BASELINE ASSESSMENT OF TSUNAMI AFFECTED VILLAGES

TAMBON KAMPUAN, SUK SAMRAN DISTRICT, RANONG PROVINCE, THAILAND

PREPARED BY

RICHARD B. POLLNAC
DAWN KOTOWICZ

JULY 2006

THAILAND POST-TSUNAMI SUSTAINABLE COASTAL LIVELIHOODS PROGRAM

A PROGRAM OF THE LEADER WITH ASSOCIATES COOPERATIVE AGREEMENT ON SUSTAINABLE COASTAL COMMUNITIES AND ECOSYSTEMS (SUCCESS)

IMPLEMENTED BY THE COASTAL RESOURCES CENTER, UNIVERSITY OF RHODE ISLAND IN PARTNERSHIP WITH THE ASIAN INSTITUTE OF TECHNOLOGY AND THE UNIVERSITY OF HAWAII

Funded by:

Regional Development Mission/Asia
U.S. Agency for International Development
Cooperative Agreement No. 486-A-00-05-00004-00

USAID FROM THE AMERICAN PEOPLE

COASTAL RESOURCES CENTER
University of Rhode Island

ASIAN INSTITUTE OF TECHNOLOGY 1959

UNIVERSITY OF HAWAI'I HILO

Table of Contents

Tables

Tables (continued)

Tables (continued)

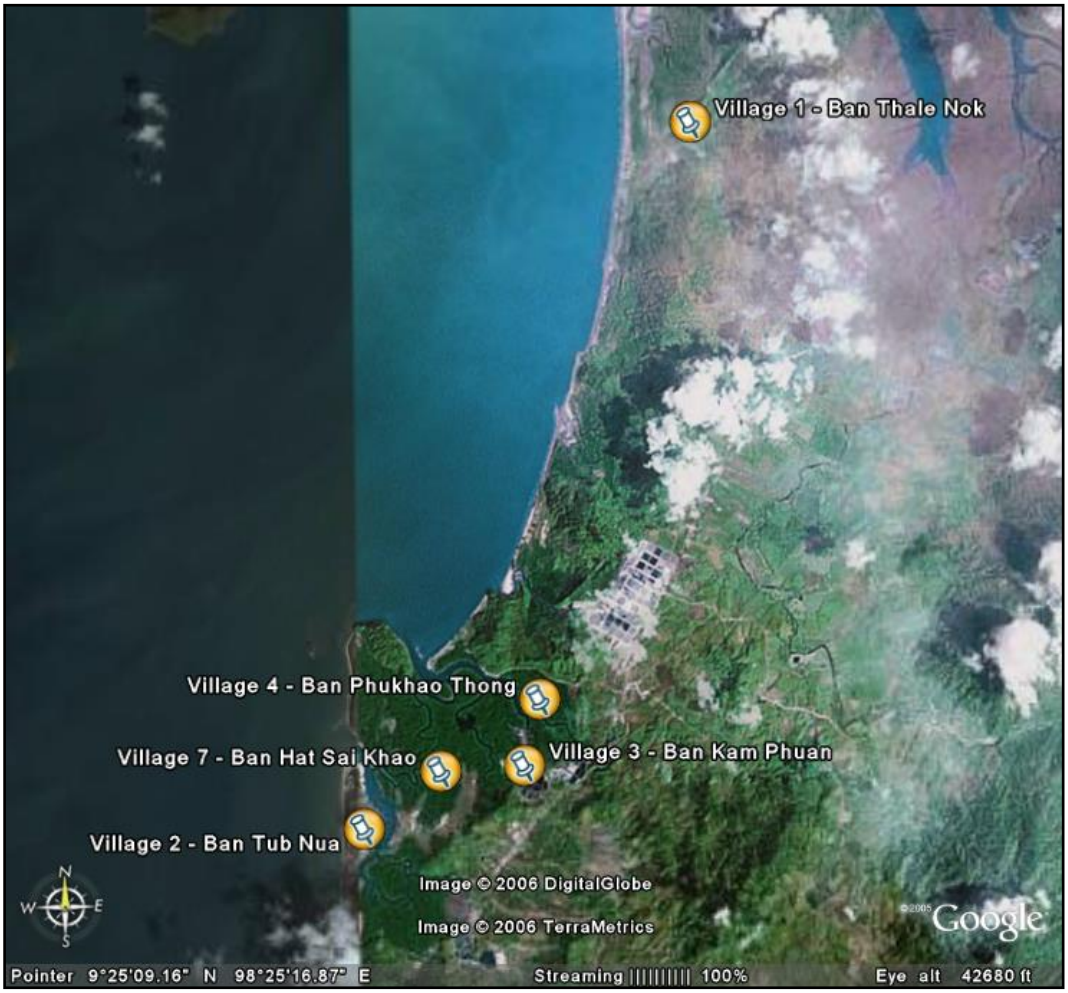
Figures

Appendices

EXECUTIVE SUMMARY OF BASELINE ASSESSMENT OF TSUNAMI AFFECTED VILLAGES TAMBON KAMPHUAN, SUK SAMRAN DISTRICT, RANONG PROVINCE, THAILAND

The purpose of a baseline is to establish a standard which can be used to evaluate changes that take place in the area of concern. In the present case it is performed before project activities in an attempt to determine project impacts. The baseline can also be used to assist in the design of these activities. To achieve this latter objective, aspects of the data collected during the baseline were analyzed and provided to project personnel in 2005 (e.g., Pollnac 2005).

Methods involved a preliminary assessment of the five project communities to determine information of use in designing and conducting a baseline survey. A map of the five villages is presented below.



Overall, 30 percent of the households in the five villages are included in the sample. One male and one female adult were interviewed in each household resulting in a total sample size of 502. Questions in the baseline survey included: 1) background on the interviewee (e.g., age, religion, gender, education), 2) the individual's household (e.g., material possessions, sources of income, household size), 3) impacts of the tsunami on humans, household material wealth, and occupation, and 4) individuals' perceptions of well-being, beliefs concerning the environment, attitudes towards the occupation of fishing, perceptions of changes over time and perceptions of ongoing and planned recovery activities (see interview form in Appendix I).

The tsunami had extensive impacts in the five project villages. Overall, 16 percent of respondents to the survey report injury by the tsunami. Twenty percent of the respondents report some household members injured and 13 percent report household members killed. Fully 37 percent report relatives injured and over one-half (54 percent) report relatives killed. Finally over half of the respondents to the survey report friends injured and killed (53 and 59 percent respectively). Except for number of household members injured, there is a great deal of variation between the five villages as detailed in the following report. For example, Village 1 has the highest mean number of household members and non-household relatives killed, and respondents from Village 3 report the highest mean number of non-household kin injured and friends killed and injured.

The tsunami also wrought damage and destruction to the villagers' material possessions. Damage to houses varied greatly between villages, ranging from under 10 percent (Villages 4 and 3) to over fifty percent (Village 7). Household impacts represent investment and savings over a relatively long time period because most people in this area move into a house after they marry and remain there for the rest of their lives while continually adding to their initial investment. Many of the families gradually built or improved their houses overtime as they accrued savings. Those households that lost houses also lost most of the contents within and, therefore, must start over again, saving for improving their houses and acquiring items.

Occupational impacts are also significant. For example, if a household loses its boat and fishing gear, it must first save enough money to invest in these things again in order to resume fishing. Many occupations practiced in this area provide food in addition to income; people practicing these occupations are hurt both in terms of monetary income and food. Other occupations were impacted because productive materials were literally washed away by the water that inundated the villages.

How have these impacts influenced villagers' perceptions of well-being? The survey clearly indicates that there are differences between the villages with respect to perceptions of changes in *household well-being* following the tsunami. Almost all respondents from Village 7 feel they are worse off in contrast to a little over half in Village 1. With respect to perceptions of *community well-being*, respondents from Villages 1 and 2 provide more positive responses than Villages 4 and 7. Analyses of perceived community level changes since the tsunami indicates an overall perception of negative changes in the five villages with regard to community well-being, with statistically significant inter-community differences. Village 7 manifests the greatest negative change and Village 1 the smallest in overall well-being. With regard to degree of change in the future, Village 7 anticipates the greatest positive change in well-being over the next three years and Village 4, the least. Overall, the findings display a remarkable resilience in response to this great natural disaster. Highly impacted villages like Village 7 project the most positive future changes. This observation is supported by the fact that on the individual level, those who perceive the most negative post-tsunami changes tend to predict the most positive future changes.

Since the livelihoods of most of the households in the five villages depend on resource extraction (fishing), sustainability of these resources should be an important consideration in recovery. Hence, it is important to understand villagers' perceptions of the environment and environmental management. The analysis of predictors of variability in perceptions of the environment suggest that older individuals, those with less education, those who were injured by the tsunami and those with a lower level of exposure to the mass media will probably require special attention in training programs directed at environmental management since they are more likely to be fatalistic—to feel that planning has no impact on what happens in the future. There is also inter-village variability. A low of 35 percent of the respondents from Village 1 agree with the statement that there is no point in planning for the future, what happens, happens and we cannot do anything about it, in contrast to almost 60 percent of those from Village 2 (table 54). This difference can probably be attributed to the fact that Village 1 is the focus of the most development work and there is internal political conflict within Village 2. Both of these factors can influence perceptions of the impact of planning, indicating that inter-village differences must be accounted for in the development of post-tsunami recovery efforts.

It is also revealing that villagers' involvement in post tsunami recovery projects appears to have had a negative effect on perceptions of future changes in empowerment with regard to the environment. This is unexpected, and should be further investigated. Has participation engendered feelings of inefficacy due to

the nature of the problems encountered, or has top-down planning resulted in feelings that they have nothing valuable to contribute to the recovery efforts? If the latter, co-management efforts will have to be structured to change these perceptions which could be dysfunctional in a situation where local participation is necessary and feelings of empowerment an essential ingredient.

A more positive finding, however, is that a large number of respondents from the project villages disagree with the statement that human activities do not influence the number of fish in the ocean. This contrasts with similar data collected in Indonesia in 2002 and Vietnam in 2004 where much smaller proportions of the samples disagreed with this statement. Responses of the Thai villagers indicate a much greater level of environmental awareness, which bodes well for involving villagers in co-management efforts. Nevertheless, one must note that a little over one-third of the respondents do not believe that human activities have an impact on fish populations. This one-third probably represents villagers who would be less likely to participate in cooperative management and would likely resist attempts to manage the fishery. Clearly there is still a need to develop some sort of educational programs for this segment of the population. Inter-village differences in these perceptions should inform these programs.

Our examination of occupations indicates that most of the households in these villages were engaged in multiple occupations, both pre- and post-tsunami. About two-thirds of the households in the five village derive income from at least 2 productive activities and about one-third from at least 3. This is an advantage for managers because if residents are accustomed to participating in different types of livelihood options, they are likely to be comfortable learning various types of skills as needed. Therefore, they may be more likely to participate in newly introduced livelihood projects to supplement their current sources of income. One option for rehabilitation is to encourage expansion of current livelihood options (e.g., raising livestock). This could be a relatively rapid way to increase income for households and will also involve less capital and training because some households already practice this type of livelihood.

It should be kept in mind that the results of the survey indicate that males and females, as well as children, although less frequently, are involved in productive activities. Hence, recovery efforts should include women and children in participatory consultations in order to design projects that will address contributions of the entire household. Women and children should be consulted as to their availability and willingness to participate and learn new skills. It is possible that children's willingness to participate in projects is different than those of adults, especially since a majority of children in this area have some experience with formal education. This may increase willingness to participate because the children are confident that they can learn new skills but it may decrease likeliness if children tend to want to devote more time to schooling. Women also may be more likely to participate in different types of projects, especially with respect to working group structure. During the survey it was observed that women tended to work in groups, for example when gleaning the intertidal areas. Men, however, tended to work (especially in the capture fishery) in pairs or threes. Project design should reflect these trends in current working environments in order to increase their likelihood of success.

Fishing was the most frequent source of livelihood in all of the villages except Village 3, and it also manifested a great deal of multiplicity with regard to specific types of fishing. The survey indicates that overall, households do not rely on only one or two types of fishing, but practice many types for both food and income. For those involved in fishing, between almost half and over two thirds use at least four gear types. At least 40 percent of the households in four out of the five villages use 5 or more gear types. This type of gear multiplicity increases a household's ability to adapt to changing conditions in a fishery. Therefore, fishing households are more likely to adapt by emphasizing other gear types if one regulation restricts a certain type of gear. Managers, however, should still be conscious that regulating one type of gear is not likely to reduce effort overall but rather, decrease stress on the stocks targeted by that effort. This data also illustrates that many fishing households are deeply involved in fishing, especially as evidenced by the investment required to acquire various gear types.

It was suggested by some that the tsunami would result in fishers fearing the sea and wanting to change their occupation. The results clearly indicate that attitudes towards the occupation are more negative than those reported by Pollnac, et al. (2001) for comparable Southeast Asian fisheries. Whether or not this can

be attributed solely to the impacts of the tsunami is not clear at this point. The tsunami indicators, as analyzed in this report, did not have a negative impact on either liking the occupation or advising a young person to enter the occupation. Those who lost family members or friends to the tsunami did tend to report that they would leave the occupation for an alternative providing the same income. Nevertheless, personal injury resulting from the tsunami did not have this effect. Further, those with a fatalistic attitude and those who perceived fishing as not dangerous tended to report that they would not leave the occupation. The survey was conducted during the monsoon season when fishing conditions were at their worst, and this may have influenced some of the negative responses. Nevertheless, we observed that as fishers obtained boats and gear, they quickly returned to the sea, frequently braving the heavy swells and crashing waves as they departed the coastal channels and river mouths to ply their traditional occupation.

Clearly the large number of respondents who state they would change to an alternative occupation bodes well for an alternative income program. Nevertheless, given the relatively large percentage of respondents who report that they like fishing (about four-fifths of the males from households where fishing is first or second in importance for income) suggests that as time goes by and memories of the tsunami fade, fascination with an alternative occupation might wane. What would fishers in the five villages prefer to do if they could no longer fish? Our survey indicates that most would prefer to become a traders or farmers, with only a small percentage mentioning other occupations. Aquaculture, which is often promoted as an alternative livelihood for fishers, is preferred by only one in 25 in our sample. Analyses of investment orientations among all villagers produced similar results. There is, however, inter-village variation with respect to these preferences, which should be considered.

The analyses of job satisfaction among fishers and investment orientations in the villages as a whole can be used to provide tsunami recovery workers some indication of activities perceived as worthy of investment by community members. Inter-village and inter-individual differences in investment orientations are information important in the structuring of credit schemes and complementary training programs to foster investment opportunities in targeted communities. But this information must be used with care—responses to questions do not always reveal realistic behavioral responses—some may see themselves as a successful traders, but do they have the necessary skills and is there a market for the proposed trade?

Trading is used as an example because investment in trading is the most frequently mentioned option in the interviews. It appeared as a first or later response in 37 percent of the interviews (table 66). Responses were often general; e.g., “invest in trading,” “open a shop,” “expand shop.” Only a few were specific; e.g., “trade fish,” “buy drugs for pharmacy,” “open grocery,” “trade fruit.” This suggests that most respondents had not even carefully considered the type of trading they would become involved in. Further, one must ask, how many traders are needed? If more than one third of the respondents open some sort of trading enterprise, would there be enough business to support such a large number of traders? Similar questions could be asked of some of the other alternatives.

If movement out of the fishery is desirable for conservation purposes, it is suggested that actions be taken soon, and that appropriate alternatives—those that provide some of the same satisfactions as fishing—be provided. Riskiness, independence and being one’s own boss are documented characteristics for alternative occupations that are most likely to satisfy former fishermen. One example of this type of occupation is charter boat trips for tourists. This is especially applicable because it is already practiced in at least one village in the study area suggesting that there is a market for such activities, but the size of the market needs to be determined. The alternative occupations uncovered in this analysis might be of some assistance in this endeavor, but the relative recency of the tsunami and villagers’ awareness of suitable alternatives may limit, somewhat, the usefulness of the information provided here. Additionally, it should be noted that overall, fishers in Villages 1, 3, 4 and 7 appear to be more amenable to an occupation outside of the fishery while Village 2 seems least likely to accept alternatives to fishing; hence, projects geared toward diverting fishermen away from the fishery would be least likely to succeed in Village 2. It is suggested that the investment orientations presented in the following analyses, in conjunction with human resource, economic and marketing analyses, as well as education programs directed at raising awareness concerning suitable alternatives be the starting point for developing comprehensive alternative occupation and recovery programs for the involved villages.

The baseline survey also examined aspects of recovery project awareness and participation. These analyses indicate that those most impacted by the tsunami (as evidenced by low material style of life scores, and household members killed or injured), with smaller households, younger, female, educated and exposed to mass media are most aware and most likely to participate in project activities. Since all these variables evidence statistically significant independent effects on project participation, they all should be taken into account when targeting individuals for training and participation (e.g., level of tsunami impact, higher level of education or female, although the combination of the variables would predict greater chances of success). Efforts should also be made to reach those less likely to participate (older, fatalistic, lower levels of education, and larger households) to convince them of the value of the recovery projects. Valuation of ongoing and proposed projects as well as information provided in previous preliminary baseline reports should also be used to inform project planning.

Finally, some of the variables examined in the following report give us a basis for evaluating project impacts (e.g., material style of life, community infrastructure) as well as tracking other changes in the community through time (e.g., population, household size, education, perceptions of coastal resources and their management). Information such as this is important in monitoring and evaluation—to tell us if the recovery activities implemented are having the expected impacts.

BASELINE ASSESSMENT OF TSUNAMI AFFECTED VILLAGES
TAMBON KAMPHUAN, SUK SAMRAN DISTRICT, RANONG PROVINCE, THAILAND

1. Introduction

1.1 Project Background

The December 26, 2004 Indian Ocean tsunami severely impacted the lives of hundreds of thousands of people in coastal villages throughout the region. The *Post-Tsunami Sustainable Coastal Livelihoods Program* was implemented to assist local government coordinate, plan and implement recovery efforts. It was implemented as a demonstration project in five communities in Ranong Province, south of the Myanmar border along the Andaman Coast. The five villages are Thale Nok (Village Number1); Nua (No. 2); Kam Phuan (No. 3); Phu Khao Thong (No. 4, also referred to as Ta Klang); and Haad Sai Kao (No. 7, also referred to as Baan Haad Yao).[1] Details concerning project background and implementation can be found in the report on the participatory rapid appraisal (PRA) conducted by Soparth, et al. (2005). Additional information on the communities can be found in Pollnac and Kotowicz (2005).

1.2 Purpose of Baseline and methods used

1.2.1 Purpose The purpose of the baseline assessment is to provide a baseline for assessing changes through time in affected villages as impacted by recovery programs and other factors. This will allow those involved in recovery efforts to assess impacts of their recovery activities as well as plan activities based on the information from the baseline assessment.[2]

1.2.2 Methods Methods involved a preliminary assessment (Pollnac and Kotowicz 2005) to determine information of use in designing and conducting a baseline survey (Pollnac and Crawford 2000). Questions in the baseline survey included: 1) background on the interviewee (e.g., age, religion, gender, education), 2) the individuals household (e.g., material possessions, sources of income, household size), 3) impacts of the tsunami on humans, household material wealth, and occupation, and 4) individuals' perceptions of well-being, beliefs concerning the environment, attitudes towards the occupation of fishing, perceptions of changes over time and perceptions of ongoing and planned recovery activities (see interview form in Appendix I).

Sample households were selected using systematic sampling in each of five villages (1, 2, 3, 4, 7). Target sample size for each village was fifty households. Sampling was accomplished by determining number of households from official statistics and interviews, then dividing that number by 50 for each village. The resulting number (X) was used to select every X^{th} household in the village for an interview. In addition, all households that relocated to other locations were identified and included in the sampling procedure to capture the portion of the population that moved as a result of the tsunami. Number of households and percent of total number of houses for each village are as follows: Village 1, 43 (94%), Village 2, 46 (17%), Village 3, 61 (34%), Village 4, 50 (23%), Village 7, 51 (43%). The reason for the relatively larger sample size in Village 3 and smaller in Village 2 was lack of information regarding the border between Villages 2 and 3 in the Sub-District and Tambon office records. Overall, 30 percent of the 840 reported households for the 5 villages are included in the sample. One male and one female adult were interviewed in each household resulting in a total sample size of 502.

[1] The numbers for the villages are official designations for the Tambon, which are used in official documents as well as terms of reference by some individuals.
[2] Much of the data presented in this baseline were presented in preliminary baseline reports prepared in the latter half of 2005.

2. Tsunami Impacts on Residents.

2.1 Introduction

In order to determine the experiences respondents in the five villages had concerning the tsunami as well as the tsunami's impacts on their physical well being as well as that of their household members, relatives and friends, they were asked the following questions:

1. As a result of the tsunami, were you injured? Yes____ No___
For the following 3 questions if the response was yes, the number was entered in the space provided.
2a. Were any members of your household killed? yes___ no___
b. or injured? Yes___ no___
3a. Were any of your kin outside your household killed? yes___ no___
b. or injured? Yes___ no___
4a. Were any close friends killed? yes___ no___
b. or injured? Yes___ no___
5. Where were you when the tsunami struck?
6. What did you see?

2.2 Injury and Death

2.2.1 Inter-village variation Table 1 indicates the percent distribution of respondents who were injured by the tsunami. The overall differences are not statistically significant ($\chi^2 = 8.19$, df = 4, $p>0.05$), but Village 4, in comparison to the other villages combined has a smaller number of respondents who report injury by the tsunami ($\chi^2 = 6.29$, df = 1, $p<0.05$).

Table 1. Percent respondents injured by tsunami.

	Village					
	1	**2**	**3**	**4**	**7**	**Total**
Percent respondents injured	13	18	20	07	19	16

N=457

Tables 2 and 3 indicate the percent distribution of numbers of household members injured or killed by the tsunami. Village 4 has the smallest percentage of respondents reporting some household members being injured or killed (12 and 1 percent respectively). Village 7 has the largest percentage reporting some household members injured (25 percent) and Village 1 reports the largest percentage with some killed (36 percent). Statistical analyses of total numbers are presented below in table 8.

Table 2. Percent distribution of number of household members injured by the tsunami.

	Village					
Number injured	**1**	**2**	**3**	**4**	**7**	**Total**
0	80	81	77	88	75	80
1	16	10	18	08	19	15
2	01	06	03	04	06	04
3	00	03	01	00	00	01
4	03	00	00	00	00	<01
5	00	00	01	00	00	<01

N=458

Table 3. Percent distribution of number of household members killed by the tsunami.

	Village					
Number killed	**1**	**2**	**3**	**4**	**7**	**Total**
0	64	84	89	99	96	87
1	15	13	06	01	02	07
2	11	03	05	00	02	04
3	02	01	00	00	00	01
4	04	00	00	00	00	01
5	04	00	00	00	00	01

N=461

Tables 4 and 5 present percent distribution of numbers of relatives outside the household injured or killed by the tsunami. It should be noted that some of these kinsmen might be from other villages. Villages 2, 4 and 7 have the lowest, and Villages 1 and 3 have the highest percent of respondents reporting some relatives outside the household injured. With regard to percent distribution of relatives killed Village 7 has the lowest percentage reporting some (26 percent) while Village 1 has the highest (79 percent). Once again, statistical analyses of the raw numbers reported are presented in table 8 below. Tables 6 and 7 indicate percent distribution of respondents reporting numbers of friends injured or killed by the tsunami. Like with regard to relatives, Villages 2, 4 and 7 have the lowest percent of respondents reporting some

Table 4. Percent distribution of number of relatives injured by the tsunami.

	Village					
Number injured	**1**	**2**	**3**	**4**	**7**	**Total**
0	46	74	51	74	70	63
1	28	05	06	07	14	12
2	10	04	08	05	07	07
3	08	06	08	06	02	06
4	01	00	06	02	01	02
5	01	05	05	03	00	03
6	02	00	00	00	00	<01
7	02	00	03	00	03	02
8	00	00	02	00	00	<01
9	00	00	00	00	00	00
10	00	03	06	00	02	02
>10	00	02	04	00	01	02

N=458

Table 5. Percent distribution of number of relatives killed by the tsunami.

	Village					
Number killed	**1**	**2**	**3**	**4**	**7**	**Total**
0	21	53	34	46	74	46
1	25	11	19	22	09	17
2	04	04	07	06	10	07
3	06	16	17	06	03	10
4	10	01	02	03	01	03
5	15	05	09	04	00	07
6	06	04	01	04	00	03
7	02	01	02	03	00	02
8	02	00	02	02	01	02
9	00	00	00	01	00	<01
10	02	04	01	02	00	02
>10	06	01	06	00	01	03

N=458

Table 6. Percent distribution of number of friends injured by the tsunami.

	Village					
Number injured	**1**	**2**	**3**	**4**	**7**	**Total**
0	37	52	39	56	50	47
1	12	06	03	02	08	06
2	07	09	03	05	05	06
3	10	04	10	14	07	09
4	05	03	00	05	04	03
5	09	08	12	04	05	08
6	07	01	04	03	00	03
7	01	01	04	03	02	02
8	04	00	02	02	01	02
9	01	00	01	00	01	01
10	04	10	08	02	08	07
>10	01	04	16	03	07	07

N=458

Table 7. Percent distribution of number of friends killed by the tsunami.

	Village					
Number killed	**1**	**2**	**3**	**4**	**7**	**Total**
0	28	38	36	44	57	41
1	09	08	06	09	08	08
2	06	10	05	07	03	07
3	04	09	03	06	05	05
4	10	00	06	03	01	04
5	07	13	11	06	02	08
6	02	03	02	03	01	02
7	00	01	01	03	01	01
8	05	00	02	02	04	03
9	00	00	00	07	06	03
10	15	12	20	05	10	13
>10	12	06	09	03	00	06

N=458

friends injured, and Villages 1 and 3 have the highest reporting some injured. With regard to friends killed by the tsunami, Village 1 has the highest percentage reporting some and Village 7 the lowest. Once again, these friends could have come from other villages. Statistical analyses of the raw numbers reported are presented in table 8.

Table 8. Analysis of variance of tsunami impacts on household members, relatives and friends.*

	Village							
Relationship and impact	**1**	**2**	**3**	**4**	**7**	**df****	**f-ratio**	**p**
House Killed	0.778	0.215	0.156	0.010	0.062	4 456	18.530	<0.001
House Injured	0.287	0.312	0.312	0.167	0.312	4 453	0.907	>0.05
Kin Killed	3.457	1.895	3.037	1.802	1.042	4 453	4.542	<0.005
Kin Injured	1.179	1.208	2.587	0.863	0.948	4 453	6.423	<0.001
Friend Killed	5.944	4.610	6.667	3.229	2.521	4 453	4.941	<0.005
Friend Injured	2.728	3.013	6.000	2.188	3.625	4 454	5.675	<0.001
Total Killed	10.179	6.776	9.861	5.042	3.625	4 452	9.316	<0.001
Total Injured	4.181	4.532	8.899	3.242	4.885	4 452	8.520	<0.001

*cell entries are mean values.
**df changes due to missing data on some variables.

Table 8 presents an analysis of variance of numbers of household members, non-household kinsmen and friends injured or killed by the tsunami. It also presents analysis of total number of household members, non-household kin and friends killed or injured (all three categories summed). Except for number of

household members injured, differences between the five villages are statistically significant. Village 1 has the highest mean number of household members and non-household relatives killed. Respondents from Village 3 report the highest mean number of non-household kin injured and friends killed and injured. These latter findings can possible be explained by the fact that Village 3 is the local trading center where village members have many contacts in the other villages. Also, Village 7 was a part of Village 3 until recently. Overall, Village 1 reports the largest number of household members, non-household kin and friends killed (the summary measure). Village 3 reports the highest number injured.

2.3 Locations and Experiences of Residents during the Tsunami

2.3.1 Locations of Residents Table 9 indicates the location of respondents during the tsunami. Half the respondents reported being at home, 10 percent in boats at sea, a total of 9 percent on the beach, on an offshore island, in the mangroves, or at the pier or in the canal. About one-fourth (23 percent) were at other locations in or outside their village. Finally, nine percent of respondents did not want to talk about their location at the time of the tsunami.

Table 9. Percent distribution of location of respondents during the tsunami.

	Village						
	1	2	3	4	7	Total	N
No response	7	16	11	5	6	9	45
Other	30	18	24	19	22	23	113
Home	49	48	47	50	56	50	250
Mangroves	1	2	0	1	0	1	4
Pier/canal	0	0	0	4	4	2	9
Beach	3	8	8	3	1	5	24
Island	1	1	0	3	0	1	5
Boat at sea	8	7	10	15	12	10	52
N	86	92	122	100	102		502

2.3.2 Experiences of Residents Table 10 presents percent distribution of experiences during the tsunami as reported by respondents. Response categories in table 10 are sub-categorized from 85 response categories in the raw data. The category "debris" includes reports of automobiles, houses, and other large debris being broken and/or washed through the village by the waves. "Boats sinking" refers to reports of visually observing boats sinking. Any description of the waves, e.g., "high waves", "lots of waves", "big white waves", "wave about 7 meters high", etc. were categorized as simply "waves". Any mention of the impact on people, e.g., "people running", "dead people", "people crying", was categorized as "people". The category "high water" included mention of flooding, "water rising quickly", etc. Some reported not seeing anything (nothing) and others refused to talk about the tsunami (no response). Responses that could not be categorized into these categories are noted as "other".

Table 10. Percent distribution of respondent's experiences during the tsunami.

	Village						
	1	2	3	4	7	Total	N
No response	16	16	11	8	6	11	56
Debris	2	1	2	4	7	3	16
Boats sinking	1	0	2	9	7	4	20
High water*	19	5	4	33	19	16	78
Waves*	47	24	20	36	55	36	179
People	10	4	8	20	15	12	58
Other*	10	10	9	22	17	14	68
Nothing*	19	49	59	26	20	36	179

*Statistically significant ($p<0.05$) differences across villages.
Columns can sum to more than 100% because respondents could supply more than one response.

Focusing only on inter-community differences that are statistically significant, table 10 indicates that villagers from Village 4 are more likely to note the high water ($\chi^2 = 43.91$, df = 4, $p<0.001$) than villagers from the other villages. Since Village 4 is located in the mangroves for the most part, they probably only experienced the increase in water, the waves being buffered by the trees. Villagers from Villages 1 and 7 are more likely to report aspects of the waves ($\chi^2 = 38.65$, df = 4, $p<0.001$), probably as a result of their overall more exposed location. Behavior of people were mentioned most frequently by respondents from Village 4 ($\chi^2 = 14.09$, df = 4, $p<0.01$). It is difficult to explain this relationship. Finally, respondents from Villages 2 and 3 are most likely to report seeing nothing ($\chi^2 = 62.48$, df = 4, $p<0.001$). This response can probably be explained by the fact that significant proportions of the populations of these two villages live inland and farther away from the sea than those from the other villages.

3. Impacts of the Tsunami on Possessions and Productive Materials

3.1 Introduction

Recovery efforts in the aftermath of natural disasters must be designed to meet the needs of the affected population. The extent and type of aid needed is determined by the impact of the disaster on households and livelihoods. Therefore, it is important to describe the extent of damage to possessions and productive materials. This information can then be used to structure recovery over the life of the program.

In order to describe the affects of the tsunami on possessions and productive materials, we surveyed a sample of 251 households. The respondents were asked the following questions:

1. Do you have a replacement boat? If so, does it have a replacement motor?
2. In terms of the gear associated with the productive activities, was any of it
3. damaged or destroyed by the tsunami? If yes, what and what was the extent of the damage?
4. With regard to your house and/or its contents, was anything damaged or destroyed by the tsunami? If Yes, what?

3.2 Impacts on Possessions and Productive Materials

Table 11 illustrates damage to various aspects of households in each village. Due to changes in the survey after completing the first sample in Village 1, a shortened survey was administered to twenty-five households to provide more detailed information. Therefore, the data for the boat, engine and gear damage was calculated from the smaller sample for Village 1 and the house and household item damage was determined from the larger sample. However, the relative percentages are of the respective sample from which the data was gathered.

Table 11. Damage to boats, engines, gear, house, and household items grouped by village

	Village 1		Village 2		Village 3		Village 4		Village 7	
	No.	%	No.	%	No.	%	No.	%	No.	%
Boat	13	52.0	18	39.1	20	32.8	27	54.0	36	70.6
Engine	13	52.0	17	37.0	20	32.8	21	42.0	35	68.6
Gear	20	80.0	26	56.5	23	37.7	35	70.0	41	80.4
House	13	30.2	18	39.1	5	8.2	3	6.0	27	52.9
Household Items	35	81.4	19	41.3	12	19.7	7	14.0	39	76.5

Over two-thirds of the residents in Village 7 (70.6 percent) lost one or more boats during the tsunami. In Villages 1 (52 percent) and 4 (54 percent) over half of the households lost boats. Approximately one-third of the boats were lost from Villages 2 (39.1 percent) and 3 (32.8 percent). In all of the surveyed villages, the percentage of engines lost was the same or slightly less than loss of boats (Villages 1 and 3, equal; Village 2, 2.1 percent less; Village 4, 12 percent less; Village 7, 2 percent less). This is to be expected because some of the boats that were destroyed by the tsunami did not have engines.

Gear damage, as recorded in the table above, includes all fishing gear that was reported damaged and/or destroyed. Overall, more gear was lost by a larger percent of surveyed households in all of the villages than boats or engines. Eighty percent of the households sampled in Villages 1 and 7 (80.4 percent) lost fishing gear. Seventy percent of the households in Village 4 and over half of the sample in Village 2 (56.5 percent) lost fishing gear.

Damage to houses differed largely between villages, ranging from six (Village 4) to over fifty percent (Village 7). This disparity is best explained by the proximity of each of the villages to the ocean. The location of the houses in Village 7 (52.9 percent damage) were along a canal that led to open ocean. About one-third of the sample in Villages 2 (39.1 percent) and 1 (30.2 percent) experienced damage to houses. In Village 3 (8.2 percent) houses were less likely to experience damage because their location is further inland and Village 4 (6.0 percent), within a mangrove area that is protected from open ocean waves.

Damage to household items is higher in each of the villages than damage to houses but generally follows the same trend. Villages 1 (81.4 percent) and 7 (76.5 percent) experienced the greatest percentage damage

to household items at over two-thirds of each of the samples. Over forty percent of the households surveyed in Village 2 (41.3 percent) sustained damage to household items. In Villages 3 (19.7 percent) and 4 (14.0 percent), less than one-fifth of the surveyed households reported damage to household items.

Table 12 categorizes household damage as none, partial or total. Many houses were completely destroyed along with all of the contents within. However, there were some households that experienced water damage, which may have affected household items, without damaging the house itself. Over two-thirds of the houses in Village 7 (64 percent) were completely damaged by the tsunami. Villages 2 (37 percent) and 1 (30.2 percent) each reported complete damage in approximately one third of the surveyed households. This is consistent with the presence of rebuilt houses in each of these villages. Although there are rebuilt houses in Village 2, a large portion of the village is located inland and did not experience damage. This explains the relatively large percentage of households reporting no damage (58.7 percent) in addition to approximately one-third of the sample that experienced total damage (37 percent). Over half of the households surveyed in Village 1 (51.2 percent) experienced partial damage to their house and/or household items. Less than fifteen percent of the sample in Villages 2 (4.3 percent), 4 (8 percent), and 7 (14 percent) experienced partial damage. There were no households that reported partial damage in Village 3. Villages 3 (80.3 percent) and 4 (86 percent) reported the largest proportion of households with no damage. This finding is consistent with the settlement pattern in Village 3 because the village is located further inland than other villages. Most houses in Village 4 are also relatively protected from the open ocean because the village is located behind a thick area of mangroves and the houses are constructed on stilts and connected by raised walkways.

Table 12. Damage to houses and household items

	Village 1		Village 2		Village 3		Village 4		Village 7	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
No Damage	8	18.6	27	58.7	49	80.3	43	86.0	12	24.0
Partial Damage	22	51.2	2	4.3	0	0.0	4	8.0	7	14.0
Total Damage	13	30.2	17	37.0	12	19.7	3	6.0	32	64.0
Total (No. & %)	**43**	**100**	**46**	**100**	**61**	**100**	**50**	**100**	**51**	**102**

Table 13 illustrates those households that experienced disruption to occupations other than fishing, as a result of the tsunami. This data does not include fishing because there is more detailed data on the losses to households because of fishing, specifically. Over half of the households in each of the villages responded that their non-fishing occupations were not affected by the tsunami. Villages 3 and 4 (80.3 percent) each contained the highest proportion of households that did not report any impact to occupations while Village 2 (56.5 percent) reports the least percentage of households that experienced no impact upon occupations.

Table 13. Tsunami Impacts on Non-Fishing Occupations by Village

	Village 1		Village 2		Village 3		Village 4		Village 7	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
No Response	5	20.0	11	23.9	0	0.0	0	0.0	0	0.0
No Impact	18	72.0	26	56.5	49	80.3	36	80.3	33	64.7
Change of Occupation	0	0.0	0	0.0	1	1.6	1	1.6	1	2.0
Less income, work or savings	1	4.0	2	4.3	2	3.3	8	3.3	5	9.8
Loss of equipmant, livestock, crops	1	4.0	4	8.7	5	8.2	2	8.2	7	13.7
No primary occupation	0	0.0	3	6.5	3	4.9	1	4.9	4	7.8
Other negative impact	0	0.0	0	0.0	0	0.0	2	0.0	1	2.0
Partially recovered	0	0.0	0	0.0	1	1.6	0	1.6	0	0.0
Total (no. and %)	**25**	**100.0**	**46**	**99.9**	**61**	**99.9**	**50**	**99.9**	**51**	**100.0**

Table 14 illustrates the cumulative effects of the tsunami on surveyed households in each of the five villages. Only house and household item damage are included for the data in Village 1 because there are two sets of data that cannot be combined to analyze for the purposes of this table. In Village 1, over ten percent sustained one impact (11.6 percent) and about one third of the sample sustained two impacts (30.3 percent). This data includes two-fifths of the total number surveyed (43 households) because the remaining households may have sustained other impacts but it cannot be determined from the information gathered.

Table 14. Cumulative impacts.

	Village 1		Village 2		Village 3		Village 4		Village 7	
	No.	%	No.	%	No.	%	No.	%	No.	%
No Impacts	-	-	13	28.3	33	54.1	8	16.0	2	3.9
One Impact	5	11.6	8	17.4	6	9.8	11	22.0	5	9.8
Two Impacts	13	30.3	5	10.9	2	3.3	7	14.0	5	9.8
Three Impacts	-	-	7	15.2	7	11.5	15	30.0	7	13.7
Four Impacts	-	-	0	0.0	8	13.1	8	16.0	9	17.6
Five Impacts	-	-	11	23.9	1	1.6	1	2.0	14	27.5
Six Impacts	-	-	2	4.3	4	6.6	0	0.0	9	17.6
Total (No. and %)	**18**	**41.9**	**46**	**100**	**61**	**100**	**50**	**100**	**51**	**99.9**

Impacts analyzed for Villages 2, 3, 4, and 7, in table 14 are house, household items, boat, engine, gear and impacts to occupations other than fishing. Over half of the sample in Village 3 (54.1 percent) and over one-quarter of Village 2 (28.3 percent) sustained no impacts that were addressed in the survey. In Villages 4 (16 percent) and 7 (3.9 percent) less than one-fifth of the surveyed households reported no impacts to occupations or possessions. In Village 2, about one quarter of the households sustained five impacts from the disaster (23.9 percent). This is significant because it shows that while many households were not impacted (28.3 percent), a significant portion was also severely impacted. This reflects the settlement pattern because those households that were located adjacent to the ocean were heavily affected and those located inland, were not. The data in Village 3 reflects the settlement pattern of households as well. Other than the households that did not experience any impacts, the highest remaining percentage sustained four impacts (13.1 percent) and constitutes less than fifteen percent of the sample. Because households are generally located inland in Village 3, there were many surveyed households that sustained no damage to their houses and household items. However, Village 3 is connected to the ocean via a river. This river is used as access for boats from Village 3 to the ocean and, therefore, its residents still rely on fishing for food and income and may have sustained impacts to this aspect of their household income. Although many of the houses in Village 4 are built on stilts above the water, they were largely protected from the surge of water because they are located within a mangrove area. However, many households in Village 4 participate in fishing, and their boats that were docked nearby did not fair as well as houses in the area. The largest portion of households in this sample sustained three impacts from the tsunami in Village 4 (30 percent). Over one-fifth of the sample reported one impact (22 percent) and over eighty percent of households experienced one or more impacts (84 percent). The settlement pattern of Village 7 is more concentrated on the ocean than any other village. This is reflected in the data where over ninety five percent (96.1 percent) of the sample experienced at least one impact from the tsunami and the largest percentage (27.5 percent) sustained five impacts to their household.

3.3 Conclusions

This data as a whole illustrates the severity of tsunami impacts to material objects (both personal possessions and productive materials). Household impacts represent investment and savings over a relatively long time period because most people in this area move into a house after they marry and remain there for the rest of their lives while continually adding to their initial investment. Many of the families gradually built or improved their houses overtime as they accrued savings. Those households that lost houses also lost most of the contents within and, therefore, must start over again, saving for improving their houses and acquiring items.

Occupational impacts are also significant. For example, if a household loses its boat and fishing gear, it must first save enough money to invest in these things again in order to resume fishing. Many occupations

practiced in this area provide food in addition to income; people practicing these occupations are hurt both in terms of monetary income and food. Other occupations were impacted because productive materials were literally washed away by the water that inundated the villages. For example, one respondent was a seamstress prior to the tsunami but her sewing machine and all of her tools and materials were washed away. She now has to save enough money to begin to rebuild her practice but because she has lost her machine, she needs to find a new occupation, or another way to access necessary tools to sew, in order to begin the rebuilding process. An additional impact is indirect. Many households are saving as much as possible in order to invest in materials necessary for practicing their former occupations, but because of this, they are less likely to spend money on things that are not absolutely necessary. To continue with the example above, the woman who wants to start a new occupation in order to buy a sewing machine will not be likely to save much by continuing as a seamstress (for example, by hand) because other villagers are less likely to hire her for her expertise. Therefore, the community as a whole will recover more slowly than if residents were able to resume their former livelihoods with the necessary tools.

4. Current Occupations

4.1 Introduction

Occupations are a very important aspect of social structure as well as an indicator of the relative importance of different components of the coastal resource. During recovery efforts, an accurate description of occupational distribution is essential to determine options for livelihood rehabilitation projects. Scale, working group size and level of occupational multiplicity can provide additional information for use in designing recovery projects. Occupational multiplicity exists when a given individual or household practices two or more income or subsistence-producing activities. This is often a characteristic of coastal communities, especially in rural areas. Secondary data is often an inadequate source of information concerning occupations, since most published statistics only include the full-time or primary occupation. The only way to more accurately represent the distribution and relative importance of these activities is with the use of a sample survey (Pollnac and Crawford, 2000).

In order to provide an accurate description of livelihood distribution, we surveyed 251 households in the five village sites. The respondents, either the female or male head of household, were asked to rank livelihood activities by priority as they contribute to household income and/or subsistence.

4.2 Current Occupations

Fishing is the most important and the most common livelihood in each of the villages except for Village 3. Trading and farming are relatively more common in Village 3 because it is the center of commercial activity. Overall, the villages show occupational multiplicity to be the norm for households in the sample. Two of the five villages had at least one household rank six or more activities and over half of the households in the survey listed more than one activity.

Table 15. Percent distribution of Village 1 Occupations by rank

Activity	1st	2nd	3rd	4th	5th	6th	7th	Total
Fishing	51.2	25.6	4.7	-	-	-	-	81.5
Aquaculture	-	-	-	-	-	-	-	0.0
Farming	9.3	9.3	7.0	2.3	2.3	-	-	30.2
Livestock	4.7	14.0	9.3	4.7	-	-	-	32.7
Trading	9.3	4.7	2.3	-	-	-	-	16.3
Tourism	-	-	-	-	-	-	-	0.0
Labor	20.9	7.0	7.0	-	-	-	-	34.9
Taxi	-	-	-	-	-	-	-	0.0
Other1	2.3	2.3	-	-	-	-	-	4.6
Other2	-	-	-	-	-	-	-	0.0
Total	**97.7**	**62.9**	**30.3**	**7.0**	**2.3**	**0.0**	**0.0**	

According to Table 15, the most important occupation among the surveyed households in Village 1 is fishing (81.5 percent), with over half of the households (51.2 percent) listing this as the highest ranked occupational activity. Farming (30.2 percent), livestock (32.7 percent) and labor (34.9 percent) all contribute significantly to income generation for this village with about one-third of the surveyed households ranking these three occupations. Trading is identified by a relatively small percentage (16.3 percent). The remaining 4.6 percent are engaged in making soap for sale in the village and distributed to a small city, Kuraburi, nearby for sale to tourists.

As summarized in Table 16, over half of the surveyed households in Village 2 participate in fishing (58.7 percent). Labor (49.9 percent) and farming (47.8 percent), however, contribute to income and food in almost half of the sampled households in this village. Slightly less than one-third of the sample ranked trading (30.5 percent) or aquaculture (28.3 percent) as a contribution to household income. Almost one-fifth of those surveyed ranked raising livestock (19.6 percent) as a source of income, but none lists this as the primary source. Other activities contributing to income (15.3 percent) consist of a variety of non-traditional occupations including motorcycle taxi, car-for-hire, and roadside maintenance-person in addition to more common occupations like teacher, policeman, and maker of fishing traps.

Table 16. Percent distribution of Village 2 Occupations by rank.

Activity	1st	2nd	3rd	4th	5th	6th	7th	Total
Fishing	41.3	8.7	4.3	2.2	2.2	-	-	58.7
Aquaculture	2.2	13.0	10.9	2.2	-	-	-	28.3
Farming	19.6	13.0	13.0	2.2	-	-	-	47.8
Livestock	-	2.2	8.7	6.5	-	-	2.2	19.6
Trading	17.4	8.7	4.4	-	-	-	-	30.5
Tourism	-	-	-	-	-	-	-	0.0
Labor	8.7	32.6	4.3	4.3	-	-	-	49.9
Taxi	-	-	-	-	-	2.2	-	2.2
Other1	10.9	2.2	-	-	-	-	-	13.1
Other2	-	-	-	-	-	-	-	0.0
Total	**100.1**	**80.4**	**45.6**	**17.4**	**2.2**	**2.2**	**2.2**	

Table 17 shows that fishing (47.5 percent) is ranked by less than half of the households surveyed in Village 3 and farming (70.5 percent) is the most often ranked occupation. However, fishing was most often ranked first (31.1 percent) by over thirty percent of the sample. More than one-third of the households also ranked trading (42.6 percent) and/or labor (37.8 percent) as a source of income with each ranked first by less than thirty percent of the surveyed households (26.2 and 24.6, respectively). Twice each week, there is a market in this village that draws local residents selling produce and merchants from nearby cities (Kuraburi and Ranong). This could account for the relatively larger percentage of households involved in trading. Aquaculture (27.9 percent) is practiced by just under one-third of the households in the sample. Less than one-fifth of the sample ranked raising livestock (16.4 percent), with none listing this as the primary occupation, just as in village 2. The remaining occupations (14.5 percent) ranked include tourism, motorcycle taxi, manager of drivers for public transportation and village health worker. This village is not directly adjacent to the shore which could account for the relatively lower portion of the sample ranking fishing as an occupation.

Table 17. Percent distribution of Village 3 occupations by rank.

Activity	1st	2nd	3rd	4th	5th	6th	7th	Total
Fishing	31.1	14.8	-	-	1.6	-	-	47.5
Aquaculture	6.6	16.4	3.3	1.6	-	-	-	27.9
Farming	24.6	23.0	19.7	1.6	1.6	-	-	70.5
Livestock	-	3.3	6.6	4.9	1.6	-	-	16.4
Trading	26.2	8.2	1.6	6.6	-	-	-	42.6
Tourism	1.6	-	1.6	1.6	1.6	-	-	6.4
Labor	6.6	14.8	9.8	6.6	-	-	-	37.8
Taxi	-	1.6	1.6	-	-	1.6	-	4.8
Other1	3.3	-	-	-	-	-	-	3.3
Other2	-	-	-	-	-	-	-	0.0
Total	**100.0**	**82.1**	**44.2**	**22.9**	**6.4**	**1.6**	**0.0**	

Fishing (76 percent) is practiced by just over three-quarters of the households surveyed in Village 4, according to Table 18. Over half of the sample (58 percent) ranked fishing as the primary income source. Labor (47 percent) and farming (40 percent) are practiced by just under half of the sample. Almost one-quarter of the surveyed households practice trading (22 percent) and aquaculture is

Table 18. Percent distribution of Village 4 occupations by rank.

Activity	1st	2nd	3rd	4th	5th	6th	7th	Total
Fishing	58.0	12.0	4.0	2.0	-	-	-	76.0
Aquaculture	6.0	2.0	8.0	-	-	-	-	16.0
Farming	6.0	24.0	6.0	4.0	-	-	-	40.0
Livestock	-	2.0	2.0	2.0	2.0	-	-	8.0
Trading	10.0	2.0	4.0	6.0	-	-	-	22.0
Tourism	-	2.0	2.0	-	-	-	-	4.0
Labor	18.0	18.0	6.0	-	5.0	-	-	47.0
Taxi	-	2.0	-	-	-	-	-	2.0
Other1	2.0	-	2.0	-	-	-	-	4.0
Other2	-	-	-	-	-	-	-	0.0
Total	**100.0**	**64.0**	**34.0**	**14.0**	**7.0**	**0.0**	**0.0**	

ranked by less than one-fifth (16 percent) of the households. Livestock raising (8 percent), motorcycle taxi (2 percent), administrative officer (2 percent) and computer store owner (2 percent) constitute the remaining portion of the sources of income of the surveyed households, each representing under ten percent of the surveyed households.

Table 19 illustrates that over four-fifths of the households surveyed in Village 7 ranked fishing (86.3 percent) as a source of income, more often than any other village. Almost three-quarters of the sample ranked fishing first for income generation and subsistence. Over one-fifth of the sample ranked labor (39.2 percent), trading (31.4 percent) and aquaculture (23.6 percent) among the activities contributing to their household food and income. Farming (15.7 percent) and raising livestock (15.6 percent) were ranked by less than one-fifth of the sample and no surveyed households ranked either activity as a primary source of income.

Table 19. Percent distribution of Village 7 occupations by rank

Activity	1st	2nd	3rd	4th	5th	6th	7th	Total
Fishing	72.5	11.8	-	-	2.0	-	-	86.3
Aquaculture	2.0	11.8	7.8	2.0	-	-	-	23.6
Farming	-	5.9	7.8	-	2.0	-	-	15.7
Livestock	-	7.8	-	7.8	-	-	-	15.6
Trading	9.8	15.7	5.9	-	-	-	-	31.4
Tourism	-	-	-	-	-	-	-	0.0
Labor	13.7	21.6	3.9	-	-	-	-	39.2
Taxi	2.0	2.0	-	-	-	-	-	4.0
Other1	-	-	2.0	-	-	-	-	2.0
Other2	-	-	-	-	-	-	-	0.0
Total	**100.0**	**76.6**	**27.4**	**9.8**	**4.0**	**0.0**	**0.0**	

4.3 Conclusions

The above results can be used to inform tsunami recovery project design about livelihood recovery options. Most of the households in these villages are already engaged in occupational multiplicity. This is an advantage for managers because if residents are accustomed to participating in different types of livelihood options, they are likely to be comfortable learning various types of skills as needed. Therefore, they may be more likely to participate in newly introduced livelihood projects to supplement their current sources of income (Rogers 2003). One option for rehabilitation is to encourage expansion of current livelihood options (e.g., raising livestock). This could be a relatively rapid way to increase income for households and will also involve less capital and training because some households already practice this type of livelihood.

5. Distribution of Labor by Age and Gender

5.1 Introduction

During rehabilitation efforts, the workload for different parts of the family should be closely analyzed. This is important when designing livelihood recovery projects in order to target portions of the population that have time and ability to participate in activities. In coastal communities, while males usually practice fishing in the open sea, women often glean shellfish from intertidal areas and practice other types of livelihood activities. Children may also contribute to household income before and after school, if they attend. Design of recovery projects should use the information from the current distribution of family participation to inform the structure and type of projects to be implemented and the portion of the affected population to be targeted for each project.

As a means of accurately describing family participation in occupations in the villages, we surveyed 251 households in five villages. Respondents were asked to identify who in the household is responsible for each livelihood activity that contributes to the household. The possible responses were *1) adult males; 2) adult females; 3) both adult males & females; 4) children (less than 15 years old); 5) adult males and children (less than 15 years old); 6) adult females & children (less than 15 years old); 7) adults & children (less than 15 years old).*

5.2 Family Participation in Occupations

Adult males contribute the most often to households in the sample, especially in the case of fishing. However, a small percentage of adult females also participate in the capture fishery. Overall, women and children contribute significantly to household income. Children, without adults, however, are not mentioned by any of the respondents in any of the livelihood activities.

Table 20. Family Participation by Occupation in Village 1

Activity	Male	Female	Both (Adults)	Both (Children)	Adult Males & Children	Adult Females & Children	Adults & Children (Both Sexes)
Fishing	97.1	2.9	-	-	-	-	-
Aquaculture	75.0	-	-	-	25.0	-	-
Farming	69.2	-	30.8	-	-	-	-
Livestock	42.9	7.1	50.0	-	-	-	-
Trading	-	85.7	14.3	-	-	-	-
Tourism	-	-	-	-	-	-	-
Labor	66.7	33.3	-	-	-	-	-
Taxi	-	-	-	-	-	-	-
Other1	-	100.0	-	-	-	-	-

As illustrated in Table 20, occupational distribution by sex in Village 1 differs among different occupations. While fishing is practiced almost entirely by men (97.1 percent), trading (85.7 percent) is predominantly conducted only by women. In addition, palm leaf sewing (Other 1 in the table) is practiced exclusively by females, but it should be noted that there was only one respondent that listed this as an occupation. Based on this sample, children (defined in the survey as under 15 years of age) significantly contribute only to aquaculture (25 percent). Farming is practiced by only males (69.2 percent) in over two-thirds of the surveyed households and by both male and female adults in a little under one-third (30.8 percent). Half of the households raising livestock do so with both female and male participation (50.0 percent), with males only (42.9 percent) practicing in the majority of the remaining households. Labor is practiced by men (66.7 percent) in two-thirds of the households and one-third of the women (33.3 percent).

Table 21. Family Participation by Occupation in Village 2

Activity	Male	Female	Both (Adults)	Both (Children)	Adult Males & Children	Adult Females & Children	Adults & Children (Both Sexes)
Fishing	92.9	3.6	3.6	-	-	-	-
Aquaculture	84.6	7.7	7.7	-	-	-	-
Farming	50.0	9.1	40.9	-	-	-	-
Livestock	44.4	33.3	22.2	-	-	-	-
Trading	7.1	57.1	35.7	-	-	-	-
Tourism	-	-	-	-	-	-	-
Labor	43.5	21.7	34.8	-	-	-	-
Taxi	100.0	-	-	-	-	-	-
Other1	66.7	33.3	-	-	-	-	-

In Village 2 (see Table 21), none of the households surveyed reported that children significantly to any of the ranked occupations. Males only (92.6 percent) participate in fishing and aquaculture (84.6 percent) with only a small fraction of each of these occupations (3.6 percent and 7.7 percent, respectively) practiced by females or both males and females. In contrast both males and females contribute in over one-third of the surveyed households to farming (40.9 percent), trading (35.7 percent) and labor (34.8 percent). Males only contribute to farming (50.0 percent), livestock (44.4 percent) and labor (43.5 percent) in

approximately half of the households in this village. Trading (57.1 percent) is the only occupation in which females only contribute in more than half of the sample. However, females alone do practice livestock (33.3 percent), teaching and road maintenance, 'Other 1' on Table 21, (33.3 percent) and labor (21.7 percent).

Table 22. Family Participation by Occupation for Village 3

Activity	Male	Female	Both (Adults)	Both (Children)	Adult Males & Children	Adult Females & Children	Adults & Children (Both Sexes)
Fishing	75.9	6.9	17.2	-	-	-	-
Aquaculture	12.5	25.0	56.3	-	-	-	6.3
Farming	34.9	2.3	60.5	-	-	-	2.3
Livestock	30.0	10.0	60.0	-	-	-	-
Trading	7.7	50.0	42.3	-	-	-	-
Tourism	100.0	-	-	-	-	-	-
Labor	52.2	30.4	17.4	-	-	-	-
Taxi	100.0	-	-	-	-	-	-
Other1	50.0	50.0	-	-	-	-	-

In Village 3 (see Table 22), males only practice the occupations of tourism, motorcycle taxi (each 100 percent) and fishing (75.9 percent). Males and females practice farming (60.5 percent), livestock (60.0 percent) and aquaculture (56.3 percent) in over half of the households in the sample. Women only contribute to trading (50.0 percent) in half of the surveyed households, but both women and men (42.3 percent) participate in this occupation in almost half of the survey as well. In this village, adults and children of both sexes contribute to aquaculture (6.3 percent) and farming (2.3 percent), and women only (2.3 percent) also participate in farming but rarely. Labor is practiced by men only in half (52.2 percent) of the sample and, by women only in thirty percent of the households (30.4 percent). In less than one-fifth of the sample both males and females (17.4 percent) are involved in labor.

Table 23. Family Participation by Occupation for Village 4

Activity	Male	Female	Both (Adults)	Both (Children)	Adult Males & Children	Adult Females & Children	Adults & Children (Both Sexes)
Fishing	84.2	13.2	-	-	-	-	2.6
Aquaculture	50.0	-	37.5	-	-	-	12.5
Farming	35.0	20.0	45.0	-	-	-	-
Livestock	-	25.0	50.0	-	25.0	-	-
Trading	-	81.8	18.2	-	-	-	-
Tourism	100.0	-	-	-	-	-	-
Labor	40.9	50.0	4.5	-	-	-	4.5
Taxi	100.0	-	-	-	-	-	-
Other1	100.0	-	-	-	-	-	-

In Village 4 (Table 23) fishing is practiced by only males (84.2 percent) in over eighty percent of the households with females only (13.2 percent) contributing to just over one tenth of the sample and a very small percentage (2.6 percent) of households where adults and children of both sexes practice fishing. Both sexes of children and adults (12.5 percent) participate in aquaculture in over ten percent of the households surveyed. The remainder of aquaculture is practiced by men only (50 percent) in half of the sample and women only in over one third (37.5 percent). Farming is distributed more evenly between the sexes with men and women (45 percent) responsible for this activity in almost half of the households and men only (35 percent) and women only (20 percent) at lower percentages. Livestock raisingis also practiced by both

sexes of adults (50 percent) in half of the surveyed households and females only and adult males and children each representing a quarter (25 percent) of the sample. Trading is conducted by women only (81.8 percent) in over eighty percent of the households with the remainder being conducted by both men and women (18.2 percent). This is consistent with the other village samples and with other fishing communities where women handle trading and men fish. Labor is also practiced by only women in half (50 percent) of the households with only forty percent practiced by males only (40.9 percent) and a small percentage by both sexes of adults and both sexes of adults and both sexes of children (each 4.5 percent). Tourism, motorcycle taxi services, computer store operation, and administrative officer are performed entirely by men only (100 percent).

Table 24. Family Participation by Occupation for Village 7

Activity	Male	Female	Both (Adults)	Both (Children)	Adult Males & Children	Adult Females & Children	Adults & Children (Both Sexes)
Fishing	93.2	-	4.5	-	2.3	-	-
Aquaculture	41.7	33.3	8.3	-	8.3	-	8.3
Farming	-	37.5	25.0	-	12.5	-	25.0
Livestock	-	50.0	-	-	-	-	50.0
Trading	6.3	56.3	31.3	-	-	6.3	-
Tourism	-	-	-	-	-	-	-
Labor	45.0	35.0	15.0	-	-	-	5.0
Taxi	100.0	-	-	-	-	-	-
Other	100.0	-	-	-	-	-	-

Table 24 represents family participation in occupations in the sample from Village 7. Males only (93.2 percent) practice fishing in almost all surveyed households and entirely for motorcycle taxi (100 percent). Family participation in aquaculture is well distributed with males only (41.7 percent) slightly higher than females only (33.3 percent) and both sexes of adults (8.3 percent). Children also contribute to aquaculture for the households in this sample both with adult males (12.5 percent) and with both males and females (8.3 percent). Children, in the surveyed households in Village 7 also contribute significantly to farming (both with males only (12.5 percent) and with both sexes of adults (25.0 percent)) and to raising livestock. Half of the households engaged in livestock report that children and adults of both sexes (50 percent) participate and the other half is contributed to the household by women only (50 percent). Females alone (37.5 percent) and adults, both male and female, (25 percent) each also practice farming in significant portion with respect to farming. As in the other villages, trading is practiced by only females (56.3 percent) in over half of the sample in Village 7. However, both adults (31.3 percent) make up almost one-third of the surveyed households for trading.

5.3 Conclusions

The results above indicate that recovery efforts should include both women and children in participatory consultations in order to design projects that will address contributions of the entire household. Women and children should be consulted as to their availability and willingness to participate and learn new skills. It is possible that children's willingness to participate in projects is different than that of adults, especially since a majority of the children in this area have some experience with formal education. This may increase willingness to participate because the children are confident that they can learn new skills but it may decrease likeliness if children tend to want to devote more time to schooling. Women also may be more likely to participate in different types of projects, especially with respect to working group structure. Researchers observed that women tended to work in groups, for example when gleaning the intertidal areas. Men, however, tended to work (especially in the capture fishery) in pairs or threes. Project design should reflect these trends in current working environments in order to increase their likelihood of success.

6. The Capture fishery

6.1 Introduction

The first part of this section describes gears used in the capture fishery and the second section provides a discussion of the distribution of the various gears across the five villages. The majority of the households in all villages except village 3 are involved in the capture fishery; hence, it is important to describe this significant occupation. The relatively close proximity of the five project villages resulted in exploitation of approximately the same offshore waters, resulting in similarity in the capture fishery. Additionally, all villages have ready access to mangrove areas. Although the size of the mangrove area varies from village to village, the species targeted are quite similar. Similarity in coastal features also leads to similarity in coastal gears used. The only difference noted in the rapid assessment was that amount of mangrove between the residential area and the beach apparently influenced the use of push nets. This will be discussed below.

The fishery in the five project villages can be classified as relatively small scale (see Pollnac and Poggie 1991), where mechanization is minimal with motors for relatively small boats (usually less than 13 meters long) and minimal use of winches for pulling gear such as traps. Cost of boats and gear is such that most fishers own their own gear, and if they do not, they can accumulate sufficient capital for purchase in a matter of a few years or obtain a loan from a fish buyer on reasonable terms.

Given the observation that the fishery can be classified as a small-scale fishery, the gears deployed cover most of the wide range of gears deployed by small-scale fishers around the world. Monofilament gill nets (both fixed and drifting), hook and line, and long lines are used for finfish; tangle nets for crab and shrimp; traps (pots) for finfish, squid and crabs; small push nets and small seines for tiny shrimp; spear guns and harpoons for fish and cephalopods; prying devices and bare hands for shellfish. No fixed gear such as weirs and stationary lift nets were observed or mentioned although they could have been destroyed by the tsunami. It should be noted that most fishers own and use multiple gear types; thus, they are able to respond to seasonal changes and market demand.

Buyers from 3 of the 5 villages were interviewed to determine the most important types harvested. There are no buyers now in Villages 1 and 2, but a fisher was requested to provide the information for Village 1, and buyers from Village 3 and 7 are now purchasing fish from fishers in village 2. Squid, swimming crab, and silver sillago were among the top 4 in all five villages. Squid was ranked as first in importance in three of the five, silver sillago as first or second in three, swimming crab as second in two, and shrimp as third in four of the five villages. Gears for capturing these types and others are described below.

6.2 Descriptions of Fishing Gear

6.2.1 Gill nets Gill nets are deployed to capture several finfish species, mainly *pla sai* (silver sillago), *pla in-si* (Indo-pacific king mackerel), and *pla mong* (jacks).

Silver sillago The net used for *pla sai* is typically about 75 *wah* (arm spans)[3] in length and a meter deep, with a mesh size about 3-4cm (1.5”). Some fishers attach an extra 40 or so *wah* length of netting to take total length up to about 110 *wah*. The nets are deployed during the dry season anywhere from around the islands just offshore (e.g., Koh Kam, about 10Km or 1.5 hours sailing time from Villages 2,3,4,and 7) to the Surin Islands (only during the dry season as reported by one fisher who leaves Village 7 at midnight, deploys the following morning and returns at 9pm). Depending on the fisher and the weather, the net is deployed and pulled 4 to 6 times per trip. Soak time is approximately 1 to 2 hours. Boats used to deploy the net range from 6 to 11+ meter long tails.

Average catches vary with net size—the larger net averaging 40-50Kg and the smaller 30-40Kg per trip. Minimum catch for the larger net is 10-20Kg and for the smaller 10Kg. Maximum catch was reported to be

[3] Technically 1 *wah* equals 2 meters, but fishers informally measure a *wah* as an arm span (outstretched arms, about 1.7 meters—a measure somewhat like the English “fathom”)

120Kg for both sizes. Average price paid to the fisher varies between 50 and 60Bh[4] per Kg. Fishers report that catches have declined over the past 5 years, with one fisher reporting a 50 percent drop.

Total crew size (owner-captain and crew) ranges from 3 to 4 (4 on larger boats), usually kinsmen. The lay system appears to vary more than in other fisheries; here it was reported that the owner share varies from 50 to 75% after expenses are deducted (only one owner said 50%), with the crew sharing the rest.

Jacks The net (*wun twong*) used for *pla mong* (jacks and trevallys--CARANGIDAE) is composed of four 40m long by about 6m deep nets for a total of 160m (about 95 *wah*) by 6m of 4.5" mesh net. The net is deployed during the monsoon season (June to September) behind Koh Kam, for about 6 hours soak time. Boat used to deploy the net is a 12m long tail.[5]

Average catch is 40Kg with a maximum of 100 and a minimum of 12. Prices paid average between 20 and 40Bh per Kg. Catch over the last 5 years has decreased greatly resulting in 2 to 3 times the effort to catch the same amount of fish.

Total crew size (including owner-captain) is three, sometimes kinsmen and sometimes not. Lay system is 70 percent (after expenses) for the owner-captain and 30 percent split among the rest of the crew.

General Fishers without a boat were observed deploying this type of net in shallow estuary and mangrove channel waters. In Village 2, fixed gill nets (mesh 2-3") are extended between stakes (30-50m apart), perpendicular to the shoreline to capture "large" fish. Harvest is conducted at low tide.

6.2.2. Hand Line The hand line most frequently used targets fin fish, with the most important being silver sillago (*pla sai*), Indo-Pacific king mackerel (*pla in-si*), bare-breast jack (*pla mong*) and John's snapper (*pla kapong daeng*). The rig usually consists of a carved wooden or plastic spool to hold the line, a conical lead weight with a swivel attached to the bottom, two lines, each with a hook at the end, about 8 inches long tied to the swivel ring (see figure 3). The rig is baited (some say with shrimp) and dropped to the appropriate level for the target fish and left in the water until the fisher feels a strike. It was reported that most households practice this type of fishing, usually during the dry season. A fisher from Village 1 reported that many were out using this gear when the tsunami struck. Any size long tail boat can be used in this fishery since the gear takes little space.

Figure 3. Hand line hooks and reel.

Average catch is reported to be between 4 and 10kg, with one fisher reporting 10kg as the maximum. Price paid for hook-caught *pla sai* is reportedly 100 to 110Bh/Kg. In line with the reported catch trend for *pla sai* with net, the catch has reportedly decreased over the past five years.

Crew size varies between 1 and 3, probably depending on boat size and is usually composed of kinsmen, sometimes parents and children. Each fisher keeps his or her own catch and expenses are shared (if not a nuclear family fishing).

6.2.3. Long lines According to an informant in Village 7, only a few fishers from the village deploy long lines—it is usually done by commercial fishers (for a somewhat different discussion of long lines in Village 7, see Macintosh, et al. 2002). According to the informant, the long line consists of a long line with 120 to 140 hooks attached on leaders. A float marks where each long line enters the water. Target fish are *pla in-si* (Indo-Pacific Mackerel) and rays. Pieces of fish (usually mackerel) are used as bait for *pla in-si*, but the bare hook is used for ray. The line is deployed into the waters 4 to 6 miles around the offshore islands,

[4] At the time of the assessment, one US dollar = approximately 41 Bhat.
[5] Only one fisher from Village 1 using this method was interviewed.

usually for about 3 hours before retrieval. This type of fishing is conducted during the dry season. Long tail boats deploy this type of gear.

Average catch for *pla in-si* is about 100kg and for rays about 180kg; prices paid are about 100Bh/kg and 20Bh/kg respectively. We did not obtain information on catch trends for this type of fishing, but a buyer reported that catch of mackerel is decreasing, but a bit less in the past two years.

6.2.4 Shrimp net The shrimp net has three layers of mesh—the two outer layers are about 7cm mesh and the inner about 2cm mesh—it is basically a tangle net. Although the target is shrimp, it entangles many other species, which are also harvested and sold. Since fishers tie together 10 or more smaller nets per deployable shrimp net, information concerning total length is variable, ranging from 40 to 60 *wah* long and about 1.5 meters deep. Fishers report deploying several of these nets (usually around 4) on or very close to the bottom and cross current. The shrimp drift into the net. One fisher reports setting the net in the evening and retrieving it the next morning; another sets it for about 30 minutes, pulls it, and if the catch is good, deploys it again in the same place. Nets are deployed anywhere from 100m offshore to 10km (behind Koh Kam), with the smaller shrimp being caught close to shore. The nets are set from long tail boats.

Average harvest for four nets is reported to be 20-30Kg, maximum 80-120Kg, and minimum 4-20kg. The wide range may be due to variation in net length. Prices paid vary greatly according to size and demand, but the smallest sell for about 50-110Bh/kg, the middle sized for 75-150Bh/kg, and the largest 110-190Bh/kg. Shrimp catches are reported to be decreasing. One fisher has maintained harvest levels by increasing effort (time and more efficient net). A buyer in Village 7 reported a 30 percent decrease in harvest, while a Village 4 buyer noted a large decrease.

Crew size is usually 3 kinsmen—sometimes the owner and two offspring of either sex. Share system after expenses are deducted is reported to be 60 percent to the owner and 20 percent to each of the other two crewmembers.

6.2.5 Crab net The crab net is a single layer, monofilament tangle net of varying length ranging from 15 to 40 *wah* among fishers interviewed and 1.5M deep. Mesh size is about 3 inches. It is set near or on the bottom across channels in the mangrove, river mouths and in the open ocean, around the nearby offshore islands. Like the shrimp net described above, it captures crab as well as many other species (see figure 2 where the catch includes skate, tiger shrimp, squid, small chard, small tuna, at least 5 types of crabs, shell fish, horseshoe crabs, and snails). Depending on where the net is located, its size and the season of the year, the boat used can be either a small or large long tail. Fishers without a boat were observed deploying this type of net in shallow estuary and mangrove channel waters.

Figure 4. Bycatch in a tangle net.

Catches with these nets vary widely in terms of species and amount of crab. A 15 *wah* net is reported to produce an average catch of 20-30kg, with a maximum of 50kg and a minimum of 10kg. Prices and trends for crab are listed in the section on crab traps.

Figure 3. Rectangular crab trap.

6.2.6. Crab traps Two basic types of crap traps are deployed—rectangular and round. The most common rectangular trap measures about to feet long, one foot wide and about 11 inches high (see figure 3). The rectangular pot has a collapsible metal frame, which facilitates storage and transportation. The frame is covered with small mesh (ca. 1.5-2cm) netting with a funnel

Figure 4. Cylindrical crab trap.

Figure 5. Collapsed cylindrical crab trap.

opening for crab entry. The round pot is composed of two circular wire frames about one foot in diameter, attached by a small mesh (ca. 2cm) net stretched between connected by a bamboo pole through the center (see figure 6). It is also collapsible for easy transport and storage (figure 7). Rectangular crab traps are set either in the mangroves or open sea. Round traps are set only in the mangrove. These two types and locations are discussed separately below.

6.2.6.1 Rectangular crab traps—open ocean Crab traps (same as in figure 3) deployed in the open ocean are baited with chopped fish (one informant reported using fresh chopped hard-tail scad (*kang kai*) connected by a single line and dropped some 10 to 30m to the bottom forming a serpentine line of crab traps. The minimum traps per line were reported to be 300 with a maximum of 1000. Traps are deployed about 2 hours sailing time from the village (about 10k). Traps remain on the bottom for 5 to 6 hours, then are pulled using a small powered winch. Reportedly, each trap can catch up to 3 or 4 crabs. Size of long tail boat used depends on number of traps deployed, but they are usually greater than 10m.

Average harvest for a line of 1000 traps is reported to be 40-50kg, maximum 100kg and minimum 30kg. Prices paid for the biggest size (8-9 per kg.) start at 105Bh, medium size (about 14 per kg.) 60Bh and the smallest (about 20 or more per kg.) 40Bh/kg. Reports concerning trends are variable. Colorful garlands draped on the bow of the boat are for protection and good luck (see figure 6). One fisher reported adding a garland when the catch exceeds 6000Bh in value.

Figure 6. Garlands on crab boats.

Crew size for a large operation is reported to be four—owner operator and three crewmembers. Crewmembers are usually related to the owner. The owner operator usually gets 73 percent of the catch after expenses, and each of three crewmembers receive 9 percent. If catches are low, one owner reported he gives each crewmember 300-400Bh instead of the 9 percent share.

6.2.6.2 Rectangular and round crab traps—mangroves Mangrove fishers usually set some 70 to 150 crab pots in the mangroves. They are baited with "trash fish", individually set at high tide and collected at low tide. Some set the traps in the evening and retrieve them in the morning. A float marks the location of the rectangular trap, which is pulled by hand. Round traps are marked by the bamboo pole to which they are attached. These traps are usually deployed from a small, gasoline engine powered, long tail boat (ca. 4-5m). Often the boat is used to take the fisher to a desired area where he walks into the mangroves to place the traps.

Average catches are reported to be between 3 and 10kg/day, with a minimum of only one kg/day. Prices paid for the mud crab vary somewhat, with the small size selling for 30-60Bh/kg, the middle size about 60Bh/kg and the large 80-90Bh/kg. Crab trapping in the mangroves is usually an individual activity due to the small size of vessel used and characteristics of the methods used. No more than one fisher is necessary to carry out the activity.

6.2.7. Squid traps Squid traps are cylindrical in shape, approximately 1m wide and 1.25m long with a flattened bottom. The frame is made of lengths of a flexible tree branch (ca. 2cm diameter) cut in the forested hills. A rectangular base is formed and three boughs are attached and bent to form the cylindrical

shape. Five more boughs are nailed along the length of the cylinder to provide support. Within the frame, two boughs are attached to form a triangular shape from the flattened bottom to the mid-point on the cylinder for attaching bait (see figure 7). The frame is covered with a multifilament mesh (ca 4cm) that has a conical opening for squid entry. Stones are used as weight in the pot which is dropped to a depth that averages 10-30m but can reach 50m. Pots are marked by floats (several liter plastic jug) and sets of pots (about 3) are marked by a pole with a flag (floated and partially weighted with a 1-1.5 liter plastic bottle). Soak time is about 12 hours. Pots are either pulled by hand or with a small gasoline engine (ca. 10hp) powered winch. A fisher with a winch deploys 50-60 pots/day, without a winch about 20 pots a day. Fishers may deploy over 100 pots on a multi-day trip. One fisher interviewed uses a GPS to plot location of deployed pots. Boat size and season determine location of deployment. A large boat can deploy pots as far offshore as the Surin Islands (ca 50km) during the non-monsoon season. During the monsoon season pots are deployed closer to shore (10-15k). Most fishers with smaller boats deploy around the offshore islands (10-15k).

Figure 7. Squid traps.

Average harvests vary between 20 and 40kg with highs of 50-70kg. Prices paid vary widely but seem to be between 70-80Bh/kg. Reported crew sizes vary between 2 and 4. Share system varies between 50 to 60 percent for the owner operator and the rest shared by the crew. Crewmembers are usually relatives or neighbors. The trend in harvests over the past 5 years is reportedly stable, but one fisher reported an increase last year.

6.2.8. Other fishing gears The rapid assessment method limited the amount of information that could be collected, and the focus was on the most important fisheries discussed above. Other fisheries, some which were discovered too late to be investigated in all communities, were not as thoroughly investigated. These other fisheries, represented by fishing gears such as shrimp push nets and mini-seines, fish traps, spear guns, harpoons, and other methods will be briefly discussed in this section.

6.2.8.1 Small shrimp push net The small shrimp push net is a triangular, very fine mesh net with a relatively long bag, suspended between two bamboo poles (ca. 3m long), which have skids on the bottom end and are crossed near the top where the fisher holds onto the net as it is pushed through the water (see figure 8). It is similar to push nets used to collect small aquatic organisms in inshore areas worldwide. The target is a small shrimp, which is converted into shrimp paste. Although this push net is reportedly used in all villages except Village 3, Village 1 was the only village where they were seen stored by numerous houses. Both males and females operate this gear.

Figure 8. Small shrimp push net.

6.2.8.2 Shrimp mini-seine net The shrimp mini-seine net targets the same shrimp targeted by the push net. It is basically a very small mesh bag (approximately 3 wah wide), with larger multifilament mesh (ca. 2cm) wings (each approximately 4 wah) that extend from each side of the smaller bag to guide the shrimp into the bag. This type of net was found only in Village 4. Both genders are said to operate this type of net.

6.2.8.3 Fish traps Several types of fish traps are used by the project villagers. The main target is small grouper in the mangroves which are then grown out in cages (see figure 9). Fish traps observed are round (approximately 24cm diameter and 60cm long) or rectangular (ca. 35cm square and 60cm long), both covered with small mesh (2-3cm multifilament)

Figure 9. Fish trap.

with a conical entry way for fish entry. Some slightly larger traps were observed as well. These traps are set in the mangroves to trap grouper. A very large rectangular trap (2.75m square and 3.15m deep) with a wooden frame and chicken fence wire mesh was reported in Village 2. Only one survived the tsunami, but it is not being used at the present time. They were set any where from 3km from shore on rock bottom or out on the artificial reef. Target fish were reported to be "big" and *pla mong* (jacks and trevallys--CARANGIDAE) were used as an example.

6.2.8.4 Spear gun, harpoon and noose Use of a spear gun was only reported in village 2. Only a couple of fishers reportedly used this method. One, who had an Italian built spear gun, lost it in the tsunami. Another, who made a spear from a steel rod and used a rubber sling to fire it, still uses it in the mangrove. Harpoons were mentioned in Villages 2 and 7. The principal target is eel, which can also be captured live with the use of a noose.

6.2.8.5 Dip net for jelly fish After the survey was conducted, Crawford, et al. (2006) reported the use of a relatively large mesh dip net for harvesting jelly fish that float near the surface between October and February. At he time it was observed by Crawford, et al (2006), it was reported to be quite profitable, with almost all fishers with longtail boats taking advantage of an unusually high abundance of jellyfish.

6.2.8.6 Collecting shellfish Most households collect mollusks in the mangroves and on the tidal flats during low tide. This can be done by hand or with a prying device (an old knife, a long flat piece of metal). Both males and females are involved in this activity. Macintosh, et al. (2002) provide a list of mollusk species used in the Ranong mangrove ecosystem, and we asked a village informant to indicate those collected and used by local families. The species collected and used by village households are: *hoy nang rom* (Oyster, *Crassostrea commercialis*), *hoy marang poo* (green mussel, *Perna viridis*), *hoy wan* (poker chip venus, *Meretrix lusoria*), *hoy chak tin* (*Strombus sp*.?), *hoy jub jeng* (*Cerithidea rhizophorarum*, and *hoy kem* (nerites, *Nerita articulate*). We observed, but unfortunately were unable to identify, some shells collected for the ornamental trade.

6.3 Distribution of Gear Types

Recovery efforts to reinstate livelihoods are important to build capacity within communities to recovery on their own by enabling people to begin providing food and income for themselves and their families. When designing livelihood projects for fishing communities, it is essential to understand the distribution of gear used in the fishery. This information may inform project designers and managers to implement projects that are better suited for the recovering community. These projects are then more likely to have greater participation and longer life spans after outside assistance with the project ends.

The household survey gathered information on gear type use and contribution to household food and income. We asked respondents to list all gear types/fishing types that they practiced in a given year and to rank them by relative importance to the household. Below are results of the survey of 502 individuals from 251 households.

Table 25. Distribution of gear types across the five villages.

	Village					
Gear Type	**1**	**2**	**3**	**4**	**7**	**Mean**
Shrimp Net	39.1	89.3	82.7	81.6	93.2	77.18
Crab Net	78.1	42.9	55.0	81.5	75.0	66.50
Hook and Line	60.7	75.1	65.3	55.3	59.0	63.08
Fish Net	47.8	60.7	34.5	52.7	70.4	53.22
Squid Trap	4.3	64.3	51.6	18.4	72.6	42.24
Crab Trap[2]	43.3	10.7	10.3	29.0	6.9	20.04
GatherShellfish[2]	21.6	7.2	6.9	15.7	13.7	13.02
GatherShellfish[1]	21.6	10.8	13.6	10.6	11.4	13.60
Push Net	17.3	21.4	13.8	7.9	2.3	12.54
Other 1	4.3	17.9	20.6	0	13.6	11.28
Standing Net	17.3	3.6	24.0	10.5	2.3	11.54
Crab Trap[1]	4.3	0	6.9	18.4	9.1	7.74
Fish Trap	8.6	10.7	0	10.5	4.5	6.86
Gleaning	0	0	13.7	5.2	2.3	4.24
Harpoon	0	0	0	7.8	4.5	2.46
Spear Gun	0	3.6	0	0	0	0.9
Other 2	0	0	0	0	2.3	0.46
Noose	0	0	0	0	0	0

Table 25 compares gear type use in each of the five villages. Generally, all villages show the same trends in gear use. One notable exception is in Village 1 where shrimp nets are

used by only 39 percent of the surveyed households while it is the most frequently used gear type in all other villages (2, 3, 4, and 7). In contrast, crab nets are mentioned almost twice as often as shrimp nets in Village 1. One possible reason for this difference is that, relative to the other villages, less longtail boats were observed in Village 1. Since shrimp nets are usually set from longtail boats, this could explain the discrepancy. In Village 2, a deviation from general trends in the other villages is that crab nets are ranked less often than three other gear types (hook and line, fish net, and squid trap). Another interesting observation is that the harpoon, spear gun and noose are not ranked at all by at least three villages. In key informant interviews, subjects described these gear types in detail, but they were not often mentioned in the household surveys. One possible explanation for this is that the respondents didn't consider them significant when ranking gear types. It is possible, however, that this gear is not widely used, or may be used by only a small group.

Table 26. Distribution of gear types in Village 1 (Small Sample)

Activity	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Total
Crab Net	21.7	34.7	13.0	8.7	-	-	-	-	-	78.1
Hook and Line	4.3	17.4	8.7	13.0	13.0	4.3	-	-	-	60.7
Fish Net	21.8	13.0	8.7	-	-	4.3	-	-	-	47.8
Crab Trap[2]	21.7	-	13.0	4.3	4.3	-	-	-	-	43.3
Shrimp Net	17.4	17.4	4.3	-	-	-	-	-	-	39.1
GatherShellfish[1]	-	4.3	-	4.3	8.7	4.3	-	-	-	21.6
GatherShellfish[2]	-	-	4.3	4.3	8.7	4.3	-	-	-	21.6
Push Net	4.3	-	-	8.7	-	4.3	-	-	-	17.3
Standing Net	-	-	8.7	4.3	4.3	-	-	-	-	17.3
Fish Trap	-	4.3	-	-	4.3	-	-	-	-	8.6
Crab Trap[1]	4.3	-	-	-	-	-	-	-	-	4.3
Squid Trap	4.3	-	-	-	-	-	-	-	-	4.3
Other 1	-	-	-	-	-	-	4.3	-	-	4.3
Harpoon	-	-	-	-	-	-	-	-	-	0.0
Spear Gun	-	-	-	-	-	-	-	-	-	0.0
Gleaning	-	-	-	-	-	-	-	-	-	0.0
Other 2	-	-	-	-	-	-	-	-	-	0.0
Total	**99.8**	**91.1**	**60.7**	**47.6**	**43.3**	**21.5**	**4.3**	**0.0**	**0.0**	

[1]sea [2]mangrove

As illustrated in Table 26, the most common primary fishing gear (ranked first) in Village 1 are crab nets, fish nets and crab traps set in the mangroves. Shrimp nets (17.4 percent) rank next most often as primary fishing gear. Other gears ranked first in this village are crab traps set in the sea, squid traps, hook and line (or hand line) and a small shrimp push net. Crab nets (34.7 percent) are the most common gear ranked second for the households surveyed. Shrimp net and hook and line (each 17.4 percent) were ranked second by less than one-fifth, and fish net was ranked second by 13 percent of households. Other secondary gear includes fish traps and gathering shellfish from the sea (each 4.3 percent). Crab nets and mangrove crab traps were each ranked third by 13 percent of the sample. Less than ten percent of households ranked fish nets, hook and line, and standing nets (8.7 percent) third for income and food generation. Other fishing types ranked third are shrimp nets and gathering shellfish from the sea. This table also shows that over ninety percent of the sample practice more than one type of fishing (91.1 percent), and almost two-thirds (60.7 percent) of households in the sample, use three types of fishing gear.

Fishing types most often ranked fourth are hook and line (13.0 percent), crab nets and push nets (each 8.7 percent). Also ranked fourth are mangrove crab traps, gathering shellfish from the sea and mangroves and standing nets (each 4.3 percent). The most common gear ranked fifth was hook and line (13.0 percent). Gathering shellfish from the sea, and from mangrove areas (each 8.7 percent) were ranked fifth by just under one-tenth of the sample. Mangrove crab traps, fish traps and standing nets were also ranked fifth (each 4.3 percent). Over one fifth of the sample of households that practice fishing ranked six types of fishing gear. Ranked sixth were fish nets, hook and line, gathering shellfish from the sea and mangroves and small push net (each 4.3 percent). Longline fishing (4.3 percent) was ranked seventh by less than five percent of the households in Village 1. Overall, the three most commonly practiced fishing types in Village 1 are crab net (78.1 percent), hook and line (60.7 percent) and fish net (47.8 percent).

Table 27 presents ranked distribution of gear types in Village 2. The most commonly reported primary fishing gear type is shrimp nets (35.7 percent) followed by squid traps (28.6 percent) and fish nets (25.0 percent). Mangrove crab traps (7.1 percent) and standing nets (3.6 percent) are other gear types ranked first by surveyed households. Shrimp nets (42.9 percent) were most often ranked second. Other gear ranked second, all by less than one-fifth of the respondents from Village 2, were squid traps (17.9 percent), hook and line (14.3 percent), fish net (10.7 percent), mangrove crab traps and gathering shellfish from the sea (each 3.6 percent). Over four-fifths (82.2 percent) of the households surveyed ranked three types of fishing gear. Crab net and hook and line (each 17.9 percent) and fish net (14.3 percent) were all ranked third by nearly 15 percent of the sample. Other types ranked third, each by less than ten percent of the sample include shrimp net, squid trap, push net (each 7.1 percent), fish traps, gathering shellfish from the sea, and longlines (each 3.6 percent). Crab nets (14.3 percent) were the most common gear ranked fourth. Squid traps and hook and line (each 10.7 percent) were ranked fourth by approximately one-tenth of the sample. Gear ranked fourth by less than ten percent of the surveyed households were fish nets, fish traps, push nets and longlines (each 7.1 percent), shrimp net and gathering shellfish from mangroves (each 3.6 percent). Hook and line (28.6 percent) was most often ranked fifth in importance for household

Table 27. Distribution of gear types in Village 2

Activity	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Total
Shrimp Net	35.7	42.9	7.1	3.6	-	-	-	-	-	89.3
Hook and Line	-	14.3	17.9	10.7	28.6	3.6	-	-	-	75.1
Squid Trap	28.6	17.9	7.1	10.7	-	-	-	-	-	64.3
Fish Net	25.0	10.7	14.3	7.1	3.6	-	-	-	-	60.7
Crab Net	-	-	17.9	14.3	3.6	7.1	-	-	-	42.9
Push Net	-	-	7.1	7.1	3.6	-	3.6	-	-	21.4
Other 1	-	-	3.6	7.1	3.6	3.6	-	-	-	17.9
GatherShellfish[1]	-	3.6	3.6	-	-	-	3.6	-	-	10.8
Crab Trap[2]	7.1	3.6	-	-	-	-	-	-	-	10.7
Fish Trap	-	-	3.6	7.1	-	-	-	-	-	10.7
GatherShellfish[2]	-	-	-	3.6	3.6	-	-	-	-	7.2
Spear Gun	-	-	-	-	-	3.6	-	-	-	3.6
Standing Net	3.6	-	-	-	-	-	-	-	-	3.6
Crab Trap[1]	-	-	-	-	-	-	-	-	-	0.0
Harpoon	-	-	-	-	-	-	-	-	-	0.0
Gleaning	-	-	-	-	-	-	-	-	-	0.0
Other 2	-	-	-	-	-	-	-	-	-	0.0
Total	**100.0**	**93.0**	**82.2**	**71.3**	**46.6**	**17.9**	**7.2**	**0.0**	**0.0**	

[1]sea [2]mangrove

Table 28. Distribution of gear types in Village 3

Activity	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Total
Shrimp Net	37.9	41.4	3.4	-	-	-	-	-	-	82.7
Hook and Line	13.8	3.4	10.3	17.2	13.8	3.4	-	-	3.4	65.3
Crab Net	10.3	10.3	20.7	6.9	3.4	3.4	-	-	-	55.0
Squid Trap	17.2	10.3	13.8	6.9	3.4	-	-	-	-	51.6
Fish Net	6.9	6.9	6.9	6.9	6.9	-	-	-	-	34.5
Standing Net	-	10.3	-	6.9	3.4	3.4	-	-	-	24.0
Other 1	6.9	-	-	3.4	-	3.4	6.9	-	-	20.6
Push Net	-	-	-	-	6.9	6.9	-	-	-	13.8
Gleaning	-	-	-	3.4	-	-	3.4	6.9	-	13.7
GatherShellfish[1]	-	-	3.4	3.4	-	3.4	-	3.4	-	13.6
Crab Trap[2]	6.9	-	3.4	-	-	-	-	-	-	10.3
Crab Trap[1]	-	-	6.9	-	-	-	-	-	-	6.9
GatherShellfish[2]	-	-	-	-	-	-	6.9	-	-	6.9
Fish Trap	-	-	-	-	-	-	-	-	-	0.0
Harpoon	-	-	-	-	-	-	-	-	-	0.0
Spear Gun	-	-	-	-	-	-	-	-	-	0.0
Other 2	-	-	-	-	-	-	-	-	-	0.0
Total	**99.9**	**82.6**	**68.8**	**55.0**	**37.8**	**23.9**	**17.2**	**10.3**	**3.4**	

[1]sea [2]mangrove

income and food, followed by crab net, fish net, gathering shellfish in mangrove areas, push net and longlines (each 3.6 percent). Gear ranked sixth were crab net (7.1 percent) and hook and line, spear gun, and longline (each 3.6 percent). Households surveyed in Village 2 ranked gathering shellfish from the sea and push nets (each 3.6 percent) seventh for providing income and food. Shrimp net (89.3 percent) and hook and line (75.0 percent) were each ranked by over three-quarters of the sample from Village 2. Also ranked by over half of the households surveyed are squid traps (64.3 percent) and fish net (60.7 percent).

In Village 3 (see Table 28 above), shrimp nets were ranked first (37.9 percent) by slightly more than one-third of the surveyed households. Squid traps (17.2 percent), hook and line (13.8 percent) and crab nets (10.3 percent) each were also ranked most important for households in the sample. Fish nets, mangrove crab traps and longlines (each 6.9 percent) were each ranked first by less than one tenth of the sample. Shrimp nets (41.4 percent) are also the most often gear ranked second in households surveyed in Village 3. Approximately one-tenth of the sample ranked crab nets, squid traps and push nets (10.3 percent) second. Hook and line was ranked second by 3.4 percent of the sample. The gear most often ranked third was crab nets (20.7 percent). Also ranked third by about ten percent of households surveyed in Village 3 are squid traps (13.8 percent) and hook and line (10.3 percent). Fish nets, crab traps set at sea (each 6.9 percent), shrimp nets, mangrove crab traps and gathering shellfish at sea (3.4 percent) were also ranked third by surveyed households. More than half the surveyed households ranked four gear types or more that contribute to household food and income. Hook and line (17.2 percent) was most often ranked fourth by households in this sample. Other gear ranked fourth, all by under ten percent of households surveyed are crab net, fish net, squid trap, standing net (each 6.9 percent) and gathering shellfish from the sea, gleaning and longlining (each 3.4 percent). Hook and line (13.8 percent) is also the most often gear ranked fifth households in this sample. Also ranked fifth are fish net, push net (6.9 percent), crab net, squid trap and standing net (each 3.4 percent) by surveyed households. The only gear type ranked sixth by over five percent of the sample was push nets (6.9 percent). Other gear ranked sixth in household importance are crab nets, hook and line, gathering shellfish from the sea, standing net and longlines (each 3.4 percent).

In Village 4 (see Table 29), 2.6 percent of households surveyed stated that they gather shellfish, both at sea and in mangroves, for consumption purposes only. The gear type ranked first most often was crab nets (36.8 percent). Shrimp nets (26.3 percent) and fish nets (21.1 percent) were each ranked first by over one-

Table 29. Distribution of gear types in Village 4

Activity	HH Food	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Total
Shrimp Net	-	26.3	42.1	5.3	5.3	2.6	-	-	-	-	81.6
Crab Net	-	36.8	26.3	15.8	2.6	-	-	-	-	-	81.5
Hook and Line	-	2.6	7.9	13.2	23.7	5.3	2.6	-	-	-	55.3
Fish Net	-	21.1	7.9	21.1	2.6	-	-	-	-	-	52.7
Crab Trap[2]	-	5.3	2.6	7.9	7.9	5.3	-	-	-	-	29.0
Crab Trap[1]	-	7.9	5.3	-	2.6	-	2.6	-	-	-	18.4
Squid Trap	-	-	-	7.9	2.6	7.9	-	-	-	-	18.4
GatherShellfish[2]	2.6	-	-	-	2.6	7.9	2.6	2.6	-	-	15.7
GatherShellfish[1]	2.6	-	-	-	-	5.3	5.3	-	-	-	10.6
Fish Trap	-	-	-	-	5.3	2.6	2.6	-	-	-	10.5
Standing Net	-	-	-	5.3	2.6	-	2.6	-	-	-	10.5
Push Net	-	-	-	2.6	-	5.3	-	-	-	-	7.9
Harpoon	-	-	2.6	2.6	-	-	2.6	-	-	-	7.8
Gleaning	-	-	-	-	-	-	2.6	2.6	-	-	5.2
Spear Gun	-	-	-	-	-	-	-	-	-	-	0.0
Other 1	-	-	-	-	-	-	-	-	-	-	0.0
Other 2	-	-	-	-	-	-	-	-	-	-	0.0
Total		**100.0**	**94.7**	**81.7**	**57.8**	**42.2**	**23.5**	**5.2**	**0.0**	**0.0**	

[1]sea, [2]mangrove

fifth of the surveyed households. Other gear types ranked first include crab traps set at sea (7.9 percent), crab traps set in mangroves (5.3 percent) and hook and line (2.6 percent). Shrimp nets (42.1 percent) were ranked second by almost half of the sample. Just over one-quarter ranked crab nets (26.3 percent) second. Fish nets and hook and line (each 7.9 percent), crab traps set at sea (5.3 percent), crab traps in mangroves and harpoons (each 2.6 percent) were also ranked second by surveyed households. Fish nets (21.1 percent) were the most common gear ranked third by just over one-fifth of the respondents. Crab nets (15.8 percent) and hook and line (13.2 percent) were ranked third most important to income and food. Gears ranked third by less than ten percent of the sampled households were crab traps set in mangroves, squid traps (each 7.9 percent), shrimp net, standing net (each 5.3 percent), harpoon and small push nets (each 2.6 percent). Almost one quarter of those surveyed ranked hook and line (23.7 percent) fourth in food and income generation for the household. Crab traps in mangroves (7.9 percent), shrimp nets and fish traps (each 5.3 percent) were ranked fourth by five to ten percent of households surveyed in Village 4. Crab nets, fish nets, crab traps set at sea, squid traps, gathering shellfish in mangroves and standing nets were each ranked fourth in income and food contribution to the household by 2.6 percent of households. Over half of the households in the sample from Village 4 ranked four or more types of fishing gear. Squid traps, gathering shellfish from mangroves (each 7.9 percent), crab traps set in mangroves, hook and line, gathering shellfish from the sea, push nets (each 5.3 percent), and shrimp nets (2.3 percent) were each ranked fifth by less than ten percent of households in the sample. Gathering shellfish from the sea (5.3 percent) was ranked sixth by five percent of households. Other gear ranked sixth included crab traps set at sea, fish traps, hook and line, harpoon, gathering shellfish from mangrove areas, standing nets and gleaning (each 2.6 percent). Gathering shellfish from mangroves and gleaning (each 2.6 percent) were also ranked seventh by just over two percent of surveyed households. Shrimp nets (81.6 percent) and crab nets (81.5 percent) were each ranked by over four-fifths of the sample in this village. Hook and line (55.3 percent) and fish nets (52.7 percent) were each ranked by over half of the households surveyed.

Table 30 indicates distribution of gear types in Village 7. One quarter of the sample ranked squid traps (24.9 percent) first for food and income generation to the household. Crab nets (20.5 percent), shrimp nets (18.2 percent), fish nets (13.6 percent) and hook and line (11.4 percent) were each ranked first by ten to twenty percent of the households. Crab traps set in the sea and longlines (4.5 percent) were also ranked as the most important gear type in this sample, but for a small percentage of households. Push nets (2.3 percent) were ranked by two percent of the sample households as the primary gear type. Shrimp nets (31.8 percent) were ranked second by almost one third of the sample. One quarter of the households ranked squid traps second most important and one-fifth ranked fish nets (20.5 percent). Crab nets (13.6 percent) were also ranked second by over ten percent of surveyed households. Hook and line, gathering shellfish from mangroves and longlines (each 2.3 percent) were each ranked second in importance by just over two percent of the sample. It should be noted here that almost 98 percent of the sample ranked two or more types of fishing in Village 7. Shrimp nets (31.8 percent) and crab nets

Table 30. Distribution of gear types in Village 7

Activity	1st	2nd	3rd	4th	5th	6th	7th	8th	Total
Shrimp Net	18.2	31.8	31.8	11.4	-	-	-	-	93.2
Crab Net	20.5	13.6	25.0	13.6	2.3	-	-	-	75.0
Squid Trap	24.9	25.0	4.5	11.4	4.5	2.3	-	-	72.6
Fish Net	13.6	20.5	18.2	13.6	4.5	-	-	-	70.4
Hook and Line	11.4	2.3	4.5	13.6	15.9	6.8	4.5	-	59.0
GatherShellfish[2]	-	2.3	-	-	2.3	4.5	2.3	2.3	13.7
Other 1	4.5	-	-	2.3	2.3	4.5	-	-	13.6
GatherShellfish[1]	-	-	-	-	-	9.1	2.3	-	11.4
Crab Trap[1]	4.5	-	-	-	2.3	2.3	-	-	9.1
Crab Trap[2]	-	-	2.3	-	2.3	2.3	-	-	6.9
Fish Trap	-	-	-	-	4.5	-	-	-	4.5
Harpoon	-	-	-	-	-	-	4.5	-	4.5
Push Net	2.3	-	-	-	-	-	-	-	2.3
Standing Net	-	-	-	-	-	2.3	-	-	2.3
Gleaning	-	-	-	-	-	-	-	2.3	2.3
Other 2	-	2.3	-	-	-	-	-	-	2.3
Spear Gun	-	-	-	-	-	-	-	-	0.0
Total	**99.9**	**97.8**	**86.3**	**65.9**	**40.9**	**34.1**	**13.6**	**4.6**	

(25.0 percent) were each ranked third by at least one quarter of the surveyed households in income and food generation. Fish nets (18.2 percent) were ranked by over fifteen percent of households. Other gear ranked third, each by less than ten percent of households, are squid traps and hook and line (each 4.5 percent) and crab traps set in mangroves (2.3 percent). No gear was ranked fourth by more than one-fifth of the surveyed households. Crab nets, fish nets and hook and line (each 13.6 percent) and shrimp nets and squid traps (11.4 percent) were all gear types ranked by between ten and fifteen percent of the sample. Longline (2.3 percent) was also ranked fourth by households in Village 7. Fifteen percent of the sample ranked hook and line (15.9 percent) fifth. The other gear types ranked fifth important to household food and income were all ranked by less than ten percent of the sample. This includes fishnets, squid traps, fish traps (each 4.5 percent), crab traps set at sea and in mangroves, gathering shellfish from mangrove areas and longlines (each 2.3 percent). Gathering shellfish from the sea (9.1 percent) was the most common fishing type ranked sixth in importance by households surveyed. Hook and line (6.8 percent) was ranked by over five percent of the sample. Other gear type ranked fifth are gathering shellfish from mangroves and longlines (each 4.5 percent), crab traps set at sea and in mangroves, squid traps and standing nets (each 2.3 percent). Gathering shellfish from mangrove areas and gleaning (2.3 percent) were each ranked eighth by two percent of the households in the sample. Overall, shrimp nets (93.2 percent) were ranked by over ninety percent of surveyed households. Crab nets (75.0 percent), squid traps (72.6 percent) and fish nets (70.4 percent) are all used by over seventy percent of the sample in Village 7.

6.4 Conclusions

The results above indicate that overall, households do not rely on only one or two types of fishing, but practice many types for both food and income. For households involved in fishing, between almost half (Village 1; 47.6 percent) and over two thirds (Village 2; 71.3 percent) of households use at least four gear types. At least 40 percent of the households in four out of the five villages use 5 or more gear types. Only a few percent less (38 percent) in Village 3 use at least 5 gear types. Gear multiplicity increases a household's ability to adapt to changing conditions in a fishery. Therefore, fishing households are more likely to adapt by emphasizing other gear types if one regulation restricts a certain type of gear. Managers, however, should still be conscious that regulating one type of gear is not likely to reduce effort overall but rather, decrease stress on the stocks targeted by that effort. This data also illustrates that many fishing households are deeply involved in fishing, especially as evidenced by the investment required to acquire various gear types. If there is a desire in recovery, to attract fishers away from the capture fishery, alternatives must be designed to be acceptable to fishing families and should involve training. Pilot projects could be a practical way to introduce new livelihood projects to a village with a few families that are interested in leaving the capture fishery.

7. Current Socioeconomic Conditions

7.1 Village Infrastructure and Population

As can be seen in Table 31, all five villages are fairly well developed with electricity, telephone access, access to mass media (newspapers, radio, television), small shops, places to purchase prepared food (restaurant/snack shop) and paved road access. Busses traveling along Route 4 regularly connect the village area with other parts of Thailand. Motorcycles provide transportation from Route 4 into the villages that are nearby. Only Village 7 does not have a school, but the village is new, and students have access to schools in other nearby villages. Although water is present in all villages, the PRA (Soparth, et al 2005) indicated perceived need for household water containers in all villages and problems with the water supply in Villages 1 and 2. Some post-tsunami intrusion of salt water into Village 3 wells was also noted. During this assessment, key informants in Village 1 said that the water problem ended with the coming of the monsoon.

Table 31. Village infrastructure.

	Village				
	1	**2**	**3**	**4**	**7**
School	1	1	1	1	0
Health Service Center	1	0	0	1	0
Electricity	1	1	1	1	1
Telephone	1	1	1	1	1
Internet Access	0	1	0	1	0
Radio	1	1	1	1	1
Television	1	1	1	1	1
Newspaper	1	1	1	1	1
Hard top road access	1	1	1	1	1
Water supply	1	1[2]	1	1	1
Banking	0	0	0	0	0
Rotating credit association	1	1	1	1	1
Small shops	1	1	1	1	1
Guesthouse/hotel	0	0	0	0	0
Restaurants/snack shop	1	1	1	1	1

[1]cell phone access unreliable in village 1 [2] Potable water must be trucked into village 2
1=present, 0=absent. Information provided orally in Tambon Administrative Office.

Table 31 only indicates presence or absence of items; hence, does not give an overall assessment of the level of community development. Observation in the communities indicated that Village 3 has a greater number and concentration of different types of shops and places to eat than the other villages. In contrast to other villages there are shops that specialize in clothing, hardware (including fishing gear), and food. There are "shopping center" type locations with restaurants, clothing boutiques, and other retail outlets. It also has a bi-weekly market, where vendors from around the area bring produce, clothing, and other items to be sold at the intersection of Route 4 and the road from Village 7. While the number and types of shops were much lower in the other villages, Village 4 stood-out with a diesel engine repair facility and a well-stocked grocery with shelves arranged along several aisles—a modern display arrangement not observed in the other villages.

Although systems have been set-up for trash disposal and removal in most villages, the PRA indicated that a vehicle for solid waste collection was reported as a need for Village 1. It is also clear that existence of a system does not solve the problem. In Village 7, despite the existence of trash containers and pick-up and removal, residents were observed throwing plastic bags filled with trash into an area cleared of mangrove but never filled on the northwestern corner of the tsunami house complex, which was discussed above. Another problem noted in the tsunami house complex area in Village 7 was the existence of standing water on improved (but not paved) roadways and other areas which were filled for relatively long periods after a rainstorm (figure 10).

Figure 10. Standing water after a rain storm in Village 7.

Population of the five project villages can be found in table 32. Data in table 32 is derived from the most recent district statistics tables, which were acquired in early June 2005. As can be seen in the table, the data conflicts with information reported in the text of the PRA as well as table 3 in the PRA, which is closer to the PRA text, but also has conflicting information. The population of Village 1 from the most recent statistics seems a bit small given the number of households, but this is not certain. Finally, another report (NATR 2005) prepared by the North Andaman Tsunami Relief NGO notes that the tsunami killed 47 out of a population of 228 (Soparth, et al. 2005 and village statistics record 41 deaths), which would result in a population of 181, another figure to ponder.

Table 32. Distribution of village populations 2005.

Variable	Village 1	Village 2	Village 3	Village 4	Village 7
# of Households	45 (40)	273 (309)	185 (264)	218 (208)	119 (115)
Population*	135 (229)	1007 (1369)	718 (1233)	882 (1085)	484 (516)
Population estimate**	176	1213	855	1186	593
Males	73	501	350	457	251
Females	62	506	368	425	233

*Source: District Statistics for 2005. Numbers in parentheses from Soparth, et al. 2005
**Calculated from survey data derived mean number of household members and District Statistics household numbers.

As a means of estimating population at the time of the baseline survey, household size was determined for each household in the sample. This was then multiplied times the number of households from the official statistics, resulting in the population estimate in Table 32. This estimate is very close to the figure of 181 for Village 1 derived above. Given the fact that 43 of the 45 households from Village 1 were included in the survey, this gives us some confidence in the reliability of our estimate at the time of the baseline. Clearly, however, more accurate population data is needed. Nevertheless, we can note that the combined population of Villages 7 and 3, which split October 2004, is relatively high, which perhaps accounts for the advanced infrastructure of village 3.

7.2 Other socioeconomic indicators.

Age, education, household size and religion were determined for each interviewee. In addition, information on mass media exposure as well as exposure to life outside the village were determined. Rogers (2003) refers to these variables as mass media exposure and cosmopolitness, respectively. Mass media exposure was evaluated by asking each respondent the number of times weekly he or she listened to radio news, read a newspaper or watched television news. Responses to these questions were summed to form a total media exposure measure. Cosmopolitness was measured by asking each respondent how many times per year they visited Ka Peur, Kuraburi, Ranong, Phuket and Bangkok—larger communities of increasing size and distance from the project area. A summary measure of cosmopolitness was constructed by first dichotomizing each variable at the sample median, then summing the dichotomies to form a summary measure. These data are presented in table 33.

Table 33. Analyses of community differences in age, education, religion, exposure to media and travel.

	Village							
Variable	**1**	**2**	**3**	**4**	**7**	**df**	**f-ratio**	**p**
Age	36.0	41.6	43.3	37.7	42.1	4 460	5.02	<0.01
Education	5.7	6.6	6.9	5.5	6.0	4 460	2.62	<0.05
Household*	3.9	4.4	4.6	5.4	5.0	4 244	3.24	<0.05
Religion**	1.2	28.4	7.3	6.2	69.8	4	174.7	<0.001
TV news	5.3	4.5	5.2	4.1	4.1	4 455	3.47	<0.01
Radio news	3.2	2.8	2.1	2.2	3.1	4 456	2.74	<0.05
Newspaper	1.1	1.2	1.4	0.4	0.9	4 458	3.52	<0.01
Mass Media	9.7	8.5	8.6	6.5	8.1	4 450	4.43	<0.01
KaPeur	27.4	17.8	11.8	11.9	6.9	4 457	3.71	<0.01
Kuraburi	9.5	22.8	25.5	17.2	21.3	4 452	1.47	>0.05
Ranong	24.8	16.5	15.5	17.8	9.3	4 452	2.20	>0.05
Phuket***	14.8	26.6	33.0	24.0	9.4	4	20.32	<0.001
Bangkok***	3.7	18.8	12.7	9.4	11.5	4	9.72	<0.05
Cosmo.	2.2	1.6	1.8	1.7	1.4	4 446	4.08	<0.01

df varies due to missing data for some variables.
*Number of people in household. Calculated by household not individual.
**Column entries are percent Buddhist and test statistic is chi-square.
***Column entries are percent respondents over sample median, which was zero for both cities. Test statistic is chi-square.

Table 33 indicates that the sample is overall oldest in Village 3 (43.3 years) and youngest in Village 1 (36 years). Mean age for the entire sample is 40.4 years (s.d.=13.6). Village 3 also manifests the highest level of formal education (6.9 years) while Village 4 has the lowest (5.5 years). Mean years formal education for the entire sample is 6.2 years (s.d.=3.6). Household size is largest in Village 4 (5.4) and smallest in Village 1 (3.9). Sample mean for household size is 4.7 (s.d..=2.2). In terms of religion, over three-quarters of the sample is Muslim (77 percent) and the rest are Buddhist. Village 7 has the highest percent of Buddhist residents (70%) and Village 1 the lowest (1%). Finally, Village 1 manifests the highest mass media exposure and cosmopolitness scores. Total sample means for these two variables are 8.3 (s.d.=5.2) and 1.7 (s.d.=1.4),

respectively. Figures for the first three places visited (Ka Peur, Kuraburi and Ranong) are mean number of times per year. Values for Phuket and Bangkok are percent over sample median, which was zero for both cities. For the latter two places, mean values would have been misleading because the data was highly skewed.

7.3 Material Style of Life Information on income is extremely difficult to determine in an interview. In many rural areas of the world, people do not keep accurate records, and in an occupation such as fishing where day to day and month to month variability is extremely high, the figures can be quite unreliable. These observations, in combination with the fact that most of the households in our sample obtain most of their income from fishing, indicate that a measure of material style of life would be a more reliable indicator of income than a response to a direct question concerning income.

As a means of developing a standardized material style of life and household construction scales (MSL and HHC scales) for all project sites, a principal component analysis was conducted for 15 MSL variables[6] and 11 HHC variables for all 5 project villages (N = 251 households). The scree test (Cattell 1966) was used to determine the number of components, resulting in 3 components for the MSL variables and 2 components for the HHC variables, which account for a total of 44 and 63 percent of the variance in the 2 data sets, respectively. The results of these analyses can be found in tables 34 and 35. Items loading highest on the first component of the MSL variables indicate a set of relatively modern appliances and furniture. Basic services (e.g., electricity, piped water, enclosed toilet) load highest on the second component, and relatively elite appliances (computer and air conditioner) load highest on the third. With regard to the HHC analysis, items related to a relatively solid, modern type of construction (tile roof, concrete wall, glass windows) load high positive and several variables associated with the tsunami replacement houses (fiber cement wall board, tin roof and wooden shutter windows) load high negative on the first component. Concrete walls and floors load high positive while wood walls and floors and open windows load high negative on the second component reflecting solidity of construction.

Table 34. Principal component analysis of material style of life items.

	Appliances Furniture	Basic Services	Advanced
Radio/cassette player	0.736	0.098	-0.130
VCD player	0.681	-0.038	-0.039
Television	0.669	0.288	0.033
Display cabinet	0.648	0.188	0.012
Refrigerator	0.616	0.221	0.207
Washing machine	0.592	0.039	0.365
Matched living room set	0.535	0.005	0.519
Electricity	0.073	0.788	-0.013
Electric fan	0.208	0.725	0.079
Computer	-0.025	0.065	0.730
Air conditioner	0.017	-0.027	0.656
Enclosed toilet	0.021	0.463	0.362
Video game	0.258	-0.055	0.337
Multiburner cooking range	0.489	-0.018	0.187
Piped water	0.051	0.479	-0.124
Percent of Total Variance	21.647	11.852	11.539

Table 35. Principal component analysis of household construction attributes.

	Construct1	Construct2
Tin roof	-0.91	0.05
Tile roof	0.90	-0.00
Fiber cement wallboard	-0.87	0.27
Concrete wall	0.72	0.61
Glass windows	0.64	0.10
Wood shutter windows	-0.61	0.22
Wood floor	0.02	-0.94
Concrete floor	-0.13	0.91
Wood wall	0.05	-0.83
Open windows	0.04	-0.50
Tile floor	0.27	-0.02
Percent of Total Variance	34.53	28.79

[6] See Pollnac and Crawford (2000) for a discussion of the use of principal component analysis with this type of data.

Component scores representing the position of each household on each component were created for each household. The component scores are the sum of the component coefficients times the sample standardized variables. These coefficients are proportional to the component loadings. Hence, items with high positive loadings contribute more strongly to a positive component score than those with low or negative loadings. Nevertheless, all items contribute (or subtract) from the score; hence, items with moderately high loadings on more than one component (e.g., concrete wall in the analysis presented here) will contribute at a moderate level, although differently, to the component scores associated with each of the components. This type of component score provides the best representation of the data. In this paper, for this data we will refer to these scores as Material Style of Life (MSL) and Household Construction (HHC) Component Scores. They are standardized scores with a mean of zero and a standard deviation of one.

Inter-community differences in MSL and HHC Scales are found in table 36. Table 36 indicates that there are statistically significant differences between villages with respect to four out of the five MSL and HHC Component Scores. There are no significant differences between the villages with regard to Basic Services Component Scores. Village 3 scores highest and Village 7 lowest on the Furniture/Appliances and Construction-1 Component scores while Villages 2 and 3 score relatively high on the Advanced MSL Score in comparison to the other villages. Finally Village 4 scores quite low on the Construction-2 Component Score in comparison to villages 2, 3 and 7.

Table 36. Analysis of variance of community differences in MSL and HHC component scores.

	Village							
Component	**1**	**2**	**3**	**4**	**7**	**df**	**f-ratio**	**p**
Appliances	-0.02	-0.22	0.48	0.14	-0.49	4 245	8.18	<0.001
Basic Services	0.15	-0.10	0.07	-0.16	0.04	4 245	0.80	>0.05
Advanced	-0.35	0.31	0.39	-0.23	-0.22	4 245	6.51	<0.001
Construction-1	-0.18	-0.31	0.61	0.14	-0.43	4 246	11.17	<0.001
Construction-2	-0.03	0.46	0.49	-1.28	0.29	4 246	48.74	<0.001

7.4 Conclusions

Some of the variables examined in this section give us a basis for evaluating project impacts (e.g., material style of life, community infrastructure) as well as tracking other changes in the community through time (e.g., population, household size, education). Some, however, may be related to receptivity of project activities. Rogers (2003) summary evaluations of the diffusion of innovations indicate that variables such as education, mass media exposure and cosmopolitness are positively correlated with acceptance of innovations. Hence, we might expect that communities with high mean scores on these variables might be more receptive to project activities involving change. With regard to the data analyzed in this report, there are statistically significant differences between the communities with regard to these variables, but the differences are small, and it is difficult to predict their practical significance. For example, Village 3 manifests the highest average level of education (6.9 years) and the greatest frequency of newspaper reading (average 1.4 times a week). They contrast with Village 4, which is lowest on these two variables (5.5 years and 0.4 times, respectively). These two variables are also statistically significantly correlated in the total sample ($r=0.36$, $p<0.001$), but will this difference translate to a similar difference in receptivity to project activities? That is the question involving the practical significance of the findings that should be kept in mind whenever statistically significant results are presented in the sections below. Given the relatively large sample used for this baseline, small differences can be statistically significant.

8 Perceptions of Changes in Well-being

8.1 Introduction

Natural disasters obviously involve changes in perceived well-being of community members. Individual and community well-being is a basic goal of recovery activities, and community members' perceptions of this important variable is an important indicator of the impacts of both the disaster and recovery efforts; hence, it should be routinely evaluated as part of project assessment, planning, monitoring and evaluation. As a means of assessing well-being, we asked a sample of 502 individuals from 251 households in the five villages to respond to the following three questions:

> *1. In terms of household well-being are you better off or worse off or the same as you were before the tsunami?*
>
> *2. Do you expect your standard of living to be (better, worse or don't know) in 5 years?*
>
> *Question 3 involves showing the respondent a ladder-like diagram with 10 steps. The respondent is told that the first step represents the worst possible situation and the highest step is best situation. The subject is then asked where on this ladder (ruler, scale, whatever is appropriate for the subjects involved) the local area is today (the self-anchoring aspect of the scale). The subject is then asked to indicate where it was pre-tsunami (1 year ago) and where he/she believes it will be 3 years in the future. The step numbers are entered on the form for each time period.*
>
> *3. Overall well-being of community members: The first step indicates very poor families, without enough food to eat, very little or no furniture in the house, and a very poor house that is too small and doesn't protect one from the weather. The highest step indicates wealthy families with more than enough food, and beautifully furnished well built houses. TODAY___ 1 YEAR AGO___ 3 YEARS IN THE FUTURE___*

Questions 1 and 2 evaluate perceptions of individual household well-being while question 3 evaluates community well-being.

8.2 Inter-village variation in Perceptions of Changes in Well-Being

8.2.1 Household well-being Percent distribution of responses to questions 1 and 2 can be found in tables 37 and 38**.** There are clearly differences between the communities with respect to perceptions of well-being changes after the tsunami. Fully 91 percent of respondents from Village 7 feel they are worse off in contrast to a little over half in Village 1. These inter-village differences are statistically significant (χ^2 = 47.09, df = 8, p<0.001; Contingency Coefficient (C) =0 .31). Turning to changes in the future, Village 1, once again, contrasts with the other communities. No respondents from Village 1 felt they would be worse-off in the future in contrast to between 10 and 23 percent in the other villages. Most in Village 1 refused to hazard a guess—responding that they did not know; hence, fewer reported that they would be better off in the future. The inter-village differences in response patterns to this question are also statistically significant (χ^2 = 100.58, df = 8, p<0.001; C=0 .43).

Table 37. Percent distribution of perceptions of post-tsunami changes in household well-being.

	Village					
Direction of Change	**1**	**2**	**3**	**4**	**7**	**Total (N)**
Worse-off	54	68	79	69	91	73 (335)
Same/Don't Know	25	22	19	23	08	19 (88)
Better Off	21	10	02	07	01	08 (35)

Table 38. Percent distribution of perceptions of future changes in household standard of living.

	Village					
Standard of Living	**1**	**2**	**3**	**4**	**7**	**Total (N)**
Worse	00	23	14	19	10	14 (61)
Don't Know	73	09	17	26	22	27 (119)
Better	27	68	69	55	68	59 (262)

8.2.2 Perceptions of Changes in Community Well-being Villagers' perceptions of recent changes in the community as well as their evaluations of how the community may change in the future are evaluated using question 3—a self-anchoring scale (Pollnac and Crawford 2001; Cantril 1963). As a means of providing the reader with some sense of the specific level of evaluations, the percent distribution of the anchoring (today) values are provided in table 39. Table 39 indicates that the modal value is 5, right in the middle of the scale, and this applies to all 5 communities. The range of relatively frequent responses lies between 3 and 6 indicating a skewing towards the bottom of the scale. There also seem to be some inter-village differences. One way to evaluate the inter-village differences is to dichotomize the scale values at the sample mode and conduct a chi-square analysis of the distribution of responses above the mode. The results of such an analysis are presented in table 40. Table 40 clearly indicates that respondents from Villages 1 and 2 provide more responses above the modal value than Villages 4 and 7.

Table 39. Percent distribution of anchoring scale values (today) for responses to community well-being question.

Scale	Village						
Value	1	2	3	4	7	Total	N
1	0	0	0	0	1	0	1
2	1	3	4	6	2	3	15
3	19	4	7	12	22	13	58
4	8	14	16	9	24	14	65
5	48	57	54	61	46	53	242
6	10	21	12	6	3	10	46
7	14	0	5	3	0	4	19
8	1	1	1	1	1	1	5
9	0	0	1	0	0	0	1
10	0	0	1	2	1	1	4
N	80	77	109	94	96		456

Table 40. Analysis of inter-village differences in percent distribution of values above the mode for anchoring scale value for well-being.

	Village							
Scale	1	2	3	4	7	χ^2	df	Prob.
Well-being	25	22	19	13	05	16.416	4	<0.01

Slight differences between tables c and d result from rounding.

As a means of determining the degree of change between the time periods, the value for one year ago is subtracted from the value for today (change over the past year, during which the tsunami occurred) and the value for today is subtracted from the value for three years in the future (future change). An analysis of variance of the resultant 2 values was conducted to determine if there are any inter-village differences in perceived changes. Results are presented in tables 41 and 42. The analysis presented in table 41 indicates an overall perception of negative changes over the past year in the five villages with regard to community well-being. The differences are statistically significant. Village 7 manifests the greatest negative change and Village 1 the smallest in overall well-being.

Table 41. Analysis of variance of community differences in perceptions of community well-being over the past year.

	Village							
Component	**1**	**2**	**3**	**4**	**7**	**df**	**f-ratio**	**p**
Well-being	-0.39	-0.75	-0.82	-0.73	-1.54	4 450	5.94	<0.001

Table 42. Analysis of variance of community differences in perceptions of community well-being over the next three years.

	Village							
Component	**1**	**2**	**3**	**4**	**7**	**df**	**f-ratio**	**p**
Well-being	1.88	1.50	1.46	1.38	2.30	4 393	3.64	<0.01

With regard to changes in the future, inter-village differences are once again statistically significant for well-being (table 42). As can be seen in table 42, Village 7 anticipates the greatest positive change in well-being over the next three years and Village 4, the least.

8.3 Predictors of variability in perceptions of Changes in Well-Being

In this section we examine independent variables expected to be related to perceptions of changes in well-being. The responses to the first two questions (household questions) were converted into two categories: Better and other (e.g., worse, same, do not know). Better was assigned a code value of 1 and the others a code value of zero. Question 3 (perceptions of community question) has two distinct variables: change from pre-tsunami to the present (ΔT) and projected change from the present to 3 years in the future (ΔF). Non-dichotomous independent variables were converted to dichotomies for the phi correlation analysis applied to the first two questions. Household size (mean=4.7) and materiel style of life (MSL) variables (all means=0.0) were dichotomized at the sample mean, and age, education and years fishing were

dichotomized at sample medians (38, 6 and 18 years respectively). Those who did not disagree with the statement that fishing is safe are treated as perceiving fishing as safe. Respondents who agreed with the statement "*there is no point in planning for the future, what happens, happens and we cannot do anything about it*" are treated as fatalistic. If any household members, relatives or friends were reported as killed or injured by the tsunami, "killed" or "injured", as appropriate, was coded as present for the respondent, and whether or not the respondent was injured by the tsunami is a natural dichotomy. Gender female and Muslim are natural dichotomies, and finally, media exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers and this figure was dichotomized at the sample mean (8.26). The variables were not dichotomized for the Pearson's-r correlation analysis of the question 3 variables. Results of these analyses are in table 43.

Table 43 indicates that there is a tendency for individuals from larger households to expect a better standard of living in 5 years. The statistically significant negative correlations between a relatively solid, modern house construction (Construct-1 MSL—a non-tsunami house) indicate that those who live in such houses tend to project smaller future improvements in community well-being and do not consider their household to be better off than before the tsunami. Interestingly, those who consider fishing safe tend to report larger positive changes in community well-being since a year ago, but project smaller changes three years in the future.

Table 43. Correlations of independent variables with perceptions of well-being changes.

	Community Well-Being[1]		Household Well-Being[2]	
Variable	**ΔT**	**ΔF**	**ΔT**	**ΔF**
Household size	-0.03	-0.02	0.01	0.10*
Construct-1 MSL	0.02	-0.14**	-0.12**	0.00
Construct-2 MSL	-0.11*	0.07	-0.03	0.02
Appliances MSL	0.05	-0.11*	-0.07	0.01
Utilities MSL	0.04	0.00	0.01	-0.01
Advanced MSL	-0.07	-0.05	0.00	-0.07
Fishing safe	0.10*	-0.14**	0.08	0.04
Human influence	-0.08	-0.02	-0.02	–0.05
Fatalism	0.09	0.06	-0.05	0.17***
Self injured	0.00	0.07	0.01	0.08
House killed	0.11*	-0.08	0.11*	–0.06
House injured	-0.03	0.15**	-0.02	–0.01
Gender female	0.01	0.00	-0.02	0.05
Age	-0.03	-0.07	-0.04	–0.03
Muslim	0.12**	0.00	0.10*	-0.10*
Education	-0.11*	-0.01	-0.05	0.02
Media exposure	0.00	-0.02	0.03	–0.09

[1]Pearson's r [2]Phi *=p<0.05 **=p<0.01 ***=p<0.001
ΔT = change; past to today ΔF = change: today to future

The statistically significant positive correlation between fatalism and expectations of increasing household well-being is unexpected. Perhaps a fatalistic attitude facilitates a positive outlook for the future of one's household. Another unexpected finding is the positive relationship between household members being killed and perceptions of changes in well-being since before the tsunami. Perhaps the nearness of death results in a person feeling they are lucky to be alive or a denial of the negative impact of such deaths. This may also reflect a positive response to the support provided by the community and other household members in such trying times. The relationship is relatively weak, but statistically significant, and it is reflected in responses to two separate questions. The statistically significant positive correlation between house hold members being injured by the tsunami and future change in community well-being might also be explained in the same way.

Positive relationships between Muslim status and perceived changes since the tsunami, yet a negative relationship with household future well-being require further research before any explanations can be suggested. Finally, years of formal education are negatively related to perceived post-tsunami changes at the community level indicating that education seems to dampen perceptions of change—perhaps the more educated expect more than the less educated.

8.4 Conclusions

There are clearly differences between the communities with respect to perceptions of changes in household well-being following the tsunami. Almost all (91 percent) respondents from Village 7 feel they are worse off in contrast to a little over half in Village 1 (table 37). With regard to perceptions of future changes in household standard of living, Village 1 contrasts with the other communities. No respondents from Village 1 felt they would be worse-off in the future in contrast to between 10 and 23 percent in the other villages

(table 38). Most in Village 1 refused to hazard a guess—responding that they did not know; hence, fewer reported that they would be better off in the future.[7]

Turning to perceptions of community well-being, respondents from Villages 1 and 2 provide more positive responses than Villages 4 and 7 (tables 39 and 40). Analyses of perceived community level changes since the tsunami indicates an overall perception of negative changes in the five villages with regard to community well-being, with statistically significant inter-community differences. Village 7 manifests the greatest negative change and Village 1 the smallest in overall well-being (table 41). With regard to degree of change in the future, Village 7 anticipates the greatest positive change in well-being over the next three years and Village 4, the least (table 42).

Overall, the findings display a remarkable resilience in response to this great natural disaster. Highly impacted villages like Village 7 project the most positive future changes. This observation is supported by the fact that on the individual level, those who perceive the most negative post-tsunami changes tend to predict the most positive future changes ($r = -0.283$, $p<0.001$) as measured by question 3. Some of the unexpected correlations in table 43 seem to support this interpretation as well. For example, greater expectations of future changes in community well-being are statistically significantly related to living in a tsunami house (an indicator that their previous house was destroyed), having a low appliances MSL score (appliances were destroyed or damaged), considering fishing as unsafe and living in a households where another household member was injured by the tsunami. All this bodes well for recovery—those with positive expectations will probably work harder to obtain them. These villagers are not quitters in the face of disaster.

[7] There was concern, in Village 1, that Muslim respondents would not guess at the future because of religious beliefs that fortune telling (and therefore, guessing about the future) is not permitted within the religion. However, in a later key informant interview about the topic, the respondent dispelled this notion. It is possible that the original translation of the question was misleading and that later phrasing by the interviewers more accurately interpreted the question.

9 Attitudes Towards the Occupation of Fishing

9.1 Introduction

Following the tsunami, many predicted that fishers would be reluctant to resume their fishing activities. Observations in the fishing communities, however, indicate that as soon as fishers obtained replacements for equipment damaged by the tsunami, they began to fish again. Nevertheless, it is possible that their attitudes towards the occupation might be affected. In order to determine fishers' attitudes towards their occupation, we asked households with past or present involvement in the capture fishery the following five questions:

1. Would you advise a young person to become a fisher today?
2. Do you like fishing?
3. If you had the opportunity to change the primary source of your household's income to one that provided the same amount of income as fishing, would you change?
4. There is no need to worry when a fisher goes out fishing, the job is very safe. Do you agree or disagree? *If agree/disagree ask if he/she strongly agrees(disagrees), agrees (disagrees), or just slightly agrees(disagrees).* Strong disagree(1)__ disagree(2)__ slight disagree(3)__ neither(4)__ slight agree(5)__ agree(6)__ strong agree(7)__
5. *If your household's income had to be derived from a source other than fishing, what type of work would you prefer to do?*

9.2 Attitudes towards fishing

9.2.1 Inter-village variation Responses to these questions from individuals (male and female) in households who either were or are presently involved in fishing in the five project villages are tabulated in tables 44 and 45. Table 44 indicates that, overall, just a little over one fourth of those interviewed with past or present involvement in the capture fishery would advise a young person to enter the fishery. The differences between the villages are not statistically significant ($\chi^2 = 2.132$, df = 4, $p>0.05$). More than half the respondents, however, report that they like the occupation of fishing, and there are statistically significant differences between the communities ($\chi^2 = 21.890$, df = 4, $p<0.001$). Finally, only about one-fifth of the respondents say that they would not change the primary source of their household's income to one that provided the same amount of income as fishing, but there were statistically significant intervillage differences, ranging from nine to 42 percent ($\chi^2 = 45.787$, df = 4, $p<0.001$). Table 45 clearly indicates that most respondents (80 percent) disagree to some extent with the statement that "there is no need to worry when a fisher goes out fishing, the job is very safe". Nevertheless, there are some statistically significant intervillage differences, with a high of 33 percent of village 2 respondents agreeing with the statement in contrast to only 4 percent in village 1 (Kruskall Wallace one-way analysis of variance coefficient=11.47, df=4, $p<0.05$).

Table 44. Percent distribution of selected attitudes towards fishing.

	Village					
Attitude towards fishing	**1**	**2**	**3**	**4**	**7**	**Total (N)**
Would advise a young person to go into fishing	24	29	22	30	27	26 (446)
Likes fishing	67	42	43	62	66	55 (438)
Would not change job	09	42	37	15	09	22 (401)

Table 45. Percent distribution of attitudes towards the relative safety of fishing.

	Village					
Fishing is safe	**1**	**2**	**3**	**4**	**7**	**Total**
Strongly disagree	52	38	37	41	55	45
Disagree	20	19	41	19	22	25
Slightly disagree	16	08	06	18	04	10
Neither	07	03	01	01	01	02
Slightly agree	01	04	07	06	03	05
Agree	01	17	06	06	02	06
Strongly agree	02	12	03	07	13	07
N=456						

Since these attitudes might be influenced by the gender of the respondent (for the most part, males conduct most of the fishing activities) and the degree to which the household depends on fishing, the same data is examined for males from households that rank fishing as contributing most to household income (table 46). None of the observed differences between the villages are statistically significant ($p>0.05$). Nevertheless, it appears that there are statistically significant differences in the responses of males from households that have a primary dependence on fishing and others in all villages except Village 1 with regard to liking the

occupation of fishing. For example in Village 2, 81 percent of these males like fishing in contrast to only 31 percent of the others ($\chi^2 = 13.10$, df = 1, $p<0.001$). In Village 3, respective percentages are 89 and 33 ($\chi^2 = 18.93$, df = 1, $p<0.001$), in Village 4, 85 and 52 ($\chi^2 = 8.84$, df = 1, $p<0.005$), and in Village 7, 87 and 55 ($\chi^2 = 9.36$, df = 1, $p<0.005$). The only other response that manifests a statistically significant within village difference is that in Village 7, males from primarily fishing households are more likely to state that they would not change their occupation than others (19 versus 3 percent, respectively; Yates corrected $\chi^2 = 5.06$, df = 1, $p<0.05$). Table 47 examines percent distribution of the same attitudes toward fishing in households where fishing is of either primary or secondary importance. The differences in the distributions in tables 46 and 47 are minimal. The percentage of fishers who would not leave fishing for an available alternative is much lower than reported by similar fishers in the Philippines and Indonesia (84 and 64 percent, respectively; Pollnac, et al. 2001). Perhaps this difference can be attributed to changes in perceptions of the occupation of fishing resulting from the tsunami.

Table 46. Percent distribution of selected attitudes towards fishing among males in households where fishing is of primary importance.

	Village					
Attitude towards fishing	**1**	**2**	**3**	**4**	**7**	**Total (N)**
Would advise a young person to go into fishing	32	44	33	30	19	30 (114)
Likes fishing	58	81	89	85	87	81 (111)
Would not change job	18	38	17	19	19	21 (114)

Table 47. Percent distribution of selected attitudes towards fishing among males in households where fishing is of primary or secondary importance.

	Village					
Attitude towards fishing	**1**	**2**	**3**	**4**	**7**	**Total (N)**
Would advise a young person to go into fishing	31	42	33	28	24	31 (144)
Likes fishing	68	84	79	81	86	80 (140)
Would not change job	13	37	21	19	16	20 (143)

Table 48. Percent distribution of attitudes towards the relative safety of fishing among males in households where fishing is of primary importance.

	Village					
Fishing is safe	**1**	**2**	**3**	**4**	**7**	**Total**
Strongly disagree	52	31	39	59	52	49
Disagree	17	19	33	11	19	19
Slightly disagree	17	06	00	11	10	10
Neither	04	00	06	04	00	03
Slightly agree	00	06	06	07	00	03
Agree	04	19	11	00	06	07
Strongly agree	04	19	06	07	13	10

N=115

With regard to attitudes toward the relative safety of fishing, once again respondents in Village 2 seem to be less likely to disagree with the statement than respondents from the other villages (table 48). This time, however, differences across the 5 villages are not statistically significant (Kruskall Wallace one-way analysis of variance coefficient=4.80, df=4, $p>0.05$).

9.3 Alternatives to fishing As a means of determining acceptable alternative occupations that could be used to replace fishing if for some reason community members could no longer fish, respondents were asked to indicate the type of job they would like to have if they had to leave the occupation of fishing. Table 49 includes categorized responses cross-tabulated by village. Almost one-half the respondents indicated that they would like to be involved in some type of trading. Farming was suggested by about one-third, and aquaculture, which is often suggested as an appropriate alternative to the capture fishery, was selected by only six percent of the respondents. Village 7 had the highest percentage of people mentioning aquaculture, but it was only 15 percent. When the survey was given, two small scale aquaculture projects--catfish and frog--were underway in Village 7.

Table 49. Preferred occupation if household members could no longer fish.

	Village					
Occupation	**1**	**2**	**3**	**4**	**7**	**Total**
Aquaculture	03	03	06	01	15	06
Farming	42	26	28	41	18	30
Labor	06	07	05	01	04	05
Trading	36	53	57	44	53	49
Animal husbandry	00	04	02	03	06	03
Other	13	07	02	10	04	07

N=419

Since alternative occupations for households where fishing is of primary importance are those of most interest concerning attitudes towards the occupation, and since it is the fishers, who are principally males, who will be shifting their occupation, tables 50 and 51 present data for males from households where fishing is of primary importance and primary or secondary importance respectively. As can be seen in these tables, trading is still selected as the alternative occupation of choice, with farming being the second choice alternative in all villages except Village 1. This general relationship is reversed in Village 1 in households where fishing is of either primary or secondary importance. The rank-orders of these alternatives, however, are reversed in Village 2 where males from primarily fishing households show a greater preference for farming as an alternative. A detailed breakdown (uncategorized responses) of alternatives to fishing can be found in Appendix 9A. of this section.

Table 50. Percent distribution of preferred occupation by males in households where fishing is of primary importance if household members could no longer fish.

	Village					
Occupation	**1**	**2**	**3**	**4**	**7**	**Total**
Aquaculture	00	00	00	00	16	04
Farming	25	50	33	41	29	35
Labor	05	06	00	00	03	03
Trading	45	38	67	41	39	45
Animal husbandry	00	00	00	07	10	04
Other	25	06	00	11	03	09

N=112

Table 51. Percent distribution of preferred occupation by males in households where fishing is of primary or secondary importance if household members could no longer fish.

	Village					
Occupation	**1**	**2**	**3**	**4**	**7**	**Total**
Aquaculture	00	00	04	00	16	05
Farming	45	47	29	41	24	36
Labor	03	11	00	00	05	03
Trading	34	32	63	44	41	43
Animal husbandry	00	00	00	06	11	04
Other	17	11	04	09	03	09

N=141

9.4 Predictors of variability in attitudes toward fishing Variables found to be associated with job satisfaction among fishers in other research (Binkley 1995; Gatewood and McCay 1990; Pollnac and Poggie 1988) include age, education, income from fishing and number of years in the occupation. Since it has been predicted that the tsunami might have influenced attitudes toward fishing, aspects of the impacts of this variable are also examined. It has also been suggested that a fatalistic attitude helps fishers cope with the dangers of their occupation (see Pollnac, et al. 1998), hence the influence of a fatalistic attitude is examined. Perceived safety of the occupation is also expected to be related to attitudes toward fishing. Finally, the analysis explores relationships between attitudes toward fishing and gender, religion and media exposure. The analyses of the impacts of these final three variables are strictly exploratory—some relationship is expected, but the direction of the relationship is not predicted. For example, media exposure could result in people either fearing the impacts of tsunamis through raising and maintaining the level of awareness or ignoring them because of the reported rarity of such extreme phenomena.

In all cases the variables were converted to dichotomies or were natural dichotomies (e.g., gender, religion). Age, education and years fishing were dichotomized at sample medians (38, 6 and 18 years respectively). Those who did not disagree with the statement that fishing is safe (question 4, above) are treated as perceiving fishing as safe. Respondents who agreed with the statement "*there is no point in planning for the future, what happens, happens and we cannot do anything about it*" are treated as fatalistic. If any household members, relatives or friends were reported as killed or injured by the tsunami, "killed" or "injured", as appropriate, was coded as present for the respondent, and whether or not the respondent was injured by the tsunami is a natural dichotomy. Reporting fishing as first in importance for household income is used as the indicator for income from fishing; and male from a household where fishing is first and first or second in importance are treated as variables. Finally, media exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers and this figure was dichotomized at the sample mean (8.26). The correlations (phi) of these dichotomous variables with attitudes toward fishing are in table 52. Probabilities are based on the chi-square associated with the phi.

Most significantly with regard to table 52, it is clear that those who perceive fishing as a safe occupation are more likely to advise a young person to become a fisher, like fishing, and less likely to leave the occupation for an alternative that provides the same amount of income. The danger of fishing is the most frequently mentioned reason for not advising someone to become a fisher. Over two-fifths (44 percent) of the respondents who would not recommend fishing as an occupation used the rationale of danger while another 4 percent mentioned fear of the tsunami. Fatalistic individuals are also less likely to leave fishing. This may be related to the fact that fatalism is also positively correlated with perceptions of fishing as not dangerous (phi=0.21, p<0.001). Male and Muslim respondents also have a tendency to report that they would not leave fishing.

Table 52. Correlations (phi) between attitudes towards fishing and independent variables.

	Advise Fishing	Like Fishing	Leave Fishing
Age	0.010	-0.094	-0.016
Education	-0.035	-0.117*	-0.094
Fishing safe	0.194***	0.158**	-0.226***
Fatalistic	0.065	-0.054	-0.203***
Killed	0.044	0.120*	0.144**
Injured	0.051	0.178***	0.185***
Self injured	0.129**	0.138**	0.018
Female	-0.035	-0.205***	0.113*
Muslim	0.076	0.001	-0.117*
Fishing 1st	-0.049	0.036	0.008
Male fish 1st	0.048	0.306***	0.021
Male fish 1st/2nd	0.068	0.345***	0.051
Years fishing	0.024	0.088	0.095
Media exposure	-0.007	-0.043	0.034

*p<0.05 **p<0.01 ***p<0.001

Having a household member, kinsman, or friend killed or injured by the tsunami tends to influence the respondent's desire to leave fishing, but injury to self seems to have no effect on willingness to change occupation. This finding is supported by the fact that those who were injured by the tsunami still like fishing and would advise a young person to enter the occupation. This seems to be related to the finding by Pollnac, et al. (1998) that fishers who experience dangerous incidents at sea are likely to treat the incidents as less serious—they experienced the incident and survived, so why worry. A possible explanation for the negative relationship between a friend/family member being injured or killed and the desire to leave fishing could be because often kinsmen are part of the boat crew. Therefore, if a fisherman lost a person that was part of his crew, he would be less likely to want to go out after the disaster without him. Additionally, if a fisher is accustomed to a crew with close relations, he may not want to expose his crew to the dangers of fishing even if he, alone, would wish to continue to fish.

A potentially useful observation concerning these findings is that the ARC criteria for replacement boats include loss of a household member in the tsunami. Given that those who experienced death/injury to someone close to them were more inclined to desire to leave fishing, this criterion seems to be counterproductive. If one of the program goals is to reduce effort in the fishery, it might be more productive in future projects of this type to give these households priority for training for alternative livelihoods. Within the confines of the current project, households receiving boats but willing to accept an alternative occupation might be trained in another occupation, which could use the boat for tourist activities such as sightseeing or recreational fishing.

Age is not significantly correlated with attitudes toward fishing. Those with a higher level of education and females, however, are less likely to state that they like fishing. It is interesting that the proximity to injury and/or death from the tsunami did not seem to have a negative impact on a person's liking fishing—in fact, those who had a household member, kinsman, or friend killed or injured or who were injured themselves tended to report that they liked the occupation of fishing. Liking fishing is not statistically significantly correlated with the willingness to leave the occupation (phi=0.05, p>0.05), but it is significantly correlated with willingness to advise a young person to enter the occupation (phi=0.25, p<0.001).

9.5 Conclusions

The results clearly indicate that attitudes towards the occupation are more negative than those reported by Pollnac, et al. (2001) for comparable Southeast Asian fisheries. Whether or not this can be attributed solely to the impacts of the tsunami is not clear at this point. The tsunami indicators, as analyzed in this report, did not have a negative impact on either liking the occupation or advising a young person to enter the occupation. Those who lost family members or friends to the tsunami did tend to report that they would leave the occupation for an alternative providing the same income. Nevertheless, personal injury resulting

from the tsunami did not have this effect. Further, those with a fatalistic attitude and those who perceived fishing as not dangerous tended to report that they would not leave the occupation.

Clearly the large number of respondents who state they would change to an alternative occupation bodes well for an alternative income program. Nevertheless, given the relatively large percentage of respondents who report that they like fishing suggests that as time goes by and memories of the tsunami fade, fascination with an alternative occupation might wane. If movement out of the fishery is desirable for conservation purposes, it is suggested that actions be taken soon, and that appropriate alternatives—those that provide some of the same satisfactions as fishing—be provided (Pollnac, et al 2001; Pollnac and Poggie 1988; Sievanen, et al. 2005). Riskiness, independence and being one's own boss are documented characteristics for alternative occupations that are most likely to satisfy former fishermen (Pollnac, et al 2001; Pollnac and Poggie 1988; Sievanen, et al. 2005). One example of this type of occupation is charter boat trips for tourists. This is especially applicable because it is already practiced in at least one village in the study area suggesting that there is a market for such activities. The alternative occupations uncovered in this analysis might be of some assistance in this endeavor, but the relative recency of the tsunami and villagers' awareness of suitable alternatives may limit, somewhat, the usefulness of the information provided here. Additionally, it should be noted that overall, fishers in Villages 1, 3, 4 and 7 appear to be more amenable to an occupation outside of the fishery while men from Village 2 seem least likely to accept alternatives to fishing (table 46); hence, projects geared toward diverting fishermen away from the fishery would be least likely to succeed among fishers in Village 2. It is suggested that the alternatives presented here, in conjunction with human resource, economic and marketing analyses, as well as education programs directed at raising awareness concerning suitable alternatives be the starting point for developing a comprehensive alternative occupation program for the involved villages.

APPENDIX 9A

DETAILED BREAKDOWN OF OCCUPATIONS MENTIONED AS ALTERNATIVES TO FISHING IF FISHING COULD NO LONGER BE PRACTICED

	Village						
	1	2	3	4	7	Total	N
Don't know	2	1	0	0	0	0	2
Labor	6	4	0	1	0	2	8
Car for hire	3	0	0	0	0	0	2
Trading	28	51	56	41	51	46	194
Farming	42	24	26	31	16	27	113
Grocery	3	0	0	0	0	0	2
Handicrafts/sewing/make sweets	2	0	0	0	0	0	1
Trade and farming	5	0	1	3	0	2	7
Conflict with local people	2	0	0	0	0	0	1
Construction	3	0	0	0	0	0	2
Sewing	2	0	0	0	1	0	2
Aquaculture	3	1	1	1	11	4	15
Selling snacks	0	1	0	0	0	0	1
Livestock	0	3	2	1	6	3	11
Labor/Trading	0	1	0	0	0	0	1
rubber	0	1	2	3	1	2	7
Labor for construction	0	1	0	0	0	0	1
Raising chickens	0	1	0	0	0	0	1
Barber	0	1	0	0	0	0	1
Catfish culture	0	1	0	0	0	0	1
Making traps to sell	0	3	0	0	0	0	2
Bus driver	0	1	0	0	0	0	1
Garage	0	0	0	2	0	0	2
Mixed farming	0	0	0	5	0	1	5
Engine mechanic	0	0	0	1	0	0	1
Open a fishing shop	0	0	0	1	0	0	1
Making cages	0	0	0	1	0	0	1
Raising cows and farming	0	0	0	1	0	0	1
Gardening and livestock	0	0	0	1	0	0	1
Factory employee	0	0	0	2	0	0	2
Cutting nets	0	0	0	1	0	0	1
Open general repair shop	0	0	0	1	0	0	1
Gardening	0	0	0	1	0	0	1
Fish cage culture	0	0	2	0	1	1	3
Shell/mussel farming	0	0	2	0	0	0	2
Private business	0	0	2	0	1	1	3
General labor	0	0	5	0	4	2	9
Expand exisitng catfish culture	0	0	1	0	0	0	1
Fish pond	0	0	0	0	2	0	2
Too old	0	0	0	0	1	0	1
Palm plantation	0	0	0	0	1	0	1
Carpentry/mirror service	0	0	0	0	1	0	1
Aquaculture/livestock	0	0	0	0	1	0	1
Trade/fish processing	0	0	0	0	1	0	1
Trade/planting/livestock	0	0	0	0	1	0	1
Total	100	100	100	100	100	100	
N	64	70	99	91	95		419

10. Perceptions of Coastal Resources and Factors Related to their Management

10.1 Introduction

Recovery from natural disasters can involve changes that improve management of natural resources. It has been suggested that recovery from changes wrought by the tsunami could involve development of new coastal management techniques in impacted villages. Development of appropriate management initiatives requires an understanding of how potential participants perceive aspects of the environment and its management (Berkes, et al. 2001; Pollnac and Crawford 2000). What do people believe about the resources, the impacts of planning for the future, their control over local coastal resources, and the degree to which locals comply with management initiatives? All these beliefs can impact the methods used to initiate or change coastal management practices in target villages. For example, if fishers believe that their activities do not influence the number of fish in the ocean, why should they comply with restrictions on their harvesting activities? Clearly, such beliefs need to be changed with some sort of training if we want cooperation of local fishers. Without such cooperation, management efforts are doomed to failure.

As a means of assessing these important beliefs, we asked a sample of 502 individuals from 251 households in the five villages to respond to the following five questions:

> *1. Human activities do not influence the number of fish in the ocean. Strong disagree(7)__ disagree(6)__ slight disagree(5)__ neither(4)__ slight agree(3)__ agree(2)__ strong agree(1)__*
>
> *2. There is no point in planning for the future, what happens, happens and we cannot do anything about it. Strong disagree(1)__ disagree(2)__ slight disagree(3)__ neither(4)__ slight agree(5)__ agree(6)__ strong agree(7)__*
>
> *Questions 3 through 5 involve showing the respondent a ladder-like diagram with 10 steps. The respondent is told that the first step represents the worst possible situation and the highest step is best situation. The subject would then be asked where on this ladder (ruler, scale, whatever is appropriate for the subjects involved) the local area is today (the self-anchoring aspect of the scale). The subject would then be asked to indicate where it was pre-tsunami (1 year ago) and where he/she believes it will be 3 years in the future. The step numbers are entered on the form for each time period.*
>
> *3. Empowerment--Control over resources: The first step indicates a community where the people have no control over access to the community's coastal resources--anyone from anywhere is free to come and fish, gather shellfish, cultivate seaweed, etc. The highest step indicates a community where the people in the community have the right to control (e.g., develop rules) the use of the coastal resources of their community.*
>
> *4. Resource health: First step represents a situation where the beach is filthy and polluted, the mangroves are dead or dying, and the waters are so bad that nothing can live in them. The highest step indicates a beautiful beach, pure waters and healthy mangroves filled with wildlife.*
>
> *5. Compliance: The first step represents a situation where the coastal area and the sea is basically lawless, no one obeys the fishery regulations, everyone does what they want. The highest step represents a situation where everyone obeys the law and takes care of the environment.*

10.2 Inter-village variation in Perceptions of the Environment and Management

Percent distribution of perceptions of impacts of human activities on fish in the ocean and planning for the future (questions 1 and 2 above) can be found in tables 53 and 54. The results in table a indicate that a little over one-third (34 percent) of the respondents agree to some degree with the statement that human activities do not influence the number of fish in the ocean, and almost one-half (48 percent) agree with the statement that there is no point in planning for the future, what happens, happens and we cannot do anything about it.

Clearly, these beliefs are dysfunctional with regard to resource management. Inter-village differences in table 53 are statistically significant (Kruskall-Wallace one-way analysis of variance coefficient=31.513, df=4, $p<0.001$). Village 4 manifests the lowest levels of agreement with the statement that human activities do not influence the number of fish in the ocean (16 percent) and Village 2 the highest (47 percent).

Table 53. Percent distribution of responses to statement *Human activities do not influence the number of fish in the ocean.*

	Village						
Response	**1**	**2**	**3**	**4**	**7**	**Total**	**N**
Strong agree	22	32	19	13	20	21	95
Agree	6	10	22	0	5	9	42
Slight agree	0	5	3	3	9	4	19
Neither	5	0	0	0	1	1	5
Slight disagree	7	0	1	7	4	4	18
Disagree	21	31	24	15	13	20	93
Strong disagree	38	21	31	62	48	40	185
Total	100	100	100	100	100	100	
N	81	77	109	94	96		457

Table 54. Percent distribution of responses to statement *There is no point in planning for the future, what happens, happens and we cannot do anything about it.*

	Village						
Response	**1**	**2**	**3**	**4**	**7**	**Total**	**N**
Strong disagree	20	30	22	34	28	27	122
Disgree	16	8	20	17	14	15	70
Slight disagree	16	1	4	5	8	7	31
Neither	14	1	0	2	1	3	15
Slight agree	10	9	10	4	6	8	36
Agree	11	19	16	9	5	12	54
Strong agree	14	31	28	29	38	28	129
Total	100	100	100	100	100	100	
N	81	77	109	94	96		457

Table 55. Percent distribution of anchoring scale values (today) for responses to empowerment (control over resources) question.

Scale	Village						
Value	**1**	**2**	**3**	**4**	**7**	**Total**	**N**
1	0	0	0	6	1	2	7
2	0	1	1	4	0	1	6
3	5	3	5	4	1	4	16
4	9	13	3	9	5	7	33
5	13	26	35	24	29	26	119
6	4	18	15	13	13	13	57
7	14	6	8	10	8	9	42
8	14	5	8	7	15	10	45
9	17	9	5	10	11	10	45
10	22	18	21	13	17	18	82

Table 56. Percent distribution of anchoring scale values (today) for responses to resource health question.

Scale	Village						
Value	**1**	**2**	**3**	**4**	**7**	**Total**	**N**
1	3	1	0	14	3	4	19
2	11	0	3	4	6	5	22
3	23	8	8	14	20	14	65
4	25	17	28	20	20	22	101
5	11	29	35	29	28	27	123
6	8	23	10	6	11	11	52
7	15	5	9	3	5	7	34
8	0	4	2	5	2	3	12
9	5	8	2	4	2	4	18
10	0	5	4	0	2	2	10
N	80	77	109	94	96		456

Kruskall-Wallace one-way analysis of variance of the ordinal values in table 54 indicates that the overall differences are not statistically significant (coefficient=4.018, df=4, $p>0.05$). Nevertheless, if we look at the values in the table we can see that a low of 35 percent of the respondents from Village 1 agree with the statement that there is no point in planning for the future, what happens, happens and we cannot do anything about it, in contrast to almost 60 percent of those from Village 2. Chi-square analysis of the responses grouped into the categories "agree" and "other" (which would include all levels of agreement and "neither") indicates statistically significant inter-village differences ($\chi^2 = 13.380$, df = 4, $p<0.05$).

Table 57. Percent distribution of anchoring scale values (today) for responses to compliance question.

Scale	Village						
Value	**1**	**2**	**3**	**4**	**7**	**Total**	**N**
1	0	0	1	2	0	1	3
2	1	0	1	2	0	1	4
3	0	1	1	2	2	1	6
4	1	4	1	6	2	3	13
5	7	22	31	26	25	23	105
6	17	16	11	4	9	11	51
7	11	3	10	11	11	9	43
8	20	8	9	20	18	15	68
9	9	16	12	12	20	14	62
10	33	31	23	14	13	22	101
N	81	77	109	93	96		456

Questions 3 through 5 are self-anchoring scales (Cantril 1963). As a means of providing the reader with some sense of the specific level of evaluations, the percent distribution of the anchoring (today) values are provided for each question in tables 55 through 57. Modal values for all three of these questions is 5, but it is clear that responses seem to be clustered in the bottom half of tables 55 and 56**.** In table 57 the responses are clustered in the top half. There also seem to be some inter-village differences. One way to evaluate the inter-village differences is to dichotomize the scale values at the sample mode and conduct a chi-square analysis of the distribution of responses above the mode. The results of such an analysis are presented in table 58.

The observed differences in percent of responses above the modal value for empowerment are not statistically significant. With regard to evaluation of the health of the resource, respondents from Village 2 rank their resources highest while those from Village 4 manifest a lower percentage above the sample modal value. Respondents from Village 1 clearly provide a larger percentage of responses above the sample mode than those from any other village. The extreme value for Village 1 is most likely responsible for the statistical significance of the inter-village differences for this variable.

Table 58 Analysis of inter-village differences in percent distribution of values above the mode for anchoring scale values.

	Village							
Scale	1	2	3	4	7	χ^2	df	Prob.
Empowerment	72	57	57	52	64	8.474	4	>0.05
Resources	28	45	27	19	23	16.740	4	<0.01
Compliance	90	73	65	61	71	20.676	4	<0.001

The most appropriate analyses of responses to questions 3 through 5, however, involve perceived change over time from the self-anchoring point (perceptions of today). To do this the pre-tsunami value is subtracted from the value for today, providing a perception of the degree of change since just before the tsunami. Hence, a positive value indicates improvement and a negative value indicates a worsening situation. As a means of obtaining outlooks for the future, the present day value is subtracted from the future value. This results in a value indicating perceived future changes—a positive value indicating an improving situation and a negative, a deteriorating condition. Since a visual scale was used we feel justified in treating this variable as a quasi-metric, amenable to the use of parametric statistical analysis (Pollnac and Crawford 2000). Results of an inter-village analysis of variance of these values can be found in table 59.

Table 59. Analysis of variance of inter-village differences in mean values for perceived change.

	Village							
Response	1	2	3	4	7	F	df	Prob.
Empowerment ΔT	−0.17	−0.29	0.00	−0.39	−0.35	1.056	4 446	>0.05
Empowerment ΔF	0.71	1.17	0.80	1.01	1.08	0.850	4 390	>0.05
Resources ΔT	-3.34	−0.97	−1.32	-1.94	−2.12	10.704	4 450	<0.001
Resources ΔF	3.46	1.67	1.90	2.41	3.18	7.675	4 400	<0.001
Compliance ΔT	0.21	−0.08	0.07	−0.13	−0.12	0.905	4 450	>0.05
Compliance ΔF	0.37	0.83	0.94	1.08	1.26	2.705	4 401	<0.05

ΔT=change since tsunami; ΔF=change today to 3 years in the future.
df varies due to missing data.

In general table 59 indicates that villagers perceive negative changes since the tsunami (ΔT), but that they have positive outlooks for the future (ΔF). Inter-village differences are statistically significant for perceptions of changes in resources and future outlook for compliance. With regard to resources, the most negative post-tsunami changes are perceived by residents of Village 1 and the least negative by Village 2. Villages 1 and 2 are also at the extremes in terms of projected future changes in resources—Village 1 perceives the greatest positive change, and Village 2 the least. While the inter-village differences regarding post-tsunami changes in compliance are not statistically significant, residents of Village 7 perceive the most positive future changes and Village 1 the least.

10.3 Predictors of variability in perceptions of the environment and management

10.3.1 Impacts of planning and human activities In the first section of this analysis we examine independent variables expected to be related to fatalism and perceptions concerning the influence of human activities on the number of fish in the ocean and fatalism. The responses to these two questions were dichotomized into two categories: >4, and 4 and below, resulting in variables that reflecting a perception that human activities can influence the number of fish in the ocean (human influence) and that one cannot influence the future (fatalistic). In all cases the selected independent variables were converted to dichotomies or were natural dichotomies (e.g., gender, religion). Age, education and years fishing were dichotomized at sample medians (38, 6 and 18 years respectively). Those who did not disagree with the statement that fishing is safe are treated as perceiving fishing as safe. Respondents who agreed with the statement "*there is no point in planning for the future, what happens, happens and we cannot do anything about it*" are treated as fatalistic. If any household members, relatives or friends were reported as killed or injured by the tsunami, "killed" or "injured", as appropriate, was coded as present for the respondent, and whether or not the respondent was injured by the tsunami is a natural dichotomy. Reporting fishing as first

in importance for household income is used as the indicator for income from fishing; and male from a household where fishing is first in importance is treated as a variable. Finally, media exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers and this figure was dichotomized at the sample mean (8.26). The correlations (phi) of these dichotomous variables with attitudes toward fishing are in table 60. Probabilities are based on the chi-square associated with the phi.

Table 60. Correlations (phi) between perceptions and the independent variables.

	Fatalistic	Human Influence
Age	0.124**	-0.096*
Education	-0.110*	0.079
Fishing safe	0.213**	0.198**
Fatalistic	-----	-0.356**
Killed	-0.059	-0.027
Injured	-0.035	0.043
Self injured	0.119*	-0.063
Female	0.009	-0.041
Muslim	0.040	-0.062
Fishing 1st	0.070	-0.026
Male fish 1st	0.029	0.016
Years fishing	0.029	-0.018
Media exposure	-0.103*	0.069

*p<0.05 **p<0.01

Table 60 indicates that older individuals, those with less education, individuals who feel fishing is safe, those who were injured by the tsunami and those with a lower level of exposure to the mass media are likely to feel that planning for the future has no impact on what happens. Finally, younger individuals, those who feel fishing is safe, and people who feel that planning can have an influence on the future are less likely to say that human activities have no influence on the number of fish in the ocean.

10.3.2 Perceived changes in empowerment, status of the resources and compliance In this section of the analysis we examine the influence of a set of independent variables expected to be related to perceived changes in empowerment, status of the resources and compliance. The independent variables include whether or not the respondent comes from a household where fishing is primary in importance (a dichotomy), whether or not the respondent is a male from such a household (dichotomy) and perception of the relative safety of fishing (7 point scale). Degree of belief in the statement that human activity does not influence the number of fish in the ocean and degree of fatalism (questions 1 and 2 above; 7 point scales) are also expected to be related to the dependent variables. It is also expected that involvement in recovery efforts may influence perception of changes. Involvement may give them more realistic impressions of the changes taking place, as well as a feeling that they can influence the changes (empowerment). The number of recovery activities the respondent reports being involved in is the measure of this variable. Indicators of tsunami impact include total number of household members, kinsmen, and friends killed or injured (two variables—one for total killed and one for total injured). Gender and religion (dichotomous variables), as well as age, years of education, and degree of media exposure are also expected to be related to perceptions of change. Age and education are measured in years, and media exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers. The correlations of these variables with perceptions of change are in tables 61 and 62.

Table 61. Correlations of independent variables with perceptions of post-tsunami changes.

Variable	Empowerment	Resource	Compliance
Fishing first	-0.115*	0.101	-0.067
Male fish first	-0.008	-0.016	0.021
Years fishing	0.028	0.047	-0.064
Fishing safe	0.066	0.173**	0.046
Human influence	-0.042	-0.196**	0.020
Fatalism	0.029	0.177**	0.007
Involvement	0.096	0.022	0.077
Self injured	-0.057	0.049	-0.038
Total killed	-0.018	-0.055	0.070
Total injured	-0.005	-0.074	0.053
Gender female	-0.070	0.010	-0.086
Age	0.068	0.131**	0.001
Muslim	0.078	-0.038	0.015
Education	0.027	-0.030	0.042
Media exposure	0.063	-0.078	0.003

*=p<0.05 **=p<0.01

The only independent variable correlated with post tsunami changes in empowerment is coming from a household where fishing is first in importance. Those individuals are more likely to perceive a more negative impact (table 61). Table 61 also indicates that individuals who feel that fishing is safe, who feel that human activities do influence the number of fish in the ocean, who are fatalistic and who are older have less negative impressions concerning post-tsunami changes in the status of the resources.

Contrary to what was expected, involvement in post project activities is negatively correlated with projected future changes in empowerment (table 62). Additionally, perception of fishing as safe is also negatively correlated with perceptions of future changes in the resource. Finally, the belief that humans can influence the number of fish in the ocean, as well as total number of household members, kin, or friends injured by the tsunami are positively correlated with perceptions of future changes in the resource.

Table 62. Correlations of independent variables with perceptions of future changes.

Variable	Empowerment	Resource	Compliance
Fishing first	0.068	-0.008	0.075
Male fish first	-0.056	0.012	-0.029
Years fishing	-0.072	0.014	0.135
Fishing safe	-0.021	-0.151**	-0.063
Human influence	0.032	0.141**	0.065
Fatalism	-0.010	-0.075	-0.008
Involvement	-0.109*	-0.066	-0.076
Self injured	0.008	-0.015	-0.002
Total killed	0.026	0.085	-0.082
Total injured	0.003	0.134*	-0.022
Gender female	0.068	0.028	0.095
Age	0.070	-0.034	0.084
Muslim	-0.040	-0.035	-0.074
Education	-0.073	-0.042	0.003
Media exposure	-0.022	0.097	-0.034

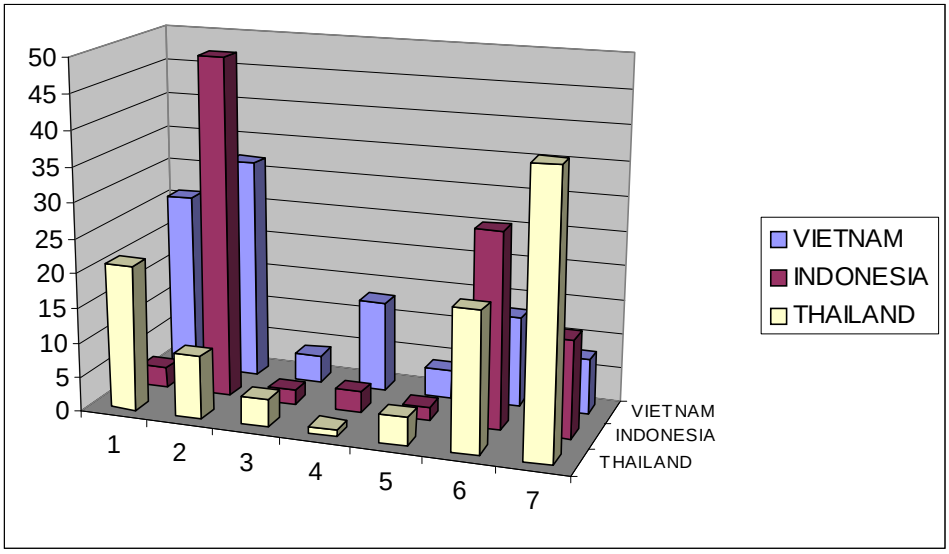
*=p<0.05 **=p<0.01

10.4 Conclusions

The analysis of predictors of variability in perceptions of the environment (table 60) suggest that older individuals, those with less education, those who were injured by the tsunami and those with a lower level of exposure to the mass media will probably require special attention in training programs directed at environmental management since they are more likely to be fatalistic—to feel that planning has no impact on what happens in the future. Additionally, a low of 35 percent of the respondents from Village 1 agree with the statement that there is no point in planning for the future, what happens, happens and we cannot do anything about it, in contrast to almost 60 percent of those from Village 2 (table 54). This difference can probably be attributed to the fact that Village 1 is the focus of the most development work and there is internal political conflict within Village 2. Both of these factors can influence perceptions of the impact of planning, indicating that inter-village differences must be accounted for in the development of post-tsunami recovery efforts.

It is also revealing that villagers' involvement in post tsunami recovery projects appears to have had a negative effect on perceptions of future changes in empowerment (table 62). This is unexpected, and should be further investigated. Has participation engendered feelings of inefficacy due to the nature of the problems encountered, or has top-down planning resulted in feelings that they have nothing valuable to contribute to the recovery efforts? If the latter, co-management efforts will have to be structured to change

Figure 11. Percent distribution of perceptions of human influence on number of fish.



these perceptions which could be dysfunctional in a situation where local participation is necessary and feelings of empowerment an essential ingredient.

A more positive finding, however, is the large number of respondents from the project villages who disagree with the statement that human activities do not influence the number of fish in the ocean (table 53). These figures can be contrasted with similar data collected in Indonesia in 2002 and Vietnam in 2004 (figure 11). Only 25 percent of respondents disagreed with this statement (scale values 5, 6 and 7; see question 1 above) in three project areas in Vietnam. In 6 villages in North Sulawesi, Indonesia only 30 percent disagreed with this statement during a project baseline (1997). In a post evaluation of the project (2002), this percentage increased to 43 percent, a statistically significant change (Pollnac, et al. 2003). In contrast to these figures from Vietnam and Indonesia, fully 64 percent of the Thai respondents disagree (40 percent, strongly—scale value 7) with this statement, indicating a much greater level of environmental awareness, which bodes well for involving villagers in co-management efforts.

Nevertheless, one must note that a little over one-third of the respondents do not believe that human activities have an impact on fish populations. This one-third probably represents villagers who would be less likely to participate in cooperative management and would likely resist attempts to manage the fishery. Clearly there is still a need to develop some sort of educational programs for this segment of the population. An examination of the inter-village differences in these perceptions (table 53) clearly indicates differences that should inform these programs—47 percent of the villagers from Village 2 believe human activities have no impact in contrast to only 16 percent from Village 4. Hence, education efforts should target Villages 1, 2, and 3 where environmental perceptions are most fatalistic and resource management would be most difficult to introduce given the perceptions revealed by the survey. Significantly, a lower percentage of respondents from Village 4 rank the status of the marine resource above the modal value for the entire sample than those from any other village. In contrast, respondents from Village 2 manifest the highest percentage of responses above the sample mode (table 58). Here it is important to note that perceptions of problems with the resource have been found to be positively related to success of various participatory management efforts (Pollnac, et al 2001; Pinkerton 1989a, 1989b). Such differences suggest that co-management efforts in Village 4 would probably advance more rapidly, providing a “learning” or “example” site for later efforts in other villages. One issue of concern for instituting a co-management arrangement is that all villages in the study use the same offshore fishery. Therefore, if a pilot project is implemented in one village, it may not be amenable to including other villages later into the scheme. One possible solution for this is to use the mangrove area in Village 4 as a pilot co-management project. However, traditional use rights in the fishery were not addressed in the baseline survey and should be investigated to insure proper structuring of inshore fishery management initiatives. Additional education programs in villages like Village 2 could prepare them for implementation of co-management efforts at a later time period, perhaps building on successes achieved in Village 4.

Finally, it is significant that most respondents rank the level of compliance with marine laws relatively high and project positive changes for the future. The fact that Village 1 predicts the smallest positive changes in compliance for the future (table 59) is related to the relatively high levels of evaluations for the anchoring point (today—see tables 57 and 58). If these responses reflect the true situation, and if there is adequate community involvement in establishing a co-management regime, the villagers will probably comply, resulting in a successful project.

11. Investment Orientations

11.1 Introduction

Recovery from natural disasters often involves providing loans associated with investment opportunities for impacted community members. It is therefore important to understand what people say they would do with a sudden windfall of money. This may give development workers some indication of activities perceived as worthy of investment by community members. This information can then be used in the structuring of credit schemes and complementary training programs to foster investment opportunities in targeted communities.

In order to assess villagers investment orientations, we asked a sample of 502 individuals from 251 households in the five villages to respond to the following two questions:

> *1. If you were to suddenly inherit or win 9,000B in a lottery, what would you do with this money?*
>
> *2. Now I will ask the same question involving more money. If you were to suddenly inherit or win in a lottery 110,000B, what would you do with this money?*

11.2 Inter-village variation in investment orientations

Ninety-nine distinct responses to the questions were coded into 12 categories plus an "other" catch-all category. Individuals were allowed to provide more than one response to each question. Tables 63 through 65 below provide the percent distributions of the first response to the 9000B question and the first and second responses to the 110,000B question. These values represent average monthly and yearly salaries for fishermen based on key informant interviews in the villages. Less than 5 percent of the sample provided second responses to the 9000B question, so the second responses to this question are not evaluated in these tables.

Similar to responses to the question concerning what a fishing household would like to do if they could no longer fish (Pollnac 2005), some form of trading is the most frequent response (28 percent) to the 9000B question (table 63). This response ranged from a low of 15 percent in Village 1 to a high of 38 percent in Village 2. Putting the money into a bank or a revolving fund is the next highest projected use (11 percent) followed closely by education for a child (8 percent), farming (7 percent) and fishing (6 percent). Village 1 manifests a relatively high percent of individuals responding they would put the money in a bank or revolving fund—28 percent, which is more than two to five times higher than in any of the other villages. It is useful to note that Village 1 has had the most experience with development organizations, especially WARED (Wildlife Animal Rescue Foundation of Thailand) which worked in the area prior to the tsunami. Respondents from Village 1 also seem to be more likely to invest in a child's education. Use for a boat was not specified, but if we assume it was for fishing (a good assumption) it would increase the percent invested in fishing up to 11 percent, tying with bank/revolving fund. Further, some responses coded "equipment" were also not specified; hence, a few more percent may possibly be directed at fishing.

Table 63. Percent distribution of investment orientations (9000B) across the five villages (1st response).

	Village						
Use of money	**1**	**2**	**3**	**4**	**7**	**Total%**	**N**
No response	6	16	11	6	6	9	45
Child's education	14	8	2	11	9	8	41
Bank/Revolving fund	28	9	5	8	11	11	57
Trading	15	38	34	23	26	28	139
Farming	5	5	12	11	2	7	37
Fishing	1	2	9	7	8	6	29
Aquaculture	2	1	6	2	6	4	18
House (fix/build)	1	3	1	3	3	2	11
Boat	0	5	3	3	11	5	23
Livestock	0	1	2	1	3	1	7
Equipment	6	5	5	5	4	5	25
Land	0	0	0	2	0	0	2
Business (other)	0	2	2	3	3	2	11
Other	22	3	9	15	9	11	57
Total	100	100	100	100	100	100	
N	86	92	122	100	102		502

Table 64 indicates a similar distribution of responses for the 110,000B question except that the percent directed at fishing (even if boat and equipment are included in the category) drops in contrast to a larger percent directed at farming (16 percent), which is now the second highest category behind trading (20 percent). Almost one-fourth (24 percent) of the respondents in Village 2 suggest farming as a good investment. This contrasts with only 10 percent in Village 1. These findings can also be due to the local logistics of farming in these villages. Village 2 is partially located inland where there is more land available to cultivate than Village 1. Additionally, water for irrigation is difficult to obtain in Village 1. Investment in a bank or revolving fund and a child's education remain as important categories (12 and 9 percent, respectively). Similar to the response to the 9000B question, Village 1 respondents, once again, seem most likely to invest in a bank or revolving fund. The second response adds only a few percent to those categories, with trading being the highest again with 4 percent.

Table 64. Percent distribution of investment orientations (110,000B) across the five villages (1st response).

	Village						
Use of money	1	2	3	4	7	Total	N
No response	6	16	11	6	6	9	46
Child's education	15	5	6	16	5	9	46
Bank/Revolving fund	35	8	8	8	5	12	60
Trading	5	20	30	18	25	20	102
Farming	10	24	15	13	17	16	79
Fishing	3	5	3	2	5	4	19
Aquaculture	1	2	10	4	11	6	30
House (fix/build)	8	7	3	7	6	6	30
Boat	0	4	1	3	2	2	10
Livestock	0	1	2	0	0	1	3
Equipment	0	1	2	8	11	5	23
Land	7	2	2	3	0	3	14
Business (other)	1	2	2	4	5	3	14
Other	8	2	5	8	3	5	26
Total	100	100	100	100	100	100	
N	86	92	122	100	102		502

Table 65. Percent distribution of investment orientations (110,000B) across the five villages (2nd response).

	Village						
Use of money	1	2	3	4	7	Total	N
No response	97	82	89	71	75	82	414
Child's education	1	1	1	4	1	2	8
Bank/Revolving fund	0	0	1	4	5	2	10
Trading	0	4	2	7	5	4	18
Farming	0	1	3	2	1	2	8
Fishing	0	2	1	3	0	1	6
Aquaculture	1	1	1	0	1	1	4
House (fix/build)	0	2	0	2	2	1	6
Boat	0	0	0	2	0	0	2
Livestock	0	2	2	0	5	2	9
Equipment	0	0	0	0	3	1	3
Land	1	0	0	2	0	1	3
Business (other)	0	2	0	0	0	0	2
Other	0	2	1	3	3	2	9
Total	100	100	100	100	100	100	
N	86	92	122	100	102		502

Responses to both the 9000B and 110,000B questions were re-coded so that individuals providing a specific response to either question, be it a first or later response, would be coded as indicating that category. For example, if a person reported that they would invest the money in trading for either question, they would be coded as "trading". Hence, an individual could be coded as reporting several investment options. Percent distribution of the re-coded responses across the seven villages can be found in table 66. Columns in table 66 can sum to greater than 100 percent since an individual may provide more than one response. Tests of significance for inter-village differences were calculated for all responses provided by more than five percent of the sample. These analyses indicate that inter-village differences are statistically significant for all responses except for investment in farming, fishing, house and business. Distributions of responses are quite similar to those in the preceding tables. Respondents from Villages 1 and 4 are most likely to suggest investing in a child's education, while those from Village 3 are least likely. Village one reports investment in a bank or revolving fund to the greatest extent, and it manifests the lowest number of respondents interested in trading or investment in a boat. The largest number of respondents interested in

aquaculture can be found in Villages 3 and 7 while a larger percentage of individuals from Village 7 are interested in investing in equipment of some sort.

Table 66. Percent distribution of investment orientations (both questions) across the five villages (all responses).

	Village									
Use of money	1	2	3	4	7	Total	N	χ^2	df	prob.
Child's education	27	12	7	25	11	16	79	23.636	4	<0.001
Bank/Revolving fund	50	13	11	16	18	21	103	56.872	4	<0.001
Trading	17	42	43	35	43	37	185	18.761	4	<0.01
Farming	15	27	25	21	18	21	107	5.458	4	>0.05
Fishing	3	8	11	11	12	9	46	5.156	4	>0.05
Aquaculture	3	4	11	6	15	8	41	11.747	4	<0.05
House (fix/build)	9	12	3	11	10	9	44	6.557	4	>0.05
Boat	0	8	4	8	13	7	33	14.085	4	<0.01
Livestock	0	4	3	1	5	3	14	*	*	*
Equipment	6	8	7	12	19	10	51	12.554	4	<0.05
Land	8	2	2	7	0	4	19	*	*	*
Business (other)	0	2	0	0	0	0	2	*	*	*
Other	1	7	4	6	8	5	26	5.064	4	>0.05

*chi-square not calculated for responses provided by less than 5% of sample.
Note: Columns can sum to greater than 100% since respondents can provide more than one response. In this table N= number of individuals providing specific response for use of money.

11.3 Predictors of variability in investment orientation Research has related several variables to investment orientations (see Pollnac 1989). The variables analyzed here include age, education, income from fishing and number of years in the occupation. It is also expected that impacts of the tsunami might influence investment orientations. This is speculative at this point, but it is possible that such a disaster might result in people wondering if it is rational to invest in such an unpredictable environment. It also seems that a fatalistic attitude might result in feelings of powerlessness, which might influence investment for the future; hence, the influence of a fatalistic attitude is examined. Principal occupation might also influence investment orientations. For example, members of households where fishing is of primary importance would probably be more likely to reinvest in fishing than members of households where farming or some other occupation is primary. Likewise, people who consider fishing as unsafe, would probably not be likely to invest in fishing. Finally, the analysis explores relationships between investment orientations and gender, religion and media exposure. The analyses of the impacts of these final three variables are strictly exploratory. For example, media exposure could result in raising awareness of investment opportunities, and we have no idea as to how gender or religion might be related to this variable.

In all cases the variables were converted to dichotomies or were natural dichotomies (e.g., gender, religion). Age, education and years fishing were dichotomized at sample medians (38, 6 and 18 years respectively). Those who did not disagree with the statement that fishing is safe are treated as perceiving fishing as safe. Respondents who agreed with the statement "*there is no point in planning for the future, what happens, happens and we cannot do anything about it*" are treated as fatalistic. If any household members, relatives or friends were reported as killed or injured by the tsunami, "killed" or "injured", as appropriate, was coded as present for the respondent, and whether or not the respondent was injured by the tsunami is a natural dichotomy. Reporting fishing as first in importance for household income is used as the indicator for income from fishing. Finally, media exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers and this figure was dichotomized at the sample mean (8.26). The correlations (phi) of these dichotomous variables with attitudes toward fishing are in table 67. Probabilities are based on the chi-square associated with the phi.

The statistically significant ($p<0.05$) correlations in table 67 are all rather weak, but it appears that there is a tendency for those who think fishing is safe to not invest in a child's education. This may be related to the fact that those who think fishing is safe are likely to invest in a boat or equipment, rather than education or farming. In addition, if a fisher wishes the next generation to become a fisherman, he does not have to invest in their education because some feel that formal education is not required to participate in the

Table 67. Correlations (phi) between investment orientations and selected independent variables.

Investment	Fishing *First*	*Age*	*Educate*	Fishing *safe*	*Fatal*	*Killed*	*Injured*	Self *Injured*	*Female*	*Muslim*	*Media*
Child's education	-0.01	-0.06	-0.02	-0.13*	-0.08	0.04	-0.01	-0.08	0.03	0.04	0.06
Bank/Revolving fund	0.14*	-0.08	0.08	0.09	0.03	0.04	0.00	0.03	0.00	0.02	0.04
Trading	-0.04	0.16*	0.02	0.03	0.14*	-0.13*	-0.06	-0.01	0.09	-0.03	-0.03
Farming	0.03	-0.03	-0.04	-0.10*	-0.05	-0.01	0.03	-0.04	-0.04	0.03	-0.07
Fishing	-0.01	0.03	-0.06	0.05	-0.06	0.04	0.01	0.02	0.00	-0.15*	-0.02
Aquaculture	-0.08	0.10*	-0.04	-0.06	-0.04	-0.01	0.02	-0.01	0.01	-0.07	-0.04
House (fix/build)	-0.07	-0.14*	0.06	0.07	0.01	0.09	0.02	0.07	0.02	0.02	-0.07
Boat	0.04	-0.02	-0.02	0.13*	0.05	-0.01	0.01	0.02	-0.09	-0.15*	-0.08
Equipment	0.03	-0.07	-0.13*	0.15*	0.01	0.03	0.01	0.06	-0.04	-0.09	-0.15*
Business (other)	*-0.10*	*-0.02*	*0.01*	*0.07*	*0.05*	*0.02*	*0.03*	*0.10**	*0.03*	*-0.00*	*-0.00*

*=p<0.05 N varies between 348 and 465 due to missing data on various included variables.

fishery. In this case, investment in productive materials for fishing is also investment for the future generation. There is also a tendency for those from households where fishing is primary to invest in a bank or revolving fund. This finding is in accordance with earlier research findings which indicate that aspects of the marine environment and the occupation of fishing result in fishers being more likely to save or invest for possible future needs associated with their productive activities (Pollnac and Poggie 1978; Poggie 1978; Pollnac, et al. 1975).

Trading seems to be the most likely option for older, fatalistic individuals who reported that none of their household members, kinsmen or friends was killed by the tsunami. Muslims appear less likely to invest in either fishing or a boat, while older individuals tend to mention aquaculture as an investment. Younger people are more likely to invest in their house, while those with more education and media exposure are less likely to invest in equipment. Finally, those who report that they were injured by the tsunami tend to say they would invest in a business.

11.4 Conclusions

The results presented above can be used to provide tsunami recovery workers some indication of activities perceived as worthy of investment by community members. Inter-village and inter-individual differences in investment orientations is information important in the structuring of credit schemes and complementary training programs to foster investment opportunities in targeted communities. But this information must be used with care—responses to questions do not always reveal realistic behavioral responses—some may see themselves as a successful traders, but do they have the necessary skills and is there a market for the proposed trade?

Trading is used as an example in the introduction to this section because investment in trading is the most frequently mentioned option in the interviews. It appeared as a first or later response in 37 percent of the interviews (table 66). Responses were often general; e.g., "invest in trading," "open a shop," "expand shop." Only a few were specific; e.g., "trade fish," "buy drugs for pharmacy," "open grocery," "trade fruit." This suggests that most respondents had not even carefully considered the type of trading they would become involved in. Further, one needs to ask, how many traders are needed. If more than one third of the respondents open some sort of trading enterprise, would there be enough business to support such a large number of traders? The same questions could be asked of some of the other alternatives.

Investment in farming (21 percent of respondents, table 66), probably a realistic venture in these rural communities, also needs more specification. What type of farming, and is there a distribution system and market for proposed crops? Since farming is already widely practiced throughout the region, answers to these questions are probably easy to obtain, and since many families both farm and fish, it appears that minimal training would be necessary. Investment in a bank or revolving fund (21 percent, table d) tells us little about the purpose of this type of investment. Is it to provide capital to replace or repair damaged or destroyed fishing equipment sometime in the future? The marine environment is tough on gear, and many fishers plan for future needs by saving money, but we do not know if this is the reason for saving. It does, however, demonstrate a cautious attitude towards expenditure of funds, an attitude that bodes well for future development and sustainability of development efforts.

If we include investment in a boat with fishing, investment in fishing ties with investment in a child's education (16 percent, table 66). Investment in education demonstrates a realistic concern for the future, but does investment in fishing? If formal education is not required of a fisherman, why would a household involved in fishing invest in a child's education? In the sense that the project villages have traditionally been involved in fishing, this investment makes sense and reflects behavior actually observed in these villages. Fishers with the means began repairing and replacing their equipment even before recovery assistance began to contribute to the process. The fishing families wanted to resume their livelihoods in the ways they knew how. But some "experts" have questioned the sustainability of the traditional fisheries and have suggested that it would be desirable to perhaps deflect some fishers from returning to their traditional occupation. Given the argument above, if the objective of a recovery program is to divert people out of the fishery, is education a way to accomplish this goal for the next generation?

If movement out of the fishery is desirable for conservation purposes, it is suggested that actions be taken soon, and that appropriate alternatives—those that provide some of the same satisfactions as fishing, and perhaps some of those uncovered by this investment orientation analysis—be provided (Pollnac, et al 2001; Pollnac and Poggie 1988; Sievanen, et al. 2005). The investment orientations uncovered in this analysis and the analysis of attitudes towards fishing in these villages might be of some assistance in this endeavor, but the relative recency of the tsunami and villagers' awareness and realistic perceptions of suitable alternatives as discussed above may limit, somewhat, the usefulness of the information provided here. It is suggested that the investment orientations presented here, in conjunction with human resource, economic and marketing analyses, as well as education programs directed at raising awareness concerning suitable alternatives be the starting point for developing comprehensive alternative occupation and recovery programs for the involved villages.

12. Perceptions of and Participation in Tsunami Recovery Activities

12.1 Introduction

Natural disasters frequently involve some sort of recovery activities, and community members' perceptions of and participation in these activities is an important indicator of the potential impacts of recovery efforts; hence, they should be routinely evaluated as part of project assessment, planning, monitoring and evaluation. As a means of assessing these perceptions and participation, we asked a sample of 502 individuals from 251 households in the five villages to respond to the following complex questions:

> *1. What are the activities in your village that are directed at recovery from the effects of the tsunami? (For each activity) Have you participated in this activity? (Each of the activities are to be evaluated using the following question: What kind of an impact has this activity had on the community? 0=made things a lot worse, 1=made things worse, 2=made things a little worse, 3=no impact, 4=made things a little better, 5=made things better, 6=made things a lot better.)*
>
> *2. The following types of activities have been proposed for your community. Each activity will be described with a standard description. (For each proposed activity) Would you participate in such an activity (Each of the above activities are to be evaluated using the following question: What kind of an impact do you think this activity would have on the community? 0=make things a lot worse, 1=make things worse, 2=make things a little worse, 3=no impact, 4=make things a little better, 5=make things better, 6=make things a lot better).*

12.2 Current Activities

In response to question 1, villagers mentioned 112 activities (Appendix 12A). They were not supposed to be prompted; hence, some obvious activities (e.g., replacement housing) are rarely listed, probably due to the fact that villagers thought they need not mention such highly visible phenomena. Activities mentioned by more than 20 villagers (4 percent of sample) are included in table a. Aquaculture activities mentioned under specific types are combined in table 68 since aquaculture is of interest to the USAID project.

Table 68. Frequency distribution of tsunami recovery activities mentioned by sample.

	Village					
Recovery Activity	1	2	3	4	7	Total
No activity mentioned	0	45	64	41	38	188
Soap making	69	0	0	1	0	70
Thai sweets	69	1	0	0	0	70
Furniture making	23	0	0	0	0	23
Reforestation/planting trees	0	10	12	8	1	31
Sewing	0	5	17	0	6	28
Making snacks/sweets	0	0	25	5	1	31
Aquaculture*	10	3	1	2	14	30

*Aquaculture includes shellfish, fish, and frog culture

The most obvious distributional anomaly in table 68 is the fact that no one in Village 1 failed to mention an activity in contrast to over half from Villages 2 and 3 (58 and 59 percent, respectively) and about two-fifths from Villages 4 and 7 (44 and 40 percent respectively). Of course, the inter-village differences in percent of respondents mentioning an activity are statistically significant ($\chi^2 = 79.62$, df = 4, $p<0.001$). Turning to participation in these activities (table 69), 40 percent of the villagers reported that they participated in the activities they mentioned. Once again, there is a fair amount of inter-village variability with regard to participation, ranging from a high of 59 percent in Village 1 to a low of 21 percent in Village 4. There were livelihood projects already beginning in Village 1 at the time of the survey, in contrast to Village 4 where there were none. These differences are statistically significant ($\chi^2 = 21.21$, df = 4, $p<0.001$). Evaluation of perceived impact of the various activities is found in table 70. Evaluations ranged from no impact to make things a lot better. None were evaluated as making things worse. Overall, the projects mentioned were favorably evaluated. The only activity evaluated by more than 50 percent of the respondents as having only little or no positive impact is furniture making.

Table 69. Percent distribution of participation in activities mentioned.

	Village						
Participation	1	2	3	4	7	Total	N
No	41	56	67	79	64	60	160
Yes	59	44	33	21	36	40	108

12.3 Proposed Activities

Among proposed activities were proposals for forming various small groups. These differed somewhat from village to village; hence, villagers were presented with the list of types of proposed small groups and asked to evaluate them in terms of whether or not they would participate and their perceptions of the value of such groups. Types of groups posed for each village are listed below.

Table 70. Percent distribution of perceived impact of project activities mentioned.

Recovery Activity	No impact	Little better	Better	A lot Better
soap making	3	6	24	67
Thai sweets	7	38	17	38
furniture making	9	61	30	0
reforestation/planting trees	0	3	17	79
sewing	4	4	23	69
making snacks/sweets	3	21	28	48
aquaculture*	3	13	23	60

*Aquaculture includes shellfish, fish, and frog culture.

Village 1 Thai sweet making, livestock raising, cashew nut processing
Village 2 goat raising, steamed mackerel, net making
Village 3 shrimp net making, fish cage culture, shrimp paste making
Village 4 women's occupations, Thai sweets, dress making
Village 7 fish sauce, Thai sweets, curry paste

Percent distribution of evaluation responses and willingness to participate are in table 71. Proposed group types were all evaluated quite favorably; nevertheless, there is inter-village variation in willingness to join, ranging from 30 percent in Village 7 to 86 percent in Village 1.

Table 71. Frequency distribution of evaluation of and willingness to participate in proposed groups.

	Evaluation							
Village	0	1	2	3	4	5	6	Join[a]
1	1	0	0	4	12	41	42	86
2	0	1	0	1	6	32	60	45
3	0	0	0	0	0	38	62	50
4	0	0	0	3	9	44	43	49
7	2	0	1	0	11	33	53	38

Evaluation: 0=lot worse, 1=worse, 2=little worse, 3=no impact, 4=little better, 5=better, 6=lot better.
[a]percent willing to join group type.

Four other proposed activities were evaluated: 1) collecting mangrove seedlings, 2) catfish culture training, 3) sewing bags, and 4) catering. Percent distribution of evaluation responses and willingness to participate in these activities are in table 72. Once again, the proposed activities were evaluated quite favorably. Catering (Village 1 only) had the lowest evaluation with almost one-half the responses suggesting that it could make things only a little better or result in no change at all. At the time of the survey, the catering project was already implemented. Nevertheless, 97 percent of respondents from Village 1 said they would participate in such a project. Sewing bags (Village 7 only) manifested the lowest level of potential participants (38 percent).

Table 72. Frequency distribution of evaluation of and willingness to participate in proposed activities.

	Evaluation							
Activity	0	1	2	3	4	5	6	Part[a]
Mangrove seed	0	0	0	1	4	26	69	75
Catfish culture	1	1	0	1	5	35	58	53
Sewing bags*	2	0	1	0	13	41	42	38
Catering**	0	0	0	3	46	23	29	97

Evaluation: 0=lot worse, 1=worse, 2=little worse, 3=no impact, 4=little better, 5=better, 6=lot better. *Village 7 only. **Village 1 only.
[a]Percent willing to participate.

12.4 Predictors of variability in project activities knowledge and participation

In this section we examine independent variables we expect to be related to variability in knowledge of and participation in ongoing project activities. We also examine factors related to willingness to participate in proposed activities. The independent variables examined include household size, material style of life (MSL), age, education, gender, and religion. Another independent variable used is fatalism. Respondents who agreed with the statement "*there is no point in planning for the future, what happens, happens and we cannot do anything about it*" are treated as fatalistic. Impact of the tsunami was measured by number of house hold members killed or injured, whether the respondent was injured, and total number of household members, kinsmen, and friends killed or injured by the tsunami. Another independent variable, media

exposure is evaluated by summing the number of times per week the respondent reports being exposed to TV news, radio news, and newspapers. Pearson product moment correlations between the independent variables and total activities mentioned, total number of these activities the respondent participated in, and number of proposed activities the respondent reported willingness to participate in are found in table 73.

Table 73. Correlations of independent variables with total activities mentioned, participation and proposed participation.

Variable	Total act.	Total partic.	Proposed partic.
Household size	-0.16**	-0.13**	-0.08
Construct-1 MSL	-0.14**	-0.10*	-0.21***
Construct-2 MSL	-0.00	0.06	0.08
Appliances MSL	0.01	-0.02	-0.17***
Utilities MSL	0.11*	0.07	-0.06
Advanced MSL	-0.15**	-0.04	-0.22***
Fatalism	-0.11*	-0.06	-0.10*
Self injured	-0.06	-0.06	0.13**
House killed	0.14**	-0.01	0.12*
House injured	0.03	0.02	0.15**
Total killed	0.12*	0.20**	0.09
Total injured	-0.01	0.05	0.10*
Gender female	0.03	0.13**	0.10*
Age	-0.13**	-0.11*	-0.17***
Muslim	0.02	0.05	-0.08
Years Education	0.05	0.03	-0.08
Media Exposure	0.12*	0.07	0.10*

***=p<0.001, **=p<0.01, *=p<0.05

Results in table 73 indicate that greater awareness of recovery activities characterizes individuals from smaller households, with low scores on MSL Construct-1 (a low score indicating characteristics associated with a tsunami house) and the Advanced MSL, a high score on the Utilities MSL, relatively young and non-fatalistic with greater exposure to the mass media and having more household members, kin and friends killed by the tsunami. Reported participation in existing recovery activities is related to a similar set of variables: smaller household, total close associates killed (total household members, kin, and friends) and younger age. Females also tend to report more participation. Finally, individuals who report they would participate in proposed recovery activities tend to have low scores on the Construct-1, Appliances, and Advanced MSL scores, tend to be less fatalistic, female, younger, more exposed to mass media and injured by the tsunami, as well as tend to have more household members injured and killed by the tsunami.

The next question concerns the relative importance of the predictor variables in terms of their individual and combined ability to account for variance in project awareness and participation. This can be accomplished with regression analyses, and most efficiently with stepwise regression analysis. In the application used here, all independent variables are intercorrelated with the dependent variables. The one with the highest correlation (the one that explains the most variance in the dependent variable) is entered first into the multiple regression equation. Then the effects of the entered variable are controlled, and the variable with the highest partial correlation with the selected dependent variable is entered into the equation. The R^2 (squared multiple correlation coefficient, which is equal to the amount of variance explained in the resource beliefs component score) for the two independent variables and the dependent is then calculated. The next step enters the independent variable that has the highest partial correlation with the dependent variable controlling for variables already entered. This stepwise procedure is continued until some pre-set criterion is reached. In this case the criterion was that the variable to be entered has a $p < 0.05$. Another criterion was that upon the entry of each new variable into the equation, variables already entered whose beta coefficient dropped below the criterion of $p<0.05$ were dropped from the equation. Partial correlations were carefully examined at each step to insure that multi-collinearity did not have an effect on the analysis. The results of these analyses for the three project awareness and participation variables can be found in tables 74 through 76.

Table 74. Stepwise regression analyses of multiple predictors of project awareness.

DEPENDENT VARIABLE: TOTAL ACTIVITIES MENTIONED

Independent variable	Standardized Beta Coeff.	Prob.
Household size	-0.146	0.002
Advanced MSL	-0.139	0.003
Household killed	0.099	0.038
Media exposure	0.157	0.001
Construct-1 MSL	-0.110	0.026

$R=0.30$ $R^2=0.09$ Adj. $R^2=0.08$ $F=8.90$ $p<0.001$

Results in tables 74 through 76 generally follow the same relationships indicated by table 73. One interesting difference is that education and media exposure are found to be significantly related to willingness to participate in proposed activities when the effects of age are controlled (table 75). Age is negatively related to this variable as well as being statistically significantly negatively related to both years

of education and media exposure. Hence, once the effects of age are removed from willingness to participate, we find that the independent effects of education and media exposure become statistically significant.

Table 75. Stepwise regression analyses of multiple predictors of project participation in proposed activities.

DEPENDENT VARIABLE: PARTICIPATION IN PROPOSED ACTIVITIES

Independent variable	Standardized Beta Coeff.	Prob.
Appliances	-0.228	<0.001
Advanced MSL	-0.228	<0.001
Fatalism	-0.104	0.019
Household injured	0.108	0.014
Gender female	0.091	0.039
Age	-0.180	<0.001
Years education	-0.159	0.003
Media exposure	0.187	<0.001
Construct-2 MSL	0.153	0.001

$R=0.44$ $R^2=0.20$ Adj. $R^2=0.18$ $F=11.71$ $p<0.001$

Table 76. Stepwise regression analyses of multiple predictors of project participation.

DEPENDENT VARIABLE: PARTICIPATION IN ACTIVITIES

Independent variable	Standardized Beta Coeff.	Prob.
Household size	-0.164	<0.001
Gender female	0.137	0.003
Media exposure	0.100	0.034
Construct-1 MSL	-0.117	0.014

$R=0.25$ $R^2=0.06$ Adj. $R^2=0.06$ $F=7.59$ $p<0.001$

12.5 Conclusions

The greater degree of project awareness and participation in Village 1 is probably due to the efforts of the NGOs active in the community (Wild Animal Rescue (WAR) and North Andaman Tsunami Relief (NATR) see NATR 2005). The analyses also indicate that those most impacted by the tsunami (as evidenced by low MSL scores, and household members killed or injured), with smaller households, younger, female, educated and exposed to mass media are most aware and most likely to participate in project activities. Since all these variables evidence statistically significant independent effects on project participation, they all should be taken into account when targeting individuals for training and participation (e.g., level of tsunami impact, higher level of education or female, although the combination of the variables would predict greater chances of success). Efforts should also be made to reach those less likely to participate (older, fatalistic, lower levels of education, and larger households) to convince them of the value of the recovery projects. Valuation of ongoing and proposed projects (tables 70, 71, and 72) as well as information provided in previous preliminary baseline reports should also be used to inform project planning.

APPENDIX 12A

Frequency distribution of known recovery activities.

	Village					
Activity	**1**	**2**	**3**	**4**	**7**	**Total**
No activity mentioned	0	45	64	41	38	188
employment occupation	1	0	0	0	0	1
house replacement	1	1	0	0	0	2
soap making	69	0	0	1	0	70
Thai sweets	69	1	0	0	0	70
livestock	1	0	0	0	0	1
furniture making	23	0	0	0	0	23
plantation	4	0	0	0	0	4
making nets	7	8	1	3	0	19
fishing nets	1	0	0	0	0	1
shellfish farming	10	2	0	1	2	15
bed and closets	1	0	0	0	0	1
loan money	1	0	0	0	0	1
forest plantation	1	0	0	0	0	1
mud crab traps	6	0	0	0	0	6
making nets for mud crabs	1	0	0	0	0	1
making artificial flowers	0	2	0	0	0	2
reforestation/planting trees	0	10	12	8	1	31
receiving shrimp nets	0	5	0	0	0	5
sewing	0	5	17	0	6	28
squid traps	0	2	0	0	10	12
steaming mackerel (*pla too*)	0	6	1	0	0	7
cooking	0	2	0	0	0	2
making traps	0	1	0	3	0	4
making fish culture cages	0	0	0	3	0	3
making drums	0	0	0	1	0	1
making batik clothing	0	0	0	4	0	4
making sai	0	0	0	18	0	18
forest plantation	0	1	0	0	0	1
training	0	2	0	0	0	2
something to do with a house	0	2	0	0	0	2
career promotion	0	0	0	1	0	1
child development center	0	0	0	3	0	3
constructing bridge	0	0	0	4	1	5
road expansion- making road	0	0	0	3	11	14
receiving nets	0	0	0	1	0	1
making fabric	0	0	0	2	0	2
multi-purpose tower	0	0	0	3	0	3
development center	0	0	0	2	0	2
fish and shellfish culture	0	0	0	1	0	1
making boats	0	0	0	2	0	2
making snacks/sweets	0	0	25	5	1	31
pine tree seedling production	0	0	1	0	0	1
new market location	0	0	1	1	0	2
receiving fishing gear	0	0	1	0	0	1
cash for work	0	0	1	0	0	1
catfish culture	0	0	1	0	8	9
orphan aid	0	0	1	0	0	1
new house	0	0	1	0	1	2
mangrove reforestation	0	0	1	0	0	1
canal dredging	0	0	0	1	10	11
receiving boat and engine	0	0	0	0	1	1
public water--water supply	0	0	0	0	3	3
making equipment	0	0	0	0	2	2
frog culture	0	0	0	0	3	3
supplementary income	0	0	0	0	3	3
plumbing	0	0	0	0	1	1
plumbing	0	0	0	0	1	1
crab traps	0	0	0	0	3	3
300 traps to be donated	0	0	0	0	2	2
nursing student	0	0	0	0	1	1
traps	0	0	0	0	1	1
mental health care	0	0	0	0	3	3
making chili paste	0	0	0	0	4	4
making bags	0	0	0	0	1	1
fish production (culture)	0	0	0	0	1	1
dam	0	0	0	0	4	4
boat yard	0	0	0	0	1	1
health care	0	0	0	0	1	1
making shrimp paste	0	3	0	0	0	3
making squid traps	0	1	0	0	0	1
extend home	0	1	0	0	0	1
collect garbage	0	0	0	1	0	1
receiving boats	0	0	0	2	0	2
making crab traps	0	0	0	1	0	1
school recovery	0	0	1	0	0	1
mangrove seedling gathering	0	0	0	0	1	1
new pier	0	0	0	0	2	2
electricity	0	0	0	0	1	1
park construction	0	0	0	0	1	1
fish traps	0	1	0	0	0	1
multi-functional room	0	0	0	1	0	1
beach rehabilitation	0	0	1	0	0	1
fish sauce	0	0	0	0	1	1
breakwater	0	0	0	0	1	1
house repair	0	0	0	0	1	1
children’s playground	0	0	0	0	1	1
sew machine/snack equipment	0	0	0	0	1	1
port/pier	0	0	0	1	0	1
fish processing	0	0	0	0	1	1
aquaculture	0	1	0	0	0	1
Total	195	101	130	118	138	

13. Summary and Recommendations

The tsunami had extensive impacts in the five project villages. Overall, 16 percent of respondents to the survey report injury by the tsunami. Twenty percent of the respondents report some household members injured and 13 percent report household members killed. Fully 37 percent report relatives injured and over one-half (54 percent) report relatives killed. Finally over half of the respondents to the survey report friends injured and killed (53 and 59 percent respectively). Except for number of household members injured, there is a great deal of variation between the five villages. Village 1 has the highest mean number of household members and non-household relatives killed. Respondents from Village 3 report the highest mean number of non-household kin injured and friends killed and injured. These latter findings can possible be explained by the fact that Village 3 is the local trading center where village members have many contacts in the other villages. Also, Village 7 was a part of Village 3 until recently. Overall, Village 1 reports the largest number of household members, non-household kin and friends killed (the summary measure), and Village 3 reports the highest number injured.

The tsunami also wrought damage and destruction to the villagers' material possessions. Damage to houses varied greatly between villages, ranging from under 10 percent (Villages 4 and 3) to over fifty percent (Village 7). This disparity is best explained by the proximity of each of the villages to the ocean. The location of the houses in Village 7 were along a canal that led to open ocean, Village 3 is inland compared to the rest and Village 4 is protected by a wide swath of mangroves. Finally significant amounts of fishing equipment such as boats, engines and gear were lost in all the villages. Damage to other productive activities was not as great.

Household impacts represent investment and savings over a relatively long time period because most people in this area move into a house after they marry and remain there for the rest of their lives while continually adding to their initial investment. Many of the families gradually built or improved their houses overtime as they accrued savings. Those households that lost houses also lost most of the contents within and, therefore, must start over again, saving for improving their houses and acquiring items.

Occupational impacts are also significant. For example, if a household loses its boat and fishing gear, it must first save enough money to invest in these things again in order to resume fishing. Many occupations practiced in this area provide food in addition to income; people practicing these occupations are hurt both in terms of monetary income and food. Other occupations were impacted because productive materials were literally washed away by the water that inundated the villages.

How have these impacts influenced villagers' perceptions of well-being? The survey clearly indicates that there are also differences between the villages with respect to perceptions of changes in household well-being following the tsunami. Almost all respondents from Village 7 feel they are worse off in contrast to a little over half in Village 1. With regard to perceptions of future changes in household standard of living, Village 1 contrasts with the other communities. No respondents from Village 1 felt they would be worse-off in the future in contrast to between 10 and 23 percent in the other villages. Most in Village 1 refused to hazard a guess—responding that they did not know; hence, fewer reported that they would be better off in the future. With respect to perceptions of community well-being, respondents from Villages 1 and 2 provide more positive responses than Villages 4 and 7. Analyses of perceived community level changes since the tsunami indicates an overall perception of negative changes in the five villages with regard to community well-being, with statistically significant inter-community differences. Village 7 manifests the greatest negative change and Village 1 the smallest in overall well-being . With regard to degree of change in the future, Village 7 anticipates the greatest positive change in well-being over the next three years and Village 4, the least.

Overall, the findings display a remarkable resilience in response to this great natural disaster. Highly impacted villages like Village 7 project the most positive future changes. This observation is supported by the fact that on the individual level, those who perceive the most negative post-tsunami changes tend to predict the most positive future changes. Some of the unexpected findings seem to support this interpretation as well. For example, greater expectations of future changes in community well-being are statistically significantly related to living in a tsunami house (an indicator that the previous house was

destroyed), having a low appliances MSL score (appliances were destroyed or damaged), considering fishing as unsafe and living in a households where another household member was injured by the tsunami. All this bodes well for recovery—those with positive expectations will probably work harder to obtain them. These villagers are not quitters in the face of disaster.

Since the livelihoods of most of the households in the five villages depend on resource extraction (fishing) sustainability of these resources should be an important consideration in recovery. Hence, it is important to understand villagers' perceptions of the environment and environmental management. The analysis of predictors of variability in perceptions of the environment suggest that older individuals, those with less education, those who were injured by the tsunami and those with a lower level of exposure to the mass media will probably require special attention in training programs directed at environmental management since they are more likely to be fatalistic—to feel that planning has no impact on what happens in the future. There is also inter-village variability. A low of 35 percent of the respondents from Village 1 agree with the statement that there is no point in planning for the future, what happens, happens and we cannot do anything about it, in contrast to almost 60 percent of those from Village 2 (table 54). This difference can probably be attributed to the fact that Village 1 is the focus of the most development work and there is internal political conflict within Village 2. Both of these factors can influence perceptions of the impact of planning, indicating that inter-village differences must be accounted for in the development of post-tsunami recovery efforts.

It is also revealing that villagers' involvement in post tsunami recovery projects appears to have had a negative effect on perceptions of future changes in empowerment with regard to the environment. This is unexpected, and should be further investigated. Has participation engendered feelings of inefficacy due to the nature of the problems encountered, or has top-down planning resulted in feelings that they have nothing valuable to contribute to the recovery efforts? If the latter, co-management efforts will have to be structured to change these perceptions which could be dysfunctional in a situation where local participation is necessary and feelings of empowerment an essential ingredient.

A more positive finding, however, is that a large number of respondents from the project villages disagree with the statement that human activities do not influence the number of fish in the ocean. This contrasts with similar data collected in Indonesia in 2002 and Vietnam in 2004 where much smaller proportions of the samples disagreed with this statement. Responses of the Thai villagers indicate a much greater level of environmental awareness, which bodes well for involving villagers in co-management efforts.

Nevertheless, one must note that a little over one-third of the respondents do not believe that human activities have an impact on fish populations. This one-third probably represents villagers who would be less likely to participate in cooperative management and would likely resist attempts to manage the fishery. Clearly there is still a need to develop some sort of educational programs for this segment of the population. Inter-village differences in these perceptions should inform these programs—almost one-half the villagers from Village 2 believe human activities have no impact in contrast to less than one-sixth from Village 4. Hence, education efforts would have the greatest impact if they target villages where environmental perceptions are most fatalistic and resource management would be most difficult to introduce given the perceptions revealed by the survey. Significantly, a lower percentage of respondents from Village 4 rank the status of the marine resource above the modal value for the entire sample than those from any other village. In contrast, respondents from Village 2 manifest the highest percentage of responses above the sample mode (table 58). Here it is important to note that perceptions of problems with the resource have been found to be positively related to success of various participatory management efforts (Pollnac, et al 2001; Pinkerton 1989a, 1989b). Such differences suggest that co-management efforts in Village 4 would probably advance more rapidly, providing a "learning" or "example" site for later efforts in other villages. One issue of concern for instituting a co-management arrangement is that all villages in the study use the same offshore fishery. Therefore, if a pilot project is implemented in one village, it may not be amenable to including other villages later into the scheme. One possible solution for this is to use the mangrove area in Village 4 as a pilot co-management project. However, traditional use rights in the fishery were not addressed in the baseline survey and should be investigated to insure proper structuring of inshore fishery management initiatives. Additional education programs in villages like

Village 2 could prepare them for implementation of co-management efforts at a later time period, perhaps building on successes achieved in Village 4.

Our examination of occupations indicates that most of the households in these villages were engaged in multiple occupations, both pre- and post-tsunami. About two-thirds of the households in the five village (range 63 to 82 percent) derive income from at least 2 productive activities and about one-third from at least 3 (range 27 to 46 percent). This is an advantage for managers because if residents are accustomed to participating in different types of livelihood options, they are likely to be comfortable learning various types of skills as needed. Therefore, they may be more likely to participate in newly introduced livelihood projects to supplement their current sources of income. One option for rehabilitation is to encourage expansion of current livelihood options (e.g., raising livestock). This could be a relatively rapid way to increase income for households and will also involve less capital and training because some households already practice this type of livelihood.

It should be kept in mind that the results of the survey indicate that males and females, as well as children, although less frequently, are involved in productive activities. Hence, recovery efforts should include women and children in participatory consultations in order to design projects that will address contributions of the entire household. Women and children should be consulted as to their availability and willingness to participate and learn new skills. It is possible that children's willingness to participate in projects is different than those of adults, especially since a majority of children in this area have some experience with formal education. This may increase willingness to participate because the children are confident that they can learn new skills but it may decrease likeliness if children tend to want to devote more time to schooling. Women also may be more likely to participate in different types of projects, especially with respect to working group structure. During the survey it was observed that women tended to work in groups, for example when gleaning the intertidal areas. Men, however, tended to work (especially in the capture fishery) in pairs or threes. Project design should reflect these trends in current working environments in order to increase their likelihood of success.

Fishing was the most frequent source of livelihood in all of the villages except Village 3, and it also manifested a great deal of multiplicity with regard to specific types of fishing. The survey indicates that overall, households do not rely on only one or two types of fishing, but practice many types for both food and income. For those involved in fishing, between almost half and over two thirds use at least four gear types. At least 40 percent of the households in four out of the five villages use 5 or more gear types.

This type of gear multiplicity increases a household's ability to adapt to changing conditions in a fishery. Therefore, fishing households are more likely to adapt by emphasizing other gear types if one regulation restricts a certain type of gear. Managers, however, should still be conscious that regulating one type of gear is not likely to reduce effort overall but rather, decrease stress on the stocks targeted by that effort. This data also illustrates that many fishing households are deeply involved in fishing, especially as evidenced by the investment required to acquire various gear types.

It was suggested by some that the tsunami would result in fishers fearing the sea and wanting to change their occupation. The results clearly indicate that attitudes towards the occupation are more negative than those reported by Pollnac, et al. (2001) for comparable Southeast Asian fisheries. Whether or not this can be attributed solely to the impacts of the tsunami is not clear at this point. The tsunami indicators, as analyzed in this report, did not have a negative impact on either liking the occupation or advising a young person to enter the occupation. Those who lost family members or friends to the tsunami did tend to report that they would leave the occupation for an alternative providing the same income. Nevertheless, personal injury resulting from the tsunami did not have this effect. Further, those with a fatalistic attitude and those who perceived fishing as not dangerous tended to report that they would not leave the occupation. The survey was conducted during the monsoon season when fishing conditions were at their worst, and this may have influenced some of the negative responses. Nevertheless, we observed that as fishers obtained boats and gear, they quickly returned to the sea, frequently braving the heavy swells and crashing waves as they departed the coastal channels and river mouths to ply their traditional occupation.

Clearly the large number of respondents who state they would change to an alternative occupation bodes well for an alternative income program. Nevertheless, given the relatively large percentage of respondents who report that they like fishing (about four-fifths of the males from households where fishing is first or second in importance for income) suggests that as time goes by and memories of the tsunami fade, fascination with an alternative occupation might wane.

What would fishers in the five villages prefer to do if they could no longer fish? Our survey indicates that most would prefer to become a traders or farmers, with only a small percentage mentioning other occupations. Aquaculture, which is often promoted as an alternative livelihood for fishers, is preferred by only one in 25. Analyses of investment orientations among all villagers produced similar results. There is, however, inter-village variation with respect to these preferences, which should be considered.

The analyses of job satisfaction among fishers and investment orientations in the villages as a whole can be used to provide tsunami recovery workers some indication of activities perceived as worthy of investment by community members. Inter-village and inter-individual differences in investment orientations are information important in the structuring of credit schemes and complementary training programs to foster investment opportunities in targeted communities. But this information must be used with care—responses to questions do not always reveal realistic behavioral responses—some may see themselves as a successful traders, but do they have the necessary skills and is there a market for the proposed trade?

Trading is used as an example because investment in trading is the most frequently mentioned option in the interviews. It appeared as a first or later response in 37 percent of the interviews (table 66). Responses were often general; e.g., “invest in trading,” “open a shop,” “expand shop.” Only a few were specific; e.g., “trade fish,” “buy drugs for pharmacy,” “open grocery,” “trade fruit.” This suggests that most respondents had not even carefully considered the type of trading they would become involved in. Further, one must ask, how many traders are needed? If more than one third of the respondents open some sort of trading enterprise, would there be enough business to support such a large number of traders? The same questions could be asked of some of the other alternatives.

Investment in farming (21 percent of respondents, table 66), probably a realistic venture in these rural communities, also needs more specification. What type of farming, and is there a distribution system and market for proposed crops? Since farming is already widely practiced throughout the region, answers to these questions are probably easy to obtain, and since many families both farm and fish, it appears that minimal training would be necessary. Investment in a bank or revolving fund (21 percent, table d) tells us little about the purpose of this type of investment. Is it to provide capital to replace or repair damaged or destroyed fishing equipment sometime in the future? The marine environment is tough on gear, and many fishers plan for future needs by saving money, but we do not know if this is the reason for saving. It does, however, demonstrate a cautious attitude towards expenditure of funds, an attitude that bodes well for future development and sustainability of development efforts.

If we include investment in a boat with fishing, investment in fishing is mentioned by as many villagers as investment in a child’s education (16 percent, table 66). Investment in education demonstrates a realistic concern for the future, but does investment in fishing? If formal education is not required of a fisherman, why would a household involved in fishing invest in a child’s education? In the sense that the project villages have traditionally been involved in fishing, this investment makes sense and reflects behavior actually observed in these villages. Fishers with the means began repairing and replacing their equipment even before recovery assistance began to contribute to the process. The fishing families wanted to resume their livelihoods in the ways they knew how.

If movement out of the fishery is desirable for conservation purposes, it is suggested that actions be taken soon, and that appropriate alternatives—those that provide some of the same satisfactions as fishing—be provided (Pollnac, et al 2001; Pollnac and Poggie 1988; Sievanen, et al. 2005). Riskiness, independence and being one’s own boss are documented characteristics for alternative occupations that are most likely to satisfy former fishermen (Pollnac, et al 2001; Pollnac and Poggie 1988; Sievanen, et al. 2005). One example of this type of occupation is charter boat trips for tourists. This is especially applicable because it is already practiced in at least one village in the study area suggesting that there is a market for such

activities, but the size of the market needs to be determined. The alternative occupations uncovered in this analysis might be of some assistance in this endeavor, but the relative recency of the tsunami and villagers' awareness of suitable alternatives may limit, somewhat, the usefulness of the information provided here. Additionally, it should be noted that overall, fishers in Villages 1, 3, 4 and 7 appear to be more amenable to an occupation outside of the fishery while Village 2 seems least likely to accept alternatives to fishing; hence, projects geared toward diverting fishermen away from the fishery would be least likely to succeed in Village 2. It is suggested that the investment orientations presented here, in conjunction with human resource, economic and marketing analyses, as well as education programs directed at raising awareness concerning suitable alternatives be the starting point for developing comprehensive alternative occupation and recovery programs for the involved villages.

Aspects of current socioeconomic conditions examined in Section 7 of this report may be related to receptivity of project activities. Rogers (2003) summary evaluations of the diffusion of innovations indicate that variables such as education, mass media exposure and cosmopolitness are positively correlated with acceptance of innovations. Hence, we might expect that communities with high mean scores on these variables might be more receptive to project activities involving change. With regard to the data analyzed in this report, there are statistically significant differences between the communities with regard to these variables, but the differences are small, and it is difficult to predict their practical significance. For example, Village 3 manifests the highest average level of education (6.9 years) and the greatest frequency of newspaper reading (average 1.4 times a week). They contrast with Village 4, which is lowest on these two variables (5.5 years and 0.4 times, respectively). These two variables are also statistically significantly correlated in the total sample ($r=0.36$, $p<0.001$), but will this difference translate to a similar difference in receptivity to project activities? That is the question involving the practical significance of the findings that should be kept in mind whenever statistically significant results are presented in the sections below. Given the relatively large sample used for this baseline, small differences can be statistically significant.

The baseline survey also examined aspects of recovery project awareness and participation. These analyses indicate that those most impacted by the tsunami (as evidenced by low MSL scores, and household members killed or injured), with smaller households, younger, female, educated and exposed to mass media are most aware and most likely to participate in project activities. Since all these variables evidence statistically significant independent effects on project participation, they all should be taken into account when targeting individuals for training and participation (e.g., level of tsunami impact, higher level of education or female, although the combination of the variables would predict greater chances of success). Efforts should also be made to reach those less likely to participate (older, fatalistic, lower levels of education, and larger households) to convince them of the value of the recovery projects. Valuation of ongoing and proposed projects as well as information provided in previous preliminary baseline reports should also be used to inform project planning.

Finally, some of the variables examined in the report give us a basis for evaluating project impacts (e.g., material style of life, community infrastructure) as well as tracking other changes in the community through time (e.g., population, household size, education, perceptions of coastal resources and their management) Information such as this is important in monitoring and evaluation—to tell us if the recovery activities implemented are having the expected impacts.

APPENDIX I

BASELINE EVALUATION SURVEY FORM

Pollnac, Kotowicz & Hep URI-CRC & AIT 2005

A. HOUSEHOLD INFORMATION

1. DATE_____ 2. QUESTIONNAIRE NUMBER_____
3. INTERVIEWER_____4. VILLAGE_____
5. ADDRESS_____
6. HOUSEHOLD SIZE *(number of people in household, including person interviewed)*_____

B. PRODUCTIVE ACTIVITIES

LIST ALL ACTIVITIES PRACTICED BY HOUSEHOLD MEMBERS THAT CONTRIBUTE TO HOUSEHOLD INCOME AND FOOD **AT THE PRESENT TIME** (*After obtaining initial response, probe "Are there any more?", then request the respondent to rank each activity in terms of relative importance to household 1= MOST IMPORTANT. The remarks column is provided for additional information. For example, if a person replies "trading", ask what types of items are traded. Additional information on any type of fishing activity (e.g., gleaning, fry collection, etc.) should be detailed in the space provided in the "fishing" question below.*) *"WHO" refers to who conducts the activity: 1) adult males; 2) adult females; 3) both adult males & females; 4) children (less than 15 years old); 5) adult males and children (less than 15 years old); 6) adult females & children (less than 15 years old); 7) adults & children (less than 15 years old).*

1. **ACTIVITY**	**RANK**	**REMARKS**	**WHO**
A_FISHING_____	_____	_____	____
B_AQUACULTURE_____	_____	_____	____
C_FARMING_____	_____	_____	____
D_LIVESTOCK_____	_____	_____	____
E_TRADING_____	_____	_____	____
F_TOURISM_____	_____	_____	____
G_LABOR_____	_____	_____	____
H_MOTORCYCLE TAXI____	_____	_____	____
I_____	_____	_____	____
J_____	_____	_____	____

2. If farming, what is the area farmed?

3. If aquaculture, what is the size of the pond(s)/cage(s)?

4. EXCEPT FOR FISHING, WERE ANY OF THESE ACTIVITIES DIFFERENT BEFORE THE TSUNAMI? YES____ NO____

5. IF YES, WHICH WERE DIFFERENT AND HOW WERE THEY DIFFERENT

IF FISHING IS PRACTICED

6. GEAR TYPE RANK SPECIES HARVESTED WHO
A_SHRIMP NET _____
B_CRAB NET_____
C_FISH NET_____
D_CRAB TRAPS OCEAN_____
E_CRAB TRAPS MANGROVE _____
F_SQUID TRAPS_____
G_GLEANING_____
H _____
I _____
J_____

7. BOAT TYPE_____ 8. SIZE_____ 9. MOTOR_____
10. REPLACEMENT YES____ NO____

11. WERE ANY OF THESE ACTIVITIES OR GEARS DIFFERENT BEFORE THE TSUNAMI?
YES____ NO____ **IF YES**, WHICH WERE DIFFERENT AND HOW WERE THEY DIFFERENT?

12. In terms of the gear associated with the productive activities, was any of it damaged or destroyed by the tsunami? YES____ NO____ If yes, what and what was the extent of the damage?

(If any female members of the household practice fishing activities, ask the following question.)
13. How frequently do female members of the family participate in any fishing activity?
rarely___ occasionally___ frequently___ almost always___

(If aquaculture is practiced, ask the following question.)
14a. With respect to any of the aquaculture practices, do any of the female members of the family participate in any way? yes__ no__
b. If yes, how frequently? rarely___ occasionally___ frequently___ almost always___

15. In terms of the income and food gathering activities we have been talking about, do you feel that your household is better off, worse off, or the same as it was before the tsunami? (*If better or worse off, ask if they are a little better/worse off, better/worse off, or a lot better/worse off. Put a check beside the response*).

A lot worse off____
Worse off____
A little worse off____
The same____
A little better off____
Better off____
A lot better off____
Why?

C. MATERIAL STYLE OF LIFE (HOUSEHOLD WEALTH INDICATOR)
Circle items that apply.
1. HOUSE CONSTRUCTION:
a) HOUSE WALLS: bamboo/ wood/ concrete block/ other
b) FLOOR: dirt/wood/concrete/tile/other
c) ROOF: nipa/wood/tin/tile/other
d) WINDOWS: open/wood shutters/glass/other
e) Tsunami house
f) Tsunami house with improvements

2. FACILITIES AND APPLIANCES:

a) ELECTRICITY……._____
b) ELECTRIC FAN……._____
c) REFRIGERATOR……..…… ..._____
d) ENCLOSED TOILET……...……..…… ..._____
e) PIPED WATER……..…… …._____
f) MATCHED LIVINGROOM SET…… _____
g) DISPLAY CABINET…… _____
h) RADIO/CASSETT PLAYER…….._____
i) VCD PLAYER ……._____
j) VIDEO GAME…….. _____
k) TELEVISION…… _____
l) >1 BURNER COOKING RANGE…… _____
m) WASHING MACHINE...…… ._____
n) COMPUTER……._____
o) AIR CONDITIONING……._____

3. With regard to your house and/or its contents, was anything damaged or destroyed by the tsunami? If Yes, what?

4. Have you received any housing assistance for repairs YES____ NO____
5. Have you received reconstruction YES____ NO____
6. Have you received replacement of household items YES____ NO____
7. If yes, who provided the assistance?

INDIVIDUAL QUESTIONS

D. EXPOSURE TO MASS MEDIA & COSMOPOLITNESS

1. How many times per week do you listen to, watch or read
   a. radio news_____
   b. television _____
   c. newspapers_____

2. How often do you travel to:
   a. Ka Peur_____
   b. Kuraburi_____
   c. Ranong_____
   d. Phuket_____
   e. Bangkok_____

E. FUTURE OUTLOOK

1. In terms of household well-being are you better off or worse off or the same as you were before the tsunami? If worse off, Why?

2. Do you expect your standard of living to be better in 5 years? (better, worse, don't know)

F. JOB SATISFACTION/ALTERNATIVE LIVELIHOOD

The following questions in this section are to be asked if the household is or was involved in the capture fishery:

1. Would you advise a young person to become a fisher today? Yes___ no___
Why or why not?

2. Do you like fishing?

3. If you had the opportunity to change the primary source of your household's income to one that provided the same amount of income as fishing, would you change? _____ Why or why not?

4. If your household's income had to be derived from a source other than fishing, what type of work would you prefer to do?

5. There is no need to worry when a fisher goes out fishing, the job is very safe. Do you agree or disagree?
If agree/disagree ask if he/she strongly agrees(disagrees), agrees (disagrees), or just slightly agrees(disagrees).
Strong disagree(1)__ disagree(2)__ slight disagree(3)__ neither(4)__ slight agree(5)__ agree(6)__ strong agree(7)__

G. ATTITUDES/PERCEPTIONS (ENVIRONMENTAL)

For each of the following questions ask the respondent if he/she agrees or disagrees. For either response ask if he/she strongly agrees(disagrees), agrees (disagrees), or just slightly agrees(disagrees).

1. Human activities do not influence the number of fish in the ocean.
Strong disagree(7)__ disagree(6)__ slight disagree(5)__ neither(4)__ slight agree(3)__ agree(2)__ strong agree(1)__

2. There is no point in planning for the future, what happens, happens and we cannot do anything about it.

Strong disagree(1)__ disagree(2)__ slight disagree(3)__ neither(4)__ slight agree(5)__ agree(6)__ strong agree(7)__

H. FUTURE ORIENTATION

1. If you were to suddenly inherit or win 9,000B in a lottery, what would you do with this money?

2. Now I will ask the same question involving more money. If you were to suddenly inherit or win in a lottery 110,000B, what would you do with this money?

I. LADDER QUESTIONS

The following questions involve showing the respondent a ladder-like diagram with 10 steps. The respondent is told that the first step represents the worst possible situation and the highest step is best situation. The subject would then be asked where on this ladder (ruler, scale, whatever is appropriate for the subjects involved) the local area is today (the self-anchoring aspect of the scale). The subject would then be asked to indicate where it was pre-tsunami (1 year ago) and where he/she believes it will be 3 years in the future. The step numbers are entered on the form for each time period.

1. Overall well-being of community members.

The first step indicates very poor families, without enough food to eat, very little or no furniture in the house, and a very poor house that is too small and doesn't protect one from the weather. The highest step indicates wealthy families with more than enough food, and beautifully furnished well built houses.
TODAY___ 1 YEAR AGO___ 3 YEARS IN THE FUTURE___

2. Empowerment : Control over resources.

The first step indicates a community where the people have no control over access to the community's coastal resources--anyone from anywhere is free to come and fish, gather shellfish, cultivate seaweed, etc. The highest step indicates a community where the people in the community have the right to control (e.g., develop rules) the use of the coastal resources of their community.
TODAY___ 1 YEAR AGO___ 3 YEARS IN THE FUTURE___

3. Benefit: Resource health

First step represents a situation where the beach is filthy and polluted, the mangroves are dead or dying, and the waters are so bad that nothing can live in them. The highest step indicates a beautiful beach, pure waters and healthy mangroves filled with wildlife.
TODAY___ 1 YEAR AGO___ 3 YEARS IN THE FUTURE___

4. Management: Compliance

The first step represents a situation where the coastal area and the sea is basically lawless, no one obeys the fishery regulations, everyone does what they want. The highest step represents a situation where everyone obeys the law and takes care of the environment.
TODAY___ 1 YEAR AGO___ 3 YEARS IN THE FUTURE___

J. PROJECT QUESTIONS

1. Recovery Activity Knowledge

What are the activities in your village that are directed at recovery from the effects of the tsunami? (*For each activity*) Who is directing this activity? (*For each activity*) Have you participated in or benefited from this activity? How? *(Each of the above activities are to be evaluated using the following question: What kind of an impact has this activity had on the community? 0=made things a lot worse, 1=made things worse, 2=made things a little worse, 3=no impact, 4=made things a little better, 5=made things better, 6=made things a lot better.)*

ACTIVITY & WHO PART. BENEFIT HOW PARTICIPATE/ BENEFIT VALUE

a._____ _____ _____ _____ _____

b._____ _____ _____ _____ _____

c._____ _____ _____ _____ _____

d._____ _____ _____ _____ _____

e._____ _____ _____ _____ _____

2. The following types of activities have been proposed for your community. Each activity will be described with a standard description. (*For each proposed activity)* Would you participate in such an activity? Do you think you would benefit/not benefit from such an activity? How would you benefit/not benefit from such an activity? *(Each of the above activities are to be evaluated using the following question: What kind of an impact do you think this activity would have on the community? 0=make things a lot worse, 1=make things worse, 2=make things a little worse, 3=no impact, 4=make things a little better, 5=make things better, 6=make things a lot better.)*

ACTIVITY PART. BENEFIT HOW BENEFIT VALUE

a._____ _____ _____ _____ _____

b._____ _____ _____ _____ _____

c._____ _____ _____ _____ _____

d._____ _____ _____ _____ _____

K. MIGRATION

1. Were you born in the village? YES__ NO__ If no, how long have you lived in this village? __ years

2. If you were not born in this village, where did you move from?

3. If you moved to this village in the last three years, why?

4. Did any member of your household or a relative permanently leave this village since the tsunami? NO__ YES___ Why?

L. IMPACT OF TSUNAMI

1. As a result of the tsunami, were you injured? Yes____ No___

For the following 3 questions enter the number following yes. If no, just enter an "x" in the space.
2a. Were any members of your household killed? yes___ no___
b. or injured? Yes___ no___

3a. Were any of your kin outside your household killed? yes___ no___
b. or injured? Yes___ no___

4a. Were any close friends killed? yes___ no___
b. or injured? Yes___ no___

5. Where were you when the tsunami struck?

6. What did you see?

7. Is there anything else that you'd like to tell us about the tsunami?

M. GENERAL INFORMATION
1. Name_____
2. Sex_____
3. Age_____

4. Ethnic group membership (if any)_____

5. Religion_____

6. Years of formal education_____

References Cited

Berkes, Fikret., R. Mahon, P. McConney, R. Pollnac and R. Pomeroy 2001 *Managing Small-Scale Fisheries: Alternative Directions and Methods*. Ottawa: International Development Research Centre.

Binkley, Marian 1995. *Risks, Dangers and Rewards in the Nova Scotia Offshore Fishery*. Montreal: McGill-Queen's University Press.

Cantril, H. 1963 A study of aspirations. *Scientific American* 208:41-45.

Cattell, R.B. 1966 The scree test for the number of factors. *Multivariate Behavioral Research* 1:245-276.

Crawford, Brian, Chris Dunbar and Theerachai Haitook 2006 The Andaman sea jelly fishery: resiliency and adaptability of longtail fishers following the Indian Ocean Tsunami. *Fishbytes Newsletter*, 12(1):1-2.

Gatewood, John B. and Bonnie McCay 1990. Comparison of job satisfaction in six New Jersey Fisheries. *Human Organization* 49(1): 14-25.

North Andaman Tsunami Relief (NATR) 2005 Ban Talae Nok: History of the village and ongoing progress. Unpublished paper prepared by North Andaman Tsunami Relief, Kuraburi, Thailand.

Pinkerton, E. (editor) 1989a *Cooperative Management of Local Fisheries: New Directions for Improved Management and Community Development*. Vancouver: University of British Columbia Press.

Pinkerton, E. 1989b Introduction: Attaining better fisheries management through co-management—prospects, problems, and propositions. *In*: Pinkerton, E. editor. *Cooperative management of local fisheries: New directions for improved management and community development*. Vancouver: University of British Columbia Press.

Poggie, John J. 1978 Deferred gratification as an adaptive characteristic for small-scale fishermen. *Ethos* 6:114-123.

Pollnac, R.B. 2005 Preliminary baseline report: Investment orientations in five coastal villages, Ranong, Thailand. Unpublished manuscript.

Pollnac, Richard B. 1989 Income variability, uncertainty, and investment orientations among small-scale fishermen in the Gulf of Nicoya, Costa Rica. in (R. Pollnac & M. Morrissey, eds.) *Aspects of Small Scale Fisheries Development*. Kingston, R.I.: International Center for Marine Resource Development.

Pollnac, R.B. and B.R. Crawford 2000 *Assessing Behavioral Aspects of Coastal Resource Use*. Narragansett, RI: Coastal Resources Center.

Pollnac, Richard B. and Dawn 2005.. *Initial Rapid Assessment of Tsunami Affected Villages Tambon Kamphuan, Suk Samron District, Ranong Province Thailand.* Project Report for the Tsunami Sustainable Coastal Livelihoods Program, Coastal Resources Center, University of Rhode Island, Asian Institute of Technology and University of Hawaii, Hilo.

Pollnac, Richard B. and John J. Poggie, Jr. 1988. The structure of job satisfaction among New England fishermen and its application to fisheries management policy. *American Anthropologist* 90(4): 888-901.

Pollnac, Richard B. and John J. Poggie, Jr. 1988. The structure of job satisfaction among New England fishermen and its application to fisheries management policy. *American Anthropologist* 90(4): 888-901.

Pollnac, Richard B. and John J. Poggie 1978 Economic gratification orientations among small-scale fishermen in Panama and Puerto Rico. *Human Organization* 37:355-367.

Pollnac, R. B., B.R. Crawford, & M.L.G. Gorospe 2001 Discovering Factors Influencing the Success of Community-Based Marine Protected Areas in the Visayas, Philippines. *Ocean and Coastal Management* 44: 683-710.

Pollnac, Richard B., Carl Gersuny and John J. Poggie 1975 Economic gratification patterns of small-scale fishermen and millworkers in New England. *Human Organization* 34:1-7.

Pollnac, Richard B. John J. Poggie, Jr. and Steven Cabral 1998. Thresholds of danger: Perceived risk in a New England Fishery. *Human Organization* 57:53-59.

Pollnac, R.B., R.S. Pomeroy and I.H.T. Harkes 2001 Fishery policy and job satisfaction in three Southeast Asian fisheries. *Ocean and Coastal Management* 44:531-544.

Rogers, E.M. 2003. *Diffusion of Innovations*. New York, NY, Free Press, A Division of Simon & Schuster, Inc.

Sievanen, Leila, Brian Crawford, Richard Pollnac, and Celia Lowe 2005. Weeding through assumptions of livelihood approaches in ICM: Seaweed farming in the Philippines and Indonesia. *Ocean & Coastal Management* 48 (3-6):297-313.

Soparth Pongquan, B. Crawford, Suman Saengkaew, and Vinij Tansakul 2005 Participatory Rapid Appraisal of Tsunami Affected Villages Tambon Kamphuan, Suk Samran District, Ranong Province, Thailand. Draft Report.