the difficulties of obtaining certain types of data, or the environmental and natural resource services

valued can guide researchers to make better design and implementation decisions.. For example, if respondents do not seem aware of or concerned with nonuse values and if only use values associated with the environmental and natural resource under investigation seem relevant, researchers might reasonably undertake a valuation study without regard to its ability to reveal nonuse values.

The data collected in the Chelém Lagoon area seemed to support the probability that a CV instrument focused on use values would have a greater likelihood for success than one aimed at total economic value or nonuse value. However, the qualitative data did highlight several important design considerations. The focus groups and individual interviews revealed a high level of distrust of the local, regional, and national government; a high level of frustration with a multinational donor agency; and a dominance of a subsistence state of mind. Therefore, the qualitative research indicated that it would take some creativity and hard work to devise CV scenarios that respondents would believe and accept. The difficulty of designing a CV instrument using a standard type of governmental change scenario to address total economic value of the Chelém Lagoon from the following excerpts:

> The government is more concerned with the wharf (Progresso) than anything else….Every time there is a change in government, everything changes….If the government comes in and gets involved we'll lose everything. (ID# 15)

> The community would not accept any restrictions….Maybe, if it was the law, people may be angry but they would obey,….but there is so much corruption like the shrimp regulation. Even though there is a law against it, we still fish for shrimp, we have to….Chivita could be regulated by closing a part of the wetland and guarding it….a season would only work if there were guards, and they are subject to corruption….The village doesn't have anything to eat, people search all day for 2 kg of chivita to make up to 20 pesos. If restricted one would have to find a way to eat meat, pork, every second day. Now, no one can do that. (ID#18)

> I am 72 years old and I sleep little. My work is to think of why the coast is dying out….People are working hard, with hunger, with cold, and they collect 2 kg of chivita.…If fishing in the river is prohibited, people will take to robbery. What will happen will be that the government will have to put us all under guard, the police and military would be the winners. (ID# 23)

FOCUS GROUPS V. INDIVIDUAL INTERVIEWS

Focus groups rely on group interactions to reveal participants' similarities and differences of opinion. Individual interviews collect in-depth information and require the analyst to make comparisons with other interviews to determine similarities and differences. There have been few studies examining whether the two methods produce similar data. As Morgan (1997, 13) puts it, "this question has been more the subject of speculation than systematic research." Kitzinger (1994a; 1994b) believed that differences detected between the two methods is not necessarily evidence of the absence of validity of one or both results. Kitzinger pointed to contextual reasons for differences, but not what to what those differences would be.

Initially, it seemed to researchers that the focus groups respondents offered more information about the ways they live; suggest more services provided by the wetland, and discuss more ways to improve the wetland than the individual respondents seemed to raise in their individual qualitative interviews. However, the individual qualitative interviews raised details and concerns that were often avoided in the focus group interviews. That is, individuals seemed to be more comfortable discussing a wider range of reasons for the decline in the fishing populations; identifying the range of problems in the area; and being critical of the government and multilateral projects (e.g., DUMAC duck habitat preservation) than they did in the focus group.

To examine the qualitative data actually obtained in the reported research for methodological strengths and weakness, the qualitative data were reanalyzed. The reported research analytically examined the focus group and individual interview data for differences and similarities. The goal was to detect patterns and tendencies, if any, in the type of information revealed by the two qualitative methods. Since the literature posits that focus group data is broader relative to individual qualitative interview data and that individual qualitative interviews reveal more detailed information. These suppositions were used in the construction of the following hypotheses: (1) if focus groups yield broader information than individual interviews, then we should see more response categories offered in focus group data sets than individual data sets; and (2) if individual interviews yield more detailed information than focus groups, then individual interview data sets should contain response categories not addressed by focus groups.

Error! Reference source not found. presents the results of this analysis. The columns allow for the comparison of subject matter variables by locale as well as by breadth of information learned using the two methods. The last column of **Error! Reference source not found.** characterizes and categorizes the type of information represented by the variables.

While certainly not unanimous, the results do give rise to some interesting possible explanations for differences in information gathered using the two qualitative research methods. Much of the information differences between the methods, it seems, results from a relationship between the context (group or individual interview) and the subject matter or type of information itself. It seems that focus group data sets (the range of themes, subjects, issues, etc.) were generally not much larger than individual interview data sets when the subject matters discussed were uncontroversial and factual in nature. Nor does it seem that individual data sets reflect information outside the scope of focus group in those same instances when the discussions centered on relatively uncontroversial matters of fact applicable to the region as a whole. Therefore, the focus groups were no broader than individual interviews and individual interviews were no more detailed than focus groups for subject matter that can be characterized as uncontroversial and factual information (i.e., Where Fish, Restrictions, and Name).

In some cases, focus groups did not raise more information for discussion than did individual interviews while individual interviews on those same topics raises issues and concerns not discussed in focus groups. Such instances where individual interviews were as broad as focus groups and the individual interviews were "more detailed" focus groups generally concerned problems and their causes. Respondents seemed more willing to share their ideas and concerns about sensitive matters or matters not usually discussed in public in individual interviews. That is, individuals were able to offer more possible reasons and ideas behind the areas' problems including reasons for the decline in fishing productivity during the individual interviews.

The subject matter variable "improvement" collected respondents contributions on how the area might be improved. As **Error! Reference source not found.** shows, the results for this variable for the village of Chelém resembles those factual information type variables. That is, the groups and individual interviews yielded substantially similar data. However, **Error! Reference source not found.** shows that data for this variable in Chuburná does not resemble the data for factual information variables. In the Chuburná data, focus groups were broader sources of information and individual interview raised points not mentioned in focus groups. Upon closer inspection of the information giving rise to these differences, the researchers were able to ascribe the findings to an on going controversy with a Duck's Unlimited of Mexico, America, and Canada (DUMAC) project. The negative impact of this duck habitat project on the viability of Chelém Lagoon as a source of chivita and fish was being felt most immediately by the people of Chuburná. However, the data gathered in the one-on-one qualitative interviews demonstrated individuals' frustration and anger concerning the DUMAC project.

The data indicates that respondents felt uncomfortable complaining about their neighbors, criticizing the few (and perhaps powerful) community members profiting from the project, and opening sharing their frustration and anger. The Chuburná individual interviews raised and discussed things that were either avoided, missed, or otherwise absent from the focus group discussions in Chuburná. A review of the transcripts confirms that this is not necessarily a result of focus groups promoting broader topics of discussion. Rather, it seems to be a function of individuals' willingness and, in some cases, single-mindedness to make the point that they were unhappy with the project and blamed it for many of their problems.

Further analysis of the comparative analysis of the data showed marked differences between the relationship of focus group and individual interview information sets between the two communities. While, focus group information appears to be substantially similar between the two communities, individual interview data sets appear to vary markedly. The differences in the focus group data sets appear to reflect differences in underlying factual differences. For example, Chelém is much closer to Progresso (port city) and Mérida (major urban center) than Chuburná. This explains why the focus groups and individual interviews from Chelém discuss work outside their community more often than Chuburná. Likewise, the higher number of seasonal residences in and around Chelém than those near Chuburná explains increased discussion of seasonal work in Chelém. Such fact-based differences between the communities and reflected in the focus groups and individual interviews are labeled as "Fact Based" in **Error! Reference source not found.**.

The final category of variables grouped together according to the similarities and dissimilarities in focus group and individual interview data seemed to concern vague concepts. These variables, in general, support the notion that focus groups reveal broader sets of information than individual interviews. However, they do not seem to support the notion that individual interviews reveal detailed information. These results may be explained by the vague nature of the topics captured and represented by the particular variables—respondents' perceptions of the mangrove ecosystem (perceptions) and the services provided by the ecosystem (services). These variables represent ill-defined or vague concepts. Perhaps, groups of people, as Morgan (1997) suggested, use group interaction to reveal a broader range of ideas when discussing such vague concepts as the perceptions and the services of the mangrove wetland. Likewise, the absence of more detailed information on these topics in the individual interviews may be seen as supportive of the notion that focus groups and the interaction between

participants is useful for participants to grapple with, understand, and offer input on vague or difficult to grasp topics.

DIFFERING RESOURCE AGENDAS

The research revealed several conflicting resource agendas for the shared mangrove ecosystem of Chelém Lagoon. One level, there is a conflict between the growing urbanization of Progresso, including its conversion of wetlands into building sites, with the continued viability of the mangrove ecosystem of Chelém Lagoon. Similarly, there is the ongoing conflict between the Mexican Navy and commercial fishing fleets' use and maintenance of the safe harbor and the ecosystem's ability to accommodate those fleets. On another level, there is a real conflict over the use and maintenance of the mangrove lagoon as migratory bird habitat by an international non-governmental organization. While arguably well-intentioned, the DUMAC project just west of Chuburná was identified by respondents as poorly conceived, poor executed, and destructive to the local communities ways of life. During the course of some follow-up interviews with municipality officials, the researchers learned for the first time of a written demand made by community members to DUMAC and the municipal government to remove the DUMAC dike. The communities' letter warned that unless DUMAC removed or "fixed" the dike to allow seawater circulation, the dike would be "blown-up."

Other conflicting resource agendas that were learned by researchers include the tension between the villagers with the increased and apparently little regulated commercial trawler activity in the Gulf. The respondents blamed the increased fishing pressure in the Gulf for their necessity to fish further and further out in the gulf (both dangerous and expensive for villagers) and their increased reliance on chivita collection and the lagoon.

The Mexican governmental programs and policies encouraging coastal settlement conflict with the sustainable management of coastal resources, like Chelém Lagoon. Policies that promote intensive harvesting of chivita, or the coastal fishery, that do not identify the maximum sustainable yield of such fisheries are prescriptions for disaster. Furthermore, the uncoordinated efforts of several governmental and non-governmental agencies also threatens the loss of destruction of precious natural resources. Chelém Lagoon provides a glimpse at some of the conflicting resource agendas faced by communities and ecosystems in Mexico.

CONCLUSIONS

The data revealed during the focus groups were broader than the data revealed using the individual interviews. Individual interviews, on the other hand, revealed details and concerns that were avoided by respondents in focus group sessions. While non-controversial facts were revealed by both methods, more information about sensitive topics and local problems was revealed by individual interviews than focus groups. For example, an ongoing conflict about a dike built by Ducks Unlimited was not mentioned in focus groups while it was continually raised during individual interviews.

The research demonstrates how qualitative tools may be used to draw well-supported conclusions rather than merely generate supporting impressions of preconceptions. It shows that qualitative tools such as focus groups and individual interviews lead to distinct types of information. This is especially interesting given some researchers' suspicion that that qualitative work can confirm, but not refute preconceived notions. The research suggests the value of a sequential use of focus groups and individual interviews to gain useful insights into respondents'

resource use, understanding, and perceptions. Focus groups, it seems, should be used first with individual interviews used subsequently to learn more specific and sensitive information. The complementary perspectives gained from focus groups and individual interviews promise to improve economic valuation study design.

The research also demonstrates that key person interviews, even with local experts, do not always reveal underlying and strongly held beliefs about shared natural resources. The research revealed conflicting agendas for the shared mangrove ecosystem. While the Mexican government views the mangrove wetland as an opportunity to build sheltered harbors for its navy and commercial fishing fleets and an international environmental organization sees the ecosystem as a drier place necessary for duck wintering habitat, local subsistence communities increasing see the mangrove resource as the means by which they can feed themselves and others. Furthermore, the growth of Progresso brought about by government policies and a weak economy further threatens the ecosystem as families fill the wetland as a way to provide shelter for their families. The absence of a concerted effort to develop a sustainable policy aimed at the continued existence of a viable mangrove ecosystem in Chelém Lagoon portents of increased difficulties and conflicts in the future.

APPENDIX

Figure 1: Yucatán Peninsula

Chelem Lagoon

GULF OF MEXICO

Progresso

Chelem Village

Chuburna Village

Yucalpeten Estuary
(Chelem Lagoon)

MERIDA

Legend:
- Cities
- Political Boundary
- Rivers/Streams
- Water
- Roads
- City Limits
- Swamp Lands

N
W   E
S

10   0   10   20 Kilometers
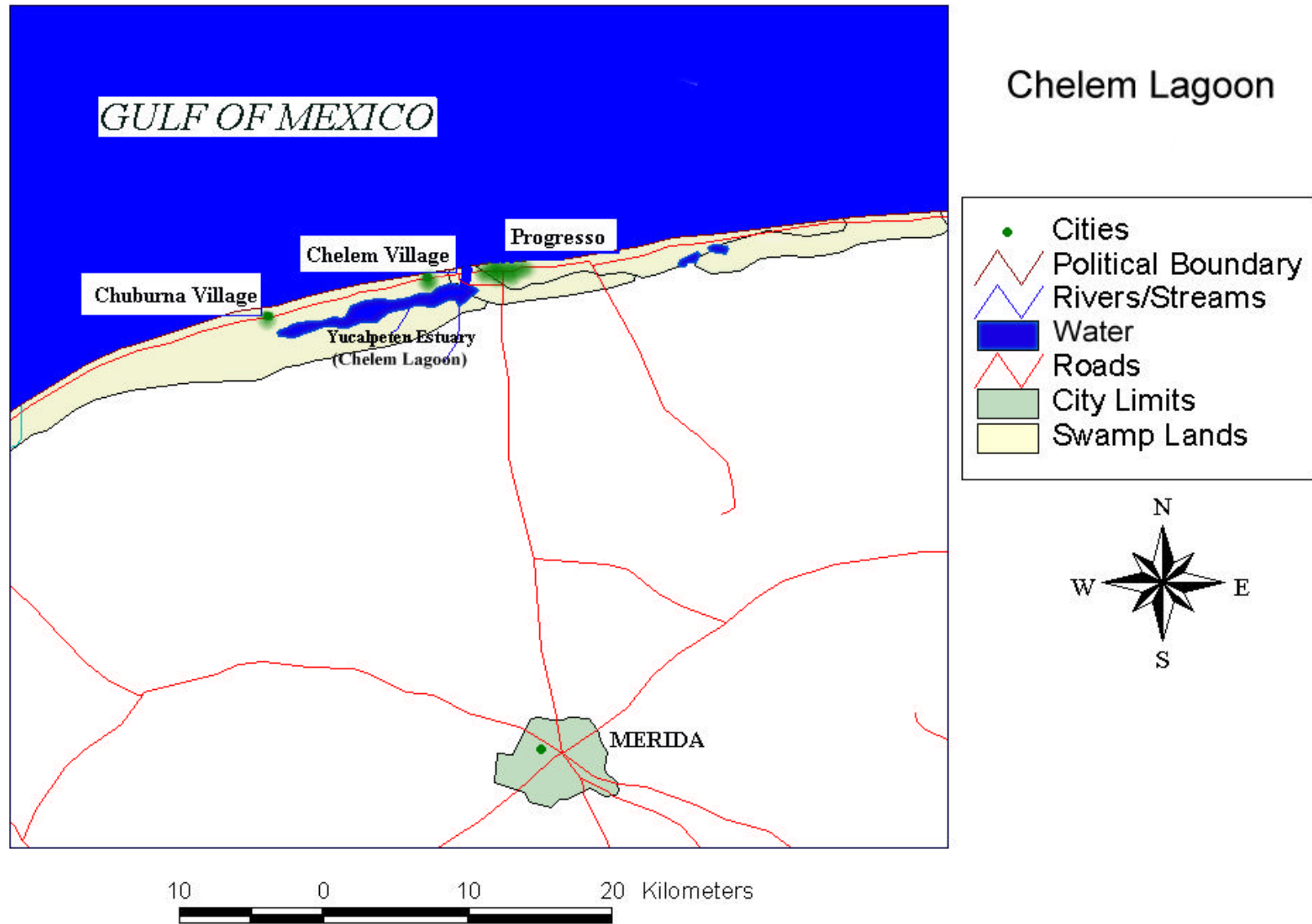
Figure 2: Chelém Lagoon
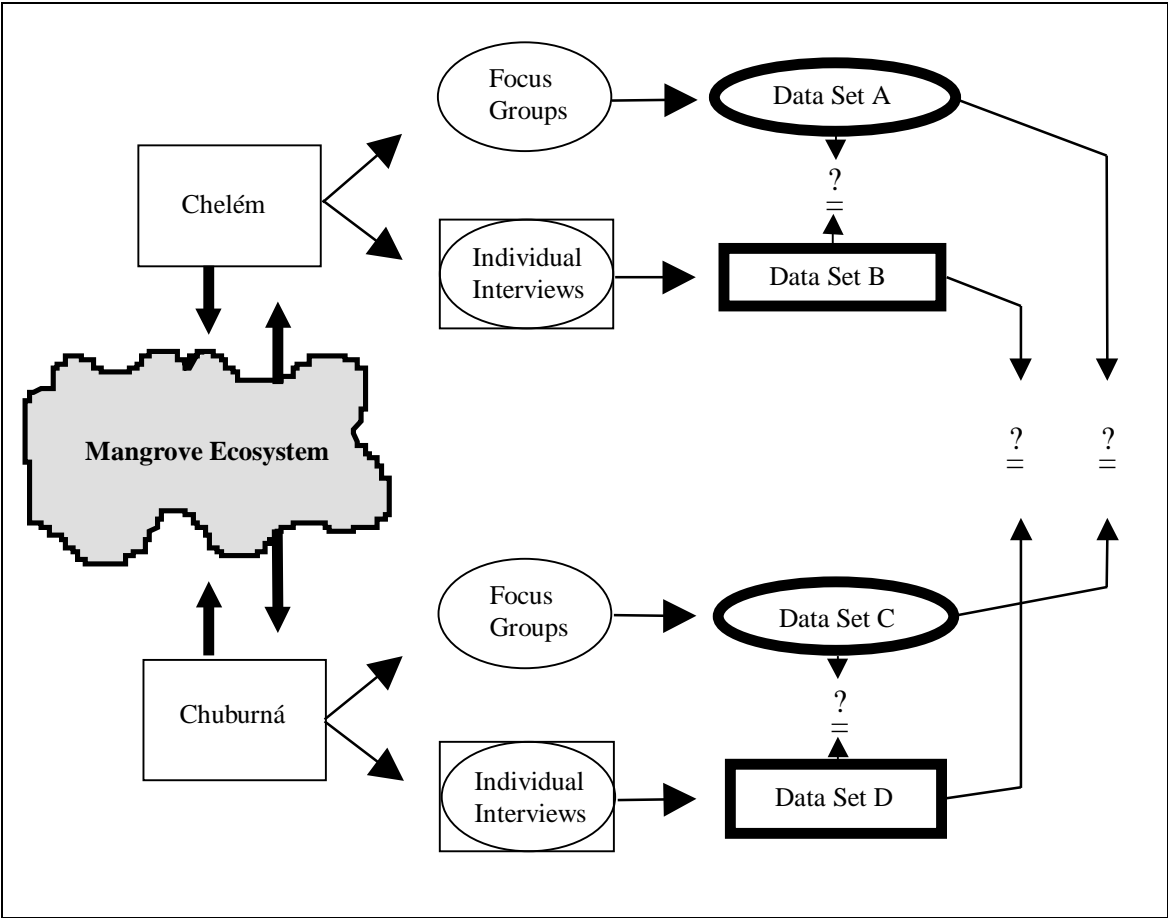
Figure 3: Research Design

Iterative Coding

- **OPEN CODING**
- **AXIAL CODING**
- **SELECTIVE CODING**

f**requencies**

Cross-Tabulations

%	%
%	%

Transcripts

- 14 Focus Groups
- 19 Ind. Interviews

Data Sets

- Chelém
- Groups
- Ind. Interviews
- Chuburná
- Groups
- Ind. Interviews
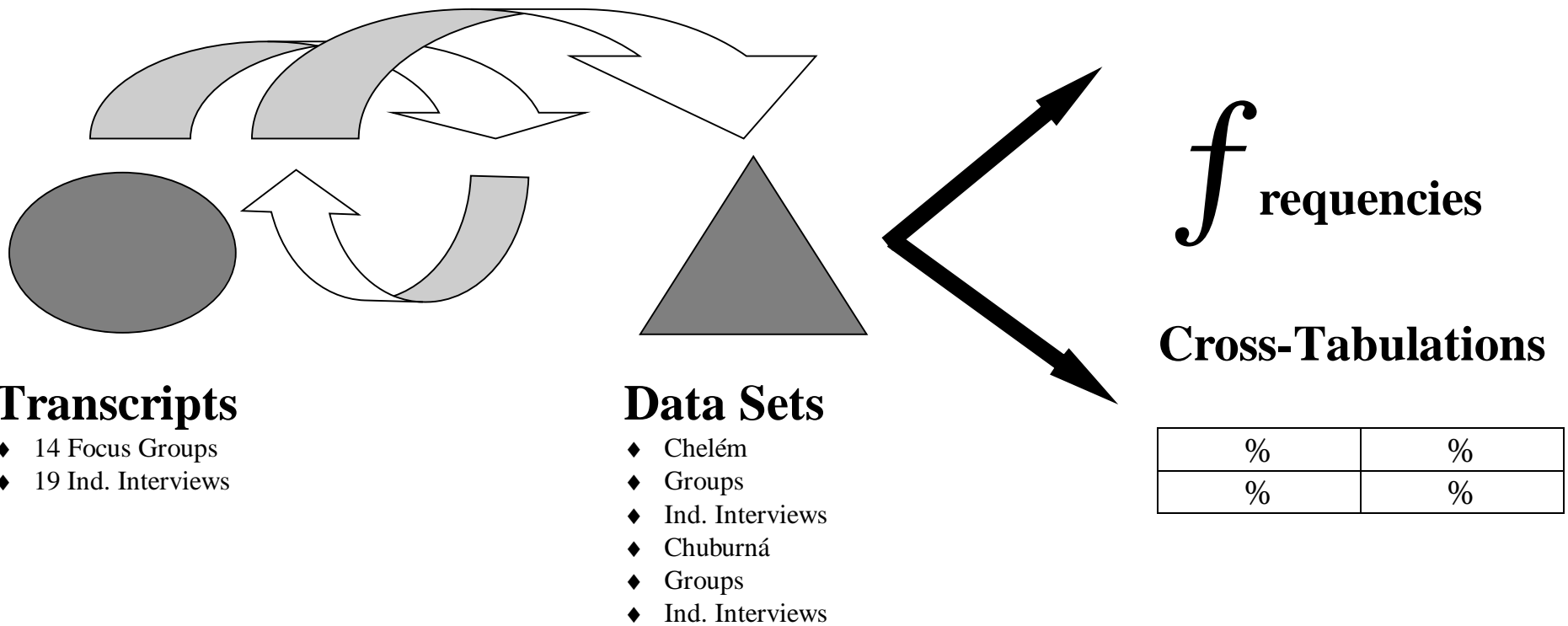
Figure 4: Data Analysis Process

CHIVITA COLLECTION SEASON (no chivita collected during octopus season)
8	month chivita season
24	working days/month
192	collecting days
1.8	kg chivita/day
346	kg/season
7.9	pesos/kg
2,733	pesos/household per chivita season
	or

±$ 390* per household per chivita season

CHIVITA COLLECTION YEAR-ROUND (12 months @ 24 collection days)

4,095 pesos/household per year

or

±$ 585* per household per year

AGGREGATE ANNUAL VALUE TO CHELÉM & CHUBURNÁ (600 households)

Excluding Octopus Season	Year-Round Collection
1,639,800 pesos per year	2,457,000 pesos per year
or	or
±$ 234,257* per year	**±$ 351,000* per year**

* Exchange rate of 7 pesos per dollar

Figure 5: Wetland Use Value Estimate

Table 1: Mangrove Services

USE SERVICES	PASSIVE USE SERVICES
On-site fishery	Future use services (option value)
Crabs	Future research & education
Fish	Biodiversity
Shrimp	Potential medicinal plants
Off-site fishery	Cultural & aesthetic significance
Fish	Spiritual & religious significance
Shrimp	Carbon sequestration
Lobster	Habitat maintenance
Forestry	Coral reefs
Firewood	Migratory birds
Timber	
Poles	
Roofing materials	
Woodchips	
Charcoal	
Hunting	
Duck	
Small game	
Deer	
Tourism & Recreation	
Ecotourism	
Birdwatching	
Agriculture	
Fruit trees	
Animal feed	
Vegetables	
Palm oil, etc.	
Storm protection	
Water purification	
Medicinal practices	
Aquaculture	
Shrimp	
Crab	
Fish	

Table 2: Group and Individual Interviews

	Chelém		Chuburná	
	Men	Women	Men	Women
Focus Group Interviews	4 groups	3 groups	3 groups	2 groups
Individual Interviews	8 interviews	2 interviews	7 interviews	2 interviews
Total	12 transcripts	5 transcripts	10 transcripts	4 transcripts

Table 3: Research Overview

Stage	Name	Components	Comments
1	Initial Scoping	• Key Person and Expert Interviews • Site Visits • Collaboration Building	• Reviewed various potential research sites • Formed research partnerships • Met with local beneficiaries • Met with governmental & non-governmental agencies • Drafted research plan
2	Focus Groups	• Further Scoping • Visited research site & began informal interviews • Finalized research plan • Designed, organized & attended focus groups • Began to analyze focus group data	• Learned about ecological, socioeconomic characteristics of site. • Coordinated research program with Mexican collaborators • Collected information on mangroves, population, laws, & policies. • Developed focus group script and key questions • Identified & segmented focus groups by gender, geographic location, & socioeconomic level. • Attended, conducted, & oversaw focus group sessions.
3	Individual Interviews	• Design & organize individual interviews • Conduct key-person interviews • Train research assistants/interviewers	• Develop script for individual interviews • Conduct and observe individual interviews • Debrief interviewers
4	Data Analysis	• Transcribe audio cassettes of interviews • Develop a system of codes for qualitative data • Code transcripts • Re-evaluate coding scheme • Re-code data • Analyze codes using computer program	

Table 4: Chelém & Chuburná Population Characteristics

Locale	Population	Women	Fishing Licenses[*]	Literacy (>15yrs)	Not Local Born	<1 min. salary[*]	1-2 min. salaries	2-5 min. salaries	Homes	People per Home	Sewer/ Septic
Progresso	23,688	12,050 (51%)	2964 (25% of men)	64%	10%	7%	11%	11%	5324	4.45	76%
Chelém	2,180	1,065 (49%)	160 (14% of men)	54%	1%	16%	10%	5%	375	5.81	58%
Chuburná	1,244	591 (48%)	132 (20% of men)	58%	1%	14%	11%	4%	214	5.81	41%

Sources: (Instituto Nacional de Estadística 1992); [*] (Paré and Fraga. 1994)

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[*] Minimum salary in Mexico for factory work was reported to be 15 pesos per day. That is roughly requals $2 per day (exchange rate 7 pesos/$).

Table 5: Data Analysis Framework

| | | Theme | | | | Word Choice |
		How Live	Problems	Wetland Value	Resource Manage't	Wetland
Chelém	focus groups	$1A_n$	$2A_n$	$3A_n$	$4A_n$	$5A_n$
	individual interviews	$1B_n$	$2B_n$	$3B_n$	$4B_n$	$5B_n$
Chuburná	focus groups	$1C_n$	$2C_n$	$3C_n$	$4C_n$	$5C_n$
	individual interviews	$1D_n$	$2D_n$	$3D_n$	$4D_n$	$5D_n$

Note: n = each category option for each code

Table 6. What Problems Here

```
                                            Pct of   Pct of
Category label                      Count  Responses  Cases

Coastal fishing down                   20     34.5    83.3
Lagoon fishing down                    17     29.3    70.8
people coming here to live              8     13.8    33.3
DUMAC project                           7     12.1    29.2
Unemployment                            4      6.9    16.7
No more salt                            2      3.4     8.3
                                    -------   -----   -----
                  Total responses      58    100.0   241.7
7 missing cases;   24 valid cases
```

Table 7. Why Few Fish

```
                                              Pct of   Pct of
Category label                     Count   Responses   Cases

too many fishers                      14      33.3     70.0
no regulations                         8      19.0     40.0
trawling fleets                        7      16.7     35.0
DUMAC project                          6      14.3     30.0
weather                                4       9.5     20.0
pollution                              3       7.1     15.0
                                   -------    -----    -----
                 Total responses      42     100.0    210.0

11 missing cases;  20 valid cases
```

Table 8. Problems with DUMAC Project

```
                                              Pct of   Pct of
Category label                     Count   Responses   Cases

drying up wetland                      6      46.2     75.0
killing fish in ciénaga                6      46.2     75.0
only few guides gain w Ducks           1       7.7     12.5
                                   -------    -----    -----
                 Total responses      13     100.0    162.5

23 missing cases;  8 valid cases
```

37

Table 9. Problems by Locale by Focus Group

```
                 $PROBLEM

        Count  I Coastal Unemploy No more  Lagoon    people
        Row pct I fishing ment     salt    fishing   coming      Row
                I down                      down      here        Total
                I    21  I    22  I    23  I    24  I    25  I
LOCALE          --------+--------+--------+--------+--------+--------+
             1  I     2  I     2  I     0  I     3  I     2  I     4
   Chelém       I  50.0  I  50.0  I    .0  I  75.0  I  50.0  I  66.7
                +--------+--------+--------+--------+--------+
             2  I     1  I     2  I     1  I     2  I     1  I     2
   Chuburná     I  50.0  I 100.0  I  50.0  I 100.0  I  50.0  I  33.3
                +--------+--------+--------+--------+--------+
        Column        3        4        1        5        3        6
         Total     50.0     66.7     16.7     83.3     50.0    100.0

Percents and totals based on cases
```

Table 10. Problems by Locale by Individual Interview

```
                 $PROBLEM

        Count  I Coastal No more  Lagoon  people  DUMAC
        Row pct I fishing  salt    fishing coming  project      Row
                I down             down    here                 Total
                I    21  I    23  I    24  I    25  I    26  I
LOCALE          --------+--------+--------+--------+--------+--------+
             1  I    10  I     0  I     5  I     4  I     1  I    10
   Chelém       I 100.0  I    .0  I  50.0  I  40.0  I  10.0  I  55.6
                +--------+--------+--------+--------+--------+
             2  I     7  I     1  I     7  I     1  I     6  I     8
   Chuburná     I  87.5  I  12.5  I  87.5  I  12.5  I  75.0  I  44.4
                +--------+--------+--------+--------+--------+
        Column       17        1       12        5        7       18
         Total     94.4      5.6     66.7     27.8     38.9    100.0

Percents and totals based on respondents

24 valid cases;  7 missing cases
```

Table 11. Data Comparison Key

50% or more of cases raised response category	**BOLD %**	
Less than 50% of cases raised response category	normal %	
No cases raised the response category		
Focus Groups:	Chelém	A
	Chuburná	C
Individual Interviews	Chelém	B
	Chuburná	D

Table 12. Problems Data Comparison

		Coastal Fish Down		Lagoon Fish Down		People Coming		DUMAC Project	
		%	#	%	#	%	#	%	#
Chelém	A	**50%**	2	**75%**	3	**50%**	2		
	B	**100%**	10	**50%**	5	40%	4	10%	1
Chuburná	C	**50%**	1	**100%**	2	**50%**	1		
	D	**88%**	7	**88%**	7	13	1	**75**	6
Aggregate		**83%**	20	**71%**	17	33	8	29	7

24 valid cases, 7 missing case

Table 13. Declining Fish Population Data Comparison

		Weather		Pollution		Trawlers		Too Many Fishers		DUMAC Project		No Reg's	
Chelém	A					**67%**	2	**67%**	2				
	B	25%	2	13%	1	13%	1	**100%**	8			**63%**	5
Chuburná	C	**50%**	1	**50%**	1								
	D	14%	1	14%	1	**57%**	4	**57%**	4	**86%**	6	43%	3
Aggregate		20%	4	15%	3	35%	7	**70%**	14	30%	6	40%	8

20 valid cases, 11 missing cases

Table 14: Focus Group v. Individual Interviews

Variable	Locale	Focus Groups More Info. Than Ind. Interviews		Ind. Interviews More Details Than Focus Groups		Possible Reason
		Yes	No	Yes	No	
How Live	Chelém		X	X		**Fact Based**
	Chuburná	X			X	more jobs in Chelém
Perceptions	Chelém		X		X	**Vague Topic**
	Chuburná	X			X	
Services	Chelém	X			X	Indv. d/t process
	Chuburná	X		X		
Improvement	Chelém		X		X	**Single issue** (DUMAC)
	Chuburná	X		X		Indv. focused on this
Problems	Chelém		X	X		**Causes of Problems**
	Chuburná		X	X		Indv. offer more
Few Fish	Chelém		X	X		ideas/reasons
	Chuburná		X	X		
Where Fish	Chelém		X		X	**Factual Info**
	Chuburná		X		X	not controversial
Restrictions	Chelém		X		X	
	Chuburná		X		X	
Name	Chelém		X		X	
	Chuburná		X		X	

Table 15: Data for Hypothesis Tests

Theme	Variable	n	Locale	Focus Groups = Ind. Int. ? Yes $A_n=B_n$ $C_n=D_n$	Focus Groups = Ind. Int. ? No $A_n≠B_n$ $C_n≠D_n$	FG in CLM = FG in CBA? Yes $A_n=C_n$	FG in CLM = FG in CBA? No $A_n≠C_n$	Int in CLM = Int in CBA? Yes $B_n=D_n$	Int in CLM = Int in CBA? No $B_n≠D_n$
Life Here	How Live	4	Chelém	3	1	2	2	1	3
			Chuburná	1	3				
	Where Fish	3	Chelém	3	0	2	1	2	1
			Chuburná	2	0				
Problems Here	Problems	4	Chelém	2	2	4	0	3	1
			Chuburná	2	2				
	Why Few Fish	6	Chelém	1	4	0	4	3	3
			Chuburná	0	6				
Wetland Value	Wetland Value	5	Chelém	2	3	3	2	3	2
			Chuburná	3	2				
	Wetland Service	3	Chelém	1	2	2	0	1	1
			Chuburná	1	2				
Resource Mang't	Improve Ideas	6	Chelém	2	2	4	1	2	3
			Chuburná	1	5				
	Restrict'n Work	2	Chelém	1	1	2	0	1	1
			Chuburná	1	1				
Words & Meaning	Name	4	Chelém	4	0	2	2	3	0
			Chuburná	2	2				
Totals by Variable per village		9		Y N T		Y N T		Y N T	
			Chelém	3	3	3			
			Chuburná	2	4	3			
	Overall Aggregate	9		2	3	4	6 1 2		4 2 3

Table 16: Chivita Data

Variable	n	low	high	mean
Chivita (KG/day)	14	.5	4	1.8
Price (Pesos/KG)	8	5	10	7.9

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