Participation in the *Aprovechamiento* Program and Turtle Protection Behaviors in the Buffer Zone of the La Flor Refuge Nicaragua

Exploratory Qualitative Study

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ABSTRACT

Forty-one individuals including both men and women were interviewed in eight buffer zone communities of the La Flor Wildlife Refuge in southwest Nicaragua. One of the major Olive Ridley turtle nesting beaches is located in the refuge, and from July to January an estimated 4.6 million eggs are laid on the beach. During that time there is a moratorium on the harvesting of eggs. Yet, turtle egg poaching occurs. There is anecdotal evidence that large numbers of turtle eggs being confiscated on the roads in the area where the refuge is located. This study was conducted to explore whether or not residents in the area were aware of turtle protection behaviors that can be adopted by both communities and individual residents. The study also explored their knowledge about the risk of extinction faced by these turtles, the basics of turtle biology, and the characteristics of an egg harvesting system set up by the Nicaraguan Ministry of the Environment and Natural Resources (MARENA).

Results indicate that residents are aware of numerous turtle protection behaviors. However, these may be behaviors not necessarily advocated by MARENA under the current management approach or may be advocated by MARENA but not yet practiced by residents. Additional research needs to be carried out to fully identify the benefits and rights that residents see for themselves if they adopt practices currently promoted by MARENA's turtle egg harvesting policy. Results show that there are inconsistencies in the residents' knowledge about the risk of extinction faced by turtles and about turtle biology, inconsistencies that educational interventions can address.

The current natural resource management approach at La Flor was put in place by MARENA with little community involvement. Consequently, the behaviors advocated by this approach have not been adopted by residents. The current approach has also been criticized on equity grounds since women may be adversely affected. Information about how that management approach operates needs to be disseminated more widely, in a timely fashion, and in a way that demonstrates the benefits to residents.

A possible segmentation of the audience may be done by taking into account gender and distance to the refuge. In particular, women's knowledge and participation need to be addressed. This may be done by adopting a two-step educational approach: in the first phase, knowledge about turtle biology would be increased and appropriate conservation attitudes would be developed; a second stage would stress participation in the different decision-making processes. Specific behavioral suggestions for women may also be disseminated during this second stage. Informing women about how fragile turtle ecology is and what they need to do to protect the environment should be conveyed through appropriate media women tend to use most often. Small group discussions where women congregate naturally or reaching women through their children are strategies that should also be considered.

Any further educational activities for community residents should also consider targeting commissioners in an effort to develop a higher sensitivity to the concerns and needs of their constituencies. In addition, alternative sources of income apart from the sale of eggs, particularly for women, should be explored.

I. BACKGROUND

This is a formative research report to present results from a study that explored selected turtle protection behaviors of residents in eight buffer zone communities of the La Flor Wildlife Refuge, located on Nicaragua's Pacific coast. Topics explored included:

- turtle protection behaviors that residents believed should be implemented and turtle protection behaviors which they had they actually performed;
- beliefs about what achievements are possible if the mentioned behaviors are performed (outcome beliefs)
- beliefs about social pressure that is exerted on individuals to perform these behaviors (normative beliefs).

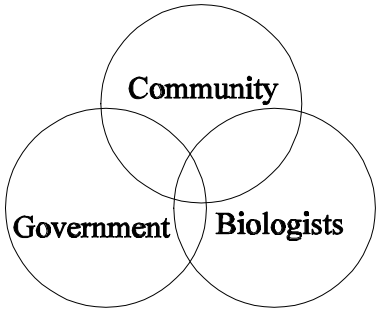
The study was carried out by the Nixtayolero Cultural Association of Nicaragua under contract from the Environmental Education and Communication Project (GreenCOM), which is financed by the U.S. Agency for International Development/Nicaragua. GreenCOM works in coordination with the Nicaraguan Ministry of the Environment and Natural Resources (MARENA). The study discussed in this report is one of the deliverables of the GreenCOM Project in Nicaragua and constitutes part of a strategy to support the educational and communication activities in protected areas in that country. Related activities include training for: (1) staff of protected areas comprising selected natural parks, refuges, and natural forests (*Sistema Minimo*); (2) NGOs working in those areas, and (3) community residents.

The zone where the study was conducted has a small protected refuge containing a beach where Olive Ridley (*Lepidochelys olivacea)* sea turtles nest. To contribute to turtle conservation efforts, MARENA established a turtle egg distribution *(aprovechamiento)* program to benefit eight buffer zone communities. The purpose of the program is to eliminate the illegal harvest of eggs during the nesting season, which happens between July and January. The La Flor Refuge is the site of a unique phenomenon known as *"arribadas"*, massive arrivals of nesting turtles, which creates potential for sustainable exploitation of eggs as occurs in other Central American countries, particularly Ostional, Costa Rica.

However, La Flor also is subject to the pressures of multiple communities living in abject poverty in the vicinity of the nesting beach. Residents in those communities have traditionally harvested eggs both for family consumption and sale. These factors dictate the need for a well designed and consistent turtle egg management program. It also dictates the need to design an educational program that can support the natural resource management efforts.

This study was part of an exercise to identify what turtle biologists inside and outside of Nicaragua, government officials within MARENA and community residents think about the behaviors that must be adopted to protect sea turtles. The hope was that there would be an overlap of the suggestions made by these different stakeholders (see Figure 1). Any educational intervention to promote these behaviors would target communities in the La Flor buffer zone.

Figure 1. Stakeholders to be Consulted to Determine Focus of Educational Intervention



MARENA bases the size of each year's legal harvest on statistics from the previous *arribada*, especially frequencies of nest loss to predators, inundation and destruction by nesting females. The objective is to balance harvest of eggs for human consumption with natural loss that would have occurred anyway from the causes mentioned earlier.

MARENA harvests and distributes about 20% of the nested eggs to residents in the buffer zone communities. A census of families in those communities was conducted by MARENA with the help of community residents. In 1997, 580 families were benefiting from that egg distribution program. Ten dozen eggs are distributed to each family in the census during the larger *arribadas*. The number of eggs is smaller during smaller *arribadas*. In 1996, MARENA estimated that 43,000 turtles had nested in La Flor. With an average of 96-110 eggs per nest, this represents about 4.6 million eggs per year.

MARENA has promoted the idea of communities electing representatives to serve as commissioners that are designed to help collect the eggs during *arribadas*, and distribute the eggs to participating families.

Anecdotal evidence suggests that many program beneficiaries believe that commission members elected to represent the community are corrupt. Egg losses have been reported along different points of the distribution chain. Poaching of turtle eggs also is common. This may be done by both community residents as well as outsiders. There is also anecdotal evidence that large quantities of eggs have been confiscated by authorities during *arribadas*.

Prior to MARENA's management of the refuge, residents in nearby communities had their own turtle egg harvesting strategy. When local human populations were low, egg harvesting by

residents was primarily limited to two months of the nesting season: October and November, which historically produce the largest *arribadas* of the nesting season. During this two month period, all of the turtle eggs were harvested. No harvesting would be conducted during the remainder of the nesting season. Since more nests are destroyed as the number of nesting turtles increases (by other turtles digging up existing nests to lay their eggs), this strategy made intuitive sense. In fact, that is generally the argument presented by residents to justify that old practice. To protect turtles and increase the number of turtles laying eggs in the area, residents adopted different practices including hatcheries, putting hatchlings in the ocean and patrolling the beach.

With an influx of many new residents to the area, however, this strategy was modified. Small hamlets were formed near the refuge by newcomers who moved from other nesting beaches; such as Chacocente, also on Nicaragua's Pacific coast. These newcomers brought with them a different egg harvesting strategy whereby they would harvest turtle eggs during every month of the nesting season. In addition, during *arribadas,* individuals harvesting eggs would gain control of certain beach areas and would consider all eggs laid in those areas to be their own. Conflicts between old residents and newcomers as a result of the newly introduced practices required the military to intervene and control turtle egg harvesting. Subsequently, MARENA stepped in, bringing to the refuge the management approach described earlier.

II. PURPOSE OF STUDY

A formative study was designed for this site with the intent of understanding what knowledge residents had of: turtle biology, the turtle egg distribution system, and how the commissions representing community residents operate. This study also was considered essential to help MARENA, NGOs, and other parties understand what turtle conservation behaviors residents believed they could engage in. Once those behaviors were listed, the resident's psycho-social determinants had to be identified. Psycho-social determinants include both barriers and enabling factors affecting their performance, particularly outcome beliefs and normative beliefs.

The study was carried out in the eight communities by the Nixtayolero Cultural Association during March, April and May 1997. The team included a sociologist, an ecologist, a coordinator and three actors. After analysis of the collected data, a small play was developed and performed to generate discussions about the major findings, as an attempt to validate the interpretations made by the researchers.

This report integrates findings reported by the contractor hired to do the field research with those obtained from GreenCOM's analysis of the data.

A. Objectives of the Study

In support of USAID's Intermediate Result 2.5.2 (Increased community participation in natural resource management), this study intended to:

1. Obtain information that can help construct a questionnaire that can be used to perform a baseline study to determine the impact of an educational intervention carried out in this area, breaking down the information by gender.

2. Identify the extent to which community residents are aware of the basics of turtle biology.

3. Identify the extent to which community residents participate in the egg distribution system, the election of commissions and commission meetings.

4. Identify the turtle protection behaviors, both at the community and individual level, that residents believe are appropriate and which they may actually perform.

5. Identify the contextual and psycho-social factors that facilitate or hinder the performance of these behaviors, particularly at the individual level.

6. Identify the possible relationship between knowledge of turtle biology and egg distribution program participation and turtle protection behaviors performed by individuals.

7. Identify the use of turtle eggs obtained through the MARENA egg distribution.

B. Assumption

GreenCOM assumes that by improving the distribution system (reducing corruption, increasing accountability, and increasing community involvement in decision-making), poaching of eggs will be reduced. Reduction in poaching should contribute to the 50% hatching rate that MARENA has set for itself.

III. METHODOLOGY

A preliminary instrument was developed and pre-tested by the study team. The instrument used in this research is included in Annex 1. This instrument had both closed-ended questions and open-ended questions that focused on:

- socio-demographics;
- turtle protection behaviors that communities and individuals should perform;
- turtle protection behaviors that were performed by study participants;
- reasons for engaging in those behaviors;
- the perception of what it means to participate in the egg distribution program;
- the extent to which study participants believed that sea turtles can become extinct, and
- the degree of involvement in commission election and commission meetings.

The instrument was used to interview 41 individuals from the eight buffer zone communities. Study participants were randomly selected from the family census developed by MARENA with the help of community residents. The distance from the refuge was an important variable in making the sample selection. Seven percent of families in the census were interviewed in each of those communities. The person providing the information was the self-appointed spokesperson for the family. An attempt was made to have equal representation by gender. However, in some households where women were to be interviewed, selected participants refused to answer. In these cases their husbands were interviewed.

Regarding the performance of behaviors, the questions in the survey asked if participants had ever engaged in those behaviors. This type of question allowed us to subsequently categorize participants into two groups: “ever-doers” and “non-doers”. An ever-doer is someone who has performed the reported behavior at some point in the past. Non-doers are individuals who report never having performed that behavior.

A. Sample Characteristics

1. Demographic Information of Respondents

A demographic representation of the respondents can be found in Tables 1 and 2 (below and page 8), including occupation, literacy rate and education level.

Key demographic findings in Table 1 suggest:

- More female respondents in this sample lived in communities closer to the refuge and more male respondents live in communities further away.
- Respondents who lived farther away are younger and have lived less time in that community.
- Female respondents had a larger family size and more people in their households than male respondents. Also, the number of dependents in households of female respondents was much higher than in households of male respondents with a slightly stronger trend for females who live close to the refuge than for females living far from the refuge.
- Gender analysis performed on the 'head of household' variable suggests that the mean number of dependents where the female is the head of the family is higher (2.5) than in cases where the male is the head of household (1.0).

Table 1. Demographic Information of Respondents by Proximity to Refuge

	Close to Refuge (within 6 km)		Far From Refuge (more than 6 km)		All Cases	
	M	**F**	**M**	**F**	**M**	**F**
N*	9	11	15	6	24	17
Mean Age	45.8	42.8	38.0	37.8	40.9	41.0
Mean # of Years in Community	33.4	35.2	16.9	26.5	23.1	32.2
Mean # of Families in Household	1.3	1.7	1.2	1.3	1.3	1.6
Mean # of People in Household	5.7	8.1	5.9	6.0	5.8	7.4
Mean Ratio Dependents/Adults	.56	1.7	1.2	1.3	.98	1.6
% indicating their head of household	78	45	87	33	83	41

*Absolute numbers.

2. Socio-economic Information

Demographic information (Table 2) such as age and years in community was also explored. The results indicated:

- The main livelihood among respondents was agriculture with a more clear tendency among respondents farther away from the refuge. Yet, male respondents in communities closer to the refuge were more evenly distributed among other livelihood categories. Fishing alone or in combination with turtle egg harvesting or farming was also mentioned in communities closer to the refuge and not at all in the more distant villages.
- High literacy rates were exhibited by respondents. Yet, literacy was more frequently mentioned among men than among women especially in communities further away from refuge.
- Many more respondents were literate than ever went to school, a discrepancy that may make sense given the different literacy campaigns implemented in Nicaragua under the Sandinistas.

Table 2. Percentual Distribution of Socio-economic Information of Respondents by Proximity to Refuge

	Close to Refuge (within 6 km)		Far From Refuge (more than 6 km)	
	M	**F**	**M**	**F**
Main Livelihood of Head of Household				
Agriculture	22	64	93	50
Bakery	0	0	0	17
Construction	0	0	0	17
Fishing/Fishing and turtle egg harvesting	22	18	0	0
Fishing and farming	33	9	0	0
Store owner	22	0	0	0
Teaching	0	0	0	16
Percentage Literate	78	73	87	67
Education Level of Respondent				
None	43	25	29	40
Completed Primary	29	13	14	0
Incomplete Primary	0	50	43	0
Completed Secondary	14	0	7	40
Incomplete Secondary	14	12	7	20

IV. RESULTS

Due to the exploratory nature of this study and the small sample size, reported data are descriptive in nature. For example, the majority of the tables contain checkmarks, the purpose of which is to indicate whether a respondent in the sample provided a given answer listed in the table. Data were analyzed by the respondents' proximity to the turtle refuge and by gender. When important differences occurred in this analysis, results are broken down by gender and place of residence: (i.e., close to the refuge [under 6km] or far from the refuge [over 6.1km]).

Findings are presented in five core areas:

- knowledge about turtle biology;
- knowledge about the characteristics of the MARENA established egg distribution system;
- participation in that system;
- turtle protection behaviors that respondents believe are necessary and/or have engaged in, and
- the use of turtle eggs distributed through the *aprovechamiento* system.

Responses provided by study participants to several questions were grouped into selected categories for presentation purposes. Content analysis of the responses pertaining to turtle conservation behaviors was performed. The categories created were:

- Reduce/Eliminate Illegal Poaching
- Improve System of Legal Egg Harvest
- Address Factors Limiting Reproductive Success
- Reduce Human Pressures on Resources

These categories were created to facilitate the presentation of findings. Examples of where such categories were created appear in Tables 5 and 6 (which deal respectively with the reasons why respondents' decide whether to get involved in the egg *aprovechamiento* system). Other examples are Tables 9, 10 and 11, where turtle protection behaviors suggested by respondents and reasons for engaging in them are listed.

In addition, an analysis was performed to test the hypothesis that knowledge and participation contribute to certain turtle protection behaviors, yielding no significant results. More details about this analysis can be found in Table 13 at the end of this section.

Following is a breakdown of the tables along with general remarks regarding findings from each.

A. Knowledge of Turtle Biology

Table 3 (page 11) reports respondents' knowledge of turtle biology, including the belief about the possibility of turtles becoming extinct.

The results indicate that:

- The belief that turtles can become extinct was more prevalent among respondents far from the refuge than among those living closer to it.

- The reasons explaining why turtles can become extinct differ by gender. Men focused on the implications of an excessive turtle egg harvest and women focused on the implications of mistreating or killing adult or juvenile turtles. In addition, men believed that turtles face many dangers. Those dangers are limited to the previously mentioned risks for adult and juvenile turtles in the case of women.

- Reasons thought by respondents for why turtles are not facing the risk of extinction include: too many turtles nesting on the La Flor beach, the annual increase in the number of eggs laid, and the protection efforts implemented by different stakeholders, particularly MARENA.

- Knowledge of turtle biology differs by place of residence. Respondents living closer to the refuge, regardless of gender, generally correctly stated that the lifespan of the turtle is under 100 years and the initiation of reproductive age of turtles is 10 years. Wrong responses on these topics were more commonly mentioned among respondents far from the refuge.

Table 3. Knowledge of Turtle Biology

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Turtles Can Become Extinct	22%	36%	79%	66%
Reasons Turtles Can Become Extinct				
turtles face many dangers	✔		✔	
turtles are mistreated by people				✔
turtles continue to be killed		✔		
too many eggs are harvested/at night		✔	✔	✔
if eggs not protected will become extinct		✔	✔	
Reasons Turtles Can Not Become Extinct				
turtles nest on other beaches				✔
turtles are not killed	✔			✔
turtles multiply		✔		
so many turtles around impossible to become extinct	✔	✔	✔	
number of eggs increases yearly	✔	✔		
protected by laws/moratorium/MARENA/community	✔	✔	✔	
gods decision	✔	✔		
Lifespan of Turtles				
under 100 years	✔	✔		
100-150 years	✔		✔	
200-300 years	✔		✔	
400-500 years	✔			✔
don't know	✔	✔	✔	✔
Initiation of Reproductive Age of Turtles				
1 year and under	✔	✔		✔
7-8 years	✔		✔	
10 years	✔	✔		
30 years			✔	
don't know	✔	✔	✔	✔

B. Knowledge of How the *Aprovechamiento* Program Operates

Respondents' knowledge of the quota system and the commission is reported in Table 4 (below).

The results indicate that:

- Respondents far from the refuge were more knowledgeable about who decides the quota than respondents close to the refuge, where some confusion existed as to who decides the quota.

- Respondents far from the refuge were more familiar with how the commission operates than those close to the refuge who were unable to state commission activities.

Table 4. Knowledge of the *Aprovechamiento* Program

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
How Quota is Established				
Per family	✔	✔	✔	✔
Per home	✔		✔	✔
Other		✔		
Who Decides The Quota				
MARENA	✔	✔	✔	✔
Commission	✔			
Community		✔		
Others	✔	✔	✔	
How Commission Operates				
harvest or obtain eggs	✔	✔	✔	✔
patrol beaches	✔	✔	✔	✔
distribute eggs		✔		✔
count eggs			✔	
announce arrivals			✔	
talk to MARENA			✔	
don't know	✔	✔	✔	✔

C. Participation in the *Aprovechamiento* Program

Participation in the *aprovechamiento* program by respondents is reported in tables 5, 6 and 7.

Table 5 (page 14), displays respondents participation in the *aprovechamiento* program and the reasons for being involved. The reasons for involvement were grouped into the following categories for clarity:

- **Environmental impact**: including activities affecting the environment in either a positive or negative manner;
- **Legal rights**: contains comments by respondents which deal with residency and management issues;
- **Convenience**;
- **Food**;
- **Revenue**;
- **Partnership**: includes comments which involve relationships in and among community members and government;
- **Equity**: contains issues that are related to equal distribution and access to the system.

Results indicate that:

- The term "participation" when used with these respondents, tended to evoke answers that were strictly limited to access to eggs. If more community involvement in the management of the refuge is to be supported in the future, the term "participation" should either be redefined or used with caution because of its limited meaning at this point.

- Communities far from the refuge seem to participate in the *aprovechamiento* program because it is convenient and provides food.

- Female respondents participate in the *aprovechamiento* program because of the revenue made from selling eggs.

Table 5. Participation in the *Aprovechamiento* Program

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Participation in *Aprovechamiento* Program				
harvests, transports or distributes eggs			✔	✔
gets eggs	✔	✔	✔	✔
Reasons for Being Involved in *Aprovechamiento* Program				
• **Environmental impact**				
avoid poaching	✔			
rational use of resources which already exist		✔		✔
• **Legal rights**				
census gives legal right		✔		✔
residence in community	✔	✔	✔	✔
• **Convenience**				
convenient to get in town			✔	
home delivered food			✔	✔
limited time required			✔	
• **Food**				
food	✔	✔	✔	✔
food in rainy season			✔	
nutritious food			✔	✔
• **Revenue**				
food and sale	✔	✔	✔	✔
money from sale of eggs		✔		
• **Partnership**				
government and community work together	✔			
community development goals			✔	
• **Equity**				
even distribution	✔		✔	
needs welfare	✔	✔		
favoritism			✔	
get extra eggs			✔	

Respondents' reasons for not participating in the *aprovechamiento* program are reported in table 6 (below). Answers were grouped into the following three categories:

- **Management**: includes issues relating to the administration of the program;
- **Equity**: those issues that are related to equal distribution and access to the system;
- **Inconveniences**: those factors that create logistical obstacles to participation in the program.

Results indicate that:

- Respondents say that factors limiting participation are: 1) poor management; and 2) inconvenience.

- For individuals who lived in communities close to the refuge access to the program (equity) was a concern. These respondents felt excluded from the program and did not feel as if they had true ownership of the system.

Table 6. Reasons for Not Participating in the *Aprovechamiento* Program

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Reasons for Not Participating in *Aprovechamiento* Program				
• **Management**				
incomplete distribution	✔	✔	✔	
lack of information about system		✔		
not permanent distribution	✔		✔	
not organized well		✔	✔	✔
untimely distribution				✔
• **Equity**				
exclusion (not including women)		✔	✔	
demagogic (behavior characteristic of stirring up a situation to gain power)	✔			
favoritism	✔			
females not allowed in commission		✔		
• **Inconveniences**				
have to take own time to do it			✔	
problems if can't get quota	✔			
too far to get quota		✔	✔	
other source of income, no need to participate		✔		

Table 7 (below), reports the respondent's participation in commission meetings and elections. Major findings were:

- Male respondents far from the refuge and female respondents close to the refuge were more likely to attend commission meetings and participate in commission elections than the other respondents. If individuals in these groups did not go it was because they were not invited.

- If female respondents close to the refuge did not go the commission elections, they cited the following reasons for not participating in them: no invitation to vote, commissions are only male, or there is no available time to attend.

  No female respondents far from the refuge attended commission elections. Yet, some did go to commission meetings. The female counterparts that did not go to such meetings did not do it because the meeting place is too far from their place of residence.

Table 7. Participation in Commission Meetings and Elections

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Attended Commission Meetings	22%	36%	67%	17%
Participated in Commission Elections	11%	27%	40%	0%
How Have You Participated in Commission Elections				
commissioner member	✔			
elects commission		✔	✔	
nominate commissioner	✔			
Why Haven't You Participated in Commission Elections				
absent	✔		✔	
didn't vote			✔	
not invited	✔	✔		
only men in commission		✔		
Why Haven't You Gone to Commission Meetings				
children go	✔			✔
distribute when harvesting			✔	
husband is commissioner		✔		
not invited	✔	✔	✔	
no time		✔		✔
too far				✔

D. Evaluation of Work of Commission

Table 8 (page 18), describes the level of satisfaction with the commission and how the commission can improve their work.

Results indicate that:

- Respondents on the whole did not feel well represented by the commission. Respondents close to the refuge were more dissatisfied than those who live far from the refuge due to equity reasons.

- Female respondents close to the refuge suggested the following improvements: inclusion of more females, better information on commission activities, increased community involvement with residents, and reduced control of MARENA.

- Respondents close to the refuge suggested improvement by ending favoritism and allowing the quota to be given out when the head of the household is absent.

- A concern for another income source in the community was expressed by male respondents close to the refuge and male and female respondents far from the refuge, as well as improvement in the distribution and transport of eggs.

Table 8. Evaluation of Work Done by Commission

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Do You Feel Well Represented by Commission	11%	27%	33%	50%
Reasons You Feel Well Represented by Commission				
works for me	✔	✔	✔	✔
legal work			✔	
trustworthy			✔	
Reasons You Don't Feel Well Represented by Commission				
unfair, no equity	✔	✔	✔	
favoritism for members	✔	✔		
How Can Commission Improve Work				
attend meetings				✔
base quota on family size		✔	✔	
control poaching	✔			
don't involve MARENA		✔	✔	
don't give extra quotas to commissioners			✔	
end favoritism	✔	✔		
give quota when head of household is absent	✔	✔	✔	
improve distribution/transportation	✔		✔	✔
improve information/ involvement with community		✔		
include females		✔		
MARENA supervision	✔			
need for other income source in community	✔		✔	✔
no improvement needed	✔	✔		
quota equity	✔			

E. Turtle Protection Behaviors

Turtle protection behaviors mentioned by respondents are reported in Table 9 (page 20). Two general categories of behaviors are reviewed:

- behaviors that respondents felt should be performed by the community and
- behaviors that are more identified with individual performance.

The table does not break down findings by place of residence or gender as in the previous tables because analysis of results indicated no significant patterns by those variables. Further, column totals do not equal 41 because the behaviors reported may have been mentioned either in isolation or in combination with another behavior. None of the behavior combinations mentioned are listed in Table 9.

Results indicate that:

- "*Improving the system of legal egg harvest*" was viewed mainly as a community activity as the behaviors suggested and classified under this category were more frequently mentioned as community behaviors.

- Certain *"factors limiting reproductive success"* were seen only as community behaviors, i.e., changing fishing practices and protecting hatchlings from predators. Not killing turtles, however, was seen as both a community and individual behavior.

- It was more common for respondents to mention behaviors which were related to a natural resource management system designed by the community when MARENA had not yet intervened in the area. These are the behaviors that were categorized as *"addressing factors that limit reproductive success"*. On the other hand, the behaviors that were in fact for the most part linked to the current management system designed by MARENA fall under the category "*reducing/eliminating illegal poaching*".

  The fact that more respondents mentioned behaviors in the former category and fewer respondents mentioned behavior in the latter category was most likely a reflection of the fact that individuals are in the process of changing management systems. The first three behaviors in the category "*reducing/eliminating illegal poaching*" were practically equivalent as "respecting the moratorium" includes "not poaching turtle eggs".

Table 9. Suggested Turtle Protection Behaviors*

	For Community	For Individuals
Nothing		
no time to help		✔
live too far away to help		✔
don't know		✔
Total		**9**
Reduce/Eliminate Illegal Poaching		
respect moratorium	✔	✔
enforce no poaching/don't poach	✔	✔
don't poach in rainy season		✔
patrol beaches	✔	✔
patrol roads to confiscate stolen eggs	✔	
punish poachers/convince poachers to stop	✔	
Total	**12**	**6**
Improve System of Legal Egg Harvest		
do a partial harvest	✔	
agree on how much to extract	✔	
obtain established quotas	✔	
have a full moratorium	✔	
have a full moratorium in fall	✔	
do anything MARENA tells me		✔
Total	**10**	**1**
Address Factors Limiting Reproductive Success		
protect turtles from predators and/or killers	✔	
don't kill turtles	✔	✔
change fishing practices	✔	
protect hatchlings from predators	✔	
place hatchlings in water at night		✔
set up hatcheries	✔	✔
make sure a nesting beach always exists	✔	✔
Total	**11**	**9**
Reduce Human Pressures on Resources		
don't sell eggs	✔	
educate others		✔
support community efforts		✔
Total	**1**	**4**

*column totals do not equal 41 because the behaviors reported may have been mentioned either in isolation or in combination with another behavior.

Table 10 (page 22) makes a comparison between the suggested turtle protection behaviors that can be implemented by individuals and those which were actually performed by study participants. Checkmarks in Table 10 indicate that the behavior listed was either suggested or performed.

An analysis of these results by gender indicated that there were no differences between men and women. Consequently, Table 10 presents findings for the sample as a whole.

A breakdown by place of residence is not included in Table 10 for the sake of simplicity. However, an analysis by that variable was also conducted. This analysis suggested mainly that respondents who lived far from the refuge did not mention hatcheries or patrolling beaches since they cannot engage in these activities due to distance to the beach from their place of residence.

The major conclusion from analyzing results in Table 10 is that residents are in a transition from the harvesting strategy used by communities prior to MARENA's presence in the area to the new natural resource management approach brought in by MARENA. For example, behaviors that fall under the category "*Factors Limiting Reproductive Success*" were more likely to have been performed than those falling under the category "*Reducing/Eliminating Illegal Poaching*". This can be attributed to the fact that the turtle protection behaviors performed which address factors limiting reproductive success relate to past conservation efforts. These were efforts that evolved with no outside influence in communities in the buffer zone of the refuge. Examples of these efforts include "placing hatchlings in water at night" and "setting up hatcheries". The egg harvesting approach used by community residents prior to the involvement of MARENA was previously discussed on page 2 and 3.

It is important to keep in mind that the questions in the survey addressed turtle protection behaviors performed at one point in time. It is often the case that such behaviors mentioned are those that were performed prior to MARENA setting up the current management approach. The behaviors supported by the current management approach are mentioned less frequently by study participants.

Table 10. Suggested and Performed Turtle Protection Behaviors For Individuals

	Suggested Behavior	Ever Done by Respondent
Nothing		
no time to help	✔	
live too far away to help	✔	
don't know	✔	
Reduce/Eliminate Illegal Poaching		
respect moratorium	✔	✔
don't poach	✔	
don't poach in rainy season	✔	
patrol beaches	✔	✔
Improve System of Legal Egg Harvest		
do anything MARENA tells me	✔	
Address Factors Limiting Reproductive Success		
protect turtles from predators and/or killers	✔	✔
protect hatchlings from predators	✔	✔
place hatchlings in water at night	✔	✔
set up hatcheries	✔	✔
Reduce Human Pressures on Resources		
educate others	✔	✔
support community efforts	✔	

Table 11 (page 24) goes one step further in exploring why a particular individual behavior listed in Table 10 was not performed. Comments are used in the body of the table to help describe the reasons and may appear more than once if more than one behavior was mentioned.

Results indicate that:

- Reasons for performing turtle protection behaviors clustered into three areas:

  - proximity facilitates performance;
  - lack of protection may put livelihood at stake;
  - social and environmental concern for the common good.

- Comments made by respondents suggest that MARENA is a major obstacle for performing certain turtle protection behaviors.

  This suggests that individuals in the community did not feel that they have true ownership of the system and cannot perform these behaviors accordingly. Individuals look to the commission/community to enforce behaviors usually classified as individual in nature. For example, "*Change Fishing Practices*" was mentioned as a community behavior, but fishing is normally done on an individual level. Other reasons for non-performance were: lack of time or interest, live too far away and being ignored by the commission.

Table 11. Turtle Protection Behaviors Performed by Individuals and Reason for Performance or Non-performance

	Reason for performance	Reason for non-performance
Nothing		● no time to help ● live too far away to help ● hate ocean
Reduce/Eliminate Illegal Poaching		
respect moratorium	● should have a moratorium ● to increase knowledge	● no time to help ● hate MARENA and commission ● moratorium lasts six months
don't poach	● wants to help	● apathy ● MARENA and military
don't poach in rainy season		
patrol beaches		● under MARENA control
Improve System of Legal Egg Harvest		
do anything MARENA tells me		● residents ignored by commission
Factors Limiting Reproductive Success		
protect turtles from predators and/or killers	● lives on beach	● under MARENA control ● no time to help ● residents ignored by commission
protect hatchlings from predators	● lives on beach ● there is a need ● is a fisherman	● under MARENA control ● too far away
place hatchlings in water at night	● MARENA doesn't do it	● residents ignored by commission ● under MARENA control ● no time to help ● too far away ● moratorium lasts six months
set up hatcheries	● wants to help ● is a fisherman	● under MARENA control ● no time to help ● have no training
Reduce Human Pressures on Resources		
educate others	● they have no training ● to increase knowledge ● family ties	● no time to help
support community efforts		● under MARENA control

To explore normative beliefs and identify referents[1] for social pressure, study participants were asked who approved and disapproved of their turtle protection actions. Referents for normative pressure to perform these actions included: family, neighbors, community, public servants or combination thereof. Referents for normative pressure not to perform those actions included: sellers, MARENA, army and MARENA, fishermen, and a minority of individuals in the community or combination thereof.

Tables 12 and 13 (below and page 26) break down these findings by performed turtle protection behavior and gender. The information is presented using the referents mentioned by respondents, in isolation or in combination.

Table 12. Who approves of you performing turtle conservation behaviors?

	family		**family and neighbors**		**community or neighbors**		**family, community or public servants**	
Performed Behavior	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
surveillance						**!**		
educate others	**!**							
hatcheries			**!**					
protect hatchlings							**!**	
put hatchlings in water			**!**			**!**		
put hatchlings in water and hatcheries							**!**	
put hatchlings in water and respect moratorium					**!**			

[1]Referent: Specific individuals or groups believed to exert pressure for behaviors to be performed or avoided. (Azjen, I. and Fishbein, M., (1980) *Understanding Attitudes and Predicting Social Behavior,* Prentice-Hall, New Jersey)

Table 13. Who disapproves of you performing certain turtle conservation behaviors?

	sellers		fishermen		MARENA		army and MARENA		some people	
Performed Behavior	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
surveillance								!		
hatcheries					!					
put hatchlings in water			!							
put hatchlings in water and protect turtles					!					
put hatchlings in water and hatcheries									!	
respect moratorium and educate others	!									

F. Use of Turtle Eggs Distributed by *Aprovechamiento* Program

Table 14 (page 28) describes whether respondents benefit from the egg distribution program and who in the household handles the money from the sale of eggs.

Results indicate that:

- Use of eggs differs by gender depending on how many eggs the family gets. In large *arribadas*, male respondents far from the refuge reported selling more and consuming fewer eggs. Females close to the refuge did the same but this happens in the case of smaller *arribadas*.

- There was apparently no connection between gender and the control of the money from the sale of eggs. The person that controls the money from the sale of eggs in the household was the person responsible for buying food. In many cases that person is a woman, but men also play that role.

Table 12. Use of Turtle Eggs Distributed by *Aprovechamiento* Program

	Close to Refuge (within 6 km)		Far from Refuge (more than 6km)	
	M	**F**	**M**	**F**
Family Gets Eggs (from MARENA Program)	100%	91%	100%	83%
Mean Ratio of Eggs Eaten to Eggs Sold				
Large *arribadas*	.42	.53	.33	0
Smaller *arribadas*	.55	.33	1.0	0
Who Handles Money from the Sale of Eggs				
Large *arribadas*				
man			✔	
woman	✔	✔	✔	✔
both	✔	✔		
Smaller *arribadas*				
man			✔	
woman	✔	✔		
both	✔	✔		
Why Does that Person Handle the Money from Sale of Eggs				
Large *arribadas*				
knows what is needed		✔	✔	✔
buys food for house	✔	✔		
avoid waste by children		✔		
Smaller *arribadas*				
knows what is needed	✔		✔	
buys food for house	✔	✔		
avoid waste by children		✔		

G. Relationships Between Turtle Protection Behaviors and Knowledge of Turtle Biology and Participation

To test for any relationship between knowledge and behavior, a knowledge index was developed which consisted of the following vectors:

- respondents' knowledge of the lifespan of turtles;
- respondents' knowledge of the initiation of reproductive age of turtles; and,
- the extent to which respondents believe turtles can become extinct.

The behavioral groupings contained in these analyses are described in the comments preceding Table 9. A chi-square analysis was performed to determine any relationship between knowledge and behavior. Results indicated no significance.

A participation index was also developed to investigate any relationship between participation and behavior. This index consisted of results from respondents based on:

- participation in the *aprovechamiento* program; and,
- participation in commission meetings and elections.

A logistic regression procedure was performed to test for any significance between participation and behavior. No significant results were indicated. Results of this analysis are presented in Tables 13A (below) and 13B (page 30).

Table 13A. Is Knowledge Related to Behavior?

	Statistics		
	Chi-square	degrees of freedom	level of significance
Relationship between Knowledge and Behavioral Category Grouping Behaviors Related to Reducing/Eliminating Illegal Poaching	.012	1	1.00
Relationship between Knowledge and Behavioral Category Grouping Behaviors Related to Factors Limiting Reproductive Success	.006	1	1.00

Table 13B. Is Participation Related to Behavior?

	Statistics		
	Wald	degrees of freedom	level of significance
Relationship Between Participation and Behavioral Category Grouping Behaviors Related to Reducing/Eliminating Illegal Poaching	1.7	1	.20
Relationship Between Participation and Behavioral Category Grouping Behaviors Related to Factors Limiting Reproductive Success	.02	1	.88

H. Gender Differences

Findings are presented below of an analysis based on gender only, regardless of where the respondent lives. Gender contrasts are reported regarding turtle protection behavior, involvement in the egg distribution program, and knowledge of turtle biology. Similarities are not presented.

Turtle protection behavior by individual

Males were more likely to have engaged in certain conservation behaviors such as hatcheries, and placing hatchlings in water at night. These are behaviors that were developed for past conservation initiatives. Consequently, men perceived no barriers to engage in these activities. Reasons for not performing conservation behaviors include: not poaching, supporting community efforts, protecting turtles and hatchlings from killers and predators, and the perception of being ignored by commission members. In general more men than women expressed a positive attitude about the moratorium.

Few females have engaged in conservation behaviors associated with past or current conservation initiatives. Respondents said that not having time was a barrier to performing any behavior.

Both males and females reported being involved in legal activities (such as those associated with past conservation initiatives) but no one, man or woman, would admit to engaging in illegal activities such as poaching.

Turtle protection behavior by community

More males were likely to mention combinations of community behaviors, whereas women only mentioned single behaviors. More females thought of poaching as a community behavior, whereas men cited hatcheries. Males said that being ignored by the commission members was a reason not to engage in community behaviors.

Involvement in the egg distribution program, commission meetings and elections

Males get involved in the egg distribution program because: they reside in the community, eggs provide food (especially during bad agricultural times), it is convenient, and it helps community development. Incomplete and non-permanent distribution were cited as barriers to involvement in the program. Program disadvantages included favoritism and inconvenience.

Females get involved in the egg distribution program because there is a major advantage: selling eggs. Untimely delivery of turtle eggs and the exclusion of females were cited as barriers to joining the program.

Attendance at commission meetings and participation in elections are higher for males than females but more men go to meetings than participate in elections. Males have voted, nominated, or been elected as commissioner but women have only voted in elections.

Males were more knowledgeable of the different roles of the commission. They thought that the commission could improve their work by controlling poaching, improving distribution and transportation of eggs, and bringing other sources of income to the area.

Females said that including females in the commission is a way that the commission can improve their work.

Knowledge of turtle biology

Generally, males think that turtles can become extinct and females think that is not true. Males were more knowledgeable about turtle lifespans and the onset of reproductive age. Males who think turtles can become extinct said it is because they face many dangers, whereas those who think turtles can not become extinct said "there are lots of turtles around".

Those females who think turtles won't become extinct said it is because there are turtle nests on other beaches. Conversely, those females who think turtles will become extinct said it is because they are mistreated by people, and they continue to be killed.

V. CONCLUSIONS

This study attempted to better understand turtle biology and turtle conservation behaviors among individuals living in the buffer zone communities around the La Flor Refuge. Key findings are described below.

A. Knowledge of Turtle Biology

- Several misconceptions about the possible extinction of turtles exist among different segments of the general population in and around La Flor. These are more prevalent among residents who live close to the refuge as they tended to think that turtles are still abundant and face no risk of extinction.

  Yet, people farther away from the refuge are less knowledgeable about two aspects of turtle biology, specifically how long turtles live and at what age reproduction begins.

B. Turtle Protection Behaviors

- This study explored two types of turtle protection behaviors:
  - behaviors that can be performed by the community as a whole; and
  - behaviors that can be performed by individuals.

  Breaking down behaviors on an individual and community basis was important to help underscore future initiatives that may be adopted when managing natural resources. Observing which behaviors can be implemented collectively by the community or individually by residents may help to resolve the current debate.

1. Community Behaviors

The analysis enabled us to observe that all of the behaviors categorized as being able to help improve the system of legal turtle egg harvest are perceived to be **community** behaviors. Examples of these actions include: deciding how many turtle eggs to harvest during *arribadas*, imposing (and enforcing) a moratorium covering a certain period during the year; and ensuring that families obtain established egg quotas. Once completed, there may be then a willingness to engage in community discussions about these issues, an important process to promote stewardship of a natural resource, and promote turtle protection in general.

2. Individual Behaviors

Questions that dealt with individual behavior led us to classify study participants into two categories: 1) Ever-doers, and 2) Non-doers. An ever-doer is someone who has performed the reported behavior at some point in the past. Non-doers are individuals

who report never having performed that behavior. Behaviors that have been performed by Ever-doers fall more frequently into the category "*Factors Limiting Reproductive Success*" than into the category "*Reducing/Eliminating Illegal Poaching*." The first category is associated with a previously administered egg harvesting program designed by community residents themselves. The second includes behaviors advocated by the MARENA system. A possible interpretation for this finding is that residents in the buffer zone communities may not yet have gained ownership of the new harvesting program. Consequently, they may be in a transition from a previous natural resource management approach to a new one.

More participation on the part of residents in making decisions about how to manage the resources may develop ownership and promote the adoption of the behaviors associated with that management approach, particularly avoiding turtle egg poaching.

- Any turtle protection program should be concerned with the protection of juvenile and adult turtles. The fact that the fishermen in the survey sample did not indicate that fishing practices could be damaging to turtles is worrisome. Fishermen in the area may need to be alerted to the possible implications for turtles of fishing practices. This is particularly important since a large segment of the population in buffer zone communities relies on turtle eggs distributed through the *aprovechamiento* program for food.

- A segment of the resident population in the buffer zone area may not know what turtle protection behaviors to adopt or think that they live too far away to have any impact on turtle conservation. Any educational intervention should address this lack of knowledge and these misperceptions.

- Study participants had no difficulty indicating what barriers preclude them from engaging in behaviors classified in the category "*Reduction/Elimination of Illegal Poaching*". In general, the reasons mentioned are associated with the negative image study participants have of MARENA and the military responsible for patrolling the beach during the moratorium. These findings again illustrate the need for MARENA to improve its relationship with buffer zone residents. Community participation in designing a resource management approach is likely to modify MARENA's image and may influence turtle protection behaviors in general. Improving the relationship between residents and the commissions as well as between the commissions and MARENA may be a way of developing stronger links between residents and MARENA. Furthermore, any subsequent educational interventions need to focus on implementing a better working relationship between MARENA and the community.

- Study participants can easily indicate why they engage in illegal poaching of turtle eggs. However, they can not easily articulate why they do not respect the moratorium and thus poach. This may be in part an instrumentation problem as well as a problem associated with how data on this topic were collected and handled. To the extent possible, it is

important that future studies clarify this matter as arguments in favor of why to respect the moratorium are key to developing persuasive messages to get residents to adopt desired behaviors.

C. The *Aprovechamiento* Program

- Certain aspects of the harvesting program and management approach adopted by MARENA are not known to residents. The program needs to be more transparent if residents are to support it.

  Information about the *aprovechamiento* program needs to be disseminated more widely and on a more timely basis.

- A strong perception among respondents is that women are excluded from the decision-making process of the program. Yet, it is mostly women who attend the commission meetings, suggesting they would like to have a say in the distribution system used. This finding is important since it is the woman in the household who is more likely to sell the turtle eggs distributed. Women in the household are normally in charge of selling turtle eggs because they are responsible for buying food for the family. The proceeds from the sale of eggs are usually used to buy groceries. Since female-headed households have a larger number of dependents to support and they make their livelihood mainly from agricultural sources, money generated from the sale of turtle eggs is an important source of revenue.

  Women's participation in decision making may enhance their support of the *aprovechamiento* program.

- Most of the eggs that are distributed to families through the *aprovechamiento* program are unable to be eaten. This is because they are only edible for a short period of time (approximately 10 days), after which they become toxic. For this reason, much of the egg quota received is then sold by the beneficiaries to make extra income.

  Curbing the illegal sale of eggs may not be possible until these issues are further clarified.

VI. RECOMMENDATIONS

Encouraging turtle protection is an enormous and demanding task. At a minimum, it requires first a consensus among biologists, government officials and community residents on what behaviors to promote. The behaviors need to make biological sense and be both politically and socially viable. The definition of those behaviors may help define a course of action which allows for gradual changes to be introduced over time. Participation of buffer zone residents in designing a management strategy of a natural resource base is also crucial in making that strategy sustainable. The research being reported here was an attempt to deal with both of these dimensions. The recommendations that follow, emanating from the findings, may be used in designing an educational intervention to promote certain practices, to promote further participation in program design from community residents, and in conducting future research activities.

A. Knowledge of Turtle Biology

Audience segmentation may be done both by gender and distance to the refuge. The misconceptions about turtle biology found both among women and residents closer to the refuge need to be corrected.

To increase general awareness, future educational interventions for residents should:

- explain why sea turtles constitute an endangered species;
- provide basic information about the lifespan of turtles, and the initiation and duration of their reproductive cycle.

B. Turtle Protection Behaviors

Future educational interventions for residents should:

- indicate what turtle protection actions residents can adopt on an individual basis;
- include not only behaviors associated with the avoidance of illegal poaching but also with (fishing) practices that can affect the life of juvenile and adult turtles.

C. The *Aprovechamiento* Program

The program should facilitate the transition of a natural resource management approach designed with the community to one where biological considerations are more systematically taken into account.

Future educational interventions for residents should:

- make the *aprovechamiento* program as designed by MARENA more transparent, for example: 1) indicate how a family census is done and why, 2) how commissions get elected and the roles they are expected to play, 3) how turtle eggs are laid on the beach and counted, and 4) how the quota of eggs is distributed, etc. ;

- change MARENA's image among buffer zone residents;

- target different audiences, mainly **residents** in the buffer zone (adults and children) and **temporary visitors** who come to the buffer zone during *arribada*s;

  use a combination of media which rely more heavily on oral rather than written communication and which can reach not only buffer zone residents but also individuals outside the buffer zone (poaching may exist within and outside the buffer zone);

- be implemented year-round, including during the off-season as well as during the moratorium.

Consideration needs to be given to:

- the need to engage buffer zone residents in designing a management approach of the protected area that makes both biological and socio-economic sense;

  increasing the involvement of women in the commissions and other natural resource management matters in order to begin resolving gender inequity concerns;

- roadblocks or other ways of enforcing the moratorium on the roads to town to prevent the transportation of large amounts of turtle eggs by single individuals during the *arribada*s; and

  the need to discuss the fact that, since eggs become toxic in a certain number of days, a large number can not be consumed and therefore must be sold

Future qualitative research activities need to:

- clarify reasons motivating community residents to engage in behaviors that reduce or eliminate poaching in order to have sufficient information to design turtle protection messages which are more persuasive.

D. Gender Considerations

Women's knowledge and participation need to be addressed. Considerations should be given to adopting a two-phased approach. In the first phase, knowledge about turtle biology would be increased and appropriate conservation attitudes would be developed. In the second stage, participation in the different decision-making processes would be stressed. Specific behavioral suggestions for women may also be disseminated at that time. Informing women about how fragile turtle ecology is and what they need to do to protect the environment should be conveyed through the media women tend to use most frequently. Convening small group discussions where women congregate naturally or reaching women through their children should be considered strategies.

In addition, alternative sources of income generation to turtle egg selling, particularly for women, must be identified and promoted.

ANNEX 1

Research Instrument Used