

**Policy, Practice and Perceptions:
Understanding governance of aquarium fishing in the
Philippines**



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Policy, Practice and Perceptions: Understanding governance of aquarium fishing in the Philippines

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Abstract:

The Philippines is one of the largest exporters of wild reef fish for the aquarium trade. As such, it provides livelihoods across the country. However, there are concerns that its overharvest and damaging fishing techniques have irreversible effects on ecosystems. Accordingly, there have been attempts to introduce policies which tackle damaging practices, such as cyanide fishing. Yet the success of these policies is variable. This project in Calatagan, in the Philippines, provides baseline information to understand and strengthen aquarium fishery management. Participatory techniques with aquarium fishers and government officials explore the *de-facto* practices in an aquarium fishery, and local perceptions of benefits and legitimacy in fishery management. Policy-practice gaps form as *de-jure* rules are translated into rules-in-use. Firstly, as national and local policies are implemented on-the-ground, and then through inconsistent enforcement. Other than cyanide bans, no rules specifically control aquarium fishing, this includes issuing special collection permits. Despite gaps at the local government level, fishers show high awareness and compliance to *de-jure* rules, thus reducing policy-practice gaps. Voluntary compliance can be explained through positive perceptions. For example, perceptions that cyanide bans yield benefits. Although a few positive perceptions exist, an overriding coercive incentive to comply is discovered. The threat of local government banning aquarium fishing creates compliance which may be less effective in the long-term. Aquarium fishers lack support from the local government and are rarely involved in *de-jure* fishery management. This indicates a lack of perceived legitimacy, and is also perceived as a limitation for future use of the aquarium fishery. However, aquarium fishers demonstrate an awareness of sustainable practices through use of their own social norms for collecting aquarium fish. By increasing aquarium fisher involvement in *de-jure* management, both social and environmental needs could be considered. Thus, creating effective management for future use of the fishery.

Declaration of Authorship

I declare that this work has not previously been presented to obtain a degree in any form. It has been produced by myself, in collaboration with supervisors and project partners.

I give permission for Lancaster University to provide online access to this thesis.

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1. Introduction

1.1. Overview

The trade of wildlife products directly impacts wild populations of fauna and flora. In the case of the marine aquarium trade, live reef fish are harvested directly from coral reefs to supply the luxury, and therefore often controversial, fish keeping hobby (Wood 2001; Wabnitz et al. 2003). However, over-exploitation of reef fish is frequently observed, and damaging harvest techniques have irreversible effects on coral reefs (Rubec 1986; Rubec 1988; Kolm and Berglund 2003; Shuman et al. 2005).

The Philippines is among the top three global exporters of wild aquarium fish, a trade that supports many coastal livelihoods and is driven by global consumer demand (Fabinyi and Dalabajan 2010). However, the Philippines are also under heavy environmental degradation, with coral reefs faring poorly as dependence by local communities continues to grow (Rubec 1986; Muallil et al. 2013). With importing countries increasing pressure on illegal fishing in the Philippines, the national government have revised fishery policies that ban the use of damaging techniques, such as stating higher sanctions for fishing with sodium cyanide (Dee et al. 2014; Talbot 2015). Due to the environmental concerns about the aquarium trade, this study plans to investigate the realities of management within an aquarium fishery in Calatagan, in the Philippines, for instance the actual prevalence of sodium cyanide fishing.

Surprisingly, among the aquarium fishers in Calatagan, an alternative picture is shown. Destructive fishing with sodium cyanide is found to be low and therefore not the controversial problem in this aquarium fishery. However, despite the aquarium fishers using environmentally friendly techniques with specialised nets, communities perceive that future use of Calatagan's aquarium fishery is hindered. This study provides a deeper insight into the influences on an aquarium fishery; exploring social aspects, local governance and on-the-ground fishery management.

The management of aquarium fisheries involves implementing and enforcing rules, and can also integrate cooperation with local communities. Governance brings an element of power to management. Governing bodies, such as local government and fisheries agencies, have the power to design rules which are written into policies. Successful implementation of government policies as rules-in-use can vary, and thus effective management on-the-ground can also suffer. For example, not all the rules stated in policies may be implemented and enforced locally. This can result from weak governance and a lack of consideration of local livelihood needs (Robbins et al. 2009; Fabinyi and Dalabajan 2010; Dee et al. 2014).

Policies used to manage resources, such as aquarium fisheries, contain *de-jure* rules stating which activities are legal or illegal (Dee et al. 2014). These rules have attributes that can be extracted, studied and compared across contexts (Crawford and Ostrom 1995; Basurto et al. 2009). Such attributes as conditions and sanctions of the rules can be used for comparing the *de-jure* rules and *de-facto* practices, and therefore the reality for fishery management. By doing so, we can better understand management and specifically, the gap between policy (*de-jure*) and practice (*de-*

facto) (Basurto et al. 2009; Carmenta et al. 2013). In reality, *de-jure* rules exist as rules-in-use, which govern the *de-facto* practices, and thus result in the policy-practice gap (Ostrom 1990; Fabinyi and Dalabajan 2010; Cole 2014). For example, when the fishers do not accept *de-jure* rules non-compliance would arise (cf. Robbins et al. 2009). Compliance with the rules is necessary for resource management to have its desired effects. When *de-jure* rules are misaligned to local livelihood needs, the harvesters will have few incentives to comply with the *de-jure* rules (Grafton 2000; Pascual et al. 2014; Solomon et al. 2015). In Calatagan, although do gaps are found to exist between policy and practice, there is also a degree of alignment. For example, the high levels of compliance among aquarium fishers. This introduces the question of what incentives do the aquarium fishers have to comply with *de-jure* rules.

Ostrom put forth the idea that when harvesters can participate in designing and enforcing rules, resource management may be more appropriate and effective (Ostrom 1990). More fisher participation will also increase positive perceptions of legitimacy in management, such as fairness and trust, which in turn increases incentives to comply (Tyler 1990; Hatcher et al. 2000; Nielson 2003). Yet, cooperation between the local government and aquarium fishers are severely lacking in this study. With low legitimacy in Calatagan's aquarium fishery management, alternative approaches may explain the high compliance among fishers.

According to the 'Reasoned Action Model' developed by Fishbein and Ajzen (2010), incentives to comply can arise from perceived benefits and legitimacy in *de-jure* rules, social norms, and the possession of skills, knowledge and time to alter illegal

behaviours (Tyler 1990; Fishbein and Ajzen 2010; Arias 2015). These incentives will influence voluntary compliance, and so the success of aquarium fishery management (Arias 2015). For instance, where there are perceptions that the *de-jure* rules banning destructive fishing practices yields benefits aquarium fishers are more likely to comply in the rules (Tyler 1990; Nielson 2003). The rules would be more aligned with livelihood needs, and social or moral obligations to comply would also exist (Keane et al. 2008; Arias 2015). Thus, incentives to comply will in turn reduce policy-practice gaps (Stern 2008; Arias 2015). Therefore, management authorities must consider the social realities and perceptions of aquarium fishers, including their participation, for effective and sustainable management of the aquarium trade (Ostrom 1990; Fabinyi and Dalabajan 2010).

In this study, communities of aquarium fishers in the Philippines will be studied. Through structured comparison of the *de-jure* policies and *de-facto* practices, the rules-in-use for aquarium fishery management will be understood. Perceptions of benefits and legitimacy in *de-jure* rules are explored, to show their influence on fisher compliance, and thus policy-practice gaps. Finally, fisher perceptions are used to assess the effectiveness of existing management for future use of the fishery, with the application of Ostrom's eight principles for effective resource management.

1.2. Aims and Research Questions

The aim of this study is to understand the management of an aquarium fishery in the Philippines, by identifying policy-practice gaps and aquarium fisher perceptions of existing management.

Two overriding questions will be the basis for research:

1. What are the *de-facto* practices in aquarium fishery management, and how do they differ to the *de-jure* rules?
 - i. Identify *de-jure* rules which govern aquarium fishing.
 - ii. Understand the rules-in-use, *de-facto* enforcement, and fisher awareness of *de-jure* rules.
 - iii. Gather estimates of non-compliance through a specialised questioning technique.
 - iv. Learn about the day-to-day lives of aquarium fishers, including which techniques are commonly used for aquarium fishing.
2. How do the fishers perceive existing aquarium fishery management?
 - i. Recognise themes in fisher perceptions of benefits and legitimacy in *de-jure* rules.
 - ii. Explore whether existing management is perceived as effective for future use of the aquarium fishery.

2. Literature Review

2.1. The Aquarium Trade

2.1.1. Background

The trade of wildlife products targets thousands of species worldwide (Phelps et al. 2016). Animals and plants alike are caught, farmed and sold to consumers as meat, pets, medicinal products and luxury items, to name a few. Whilst most focus is on

large and charismatic species, such as elephant and rhino, many less familiar species tend to be overlooked (Phelps et al. 2016). The wildlife trade encompasses both illegal and legal activities, each with management challenges; even for the legal wildlife trade sustainability is difficult to achieve. Over a 9-year period in South East Asia alone, over 35 million animals were recorded in legal international trade, 30 million of which were wild caught. These species included butterflies, reptiles, mammals, birds and fish (Nijman 2010). However, these figures apply only to species listed on the Convention for International Trade of Endangered Species (CITES), while most fish species traded for aquariums, are not CITES listed suggesting that previous recorded estimates for traded fish are ever higher (Wabnitz et al. 2003; Rhyne et al. 2012).

The US is a huge importer of aquarium fish from the Philippines, with the two countries holding many trade links (Rhyne et al. 2017). Rhyne et al. (2017) calculated a figure just shy of 1,800 aquarium fish imported into the US over one year, between 2009 and 2011. Import records for aquarium fish entering the US, lack identification to the species level, and are instead listed under a generic code. This insufficient monitoring highlights a lack of clarity over the amount of species involved in the aquarium trade (Rhyne et al. 2017). Yet, existing trade numbers portray the magnitude of wild fish populations that are continuously impacted by global demand, which could increase further with improved identification and monitoring (Rhyne et al. 2012). The Philippines were among the first countries to begin trading aquarium fish and are one of the largest global exporters, therefore harvesting a huge amount of wild reef fish (Wabnitz et al. 2003; Leal et al. 2016).

2.1.2. Impacts

The aquarium trade can have positive effects for society, yet negative impacts on the environment. At the harvester level, fishing for the aquarium trade provides vital jobs across approximately 45 developing countries (Wood 2001). For example, in the Philippines, small rural communities face few job opportunities and the aquarium trade can provide an essential source of income (Wabnitz et al. 2003).

Yet, reliance on wild species for economic stability can result in overexploitation of the resource (see Hardin 1968). The subsequent removal of biodiversity from coral reefs leads to widespread controversy (Wabnitz et al. 2003). For example, fishing pressure on the Indonesian Banggai Cardinalfish (*Pterapogon kauderni*), a popular aquarium fish, has resulted in lower population densities and smaller group sizes (Kolm and Berglund 2003). In 2017, the collection of Banggai Cardinalfish was proposed for regulation under CITES (CITES 2017), due to its risk of overexploitation. However, this was opposed by Indonesia, another large exporter of aquarium fish (Wabnitz et al. 2003; CITES 2017). The collection of sea anemones from Cebu, in the Philippines, has also led to lower population densities in exploited areas (Shuman et al. 2005). Due to the interconnected nature of ecosystems, the removal of one species will consequently impact others; by removing sea anemones from their natural habitat, anemonefish population sizes have declined by 80% (Shuman et al. 2005). A coral reef is host to a large diversity of ecological relationships, where species have evolved to coexist and depend on one another (Dee et al. 2014). Therefore, harvesting aquarium fish without suitable management, can have

extensive impacts on the coral reef ecosystem, with future consequences for human livelihoods.

The impacts of harvesting aquarium fish are further exacerbated when they are collected using destructive techniques (Barber and Pratt 1998). Cyanide fishing was first observed in the Philippines in 1962, and has spread across country due to the ease and quantity with which fishers can maximise their catch (Rubec 1986; Fabinyi and Dalabajan 2010; Dee et al. 2014). This technique consists of using a squeeze bottle containing a substance of sodium cyanide powder and seawater, which is squirted into coral reef crevices. The chemical substance stuns and paralyses the fish, allowing efficient collection (Wabnitz et al. 2003). However, sodium cyanide is a poisonous substance, which can affect target and non-target organisms (Rubec 1988). It is extremely detrimental to coral; it kills symbiotic zooxanthellae algae, which some coral species require for respiration. The resulting effect is coral bleaching, with direct coral death in high cyanide doses (Jones and Steven 1997). Cyanide is also damaging to the fishes' liver, leading to extremely high instant and delayed mortality rates (Rubec 1988). Of the fish caught by cyanide fishing, only 20-30% have been found to survive the first few days following capture, and 98% of fish die within one year of being sold due to their poor health (Smith 1984; Rubec 1986; Millar 2013).

Coral reefs provide essential habitats for one third of the worlds marine fish species, as well as providing an important source of income for millions of people in tropical, developing countries (Paulay 1997; Wabnitz et al. 2003). The Philippines lies in the centre of global coral reef biodiversity. Thirty years ago, 71% of the Philippine's coral

reefs were found to be in poor to fair condition, partially due to over-harvest and widespread cyanide fishing (Rubec 1986). More recent research on the impacts of destructive fishing in the Philippines, has found coral cover to have declined by 67% over 2 years (Russ and Leahy 2017). Additionally, evidence from the Philippines shows that most small-scale fisheries, including food fisheries, are unsustainable to the point of fishery collapse (Muallil et al. 2013). Therefore, fishing techniques which are detrimental to coral reefs, deny the long-term use of resources which reefs provide. To combat unsustainable practices used in aquarium fishing, effective management schemes are necessary (Wood 2001; Dee et al. 2014).

2.2. Managing aquarium fisheries

2.2.1. A Common Pool Resource

To better understand how the fragility of aquarium fisheries leaves them susceptible to overexploitation, their depletable and renewable nature allow the fisheries to be thought of as common pool resources (CPR) (Ostrom et al. 1999). A common pool resource is where one harvester's exploitation of the resource reduces the amount available for others, and when the exclusion of harvesters is difficult and costly to achieve (Ostrom et al. 1999). For instance, if one fisher collects large volumes of fish, regardless of the costs to the remaining population, there will be even less left for other fishers. The short-term benefits of this one fisher maximising personal gain will only create negative impacts for the future as fish populations are depleted (Hardin 1968). This process of decimating a common pool resource, was termed the 'Tragedy of the Commons'. In Hardin's opinion, the best way to prevent the tragedy of the commons is to privatise lands, restricting access to resources for only select

individuals, for instance by government ownership (Hardin 1968). However, Ostrom takes a different route that humans are norm-using, and that alternative solutions to government ownership exist, such as increasing the involvement of harvesters in CPR management (Ostrom et al. 1999; Ostrom 1999).

Managing common pool resources is a challenging task, as it requires understanding a variety of interplaying factors (Ostrom 2009). For example, replenishment of aquarium fisheries after depletion relies on the life history traits of its species (Kolm and Berglund 2003). Therefore, for aquarium fisheries to exist as a sustainable common pool resource, they will require appropriately designed management regimes which consider its complex ecological interactions and dynamics (Ostrom 1999; Kolm and Berglund 2003; Dee et al. 2014). As well as these ecological features, the reliance of coastal communities on fishery resources means that social influences also play a significant role in aquarium fisheries. Aquarium fishing provides an income to support families living within rural, coastal areas (Wabnitz et al. 2003). Additionally, aquarium fishing is a consumer driven livelihood with huge global demand from public aquariums and hobbyists for aquarium fish. With growing human populations and pressure on coral reef ecosystems, there is a mounting necessity to design effective management for aquarium fisheries and trade (Wabnitz et al. 2003).

2.2.2. Current management schemes

In response to the increasing pressure on coral reef species, several states and countries involved in the aquarium trade have introduced new *de-jure* rules that seek

to enable legal and sustainable trade (Wood 2001; Dee et al. 2014). These regimes span from international regulations to national policies, and even locally designed rules specific to a subset of communities (Dee et al. 2014). For the structural analysis of *de-jure* rules, they can be defined using a grammatical syntax, called the ADICO syntax, developed by Crawford and Ostrom (1995). Here, rules are conceptualised into 5 sub-components (Basurto et al. 2009). Within each rule there is an attribute (A); the persons to whom the rules apply, the deontic (D), for example 'must not', 'must', 'it is prohibited to', the aim (I) of the rule, such as what actions are prohibited or required. For each rule, there must also be conditions (C); when or where the rule must be followed, and finally, the sanctions, 'or else' (O), if the rule is not followed (Crawford and Ostrom 1995). For instance, "Fishermen are banned from using damaging harvest techniques during fishing trips. The use of damaging harvest techniques will result in confiscation of equipment and catch" (Basurto et al. 2009). The underlined phrases represent each of the 5 sub-components which define this as a rule. This syntax is useful for comparing *de-jure* rules within policy documents, and also for comparison of *de-jure* rules and *de-facto* practices (see Chapter 3).

Popular *de-jure* rules for managing aquarium fisheries have included placing restrictions on damaging fishing techniques and the establishment of catch limits and no-fishing areas, to prevent over-harvest (Wood 2001). For instance, Indonesia has implemented a ban on cyanide fishing and created Marine Protected Areas (MPAs), which so far have appeared to be a useful form of management (Dudley and Ghofar 2006). The Maldives also placed a ban on destructive fishing techniques and established annual export quotas of 100,000 reef fish and invertebrates which is

monitored through regular reports from fishers and exporters (Edwards and Shephard 1992). In Australia, permits are issued to collectors each year to monitor collection efforts (Wood 2001).

On a wider scale, the countries which import wild reef fish for the aquarium trade have also implemented rules, with the aim of minimising illegal and destructive fishing in the exporting countries. For instance, the U.S. Lacey Act prohibits the importation of species collected by illegal methods. However, cyanide caught species may be unknowingly imported, due poor enforcement in exporting countries and difficulty in detecting cyanide in collected species (Calado et al. 2014). Following a threat by the EU in 2014 to ban trade with the Philippines if the country did not address all illegal, unreported and unregulated fishing, the national government created an agreement with New England Aquarium to gather and assess data on the Philippine's aquarium exports (Talbot 2015). Consequently, steps are being taken by the Philippine government with the aim of increasing fishery sustainability. The undersecretary for the Bureau of Fisheries and Aquatic Resources, stated a "mandate to take out all unsustainable practices as it creates poverty in the long term" (Talbot 2015). Aquarium fisheries in the Philippines are governed by a national policy created in 1998: Fisheries Code RA 8550, which is managed nationwide by the Bureau of Fisheries and Aquatic Resources (BFAR) (Pomeroy et al. 2010). Following the New England Agreement, stricter enforcement ensued on the Philippines national ban on destructive fishing techniques, including cyanide fishing (Dee et al. 2014). For instance, 2014 amendments to the 1998 Fisheries Code included increases in the sanctions for fishing with sodium cyanide (Policy RA 10654).

A range of options for sustainably managing both aquarium fishing and trade have been proposed, such as gear restrictions, species quotas and monitoring of exports/imports (Wood 2001). Nonetheless, international agreements and nationwide laws may not be sufficient for increasing the sustainability of aquarium fisheries, as implementing rules at the harvester level can be problematic. Failure to effectively implement and enforce rules results in gaps forming between policy and practice (Fabinyi and Dalabajan 2010; Carmenta et al. 2013). These gaps can be attributed to weak governance, as well as mismatches between *de-jure* rules/management schemes and the lives of local fishers (Dee et al. 2014; cf. Pascual et al. 2014). To be able to minimise policy-practice gaps, we need understand how they can arise.

2.3. Policy-Practice gaps

Government run schemes and policies are often unsuccessful in managing common pool resources (Ostrom 1999). This results in the rules-in-use for resource management, and the *de-facto* practices they govern, differing to the *de-jure* rules defined in policies (Robbins et al. 2009; Carmenta et al. 2013). The ultimate effect will be a gap between policy (*de-jure*) and practice (*de-facto*) (Cole 2014). There are many reasons why policy-practice gaps will form. One important reason is the mismatch between policy objectives and the livelihood needs of local harvesters (Schendel and Abrahams 2005; Pascual et al. 2014). When this is the case, *de-jure* rules can be altered as they are implemented at the harvester level. For instance, when harvesters lack incentives to follow the *de-jure* rules, due to a mismatch with their livelihood needs, they can construct their own social norms for using the

resource (Schendel and Abrahams 2005). Though licit (socially sanctioned) rules, these social norms may also be illegal (Figure 1) (Schendel and Abrahams 2005; Abrahams 2006; Phelps 2013). This was observed in a forest reserve in India where access was banned for local harvesters through *de-jure* rules, but the forest was still used for grazing, fodder collection, fuelwood and tree-felling (Robbins et al. 2009). Open-access was permitted through locally negotiated bribes to the forest guards. This occurred because the *de-jure* rules were mismatched to the needs of an impoverished community (Robbins et al. 2009). Licit and illicit social norms could affect the management of aquarium fisheries and influence how policy-practice gaps will form.

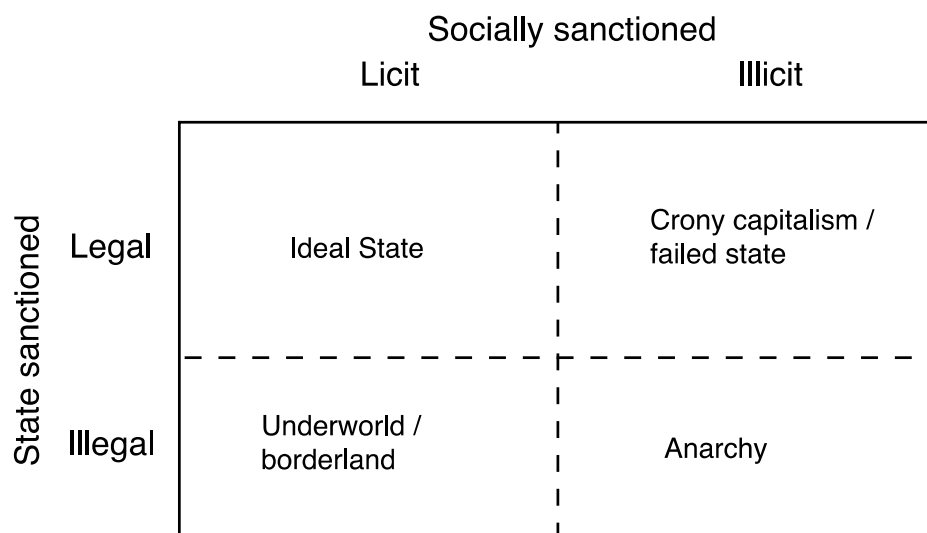


Figure 1: Forms of state and social authority (Abrahams 2006).

The social norms will act as unwritten rules, contributing to the rules-in-use for resource management (Schendel and Abrahams 2005). The rules-in-use describe the reality of management schemes, for instance they can be combinations of implemented *de-jure* rules and social norms, controlling the *de-facto* practices on-the-ground (Phelps 2013; Cole 2014). Therefore, the influence of social norms can

result in large differences forming between the *de-jure* rules and existing *de-facto* practices (Cole 2014). In communities where harvesters are highly dependent on the resource, for subsistence or income, they may have few alternatives once resource access is restricted and so will revert to non-compliance (Robbins et al. 2009). Similarly, aquarium fishers will have their own preferences for how the resource should be managed, due to local livelihood needs which the government may be indifferent to (Cole 2014). This process of implementing *de-jure* rules on-the-ground, creates a gap between policy and practice (Ostrom 1990).

Ostrom and colleagues have provided useful ways of thinking about how these policy-practice gaps can be reduced (Ostrom 1990; Ostrom et al. 1999; Grafton 2000; Cole 2014). Eight principles were devised to address some of the difficulties in managing common pool resources. She compiled evidence from long-lasting management schemes of CPRs and enforced the need to consider community rights for increasing incentives to comply (Ostrom 1990; Ostrom 2009). For instance, she states that permitted resource use must be related to local conditions, and harvesters should participate in designing and enforcing the rules (Table 1).

Table 1: Elinor Ostrom’s (1990) “eight design principles illustrated by long-enduring CPR institutions”.

| | |
|---|---|
| 1. Clearly defined boundaries | Individuals or boundaries who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself |
| 2. Congruence between appropriation and provision rules and local conditions | Harvest rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labour, material and/or money |
| 3. Collective-choice arrangements | Most individuals affected by the operational rules can participate in modifying the operational rules |
| 4. Monitoring | Monitors, who actively audit CPR conditions and harvester behaviour, are accountable to the |

| | |
|---|---|
| | harvesters or are the harvesters |
| 5. Graduated sanctions | Harvesters who violate operational rules are likely to be assessed by graduated sanctions (depending on seriousness and context of the offence) by other harvesters, by officials accountable to these harvesters, or by both |
| 6. Conflict-resolution mechanisms | Harvesters and their officials have rapid access to low-cost local arenas to resolve conflicts among harvesters or between harvesters and officials |
| 7. Minimal recognition of rights to organise | The rights of harvesters to devise their own institutions are not challenged by external government authorities |
| 8. Nested enterprises | Harvest, provision, monitoring, enforcement, conflict resolution and governance activities are organised in multiple layers of nested enterprises |

When the *de-jure* rules in management schemes lack such principles, there is a risk of marginalising harvesters. (Ostrom 1990; Pascual et al. 2014). Alternatively, when rules are designed collectively, the government can provide advice and support to the community, while harvesters are able to communicate their ideas and concerns to authorities (Grafton 2000). Sharing management over the resource allows harvesters to develop on existing *de-jure* rules and design locally-derived rules, which are then legalised by the government (Pomeroy and Berkes 1997; Feeny 1990). Therefore, greater harvester participation could mean a closer match between policies and local livelihood needs. This would lead to a wider acceptance of *de-jure* rules within the community (Pascual et al. 2014). Effective management of aquarium fishing relies on the acceptance and compliance of fishers to the *de-jure* rules (cf. Pascual et al. 2014). The harvesters would have less need to ignore or alter the *de-jure* rules, and incentives to comply would increase. In doing so, the policy-practice gap can also be reduced. There are various ways in which incentives to comply are created (Arias 2015). By understanding what influences these incentives, fishery management can attempt to achieve long-term and effective management.

2.4. Perceptions

Compliance is necessary for *de-jure* rules to have their desired impacts and for conservation efforts to be successful; without compliance, the rules would be unusable (Keane et al. 2008; Solomon et al. 2015). Non-compliance occurs in a variety of conservation-derived rules, such as timber extractions, forest fires, poaching, and over-fishing (Robbins et al. 2006). Yet, non-compliance is complex to study; it takes place on many levels from individual behaviours to community-wide social norms (Keane et al. 2008). To understand non-compliance, the “5 W’s” need to be addressed; the who, what, when, where and most importantly, why people chose to break rules (Arias 2015).

Occasionally, decisions of when or when not to comply can be based merely on the estimated economic gain or loss of following *de-jure* rules, and such dilemmas can be tackled by increasing enforcement (Nielson 2003). For instance, effective enforcement and high sanctions would increase compliance rates (Nielson 2003; Keane et al. 2008; Arias 2015). Enforcement is coercive compliance. It deters non-compliance by prosecuting rule breakers. However, if governance is weak, and susceptible to a lack of sufficient resources or corruption, effective enforcement and thus compliance will suffer (Keane et al. 2008). This was seen in the Comoros Islands, when funding ran low for a Marine Protected Area enforcement was reduced and illegal activities restarted (Poonian et al. 2008).

Voluntary compliance is more effective in the long-term. It will not only provide a buffer when enforcement decreases, but also demonstrates effective management

schemes that are aligned to local livelihood needs (Arias 2015). In these cases, *de-jure* rules will gain more acceptance within harvester communities (Keane et al. 2008). Voluntary compliance is influenced by positive incentives, which can create social and moral obligations to comply (Keane et al. 2008). Positive incentives include perceptions, for instance when harvesters perceive that the management and *de-jure* rules yield benefits, or are legitimate due to feelings of fairness, trust and involvement (Nielson 2003; Mills et al. 2013). The perceptions of aquarium fishers towards *de-jure* rules are therefore an important aspect to consider when looking at compliance.

To explain the instance of non-compliance behaviours, Fishbein and Ajzen provided a widely-used model, the 'Reasoned Action Model', developed from the 'Theory of Planned Behaviour' (Ajzen 1991; Fishbein and Ajzen 2010) (Figure 1). This model has previously been used to understand non-compliance behaviours in other contexts (see Poulter et al. 2008; Fishbein and Ajzen 2010).

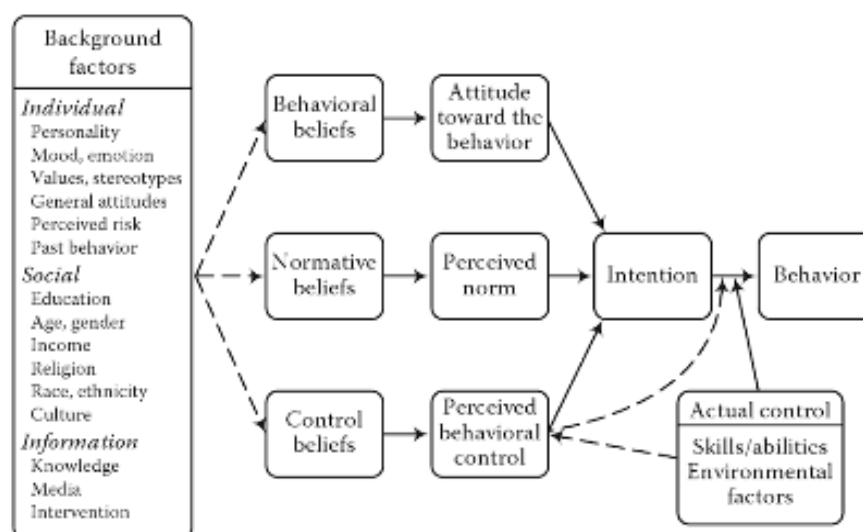


Figure 2: The Reasoned Action Model from Fishbein and Ajzen (2010).

The Reasoned Action Model; is summed into three beliefs; behavioural, normative and control beliefs (Figure 2). The model integrates an individual's environment, social interactions and internal beliefs to predict behavioural changes, such as altering between legal and illegal behaviours (Fishbein and Ajzen 2010). Firstly, behavioural beliefs are the perceived benefits and costs of changing a behaviour, such as direct or indirect benefits provided by the rules. Secondly, normative beliefs involve social obligations (Fishbein and Ajzen 2010). These are complex as they delve into social norms; the social pressure on how an individual should or should not behave. Normative beliefs relate to the illicit and licit rules within communities, for example socially undesirable behaviours versus the socially desirable (Schendel and Abrahams 2005). Individuals will feel a social pressure to abide by social norms, and moving away from the 'norm' will result in social policing (Ostrom 1997; Fishbein and Ajzen 2010). Yet, the Reasoned Action Model does not include perceptions of legitimacy in its normative beliefs. Legitimacy can also effect social obligations to comply as it is affected by fairness and trust towards management authorities. A wider normative approach also considers legitimacy as an internal incentive to comply (Tyler 1990; Nielson 2003). For instance, if there is perceived legitimacy, loyalty can form between harvesters and authorities. This legitimacy is influenced by perceptions of fairness, trust and harvester involvement in *de-jure* management schemes (Nielson 2003). Lastly, control beliefs are the available factors that either hinder or aid in altering a behaviour, such as skills, knowledge or time (Fishbein and Ajzen 2010). For example, whether fishers possess the skills for changing their well-practised fishing techniques (Arias 2015). These aspects will interact in a multifaceted system to explain human behaviour in decision making. A combination

of these incentives results in one's decision to perform a behaviour, such as using legal fishing techniques instead of illegal (Figure 2) (Fishbein and Ajzen 2010; Arias 2015).

2.4.1. Perceived benefits

The benefits associated with compliance to the *de-jure* rules will influence the incentives of aquarium fishers. Fishers will accept new rules when they are perceived to yield benefits, human and/or environmental (Arias 2015). Benefits derived from the rules can be direct or indirect. Direct benefits can be in the form of increased income, for example if sustainably caught fish command a greater value, higher fish survival, or if the community feel empowered through increased involvement and responsibility in fishery management (Wabnitz et al. 2003; cf. Stern 2008). Indirect benefits would be ensuring future use of the fishery, for example through the protection of coral reef habitats and species abundance, thus ensuring continued livelihoods for future generations of aquarium fishers (cf. Arias 2015).

The perceived benefits will vary between fishers and government officials, as the benefits each gain will differ (cf. Carmenta et al. 2013). The management of a Marine Protected Area (MPA) in Kenya is an example of this, and illustrates how the design of a management scheme was mismatched with community needs (McClanahan et al. 2004). Government officials were under the assumption that the fishermen benefitted from the MPA, while the fishermen shared no perceived benefits (McClanahan et al. 2004). This demonstrates that government and harvesters will differ in their understanding of the issues in resource management. Governments

are not always aware of local perceptions and enforcement can be ineffective, thus reducing local incentives to comply (Ostrom 1999; Grafton 2000; Nielson 2003).

2.4.2. Perceived legitimacy

Alongside the perceived benefits, perceptions about legitimacy are also highly influential on compliance with *de-jure* rules (Tyler 1990; Hatcher et al. 2000; Nielson 2003). The term legitimacy can be defined by perceptions of fairness and trust in authorities, and harvester involvement in resource management (Tyler 1990). When positive perceptions about these aspects exist, social and moral obligations will be created for voluntary compliance (Arias 2015). Fairness exists when everyone is treated equally by the rules, for example in the benefits they receive, and when the rules are enforced equally across communities (Stern 2008). Perceived fairness of the rules would increase when fishers feel involved in the decision making and the management of resources (cf. Tyler 1990; Hatcher et al. 2000; Nielson 2003). Trust in government officials has been observed as a key factor in the acceptance rules, and for increasing positive perceptions. Trust is influenced by an individuals' past experiences, and like fairness, can increase through more involvement (Ostrom 1997; Stern 2008). Therefore, perceptions of legitimacy are improved when fishers have had positive experiences with authorities and have cooperated in fishery management (cf. Nielson 2003). Ineffective management of a food fishery in Palawan, in the Philippines, was partly due to a lack of participation among fishers in the decision-making process. This caused negative perceptions about the government, and a lack of fisher awareness of the *de-jure* rules (Fabinyi and Dalabajan 2010). This example illustrates that effective management of a fishery

requires active involvement of the fishers, which will in turn increase perceptions of legitimacy.

Communication between government officials and fishers has been proven to lead to successful management regimes. Repeated interactions and communication with one another allows reciprocity and trust to form between individuals (Ostrom 1997). In the Philippines, successful fishery management on San Salvador island is due to the introduction of community-based management. The involvement of all fishers in decision making, and shared responsibility in enforcement, consequently led to raised awareness of the need for sustainability (Katon et al. 1999; Pomeroy et al. 2010). The result was effective implementation of a marine sanctuary, to which there is now a high compliance among locals. Subsequently, San Salvador island has seen improved habitats, biodiversity and species abundance (Katon et al. 1999). Transformed incentives led to social norms arising within the community; those who do not cooperate will fall outside of the social norm, and may even be punished via social policing (Ostrom 1997; Katon et al. 1999). Incentives shifted from self-interest at the cost of others to those which will benefit the collective good. Increased communication has been observed to address problems in common pool resource management, as extensive as issues of climate change and transboundary pollution which prevail at much larger scales (Dietz et al. 2003).

2.5. Conclusion

Growing research on the social factors within governance has targeted effective CPR management and the drivers of non-compliance, yet there is still a need to apply the

social sciences within conservation schemes (see Nielson 2003; Hampshire et al. 2004; Kahler and Gore 2012; Carmenta et al. 2013; Bennett et al. 2016). These studies highlight the importance of perceived benefits, legitimacy and harvester involvement, in influencing internal incentives to comply (Kahler and Gore 2012). Such variables have important roles in defining policy-practice gaps, and therefore in predicting the rules-in-use. Gathering an understanding about how aquarium fishers perceive the *de-jure* rules which govern their livelihood, and the existing rules-in-use would enable researchers and management authorities to implement management schemes which reflect the realities of the fishers (cf. Ostrom 2009; Carmenta et al. 2013). Successful governance of aquarium fisheries requires rules which evolve simultaneously with conditions within harvester communities as well as the ecological components of coral reefs, however to date, little research has investigated the realities of fishers for the aquarium trade (Dietz et al. 2003). This research is essential.

The Philippines is one the largest global exporters of aquarium fish and among the first users of cyanide fishing. There is concern over poor monitoring of the trade, high export numbers, and the prevalence of damaging collection practices due to non-compliance among aquarium fishers (Rhyne et al. 2012). The lack of appropriate regulations and compliance within the aquarium trade highlights the fact that fishery management needs improvement (Wood 2001; Pomeroy et al. 2010; Dee et al. 2014). This study in the Philippines will use the above concerns over the aquarium trade to explore the realities of an aquarium fishery and its management on-the-ground. My research will use structured analysis to draw comparisons between the

de-jure rules and *de-facto* practices in a Philippine aquarium fishery (see Crawford and Ostrom 1995; Basurto et al. 2009). In doing so, the differences between *de-jure* rules and on-the-ground management for an aquarium fishery will be identified (see Carmenta et al. 2013). This will encompass the compliance of aquarium fishers, such as the prevalence of destructive fishing techniques. Additionally, the influence of perceptions on fisher compliance will be investigated, particularly the existence of benefits and legitimacy in *de-jure* rules (see Stern 2008). With research focused at the harvester level, the realities of aquarium fishing can be explored. Through participant observation, focus group discussions and semi-structured interviews, aquarium fishery management will be investigated from the perspectives of aquarium fishers and government officials.

3. Methods

3.1. Field site

Calatagan is a municipality within the province of Batangas, in the northern Philippine island of Luzon. Situated on the south-western coastline of Luzon, and a part of the biodiverse marine 'Verde Island Passage' (Figure 3), Calatagan is surrounded by mangrove forests and live coral reefs, offering primary fishing livelihoods for over 1000 residents (Forbes 2016). Among these resident fishers, 36 men collect marine reef fish and 13 women collect invertebrates for the aquarium trade. Additionally, being positioned just 125 km from the capital city, Manila, and linked by main roads, Calatagan is well connected to global trading networks, including several exporters for the aquarium trade (Forbes 2016). Also, prior to the

study, several aquarium fishers in Calatagan had expressed an interest in changes to how the aquarium fishery was being managed.

Aquarium fishing is governed by the same laws as other municipal fishing activities; fishing using boats less than 3 gross tonnes in size and within 15km from the shoreline. Legal responsibility for aquarium fishery management falls the local government of Calatagan. This is because, responsibility of managing municipal waters has been decentralised since 1991. A decentralised government offered an interesting opportunity to study local management of an aquarium fishery. This made Calatagan an ideal site to begin investigating the origins of species collected for the aquarium trade.



Figure 3: A map of the Philippines, showing the location of Calatagan, within the province of Batangas.

Maps available at: https://en.wikipedia.org/wiki/Calatagan,_Batangas

Data were gathered over three months between May and August 2017, coinciding with the peak season for collecting aquarium fish and the change from dry to wet season. Our research was based within two sites in the municipality of Calatagan.

Calatagan has a total of 25 barangay (towns) and the aquarium fisher communities reside in two different barangay in Calatagan: Santa Ana and Poblacion Uno. 19 fishers and 12 invertebrate collectors work from Sta. Ana, with 17 fishers and 1

invertebrate collector from Pob. Uno. All the aquarium fishers in Calatagan were male, aged between 27 and 75, while all invertebrate collectors were women, most of whom were married to the fishers. Local aquarium fishers and invertebrate collectors also work as local middlemen/women (*byahero*); this consists of 8 women and 7 men in Calatagan.

The fieldwork was carried out in coordination with a Filipino Non-Government Organisation (NGO), 'Community Centred Conservation' (C3). They made initial contact with the local government, obtained the necessary research permits, and met the local aquarium fishing communities for primary introductions. C3 organised the logistics for fieldwork and provided a local interpreter for Tagalog-English translations.

3.2. Qualitative methods

The research involved a mixed-methods approach, with a combination of qualitative techniques drawn from ethnography, as well as highly structured qualitative instruments, summarised in Table 2. This included reviews of Philippine policies to analyse the *de-jure* rules that govern aquarium fishing at different scales. It then drew on diverse field-based methods to understand the *de-facto* practices among aquarium fishers in Calatagan and local perceptions towards fishery management. Including, complementary ethnographic methods: focus group discussions, semi-structured interviews and participant observations (Table 2). Afterwards, the findings about aquarium fishery management are linked back to Ostrom's eight principles for

effective resource management, to examine if these principles are supported in Calatagan.

This was embedded within an ethnographic research approach, adopting a scientific, holistic approach to studying socio-cultural context of aquarium fishing (Schensul et al. 1999). Ethnographic research methods gather extremely in-depth qualitative data, allowing high contextual validity (Myers 1999; Newing 2011; Hautzinger 2012). The researcher becomes immersed in community life, and hence learns first-hand about the lives of respondents in their natural environment. This enables the researcher to capture experiences in seldom studied topics, thus increasing their understanding from the respondent's perspective (Osborne and Fogel 2009; Sifaneck and Neaigus 2009; Newing 2011). Ethnography has previously been used to understand perceptions, for instance in exploring motivations for non-compliance (Hatcher et al. 2000; Robbins et al. 2009; Sifaneck and Neaigus. 2009; Carmenta et al. 2013). Nevertheless, ethnographic research methods do have their drawbacks. For instance, social desirability and researcher bias can decrease validity (Hautzinger 2012). To combat this, combining various ethnographic methods in a mixed-method approach and including more structured approaches can corroborate and triangulate findings, hence increasing their value (Hatcher et al. 2000; Carmenta et al. 2013).

Table 2: A matrix linking research questions to methods and respondent groups.

| Research questions | Sub-questions | Methods | Data Source | Number of respondents | |
|---|---|----------------------|--|--|----|
| 1. What are the <i>de-facto</i> practices in aquarium fishery management, and how do they differ to the <i>de-jure</i> rules? | i) What are the <i>de-jure</i> rules governing aquarium fishing? | Policy Analysis | Internet | 'Fisheries Code RA 8550' 'Amended Code RA 10654' 'Wildlife Resources and Conservation Act Order No. 233' | |
| | | | Local government office | 'Calatagan Fisheries Ordinance' | |
| | ii) What are the rules-in-use for aquarium fishing? E.g. implemented rules, social norms. | | Participant observation | Aquarium fishers | 36 |
| | | | Focus group discussions (FGDs) | | 17 |
| | | | First interview | Aquarium fishers | 35 |
| | | | | Government officials | 2 |
| | iii) Are fishers aware of the implemented rules for aquarium fishing? | | FGDs | Aquarium fishers | 17 |
| | | | First interview | | 35 |
| | | | Participant observation | Aquarium fishers | 36 |
| | FGDs | | | 17 | |
| | First interview | Aquarium fishers | | 35 | |
| | | Government officials | | 2 | |
| | iv) What is the <i>de-facto</i> enforcement of implemented rules? | | Participant observation (informal discussions) | Enforcers: Coastguard + Bantay Dagat | 6 |
| | | | First interview | Aquarium fishers | 35 |
| | | | | Government officials | 2 |
| v) Do fishers comply to the implemented rules? | | First interview | Aquarium fishers | 35 | |
| | | Bean Method | | 35 | |

| | | | | |
|---|---|--|---|------------------------------------|
| | vi) What are the day to day activities in aquarium fishing e.g. collection techniques used? | Participant observation | Aquarium fishers | 36 |
| | i) Do fishers perceive that <i>de-jure</i> rules yield benefits? | FGDs | Aquarium fishers | 17 |
| | ii) Do fishers have perceptions of fairness and trust in aquarium fishery management? | Key Informant interviews | Aquarium fishers | 17 |
| | | | Women (invertebrate collectors and byahero) | 9 |
| | | FGDs | Aquarium fishers | 17 |
| 2. How do the fishers perceive aquarium fishery management? | iii) What is involvement of fishers and local government in managing the aquarium fishery? | Key Informant interview (with likert scales) | Aquarium fishers | 17 |
| | | | Women (invertebrate collectors and byahero) | 9 |
| | | | Government officials | 3 |
| | Any benefits or limitations of existing management for future fishery use? | Key Informant interview (with likert scales) | Aquarium fishers | 17 |
| | | | Women (invertebrate collectors and byahero) | 9 |
| | | Feedback to results | Secondary data | Ostrom (1990); Mills et al. (2013) |

3.2.1. Policy reviews

Analysis of four policy documents was conducted: the national ‘Fisheries Code RA 8550’, the ‘Amended Code RA 10654’, the Wildlife Resources and Conservation Act Order No. 233’, and the local government’s ‘Calatagan Fisheries Ordinance’. The national policies were available online and the Calatagan Fisheries Ordinance was obtained from the local government. National *de-jure* rules applicable to municipal

fishers, such as aquarium fishers, were cross referenced with the Calatagan Fisheries Ordinance to determine if *de-jure* rules were also stated in local policies and to identify any additional local *de-jure* rules. A total of 16 rules applicable to aquarium fishers were discovered from both national and local policies. These policy documents were analysed using a grammatical syntax, ADICO, developed by Crawford and Ostrom (1995) (Basurto et al. 2009). ADICO represents five subcomponents which define a rule; the (A) attribute (e.g. who the rule is for), (d) deontic (e.g. 'must'/'must not'), (I) aim (e.g. what the rule requires or prohibits), (C) condition (e.g. when/where the rule applies) and (O) or else (e.g. the penalty) (Crawford and Ostrom 1995; Basurto et al. 2009). The ADICO syntax was used to identify *de-jure* rules in the policy documents which could apply to aquarium fishers, what they require aquarium fishers to do or not do, and the conditions under which these rules apply, along with the penalties they demand if broken.

These identified *de-jure* rules were used as a baseline for comparison to *de-facto* practices, through focus group discussions, interviews and participant observations. Further analysis determined which of the rules are currently being implemented on-the-ground (Carmenta et al. 2013). Rules were coded as 0, 1 or 2 depending on their degree of implementation. If a rule was not implemented at all, it was coded "0", if a rule was fully implemented for aquarium fishing, it was coded "2". Lastly, for a rule which was implemented, but not for aquarium fishing, it was coded "1" (see Carmenta et al. 2013). For all rules coded as "2" (fully implemented), the level of *de-facto* enforcement was also coded as "0" (absent) or "1" (present), using both

government and fisher reports. It was also noted whether sanctions were graduated for each rule, such as higher sanctions for multiple offences.

3.2.2. Participant observation

Living close to the two community sites and constant contact throughout fieldwork, allowed observation of the aquarium fisher's everyday lives and fishing activities.

Therefore, the realities of aquarium fishing, such as who the fishers are, fishing schedules and common fishing techniques could be learnt (Fabinyi 2010).

Additionally, the market chain for the aquarium trade could be constructed by observing what happens to the fish after harvest, and during informal visits to two exporters in Manila. In our time spent with the communities, we could familiarise ourselves with the fishers and build rapport among them (Whitehead 2005). Here, the realities of aquarium fishing could be observed in a passive way, for example the social norms in fishery management and common problems faced, while also allowing for informal discussions to collect additional information not gained through focus group discussions and interviews (Power 2009; Carmenta et al. 2013). For instance, local enforcers (coastguard and bantay dagat) could be informally spoken with. Notes were made throughout observations, to be written up in a narrative format at the end of day. All fieldwork was carried out together with an interpreter; a staff member from local NGO, C3. All the following methods were completed in the local language 'Tagalog', with translations given throughout.

3.2.3. Focus group discussions

Three focus group discussions (FGDs) were carried out with 17 aquarium fishers. FGDs took place in a public area, such as a community hall, which respondents were familiar with. FGDs were 2 hours long, and conducted with two groups of six Sta. Ana fishers, and one with a group of five Pob. Uno fishers. More FGDs were conducted with aquarium fishers from Sta. Ana because it was discovered that these fishers collect across more areas than aquarium fishers from Pob. Uno, while fishers from Pob. Uno stay in one small areas and collect aquarium fish less regularly. Thus, those from Sta. Ana will encounter a wider variety of rules and experiences with enforcement. Therefore, a second FGD was done with Sta. Ana to allow for saturation of findings. The FGDs were conducted after 3 weeks of being in the field and carrying out participant observation, to allow for familiarity to form between respondents and researchers. Aquarium fishers were approached directly and asked if they would be willing to take part in an FGD, with a briefing about this method and what participation would involve. Respondents selected for the FGDs varied across age groups to represent a range of aquarium fishers. FGDs were homogenous in terms of sex and livelihoods; all were men and aquarium fishers. Sampling for FGDs was purposive, as not all fishers was approached, as well as for convenience in terms of who was available.

Focus group discussions allowed for participatory techniques, such as policy discussions and group activities, during which rich qualitative data could be gathered (Hautzinger 2012; Carmenta et al. 2013). FGDs provided a group setting where the researcher could observe opinions forming, being built on, or contested (Hampshire et al. 2004). The researcher used the policy discussions to fill in a structured table.

This table was followed a similar structure to the policy analysis table, to allow comparison of *de-jure* and *de-facto* rules (see Appendix 1). For instance, there were separate columns to address rule implementation, *de-facto* conditions, and sanctions in Calatagan. Other useful information was also noted down during the FGDs, such as common problems the fishers face and unwritten rules (licit or illicit) governing the aquarium fishery. The FGDs were closed with a short activity to gauge an understanding of the aquarium fisher's perceptions about the implemented *de-jure* rules. Fishers were asked to freely place cue cards symbolising the different rules, on to a 1-5 scale from 'I would least like to see this continue' (1) to 'I would most like to see this continue' (5). Care was taken to involve all respondents and discuss the group's decisions, for instance any benefits or limitations of the rules (See Chapter 6). During the FGDs, a Sony IC audio recorder was used. This was listened to after each FGD to clarify and develop on existing notes. The audio recordings were listened to with the help of our Tagalog interpreter.

3.2.4. Semi-structured interviews

Two semi-structured interview schedules were conducted with the aquarium fishers from both Sta. Ana and Pob. Uno. Interview question topics were established in advance, and open-ended questions were effective for further exploration of answers (Hampshire et al 2004; Osborne and Fogel 2009) (see Appendix 2). In all cases, respondents were asked face-to-face if they would be willing to take part in the study, with briefings beforehand about what the interviews involved. Interviews took place on either a secluded area beach where aquarium fishers would gather or at the respondent's home.

3.2.4.1. First interview

The first interview was 15 minutes long and contained semi-structured questions about fishing techniques, awareness of rules, enforcement consistency, and direct questions about compliance (see Kahler and Gore 2012). Answers were recorded during the interview, after translation by the interpreter. 35 out of 36 aquarium fishers in Calatagan were interviewed, minus one fisher who was hard of hearing, therefore providing an almost 100% saturation sample (Sta. Ana: n=19, Pob. Uno: n=16). Interviews were ended with a specialised method for indirectly asking about compliance, called the Bean Method, for comparison against the direct questioning technique (see 3.2.5).

3.2.4.2. Second interview

The second interview schedule was 30 minutes long and used purposive sampling; it was conducted with 26 key informants. This included women involved in the aquarium trade as invertebrate collectors and middlewomen (byahero) (n=9), aquarium fishers from Sta. Ana (n=10), and from Pob. Uno (n=7). The aquarium fishers in this second interview had all participated in the first interview as well. A saturation sample was not used here, as thematic analysis was being used so saturation could be achieved after a small subset of interviews. Key informants were chosen as they appeared knowledgeable about fishery management. Interviews were stopped within each of the three groups (Sta. Ana, Pob. Uno and invertebrate collectors), when the data gathered became repetitive, and little or no new information was discovered.

The women were included as respondents in this interview, because their frequent involvement in the aquarium trade had been observed. The women were not selected for the focus group discussions or first interview schedules because they had low awareness of specific rules and enforcement, due to not fishing in the sea. Yet, they were aware of general aspects of fishery management and threats faced by the aquarium fishery. The women's perceptions, therefore, proved valuable for key informant interviews.

The key informant interviews used semi-structured questions which could explore in-depth about perceived trust and fairness in aquarium fishery management, fisher and government involvement, and benefits/limitations for future fishery use (see Myers 1999; Stern 2008; Osborne and Fogel 2009; Kahler and Gore 2012). Three 5-point likert scales were also included for structured ratings, before being explored more with open-ended questions (see Stern 2008; Kahler and Gore 2012). They were used to measure opinions of 'likely future use of the fishery for the next 10 years', 'fisher involvement in fishery management', and 'local government involvement in fishery management'. Due to their qualitative nature, each key informant interview was audio recorded, and used to validate interview transcripts, with the interpreters help.

3.2.4.3. Government interviews

Data were also gathered from five government officials using 30-minute, semi-structured interviews. This included respondents from local government: the head of the Municipal Agriculture Office (MAO), the Environmental Chair in the local council

(Sangguniang Bayan), and the barangay chairmen of the Sta. Ana and Pob. Uno. It also included a local representative of the national government agency: the director of the Provincial Fisheries Office (PFO), under BFAR. There were two interview schedules conducted with different government officials; time constraints did not allow for both schedules to be done with each respondent. The interviews with MAO and the director of PFO followed a similar structure to the table completed in FGDs (see Appendix 3), to understand *de-facto* rules and enforcement from the government's point of view, as these members of government are responsible for implementing policy rules. With the Environmental Chair in local government, and the two barangay chairmen, the interview schedule was similar to key informant interviews with fisher respondents. Thus, these interviews used more open-ended questions, exploring perceptions of fishery management. Interviews were conducted with government officials in the aim of triangulating data gathered from fishing communities, and to understand aquarium fishery management from the government's perspective (see McClanahan et al. 2004). Additional informal discussions with two different barangay chairmen opposed to aquarium fishing, and two national BFAR staff in Manila were also conducted at the end of study for clarification of the findings.

3.2.5. The Bean Method

The Bean Method is a simple and easily understood technique, which ensures anonymity by pooling several respondent's answers together (Lau et al. 2011; Nuno and John 2015). It is designed with aim of asking sensitive questions in an indirect, less intrusive way. Therefore, the Bean Method is predicted to gain more accurate

estimates of non-compliance than direct questioning (Nuno and John 2015). It works by having two jars, one small and one large, with a known quantity of assorted coloured 'beans' and black 'beans' (Lau et al. 2011; Nuno and John 2015). In this Bean Method there were 20 black, 15 yellow, 15 blue, and 15 white dice in the small jar, and 40 black, 25 yellow, 25 blue, and 25 white dice in the large jar. When respondents were asked a yes or no question about whether they are not following a rule, if they wished to answer "yes", they would move a set coloured dice from the small jar to the large, or for "no", they would move a black dice from the small jar to the large. Respondents were given privacy to move the dice so no actions were observed. Two to three of the same questions were asked for direct questioning and the 'Bean Method'. These were: 'Do you currently use cyanide to collect aquarium fish?' with yellow dice, 'Do you currently use compressors to collect aquarium fish?' with white dice, and for Sta. Ana fishers, who fished in areas with a Marine Protected Area, 'Do you currently enter the MPA to collect aquarium fish?' with blue dice. After each week of interviews, the dice were recounted to determine how many of each colour had been moved, and therefore, how many fishers within each community admitted to non-compliance. The Bean Method was used to estimate compliance for these three rules, because they were recognised as sensitive topics to discuss, whereas the fishers would openly share about the other rules and compliance could be easily observed, such as registrations and species restrictions.

3.3. Data analysis

FGD tables and interview notes were inputted onto a computer following the discussion or interview. The focus group discussions and key informant interviews

were audio recorded, via a Sony IC Recorder, with verbal consent from respondents. These were later used to validate notes, and listened to by one researcher and interpreter. Due to the qualitative nature of the data, mainly descriptive statistics and narratives are used for presentation (Carmenta et al. 2013).

FGD discussions and interview notes were integrated, and subjected to thematic coding by hand, by one researcher (see Hampshire et al 2004; Tong 2007; Stern 2008). The codes were applied consistently across all research methods throughout analysis and entered in a spreadsheet. Notes from observations and informal discussions were also coded by hand. This provided additional qualitative data, and were invaluable for describing the daily activities which occur in aquarium fishing and trade (Fabinyi 2010).

In the parts of the FGDs and first fisher interviews, there were more structured questions. In the focus group discussions, and two government interviews, structured tables were completed (see Appendix 1 and 3). These five tables were combined, and then used as a comparison to the policy review table. Using the first fisher interviews, percentage awareness and consistency of enforcement for each implemented *de-jure* rule could be calculated (Kahler and Gore. 2012). In the first fisher interviews, non-compliance estimates were gathered from both direct questioning and the Bean Method. The proportion of non-compliance from both methods are presented in this study to show comparisons of their effectivity (Lau et al. 2011; Nuno and John. 2014).

Likert scales in key informant interviews and the focus group activity were analysed by calculating average scores (1-5) (Kahler and Gore. 2012). The average results from the focus group activity are presented along a 20cm line, where 5cm represent each point along the likert scale. A total of 6 rules are placed along this line, signifying fisher preferences on how much they would like to see the rules persist in the future.

3.4. Ethics

Research was approved by the Lancaster University Ethics Board. Human-based research must follow ethical guidelines to prevent distress and negative consequences among respondents.

This study had ethical issues in its sensitivity of certain questions. For example, questions about non-compliance, which may unsettle respondents and divulging this information could put them at risk. Therefore, a specialised method was used to ask about non-compliance: the Bean Method is designed for complete anonymity and privacy. The identity of the fishers was protected throughout the study as all data was anonymised. Place names were included in this study, such as 'Calatagan', and the areas where the communities reside for context. For further protection of the fishers, the findings from each area were grouped together.

To reduce feelings of distress, the fishers were briefed before each method and informed that they had the right to refuse any answers, and could stop the interview or focus group discussion at any time. Additionally, oral consent was gained before each focus group discussion and interview, as well as consent for an audio recorder to be used. Audio recordings were deleted after they had been replayed, and this

was kept solely between the researcher and the interpreter. Conducting the methods in the respondents' everyday environment, for example at home or in communal areas, increased comfort and openness. Therefore, the ethical protocol used was effective at protecting the respondents in the study.

3.5. Researcher reflexivity and positionality

Qualitative research, such as participant observations, focus group discussions and semi-structured interviews, require a degree interpretation by the researcher. These ethnographic methods, particularly when conducted among different cultures, are receptive to bias and misinterpretation (Clancy 2013).

For added credibility and depth during the research process, reflexivity is an important characteristic. During interactions with the aquarium fishers, I was reflexive in asking open-ended questions and using the relevant prompts. This allowed further exploration and clarity of perceptions and personal experiences (England 1994; Bradshaw and Stratford 2010). Reflexivity was also valuable when coding transcripts and narratives, as I had gained an in-depth understanding of contexts, and thus was able to reflect on this information during analysis (Clancy, 2013).

As the researcher, I was conscious of my positionality, particularly the effect my presence would have on the fisher's behaviour (England 1994). In this case, cultural, gender and age differences, could have influenced behaviours and the information shared. For researchers to integrate within the community, time was allowed at the beginning of fieldwork for various introductions and acclimatisation before beginning

any face-to-face methods. Coordinating with a local NGO would have helped with familiarities. The community were already well acclimatised and welcoming to members of the NGO from their previous visits. Therefore, introductions to community initiated by the NGO were extremely useful in reducing negative feelings. By working with a Filipino interpreter throughout fieldwork, the researchers gained cultural awareness and behaved and dressed respectfully within the community. Minimising the language gap, for instance in translations and learning important Tagalog words, aided in clarity and approachability.

Reflexivity and positionality were drawn upon throughout research in the field and data analysis, providing an insightful account of the practices in aquarium fishing, and perceptions shared by respondents.

4. Results: From the Reef

This chapter presents narratives gathered from participant observations and informal discussions to describe, first-hand, the day to day activities of Calatagan aquarium fishers (Box 1), and the journey which fish will take before being shipped to customers worldwide (Figure 5). This is important for providing context on the aquarium fishing livelihood in Calatagan. By doing so, the following information will lay the ground for further exploration of *de-jure* rules and *de-facto* practices in aquarium fishery management.

4.1. The aquarium fishers

The aquarium trade began in the Philippines in the 1950's, specifically between 1954 and 1955 in Calatagan. It was introduced by an intermediary (locally named 'byahero') and an exporter from Manila. The oldest aquarium fishers in Calatagan have been collecting aquarium fish for over 50 years, and learnt how to do so from their fathers and uncles, skills which they have passed down to their own sons and nephews. Fishers, invertebrate collectors and byahero in Calatagan hold many family ties and "look after each other", even sharing their income with a fellow fisher who has been unable to work for some time, or someone who needs new equipment. Families of an aquarium fishing community, live close to one other and the community gathers together to work, share out income, and discuss fishing schedules. The two aquarium fishing communities in Calatagan: Sta. Ana and Pob. Uno, will rarely interact with one another. Their fishing practices are described below.

4.1.1. Santa Ana

Barangay Sta. Ana is home to the majority of those involved in the aquarium trade in Calatagan; 19 aquarium fishers and 12 invertebrate collectors (Figure 5). Sta. Ana fishers will fish in groups of three to four men, sharing small motorised boats as not all fishers have their own due to the expenses, including an annual registration fee of 300 pesos (~£5.00) for each motorised boat. Aquarium fishers in Sta Ana gather on the same main beach to store and package their collected fish. Unfortunately, aquarium fishers "may lose the packing area because of tourist development", as this

beach neighbours two tourist beach resorts. However, the resorts do provide an alternative livelihood for aquarium fishers who work as tourist boatmen during the months of January to June when the tourist season is at its peak. On an average fishing day, the aquarium fishers will leave from the Sta. Ana beach between 7 and 8 am and return at 2 pm, giving 6-7 hours of fishing per day. This may however vary, when adverse weather prevents suitable fishing conditions. Local women, usually the wives of the fishers, go to the beach at low tide to collect invertebrates for the aquarium trade, such as snails, crabs and sea stars.

The peak season for collecting aquarium fish is between March and July when the weather is calm, and before the start of wet season in mid-July. Wet season also coincides with the North-West monsoon from July to September. When the winds and waves become too strong, Sta. Ana fishers will move their collection areas to a secluded bay in Calatagan, Papagas Bay, and will continue to collect here until October. Two Marine Protected Areas (MPAs) are located within Papagas Bay, which are designed to aid fish reproduction, the establishment of a giant clam population, and to attract tourists (Figure 4). Additionally, Papagas bay is home to a strip of private resorts, and two additional barangay which are specifically closed to aquarium fishing, so there are a number of restricted areas for aquarium fishers (Figure 4). For the remainder of the year, aquarium fishing can take place all along the more exposed side of Calatagan, which is closer to where the community resides and has no large restricted areas.

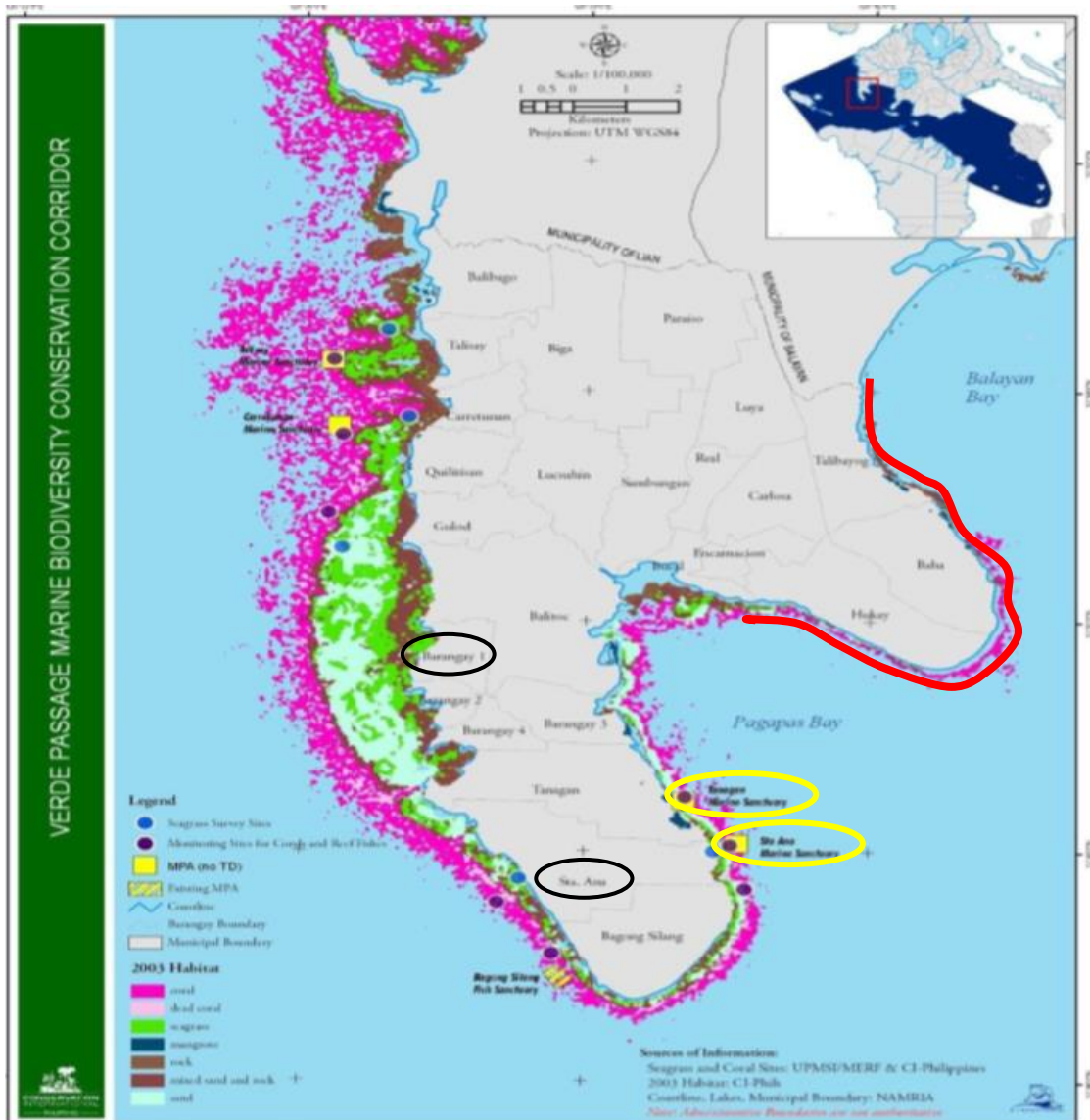


Figure 4: A map of the coastline around Calatagan, obtained from a local government document. The locations of the two communities (Santa Ana and Poblacion Uno) are indicated with black circles, and the two MPA's (Santa Ana and Tanagan) with yellow circles. (On the map Poblacion Uno is labelled with its alternative name 'Barangay 1') The restricted coastlines, for private resorts and closed barangay, are shown with red lines. For fishing in mid-July to October: Papagas bay, as labelled on the map. For fishing in October to July: the exposed, western coastline is used.

Ten aquarium fishers, originally from Sta Ana, are now registered in another municipality, and regularly travel there instead to collect aquarium fish. Registering means that all fishers, food and aquarium alike, must register themselves with the local government, in the municipality where they work and reside. For instance, the fishers in Calatagan would register themselves here, and those in other

municipalities would do the same there. This also means that all fishers are only legally allowed to fish in the municipality where they are registered, and must not fish elsewhere. The municipality where several aquarium fishers have relocated to provides “more fish, and fewer tourists, food fishers and fish pens”. As well as a greater abundance of aquarium fish there are more valuable species, for example, the Blue Tang (*Paracanthurus hepatus*), Firefish (*Nemateleotris magnifica*) and Emperor Angelfish (*Pomacanthus imperator*). Following a fishing trip, these fishers will return to Sta. Ana to transport and sell their catch to the local byahero (intermediaries) who have family ties and an established rapport with the fishers. Seven invertebrate collectors, as well as four of the aquarium fishers, also act as the byahero to small groups of around four fishers each (Figure 5). They are responsible for transporting the aquarium fish and invertebrates to exporters in Manila and for sharing the payments received from exporters among their group of fishers (Box 1).

4.1.2. Poblacion Uno

The community of aquarium fishers in Pob. Uno is smaller than the one in Sta. Ana with only 17 active fishers. Many aquarium fishers in Pob. Uno are now elderly or have stopped aquarium fishing due to available alternative livelihoods, such as seaweed farming. Fishers remaining in Pob. Uno collect aquarium fish in one small area year-round, staying close to the barangay’s shoreline rather than travelling to other areas in Calatagan. Unlike the Sta. Ana fishers, fishers from Pob. Uno only have individual non-motorised paddle boats. The expenses are lower for these boats with a registration fee of 100 pesos (~£1.60). The fishers work independently and spend less time fishing compared to the Sta. Ana fishers; spending 3-4 hours fishing per day.

Catch sizes are smaller in Pob. Uno compared to than those of Sta. Ana, which also means that there are also fewer people working as byahero in this community. Three aquarium fishers tend to transport fish to Manila, and there is only one woman in Pob. Uno involved in the aquarium trade as both an invertebrate collector and byahero (Figure 5).

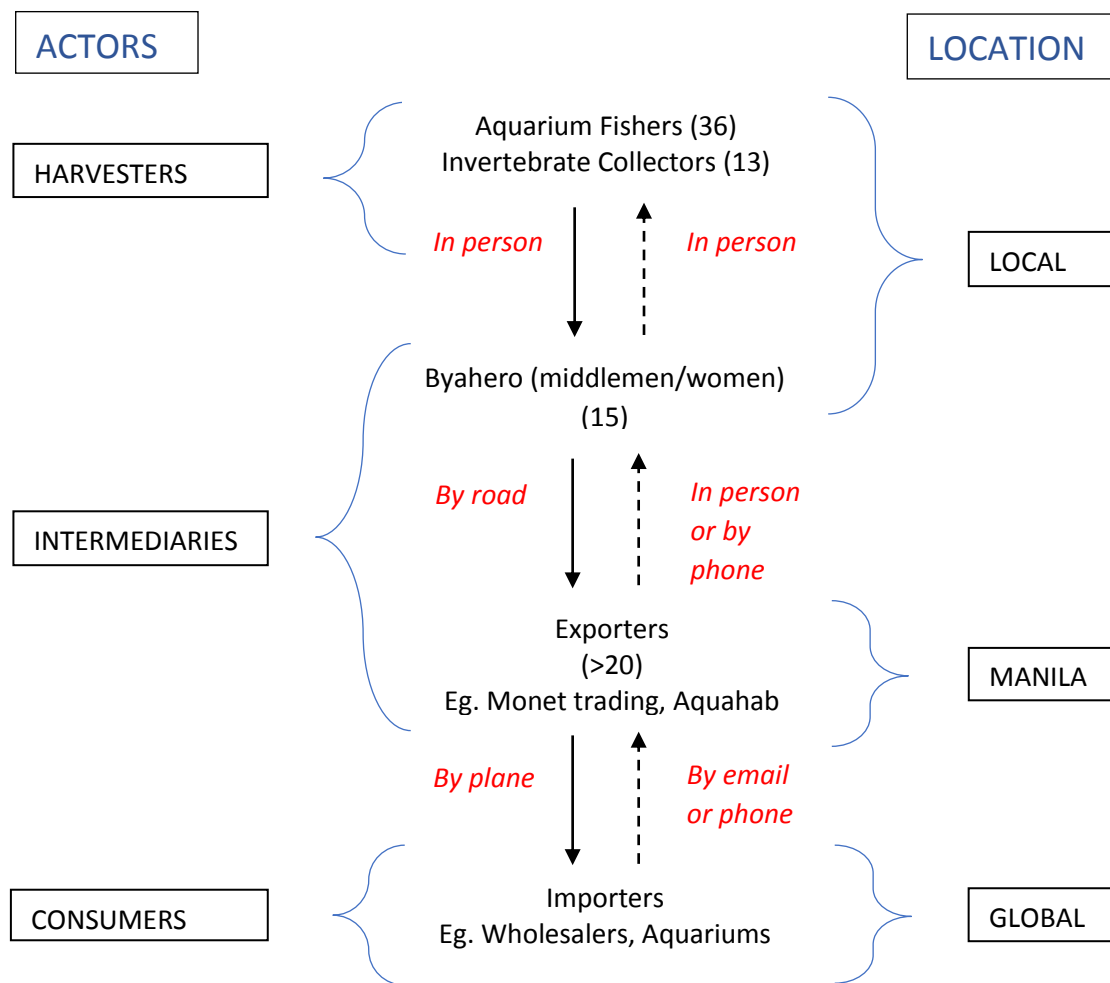


Figure 5: A Market Chain portraying the actors within the aquarium trade. With straight arrows showing the journey aquarium fish will take from the harvesters to consumers, while dashed arrows symbolise the orders passing from the consumers to harvesters. The numbers in brackets represent how many people in each group exist for Calatagan’s aquarium trade.

4.2. The fish’s journey

4.2.1. Collecting aquarium fish

The aquarium fishers of Calatagan have developed specialised collection techniques to maximise their fishing and demonstrate great amounts of skills and patience while working (Figure 6). They use similar collection techniques, for example, all fishers use the same design for short, paddle-like fins made from PVC for free-diving (Figure 6d). Small schooling species such as Chromis are commonly caught using a large fine mesh net called a saplad (Figure 6c). While fast-moving species, for instance Moorish Idols (*Zanclus cornutus*), are collected using a combination of a scoop net (sigpaw) with a barrier net (lambat) to corner the fish (Figure 6a and 6b).

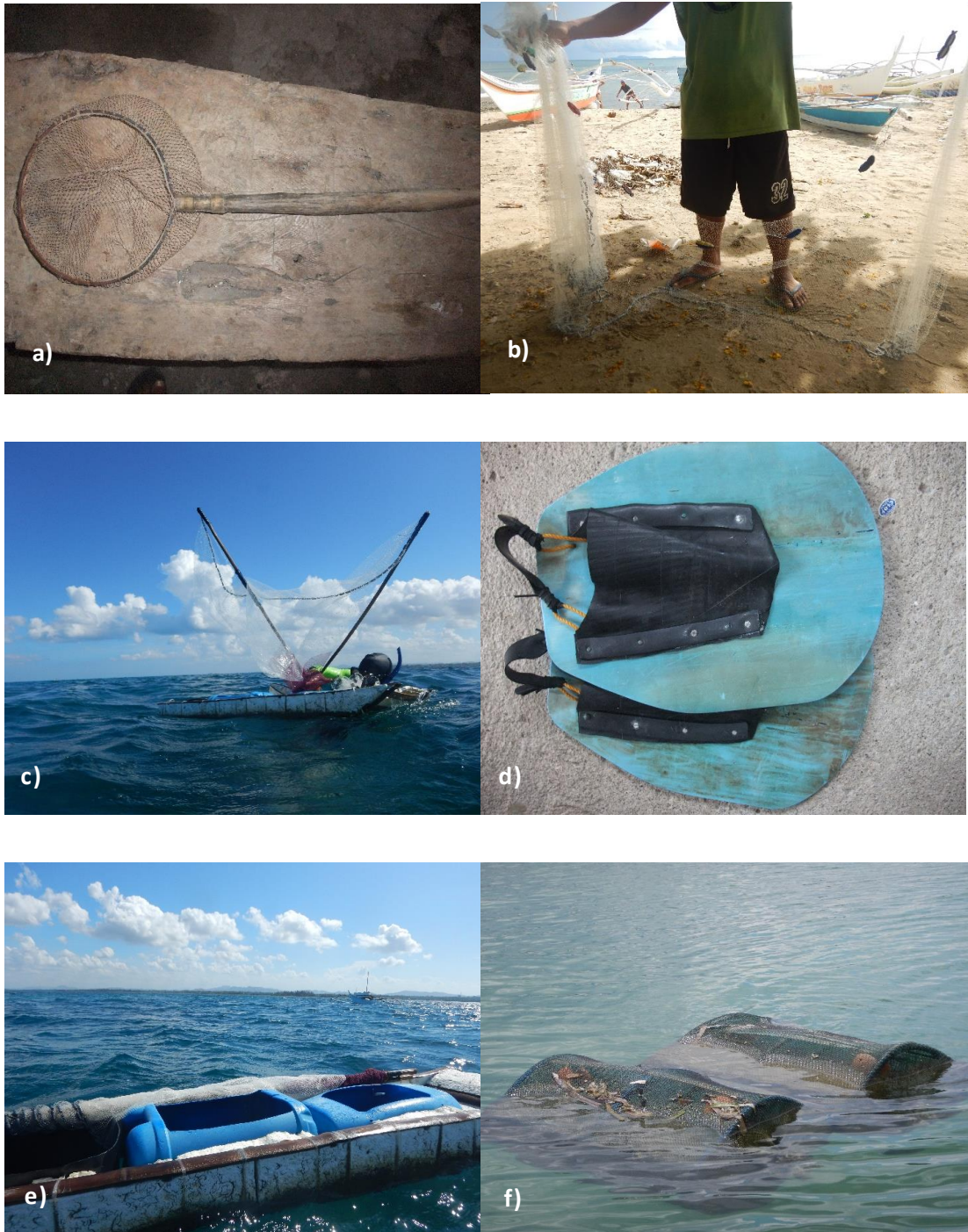


Figure 6: a-f show pictures of the various equipment used by aquarium fishers. In order: a) is the sigpaw or scoop net, b) is the lambat or barrier net, these two are used together for fishing and the scoop net is also used for handling fish. c) is the saplad net used for collecting small, schooling species, d) are the paddle-like fins used by aquarium fish collectors. e) is the floating container carried along by fishers during fishing, and f) are the large nets used to store collected fish in until packaging days. Photo credit: R. Turley (author).

From interviews with the fishers, it was learnt that in the past cyanide fishing was used to target species of Angelfish (*Pomacanthidae*) and Triggerfish (*Balistidae*) as they are fast-moving species and difficult to catch. Compressor tanks would also have been used to collect species found in deeper waters, such as Blue Tang (*Paracanthurus hepatus*), Clown Triggerfish (*Balistoides conspicillum*), and Angelfish (*Pomacanthidae*) species' (for current occurrences see Chapter 5). Compressor diving is used by fishers to reach fish in deeper waters. However, this is unsafe for fishers as the tanks remain on the surface and the equipment, including breathing tubes, tend to be dirty. Therefore "compressors are bad for fisher health", as they can lead to breathing problems in the future and risks of decompression sickness. As compressors also allow access to deeper waters, fish are easier to exploit, including "small, juvenile fish". Therefore, the use of compressor tanks is detrimental to both human and environmental health.

Once the fish are collected they are transferred to floating containers on the surface which the fishers pull behind them while swimming and freediving. The containers have separate compartments to allow fish to be grouped according to their behaviours (e.g. aggressive fish kept separately) (Figure 6e). They only collect what is ordered by the exporters, and aquarium fishers "return extra or unwanted fish to the reef" immediately. At the end of each fishing day, the catch is transferred into large barrel-like nets (Figure 6f). This negates the requirement for water changes or feeding as the seawater flows through the nets and algae provides food for the fish. These nets are kept tied to posts offshore, adjacent to the beach, and contain all the days' catches until the fish are packaged for transportation to Manila by the byahero.

4.2.2. To the exporters

Usually after four to six days of fishing, two or three of the byahero will transport the fish and invertebrates to exporters in Manila by road (Box 1, Figure 5). For three hours in the afternoon, the fishers and their families transfer fish from the offshore nets to the shore, placing them into large, transparent, plastic bags which are filled with approximately 1/3 seawater and 2/3 of oxygen from large compressor tanks.

Fishing Schedule

1. 4-6 days of fishing (until sufficient amount collected)
2. Package fish, and byahero transport them to Manila
3. Byahero at the exporters – fish are screened and payments given. New orders may be passed on here. (Rest day for fishers.)
4. Sharing of income and new orders.
5. Fishers return to collecting fish (Orders can also be passed on from exporters during this time via phone calls to byahero).

Box 1: The fishing schedule taken by aquarium fisher communities in Calatagan.

Throughout holding and packaging, fish are kept in groups depending on their species and behaviour. For example, small communal species of Chromis and Anemonefish (*Amphiprioninae*) are grouped together, while Emperor Angelfish (*Pomacanthus imperator*) are kept alone. On an average packing day, 150 bags were counted, containing assorted species and numbers of individual fish. Each fisher's bag is labelled with their initials, and the byahero keeps a record of the quantity and species that the group of fishers have delivered. Bags of fish are then loaded into vans (jeepneys) which have boards placed on the floor to prevent the bags from heating up. (Figure 7).



Figure 7: Packed bags of aquarium fish and invertebrates ready to be moved onto the jeepney.

Photo credit: R. Turley (author)

In Sta. Ana and Pob. Uno, although the two communities operate independently from each other, within each community they will “work together to package and transport fish. Aquarium fishers within the community will compromise on which day to transport the fish”, depending on whether some fishers need more time to collect enough to meet exporter demands, and achieve their necessary income. For instance, adverse weather conditions in the wet season makes fishing more difficult so it is common for additional collection days to be required. During informal discussions with the fishers, it was reported that there was high mortality among a week’s catch of fish during a period of extreme hot weather, and several fishers required extra days to catch more fish hence pushing back the transport date. Before leaving for Manila, the byahero’ must visit the local government to collect the necessary paperwork and pay for auxiliary invoices. Auxiliary invoices are the

necessary paperwork and expenses for everyone transporting fish, stating the number of bags, without which it would not be possible to reach Manila.

It is estimated that it takes six hours from the start of packaging to when the fish leave Calatagan. During the five hour journey to Manila, “[the fish] pass through three security checkpoints where the auxiliary invoice, and only occasionally the bags, are checked by police. If everything is in order the fish can continue. However, byahero shared that in the past, the police have raised issues with the paperwork and the byahero were “stopped to ask for money before letting [them] pass”. This now occurs less often due to new administrations in national government. The more time that is spent at these checkpoints, the greater the risk of repercussions on fish survival rates, yet the researchers were told that most do survive the journey.

Upon arriving in Manila, byahero will visit their specific exporters (Figure 5). Each byahero will sell to a different exporter in Manila, whom they have chosen based on prices, screening procedures and a good working relationship. During visits to exporter facilities in Manila, it was learnt that they screen the fish on arrival and will reject any fish with damage to the fins or body, or those below the minimum size limit. We enquired about any cyanide testing that might occur at this stage. The two exporters, shared that cyanide testing is less frequent now than when cyanide bans were first introduced, as traces dissipate from the fish within three days so the process proved to have little success. One exporter explained that they are however familiar with the behaviour exhibited by cyanide-caught fish, and so will challenge the byahero of said fish. It is still not clear exactly what happens to the rejected fish; one exporter reported that they are returned to the sea, though this was not

observed and survival rates would be questionable due to the distance to habitable reefs. It is possible that rejected fish may be sold to underground (illegal) trader markets, or to exporters with lower quality standards.

During informal discussions with directors at the exporters, we were told that after fish are screened, the byahero are paid in cash, and given a receipt for the fish and invertebrates that have passed the screening process. In some cases, the exporters will give cash advances to the fishers via byahero, to cover the cost of their equipment or fishing expenses. After being screened and approved by the exporter, the fish are quarantined at the exporter facility. Through observations, the quarantine process varies between exporters; some have multiple stages and move fish into a main holding area after a few hours, while some keep fish in quarantine until being shipped. For shipping to the importers, the fish are packaged using a mix of 40% water and 60% oxygen to increase survival. The main countries which import aquarium fish from Manila include; the US, UK, Germany and China (Figure 5). To obtain the variety of species ordered by the importers, exporters receive fish from aquarium fishing communities throughout the Philippines; from northern Luzon, to Cebu, and even the very south in Mindanao. However, it became apparent during interviews with exporters that while there are currently many communities of aquarium fishers across the Philippines, local governments have begun to prohibit aquarium fishing in certain municipalities because of the negative connotations the industry has in relation to sustainability and use of destructive fishing techniques. Aquarium fishing can vary between different communities' due to the role local government units will play (see Chapter 5). For example, fisher accounts shared that

the incidence of illegal techniques may be higher in some areas than others, or government support towards fishers can also differ.

Aquarium fishing in the Philippines is driven by consumer demand. The exporter, as an intermediary, passes on orders received from the importers (consumers), to the byahero (intermediaries), who then relays the order to the fishers (harvesters) (Figure 5). In this case, limits on catch size are more determined by consumer orders than government harvest rules. When the byahero return from transporting fish to Manila, they meet with their group of fishers to distribute payment to each fisher based on their catch (Box 1). Therefore, the aquarium fishers are usually paid for their work after the fish have been collected, transported to Manila, and approved by the exporter's screening process. This day is always accompanied by lots of celebrations, before the aquarium fish collectors return to work the next day.

5. Results and Discussion: Policy-Practice Gap

Aquarium fishing in the Philippines is governed by national and local government policies (Wood 2001; Dee et al. 2014) (Table 3). These *de-jure* rules are designed to increase sustainable practices, for example, by prohibiting the use of destructive fishing techniques and defining boundaries for the harvest of fishery resources. However, as across contexts, gaps often form between policy and practice (see Hatcher et al. 2000; Robbins et al. 2009; Carmenta et al. 2013). These gaps can arise due to weak governance, when managing authorities fail to fully implement and enforce *de-jure* rules, or when the rules are misaligned to harvester needs (Fabinyi and Dalabajan 2010; Pascual et al. 2014). This in turn can result in non-compliance

among the fishers; communities simply do not follow the rules, or unwritten rules emerge that counteract *de-jure* rules (Schendel and Abrahams 2005; Phelps 2013). The fishery's rules-in-use define its on-the-ground practices, which often differ from *de-jure* rules stated in legislation. This gap between *de-jure* rules and *de-facto* practices is termed the policy-practice gap. By exploring how policies are shaped at the local level, this study seeks to identify policy-practice gaps for a Philippine aquarium fishery. Policy-practice gaps are exacerbated by non-compliance, and concern over the persistent use of cyanide in aquarium fishing, could mean that policy-practice gaps are widened by non-compliance to *de-jure* rules banning cyanide use (Fabinyi and Dalabajan 2010). However, through structured analysis of policies, *de-jure* vs *de-facto* rule implementation and enforcement, as well as investigating fisher awareness and compliance, this study presents an alternative hypothesis. Policy-practice gaps form at the government level and are not necessarily widened by non-compliance at the harvester level.

5.1. Government policies

The process of collecting and trading aquarium fish is governed by a set of policies laid out in the National Fisheries Code 1998 (RA 8550), and the amended code in 2014 (RA 10654). Additionally, the collection of aquatic wildlife, such as marine reef fish for the aquarium trade, is controlled by special permits included in the National Wildlife Resources and Conservation Act, under the Wildlife Resources Conservation and Protection Act of 2001 (Fisheries Administrative Order No. 233). The role of managing fishery resources and fishing activities falls to the Bureau of Fishery and Aquatic Resources (BFAR), under the National Department of Agriculture (DA) (Figure

8). However, as the Philippine government became decentralised in 1991, management responsibilities are now split amongst different levels; National, Regional, Provincial BFAR offices, and Local Government Units (Figure 8).

Observations and discussions with government officials revealed that regions in the Philippines consist of groups of Provinces, such as Batangas, which contain a number of Municipalities. The national BFAR Office in Manila controls exporters for the aquarium trade, and focuses on regulating commercial fishing activities (boats over 3 gross tonnes). Regional and provincial BFAR offices are created where necessary to localise the management of resources, oversee and provide support to the local governments in each municipality (Figure 8).

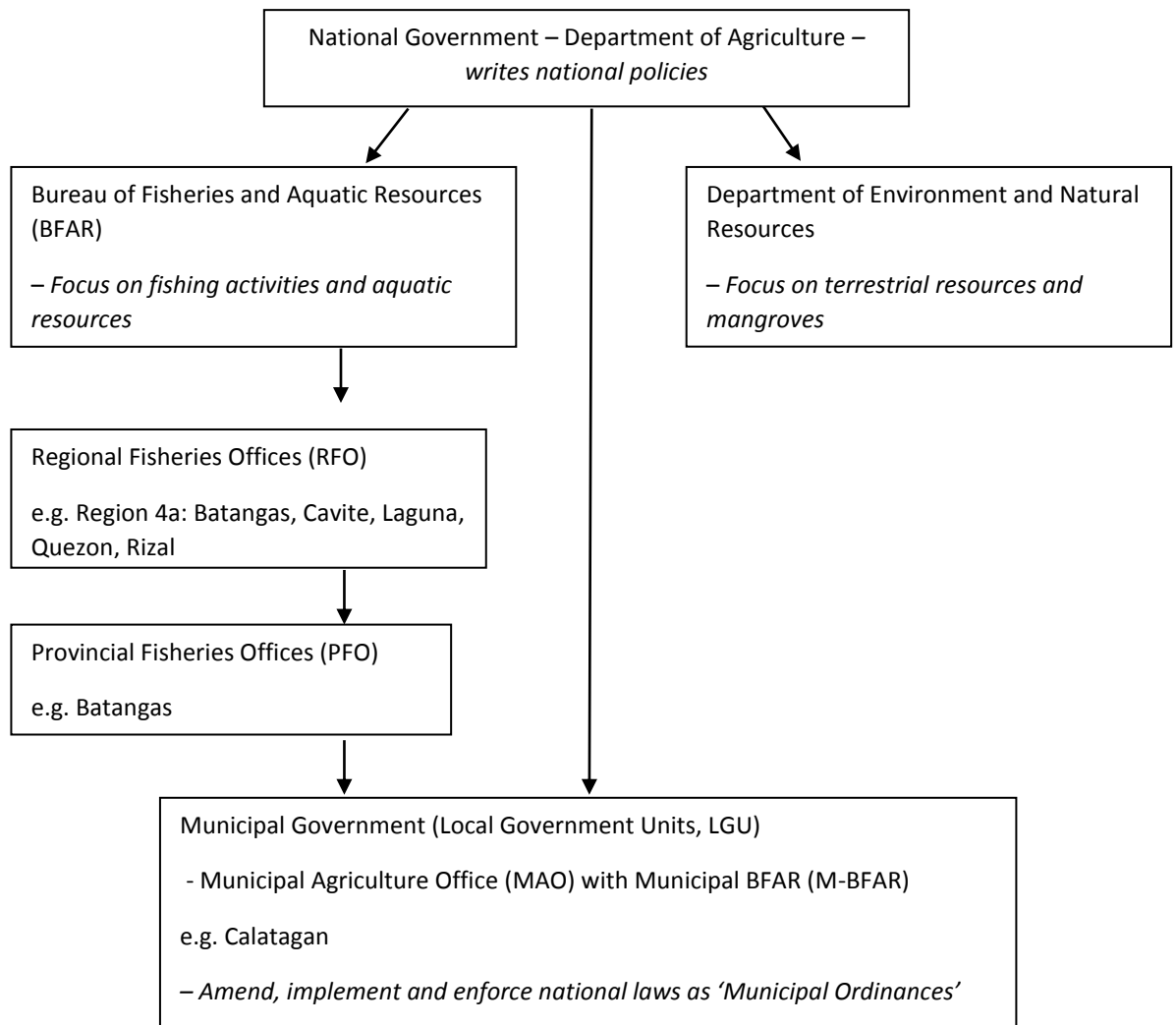


Figure 8: The structure of government offices and agencies governing aquaculture fishing in the Philippines.

Local governments have authority and responsibility over their municipal resources, including waters 15 km from the shoreline. Therefore, each municipality has its own policies, called ordinances. Government officials shared that municipal ordinances are written by the Mayor and Sanggunian Bayan (local council) (Figure 8). These ordinances implement, and can also amend and add to national policies (Table 3). For instance, sanctions within municipalities have a maximum fine of 2500 pesos, with exceptions for certain rules. Within each local government there is a Municipal Agriculture Office (MAO), some of which also have municipal BFAR staff. MAO

manages municipal fishery activities (boats under 3 gross tonnes) by implementing and enforcing *de-jure* rules (Figure 8). Fishing activities within the municipal waters of Calatagan are governed by the Calatagan Fisheries Ordinance from 2006, this includes collecting aquarium fish. Before government decentralisation, fishers were permitted to travel to different municipalities to fish. Now fishers must register their boats and themselves in one municipality, while entry of unregistered fishers is restricted. In Calatagan, BFAR was observed to be seldom active, and the closest active office is the Provincial Fisheries Office (PFO) in Batangas, to which the Calatagan Municipal Government reports illegal activities and sends updated the lists of registered fishers and boats. Within a municipality there are further groupings of 'barangay', resembling small towns or villages. A barangay will also have elected chairmen to represent residents at the LGU, and resolve local issues. Barangay Chairmen are more familiar with their local communities, for instance the Pob. Uno Chairman was previously an aquarium fisher and byahero himself. Barangay do not have their own ordinances, and so enforce rules according to municipal ordinances.

De-jure rules from national fishery policies have been translated into Calatagan's fisheries ordinance, which was last updated in 2006. Through translation, the national *de-jure* rules are altered to coincide with local conditions, such as defining specific closed seasons and restricted breeding/spawning species. 16 *de-jure* rules from national and local policies, which could apply to aquarium fishers, are presented below in Table 3.

Table 3: National and Local (Calatagan) de-jure rules governing aquarium trade from policy analyses.

| Rules | Legislation | Year Written | Defined in local policy? | Who rules applies to | Deontic | Activity | Conditions | Sanction | Graduated? |
|---|---------------------------------|--------------|--------------------------|--|---------|---|---|---|-------------|
| Registration of municipal fishers | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Shall | Register as fisherfolk | For all fishing activities within municipal waters | P1500 fine, confiscate catch | Not defined |
| Registrations of fishing vessels | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Shall | Register fishing vessels | All motorised, non-motorised and paddle boats 3 gross tonnes and below must be registered | P2500 fine (for motorised boat) OR P1500 (for non-motorised boat), and confiscate catch | Not defined |
| Local Transport Permit (LTP) OR Auxiliary Invoice | National Fisheries Code RA 8550 | 1998 | Yes | All fish and fishery products produced, cultured, captured, gathered, collected, processed | Shall | Have an auxiliary invoice for transport from point of origin to point of destination within the Philippines | At all times. Issued by Municipal Government of Calatagan prior to transport | All catch impounded during transport | Not defined |

| Rules | Legislation | Year Written | Defined in local policy? | Who rules applies to | Deontic | Activity | Conditions | Sanction | Graduated? |
|--|---|--------------|--------------------------|--|------------|--|--|--|---|
| Aquatic Wildlife Special Use permit | National Wildlife Resources and Conservation Act Order No. 233. | 2010 | No | All economically important aquatic wildlife for the ornamental/aquarium industry or the trade of handicrafts and decorative items. | Shall | Be collected by means of an Aquatic Wildlife Special Use Permit (AWSUP) | At all times. Issued by the nearest BFAR Provincial Fishery Office | Imprisonment 10 days to 1 month and fined. Extra fine if collection techniques are inappropriate | Yes: increases with severity of actions |
| Use of explosives, poisonous or noxious substances | National Fisheries Code RA 8550 | 1998 | Yes | All persons | Prohibited | To catch, take or gather any fishery species with the use of explosives, noxious or poisonous substance such as sodium cyanide | At all times: for possession and use in Philippine waters | Possession: 6 months – 2yrs imprisoned. Use: 5yrs – 10yrs imprisoned. In both cases: illegal substance, boat and catch confiscated | Yes: increases with severity of actions |

| Rules | Legislation | Year Written | Defined in local policy? | Who rules applies to | Deontic | Activity | Conditions | Sanction | Graduated? |
|-----------------------------|---------------------------------|--------------|--------------------------|-----------------------|------------|--|--|---|---|
| Use of compressors | Calatagan Fisheries Ordinance | 2006 | Yes | All Municipal Fishers | Prohibited | To use compressor as paraphernalia or breathing apparatus in fishing or catching fish | At all times: for possession and use on shore and in Philippines waters | Possession: impound compressor , Use: P2500 fine and confiscate compressor | Yes: increases with severity of actions |
| Use of fine mesh net | National Fisheries Code RA 8550 | 1998 | Yes | All persons | Prohibited | Use of fishing nets smaller than that determined by D/A | Shall not apply to the gathering of species that by their nature are small but already mature e.g. aquarium fish | P2000 - 20,000 fine and/or 6mths -2yrs imprisoned | Not defined |
| Banned collection of corals | National Fisheries Code RA 8550 | 1998 | Yes | All persons | Prohibited | Gathering, possession, commercially transporting, selling or exporting ordinary, semi-precious and precious corals, whether raw or in processed form | Can be collected for research under special circumstances | 6 months – 2yrs imprisoned, P2,000 - 20,000 fine and confiscate corals and boat | Not defined |

| Rules | Legislation | Year Written | Defined in local policy? | Who rules applies to | Deontic | Activity | Conditions | Sanction | Graduated? |
|---|---------------------------------|--------------|--------------------------|-----------------------|------------|---|---|---|-------------|
| Banned collection of rare or endangered species | National Fisheries Code RA 8550 | 1998 | Yes | All persons | Prohibited | Collection of rare, threatened or endangered species | As identified by existing laws: listed in the CITES and as determined by the D/A. Can be collected for research under special circumstances | 12-20yrs imprisoned and/or P120,000 fine, and confiscate catch | Not defined |
| Restricted collection of shellfish | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Prohibited | Collection of sexually mature shellfish or those below minimum size or above maximum quantities | As determined by DA and/or Local Government | P2000 – 10,000 fine and/or 1 month – 6 month imprisoned | Not defined |
| Restricted collection of breeders/spawners | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Prohibited | Collection of spawners or breeders of any fish | As determined by DA and/or Local Government | 6 months – 8yrs imprisoned and or P80,000 fine and confiscate catch and equipment | Not defined |
| Restricted collection of juvenile fish | Calatagan Fisheries Ordinance | 2006 | Yes | All Municipal Fishers | Prohibited | Catching/fishing of juvenile fishes and other species | As determined by DA and/or Local Government | P2500 fine and confiscate catch | Not defined |

| Rules | Legislation | Year Written | Defined in local policy? | Who rules applies to | Deontic | Activity | Conditions | Sanction | Graduated? |
|--|---------------------------------|--------------|--------------------------|-----------------------|------------|---|---|---|-------------|
| Marine Protected Areas | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Prohibited | Fishing within the “no-fishing zone” in Marine Protected Areas | As determined by DA and/or Local Government. Regulated fishing activities shall be allowed within the buffer/sustainable-use zone | Cancellation of permit to fish in municipal waters and confiscate catch | Not defined |
| Altering MPA and boundary buoys | Calatagan Fisheries Ordinance | 2006 | Yes | All Municipal Fishers | Prohibited | Remove or alters markers of protected areas or boundaries of municipal waters | At all times | P2500 fine | Not defined |
| Closed fishing season | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Prohibited | Violate catch ceiling | As determined by DA and/or Local Government | P2500 fine and cancellation of permit to fish in municipal waters | Not defined |
| Over-harvest rules e.g. catch ceilings | National Fisheries Code RA 8550 | 1998 | Yes | All Municipal Fishers | Prohibited | Violate catch ceilings | As determined by DA and/or Local Government | P2500 fine and confiscate excess catch | Not defined |

The previous table shows the various types of rules applicable to municipal fishers, which include aquarium fishers. For example, registrations, permits, gear restrictions, species restrictions, quotas, spatial and temporal closures. The local fisheries ordinance for Calatagan have added a gear restriction banning the possession and use of compressor tanks for fishing. This *de-jure* rule is not in national policies, showing that local policies are tailored to suit local conditions. Many specifications of the *de-jure* rules, such as exact closed seasons, catch ceiling limits and the restricted juvenile or breeding/spawning species, are not defined in national or local policies, merely that this is determined by the Department of Agriculture or Local Government (Table 3). These specifications are made as the *de-jure* rules are implemented on-the-ground. Table 3 also shows that one national *de-jure* rule was not stated in the local policy for Calatagan; the requirement of individual fishers to have an Aquatic Wildlife Special Use permit for collecting aquarium fish.

A decentralised government means that local governments can manage local resources in a way that is beneficial to them. For instance, as national policies are written into local policies, the *de-jure* rules can be specified to suit local conditions (Pomeroy et al. 2010). Localised management may also allow local fishers to have greater participation in the management of the resource, and the *de-jure* rules could be better matched to local livelihood needs (Grafton 2000). However, sharing management of fishery resources among local governments across the country does have its weaknesses (Pomeroy et al. 2010). It can be challenging for the national government to monitor the resource management of each specific municipality. For instance, discussions with officials in national BFAR revealed that they do not have a

compilation of local ordinances. Such limited communication can be a weakness of decentralised government (Gonzales and Savaris 2005). Some municipalities could lack the resources to effectively implement and enforce *de-jure* rules, while more interactions between managing authorities and local communities could result in cases of bribery or corruption (Robbins et al. 2009; Fabinyi and Dalabajan 2010; Pomeroy et al. 2010).

5.2. Rules-in-use

There are often challenges in fully implementing the *de-jure* rules as rules-in-use. Not all the *de-jure* rules may be implemented by the Municipal Agriculture Office, and those which are implemented may be lacking in enforcement. *De-facto* implementation of the 16 *de-jure* rules for municipal fishers in Calatagan was investigated, as well as *de-facto* enforcement (Table 4). It is seen whether the rule specifications for *de-jure* rules, such as catch ceilings, closed seasons and species restrictions, are implemented for the aquarium fishery (Table 4).

Table 4: The rules-in-use governing Calatagan’s aquarium fishery, gathered during Focus Group Discussions (n=17) and government interviews (n=2).

Fully implemented rules (2), Rules implemented for other fishing activities, but not for aquarium fishing (1), Rules not implemented at all (0).

For rules not fully implemented (1/0): N/A for further columns as these rules are not in use for aquarium fishing.

For fully implemented rules (2): active enforcement (1), or no enforcement (0). Active enforcement refers to rules which are enforced during patrols by authorities e.g. coastguard.

| Rules | Implemented? (0/1/2) | <i>De-facto</i> conditions | Enforcement (0/1) | <i>De-facto</i> sanction | Graduated sanctions? |
|--|-------------------------|--|----------------------|---|--|
| Registration of municipal fisherfolk | 2 | Fisherfolk from other municipalities enter Calatagan to fish | 0 | None | N/A |
| Registrations of fishing vessels | 2 | Boat registration implemented more recently to ordinance: since 2015 | 1 | 1 st offence: verbal warning, 2 nd offence: sent to MAO/BFAR and boat impounded | Yes: increases with frequency of actions |
| Auxiliary Invoice | 2 | None | 1 | Can leave Calatagan. Catch impounded by police at checkpoints between point of departure and destination. | No |
| Aquatic Wildlife Special Use permit | 0 | N/A | N/A | N/A | N/A |
| Use of explosives, poisonous or noxious substances e.g. sodium cyanide | 2 | None | 1 | Handed over to MAO. Fined, taken to court and imprisoned | No |

| Rules | Implemented? (0/1/2) | De-facto conditions | Enforcement (0/1) | De-facto sanction | Graduated sanctions? |
|---|-------------------------|---|----------------------|---|---|
| Use of compressors | 2 | Can be used in shallow waters with permit | 1 | Sent to MAO. Use: 1 st offence: impound compressor, 2 nd offence: impound boat Possession: 1 st offence: impound compressor and fined OR impound boat. 2 nd offence: impound compressor AND boat, fined more. Can be taken to court and imprisoned. – <i>penalty varies</i> | Yes: increases with frequency and severity of actions |
| Use of fine mesh net | 1 | Use of fine mesh net allowed for aquarium fishing | N/A | N/A | N/A |
| Banned collection of corals | 2 | None | 1 | 1 st offence: verbal warning, 2 nd offence: sent to MAO/BFAR - fined and imprisoned. Can be checked at checkpoints. Would not be exported | Yes: increases with frequency of actions |
| Banned collection of rare or endangered species | 2 | None | 1 | 1 st offence: verbal warning, 2 nd offence: sent to MAO/BFAR - fined and imprisoned. Can be checked at checkpoints. Would not be exported | Yes: increases with frequency of actions |
| Restricted collection of shellfish | 0 | N/A | N/A | N/A | N/A |
| Restricted collection of breeders/spawners | 1 | No species applicable for aquarium fishers. Only restricted in closed season for two pelagic fish species | N/A | N/A | N/A |
| Restricted collection of juvenile fish | 1 | No species applicable for aquarium fishers. Only restricted in closed season for two pelagic fish species | N/A | N/A | N/A |

| Rules | Implemented? (0/1/2) | <i>De-facto</i> conditions | Enforcement (0/1) | <i>De-facto</i> sanction | Graduated sanctions? |
|---|---------------------------------|---|------------------------------|---------------------------------|-----------------------------|
| Marine Protected Areas | 2 | Two existing Marine Protected Areas (Sta Ana, Tanagan). Fishing permitted in 'sustainable use zone' for all fishers EXCEPT for aquarium fishers. Some aquarium fishers aware of only one MPA. | 1 | Verbal warning | No |
| Altering MPA and boundary buoys | 0 | N/A No buoys for municipal boundaries, missing buoys for MPAs | N/A | N/A | N/A |
| Closed fishing season | 1 | In December. For two pelagic species: Brown Scat and Big Eye Scad. No species applicable for aquarium fishers. | N/A | N/A | N/A |
| Over-harvest rules e.g. catch ceilings | 1 | No harvest rules implemented for aquarium fishing | N/A | N/A | N/A |

In accordance with policies, the cyanide and compressor bans are among several *de-jure* implemented in practice by Calatagan's local government. However, policy-practice gaps begin to emerge as *de-jure* rules are not implemented specifically for aquarium fishers. The results suggest that half of the *de-jure* rules written in national and local policies and applicable to aquarium fishers, are being implemented for the aquarium fishery in Calatagan (Table 4). For example, there is no implementation of an Aquatic Wildlife Special Collection permit for aquarium fishing. Aquarium fishers in Calatagan expressed an interest in obtaining a special collection permit, yet this has not been provided by the local government. The permit is issued by the Provincial BFAR Fisheries Office (PFO). During an interview with the head of PFO we learnt that PFO are under the presumption that Calatagan's local government have prohibited all aquarium fishing and no aquarium fishers reside in this municipality. This circumstance highlights issues of miscommunication across government levels. A limitation of decentralised government in countries such as the Philippines is miscommunication, and local governments may lack the data and enforcement capacities for successfully implementing rules (Gonzales and Savaris 2005; Dee et al. 2014).

Various *de-jure* rules are implemented for other municipal fishing activities, but little attention has been given to aquarium fishing. Restricted collection of breeding/spawning fish, juvenile fish and closed seasons are *de-jure* rules that are currently implemented for food fishery species but not for species in the aquarium trade (Table 4). The only locally implemented restrictions for species in the aquarium trade is the prohibited collection of corals and endangered species defined under the

CITES (Wood 2001; Dee et al. 2014). This lack of implemented rules for aquarium fishing reflects gaps forming between policy and practice at the local government level.

Additional gaps between policy and practice are seen in Calatagan's two Marine Protected Areas (MPAs). The MPA in Tanagan covers most of this barangay's coastline, and has existed since the 1900's, however its guardhouse and buoys were destroyed in a typhoon many years ago and new ones have been requested for the last three to four years (Table 4). The missing guardhouses and buoys, illustrate that MPA enforcement may be ineffective at deterring entry, and therefore needs strengthening to achieve its desired purpose. *De-jure* rules need to be effectively enforced as well as implemented to integrate them as rules-in-use for the fishery (Keane et al. 2008).

It has been found that *de-facto* enforcement in Calatagan differs slightly to what is defined in national and local policies (Table 4). In practice, the sanctions tend to consist of more verbal warnings. The fines, confiscations and imprisonment can only be dealt out by the Municipal Agriculture Office, so when rule breakers are caught by enforcers in the sea, verbal warnings are often used (Table 4). The findings also show that more graduated sanctions exist in practice than are stated in policies. This is because verbal warnings are usually given for first offences, before higher sanctions are given (Table 4). Graduated sanctions are punishments that increase, with the frequency or severity of rule breaking. As such, these types of sanctions are thought to be effective at increasing compliance to *de-jure* rules (Cinner et al. 2012). By initially using verbal warnings, rather than taking all rule breakers to MAO, the

enforcers of Calatagan would also be saving their time and resources. Other than giving appropriate sanctions, consistent enforcement is also important for compliance, such as consistently giving sanctions to rule breakers and regular patrols to detect non-compliance (Keane et al. 2008).

5.2.1. Enforcement

Enforcement is important for reducing policy-practice gaps in management (Keane et al. 2008). Strong enforcement would use coercion to create compliance among harvesters (Arias 2015). Of the eight *de-jure* rules implemented for aquarium fishing, six are actively enforced by four resident coastguards and 32 volunteer sea patrollers, locally named ‘bantay dagat’, who patrol the coastline of Calatagan. The auxiliary invoice is enforced by police outside of Calatagan during transportation of fish to Manila (Table 4). Informal discussions with the coastguard and bantay dagat revealed that coastline patrols occur one to three times a week, and thrice a week for MPAs, with not many illegal activities encountered as “most people [in Calatagan] follow the rules”. To triangulate these statements, the perceived ‘likelihood of detection’ for non-compliance was measured through structured interviews with aquarium fishers (Figure 9).

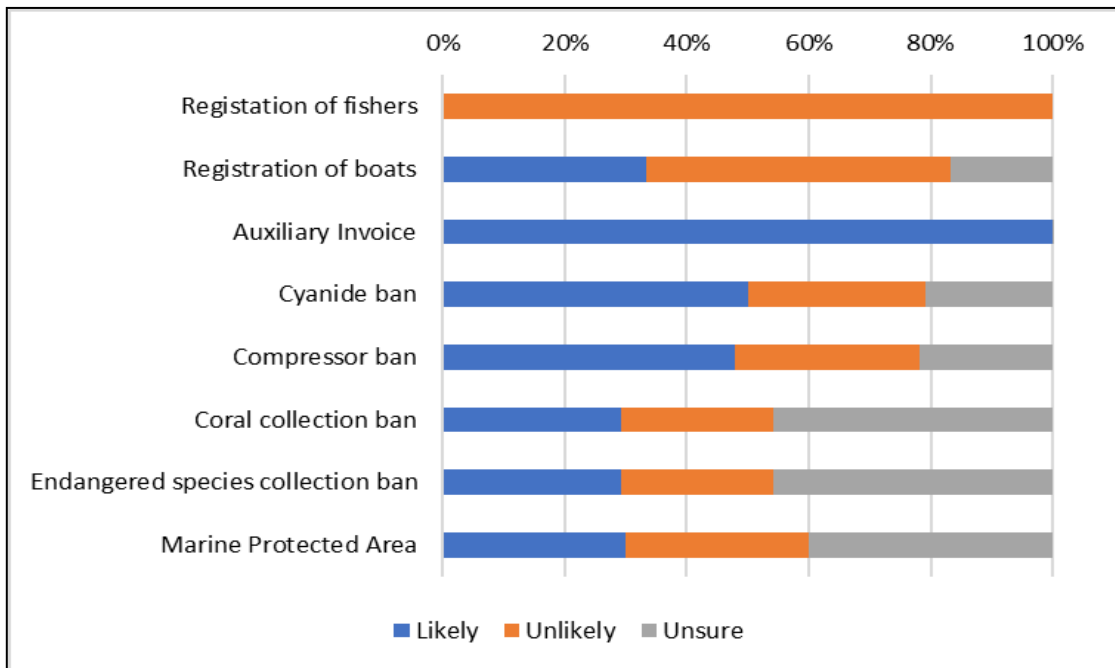


Figure 9: Likelihood of being detected by enforcement for breaking eight *de-jure* fishery rules, as perceived by aquarium fishers in interviews (n=35).

The findings show that enforcement of *de-jure* rules appears to be stronger outside of Calatagan than within the municipality. 100% of fishers perceived likely detection if transporting fish to Manila without an auxiliary invoice; “auxiliary invoices are always checked at checkpoints” (Figure 9). This invoice is obtained from the local government before transporting collected fish to Manila. During interviews, the fishers shared that the fish can leave Calatagan without an auxiliary invoice, yet would be unable to reach their exporter as the invoice is enforced on route.

Throughout the journey the fish must pass through three police checkpoints where the bags of fish and paperwork are checked. If the auxiliary invoice is not shown, all the fish would be confiscated.

In comparison, Figure 9 illustrates a broad variation in the fishers’ perceived likelihood of detection for non-compliance within Calatagan. For instance, 100% of fishers perceived unregistered fishers unlikely to be detected in Calatagan, although

unregistered boats are more likely to be detected. During participant observations, fishers shared that “fishing in Calatagan is open” to unregistered fishers from other municipalities. This portrays a lack of consistency in enforcement. The boundary rules do not appear to be strongly enforced; unregistered fishers are not restricted and there is also no limit on the number of individuals that can register as fishers in Calatagan.

Notably, use of cyanide and compressors were perceived as the most likely to be detected by enforcement within Calatagan. This demonstrates that enforcement in Calatagan is focused towards controlling cyanide and compressor use, rather than restricting resource users and harvest limits, reiterating the inconsistency of enforcement. Fishers also stated that they are “not caught for using cyanide because it is not used”. Therefore, it may be that enforcing harvest limits for aquarium fishing and restricting resource users is a more complex issue than banning cyanide and compressors. Compliance to *de-jure* rules is influenced by a broader range of factors than effective enforcement (Hatcher et al. 2000). Compliance towards cyanide and compressor bans may also be driven by factors such as the fisher’s perceptions towards *de-jure* rules (Fabinyi and Dalabajan 2010; cf. Tyler 1990; Fishbein and Ajzen 2010) (see Chapter 6).

The results show that policy-practice gaps are effected as *de-jure* rules are translated into rules-in-use on the harvester level. The *de-facto* enforcement in Calatagan is inconsistent and varies to *de-jure* enforcement stated in policies, therefore widening the policy-practice gap. This gap may be further increased as inconsistent

enforcement could affect the compliance of aquarium fishers to *de-jure* rules (Keane et al. 2008).

5.2.2. Awareness

An awareness of *de-jure* rules among aquarium fishers is important for the rules to achieve their purpose (cf. Bitanyi et al. 2012; Kahler and Gore 2012). If awareness exists, it would illustrate *de-jure* rules becoming integrated at the harvester level, and therefore they would be more likely to play a part in the *de-facto* practices of the aquarium fishery (cf. Kahler and Gore 2012).

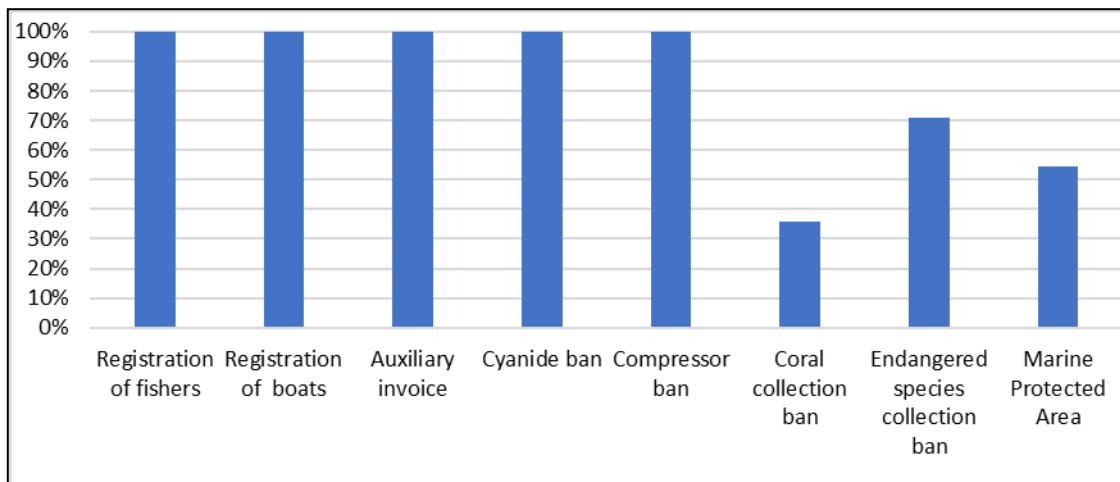


Figure 10: Fisher's reported awareness of eight implemented *de-jure* rules during interviews (n=35).

There was 100% awareness among aquarium fishers for the requirement to register as fishers, to register their boats, the need to obtain an auxiliary invoice, and the prohibited use of sodium cyanide and compressors (Figure 10). As the auxiliary invoice is strongly enforced, and cyanide and compressor bans are the most enforced *de-jure* rules within Calatagan, it is unsurprising that fishers were aware of these rules. However, there is high fisher awareness of the need to register as fishers, despite unregistered fishers not being monitored or sanctioned. The desire of

aquarium fishers to have special collection permits, as they have “asked the local government for these”, reveals their wish to be seen by others as legitimate fishers, a recurring theme which arose during fieldwork, and could justify their awareness and willingness to register. Also, the local government hold meetings, open to all fishers, to raise awareness of requirements and prohibited activities. As boat registrations and one MPA have only been implemented within the last two years, meetings have been conducted to share the implemented *de-jure* rules. This may explain high awareness despite inconsistent enforcement.

Aquarium fisher’s awareness of *de-jure* rules for the MPAs and restricted species varied. 71% of fishers were aware of five restricted endangered species (seahorses, humphead wrasses, sea clams, sharks/rays, grouper species). There was less awareness (36%) among the fishers for the prohibited collection of corals (Figure 10). The fishers may have less awareness of species restrictions because the aquarium trade is consumer driven. From observations and discussions with fishers and the exporters, we learnt that they do not receive orders for these species from exporters, who may be more aware of restrictions because they will be checked at export, so do not need to collect corals and endangered species. An incomplete awareness of MPA’s in Calatagan is because not all aquarium fishers will enter areas where the MPA’s exist (Figure 10). Of the aquarium fishers who travel to this part of Calatagan, 100% were aware of at least one MPA. Nevertheless, two MPA’s are implemented and there is confusion among fishers about their exact locations and how long each has existed.

Overall, there was a high awareness of the *de-jure* rules implemented for aquarium fishers in Calatagan. Meetings run by the local government to raise awareness show an effectiveness in fishery management, and indicate interactions between fishers and government officials. This is a step towards integrating *de-jure* rules as rules-in-use, and reducing policy-practice gaps (Ostrom 1990). Without awareness, *de-jure* rules could not be translated into rules-in-use for the aquarium fishery, and would also make it difficult to study the fisher's compliance and perceptions (cf. Bitanyi et al. 2012; Kahler and Gore 2012).

5.2.3. Licit and Illicit rules

As they are translated into rules-in-use, *de-jure* rules are shaped by the community to reflect livelihood needs (Schendel and Abrahams 2005). These adaptations may become licit rules that match local needs, but in doing so they can also become illegal activities (Table 5) (Robbins et al. 2009). Licit and illicit rules are unwritten rules derived from social behaviours (Schendel and Abrahams 2005). Licit rules are socially sanctioned, or accepted, within the community, while illicit rules are unsanctioned (Schendel and Abrahams 2005). Licit and illicit rules interplay with *de-jure* rules to create the rules-in-use, which govern the *de-facto* practices (Ostrom 1990). For example, the use of a forest reserve in India was governed by *de-jure* rules that were mismatched to community needs. As a result, the *de-jure* rules were altered during integration at the harvester level, and the rules-in-use for the forest reserve were actually licit rules that were also illegal (Robbins et al. 2009). However, this need not always be the case. Sometimes the *de-jure* rules become both licit and legal rules-in-use, while illegal activities are also illicit (Phelps 2013). Table 5

highlights that the Calatagan aquarium fishery is governed by a combination of *de-jure* rules and unwritten rules from local communities. In addition to the eight rules implemented by the local government for aquarium fishing, there are also seven unwritten rules (Table 5). Results from focus group discussions, interviews and participant observation, found two unwritten rules among aquarium fishers which limit the collection of spawning/breeding fish and small individual fish. These activities are illicit yet still legal. In comparison, another two unwritten rules restricting entry of the aquarium fishers to certain areas, are themselves illicit among the aquarium fishers nor entirely legal. The remaining three unwritten rules are licit activities among aquarium fishers, however are also illegal (Table 5). All three of these refer to illegal entry of fishers, for instance unregistered fishers into Calatagan, entry of Calatagan fishers into other municipalities, and entry into MPAs. In each case there are socially sanctioned conditions for these three unwritten rules, such as familiarity with the enforcers in question. Table 5 presents these unwritten rules in their complementary categories, along with an additional three *de-jure* rules that are licit as well. These refer to the collection methods used in aquarium fishing; fine mesh nets are legal and licit to use for aquarium fishing, while cyanide and compressors are both illegal and illicit.

Table 5: The legal/illegal and licit/illicit rules governing Calatagan’s aquarium fishery shared by aquarium fisher communities during Focus Group Discussions, qualitative interviews, informal discussions and participant observation.

| | Legal | Illegal |
|----------------|--|---|
| Licit | <p>The collection and trade of marine reef fish for the aquarium trade, <i>provided</i> the correct permits have been obtained and legal collection methods are used.</p> <p>The use of fine mesh nets to collect marine reef fish.</p> | <p>Unregistered fishers can enter and fish within municipal waters outside Calatagan <i>provided</i> they are accompanying a relative who is registered, <i>and</i> the enforcing officer is familiar with the persons in question.</p> <p>Any unregistered fishers who are not residents of Calatagan, are able to enter and fish within municipal waters <i>provided</i> they are using legal fishing methods.</p> <p>Fishers can enter within the buoys of the Marine Protected Area (MPA), if they are familiar with the MPA guard.</p> |
| Illicit | <p>The collection of breeding/spawning fish is limited, particularly if the species in question are seasonal breeders/spawners. (This is knowledge possessed by the fishers from experience)</p> <p>The collection of small individuals of aquarium species is restricted.</p> | <p>The use of the poisonous substance, sodium cyanide, and compressor tanks for collecting aquarium fish is both prohibited and socially undesirable.</p> <p>The restricted entry of aquarium fish collectors to waters surrounding two barangay within Calatagan.</p> <p>Restricted entry of all fishers to a strip of privately owned beach resorts in one barangay.</p> |

The illegal entry of fishers to unregistered municipalities and MPAs is a licit rule, learnt through informal discussions and interviews with the fishers, where exceptions have been identified to *de-jure* rules depending on the actors’ present (cf. Phelps 2013). Entry into the MPAs or a municipality other than Calatagan is possible due to familiarity with fellow fishers and enforcers. On the other hand, unregistered fishers from elsewhere entering Calatagan have less requirements. The fishers shared that “fishers from other municipalities can also enter” and that they “do not mind” others entering, provided they fish with legal methods. This exception is also

possible due to the lack of consistent enforcement for unregistered fishers in Calatagan. The fishers stated that other municipalities differ to Calatagan in their fishery management, such as by having stricter boundary rules. Calatagan fishers can only enter and fish in places where they are unregistered depending on certain conditions, whereas unregistered fishers from elsewhere can enter and fish in Calatagan without hindrance.

Two unwritten rules in Table 5 demonstrate that the aquarium fishers use their own social rules to control the harvest of fish. Limiting the collection of breeding/spawning fish and small individual fish reduces high mortalities post-collection. It is also beneficial for the future of the aquarium fishery as fish can survive on the reef to grow and reproduce. As this activity is not restricted for aquarium fishing under any *de-jure* rules, the aquarium fishers appear to be using social norms to manage the fishery themselves. Such activities were also observed during fishing trips with fishers to back up their statements. However, these unwritten rules are not acknowledged or legitimised by the local government. Cooperation between the fishers and government officials could allow appropriate rules to be integrated into fishery management, which match both social and ecological needs (cf. Feeny et al. 1990; Ostrom 1999).

Collection methods which are damaging to the fishery are controlled by both *de-jure* and social rules. The use of cyanide and compressors is illicit among the aquarium fishers, as well as being illegal, meaning that their use is socially undesirable and so likely to be low. This links back to the enforcement of cyanide and compressors.

These *de-jure* rules were perceived as the most enforced in Calatagan, although this

could be because they are easier to enforce than other *de-jure* rules. It is notable that the two barangay captains who restricted entry of aquarium fishers, shared that they have done so because they perceive aquarium fishing to be detrimental for fish in the area. However, damaging collection methods are illicit in the aquarium fishing community as well, as shared in an FGD, they are perceived to be “bad for fisher health and corals”. Additionally, legally all waters in Calatagan are under ownership of the local government, and so barangay do not have the legal power to restrict the entry of any registered fishers. In an interview with a government official it was verified that “Barangay cannot stop people fishing there, unless they are doing illegal activities, as Calatagan only has a municipal ordinance”.

The findings have shown that, as *de-jure* rules are integrated on the harvester level, they are effected by licit and illicit rules. These unwritten rules can reduce as well as widen the gap between *de-jure* rules and *de-facto* practices. As cyanide and compressor use is illicit its makes compliance to these *de-jure* rules more likely, while *de-facto* exceptions exist for entry to restricted fishing areas. Negative connotations about the aquarium trade have been found at the harvester level and unwritten rules, which are not entirely legal, further limit the available collection areas for aquarium fishers. These connotations are based on aquarium fishing being detrimental to the environment. However, use of damaging techniques is illicit and aquarium fishers also have unwritten harvest rules which could increase the sustainability of the fishery.

5.2.4. Non-compliance

Compliance is not only influenced by unwritten rules and *de-facto* exceptions, but also by simple rule breaking (Arias 2015). Aquarium fishers (N=35) reported on their levels of non-compliance with three *de-jure* rules: the ban on cyanide use, the ban on compressor use, and restrictions on fishing within the MPAs, using both the Bean Method and direct questioning. The prevalence of illegal behaviours, were calculated as the number of participants answering “yes” in direct questioning (DQ), and moving a coloured dice (blue, white or yellow) in the bean method (BM). Under DQ, no respondents reported breaking any of the three rules. Under the BM, 5.7% (n=2) reported using cyanide, and 5.7% (n=2) reported using compressors to collect aquarium fish. Only those participants who were aware of an existing MPA (N=19), were questioned about illegal entry. Results from the BM, showed that 10.5% (n=2) of participants aware of an MPA admitted to entering one illegally to fish. The Bean Method was thus better at detecting reported cases of non-compliance, although in small numbers.

Compliance to the other *de-jure* rules was also observed and shared by the aquarium fishers during fieldwork. No collection or transportation of endangered species and corals was observed by researchers. Prohibited species, including corals, are checked during exports so are not ordered by exporters in Manila, as they would be fined for trading these species. Additionally, the auxiliary invoice is always necessary to transport fish to Manila; “cannot pass through check points without an auxiliary invoice”. Due to strong enforcement at checkpoints, the fishers would not reach their destination without one. All aquarium fishers in the study had registration cards for fishing in Calatagan. Two Calatagan aquarium fishers did admit to fishing in a

municipality where they were unregistered while sharing a registered friend's boat, which coincides to the conditions of the licit rule.

These relatively high estimates of compliance reduce the mismatch between *de-facto* practices and *de-jure* rules (Keane et al. 2008). As compliance to the *de-jure* rules means that they can become rules-in-use for the fishery, this helps to minimise further policy-practice gaps. Compliance can be explained by economic incentives, such as high costs of non-compliance due to strong enforcement (Keane et al. 2008; Arias 2015). However, in Calatagan enforcement has been found as inconsistent, and so may not justify the levels of compliance found. By taking a broader approach to study why harvesters chose to comply, the social influences on compliance behaviour in aquarium fishers are explored (cf. Hatcher et al. 2000; Kahler and Gore 2012).

6. Results and Discussion: Perceptions

There are many reasons why harvesters choose to comply with environmental regulations (Arias 2015). While people often assume this is associated with economic costs, harvester perceptions of *de-jure* rules also come into play (Neilson 2003; Hatcher et al. 2000). Positive perceptions can arise when the *de-jure* rules are aligned with the harvesters' needs (Carmenta et al. 2013; Pascual et al. 2014). For example, harvesters may perceive benefits in complying with *de-jure* rules, perceive legitimacy in management, possess social norms which comply with *de-jure* rules, and the skills to align existing *de facto* practices with *de jure* rules (Normative Approach, Tyler 1990; Reasoned Action Model, Fishbein and Ajzen. 2010). These positive perceptions can create incentives for voluntary compliance to *de-jure* rules, and are therefore

important for reducing policy-practice gaps (Arias 2015). Voluntary compliance has been preferred to coercive compliance via enforcement; it provides a buffer if costly enforcement fails, as well as reflecting effective and beneficial management schemes (Arias 2015). The findings have illustrated high levels of compliance in Calatagan's aquarium fishery. Therefore, the existence of positive perceptions is studied in this chapter to further our understanding of both incentives to comply and how this aquarium fishery is managed.

6.1. Perceived benefits of *de-jure* rules

In the Reasoned Action Model, the behavioural beliefs are described as the perceived benefits and costs of complying. When the benefits outweigh the costs, incentives for voluntary compliance are formed (Fishbein and Ajzen 2010). For example, when reducing cyanide or compressor use provides more environmental and human benefits compared to the costs of smaller catch sizes, fishers would voluntarily change to using legal collection methods. During focus group discussions, the aquarium fishers were asked to discuss their perceptions of the benefits and limitations of implemented *de-jure* rules. Their average preferences for the implemented *de-jure* rules to continue in the future are displayed on a scale (1-5) (Figure 11). Fisher and boat registration were grouped together, as were the endangered species and coral restrictions, due to their similar nature.

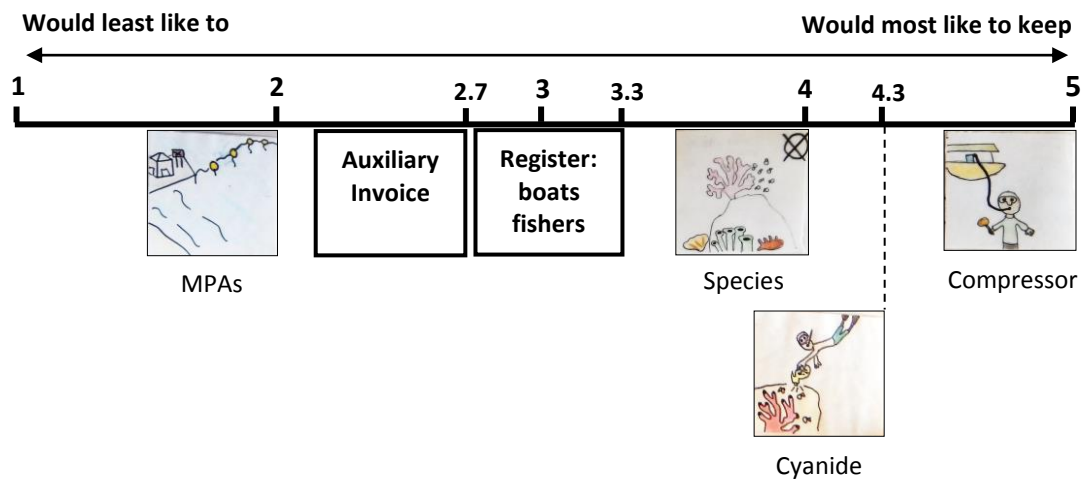


Figure 11: The aquarium fisher’s average preferences for implemented *de-jure* rules (n=17).

The fisher’s overall preferences for *de-jure* rules to continue average at 3.55, on the higher end of the scale. Fishers showed the highest preference to see cyanide, compressor bans and species restrictions continue; “the fish can now increase”. This is compared to low preferences towards the MPAs; “aquarium fishers cannot enter”. The fishers had more neutral preferences towards continued implementation of registrations and the auxiliary invoice; they are “expensive” yet “can fish freely in the municipality” and “legally transport fish to Manila”. (Figure 11). Preferences towards the cyanide and compressor bans coincide with previous findings that the use of these illegal collections methods is also illicit, as well as the high levels of compliance towards these *de-jure* rules (see Chapter 5). Notably, high compliance was also found for MPA entry, yet fishers show low preferences for the continuation of this *de-jure* rule. To gather a deeper understanding of the aquarium fisher’s preferences, their reasoning behind rule placements was discussed (Table 6).

Table 6. Fishers’ perceived benefits and limitation of *de jure* rules, based on focus group discussions (n=17).

| Rule | Benefits of Rule | Limitations of Rule |
|-----------------------------------|--|--|
| Compressor use | Bad for fisher health: less mortalities since ban implemented | Nothing |
| Cyanide use | Bad for fisher health. Fish caught would be thinner and weaker Both fish and corals would die - can increase now Nets are easier to use | Easier to collect some species e.g. angelfish |
| Species bans | Good corals here and needed for the fish’s survival | Nothing |
| Registration of boats and fishers | Can fish freely within Calatagan. For identity and safety | Could fish anywhere before (other municipalities) Extra expense |
| Auxiliary Invoice | Able to transport fish legally | Extra expense and price has increased over time, although price received for fish has not Not always by police honoured at checkpoints to Manila; time wasted and bribes paid |
| MPA | Nothing | Another area restricted for fishing (additional to closed barangay and private resorts) Food fishers can enter “sustainable use zone” but not aquarium fishers |

The aquarium fishers perceive that several existing *de jure* rules yield both environmental and human benefits (Table 6). Therefore, these positive perceptions can create incentives to comply. As would be expected, they would prefer to see those rules continue, which are perceived to yield more benefits than limitations. There is an awareness of the negative impacts cyanide and compressor use has on the environment, and on fish survival post-collection. Additionally, aquarium fishers show an awareness of the benefits provided by prohibiting coral collection; fishers in FGD’s said that “corals are needed for fish survival”. The results reveal that fishers are knowledgeable of the factors that will impact marine reef species. This is further

demonstrated by their licit rule limiting the collection of small and breeding/spawning fish, and their widespread use of legal collection methods (see Table 5 and Figure 5).

To aid in the change of collection methods from illegal to legal techniques, control beliefs also play an important role (Fishbein and Ajzen 2010). The skills, knowledge and time possessed by aquarium fishers will affect how they change their behaviour to coincide with *de-jure* rules, and thus will ease or deter compliance (Hornik et al. 1995). If aquarium fishers are able to effectively gather their required species with legal collection methods, there will be a move away from cyanide and compressors.

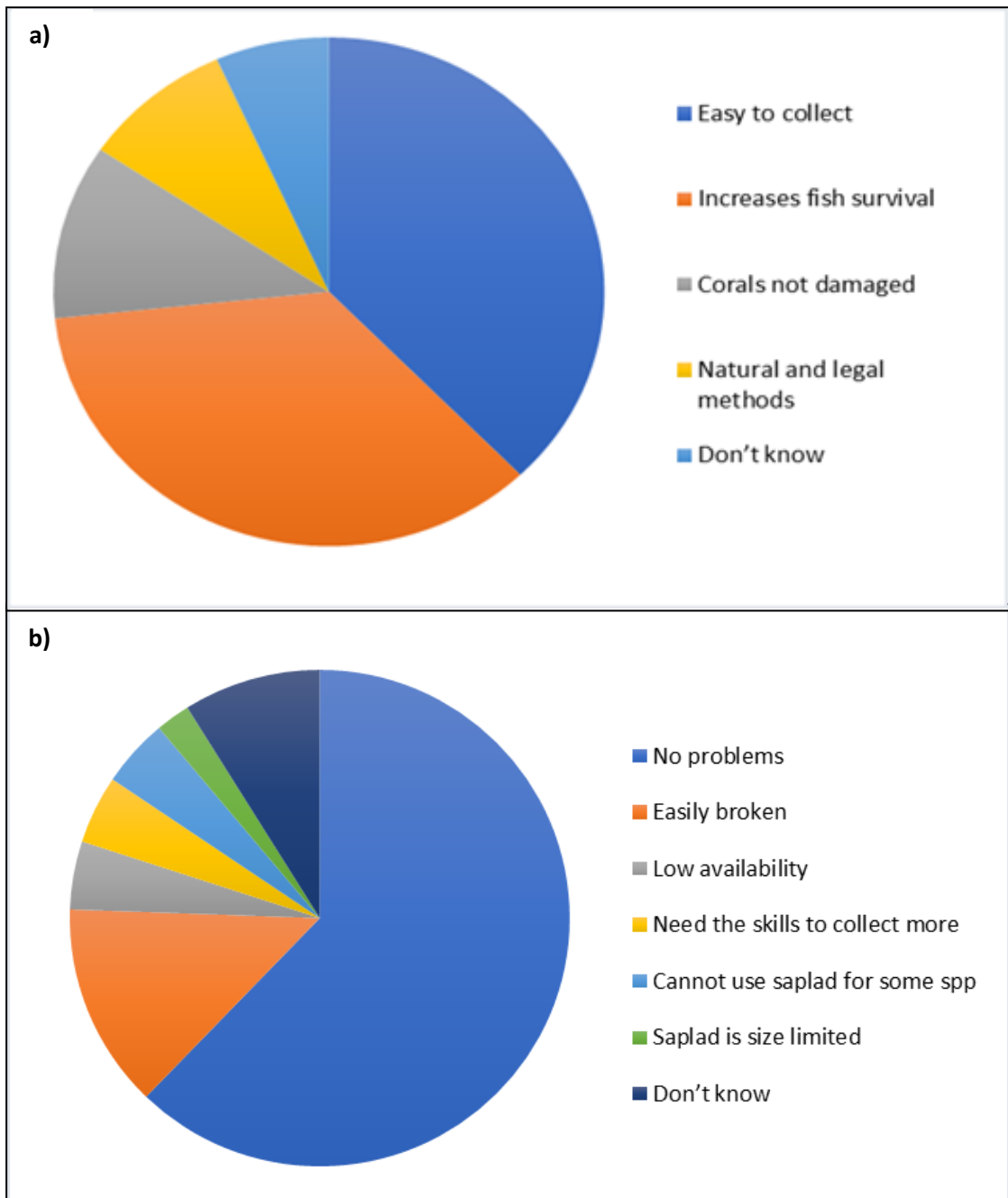


Figure 12: a) The advantages of using saplads, scoop and barrier nets. b) The limitations of using saplads, scoop and barrier nets. Based on aquarium fisher interviews (n=35).

In Calatagan, 100% of aquarium fishers use a combination of nets, the saplads, scoop and barrier net, to collect aquarium fish (Figure 5), and all aquarium fisher respondents shared advantages of using these methods (Figure 12a). Most of the advantages fall into 2 categories; 38% of participants said that the nets are “easy to use” to collect aquarium fish and 35% stated that the nets “increase fish survival”, as

the fish are not damaged by the nets making them stronger and better quality. These advantages aid in deterring the use of cyanide and compressors, which are environmentally damaging and widely used due to quick and easy collection of fish (Rubec 1986; Wabnitz et al. 2003).

The aquarium fishers were also asked about any limitations of using these nets (Figure 12b). The main limitation experienced with the nets is that they can be easily broken, for example when they are old or get caught on corals, which results in them being difficult to use. One limitation which stood out was the low availability of the nets, the saplad net in particular; unless made by the fisher himself or a local net weaver, they can be occasionally be found at the exporters, but they are expensive to buy. The aquarium fishers require finer mesh than other fishers, which makes their preferred nets more difficult to find. Despite a few limitations, all aquarium fishers reported preferences for using nets. When these incentives are combined with social norms and perceived benefits of banning cyanide and compressors, the reasons for high compliance to these two *de-jure* rules becomes clearer.

Most negative perceptions towards *de-jure* rules seem to be driven by limited collection areas (Table 6). Fishers can only legally fish within Calatagan because of the required fisher and boat registrations, then there are the unwritten rules banning aquarium fishing in two barangay within Calatagan. The addition of MPAs is perceived by the fishers as another restriction rather than an environmental benefit, especially as aquarium fishers are the only type of municipal fisher not permitted to use the MPA's outer "sustainable use zone" (Table 6). Inconsistent enforcement of the MPAs, combined with a low awareness of among the fishers, could mean that

the MPAs are not currently effective in providing widely seen environmental benefits (see Chapter 5). This lack of perceived benefits and more restricted fishing areas, would suggest low compliance to the MPAs. However, the differences in perceptions towards MPAs compared to cyanide and compressor bans, is not reflected in their compliance estimates.

Compliance with *de-jure* rules for registrations were also observed. Through registering, the fishers shared a feeling of recognition as legitimate fishers, and even a wish to obtain special collection permits for aquarium fishing; “[the fishers] have asked for this but it is not given”. Aquarium fishers are treated differently to food fishers, for instance in their additional restricted fishing areas. Discussions with the fishers revealed that local government policies in other municipalities had completely prohibited aquarium fishing. The director of Provincial BFAR was unaware of any aquarium fishers in the Batangas province, assuming that Calatagan had also prohibited the livelihood. The aquarium fishers stated that the local government of Calatagan have threatened to ban aquarium fishing due to concern over its damaging effects on the environment. Therefore, there are likely large costs of non-compliance among the aquarium fishers; if they displayed low levels of compliance to *de-jure* rules, the local government may be more inclined to prohibit aquarium fishing. However, aquarium fishers in Calatagan have shown a range of incentives for not using damaging and illegal collection methods, so the negative connotations they possess may be unjustified. Also, the fear of their livelihood being prohibited suggests a coercive, rather than a voluntary, incentive to comply (cf. Arias 2015).

Voluntary compliance, which stems from an alignment between *de-jure* rules and local livelihood needs, is more effective for long term success of management schemes (Cinner and Huchery 2013; Pascual et al. 2014). By considering the social influences on compliance and engaging with the aquarium fisher community, the local government could create management schemes with more desirable incentives (Katon et al. 1999; Challender and MacMillan 2014). Therefore, the rules-in-use would better reflect the *de-jure* rules, and the policy-practice could be reduced in the long term.

6.2. Perceived legitimacy of *de-jure* management

As the findings have shown so far, various incentives from the Reasoned Action Approach exist to support compliance towards cyanide and compressor bans (see Fishbein and Ajzen 2010). However, they may not explain the high compliance found to other *de-jure* rules. For instance, no evidence of social norms was found for these rules and fishers did not perceive them as yielding as many benefits. To further understand the high compliance of aquarium fishers, the normative approach is explored more deeply (see Tyler 1990). Other than social norms, the normative approach encompasses perceptions of legitimacy (Arias 2015). If perceived legitimacy exists in aquarium fishery management, the fishers are more likely to accept managing authorities and their *de-jure* rules, thus also increasing voluntary compliance (cf. Stern 2008; Kahler and Gore 2012). This occurs when fairness and trust are formed between fishers and government officials, and is improved when both parties are involved management schemes (Ostrom 1990; Tyler 1990).

6.2.1. Fairness and trust

Fairness and trust are important aspects for voluntary compliance (Stern 2008).

Studies show these perceptions arise during personal experiences (Neilson 2003;

Stern 2008). Perceptions of fairness and trust towards management authorities in

the aquarium fishery, including the coastguard, bantay dagat and local government,

were investigated from the perspectives of aquarium fishers and invertebrate

collectors in Calatagan (Table 7).

Table 7: Positive and negative perceptions of the fairness and trust in aquarium fishery management authorities, coded from key informant interviews (n=26) and participant observation narratives from aquarium fisher communities (n=49).

| Positive Perceptions | No. of mentions | Negative Perceptions | No. of mentions |
|---|------------------------|---|------------------------|
| The rules equally affect all of those involved: "Prohibited activities are for everyone" | 16 | The rules do not equally affect all those involved: "Not everyone follows the rules", "Government do not see things equally" | 7 |
| Bantay dagat possess the right skills to do their job: "They would not be in that position if did not possess right skills" | 10 | Aquarium fishers are treated differently: "Two barangay closed to aquarium fishers", "Aquarium fishers cannot enter the MPA, but other fishers can", "Not being given a special permit to collect aquarium fish", "Lack of government attention for aquarium fishers" | 4 |
| Local government allow aquarium fishing: has been banned elsewhere: "Trust the local government because they allow aquarium fishing" | 8 | Unequal power: "You are stronger if know people inside government, weaker if you do not" | 4 |

| | | | |
|---|-----------|---|-----------|
| Familiar with bantay dagat and coastguard: “See them patrolling in the sea” “Do not harass the fishers”, “Ask kindly to inspect their boats” | 7 | No experience with the local government, coastguard or bantay dagat | 4 |
| Rules are for the fisher’s benefit | 3 | | |
| Bantay dagat and coastguard follow the rules too | 2 | | |
| Total | 46 | Total | 19 |

As Table 7 portrays, there is a divide in the positive and negative perceptions of fairness and trust towards management authorities. For instance, contradictions in most the frequently mentioned categories; that *de-jure* rules equally effect everyone involved, while they are also unequal. In this case, it appears that the *de-jure* rules are equal within the aquarium fisher community, and on a wider aspect are not equal for everyone in Calatagan; as stated by a fisher “not everyone follows the rules”. For example, the MPA was perceived as unequal as it is open to tourism and other fishers can use the “sustainable use zone”, while “aquarium fishers cannot enter”. If awareness has not been not raised over the potential benefits of MPAs, it can result in ambiguity over its purpose. On the other hand, several fishers reported that they know the *de-jure* rules are for the fishers’ benefit. These perceptions coincide with previous findings, that the aquarium fishers recognize benefits of the *de-jure* rules, however they are treated differently to other types of fishers by the local government. Despite this inequality, many aquarium fishers seem satisfied with being allowed to perform their livelihood as the local government has not prohibited aquarium fishing (Table 7). For instance, in a key informant interview it was said that “[fishers] trust the local government because they have not banned aquarium

fishing”. This finding reiterates that aquarium fishers fear their livelihood being banned which can induce coercive incentives to comply, due to the high costs that could occur if they were to display widespread non-compliance.

Most categories for positive perceptions refer to trust in the enforcers: the bantay dagat and coastguard. Participants are familiar with these groups and trust seems to have arisen from positive personal experiences, such as being treated “kindly” by the coastguard and bantay dagat (Table 7). Yet, there are also negative perceptions towards them. A small number of aquarium fishers mentioned having little trust in the enforcers and local government as they have no experience of them (Table 7). This strengthens the point that personal experiences affect perceptions of legitimacy. For instance, a lack of interaction or negative experiences will drive perceptions of distrust and unfairness (Stern 2008). This in turn can influence decisions to comply (Arias 2015). The discovery of some fairness and trust towards management authorities could indicate perceptions of legitimacy, and hence incentives to comply among aquarium fishers (cf. Tyler 1990). As personal experiences are found to influence these perceptions of legitimacy, the involvement of fishers in management could also affect their compliance (cf. Stern 2008).

6.2.2. Harvester and government involvement

Perceptions of legitimacy can be improved with more interactions between aquarium fishers and management authorities (cf. Tyler 1990). Therefore, fisher involvement in aquarium fishery management, such as in *de-jure* rule design and enforcement, would increase perceptions of legitimacy (cf. Tyler 1990; Nielson

2003). Previous studies have also shown that more direct involvement of fishers in resource management would improve levels of compliance (Hatcher et al. 2000; Cinner et al. 2012). Thus, involvement of the aquarium fishers in managing the fishery may contribute to the high levels of compliance found in Calatagan.

In Calatagan, key informants in the aquarium fisher communities (n=26), rated their overall involvement in fishery management an average of 2.26 (1-5 scale); rare, and government involvement as 2.10, also rare. On the other hand, government officials (n=3) rated both aquarium fisher and government involvement an average of 3.67; frequent. The way in which aquarium fishers and local government are involved in aquarium fishery management were further explored (Table 8).

Table 8: Ways in which aquarium fishers and invertebrate collectors, from key informant interviews (n=26) and participant observations (n=49), reported: a) fisher involvement and (b) local government involvement in managing the aquarium fishery. Shaded boxes show the categories shared by government officials in interviews (n=3).

| a) Aquarium fisher involvement | Number of mentions | Lacking aquarium fisher involvement | Number of mentions |
|--|---------------------------|---|---------------------------|
| Aquarium fishers fish unitedly: talk/meet when collecting and transporting fish | 9 | No consultations with the government: "Just told what the rules are, they are not discussed", "Not consulted about increase in auxiliary invoice price" | 14 |
| Invited to local government meetings: raising awareness about prohibited activities | 8 | Not involved in designing or enforcing the rules | 7 |
| Conflict Resolution: fishers talk among selves to work out problems "Rare to have conflict", "Like a family and can resolve problems easily" | 7 | Do not manage among selves: "Only pack together", "Just do our own fishing" | 5 |
| Aquarium fishers do not collect spawning/breeding fish, or those below minimum size | 6 | Not all fishers attend government meetings | 2 |

| a) Aquarium fisher involvement | Number of mentions | Lacking aquarium fisher involvement | Number of mentions |
|---|---------------------------|--|---------------------------|
| Protect resources: use legal techniques and do not destroy corals | 3 | | |
| Total | 33 | Total | 28 |

| b) Local government involvement | Number of mentions | Lacking local government involvement | Number of mentions |
|--|---------------------------|---|---------------------------|
| Always give out the auxiliary invoice for legal transportation of fish | 10 | Lack of local government support (financial and technical): “Government only sit in municipal hall”, “Not giving special permit after a long time of asking”, “Do not do anything for aquarium fishers: nets given to other fishers”, “Focus on other activities e.g. seaweed farming, mangroves) | 23 |
| Enforcement of prohibited activities: cyanide, compressors, dynamite, destruction of corals (bantay dagat) | 9 | Meetings are insufficient: “Rare”, “No outcome”, “Only when the government want to say something” | 9 |
| Local government meetings: raise awareness of prohibited activities and correct fishing techniques: “Twice a year” | 8 | Local government not strictly implementing or monitoring rules, only the bantay dagat | 4 |
| Design the rules | 6 | | |
| Local government support: have not banned aquarium fishing, invertebrate collectors (women) are given batteries for lights | 5 | | |
| Conflict resolution: Barangay Chairman will hold meetings and provide fish packing areas | 3 | | |
| Total | 41 | Total | 36 |

Other than attending government meetings, the fishers are not involved in any *de-jure* processes or government supported management as they are “just told what the rules are”. Among the aquarium fishers, there was a divide in how they perceived themselves; several had the opinion that they manage themselves by “talking before doing anything” and “not collecting small or pregnant fish”, while others shared that they work alone and only coordinate to transport fish because they have no “organisation”. (Table 8). Nevertheless, aquarium fishers shared that when conflict arises within the community, issues would usually be resolved amongst themselves, as they are “like a large family”. Social norms exist in their use of legal fishing techniques, care to not destroy coral, and limited collection of small and breeding fish, which the local government are unaware of (Table 8). Therefore, the aquarium fishers to appear to have their own methods of managing the aquarium fishery, even though this is not recognised by the local government.

In many cases of decentralised resource management, the local authorities do not represent the needs of local communities (Ribot et al. 2010). The authorities may be indifferent to local harvester communities and have their own profit driven interests for managing resources (Ribot et al. 2010). In Calatagan, aquarium fishers make up only a small proportion of all the fishers, and so this livelihood may procure less revenue for the local government. The lack of attention given to aquarium fishers becomes apparent during discussions about local government involvement, and is an aspect the local government agree upon. Both aquarium fishers and government officials stated that the government focus on supporting and managing other

livelihoods (Table 8). For instance, local government officials stated that “there is no active implementation of rules for aquarium fishers” and that “BFAR are not involved in the aquarium fishery here”. The negative connotations and spread in other municipalities banning aquarium fishing, may provide few incentives for Calatagan’s local government to devote time and resources on managing the aquarium fishery.

The findings show a lack of interaction between aquarium fishers and local government, and do not provide perceptions of legitimacy (Table 8). Rather, these findings support the idea that incentives to comply may stem from the cost of losing an aquarium fishing livelihood. Although this is a strong incentive, it can be less desirable than incentives for voluntary compliance. For instance, it has arisen from negative perceptions and does not reflect constructive relationships between fishers and government (cf. Arias. 2015). More incentives for voluntary compliance would indicate that *de-jure* management is accepted by the aquarium fisher community, and better suited to local livelihood needs (see Cinner and Huchery 2013). This would allow effective management of the aquarium fishery and continue to provide livelihoods in the future.

Decentralised management which involves the local harvesters can have social and environmental benefits (Ribot et al. 2010; Cinner et al. 2012). For example, when local harvesters and managing authorities work together, it can benefit local livelihoods, improve compliance and even increase fish abundance (Cinner et al. 2012). As a result, this form of decentralised management would have positive outcomes for the sustainability of the fishery. Evidence of this was not found for Calatagan’s aquarium fishery, and existing local management may not be able to

ensure sustainability for the future. Authorities in local government will design and enforce *de-jure* rules, however we have seen failures to implement *de-jure* rules for aquarium fishing, such as harvest limits and closed seasons (Table 8) (see Chapter 5). Consequently, insufficient involvement of both aquarium fishers and local government in *de-jure* management, combined with the threat of banning aquarium fishing, could make the aquarium fishery unlikely to persist into the future.

7. Results and Discussion: Management for Future Use

People often assume that compliance with the rules leads to sustainability. However, as Ostrom reminds us, there are many other factors at play in resource management (Ostrom 1990). The way in which resources such as fisheries are managed relies on more than simply compliance. A theme Ostrom continuously uses for successful and sustainable resource management is the involvement of harvesters (Ostrom 1990; Ostrom 1999; Ostrom 2009). The aquarium fishers in Calatagan have little involvement in *de-jure* management the aquarium fishery. Notably, Calatagan's local government are also rarely involved in directly managing the fishery (Table 8). Additionally, policy-practice gaps are observed as national and local policies are translated into rules-in-use, for example, in the implementation of *de-jure* rules and consistent enforcement (see Chapter 5). These findings initiate a deeper look at the effectiveness of aquarium fishery management. The benefits which fishers perceive in *de-jure* rules have been shown as an important incentive for compliance (see Chapter 6). Therefore, the perceived benefits and limitations for future use of the aquarium fishery are also explored. Together with fisher perceptions and the

application of Ostrom’ eight principles, the effectiveness of existing management for future use of the aquarium fishery is investigated.

7.1. Benefits and limitations of existing management

Members of the aquarium fisher communities (n=26) reported, that under the way the aquarium fishery is currently management, it is only “a little likely” to provide livelihoods in the next 10 years, with an average rating of 2.03 (1-5 scale). To justify their ratings, the participants were asked to expand on any benefits or limitations for the fishery’s future use (Table 9). This encompasses design and enforcement of the eight *de-jure* rules, local unwritten rules, local government support, and any issues commonly shared among the aquarium fishers.

Table 9: Aquarium fishers and invertebrate collectors reported benefits and limitations for future use of the aquarium fishery, during key informant interviews (n=26) and participant observation (n=49).

| Reported Benefits | No. of mentions | Reported Limitations | No. of mentions |
|--|------------------------|--|------------------------|
| Prohibited use of destructive methods (e.g. cyanide and compressors): good for coral and fisher’s health | 12 | Overharvest of fish: many fishers, fish populations declining, fish unable to reproduce | 20 |
| Reduced fishing pressure: “Alternative livelihoods”, “Elderly fishers”, “Can move around Calatagan” | 6 | Collection areas are reduced: closed barangay and MPAs in Calatagan, and cannot go outside Calatagan | 15 |
| Can collect aquarium fish freely in Calatagan: “Has not been stopped yet” | 5 | Low prices received for fish at exporters | 10 |
| There are still many fish to collect in Calatagan | 5 | Lack of government support: “[Aquarium fishers] are not given a livelihood” | 6 |

| | | | |
|---|-----------|---|-----------|
| Aquarium fishers do not collect spawning/breeding fish, or those below minimum size | 3 | Illegal activities in the past and still now (e.g. cyanide, dynamite fishing): destroy corals | 5 |
| Auxiliary invoice helps to transport fish legally | 2 | Tourist resorts: release chemicals into sea (e.g. chlorinated pool water) | 4 |
| | | Expenses: fisher and boat registrations, auxiliary invoice, transportation | 4 |
| | | The auxiliary invoice is not always honoured by police at checkpoints: ask for bribes | 3 |
| | | No new generations of aquarium fishers | 2 |
| Total | 33 | Total | 69 |

Table 9 highlights the issue of overharvest limiting future use of the fishery, as “there used to be many more fish”, Calatagan’s fish populations are in decline because they “cannot reproduce”. Also, there are many fishers of different types working in Calatagan, yet interestingly, a reduced number of aquarium fishers as no new generations are taking up the livelihood and “many have stopped aquarium fishing” due to more livelihoods in the tourism industry (Table 9). This reflects the interrelated nature of different fisheries, and that the pressure on coral reefs is not only from aquarium fishing (MacPherson 2017). Detrimental environmental impacts are added to by mentions of negative effects from tourist resorts and illegal dynamite fishing, neither of which are the result of aquarium fishing (Table 9). Several aquarium fishers and invertebrate collectors raised the issue that “beach resorts put chlorinated water into the sea, that effects fish and invertebrates”. However, a few fishers commented that there are “still many fish to collect”, despite decreasing abundances. Environmental benefits were once again perceived in *de-jure*

rules banning illegal collection methods (cyanide and compressors) as aquarium fishers are aware that this “protects the coral”. Additionally, the aquarium fishers perceive their own licit rule as beneficial for the environment; “we do not collect pregnant fish and only those of the right size”. (Table 9). This illustrates that the aquarium fishers share an awareness of sustainable fishing practices.

The perceived limitations for future use of the fishery, vary between environmental and social impacts. For instance, limited collection areas for aquarium fishers and the destruction of corals (Table 9). Several fishers perceived the lack of support from local government as making aquarium fishing less likely to continue in the future. This will influence future livelihood choices, as if aquarium fishers are not given financial and technical support they may be inclined to move to alternative livelihoods which gain support from the local government. Such cases have already been seen, as the numbers of aquarium fishers in Calatagan are decreasing. A shared benefit for future use was that local government still permits aquarium fishing. Several aquarium fishers felt that the local government “would like to stop aquarium fishing”. It seems unusual for this to be thought of as a benefit and not merely a way of life, as is granted for food fishers. This reflects a difference in how aquarium fishers are perceived by others. Yet, the aquarium fishers of Calatagan have shown use of legal collection methods, while taking care to protect the coral reef.

In Calatagan, gaps between policy and practice first appear at the local government level (see Chapter 5), as do some limitations for future use of the aquarium fishery. The lack of implemented rules specific to aquarium fishing are an example of this. The local government “focus on other livelihoods, like seaweed farming”, and have

little control over the amount of fish harvested for the aquarium trade; this is driven more by consumer demand. Also, the data shows that there is no support from the local government or involvement of aquarium fishers in *de-jure* management, to allow the design and enforcement of *de-jure* rules that could reflect both the needs of aquarium fishers and environmental conditions (Ostrom 2009). Therefore, the future of Calatagan's aquarium fishery is not certain.

7.2. Effective management for future use

Effective management schemes would be relevant to both environmental and social needs (Ostrom 2009; Fabinyi and Dalabajan 2010). As aquarium fishers perceive the fishery as unlikely to continue in the next 10 years, existing management may fail to address both the environmental and social aspects. Therefore, despite high compliance and low use damaging collection methods, the management of Calatagan's aquarium fishery would need improving to ensure its existence in the future. As resource management is a complex task with many interplaying factors, priority areas for improvement can be identified (Pomeroy and Berkes 1997; Fabinyi and Dalabajan 2010; Pomeroy et al. 2010). For instance, Ostrom (1990) constructed eight principles for effective resource management, obtained from examples of enduring CPR institutions, which have succeeded in gaining acceptance among generations of harvesters. Table 10 illustrates whether Calatagan's management of its aquarium fishery supports Ostrom's eight principles.

Table 10: Ostrom’s eight Principles for effective CPR management, as seen in Calatagan’s aquarium fishery (Ostrom 1990; Mills et al. 2013)

| Ostrom’s Principles | Description | Supported in Calatagan? |
|--|--|---|
| Clearly Defined Boundaries | Individuals or boundaries who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself. | Yes, there are municipal boundaries for fishery resources, and those with access rights must register with their local government. However, in practice the boundaries are not actively enforced in Calatagan, as unregistered fishers have been known to enter. |
| Congruence between appropriation and provision rules, and local conditions | Harvest rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labour, material and/or money. | No, government management has little knowledge about the aquarium fishers. Aquarium fishery management does not address harvest limits or temporary closures. Harvest is controlled by consumer demand. Marine Protected Areas exist but are opposed, with varied awareness of their implementation and benefits. Yet, prohibited collection methods are accepted by local communities, due to perceived direct and indirect benefits. |
| Collective-choice arrangements | Most individuals affected by the operational rules can participate in modifying the operational rules. | No, aquarium fishers are not involved in designing and implementing fishery rules. |
| Monitoring | Monitors, who actively audit CPR conditions and harvester behaviour, are accountable to the harvesters or are the harvesters. | No, aquarium fishers are not involved in any monitoring or enforcement of rules. Although, the use of cyanide and compressors is socially undesirable. Enforcement is carried out by the coastguard and bantay dagat but perceived as inconsistent. |

| | | |
|---|--|---|
| Graduated Sanctions | Harvesters who violate operational rules are likely to be assessed by graduated sanctions (depending on seriousness and context of the offence) by other harvesters, by officials accountable to these harvesters, or by both. | No, aquarium fishers are not involved in enforcement and do not give each other sanctions. In practice, graduated sanctions exist for four rules: unregistered boats, compressor use, the collection of corals and endangered species. However, sanctions are not clearly defined in policies and there are varied accounts in practice. They are instigated by coastguard, bantay dagat and local government. |
| Conflict-resolution mechanisms | Harvesters and their officials have rapid access to low-cost local arenas to resolve conflicts among harvesters or between harvesters and officials. | No, the local government does not have a conflict-resolution mechanism. Conflicts are rare and mostly resolved within the community among aquarium fishers. At serious times, the barangay captain will mediate due to his familiarity with the fishers. |
| Minimal Recognition of rights to organise | The rights of harvesters to devise their own institutions are not challenged by external government authorities. | No, only the local government have authority to design and implement rules. Aquarium fishers possess licit rules for aquarium fishing, such as controlling collection of small and breeding/spawning fish. These are not recognised by local government. |
| Nested enterprises | Harvest, provision, monitoring, enforcement, conflict resolution and governance activities are organised in multiple layers of nested enterprises. | Yes, there are different levels within Philippine government (municipal (local) to national). Levels in the aquarium trade's market chain are managed by these different levels in government. For example, municipal government manage local harvest and national government manage global exportation. |

Calatagan's existing management for the aquarium fishery supports two out of Ostrom's eight principles (Table 10). This includes nested enterprises, as levels of the aquarium trade are governed by respective levels in the Philippine's decentralised government, and secondly the clearly defined boundaries for resource use. However, in practice the defined municipal boundaries for Calatagan are poorly enforced; "fishing in Calatagan is open" thus counteracting its purpose (Figure 9). Some of the perceived limitations for future use of the fishery are reflected in the lack of Ostrom's principles found in existing management (see Table 9 and 10). This is mainly because aquarium fisher involvement in management, such as in designing, monitoring and enforcing fishery rules, is absent. Moreover, local government are unaware of, and "do not consider", their social unwritten rules as a legitimate form of management (Table 8). Fish collection, transportation and conflict resolution are handled by the fishers, showing an ability to manage and coordinate themselves. (Table 8).

These findings highlight areas that need improvement in aquarium fishery management. Increasing the involvement of aquarium fishers in *de-jure* management could address some problems. As well as allowing more of Ostrom's principles to be met, more fisher involvement can improve positive perceptions and incentives for voluntary compliance (cf. Ostrom 1990; Tyler 1990; Cinner et al. 2012). Increased support from the local government would also be advantageous. Aquarium fishing could become a more desirable livelihood, thus slowing the decrease in aquarium fisher numbers. The local government could learn more about the aquarium fishers, such as livelihood needs and legitimise the fisher's unwritten rules

for fish collection (cf. Katon et al. 1999; Grafton 2000). Therefore, more communication between local government and aquarium fishers would aid the implementation of *de-jure* rules aligned with both social and environmental conditions. Thus, improving the effectiveness of management for future use of the fishery (Pomeroy and Berkes 1997; Katon et al. 1999; Fabinyi and Dalabajan 2010).

8. Conclusion

This study provides a snapshot in time of an aquarium fishery in the Philippines. It explores policy-practice gaps, fisher perceptions of *de-jure* rules, and the pitfalls of management which limit fishery use in the future. The negative connotations associated with aquarium fishing are well known, such as the use destructive cyanide fishing (Wabnitz et al. 2003). Findings show that these connotations also exist at the harvester level and influence how local government will manage aquarium fisheries.

From aquarium fisher accounts, it was learnt that several municipalities in the Philippines have prohibited aquarium fishing. However, findings from Calatagan show that the use of illegal cyanide fishing is low, thereby contradicting environmental concerns. Results from Calatagan have shown that aquarium fishers are aware of *de-jure* rules and perceive benefits in several *de-jure* rules, which can influence their compliance. Perceptions that compressor and cyanide bans yield environmental benefits have resulted in social rules making their use illicit and high compliance to these *de-jure* rules (see Chapter 5 and 6). This compliance helps to align policy and practice, as the rules-in-use are better matched to *de-jure* rules. Yet, the local government in Calatagan have threatened to prohibit this livelihood, and

currently aquarium fishers are treated differently to food fishers. The aquarium fishers receive less support from the local government, and few *de-jure* rules are implemented specifically for aquarium fishing. For example, in the absence of Aquatic Wildlife Special Use permits, and local specifications to *de-jure* rules do not consider species in the aquarium trade (see Chapter 5). In doing so, policy-practice gaps begin to emerge at the government level. Prohibiting aquarium fishing may appear to be the simpler choice when it comes to managing a complex resource, where illegal practices have negative impacts on the environment (Rubec 1988; Muallil et al. 2013). However, the aquarium trade provides livelihoods for communities in developing countries (Wabnitz et al. 2003).

Voluntary compliance to *de-jure* rules would indicate that the rules are aligned to local livelihood needs, therefore being more effective in the long-term than coercive compliance (Keane et al. 2008; Arias 2015). Despite, aquarium fishers perceiving benefits in some of the *de-jure* rules, perceived legitimacy is found to be low. This stems from a lack of cooperation between the fishers and local government, and could result in *de-jure* rules being misaligned to local livelihood needs (Ostrom 1990; Cole 2014). Both fisher and government involvement in managing the aquarium fishery was reported as rare. The lack of cooperation between aquarium fishers and local government in managing the fishery can impact on its future use (see Chapter 7) (Cinner et al. 2012). Aquarium fishers reported that the fishery was unlikely to exist in the future because of limitations in existing management (see Chapter 7). In combination with the absence of most of Ostrom's effective management principles,

this highlights that existing aquarium fishery management needs improvements to provide livelihoods in the future (Ostrom 1990).

By using a comparison of the bean method and direct questioning to estimate compliance, the theoretical implications of this study show the effectiveness of indirect questioning techniques, such as the bean method, for investigating sensitive topics. Also, two frameworks for studying social influences on compliance are combined to integrate a wide range of perceptions. The results show that both these frameworks hold important characteristics for studying social perceptions about management schemes and their effect on compliance.

The results imply that existing fishery management has low cooperation between the aquarium fishers and local government. Few interactions reduce perceptions of legitimacy and effect the alignment between *de-jure* rules and livelihood needs, and thus the acceptance of management schemes among fishers (Ostrom 1990; Katon et al. 1999). The absent principles for effective resource management focus largely on the involvement of the aquarium fishers in *de-jure* fishery management (Ostrom 1990). Grey areas are also observed in the principles, with informal management schemes among the aquarium fishers not being considered. Low cooperation between the fishers and local government result in the social rules, used by fishers to manage their fishery, not holding any legal power. Involving the aquarium fishers in designing, monitoring and enforcing *de-jure* rules, means that management schemes can be better aligned to local conditions (cf. Ostrom 2009; Cinner and Huchery 2010). Increasing the fisher's involvement would allow policy-practice gaps to be addressed; *de-jure* rules can be implemented which focus on managing the aquarium fishery (cf.

Ostrom 1990; Cinner et al. 2012). For example, the absence of implementing special collection for aquarium fishers means national government agencies are unaware of aquarium fishers in Calatagan and that they perceive aquarium fishers themselves as lacking legitimacy. The implication of implementing this *de-jure* could increase support for the aquarium fishers and communication between fishers and government. Also, social rules previously not considered by the government could be acknowledged and legitimised, such as collection restrictions for breeding and small fish. As a result, the local government would recognise the fisher's unwritten rules (cf. Grafton 2000). The lack of involvement local government has in managing the aquarium fishery has also been reported (see Chapter 6). As cooperation increases, the local government's perceptions of the aquarium fishers could similarly improve. Through greater familiarity with each other and a clearer understanding of *de-facto* practices in aquarium fishing, the negative connotations in Calatagan may be removed. Subsequently, aquarium fishers may receive government support in a similar way to food fishers.

These findings can be applied to other aquarium fisheries. The negative connotations of aquarium fishing would appear in other exporting countries (MacPherson 2017). Other aquarium fisheries may not have high rates of compliance, and so a comparison of their perceptions and rules-in-use would be interesting for future research projects (Fabinyi and Dalabajan 2010). *De-jure* rules for managing natural resources will always require integration into rules in use (Ostrom 1990; Robbins et al. 2009). Structured analysis of policy-practice gaps can also be used in other forms of resource management. Overall, extending this study to more aquarium fisheries

would allow for further triangulation of findings. Understanding the rules-in-use for one fishery and highlighting important areas to improve is a positive step. For more effective analysis of the fishery such as the overharvest of Calatagan's fish populations, as noted by aquarium fishers, underwater surveys would be useful to assess fisheries. For notable progress, research on fisheries for the aquarium trade needs expanding. For example, creating an in-depth value chain for aquarium fish by applying more research to the exporter links in the chain. The socioeconomics of aquarium fishers would provide data on drivers for an aquarium fishing livelihood, and heterogeneity of the fishers means that individuals will hold different motivations and perceptions. In taking research questions further, concerns for the sustainability of the aquarium trade can attempt to be resolved.

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Appendix

Appendix 1: Focus Group Discussion Questions

| |
|---|
| 1. Rules in the Aquarium Fishery: each question (a-e) represent a table column |
| a. Awareness |
| <p>i. Are there any places where you are not allowed to fish for the aquarium trade? <i>Prompt: Why are you not allowed to fish there?</i> <i>If no mention of other resource users: Are there any competitor users of the local coral reef? E.g. fishers for food, tourist resorts</i></p> <p>ii. We've talked about restrictions on the areas where you collect fish: Are there any other rules or regulations that affect your fishing? <i>Prompt: species that cannot be collected, techniques which cannot be used, any permits needed for aquarium fishing?</i> <i>(in table: 1 for awareness of rule, 0 for none, and add rows for additional rules)</i></p> |
| b. Enforcement |
| <p>i. Does anything happen if these are not followed? <i>(in table: 1 in column two for awareness or 0 for no enforcement, penalty in column 3, e.g. imprisonment, fines, verbal warning)</i></p> <p>ii. What would happen?</p> <p>iii. Who is responsible for enforcing this rule?</p> |
| c. Origins |
| <p>i. Who made this rule?</p> <p>ii. How did you hear about it?</p> |
| d. Exceptions |
| <p>i. Are there any times or situation when these rules do not apply?</p> <p>ii. Are there any social customs or traditions you follow as aquarium fishers</p> |
| e. Involvement |
| <p>i. Is there any consultation with the government about the fishery management? e.g. deciding on rules, enforcing, meetings?</p> <p>ii. Any fisherfolk organisations for aquarium fishers?</p> |
| 2. Rule preferences: Group activity using large sheet, with scale and cut out cards of identified rules. |
| <p>a. Which of these two rules you prefer to see continue? <i>(two rules cards at a time)</i> <i>Place on scale: of 'Most like to keep' to 'Least like to keep'</i> <i>Next rule: Would you prefer to see this rule continue more or less than ...</i> <i>(pick a rule already on scale)</i> <i>Repeat for each rule cue card</i> <i>Photograph sheet.</i></p> |
| b. What do you would you say are some good things about these rules? |
| c. Would you say there are any problems with these rules? |

Appendix 2: Fisher Interview Questions

1. First Interview: saturation sample

| | | | | | | |
|--|--------------------------------|--------|---------------|---------|-------------|-------|
| Ppt number: In FGD: YES/NO | | | | | | |
| 1.1. Awareness of rules for collecting aquarium fish | | | | | | |
| a. Fishing techniques. <i>Fill in table below</i> | | | | | | |
| i. Could you describe to me the techniques you use to collect aquarium fish? <i>X in table</i> How about cyanide, compressors? | | | | | | |
| Techniques | | | | | | |
| Sigpaw (scoop net) | Barrier net (lambat) | Saplاد | Condom net | Cyanide | Compressors | Other |
| X | | | | | | |
| ii. Are there any advantages or disadvantages to using these techniques? | | | | | | |
| b. Fishing boundaries | | | | | | |
| i. Are there any restrictions by local government, on where you can go to collect aquarium fish? <i>(Possible examples: Unregistered municipalities, Marine Protected Area)</i> | | | | | | |
| ii. Do you collect fish close to the buoys for the Marine Protected Area? Yes... No.... Don't know | | | | | | |
| c. Species | | | | | | |
| i. Do you know of any species of fish, coral or other organisms, that are not be collected for the aquarium trade? | | | | | | |
| ii. Do you know why you cannot collect these species? | | | | | | |
| d. Exceptions | | | | | | |
| Could you please describe if there are any times or situations, when these do not apply? | | | | | | |

2.1. Effectiveness of Enforcement.

- a. Have you reported somebody for breaking any of these rules before?
- b. Of these rules for the aquarium fishery, do you know what would happen if the rule was not followed? (option for **'UNSURE'**)
- c. If someone does not follow this rule, what are chances they will be caught? (option for **'UNSURE'**)

| Local Government Rules | b. If known, what would the penalty be? | c. Chance of being caught? (likely/unlikely/unsure) |
|-------------------------|---|--|
| Registration of fishers | | |
| Registration of boats | | |
| Auxiliary Invoices | | |
| Marine Protected Area | | |
| Species restrictions | | |
| Compressor use | | |
| Cyanide use | | |

d. Do you know whether enforcement activities increase, when there are many aquarium fishers not following a rule?
 Don't know

Prompt: Could you please tell me about a time when this happened?

e. Do you know if penalties become more severe, if someone is caught not following the same rule multiple times?
 Don't know

Prompt: Could you please tell me about a time when this happened?

3.1. Bean Method

“We have talked about how other people collect aquarium fish, this time I would like to ask a little about you”

This game is completely anonymous and any answers will not be able to single you out as an individual, everything you answer is pooled together with all other respondents.

The dice will not be counted until all interviews have been completed, and results will not be reported to any authorities for your protection”

Bean Method. *CYANIDE (yellow), MPA (blue), COMPRESSORS (white)*

- i. If you **have** [used cyanide] please move a [yellow] bean from the large jar to the small jar.
- ii. If you **have not** [used cyanide], please move a black bean from the large jar to the small jar.

2. Second Interview: Key Informants (purposive sample)

| |
|--|
| Ppt number: Role in aquarium trade: Gender: Age group (<35/35-60/>60) |
| 1. Benefits of the rules |
| <p>a. Is there anything you like or dislike about the way this aquarium fishery is managed, for example by the local government? <i>Prompt: any consideration of livelihoods</i></p> <p>Don't know</p> <p>b. Would you like to see any changes to how this aquarium fishery is run? Don't know</p> |
| <p>c. Are there any issues effecting the future use of this aquarium fishery?</p> <p>d. Under the current way this fishery is managed, how well do you think it will provide aquarium fish as a livelihood in the next 10 years, . For example, when your [<i>children/grandchildren/great grandchildren</i>] would be old enough to collect aquarium fish? [<i>Delete as appropriate</i>]</p> <p>Don't Know</p> <p style="text-align: center;">Not at all (1), A little (2), Somewhat (3), Mostly (4), Completely (5)</p> <p>e. Do you think there are any ways in which this aquarium fishery is managed now, that ensure it will be a good livelihood for future generations?</p> <p>f. Do you think there are any ways the management of this aquarium fishery could be improved, to ensure that it will be a good livelihood for future generations?</p> |
| 2. Legitimacy of the rules |
| 2.1. Fairness |
| a. Do you believe that the local government rules equally affect all the people |

| |
|--|
| involved in this aquarium fishery? <i>Prompt: Why do you say that? For rule design, enforcement?</i> |
| 2.2. Trust |
| b. If you have a concern about fishery, such as seeing someone not following a rule or conflict with another fisher, how are those issues resolved? |
| c. How would you describe your trust in the local government, and enforcers of the rules? For example, Bantay Dagat, PNP, Coastguard. |
| 2.3. Involvement in fishery management |
| a. What is your, and the fishers, role in managing this aquarium fishery? <i>Prompt: consulting with government (e.g. for designing rules, enforcement, meetings), managed amongst fishers themselves, outcome of involvement, FARMCs?</i> <i>Code after:</i> <i>Active Passive.... Both None</i> |
| i. Overall, would you say the fishers are involved in managing the fishery Not at all (1), Rarely (2), Occasionally (3), Frequently (4), Always (5) |
| ii. Do you think, the fishers feel that they can manage this aquarium fishery themselves, or do they feel that there is a need for government for this? |
| b. What is the local governments role in managing this aquarium fishery? <i>Prompt: Could you please describe how they are involved? Any consultations about rules? Offers of financial or technical support?</i> <i>Code after:</i> <i>Active Passive Both None</i> |
| i. Overall, would you say the government are involvement in managing the fishery Not at all (1), Rarely (2), Occasionally (3), Frequently (4), Always (5) |

Appendix 3: Government Interview Questions

1. Structured Government Interview: Rules for the Aquarium Fishery

| |
|--|
| a. Origins |
| i. Could you tell me how the rules are made for the aquarium fishery? <i>Prompt: The process: decision making. Are BFAR involved?</i> |
| ii. How are rules made known to the aquarium fishers? |

| |
|---|
| <i>Prompt: any consultations/meeting?</i> |
| <p>b. Awareness and enforcement: each question represents a column in a table <i>Referencing rules from the table:</i></p> <p>These are some of the rules we know are in place for the aquarium fishery, are there others you would like to add? <i>Add rows to table is needed</i></p> |
| <ul style="list-style-type: none"> i. Are the rules clear about what is or what is not allowed? ii. Who made this rule? iii. Since when has this rule been implemented? iv. Do you know who this rule applies to? v. Do you when this should be followed, for example, are there any times or situations when it does not apply? vi. Are these rules enforced? vii. Who enforces this rule? viii. What happens if someone is seen breaking this rule to collect aquarium species? ix. If someone was not following this rule, how often would they be caught? x. And receive the penalty? |
| <p>c. Effectiveness of enforcement</p> |
| <ul style="list-style-type: none"> i. Do enforcement activities become more common when there are aquarium fishers not following a rule? Don't know <p><i>Prompt if needed: Could you please tell me about a time when this happened?</i></p> |
| <ul style="list-style-type: none"> ii. Do punishments become more severe for individual aquarium fishers, when they break a rule more than once? Don't know <p><i>Prompt: Could you please tell me about a time when this happened?</i></p> |

2. Semi-Structured Government Interview: Perceptions of the Rules

| |
|--|
| 1. Demographics |
| a. Gender |
| b. Position in government |
| c. Level of government |
| 2. Benefits of the rules |
| <ul style="list-style-type: none"> a. Is there anything you like or dislike about the way this aquarium fishery is managed? <i>Prompt: for considering peoples livelihoods</i> Don't know |
| <ul style="list-style-type: none"> b. Would you like to see any changes to how this aquarium fishery is run? Don't know |

| |
|--|
| <p>c. Are there any issues effecting the future use of this aquarium fishery? Don't know.....</p> |
| <p>d. Under the current way this fishery is managed, how well do you think it will provide aquarium fish as a livelihood in the next 10 years, for future generations? Don't Know</p> <p style="text-align: center;">Not at all (1), A little (2), Somewhat (3), Mostly (4), Completely (5)</p> |
| <p>e. Do you think there are any ways in which this aquarium fishery is managed now, that ensure it will be a good livelihood for future generations?</p> |
| <p>f. Do you think there are any ways the management of this aquarium fishery could be improved, to ensure that it will be a good livelihood for future generations?</p> |
| <p>3. Legitimacy of the rules</p> |
| <p>a. Fairness</p> |
| <p>i. Do you believe that the local government rules equally affect all the people involved in this aquarium fishery? <i>Prompt: Why do you say that? For rule design, enforcement?</i></p> |
| <p>b. Trust</p> |
| <p>i. Do you know how issues are resolved if aquarium fishers have a concern about the fishery, for example conflict with another fisher or seeing someone not following a rule?</p> |
| <p>ii. How would you describe your trust in the aquarium fisher community?</p> |
| <p>c. Involvement in fishery management</p> |
| <p>i. What is your, and the [local/provincial/national] governments, role in managing this aquarium fishery? <i>Prompt: for designing rules, enforcement, meetings. BFAR involvement here for aquarium fisheries? Outcome of involvement? Offers of financial or technical support?</i></p> <p><i>Code after:</i></p> <p><i>Active Passive.... Both None</i></p> |
| <p>ii. Overall, would you say the [local/provincial/national] government are involved in managing the fishery Not at all (1), Rarely (2), Occasionally (3), Frequently (4), Always (5)</p> |

iii. What is the aquarium fishers role in managing this aquarium fishery?
Prompt: design of rules, enforcement, meetings, consulting with government?
Managed amongst fishers. Fisherfolk organisation for aquarium fishers? Outcome of involvement?

Code after:

Active Passive Both None

iv. Overall, would you say the fishers are involvement in managing the aquarium fishery:
Not at all (1), Rarely (2), Occasionally (3), Frequently (4), Always (5)

v. Do you think the fishers can manage the aquarium fishery themselves, or do you feel there is a need for government to do this?