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The Inland Fisheries Research and Development Institute (IFReDI) is a national agency under the supervision of the Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries in Cambodia. IFReDI aims at providing scientific information and technical support for the sustainable development and management of inland living aquatic resources in Cambodia, based on biological and socioeconomic research, for the country's food security and economic prosperity.

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EXECUTIVE SUMMARY

This protocol has been developed to create a monitoring network for collecting high-quality quantitative fisheries data. It is tiered and allows for flexibility in effort. The protocol has been adopted or endorsed by a wide range of organizations in Cambodia and abroad. It includes practical information for implementation, training and data quality control.

The tiered-monitoring system allows different quantities of data to be collected and has extensive quality-control checks by using cameras to verify species identifications. The top tier engages a limited number of highly trained individuals within communities to collect high-quality data. More widespread data collection – and therefore more data coverage – is facilitated by engaging a larger number of individuals to collect more limited data, which is less affected by finer details and requires less time. The increased coverage and engagement of individuals allows widespread geographic coverage and increases community awareness.

1 INTRODUCTION

The protocol for standardized fish sampling in Mekong countries has been developed to create a monitoring network to collect high-quality quantitative fisheries data. The purpose of the initiative is to:

- develop capacity for a self-reliant and sustainable long-term monitoring system for fisheries and to build national scientific research competence;
- identify key habitats required for fisheries ecology within the Lower Mekong Basin to identify impacts of threats to the system, providing critical insight into the impacts of infrastructure changes;
- advise government policy and management through scientific investigation, enabling informed policy decisions; and
- bridge the gap between the government and communities as well as science and policy.

The key elements of the initiative are:

- accumulation of empirical data on fisheries for the Lower Mekong Basin (LMB) that are needed to understand biodiversity and food security issues;
- support for the development of a suite of monitoring indicators and a tiered strategy to provide both high-quality and widespread data coverage in collaboration with the Scientific Capacity Development Initiative (Sci-Cap);
- capacity development for systematic monitoring and surveys of the LMB that are standardized across government agencies, non-governmental organizations and community fisheries;
- integration of data into the online monitoring database set up by Sci-Cap for collation and distribution of data and information; and
- linkage to the science cluster and food-web modeling group for development of scenario-based analysis and feedback to policy and management: biogeographic interpretation, eco-hydrological context, ecological resource flows, ecosystem services and policy.

The protocol is designed to allow participation of stakeholders with varying technical ability, including recommendations for how the protocol can be implemented at university level in the region. This report includes a list of organizations using or endorsing the protocol (Section 3).

The location for developing the protocol was the downstream reaches of the 3S River Basin in northeast Cambodia comprising the Sesan River, the Sekong River and the Srepok River (the Sekong and Srepok both originate in Vietnam and flow into the Sesan which also originates in Vietnam and joins the Mekong River in Stung Treng Province in Cambodia). The protocol can, however, be used in any country.

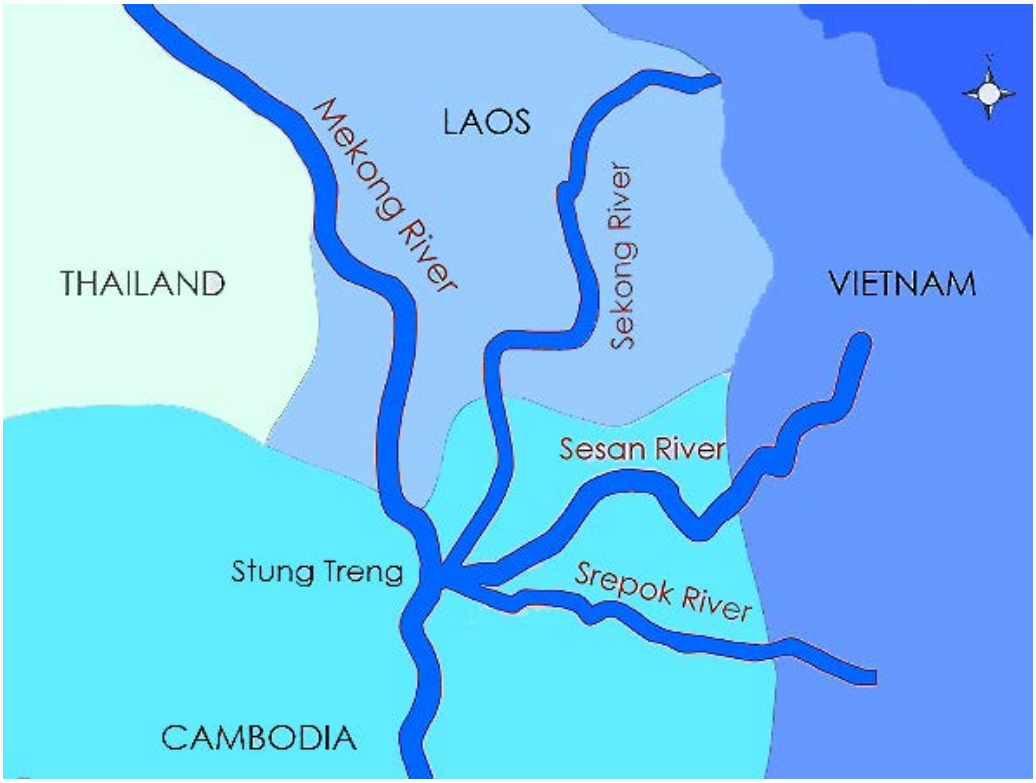

Figure 1: Study target area

2 METHODOLOGY

This section covers the study area and the protocol including the monitoring and data-collection strategy. Other aspects of the protocol are the methods used, the training and implementation schedule, quality checks and the selection of fishermen.

2.1 STUDY AREA

Three MSc Students from the Royal University of Phnom Penh undertook research in the Cambodian part of the 3S River Basin in 2014. Due to the short-term nature of the projects, there were intensive efforts to collect enough data for comparisons. Fishermen were selected from river areas in Stung Treng Province and Ratanakiri Province.

The fishermen chosen in Ratanakiri were trained in a Sci-Cap protocol and successfully collected both daily interview data and monthly catch data. They were selected with the assistance of a local non-governmental organization, which supported the fishermen. Those in Stung Treng had all previously been engaged in similar projects. The 3S River Basin was chosen due to its role as the major tributary of the Mekong and the need to collect baseline data before dam development projects began. The fishermen were all subsistence fishers and sellers.

In Ratanakkiri Province, work to develop the protocol took place in Veun Sai District (Veun Sai Market and Landing Site, Tiem Leu Village and Kampong Cham Village) and Lumphat District (Lumphat Village and Dei Lou Village). The location of the four villages is in Figure 2 below.

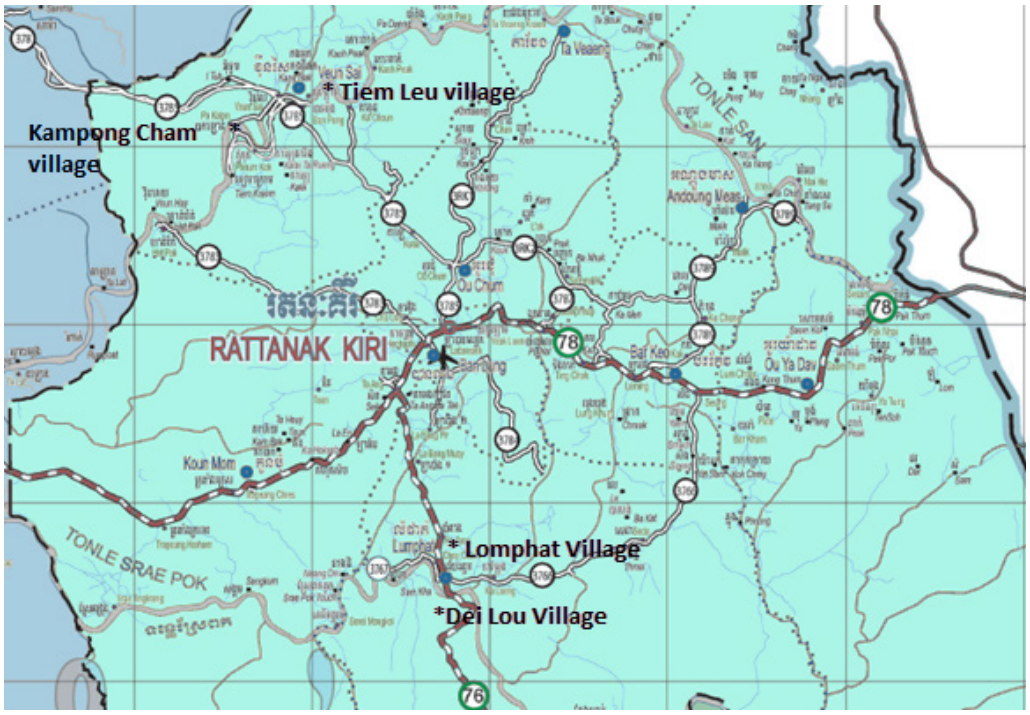

Figure 2: Map of study areas in Ratanakiri Province

In Stung Treng Province, work to develop the protocol was in Sesan District (Kamphun Village and Phluk Village). The location of the two villages is in Figure 3 below.

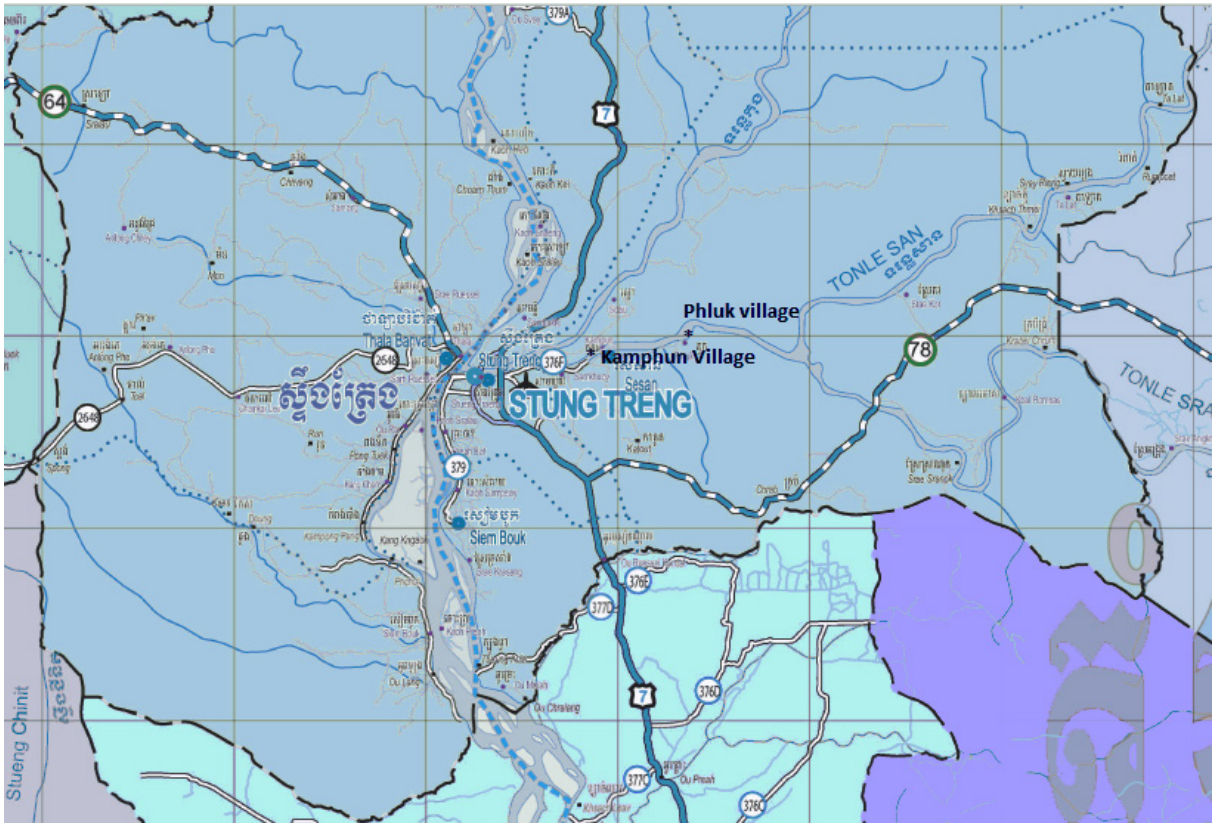

Figure 3: Map of study areas in Stung Treng Province

2.2 PROTOCOL

2.2.1 MONITORING AND DATA-COLLECTION STRATEGY

The tiered monitoring and data-collection system involves stakeholders of varying technical ability (see Figure 4). It allows different quantities of data to be collected and has extensive quality-control checks by using cameras to verify species identifications. The top tier engages a limited number of highly trained individuals in communities to collect high-quality data. More widespread data collection – and therefore more coverage – involves engaging a larger number of individuals to collect more limited data, which is less affected by finer details and requires less time. Increased coverage and engagement of individuals allows widespread geographic coverage and increases community awareness.

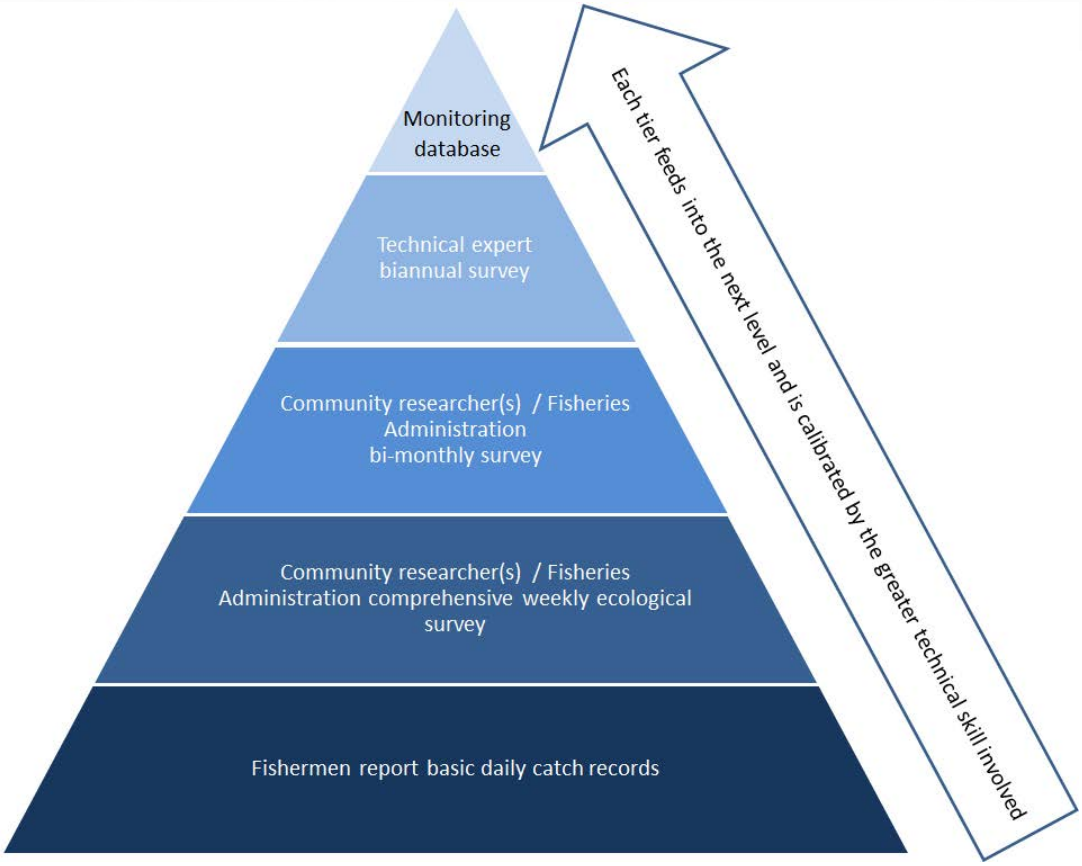

Figure 4: Tiered monitoring and data-collection strategy

The stratified element is concerned with the timing and engagement of various partners working in Cambodia. Different levels of catch assessment are conducted at different times. Targeted catch efforts and assessment – supported by technical experts and community researchers – are conducted at least every six months in collaboration with partners that also carry out these intensive survey methods. In this way, the data is verified by high-quality data collected at these times.

A. **Technical experts** conduct independent biannual fisheries assessments. Comprehensive data collection includes standard lengths, fish numbers per species, weights, scientific study data, environmental variables and hydrology.

B. **District representatives of the Inland Fisheries Research and Development Institute (IFReDI) and the Fisheries Administration as well as locally engaged members of partner organizations of Sci-Cap** conduct district-level assessments. Comprehensively trained fishermen collect substantial regular monitoring data once a month and oversee daily and weekly collections of other data by fishermen.

   When support and resources are available, these individuals also monitor purchases from subsistence fisheries by middlemen.

C. Community researchers and fishermen monitor catches and fishing gear used. Suitable fishermen are selected to record daily catch effort data and their own total catch data on a weekly basis. Basic equipment provided includes cameras and shared use of a global positioning system (GPS) device. Local community researchers who are fishermen measure and monitor their own catches and record types of gear used. They assess their usual fishing activities and do not modify placement or gear use. The researchers also conduct regular interviews in their community to record gear type and size of catch. This provides an indication of how representative the researchers' catch is of the community's catch. For each area of interest, at least two or three fishermen with aptitude should be trained. Intensive training occurs at the start with at least three sessions to build knowledge and understanding. This is followed by continued support during an initial three-month period with feedback and retraining as required by trainers or the local NGO partner organization. This document includes a Training Handbook in English and Khmer (Annex B) as well as Data Sheets in English and Khmer (Annex C).

D. Several people in each village report their daily catch data and fishing effort, and species present in their catches. Incentives include basic per diems and nets along with rewards for good data. Depending on resources, there is flexibility as to how often they record a full catch. However, it is recommended that the maximum time between records is no longer than one month. Due to changes in hydrology and fish movement patterns, recording gaps longer than a month would result in significant losses of information and coherence. In 2014, most community researchers recorded their catch once per week.

2.2.2 METHODS

A. TOTAL DAILY CATCH AND EFFORT

Using a list of 21 local fishermen, the community researcher conducts three interviews per day on a random schedule (21 interviews per week). If a fisherman is not fishing on the interview date, the reason should be noted. The following information is recorded:

1. Gear type and size (length/depth/mesh size for seine nets, for example, or length and number of hooks for hook and line).

2. Quantity of gear type.

3. Location (local name) for each gear type and how many in each location ("five box traps in Boeung Chhmar", for example).

4. Time set, time recovered.

5. Most abundant species caught each day and weight, if known.

6. GPS locations of fishing areas monitored (follow-up activity).

B. WEEKLY ASSESSMENT

1. Weigh total catch.
2. Separate into species.
3. Weigh each species and record.
4. Select largest/smallest and eight intermediate fish for each species (ten total).
5. Cut provided label and place next to fish (includes fisher's unique code, date and fish number).
6. Lay ten fish for each species on size board and photograph.
7. Record standard length and individual weight for ten fish of each species.
8. Cut small tissue sample from tail or fin, staple label to tissue sample and place in ethanol.
9. Record location, gear type and size, time equipment set and collected, and water conditions.

C. TOTAL DAILY CATCH AND EFFORT

1. Gear type and size (length/depth/mesh size for seine nets, for example, or length and number of hooks for hook and line) – basically whatever is needed to describe the gear to someone who is going to buy the same thing again.
2. Quantity of gear type
3. Location (local name) for each gear type and how many in each location ("five box traps in Boeung Chhmar", for example)
4. Time set, time recovered
5. Local name of each fish species in catch according to net type
6. GPS points for locations listed

2.2.3 TRAINING AND IMPLEMENTATION SCHEDULE

The following training schedule is based on experience with pilot and initial communities. Adding stages for training and equipment allocation gives community researchers time to build capacity and confidence in their abilities.

A. Engage with local partners and contacts to identify suitable fishermen (see Selection of Fishermen in Section 2.2.5 below)

B. Hold Workshop (1) to demonstrate the methodology and gauge interest and capability of potential fishermen becoming community researchers. Invite more fishermen than required and then invite only the most interested and competent to further training sessions.

C. **Hold Workshop (2)** with the most able and committed fishermen. At the end, fishermen are provided with daily interview surveys to complete for one month.

D. **Visit Village (1)** to train the fisherman in using his catch. If he meets the requirements of still being interested, completing the daily catch survey and being capable of learning the protocol, he is provided with weekly catch datasheets and basic equipment (not including the camera or electronic scales). For weekly catches, the fisherman uses a simplified method without recording individual fish weights or taking pictures. This allows the fisherman to become more confident in recording the data, and not be overwhelmed.

E. **Visit Village (2)** to process the catch together with the fisherman. Data sheets should be checked for errors or confusion. If the fisherman is competent, the digital scales and camera are allocated (see Annex A for the full list of equipment). The fisherman can then start recording individual fish weights and taking pictures.

F. **Make regular phone calls and visits** to ensure that fishermen are capable and confident in their required tasks. In the initial stages of the project, visits and phone calls need to be more regular until the fishermen have an established routine.

2.2.4 QUALITY CHECKS

The schedule for training and visiting villages is designed to ensure fishermen can carry out their tasks reliably and accurately. Other checks have been built into the training to ensure high-quality data:

Catch assessment with fishermen
A fisheries observer lands the catch with the fisherman, who has set the nets in the usual way. The fisherman and observer record the catch together. This data is then compared to previous recorded catches from the fisherman to detect any under or misreporting.

Independent standardized check
Independent experts set nets in each fisherman's usual fishing area. The three options for types of nets are the fisherman's nets, a multi-panel net (standardized experimental gill net) or a set of standardized nets. Multiple nets of varying sizes are preferred but are time consuming and more difficult. The second preference is a multi-panel experimental gill net, although these are difficult to source, relatively expensive and prone to damage. A cheaper and more practical method is to use the same size net across sites.

Specimen photographs
The fisherman takes a photograph of each species as part of the protocol for the weekly catch. This improves the reliability of species identification and accuracy of standard length measurements to be checked. The fisherman records the fish using the local name. The photographs confirm that the fisherman is recording actual data (cameras can be programmed to record a time-stamp which confirms he is correctly recording the date on which data was collected). Ensuring accurate species identification is extremely important. Experts check the photographs of each species and translate the local common name into the scientific name. This process can feed back into the training of the fisherman to improve identification of similar species. Identification to the species level in the field is not always possible for confusion species or species complexes where only one common name is used. Using a standard board with a size grid to photograph the specimens allows the standard length measurements of fish to be checked for general accuracy – and any seemingly erroneous records to be individually checked.

D. Genetic samples

DNA clips should be taken from each species recorded with samples labeled and stored in ethanol by the Cambodian Molecular Genetic Group (CMGG) at IFReDI. The samples can be used to check the accuracy of identification. For cryptic species, species complexes and confusion species, the samples can be used to both check the accuracy of field identification and provide greater clarity. An additional benefit of collecting and storing muscle samples is the creation of a large genetic resource from which a wide range of scientific studies can be carried out.

2.2.5 SELECTION OF FISHERMEN

Although the protocol is designed for individuals with a low level of formal education, minimum standards are still needed. Fishermen need to be able to read and write Khmer. A basic level of numeracy is also required, although changing from mechanical to digital hanging scales simplifies the recording of larger weights. Likewise, a repetitive training schedule and presentation style helps to build confidence and competency.

Preference should be given to fishermen who fish for the entire year and most days per week. In areas of high migration, it is prudent to check that fishermen don't have plans to leave the area to pursue other jobs. In forested areas, many fishermen may stop fishing for extended periods to undertake forestry activities.

It is advisable to use a local non-governmental organization to select and support the fishermen. The NGO partner needs to clearly understand the criteria to select suitable fishermen. If selecting more than one fisherman per district, attention should be given to those with the widest geographical range. Fishing location should also be checked to ensure the fishermen are fishing in target tributaries and river systems. Staff of any NGO partners should be trained in on how to effectively support the fishermen with clear guidelines for individual responsibilities.

Fishermen or their families should have their own mobile phone and must contact coordinators if their number changes. It is prudent to have a back-up number of a family member or neighbor. Regular communications should be maintained with the fishermen to reassure and support them. Ideally, there should be one individual who trains and then supports the fisherman for a good relationship to develop.

Fishermen should be informally assessed at every stage of training to ensure they have the potential to carry out the protocol. It is extremely important to ensure that they are enthusiastic and strongly motivated to be involved with the project. Initial workshops – in which the protocol is demonstrated and basic skills taught – can be used to assess which fishermen are suitable for further training. Inviting more fishermen than needed for each area allows the most capable and enthusiastic to be selected and gives fishermen more time to decide if the project is right for them.

2.3 DATA STORAGE

Sci-Cap has developed a database for all project partners that will provide a platform for sharing and analyzing data. All users will have a login and be able to load their data into a private version of the system. After being quality controlled, the data will go "live" and be accessible by members of the database community.

2.4 IMPLEMENTATION OF THE MONITORING METHODOLOGY AT UNIVERSITY LEVEL

WorldFish has partnered with three universities for the valuation project – Royal University of Phnom Penh (RUPP) in Cambodia, Ubon Ratchatani University in Thailand and Can Tho University in Vietnam. The monitoring methodology can be adapted for incorporation into syllabuses to ensure project continuity. Ubon Ratchatani University has used the methodology in this report with some adaptations. Can Tho University has had several student projects, although these have focused on rice field fisheries so will limit the comparability of data across the region.

The Royal University of Phnom Penh has had three MSc students undertaking research projects in the Cambodian part of the 3S River Basin. These projects have covered six sites. As part of their research, the students compared the merits of each of their research methodologies. Although their research periods were short and did not represent sustained monitoring efforts, it is possible that future students may be able to carry out similar activities.

Additional fishermen were trained in Ratanakiri and Stung Treng, and Sci-Cap has identified future research areas of interest. For future monitoring, it is recommended that fishermen selected should be fishing on main rivers rather than tributaries.

There is potential to incorporate fisheries science within the MSc program at RUPP in a similar manner to Ubon Ratchatani University. Due to scholarship commitments, it is unlikely that students will be available to undertake the monitoring as their research projects. However, monitoring could be incorporated as a first-year field course and supported by the Centre for Biodiversity Conservation.

3 RESULTS

This report identifies suitable sites for RUPP students to conduct monitoring and recommendations for inclusion within the MSc syllabus. Twenty organizations have adopted or will be adopting or endorsing the methodology and have received training on applying the protocol.

3.1 ORGANIZATIONS IN CAMBODIA

1. Birdlife International
2. Cambodian Rural Development Trust (CRDT)
3. Centre for Biodiversity Conservation (CBC, a unit of Fauna & Flora International)
4. Conservation International (CI)
5. Culture and Environment Preservation Association (CEPA)
6. Fisheries Action Coalition Team (FACT)
7. Fisheries Administration (FiA)
8. Inland Fisheries Research and Development Institute (IFReDI)
9. Royal University of Agriculture (RUA)
10. Royal University of Phnom Penh (RUPP)
11. Three S Protection Network (3SPN)
12. University of Battambang (UBB)
13. Wildlife Conservation Society (WCS)
14. WorldFish
15. World Wide Fund for Nature (WWF)

3.2 FOREIGN UNIVERSITIES

1. Paul Sabatier University (UPS, Toulouse III)
2. University of Boston
3. University of California, Santa Barbara
4. University of Guelph
5. University of Washington

4 DISCUSSION AND CONCLUSIONS

This protocol has been developed to create a monitoring network to collect high-quality quantitative fisheries data. It is tiered and allows for flexibility in effort. The protocol has been adopted or endorsed by a wide range of organizations in Cambodia and abroad. It includes practical information for implementation, training and data quality control.

The tiered monitoring system allows different quantities of data to be collected and has extensive quality-control checks by using cameras to allow verification of species identifications. The top tier engages a limited number of highly trained individuals within communities to collect high-quality data. More widespread data collection – and therefore more coverage – is facilitated by the engagement of a larger number of individuals to collect more limited data, which is less affected by finer details and requires less time. The increased coverage and engagement of individuals allows widespread geographic coverage and also increases community awareness

We have been engaging with three universities – Royal University of Phnom Penh (RUPP) in Cambodia, Ubon Ratchatani University in Thailand and Can Tho University in Vietnam. Three MSc students have undertaken monitoring projects as research components of their studies at RUPP. To ensure project continuity at the university, it is recommended that the monitoring protocol be incorporated within the taught component of the MSc syllabus. Study sites for the RUPP students have been identified in the 3S River Basin in northeast Cambodia. If the monitoring protocol becomes a fieldwork training element of the taught MSc course, it is recommended that the study site be an area of the Mekong River much closer to Phnom Penh to save time and money.

ANNEX A: EQUIPMENT NEEDED PER FISHERMAN FOR MONITORING PROTOCOL

Costs of equipment in Phnom Penh as of 2014		
Stage	**Item**	**Cost**
1	Hanging scale	$4.60
	Pencil	$0.10
	Black photo board clipboard	$1.50
	Measuring tape	$0.25
	Stapler	$0.70
	Staples	$0.15
	Plastic jar (for tail storage)	$0.25
	Ethanol (0.5 liter)	$0.60
	Scissors	$1.70
	Plastic storage zip bag	$0.60
	Plastic document wallet	$0.30
	Stage 1 costs	**$10.75**
2	Electronic 'kitchen' scale	$10.00
	Spare battery for scale	$1.00
	Stage 2 costs	**$11.00**
3	Plastic box	$3.00
	Half big green board ($10.80)	$5.40
	Nikon Coolpix S32 camera	$100.00
	Stage 3 costs	**$108.40**
	Total cost per fisherman	**$130.15**

ANNEX B: TRAINING HANDBOOK

BASIC CATCH DATA

A. Total catch assessment

1. Fisherman performs normal fishing activities – puts down the usual number of nets at the normal time wherever they usually fish at that time of year.

2. Fisherman collects their fish as they would normally do.

Either Community Fisherman Researcher asks **three** fishermen each day the following information OR 3 Fishermen per day record the following information and give to the Community Fisherman Researcher at the end of each week.

- **Total weight of all their catch from all sources for the day**

- **The name of the location where they put each net or each trap (each piece of fishing gear)**

- The details of the nets/traps used – i.e. how long, what mesh size, what gear they have used: type, size dimensions (e.g. for Seine: length/depth/ mesh size; for hook and line: length, # of hooks) - basically whatever they would need to write down to describe the gear to someone who was going to buy the same thing again.

- If possible, the weight of the catch for each different fishing method used and the 10 most common species for each method used and location.

- **If possible, the GPS location (dependent on the provision of GPS markers)**

Only IF POSSIBLE

- If possible, collect the weight and number of fish for important species – If the fisherman has sold certain species separately and knows the weight for that species.

- If possible, the weight of the catch for each different fishing method used

- If the fisherman weighed his catch from the nets separately rather than all together, or has the weight of the fish caught by a specific trap, etc.

- If possible, the weight of the catch from each location

- If possible, the GPS location (dependent on the provision of GPS)

Variations
NB – If it is not possible to meet with the fishermen and the fishermen are unable/unwilling to write down their catch. We are investigating the possibility of calling the fishermen or asking 3 fishermen to call the community Fisherman Researcher each day to report the above information. If the fisherman has not been fishing that day – they should record that they have not and some indications of why not e.g. the weather conditions – too rainy, river too strong, family problem, too tired, hung over, etc.

Selection of Fishermen to interview
Select 3 x 7 = 21 fishermen from the village/community
Each day of the week ask 3 of the fishermen – (1 small scale, 1 medium scale and 1 family fisherman) for the above information. So fishermen #1,
#2 and #3 will report their catch on Monday every week, Fishermen #4, #5 and #6 will report their catch on Tuesday every week, etc.

GPS locations
NB- if GPS markers are unavailable - the Community Fishermen
Researchers will visit the locations listed by their local name and mark the GPS point (e.g. point1 = Boeung Chhmar, damchur dakork) and record the GPS information: Latitude/Longitude (e.g. N12.345.6/ E102.13.20) for the locations listed in the daily record.

B. Detailed complete catch assessment once a week: (see datasheet: B. Detailed Catch Assessment)

Once a week the Community Fishermen Researcher collects the following information about their own catch or the catch of a willing fisherman in their community

1. Fisherman performs normal fishing activities – puts down the usual number of nets at the normal time wherever they usually fish at that time of year. AS NORMAL

2. Fisherman collects their fish as they would normally do.

Part 1

1. Complete Section A of the data sheet about the fisherman – name, village, etc.

2. Date and what time they set their trap/net

3. Date and what time they collect/check their trap/nets (collect the fish)

4. Total weight of all their catch from all sources (types of net/gear) for the day.

5. The details of the nets/traps used – i.e. how long, what mesh size, what gear they have used: type, size dimensions (e.g. for Seine: length/depth/ mesh size; for hook and line: length, # of hooks) - basically whatever they would need to write down to describe the gear to someone who was going to buy the same thing again.

6. How many of each gear type

7. The local name of the location where they put each net or each trap (each piece of fishing gear) - and how many in each location (e.g. 5 box traps in Boeng chhmar)

8. list the local name of each fish species in the catch

Part 2
Separate the catch by species. For each net or gear type at each location:

1. Weigh total catch and record

2. Separate into species/ different types of fish

3. Weigh all fish for each species and record

4. Count total number of fish for each species and record (if more than 100 for a particular species, count out the first 100 and then record the weight of the 100 individuals.

5. Select the largest, the smallest and 8 intermediate sized fish for each species and keep separate and covered.

   (NB - keep remaining fish to be assessed covered and protected from flies and sun etc. whilst continuing with the following assessment for each species - measuring and weighing each species).

Part 3

6. For each species, lay the 10 fish on the size standard board (board with grid lines) in size order largest at the top, smallest at the bottom, etc.

7. According to the pre-assigned numbers on the data sheet - and place the corresponding sample number next to the correct fish on the board

8. Take a photograph, and record the photograph number,

9. Check the photograph is in focus and it shows all of the fish on the board completely,

   (NB – if less than 10 fish for a species are present in the catch, carry-out with all the fish that are available for that species. To save time, if it is possible put several fish species together when taking the photographs–Make sure the sample numbers are with the appropriate species.)

10. After taking the photograph - Staple the corresponding sample number to the correct fish.

    For the first three months…
    If less than 7cm keep the smallest fish from each species, if greater than 7cm- remove a fin clipping (NB - it does not need to be larger than 2cm squared portion of fin if a larger piece will reduce the value of the fish)

11. Place the fish clipping into the corresponding/correct collection container for the collection – e.g. AR-APR2012(1)

12. Cover the samples with ethanol – ensure they are fully submerged – seal container.

13. Repeat for each species.

IF ANY UNIQUE, RARE OR UNUSUAL FISH ARE SEEN PLEASE KEEP THE WHOLE FISH

ឯកសារយោងនៃផលនេសាទ

ក. ការប៉ាន់ប្រមាណផលនេសាទសរុប

1. អ្នកនេសាទប្រកបរបរនេសាទជាធម្មតា ដូចជាដាក់ចំនួនមងតាមធម្មតា នៅពេលនេសាទដូចសព្វដង និងនៅទីតាំងដែលពួកគាត់តែងតែនេសាទអាស្រ័យទៅតាមខែ ឬរដូវ។
2. អ្នកនេសាទធ្វើការប្រមូលត្រីរបស់ពួកគេ ដូចដែលពួកគេប្រមូលដូចសព្វដង។

(ទាំងអ្នកស្រាវជ្រាវដែលជាអ្នកនេសាទក្នុងសហគមន៍ ធ្វើការសំភាស៍អ្នកនេសាទចំនួន៣នាក់ផ្សេងទៀតជារៀងរាស់ថ្ងៃនូវពត៌មានដូចខាងក្រោម ឬ អ្នកនេសាទទាំង៣នាក់នោះធ្វើការកក់ត្រាពីពត៌មានខាងក្រោមមួយថ្ងៃម្តងៗ ហើយប្រគល់កំណត់ត្រានោះទៅឱ្យអ្នកស្រាវជ្រាវនៅចុងសប្តាហ៍នីមួយៗ។)

— ទំងន់ត្រីសរុបរបស់អ្នកនេសាទចាប់បានពីប្រភពផ្សេងៗក្នុងមួយថ្ងៃ។
— ឈ្មោះទីកន្លែង ដែលអ្នកនេសាទដាក់មង ឬ ដាក់លប (ប្រភេទឧបករណ៍នេសាទផ្សេងៗទៀត)
— ពិពណ៌នាលំអិតពីលក្ខណៈនៃឧបករណ៍នេសាទ (មង/ លប) ដែលអ្នកនេសាទប្រើ។

ឧ. ប្រវែងមង ទំហំក្រឡាសាច់មង ឧបករណ៍អ្វីដែលពួកគេប្រើ៖ ប្រភេទ ទំហំផ្លែ (ឧទាហរណ៍ សម្រាប់ឧបករណ៍អួន ត្រូវពណ៌នាពីប្រវែងបណ្តោយ ជម្រៅ និងទំហំក្រឡាប៉ុន្មាន។ សម្រាប់ឧបករណ៍សន្ទូច និងបង្កៀ ត្រូវពណ៌នាពី ប្រវែងខ្សែ និងចំនួនផ្លែ)។ សូមធ្វើការពណ៌នាពីឧបករណ៍នេសាទ ដូចដែលអ្នកធ្លាប់បានប្រាប់នរណាម្នាក់ឱ្យទៅទិញឧបករណ៍នេសាទនោះដែរ។

— ប្រសិនជាអាចធ្វើបាន កត់ត្រាទំងន់ត្រីដែលចាប់បានពីឧបករណ៍នេសាទខុសៗគ្នា និងជ្រើសរើសត្រីដែលនេសាទបានញឹកញាប់ចំនួន១០ប្រភេទ ពីឧបករណ៍នេសាទ និងទីតាំងនេសាទនីមួយៗ។
— ប្រសិចជាអាចធ្វើបាន កត់ត្រាទីតាំង GPS (អាស្រ័យនឹងការផ្តល់ដោយ GPS)។

ប្រសិនជាអាចធ្វើទៅបាន

— ប្រសិនជាអាចធ្វើបាន កត់ត្រាទម្ងន់ និងរាប់ចំនួនប្រភេទត្រីសំខាន់ៗ ក្នុងករណីអ្នកនេសាទយកត្រីទៅលក់ដោយញែកតាមប្រភេទត្រី និងព្រមទាំងដឹងទម្ងន់ត្រីនោះផង។

— ប្រសិនជាអាចធ្វើបាន កត់ត្រាទម្ងន់ត្រីតាមប្រភេទឧបករណ៍ខុសៗគ្នា ក្នុងករណីអ្នកនេសាទបានថ្លឹងទម្ងន់ត្រីរបស់គាត់តាមឧបករណ៍នីមួយៗ ជាជាងថ្លឹងចូលគ្នា ឬក៏ថ្លឹងទម្ងន់ត្រីតាមលបនីមួយៗ។ល។

— ប្រសិនជាអាចធ្វើបាន កត់ត្រាទម្ងន់ត្រីដែលចាប់បានក្នុងទីតាំងនេសាទនីមួយៗ។ ឧ. ទម្ងន់ត្រីដែលបានមកពីមងចំនួន៣ ដៃ ដែលត្រូវបានដាក់ក្នុងបឹងឆ្នា និងទម្ងន់ត្រីដែលបានមកពីមងចំនួន២ដៃ ដែលត្រូវបានដាក់ចោល។

— ប្រសិនជាអាចធ្វើបាន កត់ត្រាចំណុចកូអរដោរនេ (GPS) (អាស្រ័យនឹងការផ្តល់ដោយ GPS)

ការបំរែបំរួល

ចំណាំ

— ប្រសិនជាមិនអាចជួបជាមួយអ្នកនេសាទ ឬជួបមួយអ្នកនេសាទដែលមិនចេះកត់ត្រាផលនេសាទបាន។ យើងនឹងធ្វើការស្វែងរកអ្នកនេសាទដោយទំនាក់ទំនងតាមទូរសព្ទ ឬឱ្យអ្នកនេសាទទាំង ៣នាក់ ទាក់ទង់ទៅនឹងអ្នកស្រាវជ្រាវដែលជាអ្នកប្រចាំនៅសហគមន៍ឱ្យជួយរាយការណ៍ពីពត៌មានផលនេសាទតាមថ្ងៃនីមួយៗ។ ប្រសិនបើអ្នកនេសាទមិនទៅនេសាទនៅថ្ងៃណាមួយ ពួកគេគួរតែកត់ត្រាថា ពួកគេមិនធ្វើនេសាទទេ និងផ្តល់នូវមូលហេតុផង។ ឧ.មូលហេតុអាកាសធាតុដូចជា ភ្លៀងខ្លាំងពេក ទឹកទន្លេជន់ខ្លាំងពេក បញ្ហាគ្រួសារ ណើយហត់ខ្លាំងពេកមិនសូវស្រួលខ្លួនជាដើម។

ការជ្រើសរើសអ្នកនេសាទមកធ្វើសម្ភាសន៍

ជ្រើសរើសអ្នកនេសាទចំនួន ៣នាក់X៧ថ្ងៃ = ២១ អ្នកនេសាទដែលមកពីភូមិ ឬសហគមន៍។ ជារៀងរាល់ថ្ងៃធ្វើការសម្ភាសន៍អ្នកនេសាទចំនួន ៣នាក់ ដែលម្នាក់ជាអ្នកនេសាទលក្ខណៈគ្រួសារ ម្នាក់ជាអ្នកនេសាទខ្នាត់មធ្យម និងម្នាក់ជាអ្នកនេសាទសិប្បិកម្ម) ។ ដូច្នេះយើងបានអ្នកនេសាទ ទី១ ទី២ និងទី៣ ផ្តល់បទសម្ភាសន៍នៅរៀងរាល់ថ្ងៃច័ន្ទ ហើយអ្នកនេសាទទី៤ ទី៥ និងទី៦ផ្តល់បទសម្ភាសន៍នៅរៀងរាល់ថ្ងៃអង្គារ។

ចំណុចកូអរដោនេ (GPS)

ចំណាំ

— ប្រសិនជា GPS មិនអាចប្រើប្រាស់បាន អ្នកស្រាវជ្រាវដែលជាអ្នកនេសាទនៅប្រចាំសហគមន៍នឹងធ្វើដំណើរទៅទីតាំងនោះ ហើយកំណត់ចំណុចកូអរដោនេនៅលើ GPS។ (ឧ. ចំណុច១ នៅបឹងឆ្នា) និងកត់ត្រាទិន្នន័យកូអរដោនេ GPS ដែលមានរយៈទទឹង និងរយៈបណ្តោយ នៅក្នុងតារាងកត់ត្រាប្រចាំថ្ងៃ (ឧ. N12.345.6/E102.13.20) ។

ខ. ការប៉ាន់ប្រមាណដោយលំអិតពីផលនេសាទម្តងក្នុងមួយសប្តាហ៍
(**មើលតារាងទិន្នន័យ** B. **ការប៉ាន់ប្រមាណដោយលំអិតលើផលនេសាទ**)

អ្នកស្រាវជ្រាវជាអ្នកនេសាទនៅប្រចាំសហគមន៍ធ្វើការប្រមូលពត៌មានពីផលនេសាទនៃការនេសាទរបស់ខ្លួន ឬផលនេសាទរបស់អ្នកនេសាទស្ម័គ្រចិត្តក្នុងសហគមន៍របស់ពួកគេម្តងក្នុងមួយសប្តាហ៍។

1. អ្នកនេសាទធ្វើការប្រកបរបបនេសាទជាធម្មតា ដូចជាដាក់ចំនួនមងតាមធម្មតានៅពេលនេសាទដូចសព្វដង និងនៅទីតាំងដែលពួកគាត់តែងតែនេសាទអាស្រ័យទៅតាមខែ ឬរដូវ។
2. អ្នកនេសាទធ្វើការប្រមូលត្រីរបស់ពួកគេ ដូចដែលពួកគេប្រមូលដូចសព្វដង។

ផ្នែក១

1. បំពេញតារាង A នៃតារាងទិន្នន័យអំពីអ្នកនេសាទ ដូចជា ឈ្មោះ អ្នកនេសាទ ភូមិជាដើម។ល។
2. កាលបរិឆ្ឆេទ និងពេលវេលាដែលអ្នកនេសាទដាក់មង ឬលប។
3. កាលបរិឆ្ឆេទ និងពេលវេលាដែលអ្នកនេសាទទៅប្រមូល ឬទៅពិនិត្យមង ឬលប (ប្រមូលត្រី)។
4. ទម្ងន់ត្រីសរុបនៃផលចាប់ដែលបានមកពីគ្រប់ប្រភពទាំងអស់នៃការនេសាទរបស់គាត់ក្នុងមួយថ្ងៃ។
5. ពិពណ៌នាលំអិតពីប្រភេទឧបករណ៍នេសាទ (មង/ លប) ដែលបានដាក់។ ឧទាហរណ៍ ប្រវែង ទំហំក្រឡា ឧបករណ៍អ្វីដែលពួកគេប្រើ៖ ប្រភេទ ទំហំផ្ទៃ (ឧទាហរណ៍ សម្រាប់ឧបករណ៍អួន ត្រូវពណ៌នាពីប្រវែងបណ្តោយ ជម្រៅ និងទំហំក្រឡាប៉ុន្មាន។ សម្រាប់ឧបករណ៍សន្ទូច និងបង្កៀ ត្រូវពណ៌នាពី ប្រវែងខ្សែ និងចំនួនផ្លែ)។ សូមធ្វើការពណ៌នាពីឧបករណ៍នេសាទ ដូចដែលអ្នកធ្លាប់បានប្រាប់នរណាម្នាក់ឱ្យទៅទិញឧបករណ៍នេសាទនោះដែរ។
6. តើប្រភេទឧបករណ៍នេសាទនីមួយមានប៉ុន្មាន?
7. ឈ្មោះទីកន្លែងដែលអ្នកនេសាទធ្វើការនេសាទ (ឧ. ចំនួនឧបករណ៍នេសាទ) និងអ្នកនេសាទធ្វើការនេសាទប៉ុន្មានកន្លែង (ឧ. អ្នកនេសាទដាក់លបចំនួន៥ ក្នុងបឹងឆ្មា)។
8. រាយឈ្មោះប្រភេទត្រីជាភាសាខ្មែរដែលអ្នកនេសាទហៅតាមតំបន់។

ផ្នែក២

ញែកត្រីដាក់តាមប្រភេទ សម្រាប់ឧបករណ៍នីមួយៗ ដូចជាមងមួយដៃៗ ឬប្រភេទលបនីមួយ តាមតំបន់។

1. ថ្លឹងផលចាប់សរុប និងកត់ត្រា។
2. ញែកត្រីតាមប្រភេទដូចគ្នា ឬប្រភេទដែលខុសគ្នា។
3. ថ្លឹងត្រីតាមប្រភេទនីមួយៗ និងកត់ត្រា។
4. រាប់ចំនួនត្រីនៃប្រភេទនីមួយៗ និងកត់ត្រា (ប្រសិនបើមានប្រភេទត្រីសំខាន់លើស១០០ប្រភេទ រាប់ត្រឹមតែ១០០ បន្ទាប់មកថ្លឹងតែចំនួន១០០ត្រីនោះហើយកត់ត្រា)
5. ជ្រើសរើសត្រីដែលធំបំផុតចំនួន១ តូចបំផុតចំនួន១ និងត្រីចំនួន៨ ទៀតមានទំហំស្ថិតនៅកណ្តាលនៃប្រភេទនីមួយៗ

ចំណាំ ~ រក្សាត្រីទុកដោយគ្រប់ និងមិនឱ្យត្រីពន្លឺថ្ងៃ ដើម្បីធ្វើការប៉ាន់ប្រមាណផលចាប់ ហើយធ្វើការវាស់ប្រវែង និងថ្លឹងទំងន់ត្រីនីមួយៗ)

ផ្នែក៣

6. ដាក់ត្រីចំនួន១០ ក្បាល់លើក្តាររង្វាស់ប្រវែង (បន្ទះក្តារដែលមានក្រិតខ្នាន់ប្រវែង) សម្រាប់ប្រភេទត្រីនីមួយៗ តាមលំដាប់លំដោយត្រី ពីទំហំធំបំផុត ទៅត្រីមានទំហំតូចបំផុត។
7. យោងទៅតាមលេខកូដ ដែលបានកំណត់ទុកជាមុនក្នុងតារាងទិន្នន័យ — ដាក់លេខកូដ សំណាក់ដែលត្រូវគ្នាជាប់ទៅនឹងត្រីដែលមានលេខដូចគ្នានៅលើក្តាររង្វាស់។
8. ថតរូបត្រីនៅលើក្តាររង្វាស់ និងកត់ត្រាលេខរូបថត។
9. ពិនិត្យមើលរូបថត ថាតើច្បាស់ ឬមិនច្បាស់ និងរូបថតមានថតបានត្រីនៅលើក្តាររង្វាស់ទាំងអស់ដែរឬទេ។

ចំណាំ ~ បើសិនមានចំនួនត្រីតិចជាង១០ ក្បាល នៃប្រភេទណាមួយដែលនេសាទបាន ត្រូវយកមកប្រើប្រាស់ទាំងអស់។ ដើម្បីសន្សំពេលវេលា ដាក់ត្រីប្រភេទខុសគ្នាមួយចំនួន ចូលគ្នានៅពេលថតរូប។ ត្រូវប្រាកដថាលេខកូដសំណាកត្រឹមត្រូវតាមប្រភេទនីមួយៗ។

10. បន្ទាប់ពីថតរូបរួចហើយ កិបលេខសំណាកឱ្យត្រូវនឹងត្រី។

សម្រាប់រយៈពេលបីខែដំបូង

ប្រសិនប្រវែងត្រីខ្លីជាង៧ សង់ទីម៉ែត្រ ត្រូវរក្សាទុកត្រីដែលតូចជាងគេបំផុត ប្រសិនបើប្រវែងត្រីលើសពី៧ សង់ទីម៉ែត្រ ត្រូវកាត់ព្រុយដើម្បីរក្សាទុក (ចំណាំ ព្រុយត្រីមិនចាំបាច់កាត់លើសពី២ សង់ទីម៉ែត្រការ៉ែ ប្រសិនវាធ្វើឱ្យប៉ះពាល់តម្លៃរបស់ត្រី)

11. ភ្ជាប់ព្រុយត្រីទៅនឹងលេខកូដដែលផ្តល់ឱ្យ និងរក្សាទុកក្នុងកំប៉ុងដែលមានលេខត្រូវគ្នា។ ឧ. AR-APR2012(1)
12. រក្សាសំណាក់ព្រុយត្រីក្នុងអេតាណុយ ឬអាល់កុល ហើយត្រូវប្រាកដថាព្រុយត្រីលិចក្នុងទឹកអេតាណុល រួចបិទកំប៉ុង។
13. សូមធ្វើសាឡើងវិញចំពោះប្រភេទត្រីនីមួយៗ។

ប្រសិនបើឃើញប្រភេទត្រីផ្លែក ឬប្រភេទត្រីកម្រ សូមរក្សាទុកត្រីទាំងមូល។

ANNEX C: DATA SHEETS FOR CATCH ASSESSMENTS

Estimated daily catch for a fisherman (One questionaire per fisherman only)

Part I

Date	/ /	Fisherman's name		
Water level	Deep Shallow Medium	Date		
Flow (direction of flow)	North South None	Surveyer		
Water condition	Rising Receding Normal	Note-taker		
Weather	Clear Cloudy Dark Breeze	Village		
Reason for not fishing	.....			
Total weight of fish				
Number of fishing gears	Gear #1	Gear #2	Gear #3	Gear #4
Name of fishing location				
GPS coordinates				
Type of gear				
Number (gillnet .....)				
Length (gillnet .....)				
Depth/height (gillnet.....)				
Size of gear (mesh size or hook size)				
Number of hooks				
Total fish catch				
At what time the gear is set up				
At what time the gear is checked				

Part II

Species most abundant in the catch	Weight	Number of fish
1		
2		
3		
4		
5		
6		
7		
Species of interest, of high value, rare or strange		

Water level	Deep/Shallow/Medium	Month:		
Flow (direction of flow)	North/South/None	Note-taker:		
Water condition	Rise/Drop/Normal	Surveyer:		
Weather	Clear/Cloudy/Dark/ Breeze	Village:		

Name of fishing location		GPS coordinates		Total fish weight	
Type of gear		Number of gear			
Length of gear		Depth/height (gillnet)			
Size of gear		Number of hooks			
At what time the gear is set up		At what time the gear is checked			

Fish name in Khmer	Scientific name	Photo code	Weight of each species	Total number of fish	Weight of each fish	Length (head to beginning of tail)	Length (head to the end of tail)	Sample code

ការប៉ាន់ប្រមាណផលចាប់ប្រចាំថ្ងៃរបស់អ្នកនេសាទ (តារាងទិន្នន័យមួយសំរាប់សំភាសន៍អ្នកនេសាទម្នាក់ក្នុងមួយថ្ងៃ)

ផ្នែកទី១

កាលបរិច្ឆេទ	/ /	ឈ្មោះអ្នកនេសាទ	
កំពស់ទឹក	ជ្រៅ រាក់ មធ្យម	ខែ ឆ្នាំ	
ចរន្តទឹក (ទឹសដៅទឹកហូរ)	ជើង ត្បូង អត់ហូរ	អ្នកប្រមូលទិន្នន័យ	
លំក្ខខ័ណ្ឌទឹក	ឡើង ចុះ ធម្មតា	អ្នកកត់ត្រា	
ធាតុអាកាស	ស្រលះ ពពក ស្រទំ ធ្លាក់ជំនោរ	ភូមិ	

មូលហេតុមិនបានទៅនេសាទ.....

ឧបករណ៍ត្រីសរុប	.....

ចំនួនឧបករណ៍នេសាទ	ឧបករណ៍ទី១	ឧបករណ៍ទី២	ឧបករណ៍ទី៣	ឧបករណ៍ទី៤
ឈ្មោះទីកន្លែងនេសាទ				
ចណ្តោចកូរអរដោនេ (GPS)				
ប្រភេទឧបករណ៍				
ចំនួន (មង.....)				
ប្រវែង (មង.....)				
ជំរៅ/កំពស់ (មង.....)				
ទំហំឧបករណ៍(ក្រលាឬផ្លែសន្ទូច)				
ចំនួនផ្លែសន្ទូច				
ផលចាប់សរុប				
ម៉ោងដាក់ឧបករណ៍				
ម៉ោងដោះ/សារឧបករណ៍				

ផ្នែកទី២

ប្រភេទត្រីដែលសម្បូរជាងគេពេលចាប់បាន	ទំម្ងន់	ចំនួនត្រី
1		
2		
3		
4		
5		
6		
7		
ប្រភេទត្រីដែលគួរឱ្យចាប់អារម្មណ៍ តម្លៃថ្លៃ កម្រ ឬផ្លែក		

ការប៉ាន់ប្រមាណផលចាប់តាមឧបករណ៍នេសាទ (តារាងទិន្នន័យមួយសម្រាប់ឧបករណ៍មួយប្រភេទ និងប្រភេទត្រីក្នុងថ្ងៃកត់ត្រានីមួយៗ)

កំពស់ទឹក:	**ស្រាវ/ រាក់/ មធ្យម**	**ខែ** :		TR	Location-
ចរន្តទឹក (**ទឹសដៅទឹកហូរ**)	**ខ្លាំង/ ស្រួច/ អត់**	**អ្នកកត់ត្រា** :			
ល័ក្ខខ័ណ្ឌទឹក	**ល្បឿង/ ចុះ/ធម្មតា**	**អ្នកប្រមូលទិន្នន័យ** :			
ធាតុអាកាស	**ស្រលះ/ពពក/ស្រទំ/ ភ្លាក់ដំណោរ**	**ឈ្មោះភូមិ** :			

ឈ្មោះទីកន្លែងនេសាទ		**ចំណុចកូអរដោនេ** (GPS)		**ទម្ងន់ត្រីសរុប**	
ប្រភេទឧបករណ៍		**ចំនួនឧបករណ៍**			
ប្រវែងឧបករណ៍		**ជំរៅ/កំពស់** (**មជ**.....)			
ទំហំឧបករណ៍		**ចំនួនសន្ទូច**			
ម៉ោងដាក់ឧបករណ៍		**ម៉ោងដោះ/សារឧបករណ៍**			

ឈ្មោះត្រីជាភាសារខ្មែរ	**ឈ្មោះវិទ្យាសាស្ត្រត្រី**	**លេខរូបថត**	**ទំងន់ប្រភេទនីមួយៗ**	**ចំនួនសរុបនៃប្រភេទត្រី**	**ទំងន់ត្រីនីមួយៗ**	**ប្រវែងពីក្បាលដល់គល់កន្ទុយ**	**ប្រវែងពីក្បាលដល់ចុងកន្ទុយ**	**លេខកូដសំណាក**
								TR-Apr14(t)-001
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								TR-Apr14(t)-003
								TR-Apr14(t)-004
								TR-Apr14(t)-005
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								TR-Apr14(t)-014
								TR-Apr14(t)-015
								TR-Apr14(t)-016
								TR-Apr14(t)-017

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