Marine Aquarium Market Transformation Initiative

Report on Roving Collectors

Case Studies from Indonesia and the Philippines

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Introduction

The Marine Aquarium Market Transformation Initiative (MAMTI) is a five year project funded partially by the Global Environment Facility (GEF) through the International Finance Corporation (IFC). The project, which commenced in January 2005, is managed by the Marine Aquarium Council (MAC), in partnership with Reef Check and the Conservation and Community Investment Forum (CCIF). Among the key objectives is a "transformation" of the marine aquarium industry.

Eighty-five percent of the marine ornamental organisms that are traded globally, come from the Philippines and Indonesia. These countries form part of the "coral triangle", the global center of biodiversity. However, the coral reefs here are also considered as marine biodiversity "hotspots" due to high levels of threat to marine species and marine habitats. Destructive and unmanaged collection of marine ornamentals are among the major threats to biodiversity in these areas.

These threats have a significant negative impact on the health of coral reefs and the livelihoods of fishers and their families in coastal communities. However, marine ornamentals represent the highest value-added product from these coral reefs. These products are traded through a complex global supply chain. Efforts to promote biodiversity conservation and livelihood development in the "coral triangle" must be part of a diversified strategy for responsible and sustainable management of the marine aquarium trade.

In the context of their programming in the Philippines and Indonesia, MAC, Reef Check and CCIF are:

- Promoting MAC Standards and Certification for the marine aquarium trade
- Improving post-harvest quality of marine ornamental organisms
- Establishing well-managed marine protected areas (MPAs)
- Strengthening business skills of local fishers and traders
- Building partnerships for environmental governance of coral reefs
- Creating an understanding of the benefits of market-based instruments in environmental conservation
- Integrating a global supply chain from "reef to retail"

Among the key challenges encountered is the phenomenon of "roving collectors", which was not completely understood during the project design. As roving collection represents a significant portion of the global industry, any efforts to transform the marine aquarium trade, will need to understand the nature of the phenomenon and advance creative and workable solutions.

This report is seminal, in that it represents a first systematic review of roving collection in countries that are a principal source of marine ornamentals for the global industry. Among other things, it is designed to foster a dialogue among the key stakeholders.

The report consists of an introductory section that provides perspectives on the context for standards and roving collection, including

- MAC Standards and Certification
- the nature of the phenomenon of roving collection
- key issues with respect to the application of MAC Standards and Certification, and
- the legal context within which roving collection takes place in the Philippines and Indonesia.

Three case studies have been undertaken a) Padang-Mentawai Corridor in Indonesia, b) Selayar District, Indonesia, and c) Verde Passage, Philippines. The case studies combined primary and secondary research techniques, that featured participant observation methods with roving collector expeditions by MAMTI personnel.

A final section on management options, outlines the elements of an integrated framework within which continued actions should be implemented. These options are set within the contours of MAMTI, with specific reference to MAC Standards and Certification, and are designed to increase the probability that roving collection will evolve into a more responsible and sustainable component of the marine aquarium trade.

1 The Context for Standards and Roving Collection

Indonesia and the Philippines have two of the largest coastlines and marine territories in the world. Indonesia has some 5.8 million km^2 of marine waters and Philippines 1.8 million km^2 . Both countries are considered the epicenter for global coral reefs. The "coral triangle" which extends between the Philippines, Indonesia and Papua New Guinea contains over fifty per cent of the world's coral reefs.

In both countries the marine aquarium trade started in the 1950's, with the initial collection beginning in Olango Island, Cebu, Philippines, Banyuwangi (East Java) and Northern Bali, Indonesia - three areas critical as a source of supply for the industry. A large number of exporters, roving collectors and traders come from, and work in, these locations.

There are an estimated 5,000-7,000 full and part-time marine ornamental fishers in the Philippines, and around 10,000 full and part-time fishers in Indonesia. Unlike the marine ornamental fishing trade in other countries, the marine ornamental industry in the Philippines and Indonesia uses artisanal 'low tech' and species-specific fishing techniques. These techniques feature the use of chemicals (principally cyanide) and surface supplied compressed air (usually the unsafe use of low throughput compressor). Not all fishers have financial means to purchase this equipment (large boats for long trips, appropriate compressors) or even the knowledge with respect to where and when to catch certain types of marine ornamental organisms.

This has led to the current situation in the Philippines and Indonesia where relatively few fishers know enough about the collection to maintain this as a full-time occupation. Most Indonesian collectors in both countries have no other means of income generation besides fish collection. If they do not receive orders for aquarium fish, they are reduced to catching a few food fish, which they mostly barter for other goods on the day of capture, rather than sell. Because they own no land, farming for themselves is not an alternative option. In the Philippines, the situation is roughly similar, although fishers and their families are likely to engage in multiple income-generating activities which include food fishing, sea shell gathering and handicraft production, small scale cultivation and general trading.

Specialized fishers tend to have come from the same villages and locations wherein the specialized collection information (which has not been systematically documented) is passed on through generations and families through oral transmission, or "word-of-mouth".

1.1 MAC Standards & Certification

1.1.1 Introduction

The Marine Aquarium Council (MAC) International Performance Standards outline the requirements for third-party certification of quality and sustainability in the marine aquarium industry "from reef to retail". The first three MAC Standards for the marine aquarium industry were launched in 2001, the fourth one in 2005.

The MAC Standards for the marine aquarium industry cover the entire supply chain from reef to retail. There are four (4) standards for the marine aquarium industry as shown in the table below.

Table 1: MAC standards, scope, who or what is certified and launch year

MAC Standard	Scope	Who or what is certified	Year launched
Ecosystem and Fishery Management (EFM) Standard	Coral reefs and marine ornamentals in the collection area	Collection Area Collection area managers	2001
Collection, Fishing and Holding (CFH) Standard	Harvested fish, coral, live rock and other marine ornamentals Harvesting practices Post-harvest handling	Collectors	2001
Handling, Husbandry and Transport (HHT) Standard	Handling, husbandry, packing, transport, etc. Export, import, other wholesale and retail commerce	Exporter Importer Retailer	2001
Mariculture and Aquaculture Management (MAM) Standard	Culture of marine ornamentals (fish, coral, invertebrates, live rock) Packaging and transport of cultured marine organisms	Producers	2005

1.1.2 Overview: The MAC Standards

Standards are the criteria that have been established through international, multi-stakeholder consultative process for best practices in the issues and activities covered by the topic area, such as managing a collection area, collecting and holding marine ornamentals, and handling and transport of these animals.

The requirements of each of the MAC international performance standards for the marine aquarium trade are shown in the table below:

Table 2: Key requirements under each of MAC International Performance Standards for the Marine Aquarium Trade

MAC Standard	Key requirements
Ecosystem and Fishery Management (EFM) Standard	Collection area is defined A collection area management plan (CAMP) is developed, adopted and implemented by community stakeholders Adaptive management tools (such as establishment of marine protected areas) are developed Total target catch for marine ornamentals are agreed and implemented Harvest, harvest methods and other uses of the collection area are properly documented Reef health and fish stocks are monitored Note: Compliance to these performance standards can be achieved through a phased approach over three years.
Collection, Fishing and Holding (CFH) Standard	Use of non-destructive collection methods, trained collectors in the use of non-destructive collection methods Collectors and fishers to comply with local laws and regulations with respect to marine aquarium organisms taken from the certified area Collect only what is ordered Maintain Catch Records and proper documentation. All organizations and individuals in the chain of custody from the collector or fisher to retailer will maintain a documentation of collection amounts, species, location and effort. Employ best practices in post-harvest handling Note: Compliance to these performance standards can be achieved through a phased approach over three years
Handling, Husbandry and Transport (HHT) Standard	Appropriate facilities and qualified staff Use appropriate acclimation, screening, packing and shipping methods Monitor and record mortality Water quality testing and monitoring Use chemicals responsibly (e.g. for disease control) Maintain documentation for traceability Segregation of certified organisms from non-certified

Mariculture and Aquaculture Management (MAM) Standard	Mariculture Production and implementation of Mariculture Area Management Plan (MAMP) for culturing in the natural environment Conduct of Environmental Impact and Risk Assessment for each mariculture area (both for mariculture and aquaculture) System for organism identification, traceability and records of mortality and rejects in place Natural disaster emergency plan in place Aquaculture Broodstock, post-larvae, coral fragments, etc. sourced from MAC Certified area or MAC certified culturing facility Quarantine and proper acclimation systems for broodstock, post-larvae in place System for organism identification, traceability and records of mortality and rejects in place Appropriate culturing systems and facilities for hatchery, nursery, grow out in tanks or ponds in place Employment of qualified staff and training program for them in place Compliance with appropriate components of the HHT Standard, e.g. packaging and transport of cultured marine ornamentals

1.1.3 The MAC Certification Process

The MAC certification process involves three principal stages as shown in the table below. The pre-certification stage for exporters, importers and retailers can take from one (1) to four (4) months or longer depending on the readiness of the company. The pre-certification stage for collectors and collection areas usually takes eighteen (18) months to more than two (2) years, again depending on the readiness of the collectors and their local governments.

Table 3: Stages in the MAC Certification process

Stages	**Activities**	
	For collectors and collection areas	**For exporter, importer, and retailer**
Pre-certification	1] Selection of collection areas that are potentially certifiable 2] Discussions and agreement with local government regarding provision of assistance in managing marine aquarium fishery 3] Profiling of collectors and the marine aquarium trade and biophysical profiling of	1] Client completes self-assessment questionnaire to determine compliance/non-compliance with the appropriate MAC Standard 2] Client implements corrective action on areas of non-compliance

	collection area 4] Formulation of Collection Area Management Plan (CAMP), including identification of adaptive management tools (such as marine sanctuaries) 5] Training of collectors in non-destructive collection methods, maintaining catch and shipment records and improving business skills 6] Pre-assessment visit done by MAC personnel 7] Implementation of corrective actions	3] Pre-assessment visit done by MAC personnel to ensure corrective actions were implemented
Certification Assessment	8] Certification assessment 9] Issuance of certificate (usually good for three years) if client is able to demonstrate compliance to the appropriate MAC Standards	4] Certification assessment 5] Issuance of certificate (usually good for three years) if client is able to demonstrate compliance to the appropriate MAC Standards 6] Client applies for use of MAC certification label (Refer Box 1)
Post Certification	10] Extension and annual surveillance visits	7] Annual surveillance visits

1.1.4 The Benefits of MAC Certification

Certification is a procedure by which a third party (a MAC Accredited certifier) provides independent assessment for compliance with the international standards and gives a written evaluation whether a product (e.g. marine ornamentals), process (e.g. how marine ornamentals were collected) or service conforms to the requirements specified under the applicable standard.

Achieving compliance with the MAC Standards for best practice and having this independently verified through certification benefits the collectors, their communities, exporters, importers and retailers, and the buyers of marine ornamentals in the following ways:

Benefits for collectors

- Reduced fishing effort because only those organisms that are ordered are collected
- Reduced mortality because of better post-harvest handling systems
- Reduced risk to health and safety because of training on safe diving
- Enhanced ability to track fish collected through catch records
- Increased ability to continuously improve quality of fish through shipment records

- Assured demand for certified marine organisms from certified industry operators
- Being part of a well-managed collection area that can guarantee sustainable income

Benefits for the community

- Healthy reefs and stocks
- Empowerment of collectors who are now active in the implementation of the management plan for the resource on which their livelihoods depend
- Sustainable income for a significant part of the community (collectors)
- Assured health and safety of a significant part of the community (collectors)

Benefits for the exporters, importers and retailers

- Sustainable supply of good quality marine ornamentals
- Assured demand from certified industry operators and hobbyists who demand certified fish

Benefits for buyers

- Assurance that they are buying healthy organisms caught with non-destructive methods from well-managed reefs
- Assurance that the organisms they bought were handled by responsible business organizations

BOX 1: Use of the MAC Certified Label

Certified industry operators (collectors, exporters, importers, retailers) that have been successfully assessed by a MAC Accredited Certifier as being in compliance with the requirements of the MAC Standards may use the MAC Certified Label. It use is optional from the collector to the wholesaler level, but is required at the retailer level.

The MAC Certified Label can be used in two ways: on-product use and off-product use. On-product use refers to uses of the label when associated directly with containers (eg. boxes and bags) and holding tanks containing MAC certified organisms. Off-product use refers to uses of the label that are not directly associated with containers, such as advertising, awareness-raising communications and invoicing.

Any proposed use of the MAC Certified label by a certified industry operator must receive a written approval from the MAC Secretariat. The MAC Certified label must be accompanied by the MAC Certificate Registration Code pertaining to the MAC Certificate of Registration to the relevant MAC Standard (see figure 1 for a sample of a MAC Certified label).

Sample of MAC Certification label for an importer in the UK (with MAC registration code AC01-UKIMP0001)

1.2 Definition of roving collection

Roughly ten to fifteen per cent (10-15%) of all fishers (not just those collecting marine ornamentals, but food fish as well) in both countries are mobile, following sometimes seasonal patterns wherever there is abundance of certain species. Fishing is among the last large scale hunted resource left in the world. Fishers may, for example, follow seasonal migrations of fish stocks or visit spawning aggregation sites etc.

Roving collection is defined as harvesting of marine ornamentals in areas where the collectors are not considered legal residents. The term "area" refers to a municipality (*munisipyo)* in the Philippines and district (*Kabupaten)* in Indonesia. Municipalities in the Philippines (approximate population: 10,000 to 120,000; approximate land area: 240 km^2 to 2,400 km^2) have the mandate to govern municipal fisheries. Many marine ornamental fishers in the Philippines use boats that weigh less than three gross tons, which would classify them as municipal fishers. In Indonesia, population densities are variable, as are the land areas of the various Kabupaten. In Kabupaten where there are only small islands in large areas of sea, the land area is limited, and the human populations living there are correspondingly relatively small. Although these islands are usually densely populated, and badly overcrowded) are mandated to govern fisheries within their area, but fishing can take place in any location as long as the fishers are Indonesian.

Roving collectors may be collecting legally, i.e. they are doing nothing against the fishery laws of the country; or illegally, i.e. they operate outside the law, without the necessary permit from the relevant authorities. In many cases, roving collectors have been documented paying bribes, giving a share of their catches to village elders and sharing the proceeds of their catches with other local persons in order for preferential treatment, permission and/or permits to collect in another area. Roving collectors may also establish informal "arrangements" with relevant authorities in other areas.

1.3 The issues with roving collection

Over the past few years, it has become increasingly apparent that a significant portion of the marine ornamentals collection in both countries (estimates range from 70 to 80%) is undertaken by roving collectors, and that these contribute much of the volume, variety and high end species that are traded through the global supply chain.

There are two issues related to roving collection and the application of MAC Standards:

The first issue relates to the illegal nature of this type of fishing activity. This is the principal issue in the Philippines where fishers are usually provided with a permit to fish within the municipal waters (15 km from the shore) of their area of domicile. Fishers are required to secure a permit from other municipalities if they want to collect marine ornamentals outside their area of domicile. In Indonesia, the issue is different because fishers are allowed under the "open access" system, to collect marine ornamentals in many areas (not just in their area of domicile) in the country.

Under the MAC Collection, Fishing and Holding (CFH) Standards, this practice of fishing outside of the area where the collector is legally domiciled or 'resident' and where there is an Ecosystem and Fishery Management (EFM) Certified collection area is in direct conflict with Clause 2.1.1:

> *Collectors and fishers shall comply with local laws and regulations with respect to access to and marine aquarium organisms taken from the certified collection area.*

This means that in the Philippines, roving collectors who are not given a permit by the municipalities where they collect fish are performing an illegal activity, and therefore they cannot be certified under the MAC CFH Standards.

The second issue is that roving collection creates a complication for Clause 2.1 of the MAC EFM Standards:

> *Those managing the fishery shall produce and implement a Collection Area Management Plan (CAMP) consistent with the above management principles.*

In a situation where there is roving collection, "those [who are supposed to] manage the fishery" (the area where marine ornamentals are collected) are not directly associated with those who are using or benefiting from marine ornamentals collection (the roving collectors). The area where marine ornamentals are being collected, therefore, may not have an incentive to establish and monitor catch limits, allocate a no-take zone, and implement adaptive management tools, which are key requirements of the MAC EFM Standards. In which case, the collection area cannot be certified for the MAC EFM Standards.

In cases where the collection area is outside a municipality or a district, the provision in the MAC EFM Standards on "those responsible for managing the fishery" is not entirely clear. There is no institutional personality responsible for managing the fishery, in which case a Collection Area Management Plan (CAMP) cannot be formulated and implemented, and the collection area cannot be certified to the MAC EFM Standards. In cases where law enforcement capability in the area where marine ornamentals are being collected is weak, collection remains unregulated and therefore the collection area cannot be certified under the MAC EFM Standards. In some cases, collection may lead to conflict between resident fishers who do not have skills in collection but are interested in gaining collection skills, and the roving collectors.

1.4 The legal context – a brief overview

1.4.1 Indonesia

Fishery Law No. 31, 2004 (which is a revision of Act No. 9, 1986) provides the basis for coastal and fisheries management in Indonesia. The law allows anyone to have access to coastal resources, but gives small-scale fisheries preference over large-scale fishing and other activities that create stresses on fisheries resources. The law states that the Indonesian fishers are allowed to fish within the territory of Indonesian waters for their livelihood, and are sometimes permitted to fish within national parks, which have designated zones for traditional fisheries and/or sustainable use. The authority to manage coastal and fishery resources in Indonesia is vested with the Department of Fisheries and Marine Affairs.

A current management priority is the devolution of some of this national authority over marine issues to Provincial and District governments. Many fishing communities in Indonesia support the “open access” nature of reef fisheries. Other legal instruments include the Guidelines of State policy (GBHN: Garis-Garis Besar Haluan Negara). However integration of activities between national and regional governments is not being done to an optimal level.

There are no official figures available for the number of people directly involved in ornamental fish collection and coral propagation, but there are estimated to be around one thousand collectors (and other people more recently being employed to tend coral propagation sites) in Bali. This does not include their families (who may also, be involved) and all the other people at the supply end of the trade, including the exporters. The current total population of Indonesia is estimated to be somewhere in the region of 230 million people.

The fishery in Indonesia is regulated through the issuance of a permit linked to the weight of the ship/boat. The fishing permit for a fishing boat below five (5) gross tons (GT) is issued by the fishery at district level. For ships / boats above this, the permit is issued under the authority of the fishery at provincial level.

Permits state the location where the permit holders are allowed to fish. Sometimes permits at the fishery district or provincial level state that the permit holder is only allowed to fish in certain areas (e.g. National Park, or sacred waters). Otherwise, there is no law in Indonesia that prohibits fishers from roving.

Another relevant regulation in Indonesia is Act No. 5, 1967 concerning forests, although this deals with coastal resources under the jurisdiction of protected areas within national parks. It is useful to note that Indonesia has the most extensive coastal mangrove forests in SE Asia, and these are important nursery sites for many fish and invertebrate species. However, poor management, uncontrolled exploitation for fuel and building timber, and conversion –(in many cases to shrimp- and milk fish ponds – has reduced the area of mangroves to less than half of what it was 30 years ago.

The “Adat” Law/unwritten (traditional) law in Indonesia gives traditional community rights for exploration, management, exploitation and conservation. In addition to the Indonesian Constitution of 1945, the Adat Law is recognized by Act No. 5, 1960, the Agrarian Act, which states that “the applicable law for land, water and air space is under Adat Law, providing that it does not conflict with national interests or disrupt the unity of the nation. These community rights therefore should be consistent with national interests and in accordance with written laws and regulations. This law is not, however implemented in most parts of the country, and traditional laws are largely ignored by the state.

According to recent reports, there is a substantial decline of the “Sasi” traditional rights system in some areas of the Indonesian archipelago. Formerly, Sasi worked well in regulating resource use in the eastern islands, but only as long as these island communities were relatively isolated from the rest of the world. More recently, outsiders (and particularly foreign fishing vessels) convinced local community leaders to allow them to fish the inshore resources, and the Sasi system slowly eroded. Foreign fishing fleets have paid government and/or enforcement agencies for the right to fish in Indonesian

waters. Exploitation of inshore resources by outsiders using more advanced fishing gear is another reason that local coastal fishers have decided to venture away from their areas of domicile in search of yield.

Local communities sometimes take the law into their own hands in order to protect their marine resources, and drive away fishers from outside their districts. There are reports of local communities burning the boats of roving fishers, in spite of permits having been issued to these outsiders. This reflects weak coordination between the various government agencies and the local communities. Given the absence of "official" patrols in many areas throughout the archipelago, governmental support for community enforcement could help to address this problem.

1.4.2 Philippines

The principal law that governs the management of fishery resources in the Philippines is the Philippine Fisheries Code of 1998 (Republic Act 8550). Philippine waters fall under the jurisdiction of the Department of Agriculture - Bureau of Fisheries and Aquatic Resources (DA-BFAR); while municipal waters (part of the sea 15 km from the shoreline within the boundaries of municipalities) fall under the jurisdiction of municipal governments. Municipal waters comprise about fifteen per cent (15%) of the country's marine waters, although a substantial portion (over 60%) of coral reefs is contained in these areas.

The estimated one million people (out of the eighty five million national population) directly involved in fisheries are classified into three categories: a) municipal fisheries (basically those using fishing vessels three (3) gross tons or less), b) commercial fishers (those using fishing vessels more than 3 gross tons), and c) those engaged in aquaculture. There are no reliable estimates of the percentage of marine ornamental collectors that can be classified as municipal fishers as against commercial fishers.

In some places, marine areas have 'national management status' and the Department of Environment and Natural Resources (DENR) – Protected Areas Wildlife Bureau (PAWB) has authority. This would include, for example, the Tubbataha Reef. These areas are managed under the National Integrated Protected Areas Act (NIPAS), and are outside the jurisdiction for the numerous national marine parks under the DENR in coordination with the local government unit (LGU) through the creation of a PAMB – Protected Area Management Board. It should be noted that the PAMBs are rarely functional. Collection of marine ornamentals is not allowed in these areas.

Indonesia

- Padang, Mentawai Corridor
- Selayar District

2 Roving Collectors in Padang Mentawai Corridor, Indonesia

2.1 Introduction

One of the overarching goals of the MAMTI project is to transform 21% of the Philippines and Indonesia marine aquarium trade to ecological and economic sustainability using conservation management and rehabilitation, to ensure the health of coral reef ecosystems and their contribution to poverty alleviation and food security. It is intended that this will be accomplished through adherence to the Marine Aquarium Council (MAC) Standards of Best Practice. However, the current MAC Ecosystem and Fishery Management (EFM) Standards do not permit certification of roving catch. In addition, roving collectors and supply also raise concerns with regard to organism quality and management of resources – as well as and safety issues for fishers.

Although there is no accurate data, roving collectors are estimated to represent 50-80% of the market, therefore any initiatives to transform the marine aquarium trade, must factor this into programming efforts. In Indonesia, roving collection can be classified into two distinct categories; long and short distance, as defined below:

a. Short Distance / Regular Rovers - those that rove and collect within one Province, either in their own district, or in neighbouring districts. It is generally assumed/known that these rovers frequent the same reefs, which can be identified, and then CAMPs can be developed there– either with local communities, or with the rovers themselves (examples of this include Padang-Mentawai and portions of Buleleng).

b. Long Distance Rovers – those that travel for weeks at a time to other Provinces. This type of rover likely frequents many reefs in an opportunistic fashion (even though these reefs may have a long history of collection by rovers, who have passed on information on where certain species can be found). It is generally believed that it would be difficult to establish CAMPs where these rovers collect, as they frequent so many remote reefs, including atolls and patch reefs, which are far from the nearest human habitation. (Examples of this type include some rovers from Bali to Sulawesi).

This report outlines the findings from a participatory field trip to gather data, observe and document patterns and assess the roving trade between Padang and Mentawai.

2.2 Report Objectives

The specific objectives of the field trip were to:

1. Document roving activities of collectors from Padang to the Mentawai Islands
2. Identify collection methods (it was previously thought that roving collectors tend to use cyanide for catching fish, and they may also be using other capture methods need to be better understood)
3. Fully document collection methods, diving methods and equipment, depths and times dived, screening, bagging, handling, holding and transportation methods, materials and facilities on the boats, for suggested improvements and training needs

4. Record the species being ordered and caught, together with the catch records at each of the collection sites
5. Map and log coordinates for each of the collection sites (a GPS device will be purchased for this purpose)
6. Understand whether the development of the management of collection areas on any reefs where rovers collect is possible, knowing that the collectors move from one areas to another.

2.3 History of the marine aquarium trade in Padang

2.3..1 Collection of marine aquarium organisms for trade started in 1988 around the Padang reefs, when the first trader, a local entrepreneur from Telo Island, Nias, ordered fish from local Padang collectors. In 1989, there were four traders established in the aquarium business. These traders were Che Yung, Peng Kuan, Ko Heng and Mr. Lee, who ran their businesses up until 2002.

2.3.2 The traders were originally from Singapore, and provided the collectors with operational capital to collect aquarium fish and sell to the traders, who then exported to Singapore. Some of the collectors then became local traders, and directly supplied to Singapore or to exporters in Medan, Jakarta and Bali.

2.3.3 At present there are five main traders operating in Padang named Musa, Rizal, Robert, Charles and Aulia. Two of the traders, (Rizal and Robert), own boats and employ collectors. The three other traders buy organisms from freelance collectors. The traders who own boats provide the operational costs for collection. The prices paid for the fish are determined by the traders who own the boats. The collectors do not receive any wages. The income they receive is from selling the fish to the boat owners. Both groups of traders (boat owners and non-owners) buy the fish from small suppliers, who consolidate the supply from the collectors. The prices paid for the fish are determined by the suppliers.

2.4 Roving activities to the Mentawai Islands

Roving to the Mentawai islands (on the SW coat of Sumatra, about 200 km due south of Padang) started in 1988. The collectors rove because the Mentawai reefs offer more variety and quantity of target fish than the reefs around Padang. This represents an opportunity to earn more income. The maximum time needed for a single trip to Mentawai is 10 days. The estimated net income for one roving trip (assuming 8 collectors and 1 boat captain is involved) is up to 1,200,000Rp or USD 132 (based on field data the maximum is Rp1,400,000 and the minimum is Rp600,000).

The estimated gross income for collecting on local Padang reefs (for a similar 10 day effort) is around Rp. 1,000,000 (USD 113). The collectors calculate that as the operational costs are covered by the boat owners, it is worthwhile to go roving, as the collectors do not need to pay for any costs during the 10 day trip.

The roving collectors claim that they have not used potassium cyanide to catch fish since 2004. The collectors have a written agreement with the boat owners, indemnifying the owners if they are caught using potassium cyanide.

With the recent increases in the price of fuel, the boat owners are now struggling to maintain their businesses.

2.4.1 Boat

The boat that was used for this roving trip (called the 'Mona Lisa I) weighs five gross tons, and belongs to Edward, a Padang-based trader who is a partner of Rizal. The boat originally cost Rp. 25 million (USD 2,800) and was made from wood in 1995. The 'Mona Lisa I' is 14 m long and 2.25 m wide at its widest point across the deck. It has several compartments, and includes a toilet, cooking area, front deck, roof decking, and an engine room (the hold below deck) where the fish are stored. According to the captain, the boat is strong enough to withstand rough seas.

The speed of the boat is 10 nautical miles per hour, with a FUSO PS in-board engine, 100 PK/horsepower. The boat is equipped with three 10-amp batteries to provide lighting during the night.

2.4.2 Safety issues

There was no safety equipment available on the boat. The mobile phone, maps, a GPS, a first aid kit box and one life vest, all belonged to the survey team. There was no radio or fire extinguisher available on the boat. The only tool they had for navigation was a compass.

2.4.3 Permits

The captain paid Rp. 10,000 (USD 1.10) for a boat license, issued by the Harbour Master in Padang. The collecting permit was obtained from the Padang Fisheries District, and represents a fishing permit specifically to fish in the waters off Padang. The type of fishing permit issued for collection depends on the tonnage of the boat. The fishing permit for a boat less than 15 gross tons (GT) is issued by the District or City Council. A fishing permit for a boat weighing more than 15GT is issued at the provincial level. The boat does not have a fishing permit to fish in the Mentawai district. A collecting permit needs to be issued at the Fisheries Service - Mentawai District level.

On arrival at one of the small towns in the Mentawai islands, the captain reported to the local harbour master, and paid him Rp. 20,000 (USD 2.20). The captain also paid Rp. 20,000 (USD 2.24) to the village Head for permission to collect marine ornamental fish in the area.

2.4.4 Collectors

The collectors, who are based in Padang, originally came from other areas in Java, such as Pulau Seribu, West Java. These collectors roved to Padang from Java some years ago. They finally settled in Padang and married local women.

These collectors now rove to the Mentawai Islands and other islands along the SW coast of Sumatra, including Nias and Simelue.

Table 4: Names of the Padang-based collectors who went roving to Mentawai Island.

Nu.	Name	Origin	Age	Role in the boat	Number of years spent roving	Collecting tools	Species Speciality
1	Adnan	Padang	46	Captain & Collector	21 years	Net, scoop net ,Karamu Net	Powder-blue Surgeonfish
2	Herman	Padang, Air Manis	37	Group leader /Collector	5.5 years	Net, scoop net, Mosquito net	Powder-blue Surgeonfish, Clown Anemonefish , Spinecheek Anemonefish , Red saddleback Anemonefish
3	Jaya	Serang, Banten	42	Collector	21 years	Net, scoop net, Mosquito net	Spinecheek Anemonefish , Blue-face Angelfish, Powder-blue Surgeonfish
4	Edi	Gunung Sitoli, Nias	32	Collector	2 years	Net, scoop net, Mosquito net	Clown Anemonefish
5	Johan	Kepulauan Seribu	35	Collector	17 years	Net, scoop net, Mosquito net	Emperor Angelfish, Bluespotted Hind, Spinecheek Anemonefish
6	Anton	Kepulauan Seribu	34	Collector	17 years	Net, scoop net, Mosquito net	Clown Anemonefish , Red saddleback Anemonefish
7	Fajar	Mentawai	23	Collector	2 years	Net, scoop net, Mosquito net	Powder-blue Surgeonfish
8	Amsal	Padang, Air Manis	21	Collector	2 years	Net, scoop net, Mosquito net	Powder-blue Surgeonfish
9	M. Jalis	Padang	49	Cook		Did not collect fish	-

2.4.5 Equipment and tools available for roving

There were five oxygen bottles, each with a capacity from one to six kilograms. Various sizes of plastic bags for fish, 8 units of nylon netting, (each set with a length of 12 m and a width of 0.5 m), three nets made from mosquito netting, 8 scoop nets, 13 plastic bowls and 8 small holding containers. Other supplies for the 10-day boat journey (9 people) included:

- 630 liters of diesel
- 5 liters of oil
- 35 liters of kerosene (for cooking)
- 25 kg sack of rice
- Other food (vegetables, noodles, cooking oil, sugar, tea, coffee, and fresh water

- Medicines for colds and headaches, malaria tablets, "betadine", and plasters

During the trip the roving collectors fished for food by using long lines while the boat was moving.

2.4.6 Collection Areas

The Mentawai islands are known as collection areas for powder blue tang (Acanthurus leucosternon) and Spinecheek Anemonefish (Premnas biaculeatus). The collectors are rovers who come from outside the Mentawai islands. The local people of Mentawai are known to be farmers. It was reported that there are a few collectors living on one or two of the islands, but these collectors all originally came from Padang.

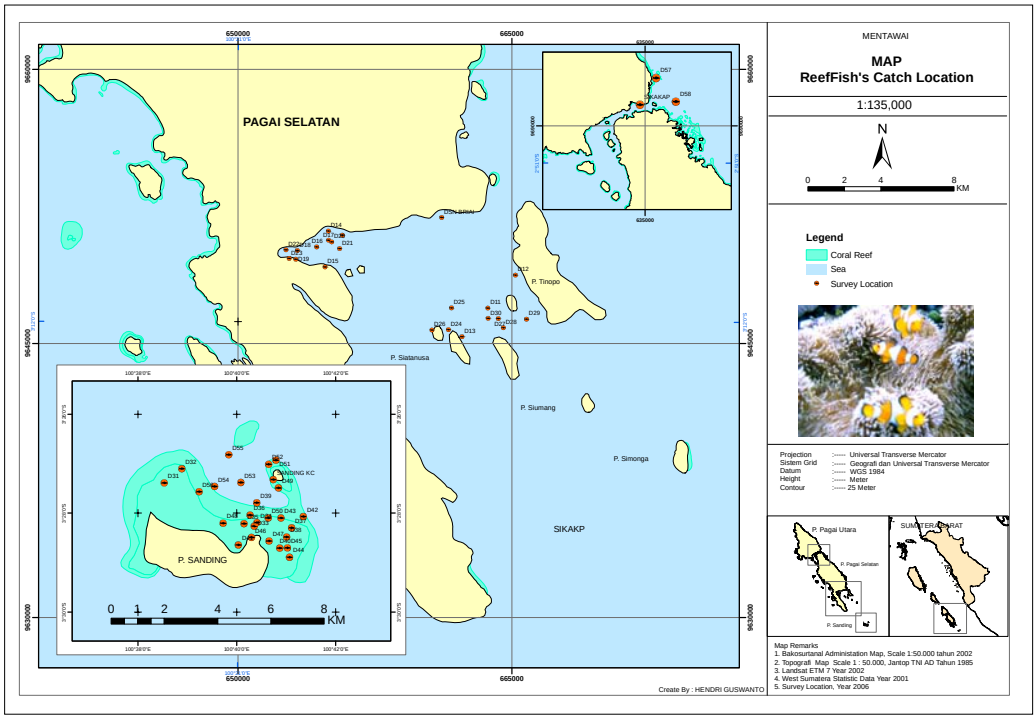

Figure 1. Mentawai Roving Map

The roving collectors who have been collecting in the Mentawai Islands have noticed that there has been a decline in the population of the major two target species, the powder blue tang and the Spinecheek Anemonefish. Powder blue tangs were originally seen in groups of 500 fish at one time. Nowadays the collectors only see between 50 to 100 fish in one school. The collectors also state that the Spinecheek Anemonefish and the anemone in which it lives, are now noticeably less common, as these two organisms have been heavily collected.

Table 5: Collection areas in Pagai island (south side)

Code	Collection site	area
D11	Gosong Besar	Tanjung Buriai
D12	P. Tanopo	Tanjung Buriai
D13	P. Pacebla	Tanjung Buriai
D14	Gosong	Tanjung Buriai
D15	P. Sinaka	Tanjung Buriai

D16	P. x	Tanjung Buriai
D17	Gosong	Tanjung Buriai
D18	Pelabuhan Lama	Tanjung Buriai
D19	Tanjung Sinaka	Tanjung Buriai
D20	Gosong	Tanjung Buriai
D21	P. Bakau	Tanjung Buriai
D22	Pelabuhan Lama	Tanjung Buriai
D23	P. Bakau	Tanjung Buriai
D24	P.x	Tanjung Buriai
D25	Gosong Panjang	Tanjung Buriai
D26	P.x	Tanjung Buriai
D27	Gosong	Tanjung Buriai
D28	P. Pasir	Tanjung Buriai
D29	P. x	Tanjung Buriai
D30	Gosong	Tanjung Buriai
D31	Gosong	P. Sanding Besar
D32	Gosong	P. Sanding Besar
D33	Gosong	P. Sanding Besar
D34	Gosong	P. Sanding Besar
D35	Gosong	P. Sanding Besar
D36	Gosong	P. Sanding Besar
D37	Gosong	P. Sanding Besar
D38	Gosong	P. Sanding Besar
D39	Gosong	P. Sanding Besar
D40	Gosong	P. Sanding Besar
D41	Karang Tepi	P. Sanding Besar
D42	Gosong	P. Sanding Besar
D43	Gosong	P. Sanding Besar
D44	Gosong	P. Sanding Besar
D45	Gosong	P. Sanding Besar
D46	Gosong	P. Sanding Besar
D47	Gosong	P. Sanding Besar
D48	Gosong	P. Sanding Besar
D49	Gosong	P. Sanding Kecil
D50	Gosong	P. Sanding Kecil
D51	Gosong	P. Sanding Kecil
D52	Gosong	P. Sanding Kecil
D53	Gosong	P. Sanding Kecil
D54	Gosong	P. Sanding Besar
D55	Gosong	P. Sanding Besar
D56	Gosong	P. Sanding Besar
D57	Gosong	Gosong Sikakap
D58	Gosong	Gosong Sikakap

Px = the island has no name

2.4.7 Coral reefs

General habitat in the collection sites are corals and sands. The average coral cover in the collection areas is estimated at around 50%, according to team members. Pak Zakiman, the village Head of Buriai, stated that the use of potassium cyanide for collection of food fish, and the use of explosives, is still common in the collection areas by both local and roving fishers.

2.4.8 Local communities

There are approximately 36 families living in Buriai village, and 95% of the villagers are farmers, the rest being fishers who catch fish for food. They collect groupers, lobsters, sea cucumber, and shells. There are no marine ornamental collectors in this village. The local communities welcome the roving collectors, as they sometimes barter with the locals for food and diesel fuel. The local villagers allow the rovers to collect fish on their reefs.

2.5 Observations

2.5.1 The Journey

2.5.1.1 Bungus – Sikakap

On 11 June 2006 at 10 pm, the boat left Bungus Teluk Kabung, Padang City on the west coast of Sumatra. The boat traveled along the south coast of the mainland, and arrived the next day at Sikakap harbour, north of Pagai Island, in the Mentawai islands. The journey took 16.5 hours with an average speed of the boat being 6.9 nautical miles per hour. The captain reported to the Sikakap harbour master, showed all the permits, and informed him of their intention to fish in Sikakap waters.

2.5.1.2 Sikakap – Duson Buriai- Tonopo

The next day (13 June 2006) the boat traveled to the collection areas, on the reefs close to Buriai village. The journey from Sikakap harbour to Buriai took 5.5 hours, as the seas were rough. When the sea is calm the journey can be completed in 3 hours.

The collectors spent three days at the Buriai and Tonopo collection sites. The captain paid the Heads of Buriai and Tonopo Rp. 20,000 ($2.40) each, in order to fish in the waters near to these two villages. The journey from Buriai to Tonopo takes only thirty minutes.

2.5.1.3 Pulau Sanding

The next and final collection site after Tonopo was Pulau Sanding. The journey from Tonopo to Pulau Sanding took 2.5 hours. The collectors spent 5 days collecting in this area. After collecting in Pulau Sanding, the boat traveled back to Sikakap where they fished a few more days and then the boat traveled home to Bungus in Padang.

2.5.2 Collection techniques

The collectors wore long-sleeved T-shirts, pants or shorts, and balaclavas. Six collectors had masks, snorkels and fins, and wore gloves. The others wore

rubber shoes and goggles. The collectors were all free divers and dive to depths of 1 to 8 m. In addition, they use two generally different types of nets:

2.5.2.1. Barrier nets from Nylon and mosquito netting

The mesh size is 1 inch, and each net is 12 m long. They use this netting as a barrier net, laid into a U shape on the reef. One to three collectors chased the fish toward the U-shaped barrier net, and when the fish became trapped inside the netting, the collectors use scoop nets to collect the fish one by one. The fish were transferred straight to buckets underwater by scoop net before taking them on board the boat. The fish were transferred using both scoop net and hands.

The target species collected using barrier nets were Acanthurus leucosternon (Powder-blue Surgeonfish), Anampses lineatus(Powderblue surgeonfish), Apolemichthys trimaculatus (Threespot Angelfish), Pomacanthus semicirculatus (Semicircle Angelfish), Pomacanthus imperiator (Emperor Angelfish), Premnas biaculeatus (Spinecheek Anemonefish), Amphiprion clarkii (Yellow-tail Clownfish), Amphiprion ephippium (Red saddleback Anemonefish), Chaetodon falcula (Saddleback Butterflyfish), Cephalopolis cyanostigma (Bluespotted Hind), Zebrasoma desjardinii (Palette Surgeonfish), Pomacanthus xanthometopon (Blue-face Angelfish) , Naso elegans (Naso unicorn), Pterois volitans (Lionfish), Magnificent Rabbitfish), Heniochus acuminatus (Longfin Bannerfish), Forcipiger longirostris (Longnose Butterflyfish), Chaetodon ephippium (Saddled Butterflyfish), Bodianus mesothorax (Mesothorax Hogfish), Gomphosus varius (Bird Wrasse), Chaetodon unimaculatus (Teardrop Butterflyfish) , Chaetodon melanotus (Blackback Butterflyfish), Acanthurus lineatus (Lined Surgeonfish), Centropyge eibli (Eibl's Angelfish), Gnathanodon speciosus (Golden trevally), Acanthurus pyroferus (Mimic Surgeonfish), Parupeneus cyclostomus (Yellowsaddle Goatfish), Chaetodon collare (Cillared Butterflyfish) , Chaetodon oxycephalus (Spot-nape Butterflyfish), Plectorhinchus chaetodonoides (Harlequin Sweetlips), Plectorynchus orientalis (Oriental sweetlips), Chaetodon trifascialis (Chevroned Butterflyfish), Hippocampus reidi (Seahorse).

The mosquito netting was used to target Chrysiptera parasema (Goldtail demoiselle), Pseudoantias spp. (baslet) and wrasse.

2.5.2.2 Scoop net

The scoop net is used to collect clownfish. The scoop net is hand made by the collector. The collectors also collect the anemones when they collect Spinecheek Anemonefish (Premnas biaculeatus). The collection techniques used to collect anemones damage the corals, as the collectors break the substrate using hammers when the anemones move and hide between the coral branches.

2.5.3 Catch results

The collection period was eight days, and each collector approximately spent 6 hours a day collecting. The total number of species collected during this trip was 34, with a total number of 5,052 fish being caught. The dominant fish caught was the goldtail demoiselle (*Chrysiptera parasema*), with a total number of 2,050 fish caught. Clown anemonefish (*Amphiprion ocellaris*) were the second highest number caught, with a total of 1,971 fish being caught.

Table 6: List of Species Caught in Mentawai

No	Scientific name	Common/English name	Tools	Number of fish
1	*Apolemichthys trimaculatus*	Threespot Angelfish	Net	11
2	*Pomacanthus semicirculatus*	Semicircle Angelfish	Net	1
3	*Pomacanthus imperator*	Emperor Angelfish	Net	30
4	*Premnas biaculeatus*	Spinecheek Anemonefish	Net and Scoop Net	96
5	*Acanthurus leucosternon*	Powder-blue Surgeonfish	Net	554
6	*Anampses lineatus*	Powderblue surgeonfish	Net	9
7	*Amphiprion ocellaris*	Clown Anemonefish	Scoop Net	1971
8	*Amphiprion clarkii*	Yellow-tail Clownfish	Net and Scoop Net	18
9	*Amphiprion ephippium*	Red saddleback Anemonefish	Net and Scoop Net	113
10	*Chaetodon falcula*	Saddleback Butterflyfish	Net	36
11	*Cephalopolis cyanostigma*	Bluespotted Hind	Net	2
12	*Zebrasoma desjardinii*	Palette Surgeonfish	Net	11
13	*Pomacanthus xanthometopon*	Blue-face Angelfish	Net	2
14	*Naso elegans*	Naso unicorn	Net	14
15	*Pterois volitans*	Lionfish	Net	17
16	*Siganus magnificus*	Magnificent Rabbitfish	Net	1
17	*Heniochus acuminatus*	Longfin Bannerfish	Net	20
18	*Forcipiger longirostris*	Longnose Butterflyfish	Net	16
19	*Chaetodon ephippium*	Saddled Butterflyfish	Net	6
20	*Bodianus mesothorax*	Mesothorax Hogfish	Net	1
21	*Gomphosus varius*	Bird Wrasse	Net	5
22	*Chaetodon unimaculatus*	Teardrop Butterflyfish	Net	2

23	*Chaetodon melanotus*	Blackback Butterflyfish	Net	2
24	*Acanthurus lineatus*	Lined Surgeonfish	Net	8
25	*Centropyge eibli*	Eibl's Angelfish	Net	8
26	*Gnathanodon speciosus*	Golden trevally	Net	2
27	*Acanthurus pyroferus*	Mimic Surgeonfish	Net	1
28	*Parupeneus cyclostomus*	Yellowsaddle Goatfish	Net	1
29	*Chaetodon collare*	Cillared Butterflyfish	Net	4
30	*Chaetodon oxycephalus*	Spot-nape Butterflyfish	Net	2
31	*Plectorhinchus chaetodonoides*	Harlequin Sweetlips	Net	3
32	*Plectorynchus orientalis*	Oriental sweetlips	Net	2
33	*Chaetodon trifascialis*	Chevroned Butterflyfish	Net	1
34	*Chrysiptera parasema*	Goldtail demoiselle	Mosquito Net and Scoop Net	2,050
35	*Hippocampus reidi*	Seahorse	Net	1
36	*Stichodactyla spp*	Anemone	Glove	25
				5,052

2.5.4 Packing

Collectors packed the schooling (social) fish with several fish in one plastic bag (a practice referred to as "gang packing"), while the solitary fish were packed individually, each in one plastic bag. The aggressive fish were also packed individually.

They used three layers of plastic bags; the inside bag, with which the fish is in contact directly, is a new plastic bag, while the second and third layers are used plastic bags. Collectors will first re-use used plastic bags before they use new plastic bags**.** They wash out used bags with sea water before using them again.

The species that were gang packed included: Goldtail demoiselle *(Chrysiptera parasema)* and Clown Anemone fish *(Amphiprion ocellaris*). Large fish were packed individually. Large fish (more than 10 cm total length) needed relatively more oxygen than small fish, and more water for space than individual smaller fish.

Tabel 7: Species and bag sizes/numbers used. The number on the plastic label indicates the width of the bag.

No	Scientific name	Common /English Name	Fish size	No. of fish per bag	Plastic bag size (cm)	Proportion of oxygen: water in bag
1	*Apolemichthys trimaculatus*	Threespot Angelfish	S, M, L	1	20 - 25	1 : 1
2	*Pomacanthus semicirculatus*	Semicircle Angelfish	S, M, L	1	20 - 25	1 : 1
3	*Pomacanthus imperiator*	Emperor Angelfish	S, M, L	1	25 - 30	1 : 1
4	*Premnas biaculeatus*	Spinecheek Anemonefish	S, M, L	1	17 - 20	1 : 1
5	*Acanthurus leucosternon*	Powder-blue Surgeonfish	S, M, L	1	25 - 30	1 : 1
6	*Anampses lineatus*	Powderblue surgeonfish	S, M, L	1	25 - 30	1 : 1
7	*Amphiprion ocellaris*	Clown Anemonefish	S, M, L	10	25	1 : 1
8	*Amphiprion clarkii*	Yellow-tail Clownfish	S, M, L	1	17 - 20	1 : 1
9	*Amphiprion ephippium*	Red saddleback Anemonefish	S, M, L	1	17 - 20	1 : 1
10	*Chaetodon falcula*	Saddleback Butterflyfish	S, M, L	1	17 - 20	1 : 1
11	*Cephalopolis cyanostigma*	Bluespotted Hind	S, M, L	1	25 - 30	1 : 1
12	*Zebrasoma desjardinii*	Palette Surgeonfish	S, M, L	1	20 - 25	1 : 1
13	*Pomacanthus xanthometopon*	Blue-face Angelfish	S, M, L	1	25 - 30	1 : 1
14	*Naso elegans*	Naso unicorn	S, M, L	1	25 - 30	1 : 1
15	*Pterois volitans*	Lionfish	S, M, L	1	20 - 25	1 : 1
16	*Siganus magnificus*	Magnificent Rabbitfish	S, M, L	1	25 - 30	1 : 1
17	*Heniochus acuminatus*	Longfin Bannerfish	S, M, L	1	20 - 25	1 : 1
18	*Forcipiger longirostris*	Longnose Butterflyfish	S, M, L	1	20 - 25	1 : 1
19	*Chaetodon ephippium*	Saddled Butterflyfish	S, M, L	1	20 - 25	1 : 1
20	*Bodianus mesothorax*	Mesothorax Hogfish	S, M, L	1	20 - 25	1 : 1
21	*Gomphosus varius*	Bird Wrasse	S, M, L	1	20 - 25	1 : 1
22	*Chaetodon unimaculatus*	Teardrop Butterflyfish	S, M, L	1	20 - 25	1 : 1
23	*Chaetodon melanotus*	Blackback Butterflyfish	S, M, L	1	20 - 25	1 : 1
24	*Acanthurus lineatus*	Lined Surgeonfish	S, M, L	1	20 - 25	1 : 1
25	*Centropyge eibli*	Eibl's Angelfish	S, M, L	1	20 - 25	1 : 1

26	*Gnathanodon speciosus*	Golden trevally	S, M, L	1	20 - 25	1 : 1
27	*Acanthurus pyroferus*	Mimic Surgeonfish	S, M, L	1	20 - 25	1 : 1
28	*Parupeneus cyclostomus*	Yellowsaddle Goatfish	S, M, L	1	20 - 25	1 : 1
29	*Chaetodon collare*	Cillared Butterflyfish	S, M, L	1	20 - 25	1 : 1
30	*Chaetodon oxycephalus*	Spot-nape Butterflyfish	S, M, L	1	20 - 25	1 : 1
31	*Plectorhinchus chaetodonoides*	Harlequin Sweetlips	S, M, L	1	20 - 25	1 : 1
32	*Plectorynchus orientalis*	Oriental sweetlips	S, M, L	1	20 - 25	1 : 1
33	*Chaetodon trifascialis*	Chevroned Butterflyfish	S, M, L	1	20 - 25	1 : 1
34	*Chrysiptera parasema*	Goldtail demoiselle	S, M, L	10	20 - 25	1 : 1
35	*Hippocampus reidi*	Seahorse	S, M, L	1	20 - 25	1 : 1
36	*Stichodactyla spp*	Anemone	S, M, L	1	20 - 25	1 : 1

2.5.5 Water

Water for packing was taken directly from the sea. The water was replaced twice a day for the first two days - in the morning and in the afternoon. Each time, all the water in each bag/container was replaced. On the third day, water was replaced once a day, in the afternoon, and only half of the water was replaced in each bag.

The result of water quality tests showed that the average water temperature was 280C to 300C, pH was 7 to 8, and ammonia levels were 0.03 to 0.05 ppm (the ammonia level of clean seawater is 0,0 ppm). Because the collectors changed the water in the afternoon, the packing water temperature was high, when the sea temperature was high. The high temperature of the water in the plastic bags could increase the stress level of the fish, and possibly reduced the health of the fish.

2.5.6 Mortality

Fish mortality was recorded during this roving trip. Total mortality was 107 fish out of 5,052 for 18 species. The highest mortalities were among the powder blue tang (33 fish) from a total of 554 fish caught, and the Spinecheek Anemonefish (29 fish) of a total of 96 fish caught. Some possible reasons for these mortalities are because of the condition of the fish as a result of bad practices during collection, water quality in the bags, the results of gang packing, dead fish remaining in the bags for long periods before the water was changed again (24 hours max) and the bursting of bags. The bursting of bags was because of nails and splinters sticking out of the wood lining the hold (although this could be remedied using a suitably thick liner).

2.5.7 Dead on Arrival (DOA) and Rejects

Statistics for the trip are as follows:

Total catch = 5,052
Total dead 107 as a % = 2.1% of total catch
Total rejected 271 as a % = 5.7% of total catch
Total dead + total rejected =378 = 7.5% of total catch

The number of dead fish on arrival at the supplier's facility was considered low (< 5%) by the collectors. There were 3 dead powder blue tang, 2 Emperor Angelfish, and 10 clownfish.

The reject rate was high for Goldtail demoiselle (Chrysiptera parasema) (200 fish) of total 2050 fish, powder blue tang (Acanthurus leucosternon) (16 fish) of total 554 fish and 40 clown anemonefish (Amphiprion ocellaris) of total 1971 fish. The main reasons for rejection were the size being too small, and wounds on the fish. The rejected fish were thrown back into the sea behind the supplier's facility. Total reject was 271 fish.

2.5.8 Payment

The fish were directly received from the collectors by the trader who owns the boat. The roving collectors were paid only 50 % of the normal price (paid if the fish had been caught locally.). The reason for this was because the trader paid the operational costs for the roving trip. So, in effect, the trader paid some of the money in advance.

The total operational costs for 8 days roving, paid by the supplier were Rp.9,000,000 (USD 1,011). The total price of fish paid to nine collectors was Rp. 9,489,000 (USD 1,066). The collectors usually receive the payment up to four days after the trip. The collector received payments based on the total number and species of fish caught. The buying price is lower than the local market price (is around 50% discount). For example, Powder-Blue surgeonfish (Acanthurus leucosternon), local price is Rp 12.000,- to Rp. 13.000, (USD 1.35 to 1.46), but the roving price is Rp. 6.000,- to Rp. 7.000, (USD 0.66 to 0.79). The coordinator will buy all fish caught by the collectors, except for very low-priced, abundant and rejected fish. The low priced and abundant fish might still be purchased, based on the buying capacity of the supplier. There was no payment made for rejected fish.

During the roving trip, the collectors did not record the catch data. In the coordinator's holding facility, all fish caught were screened and counted. The payment was made based the fish accepted by the coordinator. The coordinator only records the total number and species of fish received from each collector.

Table8: Prices paid to roving collectors for fish caught while roving, compared to prices paid for fish if caught locally

No	Scientific name	Common/English name	Local price (Rp)	Roving price (Rp)
1	*Apolemichthys trimaculatus*	Threespot Angelfish	20.000	10,000
2	*Pomacanthus semicirculatus*	Semicircle Angelfish	5.000	2,500
3	*Pomacanthus imperiator*	Emperor Angelfish	5.000	2,500
4	*Premnas biaculeatus*	Spinecheek Anemonefish	14.000	7,000
5	*Acanthurus leucosternon*	Powder-blue Surgeonfish	40.000	20,000
6	A*nampses lineatus*	Powderblue surgeonfish	2.000	1,000
7	*Amphiprion ocellaris*	Clown Anemonefish	12.000	6,000
8	*Amphiprion clarkii*	Yellow-tail Clownfish	5.000	2,500
9	*Amphiprion ephippium*	Red saddleback Anemonefish	7.000	3,500
10	*Chaetodon falcula*	Saddleback Butterflyfish	3.000	1,500
11	*Cephalopolis cyanostigma*	Bluespotted Hind	5.000	2,500
12	*Zebrasoma desjardinii*	Palette Surgeonfish	5.000	2,500
13	*Pomacanthus xanthometopon*	Blue-face Angelfish	2.500	1,250
14	*Naso elegans*	Naso unicorn	7.000	3,500
15	*Pterois volitans*	Lionfish	5.000	2,500
16	*Siganus magnificus*	Magnificent Rabbitfish	7.000	3,500
17	*Heniochus acuminatus*	Longfin Bannerfish	7.000	3,500
18	*Forcipiger longirostris*	Longnose Butterflyfish	5.000	2,500
19	*Chaetodon ephippium*	Saddled Butterflyfish	8.000	4,000
20	*Bodianus mesothorax*	Mesothorax Hogfish	5.000	2,500
21	*Gomphosus varius*	Bird Wrasse	5.000	2,500
22	*Chaetodon unimaculatus*	Teardrop Butterflyfish	10.000	5,000
23	*Chaetodon melanotus*	Blackback Butterflyfish	28.000	14,000
24	*Acanthurus lineatus*	Lined Surgeonfish	10.000	5,000
25	*Centropyge eibli*	Eibl's Angelfish	7.000	3,500
26	*Gnathanodon speciosus*	Golden trevally	4.000	2,000
27	*Acanthurus pyroferus*	Mimic Surgeonfish	8.000	4,000
28	*Parupeneus cyclostomus*	Yellowsaddle Goatfish	80.000	40,000
29	*Chaetodon collare*	Cillared Butterflyfish	12.000	6,000
30	*Chaetodon oxycephalus*	Spot-nape Butterflyfish	5.000	2,500
31	*Plectorhinchus chaetodonoides*	Harlequin Sweetlips	3.000	1,500
32	*Plectorynchus orientalis*	Oriental sweetlips	5.000	2,500
33	*Chaetodon trifascialis*	Chevroned Butterflyfish	6.000	3,000
34	*Chrysiptera parasema*	Goldtail demoiselle	7.000	3,500
35	*Hippocampus reidi*	Seahorse	5.000	2,500
36	*Stichodactyla spp*	Anemone	14.000	7,000

2.6 Recommendations

1. The boat owner should seek a fishing permit from the Fisheries Service of Mentawai District or Fisheries Service in West Sumatra Province (Provincial level). Without a permit, this operation is illegal. They must report the catch record to the authority that issued the permit. These data can be used to manage the catch operation in the area.

2. Changing packing water should be done in the early morning or at night when the sea water is still cool.

3. Upgrade the holding compartment in the boat, to avoid cause of the bursting of the plastic bags (ie: on nails, rough surface). Use sandpaper to smooth rough edges and remove splinters, and obtain a suitably thick liner for each compartment in the hold where fish bags are stored. Construct a good floor and good roof on the boat.

4. The boat and its crew would benefit from having: a communication system, maps, first aid kit and related supplies, life jackets, tool kit, and fire extinguisher.

5. Develop a collection area management plan (CAMP) for Pagai Island, Mentawai district collection area, to avoid over-exploitation, and also to ban the use of cyanide. The management options should include a ban on destructive fishing practices in the area (ie: explosives, cyanide fishing, etc).With this management plan, the people of Pagai Island (Buruai, Tonopo and Pulau Sanding) villages might be able to manage their resources more effectively. Management will be implemented by a committee at district level, and supported at the sub-district and village levels.

6. The boat should be upgraded and equipped with a water circulation system. How this might work, (both practically and in terms of design, costs, materials availability, maintenance, spare parts, etc.) still needs to be determined.

7. Collectors could benefit from training on collection and post-harvest handling techniques. They need to be trained on how to collect specific fish, how to follow best practices when collecting and post harvest handling, and use safe diving practices.

8. Other follow-up work could include: assistance to Padang District (West Sumatra Province) to prepare and implement the CAMP document; apply the MAC training program for the roving collectors, coordinators and CAMP Committee; strengthen the data monitoring capability of the CAMP Committee, and install collection, evaluation and surveillance management systems.

Appendices

Appendix 1 DOA, DAA and Reject Data

No	Scientific name	Common/English name	Total catch	Number of DAA	Number of DOA & reject	Number of Fish bought
1	*Apolemichthys trimaculatus*	Threespot Angelfish	11	7	0	4
2	*Pomacanthus semicirculatus*	Semicircle Angelfish	1	0	0	1
3	*Pomacanthus imperiator*	Emperor Angelfish	30	5	2	23
4	*Premnas biaculeatus*	Spinecheek Anemonefish	96	5	0	91
5	*Acanthurus leucosternon*	Powder-blue Surgeonfish	554	33	19	497
6	*Anampses lineatus*	Powderblue surgeonfish	9	0	0	9
7	*Amphiprion ocellaris*	Clown Anemonefish	1,971	29	50	1,872
8	*Amphiprion clarkii*	Yellow-tail Clownfish	18	1	0	17
9	*Amphiprion ephippium*	Red saddleback Anemonefish	113	1	0	112
10	*Chaetodon falcula*	Saddleback Butterflyfish	36	4	0	32
11	*Cephalopolis cyanostigma*	Bluespotted Hind	2	0	0	2
12	*Zebrasoma desjardinii*	Palette Surgeonfish	11	1	0	10
13	*Pomacanthus xanthometopon*	Blue-face Angelfish	2	1	0	1
14	*Naso elegans*	Naso unicorn	14	1	0	13
15	*Pterois volitans*	Lionfish	17	0	0	17
16	*Siganus magnificus*	Magnificent Rabbitfish	1	0	0	1
17	*Heniochus acuminatus*	Longfin Bannerfish	20	1	0	19
18	*Forcipiger longirostris*	Longnose Butterflyfish	16	1	0	15
19	*Chaetodon ephippium*	Saddled Butterflyfish	6	1	0	5
20	*Bodianus mesothorax*	Mesothorax Hogfish	1	0	0	1
21	*Gomphosus varius*	Bird Wrasse	5	2	0	3
22	*Chaetodon unimaculatus*	Teardrop Butterflyfish	2	0	0	2
23	*Chaetodon melanotus*	Blackback Butterflyfish	2	0	0	2
24	*Acanthurus lineatus*	Lined Surgeonfish	8	5	0	3
25	*Centropyge eibli*	Eibl's Angelfish	8	6	0	2

26	*Gnathanodon speciosus*	Golden trevally	2	0	0	2
27	*Acanthurus pyroferus*	Mimic Surgeonfish	1	0	0	1
28	*Parupeneus cyclostomus*	Yellowsaddle Goatfish	7	1	0	6
29	*Chaetodon collare*	Cillared Butterflyfish	4	0	0	4
30	*Chaetodon oxycephalus*	Spot-nape Butterflyfish	2	0	0	2
31	*Plectorhinchus chaetodonoides*	Harlequin Sweetlips	3	1	0	2
32	*Plectorynchus orientalis*	Oriental sweetlips	2	1	0	1
33	*Chaetodon trifascialis*	Chevroned Butterflyfish	1	0	0	1
34	*Chrysiptera parasema*	Goldtail demoiselle	2,050	0	200	1,850
35	*Hippocampus reid*	Seahorse	1	0	0	1
36		Anemone	25	0	0	25
			5052	**107**	**271**	**4,649**

Appendix 2 Collector Income, Trip

No	Scientific name	English Name	Roving Price (Rp)	US$ Equivalent	Accepted fish (ekor)	Total Sale (Rp)	US$ Equivalent
1	*Apolemichthys trimaculatus*	Threespot Angelfish	10,000	1.12	4	40,000	4.49
2	*Pomacanthus semicirculatus*	Semicircle Angelfish	2,500	0.28	1	2,500	0.28
3	*Pomacanthus imperiator*	Emperor Angelfish	2,500	0.28	2	5,000	0.56
4	*Premnas biaculeatus*	Spinecheek Anemonefish	7,000	0.79	91	637,000	71.57
5	*Acanthurus leucosternon*	Powder-blue Surgeonfish	20,000	2.25	23	460,000	51.69
6	*Anampses lineatus*	Powderblue surgeonfish	1,000	0.11	1,850	1,850,000	207.87
7	*Amphiprion ocellaris*	Clown Anemonefish	6,000	0.67	502	3,012,000	338.43
8	*Amphiprion clarkii*	Yellow-tail Clownfish	2,500	0.28	3	7,500	0.84
9	*Amphiprion ephippium*	Red saddleback Anemonefish	3,500	0.39	9	31,500	3.54
10	*Chaetodon falcula*	Saddleback Butterflyfish	1,500	0.17	2	3,000	0.34
11	*Cephalopolis cyanostigma*	Bluespotted Hind	2,500	0.28	1	2,500	0.28
12	*Zebrasoma desjardinii*	Palette Surgeonfish	2,500	0.28	6	15,000	1.69

13	*Pomacanthus xanthometopon*	Blue-face Angelfish	1,250	0.14	1,892	2,365,000	265.73
14	*Naso elegans*	Naso unicorn	3,500	0.39	32	112,000	12.58
15	*Pterois volitans*	Lionfish	2,500	0.28	17	42,500	4.78
16	*Siganus magnificus*	Magnificent Rabbitfish	3,500	0.39	2	7,000	0.79
17	*Heniochus acuminatus*	Longfin Bannerfish	3,500	0.39	2	7,000	0.79
18	*Forcipiger longirostris*	Longnose Butterflyfish	2,500	0.28	2	5,000	0.56
19	*Chaetodon ephippium*	Saddled Butterflyfish	4,000	0.45	5	20,000	2.25
20	*Bodianus mesothorax*	Mesothorax Hogfish	2,500	0.28	4	10,000	1.12
21	*Gomphosus varius*	Bird Wrasse	2,500	0.28	1	2,500	0.28
22	*Chaetodon unimaculatus*	Teardrop Butterflyfish	5,000	0.56	10	50,000	5.62
23	*Chaetodon melanotus*	Blackback Butterflyfish	14,000	1.57	2	28,000	3.15
24	*Acanthurus lineatus*	Lined Surgeonfish	5,000	0.56	1	5,000	0.56
25	*Centropyge eibli*	Eibl's Angelfish	3,500	0.39	19	66,500	7.47
26	*Gnathanodon speciosus*	Golden trevally	2,000	0.22	1	2,000	0.22
27	*Acanthurus pyroferus*	Mimic Surgeonfish	4,000	0.45	15	60,000	6.74
28	*Parupeneus cyclostomus*	Yellowsaddle Goatfish	40,000	4.49	1	40,000	4.49
29	*Chaetodon collare*	Cillared Butterflyfish	6,000	0.67	13	78,000	8.76
30	*Chaetodon oxycephalus*	Spot-nape Butterflyfish	2,500	0.28	1	2,500	0.28
31	*Plectorhinchus chaetodonoides*	Harlequin Sweetlips	1,500	0.17	2	3,000	0.34
32	*Plectorynchus orientalis*	Oriental sweetlips	2,500	0.28	3	7,500	0.84
33	*Chaetodon trifascialis*	Chevroned Butterflyfish	3,000	0.34	17	51,000	5.73
34	*Chrysiptera parasema*	Goldtail demoiselle	3,500	0.39	1	3,500	0.39
35	*Hippocampus reidi*	Seahorse	2,500	0.28	112	280,000	31.46
36		Anemone	7,000	0.79	25	175,000	19.66
		Totals	189,250	21.26	4,674	9,489,000	1,066.18

Note: 1US Dollar = 8900 Rupiah

3 Roving Collectors in Selayar District, Indonesia

3.1 Introduction and Objectives

The objectives of this case study were to:

- Document and understand the issues relating to roving aquarium ornamental collectors in Indonesia
- Develop and implement practical management options in the context of achieving meaningful MAC Certification, and ensuring sustainable/viable businesses at the collectors' level
- Understand the degree to which roving is financed/driven by exporters, identify where the major "roving sites" are located, and the frequency of collection
- Understand whether CAMPS can or cannot be established on any reefs where rovers collect, and whether the MAC Standards can be revised to accept "roving" without a CAMP,
- Identify species and habitats at risk because of market demand, and increase awareness of the end buyers about the effects of their choices on the supply end of the trade chain,
- Identify areas of high conservation priority, and then find ways to afford these areas greater protection, e.g. through regulation of collection activities there,
- Determine whether rovers should receive additional training (for experienced collectors and/or who have already been trained in net training, screening and handling, to further improve their methods), and if yes, identify their training needs,
- If training is given, then limit it only to existing roving collectors (we do not want to encourage others to start roving).
- Identify collection methods (we were informed that roving collectors tend to still often use cyanide for catching fish, and they may also be using other capture methods that we need to know about for training purposes)
- Fully document collection methods, diving methods and equipment, depths and times dived, screening, bagging, handling, holding and transportation methods, materials and facilities on the boats, for suggested improvements and training needs
- Record the species being ordered and caught, together with the catch records at each of the collection sites
- Map and log coordinates for each of the collection sites (a GPS device will be purchased for this purpose)
- Record fish /coral mortality and reasons for post-harvest stock damage and initial rejects during and immediately after the roving period
- Record any practices that damage the collection area and surrounding areas. (e.g. poor boat handling, anchor damage, pollution/waste from the boats, physical damage to reefs by collectors' movements etc)

- Make detailed records of encounters with patrols, visits to other villages, other collectors and middlemen, payments made, etc
- Document current social ties and relationships in adjacent villages that support or limit collection practices
- Record the size and type of boats used, number of crew and jobs, fuel consumption and purchase, equipment maintenance procedures (including compressors), boat safety equipment, use of navigation equipment and methods, maps etc on the boat
- Capture images (photos, film) of the roving collectors' methods and other aspects of their work**.(**Trust must not be broken through careless sharing of photo images with other parties)
- Identify possible improvements to the process of roving collection (inc. methods of collection, handling and transportation, boat holding facilities design, alternative routes to shorten time spent at sea, and alternative models where the collectors rove, but still within the same province (e.g. in Kendari in southeast Sulawesi, and Padang to Mentawai)

3.2 History of Roving from Sumber Kima village

Sumber Kima is located in North Bali, under the Buleleng district administration. The village can be reached in 3 hours by car from Denpasar in South Bali. The collection on reefs in front of Sumber Kima village was started in the early 1970s. Sumber Kima collectors started roving around 1981. The first roving destinations were the reefs of West Lombok and Madura, and further east to Sumbawa, Flores and Sulawesi.

Roving activities became intensive when six Denpasar-based exporters provided some suppliers in Sumber Kima with boats, information on fishing grounds and operational expenses (including fees to pay off the authorities if they were caught). Support from the exporters included several boats and nearly 17 years worth of operational expenses. This support lasted from 1981 until 1998. The exporters stopped providing support because of the misuse of operational expenses, which led to a reduction in profits for the exporter. The Indonesian economic crisis in the 1990's was also a factor contributing to reduction in support for the collectors. The collectors then started to travel to collection areas nearer to home, and as this had not been previously agreed between the suppliers and the exporters, financial support for the collectors was reduced**.**

There are many reasons why collectors conduct roving, and the answers given to these questions depend on who is being asked. The suppliers give one set of reasons (see **a** below), and the collectors give other reasons (see **b** below):

a. **According to the suppliers**: collectors rove partly in order to fill the orders from the exporters, because the variety of fish on their local reefs is not great, and because there are species wanted for the trade that do not occur (or no longer exist) on their local reefs. In the early days, exporters covered the operational costs for roving, and nowadays, some still do this. The supplier pays the operator of the boat, and some collectors depend on him to help pay back their loans to the supplier. The suppliers receive more profits from roving than from buying only locally-caught fish**.** The exporters order many species that do not occur in the collectors' home area, so if the supplier

supports the operational costs of roving, the collectors will provide him with a more lucrative range of fish to offer the exporter.

b. **According to the collectors**: many collectors who rove have a long-standing relationship with the suppliers, (including the ability to borrow money). Income from roving is much higher than from fish caught on the local reefs. The fishermen receive payments in large lump sums after coming back from roving trips. They can use these to cover the high costs of schooling, house repairs, and ceremonies.

During the past 25 years, roving activities have increased significantly. Nowadays, there are more suppliers who rely on, and operate, roving activities than before. Although the profits suppliers make from roving are higher than from only buying local fish, these roving activities are also an increasing financial burden for them. The price of oil has increased dramatically, and this has triggered price increases of many of the items they need to support the roving collectors, including oxygen, plastics, and logistics. This has substantially reduced their profit margins. It was reported that at least 10 of the suppliers from Sumber Kima who specialized in roving activities have gone bankrupt. Most of them cannot cope with the increase in operational costs, as there has been no matching increase in the price of fish. Besides the increase in fuel costs, the “hidden” costs are also increasing. One supplier had to pay almost Rp. 15 million (USD 1,685) in fines because his boat was caught carrying potassium cyanide. Thus, increased frequency of patrols, together with stricter law enforcement are other factors that put pressure on suppliers and roving collectors.

Some might argue that these factors might be helping to stop, or at least reduce, roving collection, and that they are therefore a “good” thing. However, it does not follow that the suppliers and collectors who are most impacted are the ones who cause the greatest environmental damage, or have the highest stock mortality rates. Also, when a supplier goes bankrupt, the collectors who worked for him may not necessarily be able to find other suppliers to work for. It is worth investigating what collectors in this situation do in terms of finding alternative sources of income. If the collectors become long-term unemployed, the economic social and economic costs to these coastal communities will also be greater.

From numerous interviews with collectors, it appears that the majority of roving collectors use potassium cyanide (KCN) to collect fish. The costs for buying KCN are included in the operational costs for each trip. It was reported that the KCN is imported from China and Taiwan, through Ketapang, Banyuwangi (E. Java) on Taiwanese boats. KCN is stored on the boat in drums or barrels**.** From Ketapang, the KCN is distributed to the fishing villages, including Sumber Kima, through a coordinated network of distributors.

Relatively little attention is given to the roving boats by the local authorities (the Local government Unit (LGU) areas where the owners of the boats reside)**.** Suppliers operate their roving boats quietly and continuously as long as they are not caught. The rovers will take high risks as their potential income is also much higher. The suppliers continue to take these risks in the hope that fish prices will increase, in order to maintain or increase their profits in the face of inflation, bearing in mind that the suppliers always substantially increase the price of the fish they buy when selling to the exporters. The collectors feel themselves to be in a weaker bargaining position for higher prices than the suppliers.

If the collectors were able to get higher prices for locally-caught fish, and the demand for local varieties of fish were to increase, this would reduce the need for them to go roving to make a living**.**

3.2.1 Collector profiles

The collectors of Sumber Kima have been roving as far as Sulawesi since the early 1980s.

Table 9: Names of the Sumber Kima collectors who went roving to Karumpa, accompanied by MAC observer

N0	Name	Role in the boat	Age	No. of years spent roving
1.	Sapar	Team leader/collector	36 yrs	21 yrs
2.	Muhammad Sari	Collector	45 yrs	20 yrs
3.	Saliya	Collector	24 yrs	7 yrs
4.	Sahirudin	Collector	35 yrs	12 yrs
5.	Surawi	Boat captain/collector	36 yrs	20 yrs
6.	Sahinuddin	Collector	30 yrs	7 yrs
7.	Adnawi	Collector	28 yrs	10 yrs
8.	Ahmad Busairi	Collector	21 yrs	3 yrs
9.	Zaini Dahlan	Boat captain/collector	37 yrs	23 yrs
10.	Mustar	Cook/collector	22 yrs	11 yrs
11.	Misrayan	Collector	20 yrs	2 yrs
12.	Asmara	Mechanic/collector	40 yrs	25 yrs
13.	Galik	Mechanic/collector	43 yrs	19 yrs
14.	Anem	Collector	30 yrs	10 yrs
15.	Nahirudin	cook/collector	34 yrs	21 yrs
16.	Halidi	Collector	29 yrs	15 yrs
17.	Basri	Collector	36 yrs	21 yrs
18.	Atok (Asman)	Collector	32 yrs	4 yrs
19.	Rifai	Collector	40 yrs	25 yrs

The collectors who joined the roving boat on this particular trip to Karumpa were all free divers (i.e. not using compressors). They dived as deep as 10 meters, and only used masks, snorkels and fins. Back in Sumber Kima village, there are collectors who do use tire compressors to dive deeper, to collect fish that either only live in deeper water, or are no longer abundant in shallow water.

On the journey to Karumpa, the boat had to stop at Bungin Island in Sumbawa, so that one of the engines could be repaired. There are also ornamental collectors and one supplier on Bungin Island. Besides KCN, the Bungin collectors also use Saponin to catch the fish. There is no information on the impact of Saponin on the health of the fish, or on the environment. (Saponin is a chemical that is also used to kill pests in fish ponds).More information is needed on the source of the Saponin, its cost, how widespread its use is, and methods of use. Why do people use saponin in preference to KCN? In order to answer these questions, a trip to Bungin Island was proposed.

The island of Bungin was once a destination for roving collectors from Sumber Kima for target species such as Acanthurus leucosternon (Powderblue Surgeonfish) and Paracanthurus hepatus (Blue Tang). However, these target species are no longer abundant on the reefs of Bungin, and the Bungin collectors are now traveling further east for collection. There are four suppliers now based in Bungin, and one of them originally comes from Sumber Kima village. Also some Sumber Kima collectors have moved to Bungin and are now based here. This is understandable as the collection areas in Sulawesi are already half way from Bungin Island. Bungin is near Alas-west Sumbawa on the map.

From where did these rovers originate?

The majority of the collectors who live in Sumber Kima are originally from Raas Island near Madura (East Java). The Raas men like to journey away from their home island, and are usually finally followed by their families, to settle in various coastal villages, including Sumber Kima in Buleleng, North Bali.

3.2.2 Transportation

The boat

The boat used for this roving trip (called the 'Putra Buana') belongs to Bali Blue, a Bali-based exporter. Matol, the supplier, has been given the responsibility of operating the boat. Bali Blue owns three boats that have been in operation for roving since 1981. The'Putra Buana' is 26 m long and 3, 5 m wide at its widest point across the deck. The boat has several compartments, and includes a toilet, cooking area, front deck, roof decking, and the engine room (-the hold below deck) where the fish are stored. According to the captain, the boat is strong enough to withstand rough seas. The speed of the boat is 8.5 nautical miles per hour (measured by our GPS)**,** with three in-board engines. There are times where only two engines are working, and the speed is then about 6 nautical miles per hour.

The main engine, with the brand name "Jiandong 300", can be put into forward and reverse, while the other two engines are only for moving forward. The engines are extremely noisy, and make the hold vibrate. The collectors are used to the noise. The boat is not really comfortable for living aboard. The roof is full of holes. When it rains, the collectors stay down in the engine room, as this is the only place on the boat without leaks where they can stay dry.

The boat is equipped with a 5 horsepower (HP) generator. Light is only available from 6 pm to 10 pm. The generator is working all the time when they travel at night, to provide light for the engine room, and so the compass can be read.

Safety issues

There is no safety equipment available, apart from one life vest which belonged to the MAC observer. There was no radio or mobile phone available on the boat. There was no first aid kit box, no maps, and no

fire extinguisher available. The only tool they have for navigation is a compass. However, during storms, this compass sometimes does not give an accurate reading. The collectors stated that there were occasions when the boat hit the reefs and became stranded. There are also no spare parts carried on the boat, and if there is engine trouble, the boat has to stop somewhere where there is a possibility of boat repair (called a “bengkel” or “garage”). The location they usually use to stop at for engine repairs is in Sumbawa. On this trip, the boat had to stop one night in Sumbawa to repair one of the engines. Having to get engines repaired means deviating from the intended route, and thereby extending the length of the journey in distance and time. This increases the amount of fuel needed, and combined with repairs and extra food costs, the overall cost of the journey is increased. Breakdowns are said to be “frequent”.

The Voyage

On April 18 2006, the boat left Bali with two engines working well, but after one hour, the captain decided to return to Sumber Kima for engine repairs, as one engine no longer worked. The day after, (on April 19) since the repair of the engine needed half a day, the boat finally left Sumber Kima at 5.30 pm.

Outbound Route

The map above shows the point of departure on north coast of Bali (left), then due east along the coasts of Bali, Lombok, Sumbawa, north of Komodo island, finally turning north east along the north Flores coast, crossing the Flores Sea towards the final destination, Karumpa, south of South Sulawesi (top right). The return journey follows a south westward course north of the outward route across the Flores Sea, as far as Sangeang Island off north east Sumbawa, and then past Lombok back to Bali.

The boat traveled along the coast of North Bali, North Lombok and traveled further east into the Flores Sea. One engine broke down on the way to Sumbawa. The captain decided to stop at an island off west

Sumbawa called Bungin Island. The captain chose Bungin Island because he knew they could repair the boat there, and also because there is no police patrol around this island. The boat generally cruised far away from the coasts, to avoid the police patrol boats. During bad weather and rough seas, they have no choice but to cruise nearer to the coastlines.

Near Satonda Island, off West Sumbawa, the boat spotted a police patrol approaching them at 7.30 pm. They switched off their light, and drifted silently for a while. The police boat cruised away into the distance and disappeared. The crew stated that, if they are stopped by the police patrol, the ornamental collectors have to pay between Rp. 500,000 to Rp. 2,000,000 (USD 52.20 to USD 224.72) in total. This is a bribe that is paid so that the police will allow them to continue on their way. The supplier gives the crew extra money for bribes in case they are stopped.

From Sumbawa, the boat headed along the northern edge of Komodo National Park, and along the North Flores Island coast. On the north coasts of Manggarai District (West Flores), the captain changed course to head northeast to their final destination - the reefs of Karumpa Island. Total sailing time was four days, including a one day stop in Bungin Island. In general, the weather and seas were good, and rough seas were only encountered in the Lombok Straits and in the waters off Komodo.

The journey home

For the home journey, the captain set a course due west from the Karumpa reefs, passing Bonerate island and heading to Sangeang island off east Sumbawa to stop to buy fuel for the journey back. From East Sumbawa, the boat continued non-stop along the north coast of Sumbawa to Lombok and Bali. It finally arrived in Sumber Kima, after a voyage of three days, having left Karumpa at 2 pm on 29 April, and arriving at Sumber Kima at 10 a.m. on 2 May.

3.2.3 Permits

Boat Permits

The boat has a boat license. However, for this journey, the captain did not obtain sailing permission, which is issued by the Harbour Master. The sailing permit costs Rp. 50,000. (USD 5.60) When asked why the sailing permit was not obtained, the reasons given were that they did not have time, and they did not want to pay. The captain and crew did not see the importance of this permit for their journey. By not obtaining a sailing permit, it means that the harbour master would not be liable for any incidents or accidents occurring during the voyage.

Collection license

The collectors did not have any collecting permits for the areas where they collected. Karumpa is part of Selayar District, under the administration of South Sulawesi Province. The reason that the

collectors did not obtain the collection permit is because the boat journey from the collection reefs (Karumpa) to the office in Selayar takes about one day by boat. They did not want to spend the extra two days needed to travel to and from Selayar, and have to pay the extra money. The roving group obtained a letter from the Head of Sumber Kima village, giving them permission to collect ornamental fish in Karumpa. However, this permit was not valid, as the rovers did not obtain the permit from the local government authority who administers the collection areas in Karumpa.

Legality

Arriving in Karumpa Island, the captain and collectors' coordinator normally report their plan to fish to the local military personnel (BABINSA). The aim of their reporting is to ask the local military for permission to collect. In exchange for the permit, they were being asked to pay Rp. 500,000. (USD 56.11) However, this time, the local military were not present, so the collectors paid money to the local police instead.

The coordinator reported to the local police, who asked to see their fishing permit at his house. As the collectors had not obtained one, they could not show it. Therefore in law, their collection is Karumpa was illegal, as they did not have a collection permit from the local fisheries office at district level. In spite of this, the local police gave the Sumber Kima collectors a permit to fish for 6 days in Karumpa, at a cost of Rp. 700,000 (US$ 70.00). It was the "bargaining" method; no permit paper was actually issued, and no receipt was given for the payment.

Marine Police posts

There were several police spot-checks on the journey from Sumber Kima, Bali, to Karumpa Island. These happened at Karangasem in west Bali, Gili Air in Lombok, Satonda in Dompu, Sumbawa, and in Labuan Bajo in Manggarai, Flores. The police boats often approach the ornamental fishery boats and ask to see all permits.

3.2.4 Logistics

Gasoline

The three day voyage from Sumber Kima to Karumpa used approximately 1800 liters of diesel fuel, and 60 litres of gasoline (petrol) for the generator, which was used for general lighting. Twenty-five (25) liters of kerosene were used for cooking. According to the coordinator, the operational costs for the voyage to Karumpa were Rp. 20 million (USD 2,247,19). The cost of diesel comprised 45 % of the total operational costs.

Food

As the person responsible for managing the boat and roving activities, the supplier provided the main staple foodstuffs, including:

- rice and corn
- vegetables and fruits
- eggs and noodles
- sugar and coffee
- spices

The collectors individually brought extra food prepared by their families.

There were two cooks responsible for cooking the main menu during the trip, and additional food was prepared by the others. The food was prepared on the boat using a primus stove. The boat had no fire extinguisher.

The boat brought three tons of fresh water for all purposes (drinking water, cooking, washing of clothes etc) for the whole journey. They did not buy or get any other additional water during the trip.

Medicines

The costs of medicines for collectors are part of the operational costs. The boat was not equipped with adequate medicines. The collectors only brought basic medicines such as pills for cold and headaches. During this trip one of the collectors became ill, so the boat stopped at the closest village to their collection site, and he went ashore to see a paramedic. There is no hospital or health center here. There is a village nurse living there, who provides health consultations. The payment for diagnosis and medicine is usually Rp. 25.000 per visit (USD 2.81). The next day, the collector was well enough to return to collection activities.

Other fishing tools

During the boat trip, collectors also caught tuna and other species using hooks and lines, and they also used bigger mesh size nets to catch food fish. When they had caught enough fish, they usually dried their fish to take home. Three months before this voyage, the collectors used cyanide both for collecting ornamental fish, and to catch food fish. While collecting aquarium fish, any other larger, edible fish were also caught to feed the crew. The crew also fished using long lines trailed behind the boat while it was moving. They dried the fish without salting. However, less food fish were caught on this trip, because cyanide was not used during the collecting activities.

3.2.5 Collection Areas

Karumpa

The collection areas are located on the Karumpa reefs. These are fringing reefs, extending widely for several kilometers to the northwest of the Karumpa islands. The reefs are three meters deep during the high tide. Karumpa Island is under the administration of Pasilambena Sub-District, Selayar District. The reefs lie southeast of Taka Bonerate National Park (SW Sulawesi). The dominant hard corals are massive

boulders, which are ideal areas for collecting aquarium fish. The collection sites were usually on the reef slopes. The inner reefs have areas of sea grass beds, where most of the Amphiprion ocellaris (clownfish) and other clown fish species were collected.

The Karumpa reef is a popular collection area for the Sumber Kima rovers. They come to fish here twice a month. They do not need to use compressors, as many fish can be collected by freediving in the shallow waters.

Table 10 shows the point coordinates of collectors where they jumped out from the boat. There were 10 collectors altogether on this trip. The collectors spread out, and the distance between each collector was approximately 50 meters.

Table 10: Coordinates entered at each point of start of the collection.

Collecting days	Date	Point	Latitude	Longitude
1st	24 April 06	1.1-3	07'19"555"'S	121'38"567"'E
		1.2-4	07'19"400"' S	121'38"949"'E
2nd	25 April 06	2.1	07'19"968"' S	121'39"574"'E
		2.2	07'18"514"' S	121'41"563"' E
3rd	26 April 06	3.1	07'14"360"' S	121'31"060"' E
		3.2	07'13"746"' S	121'29"196"' E
4th	27 April 06	4.1	07'11"990"' S	121'28"380"' E
		4.2	Data missing	Data missing
5th	28 April 06	5.1	07'12"462"' S	121'31"623"' E
		5.2	07'12"703"' S	121'33"197"' E
		5.3	07'13"455"' S	121'34"022"' E
6th	29 April 06	6.1	07'12"747"' S	121'34"382"' E
		6.2	07'11"746"' S	121'31"138"' E

Coral reefs

The general condition of the Karumpa reefs was fair to good. Some areas still have good live coral cover (60%). Only visual observations were conducted on the reefs, and no transects were laid during the observations. Many corals appeared bleached. There were also areas covered by rubble (30%). The use of potassium cyanide for catching food and aquarium fish is widespread on these reefs. Cyanide was also used by local fishermen for live grouper fishing. Selayar district had imposed a ban on the use of potassium cyanide during the previous three months. This ban was implemented at the village level. Dynamite, and home-made bottle bombs using urea or coconut/oil palm fertilizer, were also formerly used for bombing the reefs to catch fish. It was not clear from where they obtained the dynamite or other materials necessary for bomb making. Blasting was used for collecting fish in these reefs, according to the village authority, Mr. Lausaha (part of the village Marine Resource Use Team). In some areas of the reef, there are extensive stands of branching corals (Acropora spp), and the collectors did not work in these areas, because it was too difficult for them to lay their barrier nets there without damaging or tearing them.

During the observations, a list of fish species was recorded, including: Centropyge bicolor (Bicolor angelfish), Centropyge tibicen(Keyhole Angelfish), Centropyge eibli (Eibl's Angelfish), Centropyge vroliki (Halfblack Angelfish), Chaetodontoplus mesoleucus (Vermiculated mesoleucus), some species of butterflyfish , Chrysiptera cyanea (blue devil)(this species is available here but when caught and transported, it is not as robust as ones caught in other areas), Dascyllus trimaculatus (dakocan), Thlassoma(wrasse), Pseudoanthias hypselosoma(Stocky Anthias), and Odonus niger (Redtoothed triggerfish).These are low-end species, and are not the main target species for roving, as their value is not high enough to cover the operational costs. These species are only collected if space is still available to hold them on the boat, and also sometimes if the variety of fish collected needs to be increased.

Local communities

There are approximately 500 families living in Karumpa village. The main sources of income in this village are from catching and selling (dead) fresh food fish, and live fish for the live food fish trade. Potassium cyanide is still being used for the live food fish, mainly for catching groupers. There are no ornamental fish collectors in this village. It was assumed by Mr. Lausaha that this is because there are no local traders acting as middlemen to buy aquarium fish. However, the villagers stated that if there were to be a buyer in the village, then the fishers would also be willing to collect aquarium fish.

This implies that the villagers want to learn how to collect ornamental fish from their reefs. If one of the villagers were to become a buyer, and set up as a supplier, or if someone were to come from outside wanting to buy ornamental fish, the villagers would engage in collection. Based on observations it would be assumed that there are no full-time collectors, but if the opportunity were to present itself marine ornamental collection would be considered as a viable income-generating activity.

The majority of the people in the local community do not object to the roving collectors coming to their village to collect their resources. They do not think that their resources are being "stolen" by the outsiders. The rovers buy supplies such as cigarettes and food from the local shops, and therefore become an additional source of income for the villagers.

There are some locals who dislike the rovers collecting on their reefs because they know some of them use cyanide. Since awareness creation has been done by NGOs in the area, some people in the village have an understanding of the negative impact of blast and cyanide fishing. They realized that their coral reefs were becoming damaged, and this was evidenced by the recent decrease in numbers of food fish, including groupers, that were being caught for food by the villagers. They are now becoming more vocal and making representations to the local district government, which has a policy in place against illegal fishing operations in the area.

Government policy

The Head of the District (Bupati) was newly appointed at the time of this study. The new Bupati has declared that the use of destructive fishing

practices, including potassium cyanide, as a means of collecting fish, must be stopped. (It is assumed that the COREMAP Project and other NGOs have delivered awareness training with the government, including the Bupati). In each Sub-District, a community monitoring and surveillance program has been established, called POKWASMAS. In Pasilambena Sub-District, there are 42 members appointed as POKWASMAS. The function of this taskforce is to monitor and conduct surveillance on the exploitation of the local natural marine resources.

If any member of POKWASMAS encounters use of cyanide, they can arrest the person and report them to the police through the Head of the Sub-District (Camat) who then will take the person to the capital of the District on Selayar Island.

There are no protected zones proposed on the Karumpa reefs. However, outsiders are not allowed to collect any resources on reefs immediately next to the village. The reefs are regarded as their "garden" and they say "warning! No one is allowed to enter my garden". According to the Sumber Kima roving collectors, the closed areas are the places where broodstock Paracanthurus hepatus (Blue Tang) are found. This is a good area to protect for the broodstock, but the villagers were not aware of this.

Roving collectors' perceptions

The Sumber Kima collectors have conducted roving activities in the same areas for many years. They say that they always ask permission from the local authority before collecting there. Sometimes, however, they need to move on to find new collection areas if they are no longer allowed to collect in a particular area. For example, previously, they collected in Teluk Saleh in Sumbawa, and when this area started to be used for seaweed culture, they were stopped from collecting there by the local authority. This forced them to look for other collection areas. There was also a story that a local community burned a roving boat in Palasi- Selayar, because the collectors were caught using cyanide, and they were not allowed to fish there anymore. However, in the case of the rovers on this particular case study trip, there were attempts to inform villagers by showing them that they use "environmentally friendly" methods to collect aquarium fish. Subsequently they were allowed to continue fishing in the area. They will not deliberately go into any closed areas, and will respect the fishing bans and restrictions imposed on them by the local community.

Other reasons for moving to other collection areas include eventual resource depletion, and/or the need to visit several areas when the species requested in a particular order cannot only be caught in one area.

The Sumber Kima rovers indicated that the number of collection areas available to them is less than a few years ago. Many former collection areas are now used for other purposes such as seaweed culture, fish culture, and pearl culture, while other areas have been declared as national parks or other marine protected areas (MPAs). Also, the increase of fuel prices has had a significant impact in curbing roving

activities, as the operational costs have rocketed, while the prices paid for the organisms they catch have remained the same.

It is interesting to note that the roving collectors cite changes in use and reduced access as the prime reasons for a reduction in collection areas, rather than degradation of the collection area or depletion of stocks there. However, they talk about former collection areas no longer being their target areas, because “no more target fish (are) available in quantity from these locations”...Therefore, resource depletion would in fact seem to be a factor that in their roving to other areas.

3.2.6 Collection areas for roving

In the 1980s, the roving collectors only went as far as Lombok (the Gili Islands) and islands around Sumbawa, such as Sabuka, the Saguncing reefs, Medang, Tano, Sailius, Stangir and Saleh Bay. These collection areas are no longer target roving areas, as no more target fish are available in quantity from these locations. Also, some islands, including the Gili Islands, are now closed for extraction because of the tourism developments.

Before the significant increases in fuel prices, rovers from Sumber Kima went as far as Kalimantan, the Moluccas, and Sermata, near Papua. The costs for traveling to Kalimantan is now about Rp. 50 million (USD. 5,618). These days, their target collection areas are on reefs in south and southeast Sulawesi, Maumere (E. Flores) and Timor.

Table 11: Collection areas for the Sumber Kima roving collectors with target species

No	Province	Kabupaten	Location	Target Fish
1.	Sulawesi Selatan (South Sulawesi)	Selayar	Tambolongan	*Paracanthus hepatus* (Blue tang); *Chrysiptera cyanea*(Blue devil),
		Selayar	Palasi	*Paracanthus hepatus* (Blue tang); *Chrysiptera cyanea*(Blue devil),
		Selayar	Kayuadi	*Paracanthus hepatus* (Blue tang); *Chrysiptera cyanea*(Blue devil),
		Selayar	Rajuni	*Paracanthus hepatus* (Blue tang); High-end Mixing species;
		Selayar	Karumpa	*Paracanthus hepatus* (Blue tang); *Nemateleotris magnifica* (Fire goby); High-end Mixing species;
		Selayar	Pulau Burung	Mixing species
		Selayar	Takad Besi (Bonerate)	*Paracanthus hepatus* (Blue tang); *Nemateleotris magnifica* (Fire goby); Mixing species

2.	Sulawesi Tenggara (South East Sulawesi)	Wakatobi	Binongko	*Paracanthus hepatus* (Blue tang); ; *Pomachantus navarchus*(Majestic angel); *Nemateleotris magnifica* (Fire goby);
		Wakatobi	Kaledupa	*Paracanthus hepatus* (Blue tang); *Pomachantus navarchus*(Majestic angel); *Nemateleotris magnifica* (Fire goby)
3.	Sulawesi Tengah (Central Sulawesi)	Banggai Kepulauan	Pancoran	*Paracanthus hepatus* (Blue tang); *Pterapogon kaudermi* (Banggai cardinalfish)
			Kaliabu	*Paracanthus hepatus* (Blue tang); *Pterapogon kaudermi* (Banggai cardinalfish)
4.	NTT (East Nusa Tenggara)	Maumere	Takad layar, Pemanah, Pulau Besar, Pulau Perumahan	High-end Mixing species; *Nemateleotris magnifica* (Fire goby)
		Timor	Rote	*Paracanthus hepatus* (Blue tang); *Centropyge bicolor* (Bicolor angelfish), *Chrysiptera cyanea*(blue devil),
5.	Jawa Timur (East Java)	Madura	Tanjung, Sepeken, Kangean	High-end Mixing species; *Chelmon rostratus*(Copperband butterfly)

The season for fish availability varies from one area to another. Paracanthus hepatus (Blue tang) is abundant during September to October. Coris gaimard (Yellowtail coris, juv)) and Navaculichthys taeniurus (Dragon wrasse) is available in May. Therefore their choice of target collection areas also depends on the seasonality of fish abundance according to species.

3.2.7 Collection techniques

The roving collectors report that, in general, they use three techniques; a) there are compressor collectors who use cyanide, b) free divers who use cyanide and nets, and c) free divers who only use nets. The Sumber Kima rovers admitted that most of the rovers are still using cyanide. This case study trip represented the fourth occasion where they have only used nets.

The Sumber Kima rovers also reported that there are some species that still cannot be collected using nets. Therefore cyanide is still needed. For a roving boat with 15 to 25 collectors in each boat, they need 30 to 50 kg of cyanide,

because each collector will need to use 1 kg (60 tablets) of cyanide for each trip.

Lately, there is a tendency for the suppliers to buy less cyanide as the price of cyanide is rocketing. The price has now reached Rp. 70,000 (USD 7.87) per kg. Also, the use cyanide has harmed the image of the ornamental collectors, with the result that many destination areas are now closed to collectors by the local communities. The marine police will fine them on the spot between Rp. 7 - 15 million (USD 786 – 1,685) if cyanide is found in their boats. There are reports that the marine police have also confiscated their fish, and incarcerated collectors. Some of the collectors in the roving boat have spent time in the Selayar jail.

Table 12 shows the roving collectors target fish that are still caught using cyanide.

Table 12: List of species mainly caught by cyanide

No	Species NAME	Common name	CAPTURE METHOD	OTHER METHODS
1.	*Pomacanthus imperator*	Emperor angelfish	cyanide	Small size, using net
2.	*P. sextriatus*	Sixbar angel	cyanide	
3.	*Centropyge bispinosa*	Twospined angelfish	cyanide	
4.	*P. xanthometapon*	Blueface angel	cyanide	
5.	*P. navarchus*	Majestic angel	cyanide	Large size, using net
6.	*Chrysiptera parasema*	Goldtail demoiselle	cyanide	
7.	*Amphiprion melanopus*	Red and black anemonefish	cyanide	
8.	*Amphiprion ephippium*	Red clownfish-saddle	cyanide	
9.	*Apogon semiornatus*	Oblique-banded cardinalfish	cyanide	
10.	*Synchiropus picturatus*	Picturesque dragonet	cyanide	In Sumbawa (with a fine arrow – details needed)
11.	*Synchiropus splendidus*	Green mandarinfish	cyanide	In Sumbawa (with a fine arrow – details needed)
12.	*Stonogobiops xanthorinica*	Hi fin banded goby	cyanide	
13.	*Exallias brevis*	Leopard blenny	cyanide	Also caught using net only
14.	*Amblyeleotris steinitzi*	Steinitz' prawn goby	cyanide	
15.	*Amblyeleotris guttata*	Sunspot goby	cyanide	
16.	*Sufflamen chrysopterum*	Halfmoon triggerfish	cyanide	
17.	*Malichtus vidua*	Pinktail triggerfish	cyanide	
18.	*Balistoides*	Clown	cyanide	

	conspicillum	triggerfish		
19.	*Balistapus undulatus*	Orange-lined triggerfish	cyanide	
20.	*Abalistes stellatus*	Starry triggerfish	cyanide	
21.	*Rhinecanthus acuelatus*	Blackbar triggerfish	cyanide	
22.	*Paracanthurus hepatus*	Blue tang	cyanide	S,M with net, L (using some type of forceps made of bamboo (?)-details needed
23.	*Doryrhamphus janssi*	Janss' pipefish	cyanide	
24.	*Doryrhamphus exicus exicus*	Blue stripe pipefish	cyanide	
25.	*Corythoichtys amplexus*	Brownbanded pipefish	cyanide	
26.	*Doryrhamphus dactyliophorus*	Ringed pipefish	cyanide	
27.	*Calloplesiops altivelis*	Cornet	cyanide	
28.	*Rhinomuraena quaesita*	Ribbon moray	cyanide	

There are some species in Table 4 that can be caught using non-cyanide techniques. Collectors from Penyabangan, a neighbouring village of Sumber Kima, catch morays by covering their holes, and waiting with a net in front of their holes. Other collectors from Sumber Kima collect morays with lassoos. Collectors from Bungin, Sumbawa catch mandarins with fine needles. Large Blue tangs can be caught with bamboo. More observation and data on methods need to be gathered to assess effectiveness, design and implement training programs to reduce and destructive practices.

On this case study excursion, many of the species listed in Table 4, such as Pomacanthus imperator (Emperor angelfish); Pomacanthus navarchus (Majestic angel); Doryrhamphus dactyliophorus (Ringed pipefish),Paracanthus hepatus (Letter six); and Amphiprion melanophus (Red and black anemonefish); Amphiprion ephippium (Red clownfish –saddle) and Triggerfish were actually collected using nets. It is necessary to identify and film these various non-cyanide techniques that are used by the collectors for training purposes.

Roving collectors on this collecting trip used three different kinds of nets. Basically, netting varied with different sizes of mesh; (the fine mesh netting is made from mosquito nets, medium netting is ¼ inch, and big mesh is ½ inch.

Fine mesh netting is used for catching small sized fish, such as gobies, while a medium size mesh is used for medium sized fish such as Labroides. Large size mesh is used for capturing angelfish and butteflyfish. Because they used three different sizes of mesh, they had to bring all three sets of nets with them every time they went into the sea. It is their hope that there will be some sort of netting available with a fine mesh, but strong enough to catch all types of small fish, and another one with a larger mesh for bigger fish, which they can use in the future.

To date, the roving collectors have been experimenting with several capture techniques which they learned to use by trial and error. They can catch Nemateleotris magnifica (Fire goby) using nets, and they also use stones to scare the fish away from their hole, put the barrier net in front of the hole, and scare the fish into the nets. Gobys living in burrows in the sand are collected in their holes using sticks, which are used to scare the fish out from their holes. Fiveline coralgobies are also collected using sticks to scare the fish out of their holes, and then trapped by a scoop net placed in front of the hole.

3.2.8 Frequency of Roving Collection

The frequency of roving depends on the availability of operational costs from the suppliers, rather than on the amount of orders received from the buyers, except when there are very low orders, when the collectors will decide not to rove. The suppliers wait for the previous shipment payments from the exporters before arranging the next collection trips. The rovers normally stay in their home village for 7 to 10 days between roving collection trips.

Roving is the main source of income for the roving collectors. Every month they rove once or twice. The average number of times they rove in a year is ten, and only during the very rough seas do they refrain from roving collection. Fish mortality is also higher when roving is done in rough seas. The fish in the bags are strongly shaken when the boat travels in high waves. This situation also contributes to increased stress in the fish.

When there is no roving, and the weather is good in Sumber Kima, the collectors also collect fish in the reefs surrounding their village. However, their income is much lower collecting fish locally compared with income earned from roving. Fishing locally gives an approximate gross income of Rp. 25.000 a day and up to Rp.350.000 in two weeks (USD 2.81 and USD 39.33) so they will not be able generate savings. In contrast, the gross income from roving is more than Rp. 400.000 (USD 44.95) for a two week period. This means that they get a better income from roving activities than from local collection.

The time spent at sea is divided into roughly 50% for the journey and 50 % for the collecting. The journey to Karumpa is 6 days for traveling (3 days to go and 3 days to return), and 6 days for collecting. The availability of oxygen for the bags is an important limiting factor, and serves to determine the duration of the collecting trip.

3.2.9 Catch Results

Each collector catches as many high-end target fish as possible. Suppliers do not specify quantities of catch to collectors.The supplier only decides what species they are to collect, and what not to collect, but there is no catch limit for each species, as all species caught are saleable target species.

The collectors also have to spend time repairing their netting by hand during the journey, becuse the nets do frequently become torn or damaged.

From the catch record, it is apparent that each collector has his own speciality and skills for catching different species. Some collectors collect mainly only Nemateleotris magnifica (Fire goby), while others collect butterflyfish. Fire gobies have to be collected when the tide comes in. The fish swim against the current, and the collectors have to lay their netting between the fish and their bolt holes. The fish are scared from the front, and try to swim back into their holes to hide. The collectors wait at the entrances of the holes, and are ready to collect the fish that hit the nets. They collect this species alone.

The list of species collected by the 19 collectors on this trip is shown in Appendix 1. The collection period was 6 days, and each collector spent 6 hours a day collecting. The total number of species collected during this trip was 65, with a total number of 14,253 fish being caught. More than 50% of the total quantity caught were clownfish (Amphiprion ocellaris). The demand for clownfish is high, and this species can be packed as 25 individuals in one plastic bag, although it is not a "social" fish, and is not naturally found in groups.

3.2.10 Packing

Collectors packed the shoaling/ social fish as several fish in one plastic bag (referred to as "gang packing"), while the solitary fish were packed individually, each in one plastic bag. The aggressive fish were also packed individually.

They used three layers of plastic bags; the inside bag, with which the fish is in contact directly, is a new plastic bag, while the second and third layers are used plastic bags. Collectors will first re-use used plastic bags before they use new plastic bags. They wash out used bags with sea water before using them again.

The species that were gang packed included: Chrysiptera cyanea (blue devil), Nemateleotris magnifica (Fire goby), Pseudoanthias pascalus (Purple queen anthias), and Amphiprion ocellaris (Clown Anemonefish). Large fish were packed individually. Large fish needed relatively more oxygen than small fish, and more water for space than individual smaller fish. The water quality in the bags in which fish were individually packed was better than that of water in the bags where the fish were gang packed. Ammonia was higher, and the pH was lower in the bags with gang packed fish than those with individually- packed fish.

Table 13 shows the types of fish and the plastic bag sizes/numbers used for them. The number on the plastic label indicates the width of the bag.

Table 13: Types of fish and plastic bag sizes/numbers used.

No	Scientific name	Fish species (common name)	Fish size	No. of fish per bag	Plastic bag size (in cm wide)	Ratio of oxygen: water in bag
1.	*Chaetodon sp.*	Butterfly fish	S,M,L	1	20-25	1 : 1
2.	*Pomachantus sp.*	Angel fish	S,M,L	1	25-35	1 : 1
3.	*Odonus niger*	Redtoothead Trigerfish	S,M,L	6-10	30	1 : 1
4.	*Gymnomuraena zebra*	Zebra Moray	S,M,L	1	30	1 : 1

5.	*Dascyllus sp.*	Damselfish	S,M,L	25-30	30	1 : 1
6.	*Coris gaimard*	Yellowtail coris	S,M,L	5-7	30	1 : 1
7.	*Nemateleostris magnifica*	Fire goby	S,M,L	10-15	30	1 : 1
8.	*Oxymonacanthus longirostris*	Harlequin filefish	S,M,L	5-10	30	1 : 1
9.	*Anampses meleagrides*	Spotted wrasse	S,M,L	5-7	25	1 : 1
10.	*Amphiprion ocellaris*	Clown anemonefish	S,M,L	25	30	1 : 1
11.	*Amphiprion polymnus*	Saddleback clownfish	S,M,L	5	25	1 : 1
12.	*Labroides sp.*	Cleaner wrasse	S,M,L	5-7	30	1 : 1
13.	*Forcipiger longirostris*	Longnose butterflyfish	S,M,L	1	25	1 : 1
14.	*Paracanthurus hepatus*	Blue tang ("Letter six" in Indonesia)	S,M,L	1 -2	30	1 : 1
15.	*Acanthurus*	Surgeon fish	S,M,L	1	20	1 : 1
16.	*Cetoscarus bicolor*	Bicolor parrotfish	S,M,L	1	20	1 : 1
17.	*Amphiprion sp.*	clownfish	S,M,L	4-6	25-30	1 : 1

From observations of the packing process, five Oxymonacanthus longirostris (Harlequin filefish) packed in a bag of 25 cm width were healthier compared to 10 Harlequin filefish packed in a bag with 30 cm width. Mortality was higher when 10 Harlequin filefish were packed in plastic bags 30 cm wide than when 5 Harlequin filefish were packed in plastic bags with a width of 25 cm.

Oxygen was added to the bags in quantities roughly similar to the quantity of water (ratio 1:1). On this trip, the boat carried 8 oxygen tanks/bottles. Generally, collectors used oxygen conservatively, to extend the collecting and transportation periods as long as possible. The amount of oxygen taken on each trip has implications for the journey time, and how many fish can be caught and transported.

Fish were packed into bags 1 to 2 hours after being collected. Fish were re-packed if the bags leaked. Packing was conducted both while the boat was stationary, and when it was moving.

Fish were kept in the hold, where each collector had his own separate compartments, made of wooden panels. The size of each compartment was 1.5 m wide x 1.5 m long x 1 m deep. There were 24 compartments in the hold, and as there were only 19 collectors, there were extra compartments for some of the collectors to use if they had many bags.

3.2.11 Water

Replacement water for the bags was taken straight from the sea, using buckets. The water temperature depended on the time of day the water was collected - 28.5 oC during the early morning, and between 28.5-29.5 oC during the day. The water in the hold was measured at 27. 5 oC, and this temperature was more constant throughout a 24 hour period.

Water in the bags was replaced every morning, 15 to 24 hours after the last water change. Water was more frequently changed for higher priced fish, such

as Paracanthus hepatus (Blue tang); Pomacanthus navarchus (Majestic angel); and Pomacanthus imperator (Emperor angelfish). For these species, the water was changed every 12 hours. The following day, the amount of bags that needed to be changed increased because more fish had been collected during the day. Therefore, the collectors started to change the water in the bags as early as 2 a.m, and the work finished at 7 a.m at sunrise, before they started collecting again. Due to limitations of working space for changing the water, the collectors took turns to change the water.

Table 14: shows the quality of water taken from several bags. Water parameters tested were temperature (using a Hydrometer), pH and ammonia (using test kits) (Sera products).

#	Fish species	Number of fish	Bag size	Time between water changes (hours)	Temp (^{o}C)	pH	Total Ammonia (ppm)
1.	*Naso lituratus*(Orangespine unicomfish)	6	30	24	27	6,5	Unknown
2.	*Amphiprion polimnus*(Saddleback clownfish)	6	25	24	27	6	Unknown
3.	*Amphiprion ocellaris*(Clown anemonefish)	25	30	24	27	7	0,05
4.	*Oxymonacathus longirostris*(Hartequin filefish)	5	25	24	27	7	0,03
5.	*Pomachantus navarchus*(Majestic angel)	1	35	24	27	6	Unknown
		1	35	12	27	7	0,01
6.	*Forcipiger longirostris*(Longenose butterflyfish)	1	25	24	27	7	0,03
7.	*Paracanthus hepatus* (Letter six);	2	30	17	27	7	0,03
8.	*Rhinecanthus acuelatus* (Blackbar triggerfish)	6	30	24	27	7	0,03
9.	*Chaetodon punctatofasciatus* (Sunset butterflyfish)	1	20	24	27	7	0,03
10	*Acanthurus pyroferus* (Chocolate surgeonfish)	1	25	24	27,5	7	0,03
11	*Pygoplites diacanthus* (Regal angelfish)	1	25	24	27	7	0,03
		1	25	24	27	7	0,03
12	*Amphiprion clarkii* (Yellowtail clownfish)	4	25	24	27,5	6	Unknown
13	*Nemateleotris magnifica* (Fire goby)	10	30	24	27,5	8	0,05
		15	30	17	27,5	8	0,05
14	*Labroides bicolor* (Bicolor cleaner wrasse)	5	25	24	27,5	8	0,05
15	*Acanthurus nigricans* (Whitecheek surgeonfish)	1	20	10	27,5	7,5	0,02
		1	25	24	27	6,5	Unknown
16	*Cetoscanus bicolor* (Bicoluor parrotfish)	1	20	11	27,5	7	0,03
17	*Chaetodon oxycephalus* (Spot-nape butterflyfish)	1	25	24	27,5	8	0,11
18	*Anempses meleagrides* (Spotted wrasse)	3	20	24	27,5	7,5	0,09

19	*Centropyge bicolor* (Bicolor angelfish)	1	20	21	27,5	7,5	0,03
20	*Pomachantus imperator* (Emperor angelfish)	1	25	17	27,5	7	0,02
		1	20	12	27,5	7,5	0,02
		1	30	24	27	7	0,03
22	*Labroides pectoralis* (Blackspot cleaner wrasse)	7	30	24	27	7,5	0,09
23	*Coris gaimard* (Yellowtail coris)juv	5	25	24	27,5	7,5	0,09
24	*Pseudoanthias pascalus* (Purple queen anthias)	15	30	24	27,5	7	0,03

- Temperature was measured using a Hydrometer (for temperature and salinity).
- pH and Ammonia were measured with test kits from Sera (indicator drops and colour charts)

The results of water quality tests showed that the pH was 6.5 to 7, and ammonia levels were between 0.03 – 0.11. With this poor average quality of water, the conditions for the fish could be considered to be healthy. During the transportation period especially, poor water quality further stresses and weakens the fish. The fish were not fed during the journey. The noise of the engines was extremely loud in the hold, and, together with the vibrations from the engines, was a source of additional stress to the fish.

3.2.12 Fish Mortality

Fish mortality was recorded during this case study roving trip. The highest mortalities were among the clownfish, Rhinecanthus aculeatus (Blackbar triggerfish) and Oxymonacathus longirostris (Hartequin filefish). Possible reasons for these mortalities include the poor water quality, the results of gang packing, dead fish remaining in the bags for long periods before the water was changed again, and the bursting of bags.

Appendix 1 shows the record of mortalities. The high clownfish mortalities were because of burst plastic bags. The condition of the bags was not seen until the collectors next changed the water, because the bags were piled on top of each other. The reason for high mortality of Rhinecanthus acuelatus (Blackbar triggerfish) and Oxymonacathus longirostris (Harlequin filefish) was because they had been gang packed, with the number of fish exceeding the optimum number for the size of bag used. (where “gang packing” is done, the optimum number of fish per bag needs defining)

Another reason for high mortality was also the heat produced by the engines in the “palka” (hold). The compartments closest to the engines became hot, and the water temperatures in the bags increased dramatically. When the collector put his hand in the water, it was noticeably hot, although the maximum temperature was not measured.

The Rhinecanthus acuelatus (Blackbar triggerfish), Naso lituratus (Orangespine unicorn) and Pseudoanthias pascalus (Purple queen anthias) were gang packed, which led to high mortality because of insufficient water in the bag, low pH, increase in ammonia, or physical damage. When the collectors reduced the number of individuals in each plastic bag, the mortality was reduced. We asked them to try some experiments with various numbers of fish in the bags on future trips. In the case of Naso lituratus (Orangespine

unicorn), the pH in the plastic bags went down to 6, 5 and Ammonia test showed readings that were very high.

3.2.13 Dead on arrival (DOA) and reject rates

The percentage of fish that were dead on arrival (DOA) when the fish arrived at the supplier was considered low. There were only 5 DOA among the (Forcipiger longirostris (Longenose butterflyfish). However, it was assumed that there were unreported DOAs, because not all fish were taken to the supplier, and the fish that died on the journey back (on the boat), which were thrown away, also need to be taken into consideration. A few fish were taken away by the collectors' families, and sold to other suppliers.

Two hundred (200) clownfish were rejected due to their small size. It was mentioned by the collectors during the trip that the supplier had told them not to collect fish that were too small in size. However, the collectors ignored this instruction from the supplier, with the hope that the fish would still be bought by the suppliers. The rejected fish were released into the sea by the supplier.

3.2.14 Payment of collectors' income and economic analysis

The fish were directly brought to the supplier who owns the boat, and who provided the operational costs of this roving activity. He paid the collectors immediately on their return, minus any downpayments.

The collectors each received a downpayment of Rp. 200,000 (USD 22.47) prior to roving. This was given to the wives/mothers before the collectors departed, and was immediately used for the family of each collector.

Appendix 2 shows the prices paid for the fish from the roving trip. The price of fish collected on roving activities is only 35% of the price of fish collected locally. The explanation for this is that 45 % of the total costs is allocated for operational costs, and the remaining 20 % includes the supplier's "risk" and fixed cost for this activity. This money is paid up-front before the trip, to cover all costs of the voyage.

For example: the local price (100 %) for "Angel Betmen" (Pomacanthus imperator) is Rp.100.000 (USD 11.24) (price paid to local collector). The price paid for the same species (Angel Betmen) caught by roving is 35% of the price paid for the same fish, but caught locally, ((Rp. 35.000 or USD 3.92). The price paid to roving collectors for their catch is only 35 % of that paid to local collectors (65% lower than local price) because this 65% covers the operational costs (45%) and supplier's risk costs (20%)

When the fish arrive, they are screened by the supplier, who calculates the total number of fish that will be accepted (as the basis of payment). As soon as the the fish have been sent to the exporter(s) - normally within a 3 day period - the supplier then knows the total number of fish accepted by the exporter(s), and how much he will be paid by them .

The supplier normally pays the collectors within three days after their return, as the supplier also has to wait for his buyers to accept his fish. Once the supplier

knows the amount of money he will receive from the exporter, then the supplier can pay the collectors.

In a case where fish have been collected locally, the collectors are normally paid on the day they bring the fish to the supplier.

The average income of each roving collector is above Rp. 500,000 (USD 56.18) per trip. Their personal expenses, (mostly for cigarettes) are between Rp. 60,000 (USD 6.74)) to Rp. 75,000 (USD 8.43). Their final income from roving depends on the catch results, seasonality, and the locations of the collection areas.

The total operational cost of this roving trip was about Rp. 20.000.000 (USD 2,247) paid by the intermediary (supplier).

The supplier and the collectors are a team working in this business. From this income, the supplier can do everything to ensure that his business runs well, including paying off the police if they stop or catch the collectors.

The supplier has two boats, which operate in different roving areas and destinations. The smaller boat, with 15 fishermen, is used for roving trips to Madura, in East Java. It travels one day to reach Madura. The bigger boat, with a maximum of 24 collectors, travels 3 to 5 days as far as East Indonesia. The income generated from each boat covers the other, in order to ensure that the supplier never loses income.

When they are not roving, the collectors have additional income from collecting the fish from the coastal area near their village, with an income varying between USD 1.50 to USD 3.00 per day. This income is enough for daily family expenses, although it does not provide much opportunity to generate savings.

3.2.15 Waste materials

The waste materials generated by the trip consisted mainly of plastic. The plastic bags which could not be used were thrown to the sea and left floating behind the roving boat during packing and re-packing fish on the boat. The other waste was mainly plastic food wrappers (for cakes, instant noodles, meals, etc.).

3.3 Recommendations

This case study provides important insights into the phenomenon of roving collection. Some recommendations include:

1. It was learned that the collectors have difficulties in managing their limited income. They need to be shown how to manage their income more effectively for their families, perhaps through the introduction of simple saving schemes.

2. The exporters order a mix of low-end and high-end species. High-end species do not exist in their village-based collection area. There is a need for CAMP development with a no take zone in Sumber Kima, especially for high-end species recruitment.

3. Roving collection IS being undertaken without the use of cyanide. This case study should serve as an illustration to roving collectors elsewhere, who are using both net and cyanide to collect ornamentals.

4. The conduct of the trip was with only limited permits and permission letters. to strengthen the legality of the practice, each trip should have an official letter from the Harbour Master, a collection permit from the Fisheries Office at Provincial level, and collection permit from the local Fisheries authority of the collection area.

5. The boat trips would benefit in terms of safety from having: a communication system, emergency communications devices, maps, first aid kits, life jackets, tool kit, and fire extinguisher. In addition, regular servicing and maintenance of the boat engines would help to prevent breakdowns, avoid the need for deviation from the planned course to find repair shops, and prevent time being wasted for repairs. A faster return journey would also reduce the time the fish are in the bags, and hopefully retain quality.

6. Develop a management plan for the Karumpa collection area to avoid over-exploitation. The plan should propose a ban the use of cyanide. With this plan, the people of Karumpa village might be able to manage their resources more effectively. Other major components could include zonation to protect the high-end species broodstock area,

7. Since twenty-eight (28) target species are collected using cyanide, there is a need to learn more about non-cyanide collection methods for these target species, and share this information with the collectors.

8. The total travel time for the fish is roughly 9 to 15 days from collection to reaching the supplier. They have to make greater efforts to maintain water quality. Changing the water in the plastic bags more frequently (recommended at least every 12 hours) and 6 hours for the first few days of the new catch, would make a significant difference to overall water quality. This water change process could perhaps be made more efficient. It is however not a good idea to change the packing water in the middle of the day because of the heat, but doing water changes only at night does restrict and limit the number of times when water changes are possible.

9. Time, manpower and space constraints need to be considered when reorganizing how the packing and water changes are done. There is still room for improvement overall, in terms of procedures and efficiency.

10. There is a need to identify alternative transport route(s). One option is to ship fish via air cargo from the nearest airport, for example Maumere, Kendari, Palu**.** The economics of this need looking into. In addition to this, it will be important to develop alternative packing methods, and modify the collection boats by introducing a flow-through water system on the boats, in order to maintain the health of the organisms.

11. The collected fish need to be more systematically recorded against the original order, using the daily logbook. Dead after arrival (DAA) and DOA need to be properly recorded for economic analyses and management purposes.

12. Non-biodegradable rubbish (including plastic bags) should be stored in bags in the boat, not thrown into the sea. Information on environmental management practices on board ships should be shared with the collectors, boat owners and suppliers.

Appendices

Appendix 1 Table of species caught and amounts caught per species.

No	Fish species	Common name	Size	Number of individuals caught	Number of individuals DAA	Number of individuals DOA & Rejected
1	*Pomacanthus imperator*	Emperor angelfish	M	9		
		Emperor angelfish		11		
2	*Centropyge bicolor*	Bicolor angelfish	M,L	23	1	
3	*Pygoplites diacanthus*	Regal angelfish	M,L	24		
4	*Doriorhamphus dactyliophorus*	Ringed pipefish	L	2		
5	*Premnas biaculeatus*	Maroon anemonefish	M,L	39	4	
6	*Pterois radiata*	Radial firefish	M,L	7		
7	*Chrysiptera cyanea*	Sapphire devil	L	439	163	
8	A*nampses lineatus*	Powderblue surgeonfish	M	1		
9	*Acanthurus nigricans*	Whitecheek surgeonfish	M	143	2	
10	*Acanthurus olivaceus*	Orangeband surgeonfish	M	1		
11	*Acanthurus dussumieri*	Eyestrip surgeonfish	M	30		
12	*Acanthurus pyroferus*	Chocolate surgeonfish	M	23		
13	*Plectorhinchus chaetodonoides*	Spotted grunt sweetlips	M	6		
14	*Ostracion cubicus*	Yellow boxfish	S	1		

15	*Signigobius biocellatus*	Eye-spot goby	M,L	1		
16	*Amphiprion ocellaris*	Clown anemonefish	S,M,L	7.221	366	200 Rejected (too small)
17	*Dascyllus trimaculatus*	Threespot dascyllus	M	50		
18	*Labroides domidiatus*	Bicolor cleaner wrasse	L	439	43	
19	*Labroides pectoralis*	Blackspot cleaner wrasse	L	778	54	
20	*Pseudanthias pascalus*	Purple queen anthias	M,L	965	67	
21	*Amphiprion clarkii*	Yellowtail clownfish	S,M,L	37	1	
22	*Oxymonacanthus longirostris*	Harlequin filefish	M,L	473	40	
23	*Coris gaimard*	Yellowtail coris	M	93	3	
		Yellowtail coris	L	107	1	
24	*Halichoeres chrysus*	Canary wrasse	M,L	122	19	
25	*Novaculichthys taeniourus*	Dragon wrasse		39	4	
26	*Chaetodon ephippium*	Saddled butterflyfish	M,L	5	2	
27	*Chaetodon auriga*	Threadfin butterflyfish	M,L	11		
28	*Hemitaurichthys polylepis*	Pyramid butterfly-yellow	M,L	152	6	
29	*Chaetodon punctatofasciatus*	Sunset butterflyfish	M,L	187	39	
30	*Chaetodon mertensii*	Merten's butterflyfish	M,L	17	2	
31	*Chaetodon lunula*	Raccon butterflyfish	M,L	12		
32	*Chaetodon speculum*	Mirror butterflyfish	M,L	4	1	

33	*Chaetodon meyeri*	Scrawled butterflyfish	M,L	12	2	
34	*Acanthurus olivaceus*	Orangeband surgeonfish	M,L	1		
35	*Chaetodon oxycephalus*	Spot-nspe butterflyfish	M,L	59	5	
36	*Zebrasoma veliferum*	Sailfin tang	M	8	1	
37	*Cirrhilabrus solorensin*	Red-eyed wrasse	M,L	4		
38	*Ceilinus undulatus*	Napoleon wrasse	S	1		
39	*Halichoeres chrisus*	Canary wrasse		1	1	
40	*Heniochus acuminatus*	Black & white/longfin heniochus	M	7		
41	*Paracanthurus hepatus*	Blue tang (“Letter six”)	M	30		
		Blue tang (“Letter six”)	T	2		
42	*Pterois antennata*	Broadbarret firefish	M	3		
43	*Forcipiger longirostris*	Longnose butterflyfish	M,L	568	26	5 DOA
44	*Naso lituratus*	Orangespine unicornfish	M	47	20	
45	*Amphiprion polymnus*	Saddleback clownfish	S,M,L	41	10	
46	*Cetoscarus bicolor*	Bicolor parrotfish	M	23	4	
47	*Bodianus diana*	Diana’s hogfish	M	1		
48	*Amphiprion sandaracinos*	Orange anmonefish	M	18	5	
41	*Gomphosus varius*	Bird wrasse	M	1	1	
50	*Pomacanthus navarchus*	Majestic angel	L	4		
51	*Amphiprion clarkii*	Yellowtail clownfish	S,M,L	250	24	
52	*Pterois volitants*	Red Lionfish	M,L	14		
53	*Nemateleotris magnifica*	Fire goby	M,L	782	12	

54	*Ptereleotris evides*	Blackfin dartfish	L	2		
55	*Meiacanthus atrodorsalis*	Forktail blenny	M,L	23		
56	*Amphiprion melenosus*	Red and black anemonefish	S,M,L	64	1	
57	A*nampses meleagrides*	Spotted wrasse	M,L	134	17	
58	*Odonus niger*	Redtoothead triggerfish	S	590	303	
59	*Rhinechantus aculeatus*	Blackbar triggerfish	M	4		
60	*Rhinechantu verrucosus*	Blackbelly triggerfish	M	1		
61	*Stenopus hispidus*	Banded coral shrimp	M	2		
62	*Lysmata amboinensis*	Cleaners shrimp	M	1		
63	*Rhynchocinetes sp*	Camel shrimp	M	4		
64	*Gymnomuraena zebra*	Zebra muray	M	8		
65	*Dascyllus aruanus*	3 stipe tail/whitetall humbug damsel	M	15		
	T O T A L			14,253	1,250	

Appendix 2 Fish price comparison between fish caught locally and by roving.

NO.	FISH SPECIES	COMMON NAME	LOCAL NAME	SIZE	LOCAL COLLECTED PRICE (RUPIAH.)	ROVING COLLECTED PRICE (RUPIAH.)
1	*Pomacanthus imperator*	Emperor angelfish	Angel Batman	M	30.000	12.500
2	*Centropyge bicolor*	Bicolor angelfish	Angel BK	M,L	2.500	1.000
3	*Pygoplites diacanthus*	Regal angelfish	Angel Doreng	M,L	12.000	4.000
4	*Doriorhamphus dactyliophorus*	Ringed pipefish	Bajulan Zebra	L	1.500	600
5	*Premnas biaculeatus*	Maroon anemonefish	Balong	M,L	1.000	500
6	*Pterois radiata*	Radial firefish	Barong Radiata	M,L	8.000	2.500
7	*Chrysiptera cyanea*	Sapphire devil	Blue Devil	L	400	200
8	*Pomachantus imperator*	Emperon angelfish	Bluestone Asli		15.000	5.000
9	*Anampses lineatus*	Powderblue surgeonfish	Botana Biru	M	30.000	10.000
10	*Acanthurus nigricans*	Whitecheek surgeonfish	Botana Kacamata	M	10.000	2.750
11	*Acanthurus olivaceus*	Orangeband surgeonfish	Orangeband surgeonfish	M	10.000	3.000
12	*Acanthurus sp*	Eyestrip surgeonfish	Botana Kuning	M	3.000	1.000
13	*Acanthurus pyroferus*	Chocolate surgeonfish	Botana Model	M	15.000	5.000
14	*Plectorhinchus chaetodonoides*	Spotted grunt sweetlips	Brownkelly	M	7.500	3.000
15	*Ostracion cubicus*	Yellow boxfish	Buntal Koper	M	2.000	1.000
16		Eye-spot goby	Cabing Gajah	M,L	5.000	1.500
17	*Amphiprion ocellaris*	Clown anemonefish	Clownfish	S,M,L	1.500	600
18	*Dascyllus trimaculatus*	Threespot dascyllus	Dakocan	M	500	200
19	*Labroides domidiatus*	Bicolor cleaner wrasse	Dokter Asli	L	7.500	2.500
20	*Labroides pectoralis*	Blackspot cleaner wrasse	Dokter Mas	L	7.500	2.000
21	*Pseudanthias pascalus*	Purple queen	Gadis	M,L	1.000	500

		anthias				
22	*Amphiprion clarkii*	Yellowtail clownfish	Giro Pasir	S,M, L	1.000	700
23	*Oxymonacanthus longirostris*	Harlequin filefish	Jagungan	M,L	3.000	1.000
24	*Coris gaimard*	Yellowtail coris	Keling Asli	L	7.500	2.500
25	*Halichoeres chrysus*	Yellowtail coris	Keling Kuning	M,L	1.000	400
26	*Coris gaimard*	Canary wrasse	Keling Merah		3.000	1.500
27	*Novaculichthys taeniourus*	Dragon wrasse	Keling Tanduk		3.000	1.500
28	*Chaetodon ephippium*	Saddled butterflyfish	Kepe Angsa	M,L	8.000	3.000
29	*Chaetodon auriga*	Threadfin butterflyfish	Kepe Auriga	M,L	3.000	1.500
30	*Hemitaurichthys polylepis*	Pyramid butterfly-yellow	Kepe BH	M,L	8.000	3.000
31	*Chaetodon punctatofasciatus*	Sunset butterflyfish	Kepe Citrun	M,L	5.000	1.500
32	*Chaetodon mertensii*	Merten's butterflyfish	Kepe Fantasi	M,L	7.500	2.500
33	*Chaetodon lunula*	Raccon butterflyfish	Kepe Gajah	M,L	8.000	3.000
34	*Chaetodon speculum*	Mirror butterflyfish	Kepe Menangis	M,L	8.000	3.000
35	*Chaetodon meyeri*	Scrawled butterflyfish	Kepe Meyeri	M,L	8.000	3.000
36	*Acathurus olivaceus*	Orangeband surgeonfish	Kepe Monalisa	M,L	7.500	2.500
37	*Chaetodon ulietensis*	Spot-nspe butterflyfish	Kepe Piramid	M,L	8.000	3.000
38	*Zebrasoma veliferum*	Sailfin tang	Keranjang Bali	M	8.000	3.000
39	*Cirrhilabrus cyanopleura*	Red-eyed wrasse	KKO Kendari	M,L	7.500	3.000
40	*Ceilinus undulatus*	Napoleon wrasse	Lambi		10.000	2.000
41	*Halichoeres chrisus*	Canary wrasse	Lambi Kuning		10.000	5.000
42	*Heniochus acuminatus*	Black & white/longfin heniochus	Layaran Kuning	M	7.500	3.000
43	*Anampses lineatus*	Letter six	Letter Six	M	30.000	10.000
		Letter six	Letter Six	T	15.000	5.000
44	*Pterois antennata*	Broadbarret firefish	Miles	M	1.500	500
45	*Forcipiger longirostris*	Longnose butterflyfish	Monyong Asli	M,L	8.000	3.000
46	*Naso lituratus*	Orangespine	Naso Asli	M	10.000	1.500

		unicornfish				
47	*Amphiprion polymnus*	Saddleback clownfish	Negroid	S,M, L	1.500	700
48	*Cetoscarus bicolor*	Bicolor parrotfish	Noknang	M	8.000	3.000
41	*Bodianus diana*	Diana's hogfish	Opis Titik	M	3.000	1.000
50	*Amphiprion sandaracinos*	Orange anmonefish	Pelet	M	1.500	600
51	*Gomphosus varius*	Bird wrasse	Pinguin	M	7.500	3.000
52	*Pomacanthus navarchus*	Majestic angel	Piyama	L	60.000	25.000
53	*Amphiprion clarkii*	Yellowtail clownfish	Polimas	S,M, L	1.500	700
54	*Pterois volitants*	Red Lionfish	Politan	M,L	8.000	3.000
55	*Nemateleotris magnifica*	Fire goby	Roket Anten Merah	M,L	8.000	2.600
56	*Ptereleotris evides*	Blackfin dartfish	Roket B (pasir)	L	1.000	500
57	*Meiacanthus atrodorsalis*	Forktail blenny	Roket Biru	M,L	1.000	500
58	*Amphiprion melenosus*	Red and black anemonefis h	Tompel	S,M, L	1.500	700
59	A*nampses lineatus*	Spotted wrasse	Totol Asli	M,L	8.000	3.000
60	*Odonus niger*	Redtoothea d triggerfish	Triger Biru	S	1.500	500
61	*Rhinechantus aculeatus*	Blackbar triggerfish	Triger Matahari	M	5.000	1.500
62	*Rhinechantu verrucosus*	Blackbelly triggerfish	Triger Motor	M	500	200
63	*Stenopus hispidus*	Banded coral shrimp	Udang MP	M	500	200
64	*Lysmata amboinensis*	Cleaners shrimp	Udang Pelet	M	2.000	500
65	*Rhynchocinetes sp*	Camel shrimp	Udang Wayang	M	500	200
66	*Gymnomuraena zebra*	Zebra muray	Ular Zebra	M	8.000	3.000
67	*Dascyllus aruanus*	3 stripe tail/whitetail humbug damsel	Zebra	M	600	250

Note :

- *"local" means the fish that was collected by the collector who does not get all fixed and operational costs from the supplier*
- *"roving fish" means a fish that was collected by the collector who gets all fixed and operational costs from the supplier*

Appendix 3 Economic Analysis

MIDDLEMEN COSTS, REVENUE AND PROFITS

Assumption

Number of trip in a month = **1**

Number of fish (fish) = **13,005**
Total Fish Cost (USD) = **1,467**
Total Fixed costs (USD) = **200**
Total trip costs (USD) **2,000**
Total sold to exporter (USD) = **5,734**

FIXED COSTS

No.	Description	Unit	Volume	Price (Rp)	Total Costs (Rp)	Lifespan (Months)	Monthly Costs (Rp)
1	Boat & 3 engines	Unit	1	55,000,000	55,000,000	180	305,556
2	GPS	Unit	-	-	-	120	-
3	Compass	Unit	1	125,000	125,000	120	1,042
4	Life jacket	Unit	-	-	-	60	-
5	Map	Unit	-	-	-	24	-
6	Oxygen tank	tank	7	1,000,000	7,000,000	360	19,444
7	Oxygen regulator	Unit	2	250,000	500,000	24	20,833
8	Oxygen hose	meter	2	40,000	80,000	24	3,333
9	Blow Oxygen Gun	Unit	2	25,000	50,000	12	4,167
10	Cooking equipment	Set	1	500,000	500,000	60	8,333
11	Lighting	Set	1	2,000,000	2,000,000	24	83,333
12	Fresh water tank	Unit	1	150,000	150,000	60	2,500
13	Big pail (30 ltre)	Unit	5	15,000	75,000	12	6,250
14	Small pail (10 ltre)	Unit	5	6,000	30,000	12	2,500
15	Boat maintenance		1	1,000,000	1,000,000	1	1,000,000
16	Engines maintenance		1	2,000,000	2,000,000	1	2,000,000
17	Oil changes		1	65,000	65,000	1	65,000
Total Fixed Cost							**3,522,292**

ROVING OPERATIONAL COSTS

No.	Description	Unit	Volume	Price (Rp)	Total cost / trip (Rp)
1	Packing Materials				
	Plastic bags	Kg	140	7,000	980,000
	Oxygen	Bottle	7	135,000	945,000
	Rubber bands	Kg	5	24,500	122,500
2	Fuel				
	Petrol	Liter	60	5,000	300,000
	Kerosene	Liter	100	3,500	350,000
	Diesel	Liter	1,800	5,000	9,000,000
3	Meals				
	Rice	Kg	200	4,500	900,000
	Sugar	kg	15	6,000	90,000
	Coffee	kg	3	50,000	150,000
	Other				
	Additional food	Packet	1	300,000	300,000
4	Administration/Permit				
	Fishing permit (collectors village)	unit	1	20,000	20,000
	Fishing permit (collection area village)	Unit	1	750,000	750,000
5	Head man work salary	Unit	1	1,466,925	1,466,925
6	Boat crew salary	Unit	1 (?)	3,500,000	3,500,000
Total Operational Costs					**18,874,425**

REVENUE

Average revenue of intermediary per trip	**Rp. 772,066**

Collectors' revenue

Assumption

Number of trips in a month = **1**

FIXED COSTS

No.	Description	Unit	Volume	Price	Total	Lifespan (Month)	Monthly Cost (Rp.)
1	Fins	Unit					

			1 pr	200,000	200,000	60	3,333
2	Mask & Snorkel	Unit	1	200,000	200,000	60	3,333
3	Car inner tube	Unit	1	30,000	30,000	24	1,250
4	Crate	Unit	1	20,000	20,000	24	833
5	towing rope	Unit	1	5,000	5,000	36	139
6	Scoop net	Unit	1	25,000	25,000	24	1,042
7	Small mesh net	Unit	1	30,000	30,000	24	1,250
8	MAC net	Unit	1	250,000	250,000	24	10,417
9	Bigger mesh net	Unit	1	130,000	130,000	24	5,417
Total Fixed Costs							**27,014**

OPERATIONAL COSTS

No.	Description	Unit	Volume	Price	Total	Number of trips	Monthly Cost (Rp)
1	Cigarettes		1	60,000	60,000	1	60,000
2	Cakes/snacks		1	30,000	30,000	1	30,000
3	Other				-	1	-
Total Operational Costs					**90,000**		**Rp.90,000**
REVENUE							
Average revenue of collector per trip							**Rp. 772,066 (USD 86.72)**

Philippines

- Verde Passage, Batangas

4 Roving Collectors in Verde Island, Philippines

From June 21 to 25, 2006 a MAC technical officer traveled with a group of roving collectors from Barangay San Andres, Verde Island to Barangays Mananao and Harrison in Paluan, Occidental Mindoro, both collection areas for marine aquarium fish. His intent on joining was to observe the present-day practices of roving collectors. The data in this case study were culled from this trip as well as from the scoping reports MAC has completed on San Andres and on the three municipalities in Occidental Mindoro (Paluan, Lubang and Looc) where roving collectors from San Andres are known to collect fishes.

4.1 Roving Collectors in San Andres: A Short Profile

The Verde Passage Corridor covers 494,700 hectares of ocean located between the provinces of Batangas and Mindoro. It is regarded as highly critical in marine biodiversity conservation for having the highest concentration of species per unit area in the world. The village of San Andres can be found in this corridor, one of six that make up Verde Island. Batangas City has political and administrative authority over San Andres, with a total land area of 244.48 hectares and a total population of 1,136 people, most of them dependent on fishing for livelihood.

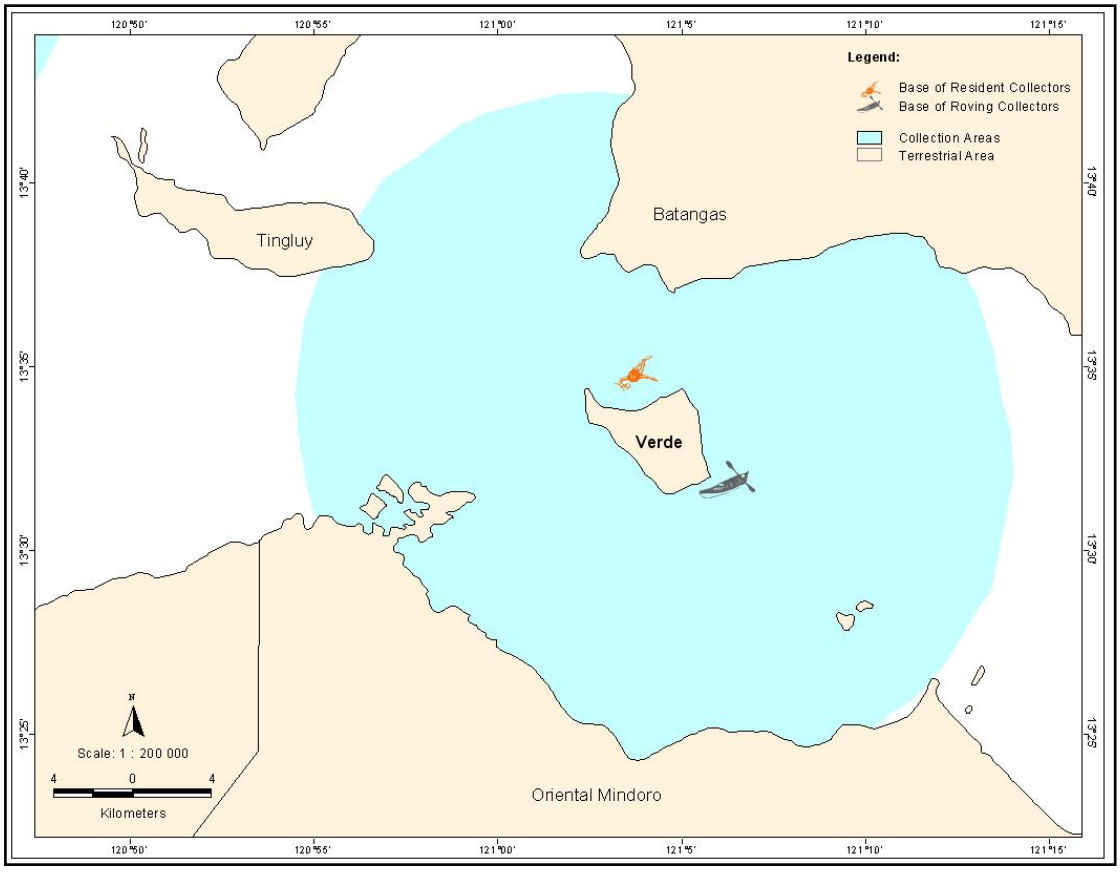

Figure 2: Location Map of Verde Island

There are 117 fishermen in San Andres, 107 of them engaged in marine aquarium fish collection. Of the 107, the majority are diver-collectors. Some 79 use

compressors during collection while 15 are into free diving (or ***mano-mano***). Some of these diver-collectors now and then function as linemen or boatmen during expeditions. There are 13 fishers who act as traders, seven of them are women. As a further classification, the 107 aquarium fish collectors may be divided into 20 groups. Eight of these groups with 42 members are roving; the remaining 12 are non-roving, with 52 resident collectors. All except one of these groups rely on compressors during collection.

Table 15: Classification of Collectors

	Mano-mano	Hookah Collectors		Total
		Divers	Linemen	
Resident		37		
▪ Total number of persons	15	23	14	52
▪ Number of groups	1	11		12
▪ Number of units	13	2		15
Roving		42		
▪ Total number of persons	0	24	18	42
▪ Number of groups	0	8		8
▪ Number of units	0	0		0
Total number of persons	15	79		94
Total number of groups	1	19		20
Total number of units	13	2		15

Note: A unit refers to a collector operating on his own.

p

In addition, most of these collectors became involved in the trade because of a relative (father or older brother). Most have one to five years experience in this type of work; the rest between five to 30 years. One out of every five divers is single and reached high school. Not one finished college. As expected, the traders earn more than the collectors, having an average income per month of PhP 7,800.00 (USD 157.56). The difference in the monthly incomes of compressor and mano-mano divers is not very significant: PhP 5,100.00 (USD 103.03) for the former against the latter PhP 4,600.00 (USD 92.93).

Table 16: Monthly Incomes of Collectors and Traders in Php (USD in parentheses)

Monthly Declared Income	Mano-mano (USD)	Hookah	Trader
▪ Lowest	900.00 (18.18)	900.00 (18.18)	2,500.00 (50.51)
▪ Highest	12,000.00 (242.42)	19,000.00 (383.83)	22,500.00 (454.55)
▪ Average	4,600.00 (92.93)	5,100.00 (103.03)	7,800.00 (157.56)

4.2 Background on the Collection Areas of Roving Collectors from San Andres

The coast line of San Andres is only two kilometers long which explains why collectors there decide to go out and explore neighboring Occidental Mindoro. The species caught in San Andres are usually low-priced (e.g. six-line wrasses, damsel fishes and yellow anthias) compared to the ones collected from roving which include not a few medium to high-end species like angel fishes (Emperator, Blue Koran, Flagfin and Japanese Swallow). The blue pygmy angel, it is said, is one species that could be found only in Verde Island.

According to the Philippines Republic Act 8550, the waters of Batangas City are open for fishing to any resident, provided he/she does not use harmful chemicals and dynamites. The city local government unit (LGU) recently passed an ordinance requiring collectors to secure "permits to gather" and traders with "permits to conduct business." Even with this legal mandate, marine aquarium collection is still confined to San Andres because of strong opposition from the four other coastal communities (San Agapito, San Agustin Kanluran, San Agustin Silangan, and San Antonio) in Verde Island.

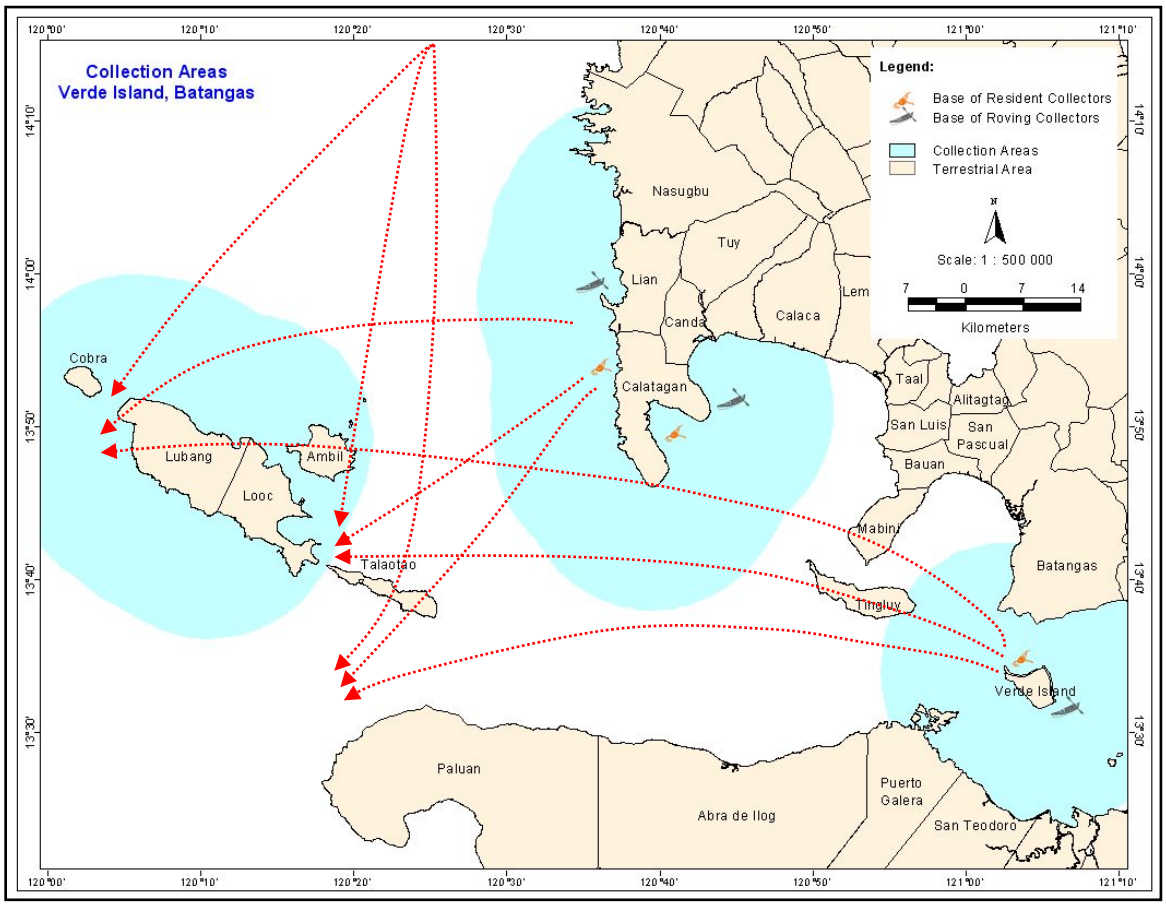

Figure 3: Roving collection routes in Verde Passage Corridor.

Given this, the alternate collection grounds of San Andres collectors are Paluan, Looc and Lubang in Occidental Mindoro. The sites mostly frequented are Calavite in Paluan and Talaotao in Looc. Interestingly, the municipal LGU of Paluan has banned

the use of compressors in any fishing activity within its municipal waters. In Lubang, a similar ban exists with added separate legislation prohibiting the collection of marine aquarium fish. The situation in Looc is not as strict since its municipal LGU only prohibits non-residents without permits to fish within its municipal waters. While these laws are in effect, the collectors of San Andres claim they have fished these areas in the last 15 years without apprehension. They come and go without hesitation, except in Lubang where enforcement is more strict and the LGU more vigilant. Hookah users are targeted more in Lubang.

Table 17: Legislated Municipal Ordinances in the Collection Areas

Major Content of Ordinances	Batang as City	Looc	Lubang	Paluan
1. Ban on collection of aquarium fish	No	No	Yes	No
2. Ban on use of hookah for fishing	No	No	Yes	Yes
3. Ban on fishing of non-residents without permit from the local government	Yes	Yes	No	No
4. Ban on the use of dynamite and obnoxious materials for fishing	Yes		Yes	Yes

4.3 Present-Day Practices of Roving Collectors from San Andres

4.3.1 Composition and Classification

Roving collectors in San Andres travel in groups of four to six. Currently, there are eight groups of roving collectors in San Andres. These groups are quite intact in a social sense as they are related to each other, hence, can be relied upon. Any person leaving a group either has either quit the trade or has migrated to other communities.

There are two ways to classify members of a group of roving collectors. First they can be classified according to method; a) those who stay above water and remain in the boat during the collection proper (referred to as ***taong ibabaw***) and b) those who dive and collect marine aquarium fish (referred to as ***bosero*** or hookah divers). The other way of classifying them would be through the role that they take onduring collection.

4.3.1.1 **Financier.** Usually, the financier is the boat owner, acting as boat captain during the expedition. In some groups, he doubles also as the trader. For every trip, he provides the fuel, food provisions of the collectors, the materials to be used for collection and other needs. At times, he provides cash advances to some members of the group.

4.3.1.2 **Boat Captain.** The boat captain makes the decisions for the group during the expedition. As stated, he could also be the boat owner, financier and/or trader. At times, where resources are scarce, he also functions as the lineman or boatman.

4.3.1.3 **Diver.** Self-trained in the collection of marine aquarium fish, the diver is the most important member of the group. Nearly all the divers in San Andres use the surface-supplied

compressed air apparatus referred to as “hookah”, when collecting. At the minimum, there are two divers in each group but the average number is at four divers per group.

4.3.1.4 **Boatman.** The boatman could either be the boat captain or the lineman, depending on the arrangements agreed upon by members of a group. He is in charge of ensuring that the engines of the boat and the compressors are well functioning during the collection period.

Figure 4: A diver and a lineman during a roving expedition.

4.3.1.5 **Lineman.** The lineman is considered an all-around help of the group, hence, takes care of a lot of “household” chores while on board the boat. Some of these chores include cooking, fetching water, keeping the air hoses free from any tangles, anchoring and de-anchoring the boat and warning other boats passing on the presence of divers underwater. He helps out in the stocking of the fish in the boat, making sure these are in good condition. Sometimes, he doubles as the boatman.

4.3.2 Collection Practices

The following characterizes roving collectors in San Andres and their routine, in general, from the time they prepare for an expedition until their catch are finally delivered to buyers based in Manila.

3.3.2.1 **Collection Paraphernalia.** A roving collector-diver wears a long-sleeved shirt, long tight pants (cycling- or pedal- type) and a bonnet when collecting. The other pieces of diving equipments used are improvised flippers made of thick plywood or plastic material, a mask and a belt weight. The barrier net is the primary tool for collection. The collector brings along with it a plastic bag to scoop the fish and an injection needle for fish decompression. The boat is usually less than three gross tons, hence, is classified by law as a non-commercial fishing vessel. These are registered with the municipal LGU which has authority for this function.

A compressor is also a normal tool used in the collection. Two divers often share one compressor. Where there are only two divers in the group, they take turns using the compressor, going underwater for a maximum of 40 minutes. Where there are more than two collectors, they are grouped in pairs. Each pair is given at the most one hour, or every diver a maximum of 30 minutes to use the compressor. When one pair is underwater, the other pairs take a rest.

4.3.2.2 **Collection Methods.** Collection is done with the use of a barrier net. A roving collector pitches a net beside a coral reef and using his hands, drives the fish to the net. The fish trapped in the net are caught using a small plastic bag that serves as a scoop net and then transferred to a large plastic bag. Lion fish are placed in separate bags.

Roving collectors from San Andres claim not to no longer use cyanide. This was confirmed when the collector-divers observed during the expedition demonstrated expertise in net collection methods. The number of fish they caught was the equivalent of the average catch for a three-day collection.

The collectors visit different collection sites. Normally in one fishing expedition, collectors harvest once only in a small reef but in the case of large reefs known to be rich in marine aquarium organisms, collectors return for a second time to harvest. Where the reefs are close to each other, the boat is stationary as the divers explore the area. In sandy beds with a small congregation of corals or stones sporadically located, marathon collection is practiced, with the divers followed by the boat. A total distance of 300 to 500 meters is covered in these cases. Finally, the collection sites are observed to be not less than 200 meters away from the shoreline.

3.3.2.3 **Packing.** Nearly all the fish are packed individually. These would include angelfish, tangs, butterfly fish, hogfish and female bird wrasses. Some, such as anthias, peaceful damsels (e.g. domino) and some wrasses (yellow and juvenile red wrasses), are packed together. Others are packed in pairs, for example a clownfish and a damsel or a wrasse and a butterfly fish. The right sizes of bags are used most of the time, allowing the fishes to move inside freely. When “gang-packing,” the norm is to have not more than 10 fish in a 14x28 plastic bag. Oxygen to water ratio in a sealed bag is estimated at 30:70 or 40:60 (30-40% oxygen and 60-70% water).

Prior to packing, the cheek spines (protrusion on the gill plate of a fish) of an angelfish are clipped using the mouth and teeth of a collector before it is transferred into a plastic bag. The “scalpels” of a surgeonfish is also cut in the same way before it being packed. To solve problems in decompression, the anal opening of a fish is pricked with an injection needle to effect the passage of air from the fish belly.

Figure 5: Packing as a collective effort of all group members.

3.3.2..4 **Handling.** The front portion of the boat's hull is designed to stock the fish caught by the collectors. It has three to five levels, with each level having a detachable cover made of plywood or made of bamboo splits with a wooden frame. These covers both protect the plastic bags underneath from being crushed and serve as the floor for the next layer of plastic bags. The fish in plastic bags are packed and placed in upright position. For two days after a fish is caught, water is changed twice a day. On the third day, only bags dirty with feces and urine from the fish are re-packed. The arrangements in layers help facilitate re-packing as the linemen and collectors assign a time to change water in the plastic bags.

The other place in the boat where fish are stocked is the shaded planks on the sides of the boat. For most part, the bags are covered with cloth, sack or native materials (buri). Water is splashed frequently to keep the fish cool.

Upon arrival in Verde Island proper, the catch are inspected again and re-packed for delivery to the exporters.

3.3.2.5 **Screening.** There is no thorough screening of the fish for the duration of the trip. Only the low-priced organisms accidentally caught are removed during packing. When re-packing, only the dead fish are removed. This same practice is repeated during the final packaging for delivery.

3.3.2.6 **Final Packing and Delivery.** The packing before the fish are delivered to their final destination starts as early as 05h00 in the morning. Upon arrival in San Andres, all of the fish are spread out in a land-based packing shanty the group has built near the beach. An oxygen tank is always available, as are different sizes of plastic bags. Packing water is drawn from the near shore.

Packing is selective at this point. All the bags are inspected, with those that contain fish in good condition (e.g. swimming straight or not gasping for air) and with clean water set aside and made ready for delivery. Re-packing is always done, however, for the following bags:

- those with large and expensive fish
- those with gang packed fish where the dead and/or weak ones are removed;
- deflated bags, without oxygen
- punctured ones, with bags being replaced
- those with dirty water and/or with fish gasping for air

Almost always, there is not enough time for all of the fish to be repacked. The trader takes over at this point, and is responsible for the delivery of the fish to the exporters in Manila. The trader is assisted by the collectors to load the fish on a boat en route to Batangas City.

Figure 6: Re-packing prior to delivery.

4.3.3 Trade Practices

3.3.3.1 **Financing.** A fishing expedition is financed by the boat owner. When the financier requires a large sum as capital, a loan is obtained from either the trader or an exporter if the boat owner is also a trader. When a loan is not secured, food and the other materials for the expedition are often bought on credit in the name of the financier.

3.3.3.2 **Profit-Sharing.** All of the groups of roving collectors in San Andres employ some form of net profit sharing scheme. The most common form has the following features:

- Every expense incurred prior, during and at the end of a fishing expedition is regarded as cost. Depreciation of the boat or the compressor is not always factored in. Instead practiced there is an allocated share from the net profit for capital expenses.

- Net profit is computed by deducting total costs from the amount the trader paid the roving collectors for the entire catch. It is then divided as follows: two shares for every diver, one share for every lineman and one share each for the boat, the boat engine and the compressor. If there is a separate boat captain and boatman, they receive one share each also.

- Profits are distributed after the trader comes back from Manila after delivering the fish to the exporters.

- Any loss incurred will be carried over to the next trip, although losses are rare.

Table 18: Sample Computation in Profit-Sharing in Php (USD in parentheses)

Assumptions:	1. The net profit amounted to PhP 9,000.00 (USD 181.82)			
	2. There are two divers and two linemen in the group. One of the linemen also functioned as boat captain.			
Profit Distribution:	Group member	Shares allocated	Number of members	Total profit distributed
	Diver	2	2	4,000.00 (80.81)
	Lineman	1	1	1,000.00 (20.20)
	Lineman-boat owner	1	1	1,000.00 (20.20)
	Boat	1		1,000.00 (20.20)
	Boat engine	1		1,000.00 (20.20)
	Compressor	1		1,000.00 (20.20)

4.3.4 Other Features of Roving Collection

4.3.4.1 **Factors Affecting Roving Collection.** Roving collection by the fisher-collectors of San Andres is done all-year round. An expedition lasts from two to seven days, depending on the following factors: a) weather condition, b) availability of resources such as fuel and food, c) the condition of the boat and its engine and d) time it takes to fill the boat with catch. Sometimes, after only two or three days, the boat is already filled with fish. Where the catch is small, the operation is continued until after the food provisions are consumed. When a storm threatens, the boat is damaged or engine trouble occurs, the boat captain decides to cut short a trip, even if this would mean losses. Demand from exporters does not appear to have a significant bearing on the number of collection trips made by rovers.

Figure 7: Unloading catch at Batangas port.

4.3.4.2 **Seasonality.** Collection peaks from March to May every year when the storms are occasional. The sea is generally calm and water temperature is conducive for diving. During this period, a group conducts between three to five fishing expeditions per month. From November to February, collection trips are down to once or twice per month but are longer in duration because water temperature is too cold for the divers. During these months, divers can not stay underwater for more than 30 minutes each dive, and require more days to fill up the boat with catch. Finally, the months of June to October are unpredictable. A well-laid out fishing trip could be canceled at last minute when a weather disturbance occurs. Without typhoons, the roving collectors conduct at the most three trips per month during this period.

4.3.4.3 **Reasons Why Collectors Rove.** Even with a ban on the use of compressors in effect, roving collectors from San Andres regularly collect in the municipal waters of Looc and Paluan and sometimes, in Lubang. To have access on these fishing grounds, some of the collectors befriend barangay and even municipal leaders from these municipalities. When in the vicinity, they drop by at their houses at night time for “social visits”. During these occasions, roving collectors will provide fuel for the power generators to provide electricity to the houses of their hosts. Other collectors decide to simply ignore regulations and when law enforcers accost them, they come prepared with a bribe, negotiate or flee. There was an attempt made by one group leader to ask for a permit from a local government but this was quickly turned down.

According to roving collectors, they continue to organize expeditions outside San Andres to these municipalities for the following reasons:

- There are too many collectors in San Andres such that they compete for buyers who could only absorb limited species caught within their barangay
- The reefs in Paluan, Looc and Lubang are abundant with marine aquarium organisms, some of these high-priced and in demand by buyers (e.g. angel fishes, powder brown and orange-lipped/lipstick tangs)
- They are not allowed to catch in other parts of Batangas City even though the law does not prohibit them from fishing anywhere within the city waters
- The other fishermen in the neighboring barangays in Verde Island are vigilant in driving them away and could not be persuaded to allow aquarium collection in their areas

4.4 Recommendations

4.4.1 On the overall management of the marine aquarium fishery

1. There is a need to organize a meeting among the municipalities of Paluan, Looc, and Lubang in the province of Occidental Mindoro (part of Region 4b) and Batangas City in the province of Batangas (part of Region 4a) and representatives of BFAR in the two regions to discuss the issue of roving marine aquarium collection in these areas. The meeting should be hosted by one of the regional BFAR offices.
2. The above meeting should a] review existing municipal laws and regulations related to the marine aquarium industry, b] law enforcement activities, c] fisheries-related extension activities with a view to coming up with a joint strategy in addressing the issue of roving collection.
3. There is a need to conduct communication and education activities among the key stakeholders in these areas with regards to the marine aquarium industry, the benefits that can be gained from it, and the possible negative impact it can have on the fishery and how these can be addressed. The key stakeholders include: a] the Verde Island Marine Sanctuary Board, b] the barangay governments of the six barangays in Verde Island, c] the OCVAS (Office of the City Veterinarian and Agricultural Services) of Batangas City, d] the municipal governments of Looc, Paluan and Lubang, e] the association of aquarium collectors in San Andres, f] NGOs in the area (especially the First Philippine Conservation International or FPCI), the g] two regional BFAR offices, and h] the Conservation International (CI).
4. There is a need to strengthen the law enforcement capacity of the municipalities of Paluan and Looc especially and to some extent in the municipality of Lubang.

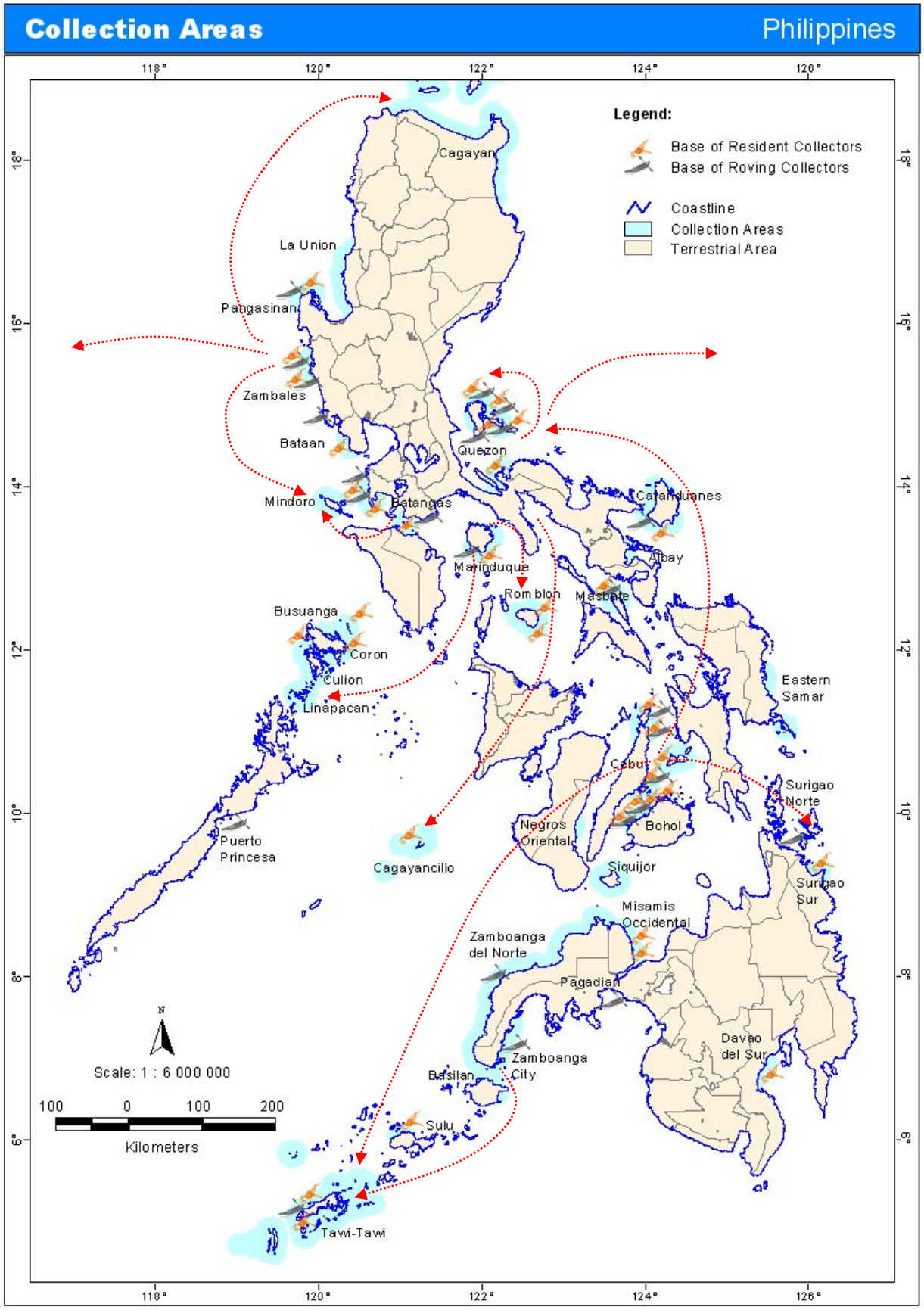

Figure 8: Roving collection routes in Philippines.

5. There is a need to conduct further study on roving collectors coming from other parts of the country that also visit the collection areas in Occidental Mindoro.

4.4.2 On collection methods

1. The collectors are already skilled in using nets (barrier, scoop and push nets). What seems to be needed is a refresher training on coral reef ecosystem that would improve the collectors knowledge on this and enhance their conservation attitude towards these ecosystems.
2. There is a need for a training on safe diving, especially for those using compressors in collection.
3. There is a need to train collectors in the proper way of decompressing caught fish.
4. There is a need to train collectors in proper screening.
5. There is a need for additional training on fish handling and husbandry (including purging), packing, preparation of packing water and transport methods.

4.4.3 On monitoring catches and shipments

1. There is a need to design and pilot test a system for monitoring catches and shipments and to orient collectors and resource managers in Batangas City and the three municipalities in Mindoro on how this can feed into resource management activities and the work on improving the quality of marine ornamentals.
2. There is a need for an orientation on fish identification – to link common names used by the collectors with scientific names.

Appendices

Appendix 1 Roving Collection Diary

Date	Time	Activities	Person In-Charge
6/21	0600-0800	▪ Supplies needed loaded	Linemen, divers
		▪ Boat and engine condition checked	Boat captain
	0800	▪ Boat left San Andres	
		▪ Breakfast cooked	Linemen
	1400	▪ Arrived at collection site	
	1400-1600	▪ 1st dive at Kaliliig to Gin-ay; depth: 4 to 6 arm span	Divers
	1600-1630	▪ Packing and stocking of fish done	All
	1610	▪ Boat departed for Kalangigan/Parola	
	1800	▪ Docked for the night at Kalangigan ▪ Water fetched	Linemen
	1830	▪ Boat captain visited barangay to inform officials/leaders of their collection activities in the area	
6/22	0500	▪ Wake up time	
	0530	▪ Coffee time/breakfast cooked	
	0600	▪ Boat left Kalangigan	
	0600-0700	▪ Repacking of fish done while boat sailed	All
	0700-1000	▪ 1st dive at Pulambato; depth: 7-8 arm span	Divers
	1000-1020	▪ Packing	Linemen
	1020-1310	▪ 2nd dive at Ignoog (left side); depth: 6-8 arm span	Divers
	1310-1340	▪ Packing completed	Linemen
	1340-1350	▪ Lunch taken	
	1350-1600	▪ 3rd dive at Ignoog (left side) ; depth: 6-8 arm span	Divers
	1600-1800	▪ Packing/Repacking	Linemen
	1630-1800	▪ 4th dive at Ignoog (front); depth: 6-8 arm span	Divers
	1800	▪ Boat moved to shore in front of the sitio	
	1830	▪ Boat anchored for the night ▪ Water fetched ▪ Dinner	Linemen

Date	Time	Activities	Person-in-Charge
6/23	0500	▪ Wake up/Coffee Time ▪ Boat checked	
	0530-0750	▪ Repacking	All
	0700	▪ Boat left for diving area ▪ 2/3 of the stock already re-packed ▪ Divers prepared for diving	
	0710-0920	▪ 1st dive at Ignoog (front); depth: 6-8 arm span	Divers
	0920-0950	▪ Packing	Linemen
	0950-1000	▪ Breakfast cooked	
	1000-1135	▪ 2nd dive at Ignoog (right side); depth: 7-8 arm span	Divers
	1135-1150	▪ Repacking	Linemen
	1150-1350	▪ 3rd dive at Pamutusin/Bagiit (coral site); depth: 12-13 arm span	Divers
	1350-1420	▪ Packing/Lunch	
	1420-1620	▪ 4th dive at Pamutusin/Bagiit (coral site); depth: 12-13 arm span	Divers
	1545-1830	▪ Repacking/Packing	All
	1830	▪ Boat moved back to Kalangigan	
	1800	▪ Boat docked for the night ▪ Water fetched	Linemen
	1830	▪ Dinner	
	1900-2300	▪ Socialized with residents	All
6/24	0520-0745	▪ Repacking (selective)	All
	0745	▪ Boat leaves to collection site	
	0750	▪ Breakfast ▪ Preparation for diving	
	0800-1000	▪ 1st dive at Aglimasan to Talahib; distance: 400-500 meters and depth: 12 arm span	Divers
	1000-1035	▪ Packing	Linemen
	1035-1120	▪ 2nd dive at Itbo; distance: 300-400 meters and depth: 16 arm span	Divers
	1120-1215	▪ Packing	Linemen
	1215-1330	▪ 3rd dive at Gin-ay; distance: 300-400 meters and depth: 10 arm span	Divers

Date	Time	Activities	Person-in-Charge
	1330-1410	▪ Packing/Lunch	Linemen
	1410-1450	▪ 4th dive at Ililijig; distance: 300 meters and depth: 8 arm span	Divers
	1710	▪ Repacking/Packing (all)	All
	1710-1745	▪ Boat checked	Boat captain
	1745	▪ Boat left Bayanan.	
6/25	0230	▪ Boat arrived at San Andres, Isla Verde	
	0500-0900	▪ Unloading, screening, repacking, segregation (per species and per trader), counting, recording, packing for transport	All
	0900-1030	▪ Fish loaded back at boat	All
	1030-1200	▪ Boat left for Batangas City (Pundohan)	Trader
	1200-1400	▪ Fish unloaded from boat	Trader
	1430-1600	▪ Fish loaded at hired jeepney for Manila	Trader

Notes:

1. While on dock at San Andres, the boat engine is occasionally checked by a hired maintenance person. The person is being paid P 200.00 per month for the service.
2. The collection activity was cut short for a day due to the announcement of a typhoon over the radio and the sudden presence of black clouds on the horizon.
3. Loading to jeepney was delayed due to late arrival of the vehicle.
4. Traders already have auxiliary invoice for the shipment prepared. If not ready, they contact the fishery office and the invoice will either be ready for pick-up at the office or will be delivered to the port (Pundohan) where the fish are unloaded from the boat.

Appendix 2 Daily Collection and Mortality Record in the Expedition with Roving Collectors

Species Type	Species	Total Catch	06/21/06	06/22/06	06/23/06	06/24/06	DOA/ Reject -6/22	DOA/ Reject - 6/23	DOA/ Reject - 6/24	Total DOA/ Reject	Total Sold
Angel	Banded Angel	1				1				0	1
Angel	Black Puma	1	1							0	2
Angel	Blue Koran	1		1			1			1	
Angel	Coral Beauty	78	30	22	20	6			3	3	75
Angel	Emperator – Adult	1			1					0	1
Angel	Emperator – Juv	2		1	1					0	2
Angel	Halbflack	18	6	6	4	2				0	18
Angel	Lamarck	1		1						0	1
Angel	Oriole	1			1					0	1
Angel	Regal	83	4	39	33	7	2	3	1	6	77
Angel	Yellow Angel	4	1	2		1			1	1	3
Anthias	Mother Shepperd	83	15		30	38		3	3	6	80
Anthias	Purple Queen	63		10	42	11				0	63
Anthias	Square Anthias	52	4	42	4	2	1	2		3	49
Anthias	Truncate Anthias	43	7			36				0	43
Anthias	Yellow Anthias	146	25	15		106				0	146
Butterfly	Auriga	2			1	1				0	2
Butterfly	Black and White Heniochus	33	1	8	16	8	2	2	4	8	25
Butterfly	Brown Heniochus	2	2							0	2
Butterfly	Diamond	56	3	50		3				0	53
Butterfly	Orna	31	1	22	8					0	44
Butterfly	Punctato	24	2	6	2	14				0	24
Butterfly	Red Checkered	7				7				0	7
Butterfly	Yellow Longnose	26	4	8	9	5		1		1	25
Clownfish	African Clownfish	17	5	1	7	4				0	15
Clownfish	Percula	4			4					0	4
Clownfish	Pink Skunk	5			5					0	5

Clownfish	Tomato Clownfish	8			7	1				0	8
Damsel	Domino	30	8			22	3			3	27
Grouper	Miniatus	1				1				0	1
Grunts/Sweet lips	Oriental Sweetlips	1				1			1	1	0
Hawkfish	Longnose Hawkfish	1	1						1	1	0
Lionfish	Peacock Lionfish	10			6	4				0	13
Lionfish	Antennata	1				1				0	3
Shark	Remora	1				1				0	1
Tang	Powder brown	215	10	95	31	79				0	215
Tang	Yellow tang	3		2		1			1	1	2
Wrasse	Coral/Split Level Hogfish	41	12	10	3	16		2	1	3	38
Wrasse	Bird Wrasse (Green)	16	1	9	2	4	1			1	37
Wrasse	Bird Wrasse (Brown)	1				1				0	1
Wrasse	Dragon	1				1				0	1
Wrasse	Purple wrasse	9	3	6						0	3
Wrasse	Rainbow	4		2		2			1	1	3
Wrasse	Red wrasse – Adult	8				8				0	8
Wrasse	Scissortail Hogfish	3	1	2						0	3
Wrasse	Tamarind	1		1					1	1	0
Wrasse	Tarry Hogfish	8	5	1		2				0	8
Wrasse	Cometa Wrasse	5		1	3	1		1	1	2	3
Invertebrates	Orange Skunk Shrimp	14	3		11					0	17
	TOTAL	1,167	155	363	251	398	10	14	19	43	1,160
	AMOUNT										19,100.00

Appendix 3 Aquarium Organisms found in Paluan

Species Type	Scientific Name	Common Name	Price
Fish			
Angelfish	*Apolemichthys trimaculatus*	Flagfin Angelfish	80.00
	Centropyge bicolor	Oriole/Bicolor Angelfish	20.00
	Centropyge bispinosa	Coral Beauty Angelfish	12.00
	Centropyge heraldi	Yellow Angelfish	12.00
	Centropyge nox	Black Puma/Midnight Angelfish	12.00
	Centropyge tibicen	Melas/Keyhole Angelfish	12.00
	Centropyge vroliki	Halbflack/Pearlscale Angelfish	8.00
	Genicanthus lamarck	Lamarck Angelfish	12.00
	Genicanthus melanospilos	Japanese Swallow Angelfish	80.00
	Paracentropyge multifasciata	Banded Angelfish	25.00
	Pomacanthus imperator	Emperator Angelfish	350.00
	Pomacanthus semicirculatus	Blue/Blue-Striped Koran Angelfish	120.00
	Pygoplites diacanthus	Regal Angelfish	45.00
Anglerfish	*Antennarius sp.*	Unidentified Anglerfish	
Anthias	*Mirolabrichthys imeldae*	Tiger Queen Anthias	8.00
	Pseudanthias dispar	Madder Seaperch/Peach Fairy Basslet	5.00
	Pseudanthias luzonensis	Yellow Anthias	5.00
	Pseudanthias pleurotaenia	Square/Squarespot Anthias	22.00
	Pseudanthias smithvanizi	Princess Anthias	5.00
	Pseudanthias truncatus/hypselosoma	Truncate Anthias	5.00
	Pseudanthias tuka	Purple Queen/Yellow-Striped Fairy Basslet	25.00
	Serranocirrhitus latus	Sunburst Basslet	120.00
Blenny	*Ecsenius bicolor*	Bicolor Blenny	
Butterflyfish	*Chaetodon auriga*	Auriga Butterflyfish	
	Chaetodon kleinii	Klein's Butterflyfish	5.00
	Chaetodon lunula	Lunula Butterflyfish	
	Chaetodon ornatissimus	Orna Butterflyfish	
	Chaetodon punctatofasciatus	Punctato/Spotband Butterflyfish	8.00
	Chaetodon unimaculatus	Teardrops/Lemon Butterfly	15.00
	Chaetodon xanthurus	Red Checkered Butterflyfish	
	Coradion chrysozonus	Coral Butterflyfish	5.00
	Forcipiger flavissimus	Yellow Longnose Butterflyfish	15.00
	Hemitaurichthys polylepis	Diamond Butterflyfish	20.00
	Heniochus acuminatus	Black and White Heniochus	35.00
	Heniochus chrysostomus	Fake Brown/Pennate Heniochus	12.00
	Heniochus varius	Brown Heniochus	5.00

Clownfish	*Amphiprion clarkii*	African Clownfish	4.00
	Amphiprion frenatus	Tomato Clownfish	10.00
	Amphiprion ocellaris	Percula Clownfish	12.00
	Amphiprion perideraion	Pink Skunk Clownfish	4.00
	Amphiprion polymnus	Saddledback Clownfish	8.00
Damselfish	*Chrysiptera caeruleolineata*	Blue Back Damselfish	15.00
	Chromis caerulea	Green Chromis	1.00
	Dascyllus reticulatus	Two-Stripe Damselfish	1.00
	Dascyllus trimaculatus	Domino Damselfish	3.00
Dartfish	*Ptereleotris evides*	Sciossortail Goby	
	Ptereleotris microlepis	Blue Goby	
Grouper	*Calloplesiops altivelis*	Comet Grouper	
	Cephalopholis miniata	Miniatus Grouper	90.00
	Variola louti	Cherry Grouper	
Grunts/ Sweetlips	*Plectorhinchus orientalis*	Oriental Sweetlips	
Hawkfish	*Cirrhitichthys aprinus*	Red Hawkfish	4.00
	Oxycirrhites typus	Longnose Hawkfish	70.00
Lionfish	*Dendrochirus zebra*	Whitefin Lionfish	10.00
	Pterois antennata	Antennata Lionfish	
	Pterois radiata	Radial Lionfish	10.00
	Pterois volitans	Peacock Lionfish	30.00
Puffer	*Arothron nigropunctatus*	Dogface Pufferfish	12.00
Snapper	*Macolor niger*	Black and White Snapper	15.00
	Pterocaesio pisang	Banana Fusilier/Snapper	5.00
Tang/ Surgeonfish	*Acanthurus nigricans*	Powder brown Tang	22.00
	Naso lituratus	Lipstick Tang	10.00
	Zebrasoma flavescens	Yellow Tang	15.00
	Zebrasoma scopas	Brown Tang	
Triggerfish	*Odonus niger*	Queen Triggerfish	
	Pseudobalistes fuscus	Yellowspotted Triggerfish	
Wrasse	*Anampses meleagrides*	Tamarind Wrasse	5.00
	Bodianus anthioides	Scissortail Hogfish	
	Bodianus axillaris	Axilspot Hogfish	12.00
	Bodianus bilunulatus	Tarry Hogfish	5.00
	Bodianus diana	Diana Hogfish	12.00
	Bodianus mesothorax	Coral/Split Level Hogfish	10.00
	Coris gaimard	Red Wrasse	8.00
	Gomphosus varius	Bird Wrasse (Green & Brown)	50.00
	Halichoeres chrysus	Yellow Wrasse	6.00
	Halichoeres ornatissimus	Ornamental Wrasse	15.00
	Halichoeres prosopeion	Purple Wrasse	5.00
	Labroides dimidiatus	Rainbow/Bluestreak Cleaner Wrasse	5.00

	Novaculichthys taeinourus	Dragon Wrasse	6.00
	Pseudocheilinus hexataenia	Sixline Wrasse	12.00
	Thalassoma lunare	Thalasoma Wrasse	5.00
Miscellaneous Fish	*Arothron nigropunctatus*	Moorish Idol	15.00
	Echeneis naucrates	Remora	
Invertebrates			
Shrimps	*Lysmata amboinensis*	Orange Skunk Shrimp	4.00
	Stenopus hispidus	Banded Shrimp	3.00
Slugs	*Chromodoris sp.*	Slug	25.00
	Chromodoris magnifa	Velvet Sea Slug	
Starfish	*Linckia sp.*	Starfish	5.00

Appendix 4 Aquarium Organisms found in San Andres

Species Type	Scientific Name	Common Name	Price
Fish			
Angelfish	*Centropyge flavicauda*	Blue Pygmy Angelfish	12.00
	Centropyge tibicen	Melas/Keyhole Angelfish	12.00
	Centropyge vroliki	Halfblack Angelfish	8.00
	Genicanthus lamarck	Lamark Angelfish	12.00
	Genicanthus melanospilos	Japanese Swallow Angelfish	80.00
Anthias	*Pseudanthias squamipinnis*	Yellow/Scalefin Anthias	5.00
	Pseudanthias hutchii	Red Cheeked Green Anthias	5.00
	Pseudanthias truncatus/hypselosoma	Truncate Anthias	5.00
Boxfish	*Ostracion cubicus*	Spotted Boxfish	10.00
	Ostracion meleagris	Whitespotted Boxfish	10.00
Butterflyfish	*Chaetodon kleini*	Kleins Butterflyfish	5.00
	Chaetodon punctatofasciatus	Punctato/Spotband Butterflyfish	8.00
	Forcipiger flavissimus	Yellow Longnose Butterflyfish	20.00
Clownfish	*Amphiprion clarkii*	African Clownfish	4.00
	Amphiprion frenatus	Tomato Clownfish	12.00
	Amphiprion ocellaris	Percula clownfish	12.00
	Amphiprion perideraion	Pink Skunk Clownfish	4.00
	Amphiprion polymnus	Saddleback Clownfish	12.00
Damselfish	*Abudefduf vaigiensis*	Indo-Pacific Sergeant Damselfish	3.00
	Acanthochromis polyacanthus	Spiny Chromis	1.00
	Chromis caerulea	Green Chromis	1.00
	Chromis retrofasciata	Black-bar Chromis	3.00
	Chrysiptera caeruleolineata	Blue Back Damselfish	15.00
	Chrysiptera talboti	Talbots Damselfish	3.00

	Dascyllus reticulatus	Two-Stripe Damselfish	1.00
	Dascyllus trimaculatus	Domino Damselfish	3.00
	Pomacentrus amboinensis	Ambon Damselfish	
	Pomacentrus coelestes	Neon Damselfish	3.00
Dottybacks	*Pseudochromis diadema*	Diadema Grouper	10.00
Dragonet	*Synchiropus ocellatus*	Red Scooter Blenny	3.00
Goby	*Eviota pellucida*	Pellucida Pygmy Goby	3.00
Grouper	*Cephalopholis miniata*	Miniatus Grouper	90.00
	Epinephelus merra	Black & White Grouper	15.00
Hawkfish	*Cirrhitichthys falco*	Red Hawkfish	4.00
	Cirrhitichthys aprinus	Spotted Hawkfish	4.00
	Paracirrhites arcatus	Arc-eye Hawkfish	4.00
Lionfish	*Dendrochirus brachypterus*	Dwarf Lionfish	
	Pterois antennata	Antennata Lionfish	
	Pterois volitans	Peacock Lionfish	30.00
Pufferfish	*Arothron nigropunctatus*	Dogface Pufferfish	15.00
	Canthigaster valentini	Valentini Pufferfish	
Snapper	*Pterocaesio pisang*	Banana Snapper	5.00
Stonefish	*Synanceia verrucosa*	Stonefish	
Tang	*Zebrasoma flavescens*	Yellow Tang	10.00
Wrasse	*Labroides sp.*	Unnidentified Wrasse	1.00
Wrasse	*Bodianus mesothorax*	Diana Hogfish	10.00
Wrasse	*Halichoeres marginatus*	Dusky/Black Wrasse	
Wrasse	*Pseudojuloides sp.*	Multi-color Wrasse	20.00
Wrasse	*Pseudojuloides cerasinus*	Pencil Wrasse	
Wrasse	*Labroides dimidiatus*	Rainbow Wrasse	5.00
Wrasse	*Coris gaimard*	Red wrasse	8.00
Wrasse	*Pseudocheilinus hexataenia*	Six-line Wrasse	8.00
Wrasse	*Thalassoma lunare*	Thalasoma Wrasse	5.00
Wrasse	*Halichoeres chrysus*	Yellow Wrasse	6.00
Invertebrates			
Starfish	*Linkia laevigata*	Red/Blue Starfish	5.00
Invertebrates	*Lysmata amboinensis*	Orange Skunk Shrimp	25.00
Invertebrates	*Chromodoris sp.*	Slug	5.00

Management Options

5 Management Options: Towards a Responsible and Sustainable Marine Aquarium Trade

The fundamental concerns as outlined in the case studies are two-fold: a) marine ornamentals are collected in areas that have no resource management governance systems in place, b} the collectors are exposed to dangerous methods in collection.

5.1 Framework for addressing the concerns

In developing a management strategy to address roving collection, there are two key elements that need to be considered. These include:

1. Property and access rights

   Marine ornamentals represent a common pool resource. Common pool resources are natural or man-made resource systems used simultaneously or sequentially by members of a community/communities regardless of the property rights involved (collective, private or public).

   A strategy for managing the marine aquarium fishery should carefully examine the property rights system that regulates the common resource. Is it open access, individual property, group property or public property? It has been demonstrated that an open access system is practically impossible to manage. Philippine fishery law gives local residents preferential use rights over municipal water resources that include marine ornamentals. Indonesian fishery law is evolving towards the same direction, although there were cases of traditional property rights systems in place and that are enforced but these are disintegrating.

2. Role of institutions with management responsibility over the common resource

   Once the property rights system in place has been established, a viable institutional framework that can guarantee enforcement of the property rights system needs to be established. Would the institutional framework include a traditional system that has been enforced for generations? Would the institutional framework consist of a government (local or national) that implements a coastal resource management plan and law enforcement system? Collectors of marine ornamentals are most likely to subscribe to best practice standards of sustainable marine aquarium fishery if their rights over access to the common resource are guaranteed.

Based on the above, there are four basic options in addressing the issue of roving collectors:

Option	**Requirements**	**Implications**
1. Blanket exclusion (ban the trade)	1. Strong law enforcement capacity of local governments 2. Information campaign about coastal resource	1. No supply of fish 2. If coastal law enforcement is weak, the marine ornamentals trade will just go “underground”

	management and dive safety issues at local level 3. Strong capacity for coastal resource management (CRM)	
2. Exclusive use rights to residents (municipal/district)	1. Strong law enforcement capacity of local governments; 2. Information campaign about coastal resource management and dive safety issues at local level 3. Strong capacity for coastal resource management	1. Supply of fish will diminish, if this is enforced 2. Many roving collectors will become unemployed or "crowd" their base collection areas 3. Weak law enforcement will allow practice of roving to continue
3. Usufruct (legal right to use another's property) rights awarded to skilled collectors through a licensing system, with the system overseen by local government with the assistance of national government	1. Strong law enforcement capacity 2. Strong capacity for coastal management 3. Information campaign on CRM and dive safety issues at local level	1. Supply of fish most likely will remain at existing levels 2. Possible conflict between roving collectors awarded usufruct rights and resident fishers who are not skilled in collection
4. Usufruct rights (as above) with direct exporter participation	1. Same as above, plus information campaign among exporters 2. Strong regulatory structure at the national level to deal with exporters	1. Same as above, plus if national regulation is weak, exporters will just continue current practices by virtue of habit

The management option in areas where roving collection is taking place will differ based on context or specific situations. However the basic requirements in order for these options to work are essentially the same, as shown in the table above.

The MAC Certification system has to date been implemented under Option 2, although Options 3 and 4 are also consistent with all the MAC Standards. Option 2, however, places at a disadvantage those who choose to become MAC Certified. Their access to the resource is confined to a limited territory, while those who are not MAC Certified are not excluded from accessing the resources in areas where coastal law enforcement is weak. They therefore gain access to the rare and more expensive species that the trade demands.

In order to support the development of management strategies for specific situations, the following actions, in the context of MAMTI, are proposed:

Communications

1. Design and implement a communications plan to highlight the "roving bandits and collectors issue" in both countries, highlighting the negative aspects of roving collection, but create opportunities for dialogue with roving collectors.

2. Highlight the models of good practice in the MAMTI model areas/sites to demonstrate how resources can be managed. This should include information about implementation of laws, reef rehabilitation and other tools provided to communities and stakeholder groups.

Governance

3. Strengthen governance related to roving collection. This includes working closely with local and national government institutions, other complementary projects and NGOs to assist in promoting MAC Standards and Certification. It would be important to establish working relationships with institutions and organizations that guarantee property rights, incentives, awards to those not roving, license systems and law enforcement at key export nodes (airports etc).

Learning Areas

4. Continue work in Verde Passage, Philippines and Indonesia (Padang/Mentawai Corridor, Selayar District) to learn more about the roving and develop possible working models of management in these areas.

5. Shift the emphasis of interaction with municipal and district governments to ecosystem-based approach to managing the marine aquarium fishery across political boundaries (as the issues are considered transboundary).

6. Explore public-private partnership models for management of the resources in the Philippines and Indonesia. An example would be to promote a private marine tenure (wherein an exporter can get paid rights to exclusively harvest a pre-determined area), that combines resource management and sharing, risk sharing and sharing of rewards.

Review of the Applicability of MAC Standards for Capacity-Building

7. Review the current MAC Standards and Certification system to identify entry points. Under the EFM Standard there it is possible to certify a “corridor” or series of collection areas. Under the CFH Standard, roving collectors can be trained to implement good collection and handling practices and be eligible for MAC Certification under Options 3 and 4 above. At the level of the HHT Standard, in order to promote a responsible and sustainable trade, intermediaries / coordinators and exporters (who wield considerable control over the finance and management of the trade) must be convinced to change their practices (adopt corporate social responsibility).

8. Consider the suite of business training materials for roving collectors that is linked to MAC Certification. In this context, incentives and instruments, such as access to microfinance schemes, compulsory savings etc can be linked to MAC Standards and Certification.

Research

9. It will be useful to build on the initial work undertaken by the IFC-supported value chain study in the marine ornamental industries of the Philippines and Indonesia. This work should be expanded to collect and manage data on the global value chain.

10. Integrated work should be done in areas which are not feasible for MAC Certification, but are very important to the marine aquarium fishery, particularly the transshipment points in the Philippines and Indonesia. In this context the roles of Malaysia, Singapore and Hong Kong should be examined.


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