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Regional Fisheries Livelihoods Programme for South and Southeast Asia (RFLP)

Community-based data gathering and co-management of marine resources in Timor-Leste

Community-based data gathering and co-management of marine resources in Timor-Leste

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Citation:
Needham, S., Alonso, E., Wilson, C., Rodrigues, P., Pereira, M. & Griffiths, D., (2013). Community-based data gathering and co-management of marine resources in Timor-Leste. Regional Fisheries Livelihoods Programme for South and Southeast Asia (GCP/RAS/237/SPA). Field Project Document 2013/1.

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Message

Fisheries and aquaculture have the capacity – if supported and developed in a regulated and environmentally sensitive manner – to contribute significantly to improving the well-being and livelihoods of poor and disadvantaged communities in developing countries. They can also help achieve several of the Millennium Development Goals, especially those related to poverty reduction, food and nutritional security, environmental protection and biodiversity. In addition, they play an important economic role, contributing to local and national economies alike.

However, fisheries and marine resources need to be effectively managed if they are to be sustained. And underpinning any successful management plan – whether it's a national policy or a plan for a local marine protected area – is reliable data.

Gathering accurate data is always a challenge especially in developing countries where local agencies may lack capacity or resources. As a new nation emerging from conflict, the challenges facing Timor-Leste in this regard are considerable.

The country's rich marine resources have the potential to play a major role in supporting the economic, nutritional and social wellbeing of the nation's citizens. Yet with little fisheries-related data existing, formulating effective policies and management plans for this important resource is difficult.

An FAO project, the Regional Fisheries Livelihoods Programme, which is funded by Spain, has worked with the Timorese authorities and coastal communities to build local capacity and put in place effective methods to gather a variety of important fisheries data. This is used to help make important decisions relating to the management of the nation's fisheries sector.

These actions, which are detailed in this publication, have been carried out at relatively little expense and in a participatory manner that has engaged communities while at the same time providing practical skills to all involved.

I believe that these are an excellent example of FAO's ability to deliver practical, innovative and well targeted interventions in the field; interventions which reflect local context, deliver tangible benefits for all involved as well as represent excellent value for money for the donor.

I am confident that the actions carried out by FAO to support Timor – Leste's fisheries sector will have long lasting impact and make a major contribution to the sustainable management of the nation's fisheries resources for years to come.

Hiroyuki Konuma
Assistant Director-General and FAO Regional Representative for Asia and the Pacific

Message

Timor-Leste is a young nation, striving to deliver social and economic progress to the benefit of its population. The fisheries sector has an important role to play in this regard, as a source of protein for an often malnourished population as well as an important livelihood for coastal communities.

Timor-Leste's marine resources remain largely underexploited and the potential exists for them to deliver both social and economic benefits to the country. However at the same time we are presented with an opportunity to avoid the unsustainable fishing practices that have led to resource depletion in many other countries in the region.

To achieve this it is vital that we enhance the capacity of the National Directorate of Fisheries and Aquaculture (NDFA) and its staff to better understand and manage the nation's fisheries. By doing so we have the chance to build a solid foundation upon which the sector can be sustainably developed.

In this regard NDFA has worked closely with the Regional Fisheries Livelihoods Programme. Together, we have carried out a wide range of activities which I feel have been both practical and sustainable as well as suited to the reality of Timor-Leste's fisheries sector.

Over a relatively short period these activities have helped NDFA gather valuable fisheries-related data. For example we now have, for the first time, a complete census of fishers, the vessels they use and where they are based. This type of information will be extremely important in helping plan and manage the development of the sector.

The creation of an online National Fisheries Statistical System in which census information and other data are stored and regularly updated also marks a major achievement for both RFLP and Timor-Leste. This represents so much more than just a website. It is a tangible result of a process that has built the capacity and confidence of NDFA staff, and which has also helped us forge stronger relationships with fishers around the country.

When RFLP ends I feel that it will have made a considerable contribution to the development of the capacity of NDFA as well Timor-Leste fisheries in general.

I would therefore like to recognize the efforts of all those involved in the activities detailed in this publication. This includes fishers, NDFA and RFLP staff as well as the FAO for its technical guidance and the Kingdom of Spain for funding these endeavors.

Lourenço Borges Fontes
Director-General
National Directorate of Fisheries and Aquaculture
Ministry of Agriculture and Fisheries, Timor-Leste

Acknowledgements

Members of the RFLP and the National Directorate of Fisheries and Aquaculture

About RFLP

The Regional Fisheries Livelihoods Programme for South and Southeast Asia (RFLP) set out to strengthen capacity among participating small-scale fishing communities and their supporting institutions in Cambodia, Indonesia, the Philippines, Sri Lanka, Timor-Leste and Viet Nam. By doing so the RFLP sought to improve the livelihoods of fishers and their families while fostering more sustainable fisheries resources management practices.

The four-year (2009 – 2013), RFLP was funded by the Kingdom of Spain and implemented by the Food and Agriculture Organization of the United Nations (FAO) working in close collaboration with national authorities in participating countries.

For more information on the RFLP see www.rflp.org

Fisheries in Timor-Leste

Timor-Leste is a new nation which faces many social and economic challenges. Its fledgling government institutions must ensure that the growing population has sufficient food and nutrition while also seeking to generate sustainable economic growth. The marine resources of Timor-Leste have an important role to play in this regard.

A type of fishing vessel commonly used around Timor-Leste

Timor-Leste has 706 km of coastline and a marine exclusive economic zone (EEZ), over which it has fishing rights of approximately 75,000 km^2. According to the government of Timor-Leste's Strategic Development Plan (2010-2030)[1] this fishing area has the potential to provide valuable animal protein to feed the population as well as to provide employment, income earning opportunities and foreign exchange from fish exports.

The main fishing grounds, which are along the northern and southern coasts, offer considerable potential. However weaknesses in policy and limited capacity to manage, monitor and protect its fisheries resources has resulted in the sector remaining undeveloped with most fishing traditionally done from small boats close to shore. Illegal fishing by foreign fleets particularly off the south coast and in the area of the Sahul Banks also threaten to deplete fish stocks.

The total volume and value of the catch from the coastal zone is unknown. However, based on the results of fisher household surveys, it was estimated by the National Directorate of Fisheries and Aquaculture (NDFA) that in 2004 catch from coastal communities accounted for almost 80 percent of the total marine fish catch of about 5,000 metric tons.[2]

In addition to marine catch, some fish rearing also takes place in village ponds. Most fish are consumed domestically and little reaches the interior of the country. This lack of availability can be linked to the general unavailability of ice, limited post-harvest processing skills, poor transportation and marketing as well as cultural aversions in certain areas to eating fish. As a result prices of fresh fish for sale tend to be high, placing it out of reach for many people.[3]

"The value of Timor-Leste's aquatic marine resources and the resulting benefits to our people, both in the short-term and long-term, will depend on how well these resources are managed." *A Policy and Strategy for the Fisheries Development in Timor-Leste. (Ministry of Agriculture 2007)*

1. RDTL. (2011). Timor-Leste Strategic Development Plan 2011-2030. Dili.

2. Amaral, J. (2010). Current Fisheries and Aquaculture Policies Relevant to the Regional Fisheries Livelihoods Project (RFLP) in Timor-Leste. Bangkok: Regional Fisheries Livelihoods Programme for South and Southeast Asia (GCP/RAS/237/SPA) Field Project Document.

3. AMSAT Int. (2011b). Fish and Animal Protein Consumption and Availability Survey in Timor-Leste (Vol. 1, p. 124). Bangkok: Regional Fisheries Livelihoods Programme for South and Southeast Asia (GCP/RAS/237/SPA). Field Project Document 2011/TIM/02. 3.

Introduction

Bringing in the catch

Fisheries Livelihoods Programme (RFLP) in the six countries of South and Southeast Asia in which it operates have all been tailored to local conditions and contexts.

For example, in Viet Nam fisheries associations have been established or strengthened. Meanwhile in Sri Lanka a variety of stakeholders - from environmental agencies to female members of fishing communities - have been involved in newly formed co-management committees for the first time to ensure a more comprehensive and inclusive approach to the management of resources.

Likewise in Timor-Leste, RFLP has undertaken an approach that takes into account the local context.

Becoming a sovereign nation in 2002, Timor-Leste's relatively new institutions of state face considerable challenges with regards to management of marine resources. High amongst these has been the almost total lack of data pertaining to the fisheries sector upon which management decisions or policies can be based.

Co-management practice can be defined as a partnership arrangement in which government agencies, fishers, non-governmental organizations, and other stakeholders (fish traders, boat owners, business people, etc.) share the responsibility and authority for fisheries management.[4]

There is no 'one size fits all' approach to co-management and actions undertaken by the Regional

For this reason, the main focus of RFLP's co-management related activities has been on increasing the capacity of the National Directorate of Fisheries and Aquaculture (NDFA) and its staff to gather and manage fisheries-related data. This has seen the establishment of a National Fisheries Statistical System – a first for Timor-Leste.

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4. Pomeroy, R.S. and Rivera-Guieb, R. (2006). Fishery Co-management, A Practical Handbook. Oxfordshire, UK: CABI Publishing.

Celebrating the launch of the National Fisheries Statistical System. From left Mr Lorenco Borges Fontes, Director General of the Ministry of Agriculture and Fisheries; Mr Francisco Carceres, Minister of Justice; Mr Marcos da Cruz, Vice Minister of Ministry of Agriculture and Fisheries; Ms Laura Soriano, AECID representative; Mr Armindo do Santos representing the Ministry of Finance; and Enrique Alonso, RFLP advisor.

A key part of this process has been enhancing the relationship between the NDFA and the fishing communities it serves. Most data gathering activities undertaken have provided clear and tangible benefits to communities involved and this 'give and take' approach has helped the NDFA to gain the trust of fisher communities and to forge far closer (and hopefully long-lasting) relations with local communities.

The implementation of resource co-management activities at community level has also been tailored to local context. While in Viet Nam or Sri Lanka the creation of fisheries associations or committees to co-manage local resources is a viable option, in Timor-Leste it is less so.

Although past attempts to form fishers groups or cooperatives in coastal villages have been made the results have been generally unsuccessful. Often these bodies were formed primarily to facilitate donation of fishing gear to fishers by government ministries. These bodies also tended to be alien to the deep seated social structures and traditions of Timorese communities and hence were not effective as management mechanisms. Those which did succeed tended to be those which were more in tune with local culture.

Therefore, rather than seeking to form new fisher groups or organizations with a high likelihood of failure, RFLP instead recognized the importance of indigenous practices known as *Tara Bandu*. These traditional laws regulate relations between people and groups as well as between people and the environment.

RFLP has worked with a community in a pilot to document these laws in written form and to advocate for their recognition by the government. Innovation has also been added to these traditional practices by mapping *Tara Bandu* areas on Google Earth maps.

Information on these initiatives is detailed in this publication along with the testimony of those from the government, RFLP and communities who were involved.

While considerable challenges still exist relating to the management of Timor-Leste's marine and coastal resources it is hoped that RFLP's actions have helped provide a foundation upon which further progress can be made.

The potential for sustainability and replication is high, however this will require the continual commitment and efforts of the NDFA, communities and donors alike.

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Establishing a National Fisheries Statistical System

RFLP has worked closely with the National Directorate of Fisheries and Aquaculture (NDFA), and particularly the Fisheries Inspection Department, helping enhance its capacity to gather fisheries-related information and to create a National Fisheries Statistical System. These activities are mainly community-based and have seen NDFA staff build closer relationships with fishers around the country. In order to safely store data and to facilitate information sharing and transparency a website for the National Fisheries Statistical System www.peskador.org was established with RFLP support. This is expected to become an important tool contributing to enhanced fisheries management and sustainability of marine resources, as well as giving increased transparency within the fisheries sector.

What species? How much? What price?

The benefits of fisheries data availability

Better availability of reliable fisheries data will facilitate and support:

- Fisheries resource management and planning;
- Investment in fisheries sector;
- Better understanding of the fisheries sector;
- Research by other institutes or partners;
- Enhanced safety for fishers and fishing communities;
- Search and rescue operations;
- Increased transparency; and,
- Better trust and relationships between fishers, local authorities and fishery officials taking part in data gathering activities.

The challenge: A lack of fisheries-related data

Prior to RFLP, little fisheries-related information was being collected or stored in Timor-Leste in any systematic manner. Those departments and donor funded projects within the NDFA that did undertake information gathering usually stored data on individual computers with no backups. As a result, data was lost due to viruses, computer failure and theft. The isolated nature of the various databases also resulted in little information sharing taking place and few management decisions being made based upon it.

Information gathering and dissemination

With RFLP support, staff of the NDFA have undertaken a variety of data gathering and dissemination activities.

- **Community-based IUU reporting** - A pilot community-based illegal, unreported and unregulated (IUU) reporting initiative has seen fishers equipped with personal GPS locator beacons. These can be used to both report IUU fishing as well as to call for assistance in case of emergency.

- **Mobile licensing service** - A mobile licensing service saw NDFA staff travel to all 11 districts in Timor-Leste registering and/or licensing almost every fishing vessel in the country.

- **Fish catch monitoring** - District fisheries officers are regularly travelling to landing centres in their districts to weigh and identify fish that have been caught and to calculate a dollar per kg price.

- **Accident at sea reporting** - Reports are being collected of accidents at sea and crocodile attacks.

- **Fishing patterns/Bathymetric data** - Data is being collected from GPS sounders (fish finders) attached by RFLP and NDFA to artisanal boats.

- **Community mapping** - Fishers and NDFA staff have worked together to gather data and map areas of interest in communities such as where illegal fishing takes place, where crocodiles are found, areas of tourist interest, etc.

- **Creation of www.peskador.org** - The peskador.org website was established as the public entry point for fisheries related information in Timor-Leste.

- **Dissemination of information on fishing regulations** - NDFA visited the communities to inform fishers and to create awareness of fisheries regulations and the upcoming visit of the mobile licensing service.

Both NDFA staff and fishers were trained in data gathering techniques

Creating local capacity to gather data

Building the capacity of government staff and communities to carry out data gathering activities has been a major priority for RFLP.

RFLP has helped train and work with NDFA staff, so that they are able to collect data from the field, enter it into the online system and carry out analysis of the results.

RFLP's five District Field Managers who were seconded from the NDFA were initially trained to undertake this task. They then passed on these skills to the NDFA's District Fisheries Officers, so that they could gather data themselves.

Both the district field managers and district fishery officers were equipped with basic equipment including a geo-referenced camera, digital weighing scale, laptop and a 3G aircard for Internet access.

With the completion of RFLP, some District Field Managers have returned to the Department of Fisheries Resource Management where they are now helping to build the capacity of other department staff.

In addition to 'hard' skills efforts have also been made to boost interaction between government staff and communities. By helping create better relationships between the NDFA and fishers and by carrying out activities in a participative manner the effectiveness of local training activities has been increased. Information gathered has also been fed back to communities by district fisheries officers.

As much as possible, capacity building actions have also involved 'on the job' training. Skills learned in the classroom have almost immediately been put to use in the field, while on-going mentoring has also been provided.

Capacity building for government staff has included:

- Training for NDFA staff to better understand fisheries regulations;

- Training on community data gathering techniques;

- Data input and database management;

- Using GPS cameras;

- Gathering catch data;

- The use and installation of GPS sounders;

- Use of personal locator beacons for IUU reporting and tracking;

- Checking the quality of data;

- Mapping and image analysis;

- Presenting data to the public;

- Reading and interpreting weather forecasts; and,

- Website management.

Feeding back information to fishers at the landing centres

Capacity building for fisher communities has included:

- Installation of GPS sounders;

- Navigation using GPS sounders;

- Potential consequences of use of GPS sounders (e.g. over fishing);

- Understanding the importance of data collection; and,

- Use of personal locator beacons for IUU reporting and reporting emergencies at sea.

www.peskador.org

The National Fisheries Statistical System for Timor-Leste and its public interface – www.peskador.org – were publicly launched on 14 June 2012. This website provides access to a wide range of statistical and environmental information relating to fisheries in Timor-Leste.

The system contains both primary data collected by NDFA staff in the field, as well as relevant information from other sources. The majority of information in the system is available to the public, although access to certain parts such as data files or information on IUU fishing is restricted to NDFA staff and relevant institutions such as the marine police.

The peskador.org website

Fisher census data entered into a Google Earth map available on the National Fisheries Statistical System

Segments of www.peskador.org

Publicly available information on the National Fisheries Statistical System for Timor-Leste includes:

- Boat census data gathered by the Fishery Inspection Department that gives a description of vessels, where they are based and who operates them. Also available are geo-referenced photos of the fishing boats showing their registration number and owner, which can beviewed on Google Earth;

An online map showing the locations of crocodiles

Crocodile attack	
Data	: 2012-02-19
Fatin	: Cova Lima
Latitude/Longitude	:
Detailu	: Fatal) - A female individual was attacked and killed by a saltwater crocodile (Crocodylus porosus) while net-fishing chest deep in water at Hasan Foun in Salele at approximately 11:25 am. Three of the victim's relatives witnessed the crocodile drag her underwater for 15 minutes before finally surfacing. Her brother managed to retrieve her body from the crocodile's mouth. The crocodile responsible was estimated to be 5 meters (16.5 feet) in length. (Source- Mark Korsten pers. comm.)

A report of a death caused by a crocodile

- Data on accidents at sea or in coastal areas gathered from the reporting system established by the NDFA, RFLP and Maritime police;

- Maps showing community based information relating to fisheries and the marine environment;

- Live maps showing fishing grounds, dangerous areas and fishers' movements collected through a bathymetric survey using GPS sounders;

Tipo/Species	Presu/Price	Unidade/Unit
Biji nangka, Tia enu mau	2.86	kg
Loloi metan fatuk, Rongkador, Pateka, Lono parami	3.57	kg
Jaringi fatuk, Sarangigi, Kamera, Kinalara, Hara mera	4.08	kg
Daun, Farde, Basarus	2.56	kg

Fish catch price data

- Daily information on the price of fish by species and location as well as catch data and the number of boats fishing;

Information about individual communities

- Maps showing aquaculture areas, mangroves etc;

- Weather information such as wave heights, water temperatures, tides and current data. This is shared with fishers by the district fisheries staff who display the information on notice boards at fish landing sites;

A restricted area of the site includes:

- Live maps and data on fishing grounds, incidents of reported illegal fishing; and,

- Complete data sets of information gathered.

Data input

Although certain data can be uploaded directly from the field, the majority is entered in NDFA headquarters in Dili. The Fisheries Resources Management Department enters the information collected on fish species. It also enters and updates live maps and relevant information on the database such as new policies, fisheries-related laws and regulations. The Department of Fishing Industry enters data on the types and quantity of fish products imported and exported. Meanwhile, the record of data logged helps managers to assess the performance of individual staff members, both in the field and at head office.

Data security

Data entered into the National Fisheries Statistical System is saved online in a secure commercial server. This takes advantage of the backups offered by

NDFA staff have been trained to input data to the National Fisheries Statistical System

commercial servers that almost totally removes any possibility of data being lost.

Restricted data

Certain data in the restricted area (such as the database files) is available to organisations upon request. It is hoped that this will help forge relationships between the NDFA and universities or research institutions who may wish to make use of data collected.

If field managers are spending hours a day uploading data it is going to be a big problem

"The www.peskador.org website is just a tool. It is an entry point. We needed to avoid this being an empty deliverable so it was important to design a site that works well."

An NDFA official shows fishers data online

"Bandwidth in Timor-Leste is very limited and common Content Management Systems such as Drupal or Joomla are simply too slow."

"Speed is important as we are asking field managers to enter data for about one hour per day. This works out at about 15 seconds per entry. In the field the Internet coverage is very thin. If field managers are spending hours a day uploading data it is going to be a big problem. As a result we decided to design the site using the open-source PHP language."

RFLP's Crispen Wilson

Creating awareness and understanding of Timor-Leste's fisheries laws

The National Directorate of Fisheries and Aquaculture (NDFA) of Timor-Leste in partnership with the Regional Fisheries Livelihoods Programme (RFLP), has carried out a series of activities to help both government staff and fishing communities gain better awareness and undestanding of fisheries-related laws and regulations. This activity has been especially important with regards to creating understanding amongst communities of the need for their boats to be registered and/or licensed.

He knows how to fish, but does he know the laws?

The challenge: a lack of awareness and understanding

With high levels of illiteracy in Timor-Leste and the fact that many fishers live in remote coastal areas with poor access to transportation, few living in coastal communities have ever had the chance to learn about the fishing regulations that should govern their activities. For example what kind of nets or fishing gears they are, or are not allowed to use. The NDFA had made previous efforts to raise awareness amongst fishers however fishers needed to travel to the events and as a result very few could take part.

Compounding the problem was that fisheries officials themselves often could not understand the laws that they were supposed to enforce. Timor-Leste's fisheries legislation was written originally in Portuguese, which although one of the country's official languages is not widely spoken. It was then translated into the local Tetum language. However as there are no Tetum words to describe certain concepts a number of terms remained in Portuguese or were directly (and not very clearly) translated. As a result, the exact meaning of the legislation was often unclear.

Making legislation understandable

To help NDFA staff increase their understanding of current laws regulating fisheries in Timor-Leste and make them more aware of their role and responsibilities, RFLP worked with local NGO Empreza Di'ak to produce a Tetum glossary of concepts included in the current fisheries law. This was produced in close collaboration with those who will use it. Some 25 NDFA officials from the Departments of Fisheries Industry, Aquaculture, Inspection, and Fisheries Resource Management helped identify the key terms causing confusion concerning language or meaning.

Building awareness amongst communities

Following on from their own capacity building exercise, NDFA staff carried out a series of visits to coastal communities in all 11 coastal districts with the support of RFLP to boost awareness of fishers on relevant regulations. A key area discussed with fishers was NDFA's initiative to register all Timorese fishing boats, since for this initiative to be successful it was vital that fishers understood their rights and obligations and knew how to prepare. Response from the community, fishers and local leaders regarding the pre-sentations given by the NDFA staff was positive. The timing of the awareness raising visits to communities was also coordinated, so that the mobile licensing team would visit the community very shortly afterwards and the community would be ready to receive them.

NDFA staff explain the rules to a fishing community

In addition to funding the work of Empreza Di'ak to provide capacity building for the NDFA officers, RFLP also equipped the mobile teams with basic equipment including a generator, laptop, printers, projector and camera.

From October 2011, the five-person dissemination law team travelled to 162 fishing centres. A total of 1,729 participants attended the sessions which took place in each fishing centre of all Timor-Leste's 11 districts. The final event took place in Dili district in October 2012.

The result of this dissemination effort was very positive as the subsequent visits by the licence team successfully registered 3,113 boats and issued 1,330 licences.

Benefits for fishers of dissemination activities

- Greater awareness of fisheries related laws and regulations that may impact on them;

- Greater awareness of the need for fisheries management;

- Greater understanding of the benefits of registering/licensing boats;

- Time and money saved by not having to travel to Dili to register their boat;

- Better able to prepare themselves for the visit of the mobile licensing team; and,

- Better able to discuss issues directly with NDFA staff.

Benefits for government

- Better able to build relationships with communities;

- Better able to understand fisheries regulations as well as confidently discuss them with communities; and,

- Better able to create awareness and understanding of the need for registrations/licensing and hence ensure success of follow up visit by mobile licensing team.

Timor-Leste officials gain better understanding of fisheries laws

Fernando da Silva

Officials in Timor-Leste's National Directorate of Fisheries and Aquaculture (NDFA) are now more confident about explaining fisheries laws to fishers following training provided by RFLP.

One of the main problems facing fisheries officials is actually being able to understand the laws that they are supposed to enforce.

To help overcome this obstacle, RFLP worked with the local NGO Empreza Di'ak to produce a Tetum glossary of concepts included in current Timor-Leste fisheries law, as well as to explain them to officials that interact with communities.

"The law is written in Portuguese and some technical words were very hard to communicate," explained Mr. Fernando da Silva, Chief of the resource management section at NDFA. "For example we could not explain fishing gear terms such as 'purse seine nets',"

"I learned a lot of information about fisheries laws from Empreza Di'ak as they gave us very short and very clear explanations."

"Now I have learned a lot more about the different legal articles and am much more confident to explain them. I understand now how resources relate to the articles and can answer questions from fishers relevant to their activities."

"I went to two districts and explained the laws to fishers. There were many questions from participants, but I could respond very well," he said.

Mr. da Silva's comments are mirrored by Mr. Lourenco dos Reis Amaral, Interim National Director for Fisheries.

"We can all read the laws okay, but it is not always easy to understand. Some terms we cannot translate. We needed time and training to understand the content (of the laws). Not just the technical parts but also the judicial points," he says.

"For example when we are talking about mesh size the term 'Polygata' which means one inch is used. Fishers cannot use a mesh size smaller than one inch and so it is very important that we understand the exact meaning of this term."

"Before we were always trying to find out what the difficult words really meant, but as a result of the training NDFA staff now have a much clearer idea of the law."

"Some of the staff are now disseminating the law to fishers. Training has made us much more confident. We now know more and can inform everyone."

Lourenco dos Reis Amaral

Community data gathering

Noting key community features on a map of the coastline. The map is passed from community to community to complete it.

While visiting fishing communities to create better awareness and understanding of fisheries-related laws and regulations NDFA staff also took the opportunity to gather other information from communities that may be useful for managing fisheries resources as well as future community development. This was the first time any data had been collected at the community level.

The team listened to community concerns including conflicts over fishing grounds and noted whether any traditional rules had been established to mitigate them. The team also took with them a large map of the coastline printed with images taken from Google Earth. This generated consider-

able interest amongst the fishers as it was the first time many of them had seen their communities and coastline from the air.

Community members marked on the map points of interest or concern such as where traditional *'Tara Bandu'* laws were in place, if there was illegal fishing, where crocodiles were found or where livestock had gone missing, upwellings, hot springs or even where whales or dolphins could be seen at certain times in the year. These maps were then uploaded to the National Fisheries Statistical System www.peskador.org where they are publicly available in the live maps section. The information was also given back to the communities.

> **This was the first time any data had been collected at the community level.**

Filling in the blanks at community level

"There was a real weakness in Timor-Leste when it came to information at community level. Data simply didn't exist. We decided to print out some really big maps from Google Earth and find out what communities thought was interesting. Fishers had never seen anything like this before and we started to get them thinking about what happened in their local area. For example had they ever seen any illegal fishing? Were there any accidents at sea? Any disputes over fishing grounds?"

Mario Pereira with a completed community map

"The fishers were happy to tell us what was happening and started to give us information… livestock had gone missing and was probably eaten by crocodiles in this area, illegal fishing took place in this area etc. Now the maps have been uploaded on Google Earth and are publicly available on the www.peskador.org website."

"We found that on the south coast most estuaries have crocodiles. Meanwhile, we mapped Tara Bandu in certain areas, hot springs in Atauro, places where whales and dolphins could be seen in the summer, and one location where natural gas seeps out of the ground and catches fire. This is all important data. For example, some communities may not have to fish, but could take tourists whale watching instead."

"This was an opportunistic activity piggy-backed onto the visits to communities to create awareness of fishing regulations and the boat registration effort. However it was an effective way to gather information, as well as helping the NDFA build links with fisher communities. We also wish to return copies of the maps to the communities to help give them the idea that they are the real owners of these natural resources." **RFLP's Mario Pereira**

A mobile licensing service for Timor-Leste's small-scale fisheries

A newly registered boat

Timor-Leste has completed its first ever national census of fishing vessels, an achievement which will greatly facilitate the sustainable management of the nation's fisheries resources.

Between October 2011 and October 2012, a Mobile Licensing Service visited 192 fishing centers in all 11 districts throughout the country. There they gathered information on almost every fishing boat currently operative in the country. A total of 3,113 boats were registered during the process, of which 1,330 were issued licenses.

Information on all the boats has been entered into a publicly accessible online system (www.peskador.org) where it forms a national census of fishing boats.

The challenge: facilitating an effective licensing mechanism

Provisions under the fishing laws of Timor-Leste establish the need for certain fishing boats (those with engines) to obtain a fishing license. However the process to obtain one was complex.

Fishers wanting a license would have to go to the national office of the National Directorate of Fisheries and Aquaculture (NDFA) in the capital Dili. Once there they had to fill out a complex form detailing the characteristics of the boat and details of the owner(s) and submit it to the Department of Fisheries Inspection.

When received, one member of staff from the Department needed to travel to the district to carry out an inspection of the boat. Afterwards, the owner was given a receipt which he/she had to take to the bank, make a US$ 5 payment and then return with the invoice to the NDFA. Finally, when all the procedures had been carried out the license would be issued by the NDFA.

Given the high level of illiteracy in Timor-Leste and especially amongst fishers, as well as the poor roads, limited means of transportation and long distances from most coastal areas to Dili, the number of boats legally licensed was previously very limited. Prior to RFLP licences had been issued to just eight non-commercial fishing boats with some 400 boats registered.

Although the price of the license could be met by many fishers, the procedures to obtain the license were costly and time consuming, resulting in additional loss of income from missed days at sea fishing. In addition, the data base of license information was neither securely stored, nor publicly available.

> Prior to RFLP licences had been issued to just eight non-commercial fishing boats.

The mobile licensing team

NDFA, with support from RFLP, decided to form a mobile licensing team to provide a one-stop service to make the licensing procedure simpler and more effective. This team also facilitated the gathering of a wide range of other fisheries-related data from communities.

A six-strong team was established comprising two staff in charge of boat inspection and marking, two for data gathering, one to manage the finances and one to issue boat licenses. RFLP helped equip the team with basic equipment including a generator, laptop, printers, a laminator, and geo-referenced camera. RFLP also helped the team coordinate its visits with that of an awareness raising team. This visited communities a week before the mobile licensing team and explained to communities the need for basic fisheries management to help fishers better understand the need for licensing. NDFA District Fisheries Officers also played a role in helping to mobilize the communities.

When the mobile teams visited the fishing centres, they first helped every fisher with a boat to fill out a form detailing basic characteristics such as the owner/operator's name, vessel length, year built, type/materials, fishing techniques used, etc.

Boat registration details as they appear on the National Fisheries Statistical System

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A total of 3,113 boats were registered during the process, of which 1,330 were issued licenses.

A registration number was then marked on every boat: spray painted for non-motorized canoes and with an acrylic plate for motorized boats. A photo of the boat and owner was taken with a geo-referenced enabled camera, making sure that the registration number was clearly visible.

For motorized boats requiring licenses fishers paid the US$ 5 fee and were issued a receipt. They were then helped to fill in the license application which was officially stamped and the license was issued on the spot.

On their return from the field the information gathered was entered into the National Fisheries Statistical Database www.peskador.org where it is publically available. The geo-referenced photographs boats/owners were also uploaded into Google Earth so that their exact location can be recorded and seen.

The benefits to the fishers and boat owners:

- Saves time and money as they no longer have to travel to Dili to obtain a license;

- Enhances fisher safety by facilitating search and rescue operations; and,

- By having the chance to interact with government staff, fishers can gain greater understanding of the need for fisheries management.

The benefits to fisheries planners, government institutions, natural resource managers and researchers:

- By facilitating a simpler and more effective data gathering process a far more comprehensive data set can be built comprising a variety of information on fishing boats, owners and locations;

- Comprehensive data such as the number of fishing boats, gear types used, ages of boats, etc., helps facilitate better fisheries planning and management;

- Inclusion of boat details in the central database can greatly facilitate search and rescue operations or identifying where boats may have originated from; and,

Dugout canoes with registration numbers spray painted on

- The mobile licensing team helps facilitate interaction, engagement and relationships between government and fishers.

"This is a major achievement for Timor-Leste. By facilitating a simpler and more effective process we now know how many fishing boats we have, where they are based and the type of fishing gear they use. This data will greatly facilitate better planning and management for the sustainable use of Timor-Leste's fisheries. At the same time by visiting communities the mobile licensing team has also helped build better relationships between the authorities and fishers." **Mr. Lourenco dos Reis Amaral, the Chief of the NDFA's Department of Fisheries Inspection**

National Fisheries Statistical System plays vital role in Timor-Leste rescue operations

Lourenco dos Reis Amaral checks boat registration data online

When fishers go missing or empty boats wash up on the shore it is vital to know the registration number, what vessels look like, who may have been in it and where they have come from.

In Timor-Leste, the online National Fisheries Statistical System – www.peskador.org – launched by the National Directorate of Fisheries and Aquaculture (NDFA) with support from RFLP is helping provide this potentially lifesaving information.

When two fishers went out to sea and failed to return from Liquica on Timor-Leste's north coast on 7 June 2012, Lourenco dos Reis Amaral, the Chief of the NDFA's Department of Fisheries Inspection immediately consulted www.peskador.org.

"I called the Marine Police and UN Police Maritime Advisor and told them to look on the website so they could see what the boat looked like and to be sure who the owner was. He was not on the boat, but two family members were," said Lourenco.

The fishers were later found safe in Oecusse (54 nautical miles away) after having drifted at sea for two days.

"We believe that their engine broke down and the wind and waves blew them to Oecusse. We (the NDFA and Marine Police) now communicate with each other much more. Things are now much more transparent and we can contact each other more easily. We can really feel the benefits of the website."

The system was also put to use when on 29 May 2012 when an empty boat washed up on Atauro Island.

"I contacted the UN authorities and they asked for details about the vessel. The UN helicopter pilot was on the computer searching for weather information while speaking to me on the phone and I told him how to go to the website so he could see the boat details and the photograph. This ability to see the information first hand helps us all as sometimes communication over the phone is difficult. Because we had the registration number of the boat, we knew it had come from Lautem. We also found out that it had gone to sea on 25 May, before washing up four days later on Atauro, 87 nautical miles away. However, despite the UN helicopter carrying out a search and rescue mission we unfortunately could not find the fisher."

In addition to providing vital support to the authorities when fishers go missing, the practical use of the system is also helping show fishers the benefits of licensing their vessels with the authorities.

"Without the registration numbers we would not be able to help them and would not know where the boat came from," said Lourenco. "Our district field officers have communicated this lesson back to other fishers."

> **The practical use of the system is helping show fishers the benefits of licensing their vessels with the authorities.**

A community-based IUU Strategy

A fisher with a personal locator beacon

resources. The lack of law enforcement capacity off the southern coast is well known by the foreign fishing vessels that illegally operate in this small country's waters.

Implementing a community-based IUU reporting system

To address this challenge, the NDFA in partnership with RFLP put in place a community-based IUU reporting system. The community-based IUU programme was very different from the standard vessel monitoring system (VMS) approach.

In a first for Timor-Leste, the National Directorate of Fisheries and Aquaculture (NDFA) working in collaboration with RFLP has established a community-based system for reporting illegal, unreported and unregulated (IUU) fishing. The initiative aims to address problems of both IUU fishing as well as safety at sea through the use of recently available and relatively inexpensive consumer technology.

The challenge: A lack of resources to combat IUU

As in many developing countries, Timor-Leste suffers the negative consequences of illegal fishing activity. This is mostly conducted by foreign vessels and concentrated in its southern waters, where there was a lack of enforcement capacity.

Timor-Leste is the newest country in the Asia Pacific region and the state institutions face huge challenges in managing the country's natural resources given its lack of budget and human

In the traditional VMS model transponders are placed on fishing boats that the government wishes to control. These VMS systems are typically installed on larger commercial boats that are required by law to have transponders or have purchased licenses or quotas from a country for fishing in a specific area. However, fishers have figured out ways to get around the VMS system, e.g. by turning off the system, by leaving it in port and switched on while they go to sea fishing, or by putting the VMS on their dinghy or another boat while they go fishing in a restricted area.

The community based IUU reporting system piloted in Timor-Leste seeks to create a relationship of trust between artisanal fishers and the state where the artisanal fishers were not the target of control, but were the ones controlling their resources. By recognizing their ownership of resources, they also took on responsibility for the sustainable management of fisheries resources, and built their capacity to work together with state institutions based on mutual respect and common goals.

> The community-based IUU reporting system piloted in Timor-Leste seeks to create a relationship of trust between artisanal fishers and the state.

The concept was first implemented in Aceh with the traditional fisheries authorities, the Panglima Laot, and has now been piloted and put into operation in Timor-Leste. In Timor-Leste the reporting system covers almost the entire coastline of the country and has produced both technical and policy outcomes. By receiving reports from fishers at different locations, the authorities involved in maritime affairs have had to revise their operating procedures in order to provide efficient responses and an agreement has been reached among representatives of the relevant ministries to create a joint body to deal with maritime affairs.

Data from the personal locator beacons can be tracked online

On 5 February 2013, following a presentation by RFLP staff on the system, the President of Timor-Leste Taur Matan Ruak called on the Secretary of State for Fisheries to coordinate with relevant ministries and marine forces to control illegal fishing in the Timor Sea and for consultations to take place with the Prime Minister, National Security Council and other relevant ministries in order to establish National Maritime Authority for this purpose. The IUU reporting system is also likely to be adopted as the main element of a national monitoring, control and surveillance policy for Timor-Leste.

One button to report IUU, one for emergencies

How the system works

The system is based on a partnership whereby the government loans personal locator beacons (PLB) to artisanal fishers. These devices are widely available in the consumer electronics market and are commonly used by outdoor enthusiasts. They are basically hand-held GPS tracking devices that automatically transmit their position every 15 minutes in near real time via satellite. The devices have two buttons: one (911) that is for used in the event of a life threatening or other critical emergency to notify the emergency services. The second button (ILLEGAL) has been reconfigured as a means for fishers to anonymously report illegal fishing activities.

By having these devices, artisanal fishers now have a means to call for help if they get into trouble at sea and in exchange for their enhanced safety, they have agreed to use the devices to report illegal fishing activity in their area to the relevant state authorities in near real time.

When the 911 button is pressed the device sends an emergency distress signal giving the boat's location through the same network as the emergency position indicating radio beacon (EPIRB) emergency systems used by larger boats. The international monitoring centre then sends an SMS message to the cellular phones of the head of the Maritime Police and the head of the Fisheries Inspection Department. At the same time the civil aviation authority is notified that a boat is in distress at a specific location and the national authorities are notified by telephone.

When the ILLEGAL button is pressed the system immediately alerts the head of the Maritime Police and the head of the Fisheries Inspection Department that a fisher has observed illegal fishing. The system transmits the time, date and the position of the IUU activity. The system ensures the anonymous involvement of fishers, while staff of the National Directorate of Fisheries and Aquaculture can view all this information on a map through a password-protected area of the www.peskador.org website. The Timorese authorities can then decide how to respond in a coordinated way.

Fishers learn to use the personal locator beacons

Delivering the devices, training the fishers

Several steps were taken to establish the system. A pilot phase was developed from February to July 2012 during which two boats operating in the southern waters of Timor-Leste were each loaned devices. The concept was then presented to relevant state institutions and partner NGOs working in fisheries related matters as a real working model.

Once the first results were available, questions such as "if a fisher pushes the 911 button indicating that they were in serious danger, what happens?" and

"if a fisher pushes the button to report illegal fishing, what should happen?" were raised. Relevant institutions were summoned to discuss these and to decide and agree appropriate response measures, communication lines, and operations and coordination mechanisms.

In August 2012, after the system had proved to be feasible and shown its potential, it was scaled up. An additional 14 devices were loaned to fishers located in several fishing centers throughout Timor-Leste.

Village leaders were involved in the selection of the participants from each area and all parties agreed to sign a contract describing their respective roles and responsibilities within the project. These fishers were trained on the use of the devices and provided with instructions in local Tetum language.

Operation of the system was explained, as were the benefits it could bring, and the current constraints faced by state authorities regarding emergency response. The potential consequences of inappropriate use of the devices was also discussed and stressed.

Within the National Directorate of Fisheries and Aquaculture, the Department of General Fisheries Inspection was assigned responsibility to record emergency and IUU reports and the regular updating of databases with information on fishing patterns, areas and illegal fishing hot spots.

A lesson learned during the early phase was that for IUU reporting to succeed, units need to be given to the right boats operating in areas where they are likely to encounter IUU. Fishers had said they were operating in areas where IUU fishing was believed to be taking place. However by viewing the tracking data it was clear that this was not the case and they had simply wanted to receive a unit. These units were therefore reassigned to boats which were operating in areas where IUU activities were more frequent.

> **The system ensures the anonymous involvement of fishers in reporting IUU fishing.**

First results of the experience in Timor-Leste

The following are examples of tangible outcomes to date:

- First database on illegal reports and IUU fishing hot spots created;

- The first maps with information on illegal fishing activity hot spots have been drafted and are regularly updated;

- First database created with information of the fishing patterns of local fishers and the most heavily exploited fishing areas;

- Improved communications and trust between fishers and state institutions. A new channel of communication has been opened;

- First lessons learned were when a vessel captain pushed the wrong button. He intended to report illegal fishing in the area and instead called for emergency help. The occurrence made the relevant institutions (Navy, Maritime Police, Port Authority and NDFA) discuss and agree appropriate lines of communication and more effective operational practices in cases of emergency. An agreement was reached at a technical level on more effective communication lines and the most appropriate ways of coordination in emergency cases; and,

- Communications and coordination among the relevant state institutions have been notably improved and also at the political level as a direct consequence of the new challenges posed by the introduction of the system to the institutions involved in maritime affairs. As a direct response to these challenges and based on the experience gained during the pilot phase, an agreement was reached on 19 April 2012 between representatives of the F-FDTL (Timor-Leste army), the Port Authority, the Maritime Police, the NDFA-Ministry of Agriculture and Fisheries and other Ministries involved to create an inter-ministerial body that will deal with issues of illegal fishing and rescues at sea in country.

Fisheries inspectors equipped with personal locators beacons aboard a commercial fishing vessel

Potential replication

The system is not necessarily tied to a specific brand or piece of equipment, but is more about the relationships and the motivations of the different stakeholders. As a consequence, the community-based IUU reporting system could be easily replicated over a wide range of fisheries.

So far the strategy has been implemented in two different contexts. In the first instance, the traditional authorities (the Panglima Laot in Aceh) provided units to fishers; in the case of Timor-Leste the National Directorate of Fisheries and Aquaculture (General Fisheries Inspection Department) engaged fishers directly and provided the devices as part of a larger national co-management strategy.

The system is ideal for developing countries such as Timor-Leste where there are very few patrol boats or extremely limited manpower to patrol remote sea areas. This system could be used to facilitate management of marine protected areas, marine reserves or remote areas with limited access. For example, in marine reserves where much of the illegal fishing activity is conducted by sport fishers from outside an MPA area, the ability to report in near real time provides a means where those living in the area can help enforce management plans.

The devices are widely available and are inexpensive (they can cost as little as US$ 100 each - plus an annual service fee of approximately US$ 165 per year). Furthermore their activation, maintenance and use does not need special skills. They can be purchased by internet directly from suppliers who provide the service and provide assistance to activate the units. The worldwide satellite coverage allows their use   in the most remote places, and presents a good opportunity for co-managed control of IUU fishing in developing countries.

What are the benefits?

The key beneficiaries of this approach are fishers, natural resource managers and state institutions.

The benefits to fishers:

- If they are in danger, the fisher now has a way to call for help;

- If a boat is overdue, families can contact the authorities and check where a fisher is and that they are OK;

- Fishers can anonymously report IUU without being threatened by vessels which may have weapons on-board;

- Reporting IUU becomes safer as there is no need to make any open transmission over the radio that illegal fishers may hear;

- Hand held units can be circulated between boats so that illegal fishers do not know who has one;

- Preventing IUU fishing should result in greater catch for Timor-Leste's fishers;

- If a fisher is arrested in waters of a neighbouring country, the fisher and the boat can be located and evidence will be available on where they were fishing; and,

- If a boat capsizes its last position and time are recorded and help and search and rescue services are more likely to be able to locate any missing fishers and their boat.

The benefits to natural resource managers:

- Engaging local fishers to help combat illegal fishing provides detailed information on where the fishers are going and what they are catching;

- Provides solid data upon which policies or man-management strategies can be used to address IUU;

- Starts to build trust and respect relationships with fishers, so that when management plans are discussed, agreed and implemented, the existing relationship fosters and encourages fishers to participate; and,

- Can be issued to fisheries observers working on commercial fishing vessels, allowing cross-checking against written log-books.

The benefits to government:

- A very affordable option. Units can cost as little as US$100 each (plus a yearly service fee of US$ 165 per year). Larger commercial VMS systems can cost upwards of US$3,000;

- Saves time, fuel, money, boats. Increases surveillance at very little cost;

- Increased likelihood that IUU offenders will be caught, making patrolling more cost-effective;

- Relationships and trust are built so that when fisheries management plans are implemented there is greater buy-in by fishers; and,

- Significantly facilitates search and rescue (SAR) operations by pinpointing a starting location for SAR from which a vessel and fisher may have drifted.

At the end of the day it's all about relationships

"When it comes to illegal fishing or safety at sea Timor-Leste suffers from a lack of data. There is anecdotal and incidental data but nothing hard. As a result, there just isn't enough information upon which to develop strategies."

"The main factors behind using the tracker units was increasing safety at sea, gathering IUU data and building relationships with fishers. Development organizations often do a 'stop and drop' when they never follow up or determine what is being done. What we wanted was to foster a real relationship between the National Directorate of Fisheries and Aquaculture and fishers."

Crispen Wilson with Timorese fishers

"One thing we have done which other initiatives do not usually do, is to take gear back that was not being properly used."

"During the design phase of our IUU pilot, fishers in Atauro said they went to the south where IUU fishing was most common. They were given locator beacons and we waited for two months for them to go south. But they never went and they really just wanted to be given something. So we took the units back. They were a little surprised as no one had done this before. The NDFA staff were great and explained the situa- tion logically. It was doing them no good and if the NDFA gave the units to fishers who were going south then we could stop IUU there. They gave the units back and they were redistributed to commercial boats which were travelling to the south."

*"The personal locator beacon (PSB) system is designed for adventurers and is much cheaper than commercial VMS. It is important to pick tools that fit a specific situation. But at the end of the day it's all about developing relationships." **RFLP's Crispen Wilson***

A community-based bathymetric survey

A fisher (right) receives a fish finder from RFLP, but if he doesn't use it properly he will have to give it back.

RFLP, working in collaboration with the National Directorate of Fisheries and Aquaculture (NDFA) piloted the use of GPS sounders (fish-finders) with a number of artisanal fishers to document traditional knowledge with respect to fishing in the inshore coastal waters around Timor-Leste.

The challenge: a lack of data on fishing patterns or near shore fishing areas

Very little data exists on the fishing patterns of Timor-Leste's artisanal fishers or of the areas where they fish. Without this type of information it is extremely difficult to manage fisheries resources in an effective way.

By installing GPS sounders (fish-finders) on boats it has been possible to gather information on fishing grounds, fishing patterns and seasonal variations in fishing practices. The location of obstructions and hazards to navigation has also been mapped. This will help prevent loss of income by reducing the incidence of boats or nets being damaged by underwater obstructions. In addition, records of the location of changes in sea temperature and ocean currents have been captured.

All of this data has been uploaded onto the National Fisheries Statistical System www.peskador.org. Data on fishing patterns can also be correlated with catch data gathered through other RFLP activities to develop a fairly accurate picture of catch per unit effort (CPUE).

Technology transfer

For the pilot activity depth sounders with data-loggers were mounted on a number of fishing boats. These units record location, depth and sea-surface temperature every time the boat moves three meters. The data was collected several times per week by District Fisheries Officers and sent by email to the NDFA office. Once sufficient data had been collected maps were produced and uploaded onto the national statistical system where they are publicly available.

As of February 2013, GPS sounders have been installed on six fishing boats in Dili, Bobonaro, and Atauro. These provide a cross section of data from different types of fishing vessels engaged in the various types of fishing throughout Timor-Leste.

The units cost about US$ 500 each to buy and should have a lifespan of approximately 4-5 years. In order to protect the units they were installed inside a wooden box, which also keeps the sun off the screen making it easier to read.

> **Very little data exists on the fishing patterns of Timor-Leste's artisanal fishers or of the areas where they fish.**

A series of training activities took place with the fishers, who were selected by village leaders and communities to receive the units. On-going mentoring has also been provided to ensure that fishers can utilize the units properly.

As part of the training fishers learned how to use these GPS equipped devices as a navigation tool. This benefits fishers in a number of ways. By knowing where fishing spots were they are able to reach them directly and save fuel. They were also be able to return to shore more easily in the dark or during bad weather, enhancing their safety.

From a resource management standpoint, by enhancing the capacity of fishers to find fish, to do so more economically and to return safety they were encouraged to expand their fishing range further off shore. This should in turn give near-shore fish stocks a chance to recover.

Building relationships

As with other data gathering activities carried out by RFLP in collaboration with the NDFA the bathymetric survey pilot has provided an opportunity to forge closer relationships between the authorities and fishing communities. The equipment provides clear benefits to both fishers (easier to find fish, saves fuel, enhanced safety through better navigation) as well as the authorities (sounder data). In such an environment both parties have been actively supportive of the initiative and have worked closely together to ensure that the equipment was used to its full potential and that data was delivered and utilized to make better informed fishery management decisions.

Beneficiary selection took place with the agreement of the chief of Suco (village) who had the responsibility to pick which fishers would receive the equipment. RFLP and NDFA staff explained that any recipient had to fish regularly and make the data available. This was collected roughly once a week but depended on the fishing patterns.
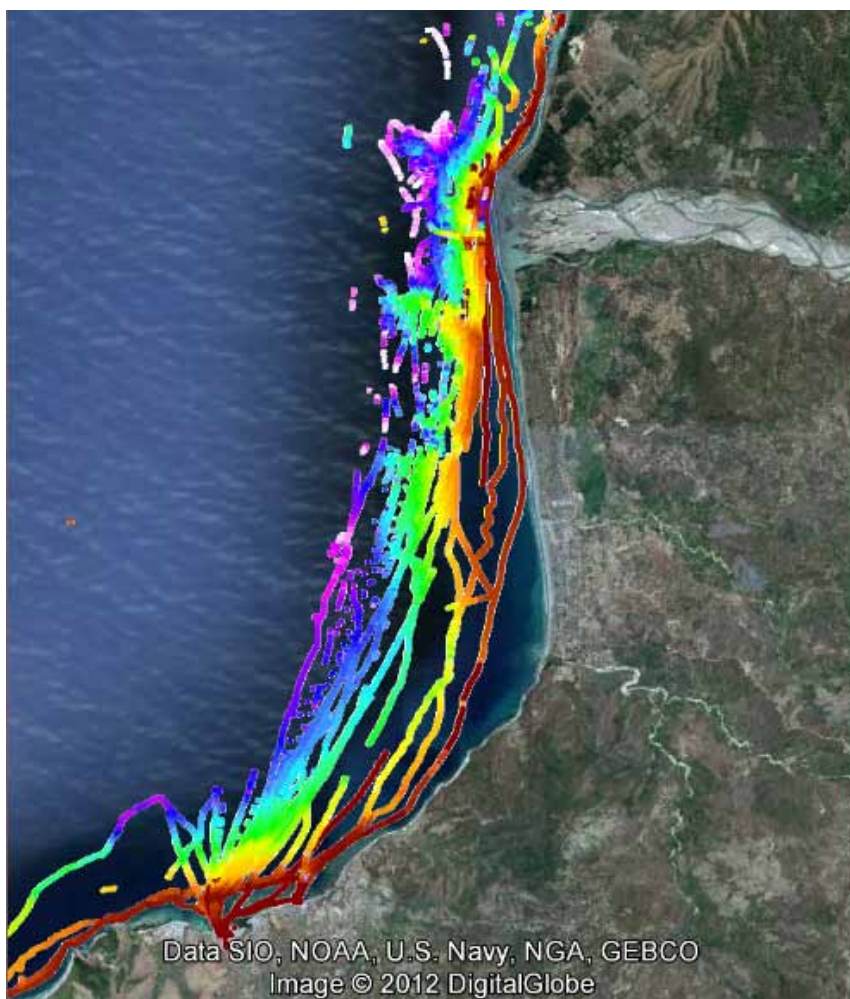
Bathymetric data as it appears on the National Fisheries Statistical System

> **The equipment provides clear benefits to both fishers as well as the authorities.**

On occasion it was necessary to threaten to remove the unit from fishers who did not make an effort to meet with the district field officer to hand over the data. Community pressure was brought to bear on these fishers by making it clear that the community was not benefitting. If necessary, units were then reassigned within the community. This was a new experience for fishers, many of whom were used to receiving donated items from donors.

Preliminary findings

Analysis of early results of data from the sounders has revealed that fishers were concentrating their efforts almost entirely on the reef areas, with extremely few fishers venturing further out.

The data also highlighted the need for reliable data gathering as it clearly showed that fishers who had said they were fishing in certain areas at certain times were not doing so. This information, which was not previously available, should lead to the development of better policies and strategies for Timor-Leste's fishery sector. The relative ease of use and affordability of GPS sounders (fish-finders) as well as the almost immediate ability of fishers to increase their catches should also help reinforce the urgency for enhanced management planning. Producing historical data series will depend on the commitment of the government to continue with data gathering once RFLP ends.

Benefits

- One-time payment only - no annual service charges to pay;

- Helps fishers locate new fishing spots, possibly further out to sea, reducing reliance on well known or over-fished inshore coastal reef areas;

Fishers and NDFA staff learn how to use the fish finders

- Can help build relationships between the authorities and fisher communities, potentially providing data for years;

- Provides solid data upon which policies or management strategies can be based;

- The growing adoption of this equipment and its impact on fishing patterns may encourage authorities to develop/strengthen fisheries management plans;

- The equipment may locate key fishing features like sea mounts, which can potentially extend EEZ coverage;

- Easy to install on almost any size boat and fairly easy to use with only limited instruction; and,

- Can be used for navigation and hence help save fuel and enhance safety.

Working with communities helps forge stronger relationships

What is irresponsible is if you give these devices without collecting data

"If you are doing a fishery management plan you need to know what fishers do. When a fisher goes fishing you can see how much effort they are making. The fish finder equipment shows the path of the boat and records every second, how far they have gone, temperature, depth, speed and course."

"In Timor-Leste fishers told us that they were fishing all over the place but the readings showed that they were only going to one spot. Meanwhile in Oecusse readings showed that fishers were not going where they said they were going or when they said they were going."

"It can be questioned why a project would provide this equipment, but these devices are cheap now. This is something that fishers will buy anyway. What is irresponsible is if you give these devices without collecting data. Don't give the units unless you have a relationship. If you provide one then someone will be able to collect hard data that helps measure fishing pressure for years to come."

"The short term risk is that fishers will get these devices and over fish a spot. They will fish until they see there are no more fish down there. This can be offset by the fact that they will also know other areas where fish are. They will expand their fishing grounds and go further offshore."

"We taught the fishers how to use these and some got it very quickly. Others thought they had a magic wand and fish would jump into the boat. Some screwed up the settings for months and would come back to ask you. However this also provides an opportunity to open a dialogue. The last thing you want is to do is give it to them and not go back."

"If every fisher in Timor-Leste uses a sounder fish stocks will quickly collapse. The use of these devices should be good motivation to make greater effort to develop management measures."
RFLP's Crispen Wilson

Gathering catch data

As part of its efforts to gather data on Timor-Leste's fisheries, RFLP has supported the National Directorate of Fisheries and Aquaculture (NDFA) to gather data on fish landings (weights and species), and prices. This information was first recorded in digital photographs and emailed to the NDFA head office to be entered into the National Fisheries Statistical System on a daily basis. In a second phase, once a database of local taxonomies was developed from primary and secondary sources, fish catch data was directly entered from the district landing centers.

The challenge: what fish are being caught where?

Little information existed on what was being caught in Timor-Leste by small-scale fishers or what prices fish were fetching in different areas. The names of species also varied considerably from place to place making accurate data gathering more difficult.

Supporting more accurate data gathering

RFLP provided training and basic equipment to NDFA district fisheries officers (digital weighing scale, laptop, and internet aircard) to gather catch data. The officers went to landing sites at least once a day in their districts when fishers returned from sea either in the morning or afternoon.

Fish in Timor-Leste are usually sold threaded onto loops known as *talin*. The officers weigh the fish and work out the per kilogram cost in the local market. Efforts were made to collect data on all species caught.

NDFA staff weigh fish at a landing centre

The local name of the fish and the price per kilogram were written on a piece of paper and a photo taken of this information alongside the type of fish caught. By using a GPS enabled camera data on the location, time and date was captured. These images were then emailed daily to the NDFA and the information used to map out fish prices on the www.peskador.org website.

> Using digital photographs rather than standard logbooks shortens the reporting period.

Using digital photographs rather than standard logbooks shortened the reporting period, as previously it took months for log books to be collected and for the data to be entered into a database.

Similar to many countries, considerable variation was found in Timor-Leste in the local names of fish. Some local names literally translate as "I don't know" or a "big one" or a "small one". And while a fish in one area may have one name, in another area the name of the same fish may be quite different. Likewise juvenile and adult fish may go by different names.

The use of photographs made it possible to collect various names of fish and to check back at the NDFA in Dili which species were in fact being caught. Google Earth was used to map where catches were taking place, while information entered into the database was used to generate graphs based on fishing centres, fishing effort, and species.

As a result, the quality of data gathered through this new method was more accurate, while the activities and performance of district field officers was also tracked by the NDFA.

Catch information gathered in the field and emailed as a photo to the NDFA in Dili

The WorldFish Centre worked in partnership with RFLP on the databases created in the first year in order to produce the initial analysis and provide on the job training to the local staff on how to 'clean the data.' This has helped ensure that data was more reliable and hence more useful.

Google Earth helps to keep exact track of what is caught where

> **Some local names for fish literally translate as "I don't know" or a "big one".**

Putting data gathering skills to use in Timor-Leste

The effectiveness and efficiency of data gathering activities carried out by staff of Timor-Leste's National Directorate of Fisheries and Aquaculture (NDFA) have been improved following capacity building provided by RFLP.

One of the key areas for which data is being gathered relates to fish landings and prices.

In order to build the capacity of the NDFA staff, RFLP conducted a series of training sessions on data gathering and entry during 2012. Amongst those who took part were Emilio Gomes and Elsa Carvalho, District Fisheries Officers (DFO) from Viqueque district and Covalima district respectively. Both felt that they benefited from the training as their data collecting efforts were now more efficient, effective and less time consuming.

"Previously I provided the fishers with a log book, pen, and weighing scale to collect the data. The fishers would then fill in the logbook

with the type and volume of fish as well as the prices they fetched every time they went fishing," explained Emilio.

"To collect data from the logbooks, I went to each fisher's house and then entered it into the computer. Once the data entry was completed, I travelled back to Dili to deliver the data to the NDFA. However I faced some difficulties as this was time consuming and sometimes the fishers did not want to fill in the logbook as they did not see the importance of the data."

"The situation is different since we received training as well as equipment such as laptops, 3G internet connections, digital weighing scales, and geo-reference cameras to gather and enter data. I no longer have to go door to door and the logbooks are no longer needed. Instead I go directly to the fishing center and gather data at the site. This makes everything much easier, while I also no longer need to travel to Dili to deliver the data as I can email it directly to the NDFA. Meanwhile when I show the data on www.peskador.org to the fishers they feel happy and enthusiastic to see it," Emilio continued.

For Elsa Carvalho the provision of basic equipment has made a big difference.

"Before RFLP provided us with equipment such as digital scales, we would only estimate the weight of fish by eye without weighing them. By using the digital scale the data we enter into the database is accurate. The system also helps fix errors if data fails to enter properly and is really efficient."

> **When I show the data on www.peskador.org to the fishers they feel happy and enthusiastic to see it.**

Harnessing the power of *Tara Bandu* to protect Timor-Leste's natural resources

A *Tara Bandu* marker

The few fisheries groups or cooperatives that have succeeded are those with a strong historical background, or those with decision making structures that were in line with local social structures.

It is these experiences that led RFLP to recognize the importance of indigenous institutions such as *Tara Bandu* and help communities revive and record their customary laws.

Looking to tradition for effective resource management

Tara Bandu are traditional laws used by communities in Timor-Leste to regulate relations between people and groups as well as between people and the environment. *Tara Bandu* restrict access to and use of natural resources and spaces and as such constitute a traditional protection and management mechanism ensuring sustainable resource use.

For example, in Aileu *Tara Bandu* prohibit the cutting down of trees to prevent flooding. Meanwhile another only allows fishing in Bemalae Lake (in Maliana) once a year giving juvenile fish a chance to grow. Sacred places are also protected, such as those where ceremonies are held to call for rain after a long dry season.

In the *Tara Bandu* process, communities set out the procedures and methods allowed when utilizing/harvesting natural resources and the penalties for those who violate them. Based upon spiritual be-

A classic co-management approach sees community groups jointly manage resources alongside government counterparts. In Timor-Leste however formal fisher groups are largely alien to local culture. Where they have been established in the past it has mainly been in order to receive hand outs from the government, NGOs or donors.

> In the *Tara Bandu* process, communities set out the procedures and methods allowed when utilizing/harvesting natural resources and the penalties for those who violate them.

liefs, "*Tara Bandu* are highly respected by Timorese communities and consequently they can be very effective in conserving common resources," explains the RFLP's Crispen Wilson.

However, although they may have long been in existence *Tara Bandu* are passed by "word of mouth" and do not exist in any written form. Consequently they are not incorporated into the Timorese legal system.

"Because they are not written down, the interpretation of *Tara Bandu* varies from community to community depending on the elders. Meanwhile, their sustainability is threatened due to their verbal nature that can only be passed on from generation to generation," explains the RFLP's Pedro Rodrigues.

Recognizing the importance of *Tara Bandu*, RFLP has worked to have these practices play a more recognized role in community resource management by helping communities document and submit them to the appropriate authorities. This initiative is in line with government policy, which sees institutions such as the Secretary of State for Environment attempting to promote *Tara Bandu*. Since Timor-Leste's legal system and law enforcement capability are still very much under development, the Ministry of Justice was also seeking to recognize the usage and enforcement of customary laws, including *Tara Bandu.*

On the other hand traditional rules are well known by communities. "By having a *Tara Bandu* written down, its interpretation can be standardized, signed documents can be kept for future reference, and enforcement can be enhanced," added RFLP's Enrique Alonso.

As a first step, RFLP's district field managers conducted interviews with elders to collect as much information as possible on the *Tara Bandu* process as well as any existing *Tara Bandu*. The location of these areas was then documented and mapped using GPS equipment. The next step was to submit the information to the appropriate governmental departments and open a dialogue, so that these

Details of *Tara Bandu* mapped on Google Earth

community-led efforts could be recognized and supported by the authorities. Information on *Tara Bandu* was collected in Liquica, Bobonaro, Baucau, and Oecusse.

RFLP work on *Tara Bandu* was very well received. In Beacou, a fishery community in Bobonaro District, RFLP assisted the local authorities to draft a written version of the *Tara Bandu*. Local leaders and community representatives were then engaged to review and improve the draft. This documents resources and areas to be protected as well as the penalties for those who break the rules. Once satisfied with the content of the written version, the community leaders and community representatives (including women members in a symbolically important step) signed and endorsed the document, witnessed by the elders/cultural leaders (*Lia Nain*).

The Beacou *Tara Bandu* was formalized on 28 August 2012 by the Secretary of State for Fisheries, Ministry Agriculture and Fisheries (MAF).

No empty threat

Proving that it is no empty threat, local authorities and the Beacou community held a traditional ceremony on 20 October 2012 to impose sanctions against five Beacou residents who had violated the *Tara Bandu* law.

"*Tara Bandu* is the basic law in the community. *Tara Bandu* indirectly assists the government in maintaining and protecting natural resources, in addition to government laws or regulations. I think

Those caught violating *Tara Bandu* must pay a penalty including food and drink for a community ceremony

this is very good and a worthy example to other regions," said Mateus Martin, Representative of Sub-district Administration of Atabae sub-district.

On 7 October 2012, five residents were found to have accidently burned down a 100 year old tamarind tree. They were grilling fish and drinking palm wine under the tree and when they went home after a few hours they forgot to put out the fire. The fire spread to the tree and at 3 o clock in the morning the tree fell and awoke local residents.

Tamarind as well as other trees such as sandalwood are protected by *Tara Bandu* law as are marine resources such as coral reefs, mangroves and turtles.

"This is the first time we have enforced *Tara Bandu* by penalizing those who damage protected natural resources. Previously we only penalized those who damaged sacred places, such as *Namon Matan*

> **Trying to introduce new fisheries regulations is not easy, and getting the fishers to comply is even more difficult. On the other hand traditional rules are well known by communities.**

and *Oho no Rae*.[5] Since we documented the *Tara Bandu* the community has started to recognize *Tara Bandu* law in earnest," said Sergio Pedroco, chief of Beacou sub-village.

Those who violate *Tara Bandu* are penalized depending on the seriousness of what they have done. They also have to hold a ceremony to make an apology, and pay the penalty for their act.

"We recognize the *Tara Bandu* law because it's a good way to protect our resources. We were drunk and when we went home forgot to put out the fire. We violated the *Tara Bandu* and must pay the price," said Buru-Bara, one of those responsible for burning down the tamarind tree.

Because this was the first time they violated *Tara Bandu*, those responsible received the first level of sanction. They had to hand over a goat, two bags of rice, two boxes of beer, two cartons of cigarettes, US$ 100 in cash, betel leaves and areca nuts to hold a ceremony and also as a symbol of their regret. At the end of the ceremony, they also presented a young pig and planted a new tree to replace the tree that burned down.

After the ceremony, all the offerings were then cooked and eaten by the community members in attendance, while the money was used to buy other ingredients to be consumed. This act symbolizes that the offerings have been received by the ancestors and that the *Tara Bandu* law will remain with them to remind them not to violate it again.

The penalty for violations of the *Tara Bandu* were set following discussion and approval from the local authorities and the community. There are three levels, with the penalties becoming progressively more severe.

"I hope this can be a lesson to others, so they don't make the same mistake. If they do, they will also be penalized," said Buru-Bara.

"I'm happy that the *Tara Bandu* has been completely implemented by the community. In the past some community members did not believe in the *Tara Bandu*. But since the Secretary of State officially launched the documented *Tara Bandu*, the community started to be more concerned about protecting resources," said the customary leader (*Lia Nain*).

Women signed and endorsed the Beacou *Tara Bandu* in a symbolic step

> **Tamarind as well as other trees such as sandalwood are protected by *Tara Bandu* law as are marine resources such as coral reefs, mangroves and turtles.**

5   *Namon Matan* is a sacred place in Beacou village where ceremonies regarding fishing and marine resources are held. *Oho no Rae*, which literally means "mountain and land" is a principal sacred place, where humans communicate with the spirits.