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Field Report

Methodology for Small-scale Fishing Household Surveys Collecting Quantitative Data

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ABSTRACT. Quantitative surveys are necessary to understand the actual conditions of fishing households and fishing villages when formulating policy for small-scale fisheries. However, many national and/or local governments in the world face problems such as a limited number of government administrators and researchers, and budget constraints. Besides, although there are a few manuals for implementing social surveys in agricultural and/or fishing villages, almost all manuals focus on methods for conducting qualitative surveys. Therefore, this paper addresses the gap by providing methods for conducting quantitative surveys, as well as ways to reduce the number of data samples. This paper includes a practical methodology: data extraction theory, methods for conducting the principal survey and random sampling methods for (fishing) village-level surveys, ideas on how to create questionnaires and how to conduct actual surveys, and ways to conduct a follow-up survey meeting to report results. In addition, a questionnaire used in a survey of fishing households in Thailand is attached.
Key words: Survey manual, Southeast Asia, Fishing village, Fishing methods, Fishing operation

Introduction

There are many household surveys of fishing villages in the world, although almost all previous surveys have concentrated on qualitative data collection[1–3]. Therefore, even in countries that have some amount of statistical data on fishing households and the fishing industry, additional quantitative surveys are necessary to understand the actual conditions under which policies are formulated. However, there are many difficulties in collecting sufficient quantitative data owing to several constraints, including the number of government administrators, the researchers in charge, and adequacy of the research budget.

In this paper, we describe survey methodologies to reduce the number of data samples that are needed to target households with statistical reliability, based on the manuals we have created for surveying fishing households in Japan and Southeast Asia[4].

We would like to provide an easily implementable practical methodology comprised of seven parts as follows: 1) "Data extraction theory" for reducing the number of samples, 2) "Principal survey and random sampling methods for fishing village surveys" for collecting fundamental information and data before moving to the next step of objective data collection using a questionnaire, 3) "Creation of questionnaires" for information on how to create a questionnaire, 4) "Actual survey procedures" at a survey site, including how to reduce information bias using face-to-face surveys with questionnaire. We have attached the actual questionnaire that was used for the survey in Thailand as an appendix to this paper. It may be helpful for acquiring a clear picture of our methodology.

Data Extraction Theory

Selection of area

Understanding similarity among local municipalities should come first when choosing an appropriate target sur-

vey area with an adequate number of fishing households.

Generally, fundamental data showing characteristics of each area, such as the number of households using each fishing method, and the annual catch value and quantity of each fishing method, may be obtained from national statistics. Then, the fundamental data are usually sorted by administrative units, such as a local municipality (village). Therefore, the target survey area is decided according to an administrative unit. The information about types of fishing gear and the labor force are sometimes included in the national and/or local statistical data. Those are then useful for the selection of survey areas. In addition, the quantity and/or value of a fish catch by each type of fishing gear per household is also treated as fundamental data for understanding the characteristics of local municipalities (villages). If the fundamental data are similar, those municipalities (villages) are recognized as similar areas to those that can be excluded from target survey areas to reduce the number of targets and to the budget. Similarity among municipalities (villages) may be evaluated by a cluster analysis as shown in Appendix 1. Municipalities (villages) located near the tips of the cluster dendrogram can be assumed to have similar characteristics. Therefore, the selection of far tips as target areas, we can avoid choosing similar municipalities (villages) as survey targets.

In order to conduct the survey effectively despite some constraints, appropriately sampled households should be chosen as survey targets. However, an adequate number of sampled households varies according to the total number of households and the varieties of households in a research area. If many households in the target area show a high similarity, the sampled number of households can be reduced via the following extraction method using a random sampling strategy (Figure 1).

Extraction of target fishing households

1) Calculation of the number of fishing households in cases where variance is not known

After selection of the target survey area, the number of target households in each area that are representative of the area will be calculated before deciding on the target households surveyed using the extraction method as in the following formula F1[5]. The Microsoft Excel expression of the F1 is:

= (P/(((B/1.96)^2)*((P-1)/(0.5*(1-0.5)))+1)).

$$N \geq \frac{P}{\left(\frac{B}{K}\right)^2 \times \frac{P-1}{A \times (1-A)} + 1} \quad \ldots (F1)$$

N: required number of households, P: total number of fishing households in a survey area, B: relative accuracy; usually 0.1 or 0.05, K: Significance level, 1.96 for 5%, A: population rate of 0.5

2) Calculation of number of fishing households when variance is known

If there are fundamental data about fishing households more than 100 households' data, such as fish catch of major species, value of fish catch, etc., following formula (F2) will provide the number of extractions using variance in the

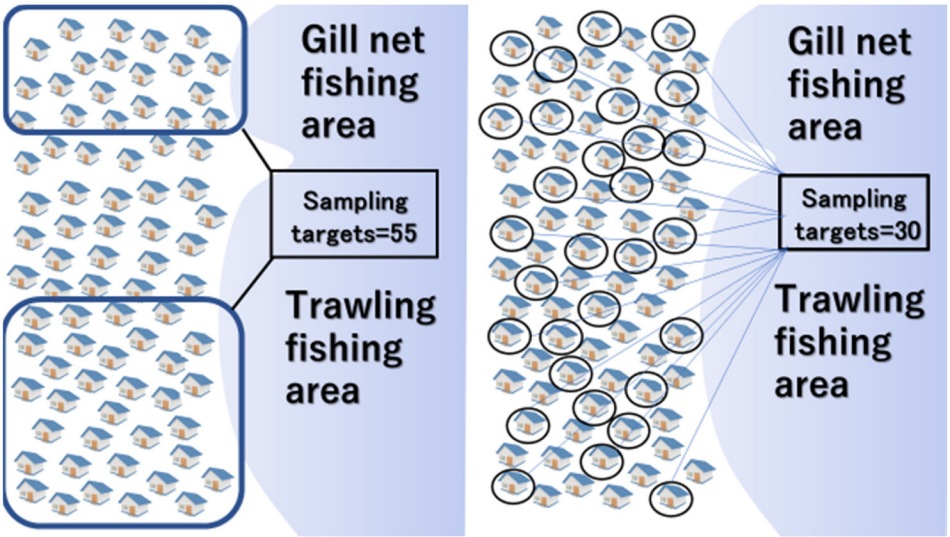


Fig. 1. Conceptual diagram arising from the geographical nonuniformity of households' characteristics.
Note: In the case on the left side, many trawling households and gill net fishing households are selected as survey targets and the center is not selected. On the right side, representative households both of gillnet and trawling fishers based on random sampling methods.

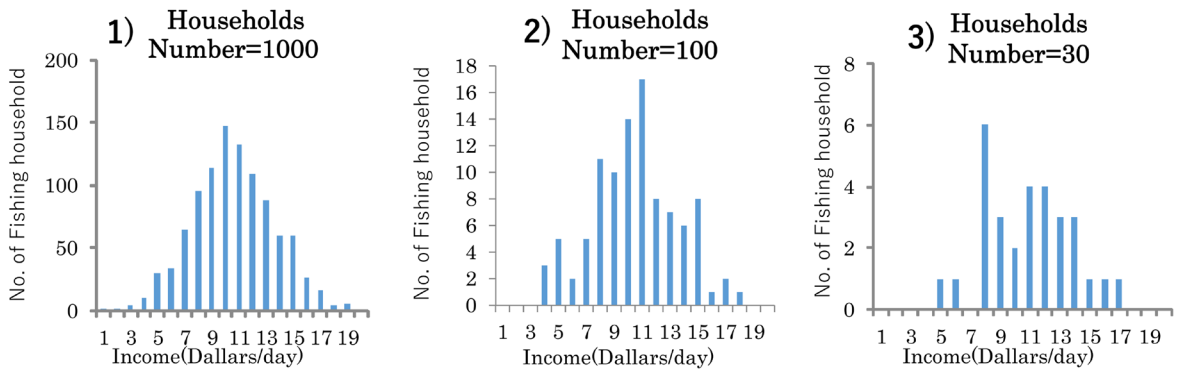


Fig. 2. Data distribution models based on three numbers of target households.

Note: 1) distribution drawn based on 1000 households' data, 2) on 100, and 3) on 30. Household numbers effect on the similarity of data distribution to normal distribution.

data[5], and F2 can then reduce a greater number of extraction than F1. Additionally, the number of extractions of fishing households N can be determined using the Microsoft Excel expression:

= (P/((((B*AVERAGE(x1:x100))/1.96)^2)*((P-1)/(VAR(x1:x100))+1))

$$N \geq \frac{P}{\left(\frac{B \times \bar{X}}{K}\right)^2 \times \frac{P-1}{\hat{\sigma}^2} + 1} \quad \ldots (F2)$$

$\bar{X}$: mean value of important data of fishing households;
$\hat{\sigma}^2$: unbiased variance of X

$\bar{X}$ and $\hat{\sigma}^2$ can be easily derived using Microsoft Excel. If x1:x100 is a column of fishing household data, $\bar{X}$ can be calculated with +AVERAGE(x1:x100), and $\hat{\sigma}^2$ can be calculated with +VAR(x1:x100).

3) Simple method for determining the number of fishing households (not recommended)

If all fishing households work in similar fishing activities (in other words, there are fewer data biases), no less than 30 fishing households from each fishing village can be used as the number of target households in the quantitative survey, because its data distribution should be close to the normal distribution (However, the total number of households should be sufficiently large.) As shown in Figure 2-1, a normal distribution is when the extraction is based on 1,000 fishing households (average = 10, standard deviation = 3). If the number of households was reduced to 100, the shape of the distribution was a crumbling normal distribution as shown in Figure 2-2. If the number of households is limited to a small number as in Figure 2-3 (30 households), the distribution shape is different from the normal distribution. Therefore, the survey planner who is also the leader or person-in-charge e.g., a government official or researcher should completely understand the distribution of data when they decide on the number of target households.

4) Two-step extraction

There is a two-step extraction process when there are no data about local municipalities for performing a hierarchical cluster analysis. Furthermore, if the target area is broad and includes many villages (municipalities), a two-step extraction should be used to decide target local villages (municipalities). Before calculating numbers of target households using formulas (F1) or (F2), make a list of all local villages (municipalities), and extract a particular number of target villages (municipalities) from the list using the random sampling method as follows. The number of households in each village (municipality) is then calculated by formula F1 or F2. A data collector (researcher or officer) subsequently collects the data for the total number of fishing households in the target villages (municipalities).

Principal Survey and Random Sampling Methods for Fishing Village Surveys

Principal survey characteristics

The principal survey is a necessary survey step for anyone writing an academic paper. It completely differs from the definition of the usual preliminary survey and initial survey. Here, principal survey means a survey before the full survey. It does not refer to information that is understood by experience and intuition. Instead, it is the initial survey for gathering a wide range of data, including fundamental information for the creation of questionnaires, data for survey planning, and data that complements the data from the full survey.

A principal survey targets local governments, fishery research institutes, fishers' groups, and fishing households

which may be representative of local villages. The survey should start from at local government, then to the research institutes and fishers' groups. The survey on individual fishing households should be last.

Principal surveys are not limited to being conducted only once. In reality, when you begin a principal survey of fishing households, you will find the need for additional interview items and the need to re-interview fishers. Therefore, obtaining permission for multiple surveys should be requested before the survey is started.

At local government offices, the following nine types of data and information relating to fishing villages should be collected: 1) basic data about fishing villages, 2) type of fishing gear, 3) number of fishing households, 4) total quantity of catch in small-scale fishing, 5) value of the catch, 6) addresses and telephone numbers (for survey appointments, etc.) of fishers and their leaders, 7) location and place-name of catch-landing sites, 8) rules, regulations, and laws concerning fisheries management, and other related activities, and 9) local issues that should be reflected in interviews and questionnaires.

At fishery research institutes, the following seven types of data and information relating to fishing villages should be collected: 1) overview of fishing gear and fishing methods, 2) type of fishing gear used in small-scale fishing, 3) major fishing-operation season or months, 3) quantity of catch by main types of fishing gear, 4) price of major species of fish for small-scale fishers, 5) location and features of fishing grounds, 6) issues concerning fishing grounds, resources, and so on, and 7) information that could not be collected during local government-office surveys.

At fishers' groups and representative fishing households in the community, the following types of information should be asked: 1) agreement and role of the group, 2) summary and special characteristics of the groups, fishing villages, and fishing households, 3) local issues about fishing, fishing grounds, fishing villages, and issues concerning management of fishing households (for creating questionnaires), and 4) confirmation of the data listed at government offices and elsewhere.

Random sampling procedure

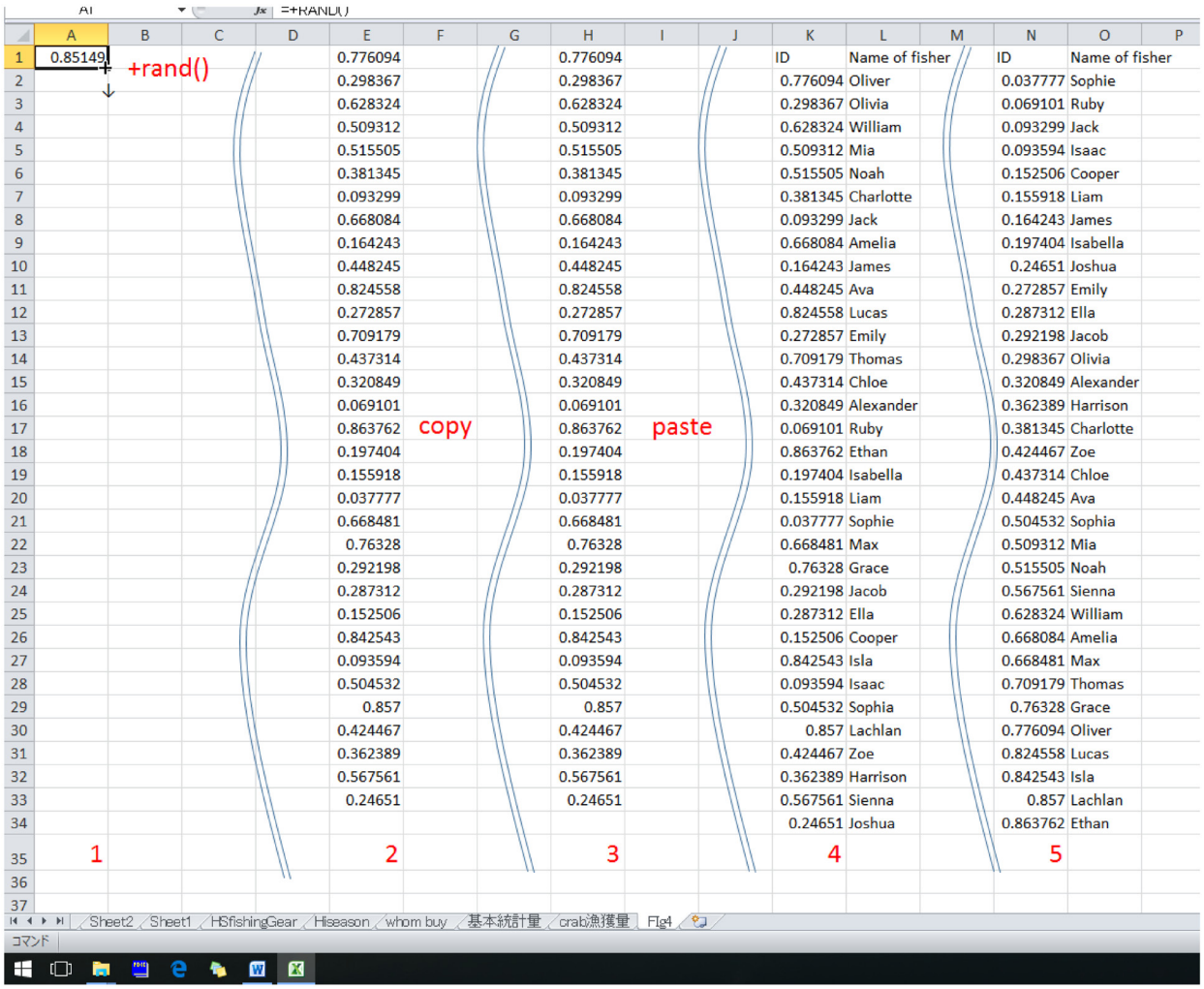
After the principal survey, target households will be selected through random sampling methods based on the number of households in each municipality (village) and a list of residential information. As the first step in random sampling, a list of fishing households (name, village name, and so on) in each fishing village is prepared in Microsoft Excel. Then, 1) create random numbers using Microsoft Excel command "+rand()" up to the number of total households in the target municipality (village) (Figure 3). The random numbers created are used as identification numbers (ID numbers) for each fishing household in the selection of target households. Each fisher's name is associated with a random number on the Excel sheet (Figure 3-4), and then they are sorted based on the random numbers obtained using Excel commands (Figure 3-5). Given the results of target household numbers calculated by F1 or F2, the target households are selected.

Creation of Questionnaires

Household level data and information are usually collected through interview surveys based on the questionnaire.

It is necessary to explain the purpose of the survey and obtain informed consent from a respondent before the survey. To obtain informed consent from fishing households/fishers, the name of the organization conducting the survey, the names and affiliations of data collectors (employers, government officials, researchers, and so on), and the purpose of the survey should be shown to the respondent. The organization and data collector should assure the respondents that collected personal information will never be released or used for purposes other than the survey. Then, the collector should obtain the signed consent form from the respondents before conducting the interviews. It is best that the explanation of the survey's purpose and the consent information are shown at the top of the questionnaire.

If the duration of the interview is long, the respondent is liable to be tired and the reliability of the data will decrease. Thus, in creating the questionnaire, the total interview duration should be no longer than one hour. The number of question items is then restricted by the interview's duration. However, important items and information should be included in the questionnaire. In this respect, the following 12 items are a good guide to questionnaire design: 1) family structure of the fishing household (including the respondent): name, gender, age, education level, relationship to the respondent, primary job; 2) main source of income in the respondent's household: fishing, aquaculture, marine-product processing, agriculture, livestock rearing, retail, labor income, or other (free text entry), as well as amounts of income and costs; 3) assets used in fishing: number and size of boats, engine power, other assets excluding fishing gear; 4) fishing schedule: names/types of fishing gear, months of operation during high and low seasons, target fish species, average quantity of catch, average quantity for self-consumption and sales, average price, average cost, average number of operations per day, number of operational days in a month; 5) employment and labors: number of workers employed during the high and low seasons, numbers of hires in a



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0.85149				0.776094			0.776094			ID	Name of fisher		ID	Name of fisher	
2					0.298367			0.298367			0.776094	Oliver		0.037777	Sophie	
3					0.628324			0.628324			0.298367	Olivia		0.069101	Ruby	
4					0.509312			0.509312			0.628324	William		0.093299	Jack	
5					0.515505			0.515505			0.509312	Mia		0.093594	Isaac	
6					0.381345			0.381345			0.515505	Noah		0.152506	Cooper	
7					0.093299			0.093299			0.381345	Charlotte		0.155918	Liam	
8					0.668084			0.668084			0.093299	Jack		0.164243	James	
9					0.164243			0.164243			0.668084	Amelia		0.197404	Isabella	
10					0.448245			0.448245			0.164243	James		0.24651	Joshua	
11					0.824558			0.824558			0.448245	Ava		0.272857	Emily	
12					0.272857			0.272857			0.824558	Lucas		0.287312	Ella	
13					0.709179			0.709179			0.272857	Emily		0.292198	Jacob	
14					0.437314			0.437314			0.709179	Thomas		0.298367	Olivia	
15					0.320849			0.320849			0.437314	Chloe		0.320849	Alexander	
16					0.069101			0.069101			0.320849	Alexander		0.362389	Harrison	
17					0.863762			0.863762			0.069101	Ruby		0.381345	Charlotte	
18					0.197404			0.197404			0.863762	Ethan		0.424467	Zoe	
19					0.155918			0.155918			0.197404	Isabella		0.437314	Chloe	
20					0.037777			0.037777			0.155918	Liam		0.448245	Ava	
21					0.668481			0.668481			0.037777	Sophie		0.504532	Sophia	
22					0.76328			0.76328			0.668481	Max		0.509312	Mia	
23					0.292198			0.292198			0.76328	Grace		0.515505	Noah	
24					0.287312			0.287312			0.292198	Jacob		0.567561	Sienna	
25					0.152506			0.152506			0.287312	Ella		0.628324	William	
26					0.842543			0.842543			0.152506	Cooper		0.668084	Amelia	
27					0.093594			0.093594			0.842543	Isla		0.668481	Max	
28					0.504532			0.504532			0.093594	Isaac		0.709179	Thomas	
29					0.857			0.857			0.504532	Sophia		0.76328	Grace	
30					0.424467			0.424467			0.857	Lachlan		0.776094	Oliver	
31					0.362389			0.362389			0.424467	Zoe		0.824558	Lucas	
32					0.567561			0.567561			0.362389	Harrison		0.842543	Isla	
33					0.24651			0.24651			0.567561	Sienna		0.857	Lachlan	
34											0.24651	Joshua		0.863762	Ethan	
35	1				2			3			4			5		
36																
37																

Fig. 3. Procedure of random sampling using Microsoft Excel.

Note: 1) Type the command "+rand()" on the cell "A1"; 2) Pull down the cell "A1" until number of fishers' names list; 3) Copy and paste the created random numbers to "Column H" as numbers not commands; 4) Associate fishers' names with random numbers one by one; 5) Sort the fishers' names using Microsoft Excels command "sort" based on random numbers. Target households are then selected from the cell "O2" until the target number by F1 or F2 in "Column O."

month's period, attributes of hired workers as well as number of family workers working without salary; 6) fishing grounds/resources: questions regarding fishing grounds, the environment of fishing grounds, fishing resources; 7) aquaculture: target fish species, methods of aquaculture, number of aquaculture facilities or pond sizes, production cycle, production volume, price, cost, information regarding employment, and so on; 8) other occupations: production output, prices, costs, self-consumption of agriculture and livestock rearing; 9) marine-product distribution and processing, business conditions of purchasers, transport methods, and so on; 10) survey topics; 11) general points of view; and 12) personal information.

Actual Survey Procedures

1) Obtain survey permission and/or endorsements from local governments

To build a good relationship with respondents and ensure the safety of the data collectors at sites, survey permission and the endorsement of local governments should be obtained in advance of the interview survey. In addition, a local government presence on the survey can help smooth the survey's implementation, including the introduction of data collectors to villagers by local government staff.

2) Town meeting with local communities

It is desirable to hold an explanatory meeting with the local people whom the survey concerns with, and inform purpose of the survey, the goals that the researchers expect

to achieve, a summary of the survey, and its expected results; these can be recirculated into the community, with specific requests for cooperation from fishing households. During the meeting, the questionnaire sample and survey period will be discussed with the local people, to ensure a good understanding of the survey. After explaining, ask the respondents if they have any concerns about the survey, or questionnaire items that they would like to revise.

3) Preparative actions for an interview survey by the survey leader and data collectors

Quality, in other words "reliability and/or accuracy" of data usually depends on the skill of the data collectors (who are usually called "interviewers"). To maintain high quality data, data collectors should understand the aim and background of each question. Therefore, the questionnaire creator (survey planner or leader of survey) should provide detailed explanations of the purpose, aim, and background of each question and the framework of the questionnaire to data collectors. After understanding the aims and background of the questionnaire, all data collectors should conduct pilot tests on several fishing households using the questionnaire to expose problems and difficulties. The survey planner/leader should discuss these with data collectors to resolve the problems based on the pilot tests and to modify the questionnaire. Repeating this process is important to improve the survey skills of the data collectors.

In the event that a data collector has some personal problems with a respondent, some risk of bias on answers and survey data exists. Thus, a short conversation between a data collector and a respondent is recommended to construct a good relationship between them. If the data collector is not familiar with the survey site and target households, introduction of the data collector by a village officer and/or key person at the site can help to build good relationships between the data collector and respondents. Data collectors should keep in mind the following two sentences: "The data collector must gain the trust of respondents" and "The data collector must not upset or annoy respondents."

A respondent sometimes may not understand the contents of various questions. If the data collector encounters this issue, he or she must provide supplemental explanations to the respondent. However, the data collector must pay attention to not leading the respondent's answers, and must prevent showing signs that influence these (e.g., saying the data collector's comments and modeling answers).

If the respondent does not answer an essential question in the questionnaire, the data collector should try to ask the question indirectly and/or from another angle. If the data collectors use different expressions for obtaining the proper answers from respondents at the interview, the different expressions should be noted in a margin or on the back of the questionnaire. When a response or comment from a respondent is outside the survey's scope, and if a data collector feels it is important to the survey, they should record it in a margin or on the back of the questionnaire.

4) Implementation planning of survey

It is important to make a detailed survey timetable and timeline for conducting an efficient survey. The period of the survey is usually estimated based on the total number of fishing households being surveyed per day. Moreover, the number of surveyed households per day is decided by the ability and skills of data collectors, and travel times between interview places.

Generally, interviews and data collection are conducted at the fisher's house, at catch-landing sites, or at fishers' meeting places. In the latter case, there may be many fishers surrounding a respondent and those individuals can sometimes answer the question instead of the respondent. Those answers and the resulting data are not reliable and have low accuracy, therefore, such a situation should be avoided. Data collectors and/or a planner/leader should choose appropriate interview places where a respondent can answer independently.

5) Follow-up survey and town meeting to report the results

There is seldom enough time to conduct the questionnaire survey at fishing households and catch-landing sites because fishers wake up early in the morning and want to take a rest as soon as possible after fishing and landing the catch. Thus, some unexpected situations occur during field surveys, and additional data will need to be requested during/after the household survey. Therefore, it is better to conduct a supplemental survey of fishing households once the survey is completed. If there are doubts about answers, interviews with the fishing households should be done again. In one case, we found new types of fishing gear during the survey; however, we could not take photos of the fishing gear owing to lack of time. In this case, we returned to take photos of the new gear and to obtain information about it (e.g., prices, useful lifetime, size, number, and how to use it).

Distribution and trading of fishery products are important for grasping the specific figures of the local fishery. Therefore, we conducted an additional (follow-up) survey of middlemen dealing in fish and/or marine products, who purchase these products from the surveyed fishing households, and clarified the pricing system of the fishery products.

After completing the research, the results should be reported in the survey area. The local governments, who

have supported the survey, usually are waiting for the results. If you cannot hold meetings to report results, you are taking a serious risk of losing relationships with the local government and the people involved.

Conclusions and Considerations

The framework of the questionnaire for the face-to-face survey targeted at fishing households was created by the author; the items of the questionnaires for Thailand and the Philippines had been discussed with members of the social team in the Costal Area Capability Enhancement in the Southeast Asia Project of the Research Institute for Humanity and Nature. The team was composed of representatives from the Japan Fisheries Research and the Education Agency (the social team leader of the project), Southeast Asia Fisheries Development Center, Kasetsart University, Kochi University, University of the Philippines Visayas, the University of Tokyo, Tokai University, and Seijo University. Finally, the detail of items in the questionnaires was discussed and revised in workshops that included data collectors in Thailand or the Philippines.

The questionnaire in Appendix 2 was created for the face-to-face survey targeted at fishing households in Thailand and was based on the methodology discussed above. The completed survey using this questionnaire for Thailand was conducted in Thailand from 2013 to 2015, and we succeeded in collecting a total of 899 filled in questionnaires.

The target provinces already decided in the project were the eastern, central, and southern Gulf of Thailand, thus we did not use cluster analysis and two-step extraction for decisions on the target areas. We collected the information on the number of fishing households in each village from local governments, and employed the extraction formula. The total number of fishing households in the target areas was 4,206 and the extraction number using the formula was 913. This extraction number was estimated by Formula 1 excluding variance, because we had less time to collect fundamental data, such as catch and value of each household in the target areas. Therefore, the total number estimated was not small enough. If we collected fundamental data and used Formula 2, the total number of samples could be smaller than it.

We had conducted a "Principal Survey" and tried to collect statistics and reports regarding a local fishing from local governments; however, there was little information. We had also collected information about a local fishing from a branch of the national Marine Fisheries Research and Development Center, and fishers' groups. We obtained interesting data on small-scale fishing and main fishing species targeted by local fishers at the branch, and information on local rules and roles of the fishers' groups from the group leaders. We then discussed questionnaire items in detail to reflect the actual situation of local fishing using the information from the researchers and the leaders, as the project's purpose was to clarify the actual situation in local fishing villages. The workshops for the discussion were held several times along with pilot tests in the target area. Finally, we completed the questionnaire as Appendix 2 shows, based on the above methodology.

Thailand's project members were researchers at the Southeast Asia Fisheries Development Center and also the data collectors for this survey; the researchers had enough experience to collect information from fishing households using questionnaire thus we did not need to hold basic training for data collectors and we had already conducted specific training through the workshops and pilot tests. Yet, even they misunderstood meanings and backgrounds of some questionnaire items initially; therefore the social team leader (this author) provided in-depth explanations on the misunderstood items at the workshops.

We conducted a follow-up survey, in which we focused especially on the distribution of the catch in the target areas. The distribution of marine products from the eastern target area was closed, despite there being a famous tourist resort, Pataya Beach, near the area. Also, we had collected information regarding fishing gear for supplementing cost items in the questionnaire. We held meetings concerning the midterm report with local officers in each area. The officers gave us additional information on local fishing; in particular, it was important to learn about the history and mechanisms of the crab bank (activity for enhancing crab resources). We found that the production system and management rules of the crab bank differed according to the fishing village, and that the fisher group members' collaboration over the crab bank developed a sense of following the rules of fisheries management.

Finally, these methods on selecting targets and survey procedures were implemented as indicated above, and we obtained 899 filled in questionnaire and good results. Therefore, these methodologies can help many others who might wish to conduct quantitative interview surveys.

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Appendix 1

Hierarchical cluster analysis for selection survey areas can be analyzed using R (free software).

```
#Data set
data1 = read.csv("Z:/19.Rsoftware/Manual of small-scale fishing
   households survey/CATCH.csv", header=T, row.name=1)
# Check data
View(data1)
# Distance matrix
d <- dist(data1, method = "euclidean")
# Clustering
fit <- hclust(d, method="ward.D")
# Drawing Dendrogram
plot(fit)
```

1) Download the software from https://cran.ism.ac.jp/
2) Create a data set consisting of information such as quantity of catch and/or value of catch, number of fishers by major fishing type, and so on.
3) Next, enter the command below `#Data set` into R. The first two lines are used to read data into the R software. The line with # is the explanation of the command (the same hereafter).

```
data1 = read.csv("Z:/19.Rsoftware/Manual of small-scale fishing
 households survey/CATCH.csv", header=T, row.name=1)
```

   Refer to http://www.r-tutor.com/r-introduction/data-frame/data-import.
4) Make sure the description of `header=T`, `row.name=1`. This is the command to specify titles of columns and rows, so that the first column is titled (e.g., quantity of catch, monetary value of catch, number of fishing households, and so on), and the first row is titled, for example, by area name not numerical value. The third line, `View(data1)`, is used to view data read into R.
5) Next, when you enter the commands under `#Distance matrix`, `#Clustering` and `# Drawing Dendrogram`, results are displayed.
6) This dendrogram provides supplemental results when dividing municipalities (villages) into several groups. It takes into consideration the characteristics of each local municipality (village), and helps in better understanding them. The final groups are determined by the survey planner (who is also the leader and person-in-charge–e.g., a government official or researcher).

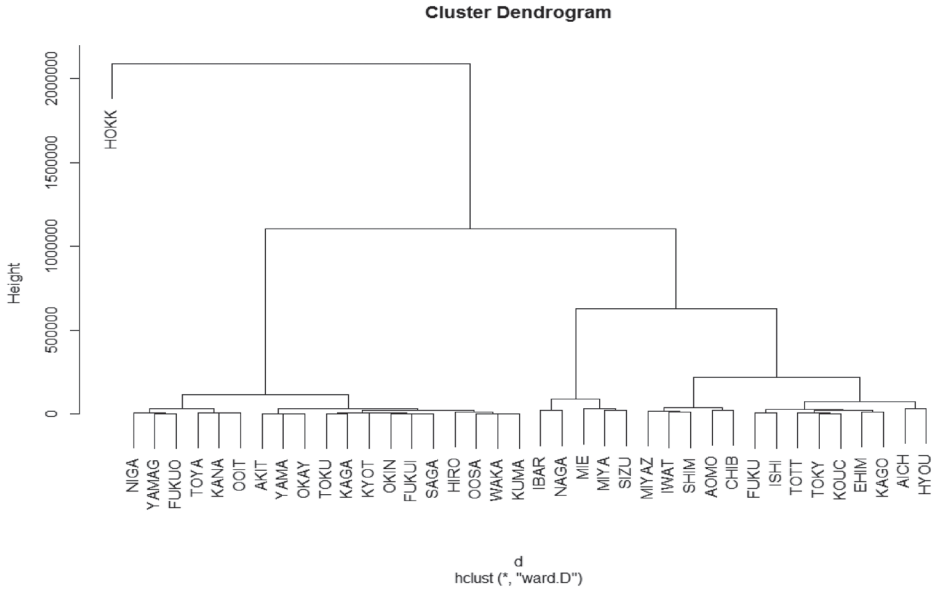

Figure APP1. Dendrogram of municipalities (villages) in a target area.

7) We determine that the dendrogram in Figure APP1 can be divided into six clusters. Enter the following command to divide it into six groups (Figure APP2).

```
# cut tree into 6 clusters
groups <- cutree(fit, k=6)
# draw dendrogram with red borders around the 6 clusters
rect.hclust(fit, k=6, border="red")
```

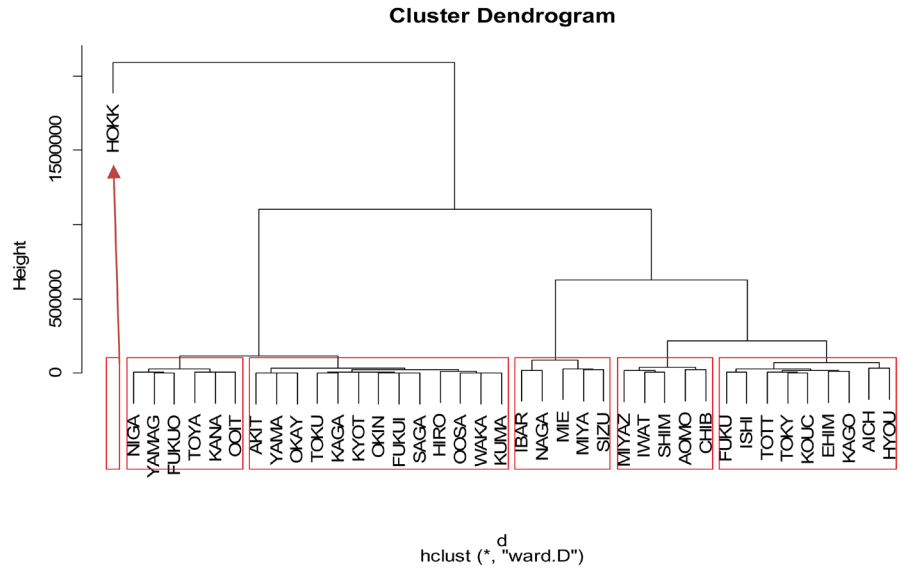

Figure APP2. Six groups of municipalities are decided based on the shape of the dendrogram.

8) From the municipalities split into six groups, the municipalities with the most fishers in each group are chosen as survey target areas.

Appendix 2

Questionnaire for fishing household survey

Fill out 1-2 of the following after finishing this survey.
1. Interview time:_____ Interviewer name:_____

2. Survey site: Fishing village/Sub-district/District:

_____

3. Province/State/Prefecture: Country: Thailand
1 Rayong
2 Prachoup Kiri Khun
3 Chumphon
4 SuratThani

1. Target person of this questionnaire: Fisheries households (head/ members, must engage on part-time or main job in fisheries)

2. Introduction of interview: Good morning/afternoon, I am_____ and we are conducting a survey in your community. The purpose of this survey is to find out about your actual conditions of fishing, and living, and work on something to develop fishing in your community. The conclusion of this survey depends on your responses. Could you kindly cooperate with us?

3. Name of respondent: _____

Relationship with household head _____

My name is : _____ Age:_____
I live in: _____

I am participating voluntarily in the survey titled "Survey regarding Fishers and their Households in Coastal Areas in_____Province."
I know and understand that:

1. This survey is for the study on Social Analysis of Coastal Communities under a research project titled, "Coastal Area Capability in Southeast Asia Project." This is a collaborative project between the SEAFDEC, EMDEC, CMDEC, Kasetsart University, and Research Institute for Humanity and Nature (RIHN) in Japan.
2. The main purpose of this survey is to describe the profile of fishers and their households.
3. All information collected and respondent's personal information will be treated with confidentiality, and will only be used for research purpose. Research results will be publicly declared.

_____ _____
Name of respondent Name of interviewer

_____ _____
Signature of respondent Signature of interviewer

_____
Date (date/month/year)

**********Cut here**********

Participant's Copy (Translate English into Thai)

My name is : _____Age:_____

I live in: _____

I am participating voluntarily in the survey titled "Survey regarding Fishers and their Households in Coastal Areas in_____Province."

I know and understand that:

4. This survey is for the study on Social Analysis of Coastal Communities under a research project titled, "Coastal Area Capability in Southeast Asia Project." This is a collaborative project between the SEAFDEC, EMDEC, CMDEC, Kasetsart University, and Research Institute for Humanity and Nature (RIHN) in Japan.
5. The main purpose of this survey is to describe the profile of fishers and their households.
6. All information collected and respondent's personal information will be treated with confidentiality, and will only be used for research purpose. Research results will be publicly declared.

_____ _____

Name of respondent Name of interviewer

_____ _____

Signature of respondent Signature of interviewer

_____

Date (date/month/year)

1. Family

(1)About respondent

Name	Nickname	Sex	Age	Educational background,
		❑Male ❑Female		1Pri 2High 3Voc 4Bac 5Oth

(2)About household members;

	Relationship, sex	Age	Educational background	Main occupation
1	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
2	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
3	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
4	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
5	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
6	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
7	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth
8	❑M ❑F		1Pri 2High 3Voc 4Bac 5Oth	1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth

**Education: 1.Primary School 2.High School 3.Vocational school 4. Bachelor's degree and higher*

5. Other(Illiterate)

** Occupation: 1.Fisheries 2 Aquaculture 3 Agriculture 4 Labor, 5 Business 6 Government job 7. Others*

(3) About former address and former job

	How many years have you been in this village	Experience in Fisheries/ Aquaculture(year)	Former address (City,Province,Country)	Former occupation
Respondent (Fisher)				1Fis 2Aqu 3Agr 4Lab 5Bus 6Gov 7Oth

2. Livelihood

		Percentage of self-consumption weight of products (%)	Amount of estimated annual income and cost (Baht) Income	Cost	*2if unavailable↓ Percentage of income in family budget (%)
1. Fishing					
2. Aquaculture					
3. Agriculture					
4. Livestock					
5. Trading		C			
6. Laboring					
7. Marine product processing					
8. Other processing					
9. Government					
Others	10. Income from remittances				
	11. Income from lending money				
	12. Saving	Amount	Baht		
13. Other sources not listed above					

***2 If answers of income and cost cannot be gotten, this column is used.**

3. Fisheries and aquaculture

3.1 Fisheries

(1) How many fishing boats do you have?

Number of boats	Length (m)	Power	Engine	Engine Power (HP)
1		❑ non-power ❑ power (❑ out-board ❑ in-board)	❑ Diesel ❑Gasoline/benzene	
2		❑ non-power ❑ power (❑ out-board ❑ in-board)	❑ Diesel ❑Gasoline/benzene	
3		❑ non-power ❑ power (❑ out-board ❑ in-board)	❑ Diesel ❑Gasoline/benzene	

(2) Production schedule.

Name and number of types of fishing gears		Mark X in operation months												Major target Species (local name)	Catch (kg/trip)	Amount of consumption out of catch (kg/trip)	Volume sold (kg/trip)	Average price received (Baht/kg)	Average cost incurred (Baht/trip)	No. of fishing trips/ day	No of fishing days/ month
		1	2	3	4	5	6	7	8	9	10	11	12								
Gear1 Name:	High season													1. 2. 3.							
Number:	Low season													1. 2. 3.							
Gear 2 Name:	High season													1. 2. 3.							
Number:	Low season													1. 2. 3.							
Gear3 Name:	High season													1. 2. 3.							
Number:	Low season													1. 2. 3.							

(3) About labor

a. Number of laborers in an operation_____

b. Relationship between you and your employer (multiple answers allowed): 1 family 2 relative 3 fellow fisher 4 neighbor 5 foreign employee 6 others_____

(4) Do you have any problems with fisheries? State the problems and level of the seriousness to continued fishing.

a. Do you have a problem regarding fishing operations in the fishing grounds? ❑ YES ❑NO

- Please describe, and rank on basis of severity of problem.

1. _____

Less serious 1 2 3 4 5 Very serious (Single Answer allowed)

- Please describe, and rank on basis of severity of problem.

2. _____

Less serious 1 2 3 4 5 Very serious (SA)

b. Do you have a problem regarding fisheries resources? ❑ YES ❑NO

- Please describe, and rank on basis of severity of problem.

1. _____

Less serious 1 2 3 4 5 Very serious (SA)

- Please describe, and rank on basis of severity of problem.

2. _____

Less serious 1 2 3 4 5 Very serious (SA)

c. Do you have a problem regarding fishing ground environment? ❑ YES ❑NO

- Please describe, and rank on basis of severity of problem.

1. _____

Less serious 1 2 3 4 5 Very serious (SA)

- Please describe, and rank on basis of severity of problem.

2. _____

Less serious 1 2 3 4 5 Very serious (SA)

3.2 Aquaculture

(1) Production schedule

Do you operate aquaculture? ❑ YES ❑NO → Go to 4

Species	Type of facility 1 – pond 2 – cage 3–others, specify	What year did you start?	How many production cycles do you have in a year? (stock to harvest)	Based on last production cycle			
				What % of the total harvest was sold and equivalent in kg? (%)	(in kg)	Price/kg received (Baht/kg)	Operation cost (Baht/kg)

(2) About labor

a. Number of laborers in an operation_____

b. Relationship between you and your employer (MA); 1 family 2 relative 3 fellow fisher 4 neighbor 5 foreign employee 6 others_____

(3) Problem on aquaculture

a. Do you face any problem during aquaculture operations? ❑ YES ❑NO

- Please describe, and rank on basis of severity of problem.

1. _____

Less serious 1 2 3 4 5 Very serious (SA)

- Please describe, and rank on basis of severity of problem.

2. _____

Less serious 1 2 3 4 5 Very serious (SA)

b. Do you have any environmental problem in the aquaculture site? ❑ YES ❑NO

- Please describe, and rank on basis of severity of problem.

1. _____

Less serious 1 2 3 4 5 Very serious (SA)

- Please describe, and rank on basis of severity of problem.

2. _____

Less serious 1 2 3 4 5 Very serious (SA)

4. Agriculture and livestock

(1) Main agriculture

Do you have an agricultural farm? ❑ YES ❑NO → Go to (2)

Crop name	How many production cycles do you have in a year? (stock to harvest)	Based on last production cycle				
		Volume of product per cycle (kg)	What % of the total harvest was sold and equivalent in kg?		Average price/kg received (Baht/kg)	Total cost (Baht per cycle)
			%	in kg		

(2) Main livestock

Do you have livestock? ❑ YES ❑NO → Go to 5

Livestock name	How many months do you raise livestock? (stock to harvest)	Based on last production cycle				
		Volume of product per cycle (kg)	What % of the total harvest was sold and equivalent in kg?		Average price/kg received (Baht/kg)	Total cost (Baht per cycle)
			%	in kg		

5. Business

(1) Marine products

a. Whom do you sell your catch to? (MA)

1 Middleman 2 Fish retailer 3 Restaurant 4 End customer (Home use, Local market)

5 Others_____

6 If the answer is 1 Middleman, the name is _____

b. How do you transport them? (MA)

1 By motorcycle 2 By Car 3 By boat 4 Human power 5 Middleman comes to pick up

(2) Aquaculture products

a. Do you sell aquacultural products?

❑ YES ❑NO → Go to 5.(3)

b. Whom do you sell your aquaculture products to? (MA)

1 Middleman 2 Fish retailer 3 Restaurant 4 End customer (Home use, Local market)

5 Processing factory 6 Others_____

c. How do you transport them? (MA)

1 By motorcycle 2 By Car 3 By boat 4 Human power 5 Middleman comes to pick up

6 Factory workers come to pick up

(3) Agricultural products

a. Do you sell agricultural products?

❑ YES ❑NO → Go to 5.(4)

b. Whom do you sell your agricultural products to? (MA)

1 Middleman 2 Retailer 3 End customer (Home use, Local market) 4 Processing factory

5 Others_____

c. How do you transport them? (MA)

1 By motorcycle 2 By Car 3 By boat 4 Human power 5 Middleman comes to pick up

6 Factory workers come to pick up

d. Do you have a fixed selling space? How much is the rent of the selling space?

❑ YES, How much? _____Baht/month ❑ NO

(4) Livestock products

a. Do you sell livestock?

❑ YES ❑NO→ Go to 6.

b. Whom do you sell your livestock products to? (MA)

1 Middleman 2 Retailer 3 End customer (Home use, Local market) 4 Processing factory

5 Others_____

c. How do you transport them? (MA)

1 By motorcycle 2 By Car 3 By boat 4 Human power 5 Middleman comes to pick up

6 Factory workers come to pick up

d. Do you have a fixed selling space? How much is the rent of the selling space?

❑ YES, How much? _____ Baht/month ❑ NO

6. Fisheries management

These sentences should be stated before the questions

At present in Thailand, fishing is an open-access activity. And anyone has a right to fisheries resources by catching fish, shrimp, crab, or mollusks in Thai waters according to the Thai Fisheries Act.

(1) Does fishing under this principle lead to overfishing and fishery resource reduction?

❑Yes ❑No ❑ Do not know

(2) Do you agree that fish, shrimp, crab or mollusk in the sea should be common property?

❑ Yes ❑ No ❑ Do not know

If NO → who should have the right to catch fish, shrimp, crab, or mollusks in the sea?

1 Only residents of the village 2 Only fishermen of the village

3 Every fisherman living in the country 4 Do not know

The reason why do you choose it;_____

(3) Do you agree that fishing should be an open-access activity?

❑ Yes ❑ No ❑ Do not know

If NO → who should have the right to catch fish?

1 Only residents of the village 2 Only fishermen of the village

3 Every fisherman living in the country 4 Do not know

(4) Explain Fisheries Management to respondents as follows:
"Fisheries Management (FM) is marine policy to control fishing gear and methods to increase aquatic resources. For example, controlling mesh size, setting seasonal closure, and prohibiting particular fishing gear in some areas." (Artificial reefs and crab banks are stock enhancement not F.M.)

Have you ever heard of fisheries management in and around your fishing ground?
❑ YES ❑ NO→go to (6)

(5) What kind of fisheries management do you have in this area?

a. Name of the target species: _____

b. Name of the target fishing gear: _____ _____

c. Outline of penalty: _____

d. Name of main organization: _____

e. purpose of the F.M.:_____

(6) Do you think fisheries management is necessary in and around your fishing ground? (SA)
No need 1 2 3 4 5 Very necessary

(7) How much % decline in the annual catch, should be implemented fisheries management?
For example, now you have 100kg catch; how much reduction of your catch should be implemented fisheries management?

1 About _____% (kg) reduction 2 Do not know

(8) If fisheries management is started to maintain fisheries' resources, the catch might decrease at the beginning.

a. How much % catch reduction can you bear? (SA)
1 About_____% 2 Cannot bear any 3 Do not know

b. How many years can you bear? (SA)
1 About_____months 2 Cannot bear any 3 Do not know
(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1Y, 1.5Y, 2Y, 2.5Y, 3Y, 3.5Y, 4Y, 4.5Y, 5Y)

7. Social capital

Human networks

(1)Are you a member of any organization in the community?

❑ YES ❑ NO⇒ go to (3)

(2) Which type of organization is this? And how many times did you attend the organization's meetings over the past year? (MA)

1 Socio-civic organization,_____times/yr. 2 Fishermen's organization,_____times/yr.

3 Associations besides fishermen's organizations,_____times/yr. 4 NGO,_____times/yr.

5 Others1,_____times/yr. 6 Others2,_____times/yr.

(3) If you suddenly needed to borrow half of your yearly income for some serious incident, would you be able to borrow money? (SA)

Never				Definitely
1.	2.	3.	4.	5.

(4) In the following cases, who do you ask for help? (MA)

You need help to pay for a medical operation of a family member.	You are likely to be involved in a crime.	Recovery from natural disaster	Chores such as baby sitting and laundry
1- Relative	1- Relative	1- Relative	1- Relative
2- Friend (neighbor)	2- Friend (neighbor)	2- Friend (neighbor)	2- Friend (neighbor)
3- Fisher folk	3- Fisher folk	3- Fisher folk	3- Fisher folk
4- Middleman	4- Others_____	4- Middleman	4- Others_____
5- Bank		5- Bank	
6- Others_____		6- Others_____	

Norms and Trust

(1) Over the past one year, did you participate in any volunteer work in your village?

❑YES ❑NO ⇒go to (3)

(2) How many times did you participate in volunteer work in the past one year?

_____Times/year

(3) In general, do you agree or disagree with the following statements?

	Disagree				Agree
a. People generally try to be helpful	1.	2.	3.	4.	5.
b. If you see somebody lost on the street, you should stop to help	1.	2.	3.	4.	5.
c. People mostly look out for themselves	1.	2.	3.	4.	5.
d. Most people in the village can be trusted	1.	2.	3.	4.	5.
e. You need to be very careful while communicating with villagers	1.	2.	3.	4.	5.

1 Strongly disagree (a few %), 2 Somewhat disagree (25%), 3 Neither agree nor disagree (50%), 4 Somewhat agree (75%), 5 Strongly agree (100%)

(4) Now I want to ask you how much you trust different types of people. On a scale of 1 to 5, where 1 means to a very small extent, and 5 means to a very great extent, how much do you trust the people in each of the categories below?

Type of people	Small				Great
a. People from your ethnic or linguistic group/ race/ tribe	1.	2.	3.	4.	5.
b. Local and national government officials	1.	2.	3.	4.	5.
c. Police	1.	2.	3.	4.	5.
d. Fishermen in your village	1.	2.	3.	4.	5.
e. People in your village, except fishermen	1.	2.	3.	4.	5.
f. Strangers	1.	2.	3.	4.	5.

1 Very small extent (a few%), 2 Small extent (25%), 3 Neither small nor great extent (50%), 4 Great extent (75%), 5 Very great extent (100%)

8. Religion

(1) What is your religion? (SA)

1 Buddhism 2 Islam 3 Christianity 4 Others (specify)_____

(2) Do(does) you/anyone in your family offer food to monks in the morning?

❑YES ❑NO

(3) How many times do you offer prayers at the temple every month?

1 4 times 2 times 3 1 times 4 Others (specify)_____

(4) Do you go to the mosque/church every week?

❑YES ❑NO

9. General public views of life

(1) How satisfied are you with the financial situation of your household? When one means completely dissatisfied and ten means completely satisfied, what number describes your degree of satisfaction with your financial situation? (SA)

Completely dissatisfied Completely satisfied

1 2 3 4 5 6 7 8 9 10

(2) Are you feeling any uneasiness or anxiety in your present life? (SA)

❑ YES ❑ NO go to (4)

(3) What causes your uneasiness and anxiety? (MA)

1 Instability or shortage of income
2 Hopelessness of present job
3 Insufficiency of children's education
4 Health condition of the family
5 Others_____

(4) Do you think strong relationships are very important within the village and neighborhood? (SA)

❑ YES ❑ NO ❑ Don't know

(5) What kind of person is respected in your village (SA)

❑ Rich person

❑ The person who owns capital properties such as a big house, several fishing boats, and many type of fishing gears

❑ The person who has a wide social network

❑ Others

(6) Do you have any hope for the future? (SA)

a. 1 Much 2 Some 3 Little 4 None 5 I do not know

b. What kind of hope? _____

(7) Are you happy in your present life?

1 Very happy 2 Happy 3 Neither happy nor unhappy 4 Unhappy 5 Very unhappy 6 Do not know.

(8)Do you think rich natural resources (excluding fishery resources) are very important for maintaining your job? (SA)

❑ YES ❑ NO ❑ Do not know

(9) Here are two statements people sometimes make when discussing the environment and economic growth. Which of these comes closer to your own point of view?

1 Protecting the environment should be given priority, even if it causes slower economic growth and loss of some jobs.

2 Economic growth and job creation should be the top priority, even if the environment suffers to some extent.

3 Any other answer.

10. Personal information

(1) What kinds of household goods does your household have?

1 TV 2 Washing machine 3 Refrigerator 4 Microwave oven 5 Air-conditioner 6 Electric fan
7 Mobile phone 8 Motorbike 9 Car 10 Home theater 11 DVD player 12 Computer

(2) Please tell me your average monthly household income._____Baht/Month

(3) Health data of respondent and health

a. All in all, how would you describe your state of health these days? Would you say it is?
1 Very good 2 Good 3 So-so 4 Poor 5 Do not know

b. Body weight_____Kg

c. Height_____cm

d. Waistline_____cm

e. Blood pressure (BP):_____ / _____mmHg

Field Report

小規模漁業漁家を対象とした量的データ収集調査の手法

宮田　勉

水産研究・教育機構

要旨

小規模漁業の政策を立案する際、漁家や漁村の現状を理解するうえで量的調査は必要である。しかし、世界中で多くの政府や地方自治体は、行政職員や研究職員が不足し、さらに予算が逼迫している問題を抱えている。また、農村や漁村における社会調査実施マニュアルもあるが、そのほとんどが定性的な調査手法に特化していた。それゆに、本論はサンプリング数を削減するための、また量的調査のための調査手法について言及する。具体的には、データ抽出法理論、漁村レベルの事前調査とランダムサンプリングの方法、調査票の作り方と調査実践に関する方法、追加調査と結果報告会を紹介する。なお、本論にはタイラインドにおいて実際に使用した漁家調査票を添付した。

キーワード：調査マニュアル、東南アジア、漁村、漁法、漁業操業