

The Exclusive Fishing Zone for the Artisanal Fishery in Chocó Colombia: Origins,
Development, and Consequences for Artisanal Fisheries and Food Security.

© Ángela V. Ramírez-Luna

A thesis submitted to the School of Graduate Studies in partial fulfillment of the
requirements for the degree of Master of Science

Environmental Science Programme
Memorial University of Newfoundland and Labrador
St. John's, Newfoundland
2013

Abstract

Exclusive Fishing Zones (EFZs) are a type of place-based management tool often used to mitigate conflicts between fishing sectors by granting fishing rights to one of the sectors. This case study enhances our knowledge of the pre- and post-implementation processes associated with EFZs as well as its consequences for fish stocks and artisanal fishers and their families. The study draws upon interviews with artisanal fishers and key informants related to an EFZ established in 2008 in Colombia (the Chocó-EFZ). The findings of this research indicate that conflicts at sea and on land between artisanal and industrial fisheries triggered the Chocó-EFZ process. Results also show some potential benefits of the Chocó-EFZ including: a) mitigating conflicts between artisanal fishers and industrial shrimpers; b) contributing to the food security of artisanal fishing households and sustaining local fish stocks; c) supporting an existing informal community-based management as well as promoting the development of a co-management regime. Potential negative effects of the Chocó-EFZ include: a) displacement of industrial fishing effort and, b) job loss within the industrial shrimp industry. The findings of this research also indicate that there are multiple factors that jeopardize the effectiveness and continuation of the Chocó-EFZ, some of which include diversity of fisheries, power struggles among stakeholders, and disagreement about exclusive access to fish resources.

Acknowledgments

I am sincerely thankful to my supervisory committee for believing in this project. I thank Dr. Barbara Neis, my next door neighbour, for her wisdom, endless patience, and understanding during this tough journey. I thank my co-supervisor Dr. David Schneider for his support, guidance, and grammar lessons, and his wife Bobbie Mayer for opening their home when I felt like an alien in St. John's. I also wish to thank Dr. Ratana Chuenpagdee for her support, guidance, and wise advice. I thank the reviewers Dr. Reade Davis and Dr. Bonnie McCay for their positive and valuable comments.

I also thank Andres Torres and David Mercer, GIS specialists, for their patience and time, for making possible the construction of the charts that gave life to this work. I thank my parents, brothers, sister, nephews, and nieces for their long-distance support, encouragement, and love during this journey far away from home but full of satisfaction and success. I thank Philip for teaching me to love Newfoundland, for his love, patience, and support especially during my weakest and hopeless moments.

I am deeply thankful to SQUALUS, they are my school, my second family. I owe them my professional development and large part of my personal growth. Special thanks to Ana Zita and Tirso, research assistants, for their support, friendship, and patience, and for being a solid bridge between the fishermen, fisherwoman, and myself. I also thank Tirso's family for giving me the opportunity to share in their family lives. I thank the fishermen and fisherwoman who allowed me entering their homes and for sharing their lives, wisdom, and knowledge. I also thank the key informants for sharing their time,

insights, and knowledge. I also want to thank Mauricio, Rafael, Diego, and Ricardo, Port Authorities in Bahía, for their friendship and support.

Production of this thesis benefitted from financial support from Dr. Barbara Neis' Pierre Elliott Trudeau Foundation Fellow funds, Dr. David Schneider's Natural Sciences and Engineering Research Council of Canada (NSERC) Funds, and from fellowship support from the School of Graduate Studies of Memorial University of Newfoundland.

Table of contents

Abstract	ii
Acknowledgments.....	iii
Table of contents	v
List of Tables.....	viii
List of Figures	ix
List of Acronyms.....	x
List of Appendices	xi
1. Introduction.....	1
1.1. The pre-implementation process of Exclusive Fishing Zones.....	3
1.2. The role of Exclusive Fishing Zones in rebuilding fisheries	4
1.3. Food security and Exclusive Fishing Zones	6
1.4. The Exclusive Fishing Zone on the Northern Pacific Coast of Colombia.....	8
1.5. The Purpose of the study.....	13
1.6. Outline of the thesis	15
1.7. Literature Cited	16
2. Methods.....	26
2.1. Introduction.....	26
2.2. Key informant interviews.....	30
2.2.1. Recruitment and data analysis	30
2.3. Local fisheries knowledge career-history interviews.....	32
2.3.1. Recruitment.....	33
2.3.3. Chart biography construction.....	39
2.3.4. Analysis of interview and chart data	43
2.4. Ethical review	44

2.5. Literature cited	48
3. Pre- and post-implementation processes of Exclusive Fishing Zones for Artisanal Fishers: lessons from Northern Chocó, Colombia	53
3.1. Abstract	53
3.2. Introduction	54
3.3. Methods	60
3.4. Results	63
3.4.1. The pre-implementation process of the Chocó-EFZ	63
3.4.1.1. Conditions and drivers: What triggered the process that led to the establishment of the Chocó-EFZ?	63
3.4.1.2. Initialization, negotiations, and preparation: Who was involved in initiating and negotiating the Chocó-EFZ, and how did these interactions influence its present form?	67
3.4.2. The post-implementation process of the Chocó-EFZ	77
3.4.2.1 Mitigation of conflicts between artisanal and industrial fisheries	78
3.4.2.2. Participation of artisanal fishers in co-management	81
3.4.2.3. Support for and constraints to the continuation of the Chocó-EFZ	86
3.5. Discussion	92
3.5.1. The pre-implementation process of the Chocó-EFZ	92
3.5.2. The post-implementation process of the Chocó-EFZ	99
3.6. Summary and conclusions	108
3.7. Literature cited	112
4. Can Exclusive Fishing Zones sustain artisanal fisheries? Lessons from the artisanal fishery in Northern Chocó, Colombia	122
4.1. Abstract	122
4.2. Introduction	123
4.3. Methods	129
4.4. Results	133

4.4.1. Interviewee profiles	133
4.4.2. Fishing up after the onset of the commercial artisanal fisheries.....	136
4.4.3. Fishing up sequence in the shrimp and tuna industrial fisheries	158
4.5. Discussion	165
4.5.1. Factors contributing to the fishing up sequence in commercial artisanal fisheries	165
4.5.2. The role of the Chocó-EFZ in rebuilding fisheries	168
4.5.3. The role of the Chocó-EFZ in promoting food security	170
4.6. Summary and conclusion.....	173
4.7. Literature cited	175
5. Conclusion	187
5.1 Pre- and post-implementation processes of Exclusive Fishing Zones for Artisanal Fishers	187
5.2 Fishing up sequence in artisanal and industrial fisheries in northern Chocó and its relationship with the establishment of the Chocó-EFZ.....	193
5.3. Future research.....	195
Appendix A	197
Appendix B	201
Appendix C	203
Appendix D.....	206
Appendix E	210
Appendix F.....	212
Appendix G.....	216
Appendix H.....	218
Appendix I	219

List of Tables

Table 2.1:	List of formal (key informants n=11) and informal interviews (n=1) about the pre- and post-implementation process of the Chocó-EFZ.....	31
Table 2.2:	Number of artisanal fishing household interviews and charts analyzed. Bahía and Huina, Pacific coast of Colombia.....	38
Table 4.1:	Differences between traditional longlines, <i>calabrote</i> , and <i>colgante</i> (variation found in Huina). All data refer to gears used by the interviewees.....	135

List of Figures

Figure 1.1:	Study area. Top corner: Buenaventura (shrimp fishery headquarters) and Bogotá (tuna fishery and government headquarters). Large map: Chocó-EFZ indicating Huina, Bahía, other communities within the zone; the first 2.5NM from shoreline (dotted line), and the borders: Punta Ardita (northern border) and Punta Solano (southern border).....	11
Figure 3.2:	Interactions between industrial vessels and artisanal fishers.....	69
Figure 4.1:	Handline fishing grounds inside and outside the Chocó-EFZ. Cabo Marzo area. “Bahía one decade” includes fishing grounds only used during childhood. These childhood grounds located away from Bahía were used by fishers who later in-migrated to Bahía. Grounds used by men only.....	140
Figure 4.2:	Handline fishing grounds inside and outside the Chocó-EFZ. Central and southern area. “Bahía one decade” and “Huina one decade” include fishing grounds only used during childhood. These childhood grounds located away from Bahía were used by fishers who later in-migrated to Bahía.....	141
Figure 4.3:	Gillnet fishing grounds inside and outside the Chocó-EFZ. Cabo Marzo and central and southern areas. “Huina one decade” includes fishing grounds only used during childhood..	142
Figure 4.4:	Beach seine fishing grounds inside and outside the Chocó-EFZ. Central and southern areas. Huina’s beach is also used by women. Since there are only two beaches used in Cabo Marzo area, this area is excluded from this figure.....	147
Figure 4.5:	Longline fishing grounds inside and outside the Chocó-EFZ. All areas. Grounds used by men only. “Huina one decade” includes a longline fishing ground used only during childhood.....	149
Figure 4.6:	Yellowfin tuna, skipjack tuna, and shrimp landings in Colombian waters (1956-2006). Database source: “Landings by species in the Waters of Colombia” Sea Around Us Project.....	162

List of Acronyms

ACODIARPE	Colombian Association of Ship Owners and Commercial Fishers <i>Asociación Colombiana de Armadores e Industriales Pesqueros</i>
ANDI	Chamber of Ship Owners of the National Business Association <i>Cámara de Armadores Pesqueros - Asociación Nacional de Industriales</i>
Chocó-EFZ	Exclusive Fishing Zone in the Province of Chocó, Colombian Pacific coast
EFZs	Exclusive Fishing Zones
GIC-PA	Interinstitutional and Community Committee of the Artisanal Fishery of the Northern Chocó Coast <i>Grupo Interinstitucional y Comunitario de Pesca Artesanal del Pacífico Chocoano</i>
IATTC	Inter-American-Tropical-Tuna-Commission
ICEHR	The Interdisciplinary Committee on Ethics in Human Research
LFK	Local Fisheries Knowledge
MPAs	Marine Protected Areas
ZEPA	<i>Zona Exclusiva de Pesca Artesanal (EFZ in Spanish)</i>

List of Appendices

Appendix A:	Participant consent form for interviews with key informants.....	197
Appendix B:	Archival deposit/access form for key informant interviews.....	201
Appendix C:	Interview schedule for key informants.....	203
Appendix D:	Participant consent form for interviews with fishing households.....	206
Appendix E:	Archival deposit/access form for fishing household interviews.....	210
Appendix F:	Interview schedule for fishing households.....	212
Appendix G:	Human investigation committee undertaking of confidentiality.....	216
Appendix H:	Letter from SQUALUS Foundation accepting the privacy and confidentiality commitments associated with the consent process.....	218
Appendix I:	Letter from a Huina fisher to the fisheries authorities requesting regulations for harmful fishing practices in the Municipality of Bahía Solano.....	219

1. Introduction

Both modern fisheries management and traditional management systems have commonly relied on place-based management, that is, temporary or permanent implementation of management actions within specific areas (Norse et al., 2005). Place-based management actions aim, to varying degrees, to limit fishing access and effort, protect habitat, and to mitigate gear conflicts or competition for access to resources between fishing sectors (McGoodwin, 1990; Johannes, 1998; Kaiser et al., 2000; Pauly et al., 2002; Davis et al., 2006; Berkes, 2008; Ahmed, 2010). Place-based mechanisms can take different forms and can be used separately or in combination. Some mechanisms may include customary sea tenure (e.g. Johannes, 1981), co-management regimes (e.g. Jentoft et al., 1998; Nielsen et al., 2004), community-based management regimes (e.g. Davis et al., 2006), government-based management regimes (e.g. Murawski et al., 2000), and voluntary agreements (Hart, 1998; Olson, 2011).

Marine Protected Areas (MPAs) are a type of place-based tool, they are usually permanent, and their primary goal is to protect biodiversity and ecosystem integrity (Norse et al., 2005). MPA goals can also include providing opportunities for education, research, tourism, fish spillover (movement of adult fish to unprotected adjacent waters), and management of conflicts among resource users and between users' needs and conservation aims (Boudouresque et al., 2005). Exclusive Fishing Zones (EFZs) are another type of place-based management tool, can also be permanent, and their primary goal is to mitigate conflicts between fishing sectors by granting exclusive rights to one sector to fish the resources that occur in a specific zone (e.g. Castilla & Fernández, 1998).

Existing research on how different place-based management tools are established and the role they play in conservation and fisheries management, as well as their impact on fishing communities, has largely focused on MPAs (Pauly et al., 2002; Gell & Roberts, 2003; Christie et al., 2003; Christie, 2004; Hilborn et al., 2004; Jaworski et al., 2006; Cadiou et al., 2009; Mascia et al., 2010; Agardy et al., 2011; McCay & Jones, 2011). Somewhat less attention has been paid to EFZs (LeDrew, 1988; Castilla & Fernández, 1998; Kaiser et al., 2000; Bourillón-Moreno, 2002; Davis et al., 2006).

This thesis contributes to the limited literature on EFZs. It does this by providing a detailed case study of an EFZ instituted in 2008 and still in effect (2013) in Chocó Province on the Pacific Colombian coast (Chocó-EFZ hereafter). The primary objectives of the Chocó-EFZ are to mitigate conflicts between the artisanal and industrial fisheries, encourage participation by local artisanal fishers in co-management, and promote food security of artisanal fishing households. In Colombia, artisanal fishery is defined as a commercial activity carried out by a diverse group of people (individuals or organizations) geographically dispersed, with low socioeconomic status, using small boats, low level of technology, and making short fishing trips (GIC-PA, 2001).

In order to enhance our knowledge of the pre- and post-implementation processes associated with EFZs, this case study seeks to answer the following research questions: 1) what triggered the establishment of the Chocó-EFZ? 2) Who has been involved in the negotiations? 3) What are the histories of the artisanal and industrial fisheries in the Chocó-EFZ and how have their conflicts evolved? 4) In the opinion of the artisanal fishers and the key informants from different sectors, has the Chocó-EFZ contributed to rebuilding local fisheries, to mitigating conflicts, to engaging local fishers in co-

management, and to promoting food security as promised in the resolution that established the zone? 5) In their opinion, what initiatives are likely to support or jeopardize the effectiveness of the Chocó-EFZ? 6) What lessons can we learn from this in depth case study of the Choco-EFZ relevant to policy makers and others interested in using EFZs as a management tool elsewhere? The remainder of this chapter reviews existing research on EFZs, introduces the existing EFZs in Colombia and describes the Chocó-EFZ, the focus of this study. The final section of the chapter presents an outline of the thesis.

1.1. The pre-implementation process of Exclusive Fishing Zones

Studies on EFZs have usually focused on the status of this tool after implementation. For instance, some have explored the relationship between the establishment of EFZs and implementation of co-management regimes (Castilla & Fernández, 1998; Sverdrup-Jensen & Raakjær, 1998; Viswanathan et al., 2003; Raakjaer et al., 2004).

Some key factors relevant to the pre-implementation process need attention since they could enhance or jeopardize the effectiveness of EFZs. One factor is the interaction between stakeholders (fishers, spokespeople, and government). For instance LeDrew (1988), Bourillón-Moreno (2002), and Davis et al. (2006) showed that during the pre-implementation process for the EFZs they studied, the excluded sector influenced the final design of the EFZ. After implementation, the excluded sector was a source of concern about encroachment that could jeopardize the effectiveness of the EFZs in the longer term. The conditions that trigger the establishment of EFZs, the factors that shape their

design, and that influence their final implementation are all factors that need further attention.

Research on the pre-implementation processes associated with co-management regimes (Chuenpagdee & Jentoft 2007; Gelcich et al. 2010), MPAs (Chuenpagdee et al., 2013) and on marine spatial planning processes (Pomeroy & Douvere, 2008) indicates that learning about the conditions (in the past and in the present) and the diversity of stakeholders in these contexts can allow us to evaluate the complexity of the situations, how the management approaches might be further developed, and their likelihood of success. Systematic research on pre-implementation processes might have similar benefits for our understanding of EFZs and their potential.

1.2. The role of Exclusive Fishing Zones in rebuilding fisheries

When the primary goal is protection of biodiversity and ecosystem integrity, place-based management tools usually include MPAs. In most cases, fishing activities are partially or totally excluded from MPAs because these are considered the main source of disturbance (Cadiou et al., 2009). By eliminating fishing from an area, advocates of MPAs argue that this tool can contribute to rebuilding fisheries (e.g. Pauly et al., 2002; Jaworski et al., 2006; Gell & Roberts, 2003). However, Hilborn et al. (2004) argue that, MPAs' contribution to fisheries will depend on whether fisheries management failures such as the improper incentives or the institutional structures to control over-capacity, over-fishing, and economic loss, are addressed.

EFZs may also contribute to rebuilding fisheries as they exclude at least one fishing sector in order to mitigate conflicts. In doing so, EFZs also have the potential to reduce

fishing effort in a specific area and to offer protection to habitats and species. For instance, the exclusion of mobile gears (e.g. trawlers) in order to mitigate conflicts between mobile and fixed gears allows habitats and benthic fauna sensitive to bottom-fishing disturbance a chance to recover (LeDrew, 1988; Bailey, 1997; Kaiser et al., 2000). Another example of ways EFZs might contribute to fisheries rebuilding is by decreasing the number of fishers and the intensity of fishing effort when excluding outsiders in order to mitigate conflicts between them and local fishers (Bourillón-Moreno, 2002; Raakjaer et al., 2004; Davis et al., 2006). When the purpose of an EFZ is to achieve conservation goals, they are often implemented together with other types of tools including MPAs, additional restrictions on fishing gear and/or numbers of fishers (Davis et al., 2006), and the introduction of quotas¹ (Castilla & Fernández, 1998; Gelcich et al., 2010).

One aspect critical to our understanding of the contribution of EFZs to rebuilding fisheries is the relationship between the past and present status of the fisheries, their conflicts, and the design of EFZs. Usually, existing (historical) data is limited; a way to address this problem is by integrating local fisheries knowledge (LFK) and scientific knowledge (Neis et al., 1999; Neis & Kean, 2003). Bourillón-Moreno (2000) did so to assess the EFZ efficiency in resolving fisheries management problems related to open access resources. He found that the EFZ was supporting the local marine tenure system producing a sustainable (crab) fishery inside the EFZ. He also identified multiple political and ecological factors that could affect the EFZ effectiveness in the longer term. These

¹ Although the authors explained that it was a “pseudo-individual transferable catch quota” (Gelcich et al., 2010, p. 16797) that differed from the Individual Transferable Quota (ITQ) (Castilla & Fernández, 1998).

factors include conflicts of variable types and intensity involving the national government, the industrial shrimp fishery, and the artisanal fisheries (aboriginal and non-aboriginal) (Bourillón-Moreno, 2000). Other factors jeopardizing the effectiveness of this particular EFZ include the inadequate design, which did not protect spawning grounds and juveniles; and external factors such as aquaculture development and agriculture run-off. Bourillón-Moreno (2000) findings show the need to combine LFK and scientific knowledge in order to understand the complex dynamics associated with EFZs and how these dynamics can affect their role in rebuilding fisheries.

Another aspect critical to assessing the role of EFZs in rebuilding fisheries is the mobility of resources that are found within the EFZ (migratory vs. non-migratory fish resources). Most of the existing research has explored EFZs that harbour resources of low mobility such as invertebrates (Castilla & Fernández, 1998; Kaiser et al., 2000; Bourillón-Moreno, 2002; Davis et al., 2006). From this perspective, there is a gap in the existing research related to the contribution of EFZs to sustaining fisheries that target highly migratory species. Research on temporary closures established to rebuild tuna stocks indicates that these closures might not be enough to achieve rebuilding and recommends integrating large scale networks of marine reserves (Gell & Roberts, 2003), gear technology modifications, and complementary management tools (Harley & Suter, 2007; Lennert-Cody et al. 2008).

1.3. Food security and Exclusive Fishing Zones

Research on the role of MPAs in food security (Mascia et al., 2010) can tell us about how EFZs might contribute to or affect food security of fishing communities. Mascia et al.

(2010) found that MPAs “sometimes enhance food security for specific fishing subgroups by reallocating fishing rights and thereby reducing local competition for fishing resources” (p. 1427). In older MPAs, food security can be enhanced as a result of increased fish biomass, which potentially increases catch rates for the “winner” sector (Mascia et al., 2010). When excluding a fishing sector in order to mitigate conflicts EFZs might enhance the food security of those groups to which exclusive fishing rights are granted -often artisanal fishers- (Bailey, 1997). This may occur in two ways: 1) by reducing competition between industrial and artisanal fishers; and 2) in the longer term, by allowing the recovery of fish resources and benthic habitats which may have been highly impacted by the trawl fishery. In contrast, EFZs can also negatively affect the incomes, employment, and food security of those excluded from fishing grounds. Consequently, and as reported for MPAs, those affected groups will tend to break the rules (Mascia et al., 2010) with large implications for the EFZ effectiveness in the longer term (e.g. enforcement costs, worsening of conflicts). Exploring the negative and positive impacts of EFZs on the fishing sectors in conflict can provide insights into how EFZs are likely to deliver the desired outcomes such as contributing to the food security of the fishing group holding fishing rights.

In summary, existing research on place-based management tools such as MPAs and EFZs indicates that there are key factors that need to be properly assessed in order to understand the role of EFZs in conflict mitigation, co-management, rebuilding fisheries, and food security. These factors include: the conditions and diversity of stakeholders involved in and excluded from the pre-implementation process (Chuenpagdee & Jentoft 2007); the relationship between the history of the fisheries, the nature of the conflicts and

the design and effectiveness of the EFZs (Bourillón-Moreno, 2002); and the mobility of resources that EFZs harbour (e.g. migratory vs. non-migratory species) (Gell & Roberts, 2003). Furthermore, existing research highlights the need to integrate scientific knowledge and LFK in order to fully understand the complex ecological, political, and economic context of EFZs and their likely effectiveness in the long term (Bourillón-Moreno, 2002).

1.4. The Exclusive Fishing Zone on the Northern Pacific Coast of Colombia

Colombian fisheries authorities established four zones between 1966 and 1981 within which the trawl fishery was banned. Their goals were to protect particular fish and shrimp species considered threatened by this fishery (Ministerio de Agricultura, 1966; INDERENA, 1974; INDERENA, 1976; INDERENA, 1981). Between 1983 and 1995, the government established three more zones that, unlike the previous ones, explicitly stated the artisanal fishers had been granted exclusive rights to access these zones. These EFZs aimed at reducing conflicts with the artisanal sector by excluding the trawl fishery from areas considered to be traditional grounds for artisanal fishers (INDERENA, 1983; INDERENA, 1988; INPA, 1995). Although there was some research on conditions prior to the establishment of some of the zones (INDERENA, 1974; INDERENA, 1976; INDERENA, 1981), the effectiveness of these and the other zones is not known because there was no research following their establishment.

The Chocó-EFZ is the most recently established EFZ in Colombia (Resolución 2650, ICA, 2008) (Resolución hereafter). It was established by the fisheries authorities in 2008. The legal framework (Ley 13, 1990) for the Chocó-EFZ states that EFZs are one of

several fisheries management instruments including seasonal closures and fishery reserves implemented in order to manage and use natural resources while guaranteeing sustainable development and conservation. As well as mitigating conflicts by granting fishing rights to the artisanal sector, the goals of the Chocó-EFZ also include encouraging participation by local fishers in co-management, and promoting food security of the artisanal fishing communities (ICA, 2008). The Resolución included some elements that were not part of earlier EFZs. These novel elements include: a) the adoption of the FAO (1995) international principles including the Precautionary Principle and the recognition of artisanal fisheries as a source of employment, income, and food security and, b) the involvement of stakeholders other than the fisheries authorities in the request for the Chocó-EFZ. These stakeholders included the local municipal authorities, fisher organizations, and the local Community Council “Los Delfines”.² The Resolución also suggested that local fishers could participate in the fishing monitoring program and it created a Verification Committee comprised of representatives of the national government, artisanal, and industrial fishing sectors to oversee the post-implementation process (ICA, 2008).

The Chocó-EFZ covers an area of 803.25 km²; it extends from the coastline out 2.5 nautical miles (NM) seaward, incorporates two major urban centers (Juradó and Bahía Solano) and 22 villages (ICA, 2008; Ramírez-Luna et al., 2008) (Figure 1.1).³ Inside the

² The Community Council is an ethnic authority created by the constitutional reform in 1991.

³ In May 2013, the Chocó-EFZ was established permanently and its area was extended south and northward (AUNAP, 2013). This thesis examines the events that took place before the implementation of the Chocó-EFZ until January 2013. [AUNAP (2013). *Acta de reunión del comité de verificación de la zona de pesca artesanal del norte del Chocó -ZEPA-*. Meeting minutes. Copy in possession of author]

zone gillnets, beach seines, and the industrial and commercial exploratory fisheries are banned, while artisanal longlines and handlines, and sport fisheries are allowed inside and outside the zone. The excluded industrial fisheries are the deep water shrimp trawl fishery (8-90 Net Register Tonnage, NRT⁴) and the tuna purse seine fishery (12-650 NRT). The shrimp fishery targets yellow leg (*Penaeus californiensis*), pink shrimp (*P. brevirostris*), and kolibri shrimp (*Solenocera agassizii*) (Barreto et al., 2001); it is carried out by a domestic fleet of trawlers; and it is headquartered in Buenaventura (the main port in the Colombian Pacific coast, ca. 264 km south from Bahía Solano in a straight line). The tuna purse seining targets yellowfin (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*) (Wielgus et al., 2010); according to the tuna's spokesperson, this fleet also targets bigeye tuna (*T. obesus*). The tuna purse seining is carried out by both domestic and foreign vessels (mostly foreign); and it is headquartered in Bogotá (the capital city) (Figure 1.1.).

Unlike previous EFZs in Colombia, the Chocó-EFZ was initially implemented for the period of one year (ICA, 2008). In order to conduct more research, especially on the impact on the artisanal and industrial shrimp fisheries, the time frame for the EFZ was extended for a second year (2009-2010) (INCODER, 2009), and then for an additional two years (2010-2012) (INCODER, 2010). It was recently extended for one more year (2012-2013) (AUNAP, 2012).

⁴ NRT data was provided by the INCODER -fisheries authorities- during the development of this study. The database collects the licences issued by the INCODER between 2004 and 2010.



Figure 1.1. Study area. Top corner: Buenaventura (shrimp fishery headquarters) and Bogotá (tuna fishery and government headquarters). Large map: Chocó-EFZ indicating Huina, Bahía, and other communities within the zone; the first 2.5NM from shoreline (dotted line), and the borders: Punta Arditá (northern border) and Punta Solano (southern border).

During the first two years of the Chocó-EFZ, two studies were conducted by the SQUALUS Foundation⁵ (an environmental NGO) in order to assess the impact of the Chocó-EFZ on the artisanal fisheries. These studies generated a baseline of information on the artisanal fisheries inside the Chocó-EFZ and in surrounding waters (Ramírez et al., 2008; Navia et al., 2010). Navia et al. (2010) found that fishers from the communities located inside the Chocó-EFZ engage exclusively in artisanal fishing and that at least 700 people depend directly on the artisanal fisheries carried out inside and in surrounding waters. Additional activities they engage in include agriculture, cattle farming, and tourism. In terms of biological services, Navia et al. (2010) found that the Chocó-EFZ might be an important nursery area for several fish species. Ramírez et al. (2008) and Navia et al. (2010) recommended the extension of the Chocó-EFZ further seaward. Despite scientific support, the geographical configuration remained the same and the zone was extended for two more years in order to conduct more research (INCODER, 2010).

This suggests that there are information gaps that need to be filled in order to get a better understanding of the decision-making process associated with the Chocó-EFZ. Some gaps might be interactions between stakeholders during the process of pre- and post-implementation of the Chocó-EFZ, and the evolution of the artisanal and industrial fisheries, their conflicts, and their relationship with the Chocó-EFZ.

⁵ The SQUALUS Foundation is the non-governmental organization within I have been employed as a researcher since 2004.

1.5. The Purpose of the study

The purpose of this study is to add a historical dimension to the post-implementation studies on the Chocó-EFZ (Ramírez et al., 2008; Navia et al., 2010) and to enhance our knowledge of the pre- and post-implementation processes associated with it as well as its consequences for fish stocks and fishers and their families. This approach allows us to examine how the Chocó-EFZ was conceived, what triggered the process, who was involved, how stakeholders' interactions might affect the future of the Chocó-EFZ. A historical approach can tell us about the general status of the artisanal fisheries prior to the implementation and since the establishment of the Chocó-EFZ, about the relationships with the industrial fishery in the past and present, and relatedly about the likely contribution of the Chocó-EFZ to the livelihoods of artisanal fishing households and sustainability of local resources.

Methods

In order to answer these questions, the research design for this thesis is based on using the Chocó-EFZ as a case study and on a multi-methods approach. I visited Bahía, the major urban centre located in the southern area of the Chocó-EFZ, where usually projects focused on marine fisheries are carried out (C. Vieira personal communication, July 29, 2010). I also visited Huina, a small village near Bahía, less visited by researchers, and a more fishing-dependent community. I did not visit other communities for safety reasons.

The multi-methods approach made it possible to gather information from sources that differ in their assumptions, observations, and in their spatial and temporal scale (Murray, et al. 2008). The multi-methods approach included:

1. Literature review to explore existing research on the role of EFZs in rebuilding fisheries, promoting food security, and co-management, and mitigating conflicts between fisheries. Other sources of information associated to the Chocó-EFZ included technical reports, meeting minutes, government resolutions, letters, scientific research, newspapers, magazines, and personal communications. An analysis of historical landings by species in the waters of Colombia by the tuna and shrimp industrial fisheries (1956-2006, Sea Around Us Project, 2011) was also included.
2. Key informant semi-structured interviews with representatives of different sectors (artisanal and industrial fisheries, non-governmental and governmental agencies). These interviews captured the perspectives of a diverse set of stakeholders on the pre- and post-implementation processes and on the future of the Chocó-EFZ. Interviews also explored the past and present circumstances that led to the exclusive zone establishment.
3. Local fisheries knowledge (LFK) career-history, semi-structured interviews, supplemented by the use of charts, with adult members of fishing households (male and female fishers) in Bahía and Huina. Findings from these interviews were used to examine the structure and dynamics of local fisheries in the period prior to and since the establishment of the Chocó-EFZ. These data also provided information on fishers' awareness of the Chocó-EFZ and their perceptions regarding the zone's geographical configuration, goals, regulations, and effectiveness.
4. Informal conversation (unstructured interviews) about the development of the shrimp fishery on the Pacific Coast of Colombia.

1.6. Outline of the thesis

Chapter 2 of the thesis describes the methods used for analysis of secondary data, semi-structured interviews with key informants, collection of fishers LFK, as well as the ethics process and recruitment of participants. The description provides considerable detail, beyond what is possible in a publishable manuscript. Chapter 3 draws on the interviews with key informants and uses an adaptation of the governance framework that Chuenpagdee and Jentoft (2007) devised to explore the conditions and actions taken prior to co-management implementation in several parts of the world. Within this framework, the chapter discusses findings related to the reasons for the development of the Chocó-EFZ; what led to its final configuration; the stakeholders involved and their interactions during the pre- and post-implementation phases of the Chocó-EFZ. This chapter discusses in detail the thoughts of interviewees about the role of the zone in mitigating conflicts between sectors and in encouraging artisanal fishers to participate in co-management. These results are compared with those in the existing literature related to EFZs and other place-based management tools and regimes in order to explore the extent to which the Chocó-EFZ shares elements with other cases in terms of existing strengths and potential obstacles to its long-term success. Elements from fishers LFK interviews are included in order to evaluate how local knowledge could contribute to the assessment and monitoring of the Chocó-EFZ. This chapter is written in the form of a manuscript suitable for publication in *Marine Policy*.

Chapter 4 of the thesis draws on findings from LFK career-history interviews with male and female fishers and uses the “fishing up” sequence approach that Neis & Kean (2003, p.71) used to reconstruct the history of the cod fishery in Newfoundland to

understand why that fishery collapsed. Through this approach, the chapter discusses the history of fishing activity in Bahía and Huina; presents qualitative data on trends in catch rates and in fish consumption; charts the location of fishing grounds; and examines indications of the impact of the Chocó-EFZ on local fishing practices and on the food security of artisanal fishing households. Results from these LFK interviews on the performance of the Chocó-EFZ are compared to current evidence of the effects of EFZs and other place-based management tools in other countries in order to identify lessons learned from the Colombian case. This chapter is written in the form of a manuscript suitable for publication in *Marine Policy*.

Chapter 5 concludes the thesis. It brings together results and conclusions of previous chapters. It revisits the central research questions and objectives of the thesis. It summarizes the lessons learned from each data source and identifies areas for future research.

1.7. Literature Cited

- Agardy, T., di Sciara, G. N., & Christie, P. (2011). Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning. *Marine Policy*, 35(2), 226-232. doi: 10.1016/j.marpol.2010.10.006
- Ahmed, M. (2010). Allocation issues in marine environment: Managing conflicts between commercial, artisanal, and tourism in tropical fisheries. In R. Metzner, D. Isowaka, Y. Liu & F. Wells (Eds.), *Sharing the fish '06: Allocation issues in fisheries management* (pp. 155-172). FAO Fisheries and Aquaculture Proceedings. No 15 Rome: FAO.

- AUNAP, Resolución 545 (2012). *Por la cual se amplía la duración del área exclusiva destinada para la pesca artesanal en el Departamento del Chocó, denominada 'ZONA EXCLUSIVA DE PESCA ARTESANAL - ZEPA' comprendida entre las localidades de Punta Solano hasta Punta Ardita (zona norte del Chocó) República de Colombia*. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2012/48516/r_aunap_0545_2012.html
- Bailey, C. (1997). Lessons from Indonesia's 1980 trawler ban. *Marine Policy*, 21(3), 225-235. doi: 10.1016/S0308-597X(97)00003-1
- Barreto, C., Polo G., & Mancilla, B. (2001). Análisis biológico pesquero y económico de la fauna acompañante en la pesquería de arrastre industrial colombiana. Contribución biológica y económica para la investigación y el desarrollo en recursos pesqueros colombianos y estimación del impacto de la fauna incidental en la pesca de arrastre del camarón. In *Tropical shrimp fisheries and their impact on living resources. Shrimp fisheries in Asia: Bangladesh, Indonesia and the Philippines; in the Near East: Bahrain and Iran; in Africa: Cameroon, Nigeria and the United Republic of Tanzania; in Latin America: Colombia, Costa Rica, Cuba, Trinidad and Tobago, and Venezuela*. (pp. 234-270). Fisheries Circular. No. 974. Rome: FAO. Retrieved from <ftp://ftp.fao.org/docrep/fao/007/y2859e/y2859e09.pdf>
- Berkes, F. (2008). *Sacred ecology* (2nd ed.). New York: Routledge.
- Boudouresque, C.F., Cadiou, G. & Le Diréach, L. (2005). Marine protected areas: A tool for coastal areas management. In E. Levner, I. Linkov, & J.M. Proth (Eds.), *Strategic management of marine ecosystems* (pp. 29–52) Netherlands: Springer.

- Bourillón-Moreno, L. (2002). *Exclusive fishing zone as a strategy for managing fishery resources by the Seri Indians, Gulf of California, Mexico*. Dissertation submitted to the Faculty of the School of Renewable Natural Resources, University of Arizona. Retrieved from http://cobi.org.mx/wp-content/uploads/2012/08/2002-c-cie_tesis_doctl_lbourillon.pdf
- Cadiou, G., Boudouresque, Ch., Bonhomme, P., & Le Diréach, L. (2009). The management of artisanal fishing within the marine protected area of the Port-Cros National Park (northwest Mediterranean Sea): a success story? *Journal of Marine Science*, 66: 41–49. Retrieved from <http://icesjms.oxfordjournals.org/content/66/1/41.full.pdf+html>
- Castilla, J.C., & Fernández, M. (1998). Small-scale benthic fisheries in Chile: On co-management and sustainable use of benthic invertebrates. *Ecological Applications*, 8:S124–S132. Supplement. Retrieved from <http://www.esajournals.org/doi/pdf/10.1890/1051-0761%281998%298%5BS124:SBFICO%5D2.0.CO%3B2>
- Christie, P., McCay, B.J., Miller, M.L., Lowe, C., White, A.T., Stoffle, R., ... Pollnac, R. (2003). Toward developing a complete understanding: A social science research agenda for marine protected areas. *Fisheries*, 28(12), 22-25. doi: 10.1577/1548-8446-28-12
- Christie, P. (2004). Marine protected areas as biological successes and social failures in Southeast Asia. *American Fisheries Society Symposium*, 44:155-164. Retrieved from <https://depts.washington.edu/smea/sites/default/files/patrickc/MPAs.Christie.AFS%20book.2004.pdf>

- Chuenpagdee, R., & Jentoft, S. (2007). Step zero for fisheries co-management: What precedes implementation. *Marine Policy*, 31(6), 657-668. doi: 10.1016/j.marpol.2007.03.013
- Chuenpagdee, R., Pascual-Fernández, J. J., Szeliánszky, E., Luis Alegret, J., Fraga, J., & Jentoft, S. (2013). Marine protected areas: Re-thinking their inception. *Marine Policy*, 39, 234-240. doi: 10.1016/j.marpol.2012.10.016
- Davis, R., Whalen, J., & Neis, B. (2006). From orders to borders: Toward a sustainable co-managed lobster fishery in Bonavista Bay, Newfoundland. *Human Ecology*, 34, 851-867. doi: 10.1007/s10745-006-9032-2
- FAO (1995). *Code of conduct for responsible fisheries*. Retrieved from <ftp://ftp.fao.org/docrep/fao/005/v9878e/v9878e00.pdf>
- Gelcich, S., Hughes, T. P., Olsson, P., Folke, C., Defeo, O., Fernandez, M., . . . Castilla, J. C. (2010). Navigating transformations in governance of Chilean marine coastal resources. *Proceedings of the National Academy of Sciences of the United States of America*, 107(39), 16794-16799. doi: 10.1073/pnas.1012021107
- Gell, F. R., & Roberts, C. M. (2003). Benefits beyond boundaries: The fishery effects of marine reserves. *Trends in Ecology & Evolution*, 18(9), 448-455. doi: 10.1016/s0169-5347(03)00189-7
- GIC-PA. (2001). *Lineamientos generales para el ordenamiento de la pesca artesanal en la costa norte de Chocó*. Grupo Interinstitucional y Comunitario de Pesca Artesanal de la costa norte chocoana. GIC-PA. Technical report. Copy in possession of author.
- Harley, S. J., and Suter, J. M. 2007. The potential use of time–area closures to reduce catches of bigeye tuna (*Thunnus obesus*) in the purse-seine fishery of the eastern

- Pacific Ocean. *Fishery Bulletin US*, 105, 49–61. Retrieved from
<http://www.biodiversitylibrary.org/item/22574>
- Hart, P. J. B. (1998). Enlarging the shadow of the future: Avoiding conflict and conserving fish. In T. J. Pitcher, P. J. B. Hart & D. Pauly (Eds.), *Reinventing fisheries management*. (pp. 227–238) London: Kluwer Academic Publishers.
- Hilborn, R., Stokes, K., Maguire, J.-J., Smith, T., Botsford, L. W., Mangel, M., . . . Walters, C. (2004). When can marine reserves improve fisheries management? *Ocean & Coastal Management*, 47(3-4), 197-205. doi: 10.1016/j.ocecoaman.2004.04.001
- ICA, Resolución 2650. (2008). *Por la cual se delimita un área exclusiva destinada para la pesca artesanal en el Departamento del Chocó*. República de Colombia. Retrieved from
http://www.avancejuridico.com/actualidad/documentosoficiales/2008/47068/r_ica_2650_2008.html
- INCODER, Resolución 1051. (2009). *Por medio de la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó por el término de un (1) año, contado a partir del 31 de julio de 2009* República de Colombia. Retrieved from
http://www.avancejuridico.com/actualidad/documentosoficiales/2009/47434/r_incode_r_1051_2009.html
- INCODER, Resolución 2107. (2010). *Por la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó*. República de Colombia. Copy in possession of author.

- INDERENA, Resolución 726. (1974). *Por la cual se prohíbe la pesca de arrastre en la zona del Litoral Atlántico denominada Golfo de Morrosquillo*. República de Colombia. Retrieved from faolex.fao.org/docs/texts/col29035.doc
- INDERENA, Resolución 1130. (1976). *Por la cual se prohíbe la pesca de arrastre en la zona del Golfo de Urabá*. República de Colombia. Copy in possession of author.
- INDERENA, Resolución 2526. (1981). *Por la cual se establecen normas para la conservación y manejo del recurso pesquero de la Ensenada de Tumaco*. República de Colombia. Retrieved from faolex.fao.org/docs/texts/col29316.doc
- INDERENA, Acuerdo 24. (1983). *Por el cual se limita el área de pesca de arrastre e industrial en la zona del Golfo de Urabá y se reserva para la pesca artesanal*. República de Colombia. Copy in possession of author.
- INDERENA, Acuerdo 54. (1988). *Por el cual se establece una zona de reserva para la pesca artesanal*. República de Colombia. Copy in possession of author.
- INPA, Acuerdo 12. (1995). *Por la cual se zonifica el Litoral Atlántico colombiano en los departamentos de Córdoba y Sucre para el control de los recursos pesqueros, se reserva y delimita la zona para la pesca artesanal y se dictan otras disposiciones*. República de Colombia. Copy in possession of author.
- Jaworski, A., Solmundsson, J., & Ragnarsson, S. (2006). The effect of area closures on the demersal fish community off the east coast of Iceland. *ICES Journal of Marine Science*, 63(5), 897-911. doi: 10.1016/j.icesjms.2006.03.001
- Jentoft, S. McCay, B. & Wilson D. (1998). Social theory and fisheries co-management. *Marine Policy*, 22(4-5), 423-436. doi: 10.1016/S0308-597X(97)00040-7
- Johannes, R.E. (1981). *Words of the lagoon*. California: University of California Press.

- Johannes, R.E. (1998). Government-supported, village-based management of marine resources in Vanuatu. *Ocean & Coastal Management*, 40, 165-186.
- Kaiser M., Spence, F. & Hart, P. (2000). Fishing-gear restrictions and conservation of benthic habitat complexity. *Conservation Biology*, 14(5), 1512–1525.
- LeDrew, B. (1988). *A study of the conflict between fixed and mobile gear in Western Newfoundland*. St. John's: Department of Fisheries and Oceans.
- Lennert-Cody, C. E., Roberts, J. J., & Stephenson, R. J. (2008). Effects of gear characteristics on the presence of bigeye tuna (*Thunnus obesus*) in the catches of the purse-seine fishery of the eastern Pacific Ocean. *ICES Journal of Marine Science: Journal du Conseil*, 65(6), 970-978. doi: 10.1093/icesjms/fsn075
- Ley 13 (1990). *Estatuto general de pesca*. República de Colombia.
- Mascia, M. B., Claus, C. A., & Naidoo, R. (2010). Impacts of marine protected areas on fishing communities. *Conservation Biology*, 24(5), 1424-1429. doi: 10.1111/j.1523-1739.2010.01523.x
- McCay, B. J., & Jones, P. J. (2011). Marine protected areas and the governance of marine ecosystems and fisheries. [Editorial]. *Conservation Biology*, 25(6), 1130-1133. doi: 10.1111/j.1523-1739.2011.01771.x
- McGoodwin, J.R. (1990). *Crisis in the world's fisheries. People, problems, and policies*. California: Stanford University Press.
- Ministerio de Agricultura, Resolución 167, 1966. *Por la cual se reglamenta la pesca con redes de arrastre en las dos costas marítimas*. República de Colombia. Copy in possession of author.

- Murawski, S. A., Brown, R., Lai H.-L., Rago, P. J. & Hendrickson, L. (2000). Large-scale closed areas as a fishery-management tool in temperate marine systems: The Georges Bank experience. *Bulletin of Marine Science*, 66(3), 775–798.
- Navia, A. F., Mejía-Falla, P. A., López-García, J., Muñoz, L. A., & Ramírez-Luna, V. (2010). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su administración. Fase 2*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_5.pdf
- Neis, B., Felt, L., Haedrich, R. & Schneider, D. (1999). An interdisciplinary method for collecting and integrating fishers' ecological knowledge into resource management. In Newell D. & Ommer R. (Eds.), *Fishing places, fishing people. Traditions and issues in Canadian small-scale fisheries* (pp. 217-238) Toronto: University of Toronto Press Incorporated.
- Neis, B., & Kean, R. (2003). Why fish stocks collapse: An interdisciplinary approach to understanding the dynamics of 'fishing up.' In Byron, R. (ed.), *Retrenchment and regeneration in rural Newfoundland* (pp. 65-102). Toronto: University of Toronto Press.
- Norse, E. A., Crowder L. B., Gjerde, K., Hyrenbach, D., Roberts, C. M., Safina, C. & Soulé M.E. (2005). Placed-based ecosystem management in the open ocean. In E. A. Norse, L. B. Crowder & M. E. Soule (Eds.), *Marine conservation biology: The science of maintaining the sea's biodiversity* (pp. 302-327) Washington: Island Press.

- Olson, K. (2011). *Step zero for marine conservation: Driving factors of voluntary fishery closures in Newfoundland and Labrador*. (Unpublished master's thesis). Memorial University of Newfoundland and Labrador, St. John's.
- Pauly, D., Christensen, V., Gu  nette, S., Pitcher, T. J., Sumaila, R., Walters, C. J., Watson R. & Zeller, D. (2002). Towards sustainability in world fisheries. *Nature*, 418, 689-695. doi:10.1038/nature01017
- Pomeroy, R., & Douvere, F. (2008). The engagement of stakeholders in the marine spatial planning process. *Marine Policy*, 32(5), 816-822. doi: 10.1016/j.marpol.2008.03.017
- Raakjaer, J. R., Degnbol, P., Viswanathan, K. K., Ahmed, M., Hara, M., & Abdullah, N. M. R. (2004). Fisheries co-management—an institutional innovation? Lessons from South East Asia and Southern Africa. *Marine Policy*, 28(2), 151-160. doi: 10.1016/s0308-597x(03)00083-6
- Ram  rez-Luna, V., G  mez, L. S., Tob  n, A., Mej  a-Falla, P. A., & Navia, A. F. (2008). *Pesquer  a artesanal de la zona norte del Pac  fico colombiano: Aportando herramientas para su co-manejo. Fase 1*. Fundaci  n SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_8.pdf
- Sea Around Us Project. (2011). *Landings by species in the waters of Colombia* (Tabular data). Retrieved from <http://www.seaaroundus.org/eez/170/1.aspx>
- Sverdrup-Jensen, S. & Raakjaer J. (1998). *Co-management in small-scale fisheries: A synthesis of Southern and West African experiences*. Institute for Fisheries Management and Coastal Community Development (IFM). Denmark.

Viswanathan, K. K., Raakjaer J., Degnbol, P., Ahmed, M., Hara, M. & Raja, N. (2003).

Fisheries co-management policy brief: Findings from a worldwide study: WorldFish Center.

Wielgus, J. Zeller, D., Caicedo-Herrera, D. & Sumaila, R. (2010). Estimation of fisheries removals and primary economic impact of the small-scale and industrial marine fisheries in Colombia. *Marine Policy* 34(3), 506-513. doi: 10.1016/j.marpol.2009.10.006

2. Methods

2.1. Introduction

This study uses a multi-methods approach in order to contribute to our understanding of pre- and post-implementation processes of EFZs and their role in mitigating conflicts, promoting the food security of artisanal fishing households, encouraging participation by artisanal fishers in co-management, and sustaining artisanal fisheries. The multi-methods approach is based on a case study of an EFZ established on the Colombian Pacific coast (the Chocó-EFZ); it is developed using semi-structured interviews with key informants, local fisheries knowledge (LFK) career-history interviews with adult members of artisanal fishing households (male and female fishers), an analysis of historical landings of tuna and shrimp industrial fisheries in the waters of Colombia (1956-2006, Sea Around Us Project, 2011), a review of existing documents (technical reports, meeting minutes, government resolutions, letters, scientific research, newspapers, and magazines), and personal communications.

The use of a multi-methods approach to explore the historical development of fisheries makes it possible to gather information from sources that differ in terms of the type of assumptions different actors bring to the table and their observations, including differences in the spatial and temporal scale of those observations (Murray, et al. 2008).

The use of a case study for exploring the use of place-based management tools such as EFZs makes it possible to examine the reasons why these tools work in some contexts and not in others and how they can be adjusted to address local conditions (Christie, 2004; Hilborn et al., 2004; Davis et al. 2006). The Chocó-EFZ case study contributes to the understanding of the role of EFZs in co-management, rebuilding fisheries, food

security, and conflict mitigation (in this case, between artisanal and industrial sectors). The case study also provides insight into how the pre- and post-implementation processes developed, and into the relationship between the historical development of local fisheries, associated conflicts, and the design and effectiveness of EFZs. The research focuses on two communities within the Choco-EFZ, Bahía and Huina (see Figure 1.1. in Chapter 1). Bahía is the major urban centre in the southern area of the Chocó-EFZ, where usually projects focused on marine fisheries are carried out (C. Vieira personal communication, July 29, 2010). Huina is a small village near Bahía, less visited by researchers, and a more fishing-dependent community. I did not visit other communities for safety reasons related to the presence of guerrilla and paramilitary groups, both illegal organizations largely involved in drug trafficking.

As opposed to structured interviews, which ask specific and closed questions and are administered by the interviewer (Bryman, 2001), semi-structured interviews allow the researcher and participants to shape the direction of the interview, to discuss a wider range of ideas, and help ensure participants have the opportunity to introduce topics the researcher did not anticipate (Johannes, 1993; Huntington, 1998; Neis et al., 1999). Semi-structured interviews were used with key informants and with artisanal fishers.

Key informants are defined as “a select group of individuals who are likely to provide needed information, ideas, and [insights] on a particular subject” (Kumar, 1989, p. 1). Groups of such individuals are small, they provide in-depth qualitative information, are interviewed in a less structured manner (semi-structured or unstructured interviews) and in an informal setting (Kumar, 1989; Johnson, 2004). Informants are selected according to their “characteristics, knowledge, and rapport with the researcher” (Johnson,

2004, p. 537). In this thesis, interviews with key informants explored the past and present circumstances that led to the establishment of the Chocó-EFZ and captured the perspectives of a diverse set of stakeholders regarding the pre- and post-implementation processes and about the future of the zone.

Semi-structured interviews with adult members of fishing households (male and female fishers) were of the career-history type, through which Local Fisheries Knowledge (LFK) was collected. LFK career-history interviews “can generate a baseline of information for a particular fisher, and when data are aggregated, for local and regional fisheries where little scientific data exist” (Neis et al., 1999, p. 1962). Local Fisheries Knowledge has been used for reconstructing trends in fisheries (Neis et al. 1999), improving understanding about the causes of collapse of fish stocks (Neis & Kean, 2003), enhancing participation by fishers in planning processes for fishing and non-fishing activities (Tobias, 1993), in fisheries management (Johannes 1978, Ruddle et al., 1992; Johannes et al., 2000; Castilla & Gelcich, 2008), and to guide the implementation of place-based management tools (Bourillón-Moreno, 2002; Davis et al. 2006). This study used LFK career-history interviews with fishers to explore multiple aspects of the history of artisanal and industrial fishing in two communities (Bahía Solano and Huina) located inside the Chocó-EFZ. This method was also used to develop an account of the processes that shaped the development of the Chocó-EFZ and its effectiveness. These interviews made it possible to examine the dynamics of the local fishery in the past and the present; the circumstances that triggered the establishment of the Chocó-EFZ; and the implications of the zone for the fishing households in the two communities. They also made it possible to gather data on fishers’ awareness of the Chocó-EFZ and their

perceptions regarding the zone's geographical configuration, goals, regulations, and effectiveness.

Analysis of LFK and key informant interviews was complemented by an analysis of historical landings of tuna and shrimp industrial fisheries in the waters of Colombia (1956-2006, Sea Around Us Project, 2011). Landings are useful to track shifts in landings between vessels of different sizes and gear sectors and shifts in aggregate effort across species (Murray et al. 2008). However, landings are not usually linked with any measure of effort, thus potentially masking increased efficiency and related spatial and temporal shifts in effort and their contribution to landings (Neis et al., 1999; Marchal et al., 2002; Murray et al., 2008). This is the case in Colombia, where the little existing scientific data on fisheries is largely based on official landings datasets (Mejía-Falla & Navia, 2011). Furthermore, there are some problems with the reliability of the existing scientific data due to the frequent transfer of management responsibilities between different Colombian agencies and associated data loss, among other challenges (Wielgus et al., 2010). In this context, the use of information from career-history interviews with local fishers becomes more relevant.

Data gathered through other sources (technical reports, meeting minutes, government resolutions, letters, scientific research, newspapers, magazines, and personal communications) not only complemented the data gathered through the interviews but also aided in tracking events related to the Chocó-EFZ occurring after the 2010-2011 fieldwork.

2.2. Key informant interviews

Interviews with key informants involved with the Chocó-EFZ process and with different backgrounds allowed me to record specific information on past and present events that shaped the way the process unfolded, as well as a diverse array of perspectives about the Chocó-EFZ. The interviews started by asking key informants about their profiles (background and occupation) and about their involvement with the Chocó-EFZ process (when and how they first became aware of the process and how long they had been in the process). We then discussed the situations that triggered the process, how the geographical location and configuration were delimited and how the goals of the Chocó-EFZ (mitigation of conflicts, promotion of food security, and co-management) were defined. I finished the interview by asking whether the goals had been achieved, what the impact of the Chocó-EFZ had been on the artisanal and industrial sectors, what they thought about the future of the Chocó-EFZ, and what they would recommend.

2.2.1. Recruitment and data analysis

Key informants were chosen based on the list of the organizations mentioned in the Resolution that established the Chocó-EFZ (ICA, 2008), on minutes of the meetings about the Chocó-EFZ (ICA, 2009), on documents published on research conducted in the area (GIC-PA, 2001) and on my experience in the two projects that followed the establishment of the Chocó-EFZ (Ramírez et al., 2008; Navia et al., 2010). I contacted 11 people and visited 3 localities: Bogotá (capital city) between July and August, 2010; Bahía Solano (within the Chocó-EFZ) between September and October, 2010, and Buenaventura (main port on the Pacific Coast) in January and February, 2011 (see Figure

1.1 in Chapter 1). All of the 11 key informants I contacted agreed to participate. Six informants were affiliated with the artisanal sector through non-governmental institutions, the Community Council, fisher and processor organizations, and with fish trading. Three interviewees belonged to the fisheries authorities; one belonged to the Colombian Association of Ship Owners and Commercial Fishers (ACODIARPE), which represents the shrimp industry, and one was part of the Chamber of Ship Owners of the National Business Association (ANDI), which includes tuna vessels larger than 386 tons carrying capacity (Table 2.1). During the visits to Buenaventura I had an informal conversation with a trawler skipper about the development of the shrimp fishery on the Pacific Coast of Colombia (Table 2.1). Key informal interviews ranged from 26 to 85 min (mean 56 ± 18 SD); the informal conversation lasted 52 minutes on average.

Table 2.1. List of formal (key informants $n=11$) and informal interviews ($n=1$) about the pre- and post-implementation process of the Chocó-EFZ

SECTOR	INSTITUTION	LOCALITY (n)
Artisanal fishery	NGOs, fishers organization, processors organization, Community Council, and fish trading	Bahía Solano (7) Bogotá (1)
Tuna fishery	ANDI	Bogotá (1)
Shrimp fishery	ACODIARPE, Skipper ^a	Buenaventura (2)
Government	INCODER	Bogotá (2), Bahía Solano (2)

Note. ^a Informal interview about the history of the shrimp fishery on the Pacific coast of Colombia

All interviews were transcribed at the end of the field work. Using NVivo 9 software, information in the transcripts was coded into multiple nodes and then re-grouped based on the following categories: origin of the Chocó-EFZ, stakeholders' role,

design (geographical configuration, time period), implications of the term “exclusive zone”, achievement of goals, and future of the Chocó-EFZ. Quotes were inserted into the relevant fields. In order to protect the identities of the two female interviewees they are presented as males in the analysis.

2.3. Local fisheries knowledge career-history interviews

Local Fisheries Knowledge (LFK) was collected using career-history interviews with linked chart biographies (Tobias 2000, 2009). Charts were used to provide a common reference point (Huntington, 1998), to help structure the interview, and to tie observations to places as needed (Murray et al., 2008). This combination of tools made it possible to visualize and discuss changes in the Bahía and Huina fisheries regarding effort and landings, as well as fishing grounds, fish species targeted, fishing gear characteristics, and the history of fish consumption and its relationship with food security of artisanal fishing households.

The interviews started by asking male and female fishers a series of demographic questions related to age, place of birth, marital status, how long they had lived in Bahía or Huina and reasons for in-migrating to the community (if they did so), parents’ occupation, education levels, and duration and gaps in their fishing careers. The second part of the interview, helped by the charts, asked about the use of fishing grounds during their careers, which was the starting point for developing an account of the fishing history in Bahía and Huina areas. During the interview, a research assistant located the fishing grounds on charts following the methodology proposed by Tobias (2000, 2009) for use and occupancy mapping. I adapted two tools, namely the *data diamond* for asking the

questions and the *chart biography* for charting fishers' careers (See Charts Construction section below for further detail). Each of the four points of the diamond refers to a different kind of information: who, what, where, and when. Instead of a data diamond I adopted a *data hexagon*, the six points of which included: distance of fishing grounds from the shore, depth, bottom characteristics (sandy, muddy, or rocky), target fish species, and gear characteristics (boat material and size, nets, hooks, and means of propulsion). We also discussed their interactions with industrial vessels in terms of where, when, and what happened during these interactions. Interactions included negative experiences (e.g. when interviewees' longlines were dragged away by trawlers) and positive experiences (e.g. when goods were exchanged with crews from the industrial fleet). Then, we discussed what happened to the fish once it entered the household, whether it was processed or consumed fresh, eaten by household members, sold or exchanged, and whether market demand impacted the kind of fish consumed by the family. We also reviewed other economic activities in which they had been engaged over their lives. Towards the end of the interview I asked the fishers what they knew about the Chocó-EFZ; what they knew about the process that led to the establishment of the zone; what the exclusive zone should look like; if it had contributed to their food security; and about opportunities and challenges they could identify for their towns for the future.

2.3.1. Recruitment

I visited Bahía and Huina, both located inside the Chocó-EFZ (see Figure 1.1 in Chapter 1). In Bahía I hosted a public meeting that was attended by six people involved with fishing, fish commercialization, local fishery authority, local high school, artisanal fisher

groups, and local men's and women's organizations. One of the attendees became the research assistant for the field work carried out in this town. She is native to the community, a Fishery Technologist with substantial experience in fish processing, organizational processes, and working with governmental and non-governmental institutions. The research assistant in Huina was a local fisherman and a Fishery Technologist with substantial experience in both artisanal and industrial fishing and who had worked with public and private institutions. They were hired to help in the selection of participants, to arrange the interviews, to organize the material during the interviews, and to locate the fishing grounds on the charts. As noted by Huntington (1998), during the interviews they prompted and clarified discussion of topics of which I, as an outsider, was unaware; they made conversations easier for some participants; at times they and interviewees engaged in discussions in which I did not intervene but became an observer.

In order to interview fishers who could talk about events taking place over several decades, the households were chosen based on three criteria: male fishers had to be more than 40 years of age, full-time fishers, and both the fisher and his wife had to have spent all of their fishing careers in Bahía or Huina. The census of fishers carried out by SQUALUS in 2009 (Navia et al., 2010) was the first source used to develop a list of potential interviewees in Bahía; a second source was the interviewees, and the third source was the research assistants. From the census, which included the names of 125 Bahía male fishers (around 90% of the population of fishers in Bahía), 18 met the three criteria, and 12 were contacted; two more fishers were recommended by other fishers and by the research assistant. In Huina (out of 21 fishers representing around 90% of the total

fishers' population; Navia et al., 2010) the list of potential participants was constructed based on the research assistant's knowledge of the local community.

In Bahía, between September 23rd and October 11th, 2010, the research assistant and I visited 15 fishing households (14 couples and one single⁶); in Huina between October 21st and November 4th, 2010 we visited 11 households (7 couples and 4 singles). In both towns I explained to them who I was, what the project involved, and that they had been identified as fishers who were knowledgeable about the fisheries in their area. I informed them that they were being contacted to see if they would be willing to do a face-to-face interview with me and with the research assistant about the history of both artisanal and industrial fisheries in the area. I also indicated that I wanted to talk with them about fish consumption within their households and about the Chocó-EFZ that was established in 2008 in this area for artisanal fishers. I told them the interview would take approximately one or two hours depending on how much they had to say.

In Bahía out of the 15 households that were contacted, 14 (13 couples and 1 single fisherman) agreed to participate. In Huina all of the 11 households invited to participate agreed to be interviewed. Once they had agreed to participate, I arranged a date and time to meet. For each interview, the assistant and myself were present; interviews were done one-on-one (as opposed to group interviews) with both the fisher and his wife present (when married) and took place in their homes (in all cases in Bahía and in 8 cases in Huina) or at the place where I was staying (remaining 3 cases in Huina). Not all interviewees met the three criteria (more than 40 years of age, full-time fishers, and both

⁶ The term "Single" included widower fishers and those who were not in common-law or married.

the fisher and his wife had to have spent all of their fishing careers in the area). After several interviews it was found that most of the older fishers were handliners and had little experience with conflict with the industrial fleet. As the field work developed more longliners (usually younger fishers) were introduced in order to collect more information on conflicts with the industrial fishery (especially with the industrial shrimp fishery). The following are other situations related to the sample that occurred in the two communities:

Bahía

- I included a fisherman who was single -but met the other two criteria- because he was familiar with the Chocó-EFZ assessments. I tested the interview schedule and the chart methodology with him. He also provided relevant information on conflicts with the industrial fleet.
- After we started the interview I realized that one couple had always lived in a northern town located inside the Chocó-EFZ near Bahía. However the fisher provided relevant information related to conflicts with the industrial fleet within the Chocó-EFZ.
- While interviewing one couple I found out that they had spent only part of his fishing career in Bahía; however the fisherman provided useful data about use of fishing grounds (with gillnets and beach seines) around Bahía and other towns located inside the Chocó-EFZ.
- The wife of one fisher was not knowledgeable about fish consumption in Bahía from a historical point of view. The fisher met the other two criteria.

- In the case of the female interviewees, out of the 10 interviewed (and included in the analysis), 4 had fished finfish and/or shellfish; charting sessions were conducted with these women. The interviews with all the 10 women and the related 4 charts were analyzed.
- One chart was eliminated because it was difficult to establish time scales and the resulting chart was confusing. The chart and household interview were excluded from the analysis.
- In one case I did not do the chart work because of lack of space and the resulting interview provided only general information. The household interview was excluded from the sample.
- In summary I interviewed 14 men and 12 women (26 in total) and developed charts with 13 men and 4 women (17 in total). I analysed 12 interviews carried with men and 10 with women (22 interviews in total) and digitized charts produced with 12 men and 4 with women (16 charts in total) (Table 2.2).

Huina

- I included three fishers who were not married or living with their partners but had spent their entire fishing careers in this town.

- One of the interviews was done with a particular woman (without any fisherman present) because she was recognized locally as a knowledgeable fisher and shellfish gatherer.
- Out of the 7 women interviewed, 5 had fished finfish and/or shellfish regularly. Charting sessions were conducted with these 5 female fishers.
- In summary I interviewed 10 men and 7 women (17 in total); developed charts with 10 men and 5 women (15 in total); and analyzed all the material collected in Huina (interviews and charts) (Table 2.2)

Table 2.2. Number of artisanal fishing household interviews and charts analyzed. Bahía and Huina, Pacific coast of Colombia

Item	Bahía	Huina	Total
Field work period (2010)	September 10 th - October 11 th	October 21 st - November 4 th	47 days
Number of men	12	10	22
Number of women	10	7	17
Charting sessions	16	15	31
Interviews' length in minutes (mean and standard deviation)	28 - 125 (76.42 ± 27.73)	41 - 224 (92.09 ± 55.43)	28 - 224 (83.32 ± 41.95)

The shortest interview ran 28 minutes (in Bahía) while the longest ran 3 hr 44 min (in Huina). The length of the interview depended on how much the interviewees had to say, whether women were also fishers (fished or gathered shellfish regularly during any period of their lifetime), the number of years they had been fishing, the number of fishing grounds and gear types they had used, and the extent of the discussion generated by the questions. Since the number of fish species was the

same across the areas and relatively stable over time, this topic did not influence the amount of time spent per interview.

2.3.3. Chart biography construction

Several steps were involved in charting fishers' careers:

- 1) I started by calculating the first decade to be charted based on the age at which the fisher started to fish. If the fisher was born in the 1960s and started to fish when he or she was 15 years old, then the first decade to be charted was the 1970s.
- 2) The research assistant located the fishing grounds listed by fishers during the first decade and then we assigned a code to those grounds consisting of the first three letters of the decade (in Spanish) and a number indicating where in the sequence it was located. I listed these codes on the chart and spoke them into the recorder so I could connect chart objects to information in the transcript.
- 3) Applying the data hexagon for each of the grounds fishers had indicated, we discussed the six questions: distance of fishing grounds from the shore, depth, bottom characteristics (sandy, muddy, or rocky), target fish species, and gear characteristics (boat material and size, nets, hooks, and means of propulsion).
- 4) Moving to the next decade, the assistant used a different color to locate the fishing grounds and we repeated steps 2 and 3.
- 5) Once the fishing areas used by artisanal fishers were located, I asked fishers about grounds where they had had an encounter with industrial vessels or had seen them. If any

encounters had taken place, I asked when this happened and whether encounters involved conflict (gear damaged by industrial vessels) or cooperation (exchange of food and non-food items such as fuel).

I had access to three types of base charts that covered different areas and were used according to the fishers' experience. Two charts were designed based on the charts developed for the research conducted by Ramírez-Luna et al. (2008) and Navia et al. (2010) and were used with the permission of INCODER (the Colombian fisheries authorities during that period of time). The third chart was published by the Oceanographic and Hydrographical Research Centre (CIOH, Spanish acronym) titled "Aproximación a Bahía Solano", and was used with permission from the Naval Authority. The first two charts cover the whole exclusive zone (scale 1:132.664), the Golfo de Cupica (scale 1:70.000), and depth contours are laid out at 50 m intervals (range 50-500 m). The third chart includes the Bahía de Solano and the depth contours appear at 10 m intervals between the shoreline and the first 50 m after which they appear at 100, 200 and 500 m intervals (scale 1:25.000 at Latitude 6°18'07.5"N). I used the first two charts in Bahía and all three charts in Huina.⁷

Three factors affected the precision with which fishers were able to identify fishing grounds on the charts and the comparability of data from different communities: a) the use in the two communities of three charts with different scales and bathymetric data; b)

⁷ I learned about the CIOH chart after I finished field work in Bahía.

differences in the knowledge possessed by the research assistants; and c) differences in fishers' notions of distance from shore.

a) Use of different charts in the two communities. When locating fishing grounds associated with specific rocky areas that fishers from both communities had used, the scale of the chart influenced the detail with which those areas were located. For instance, the area *Piedra del Norte* was not represented in the 1:70.000 chart, which was used by Bahía fishers. In Bahía, *Piedra del Norte* was located by estimating the distance from shore and it was represented as one large polygon. In Huina, the chart used was at the scale of 1:25.000 and it was possible to identify the exact location of the *Piedra del Norte* as well as to identify and chart three subareas: *Piedra de la Orilla* (the closest to shore), *Piedra del Medio* (middle distance) and *Piedra de León* (the furthest from shore). These differences in scale and precision were reflected in richer discussions about this fishing area with Huina fishers.

Since rocky areas were also used as a reference point to draw longline grounds, representation of those grounds used by Huina fishers was more accurate than representation of those used by Bahía fishers. The 1:25.000 chart used in Huina made it possible to identify the rocky areas in greater detail and contained fine bathymetric information, which is useful for locating longline grounds.

b) Differences in research assistants' knowledge. Although both of the research assistants were Fishery Technologists with substantial knowledge about fishing activity, the assistant in Huina was also a fisher, thus, his experience enhanced the detail captured in charts. The reason why a fisher was not hired in Bahía was because

it was believed that interviewees would not feel comfortable sharing this information with another fisher. This situation did not occur in Huina because it is a small town and the assistant had a close and positive relationship with interviewees.

- c) Fishers' notions of distance from shore. Fishers would use depths (bathymetric lines) or land marks (e.g. conspicuous trees, rocks, or houses on shore, or rocky areas that can be seen above the sea surface) to locate their grounds. When asked the question, "Where did you fish in X decade" it was difficult for them to locate the fishing grounds using only information on the distance from shore even in combination with the bathymetric data. The best reference point for locating fishing areas on the charts was a large rocky area called *Los Vidales*, which is located in Bahía de Solano and also clearly identified in the 1:25.000 chart. *Los Vidales* comes above the surface of the sea and can be seen from different locations around the southern area of the Chocó-EFZ.

In order to accurately digitize the fishing grounds charted during the fieldwork I used three tools. First, at the end of the field work the research assistant from Huina and I navigated around the fishing grounds located in areas adjacent to Bahía and Huina. We went around these areas because they include the most important and frequently used grounds for these fishers. Budget limitations and safety reasons prevented us from going to the other areas. Prior to this trip I developed a list of the fishing grounds mentioned by the fishers from both communities and during the trip I geo-referenced them using a GPS *Magellan Map 330*. The second tool used to improve accuracy was the databases developed by Ramírez-Luna et al. (2008) and Navia et al. (2010). These databases list the fishing grounds with their names and their geographic reference points. I used these

databases to double-check the locations of the grounds in areas adjacent to Bahía and Huina and to verify the coordinates of the grounds from northern areas adjacent to *Cabo Marzo*. Finally, I gathered feedback from the Huina research assistant when I went back to the community with all of the digitized charts four months later.

2.3.4. Analysis of interview and chart data

All interview recordings were transcribed at the end of the field work. Using NVivo 9 software, transcripts were broken down into multiple nodes and then re-grouped based on the following categories: demographics, fishing gears, fishing grounds, fishing effort, technological changes, fish consumption, interactions with other fisheries, and knowledge of the Chocó-EFZ. Where data availability permitted (4 fishers in Bahía and 2 in Huina), catch per unit of effort (CPUE) was calculated in terms of kilograms per hour. The information in the interviews was coded into a series of finer categories and quotes were inserted into the relevant fields.

I digitized each of the charts manually using ArcGIS 9 Software. Each chart provided a spatial snapshot of a fisher's career including the location of his/her fishing grounds and the fishing gears used over his/her career. Next I constructed five composite charts by combining the data gathered from fishers and removed redundant information regarding the use of each of the fishing gears and fishing grounds. One composite chart displayed the fishing grounds where handlines had been used over time; another displayed data for gillnets; two other charts showed areas where longlines and beach seines had been used. The fifth composite chart brought together information on all of the grounds where encounters between artisanal and industrial fishers had taken place. I

constructed this composite chart based on the information provided by artisanal fishers only as I did not use the chart methodology with interviewees from the industrial sector. I did not independently verify this chart information with fishers or spokespeople from the industrial sector; the conflict issues were discussed only through the interviews. In order to protect interviewees' identities and the location of individual fishing grounds, only composite rather than individual charts are included in the thesis.

2.4. Ethical review

Multiple documents were developed to guide the key informant and household interviews and to meet the requirements for informed consent and confidentiality associated with meeting the ethical requirements for this human participants research. They include a consent form indicating the researchers involved with the project, its purpose and funders, the project goals, that participation in the study was free and voluntary; potential risks and benefits of the project for participants and steps taken to minimize risks. Attached to the consent form is an archival deposit/access form giving the interviewees an opportunity to indicate what should happen to the recorded interviews and transcripts once the research project is complete. Since one of the options was to deposit the interviews with the SQUALUS Foundation, a letter from the Director accepting the privacy and confidentiality commitments associated with the consent process was also attached. Additionally, the consent form for household interviews included a third party witness form (signed by the research assistants before starting field work). The witness form was adapted from the "Human Investigation Committee Undertaking of Confidentiality" form used by SafetyNet for its staff.

These documents, the key informant and household interview schedules, and a description of the proposed research were submitted to the Interdisciplinary Committee on Ethics in Human Research (ICEHR) at Memorial University and the research design was confirmed to be in compliance with the Tricouncil ethics policy (Memorial University, 2012). All documents and interview schedules were written in English for the purpose of ethics review. Once I received ethics clearance they were translated into Spanish (my mother tongue and the mother tongue of the interviewees). All interviews were conducted in Spanish and signed forms were also in Spanish. See Appendices A-C to review key informant interviews documentation and Appendices D-G to review household interviews documentation.

Before starting the interview, I reviewed the consent form with the participants (key informants and fishers) and asked them to sign if they were willing to participate. In the case of illiterate people (4 fishers in Bahía Solano and 4 in Huina), they signed by using their fingerprint. I explained that, with their consent, the interviews would be recorded on a digital voice-recorder. All interviewees agreed to be recorded during the interview. They were also asked to indicate what should happen to the information after the research was completed. Out of the 11 key informants, 63.64% stated that they wanted their interview material (recording and transcription) to be deposited in the SQUALUS Archives; 27.7% asked that the documents be destroyed after the project is complete⁸ and 9.09% decided that only the researcher should retain their documents. Out of the seven

⁸ I explained that all materials would be retained by me in a secure place and for at least five years after the publication of the results. Only in a case where someone questions my results would he or she be able to access to information and then only by following confidentiality and anonymity conditions. After five years, materials will be destroyed.

informants that decided to deposit their material in the SQUALUS Archives, 71.43% indicated that only researchers could access their material with written permission and 28.57% stated that researchers could access their material at the discretion of SQUALUS representative with responsibility for these materials.

In Bahía 57.1% of the households stated that they wanted their interview material (recording, transcription and charts) to be deposited in the SQUALUS Archives; 35.7% decided that only the researcher should retain their documents; and 7.1% asked that the documents be destroyed after the project is complete. Out of the eight households that decided to deposit their material in the SQUALUS Archives, 87.5% indicated that researchers could access their material at the discretion of the organizational representative with responsibility for these materials; 12.5% indicated that researchers could access their material with written permission only. In Huina 54.5% of the households decided that only the researcher should have access to the interview material; the remaining 45.5% households indicated that their documents could be stored at the SQUALUS Archives. Three of these (60%) stated that researchers could access these at the discretion of the organizational representative; the remaining 40% specified that researchers must have their written permission prior to accessing the recordings, transcripts and charts.

After the consent and archival deposit forms were completed the interview started. The recorder was turned on and the date and interview number were recorded. Interviewees were told that they could ask for the recorder to be turned off during any part of the interview and that they could refuse to answer any of the questions posed to them. All key informants and fishers received a copy of the consent form with contact names and

information about the interviewers. Once interviews were transcribed, interviewees received a copy of their interviews on a CD. After the interview, the digital recorder was stopped and the recording was saved on the recorder and as a computer file. In the case of household interviews, all charts used were numbered with the date, interview number, and place.

All interviewees were told that preliminary results would be presented during feedback meetings in Bahía Solano and Huina. Feedback meetings about the history of the fishing dynamics in this area were carried out on March 20th and 24th, 2011 in Bahía and Huina, respectively. Only interviewees were invited. In Bahía, 8 men and 6 women attended out of the 26 interviewees; in Huina 8 men and 6 women were present, out of 17 interviewees. Results of the research on the Chocó-EFZ pre- and post-implementation processes were presented during a meeting that was organized by fisher organizations to discuss several issues not related to the Chocó-EFZ but to the development of other projects on marine fisheries. That meeting took place in Bahía on March 26th, 2011 and it was attended by about 30 people. The key informants who attended belonged to some of these fisher organizations. I discussed the results individually with some of the key informants who did not attend the formal meeting. In all cases (except the meeting on March 26th), the results were presented using a PowerPoint presentation, which was modified based on interviewees' feedback and then sent back to all of the key informants.

The use of the Chocó-EFZ as a case study, and the use of the multi-methods approach allowed me to reconstruct the pre- and post-implementation processes associated with the Chocó-EFZ (Chapter 3) and the history of both artisanal and industrial fisheries tied to two communities located inside the Chocó-EFZ (Chapter 4). The

historical approach provided an account of the particular context within which the Chocó-EFZ process unfolded and the relationship between the past and present fishing dynamics, the conflicts, and the role to date of the Chocó-EFZ in mitigating conflicts between sectors, promoting food security of artisanal fishing households, promoting co-management among artisanal fishers, and rebuilding fisheries. Interviews with key informants and members of artisanal fishing households made it possible to gather different perspectives on the past, present, and future of the Chocó-EFZ.

2.5. Literature cited

Bryman, A. (2001). *Social research methods*. New York: Oxford University Press Inc.

Castilla, J. C., & Gelcich, S. (2008). Management of the loco (*Concholepas concholepas*) as a driver for self-governance of small-scale benthic fisheries in Chile. *FAO Fisheries Technical Paper*, 504, 441.

Christie, P. (2004). Marine protected areas as biological successes and social failures in Southeast Asia. *American Fisheries Society Symposium*, 44:155-164. Retrieved from <https://depts.washington.edu/smea/sites/default/files/patrickc/MPAs.Christie.AFS%20book.2004.pdf>

Davis, R., Whalen, J., & Neis, B. (2006). From orders to borders: Toward a sustainable co-managed lobster fishery in Bonavista Bay, Newfoundland. *Human Ecology*, 34, 851-867. doi: 10.1007/s10745-006-9032-2

GIC-PA. (2001). *Lineamientos generales para el ordenamiento de la pesca artesanal en la costa norte de Chocó*. Grupo Interinstitucional y Comunitario de Pesca Artesanal de la costa norte chocoana. GIC-PA. Technical report. Copy in possession of author.

Hilborn, R., Stokes, K., Maguire, J.-J., Smith, T., Botsford, L. W., Mangel, M., . . .

Walters, C. (2004). When can marine reserves improve fisheries management?

Ocean & Coastal Management, 47(3-4), 197-205. doi:

10.1016/j.ocecoaman.2004.04.001

Huntington, H. (1998). Observations on the utility of the semi-directive interview for

documenting traditional ecological knowledge. *Arctic*, 51(3), 237-242. Retrieved

from <http://arctic.synergiesprairies.ca/arctic/index.php/arctic/article/view/1065/1091>

ICA, Resolución 2650. (2008). *Por la cual se delimita un área exclusiva destinada para*

la pesca artesanal en el Departamento del Chocó. República de Colombia. Retrieved

from

http://www.avancejuridico.com/actualidad/documentosoficiales/2008/47068/r_ica_2

650_2008.html

ICA. (2009). *Presentación de resultados del estudio de monitoreo de la zona exclusiva de*

pesca artesanal. Meeting minutes. Copy in possession of author.

Johannes, R. E. (1978). Traditional marine conservation methods in Oceania and their

demise. *Annual Review of Ecology and Systematics*, 349-364.

Johannes, R.E. (1993). The plight of the osfish, or why quantitative sophistication is no

substitute for asking the right questions. *NAGA, The ICLARM Quarterly*, 16(1), 4-5.

Johannes, R. E., Freeman, M. M., & Hamilton, R. J. (2000). Ignore fishers' knowledge

and miss the boat. *Fish and Fisheries*, 1(3), 257-271. Retrieved from

<ftp://ftp.fisheries.ubc.ca/m.bailey/Papers/johannes%20ignore%20fisher%20knowledge.pdf>

- Johnson, J. (2004). Key informant. In M. Lewis-Beck, A. Bryman & T. Liao (Eds.), *Encyclopedia of social science research methods*. (pp. 537-539). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781412950589.n463
- Kumar, K. (1989). *Conducting key informant interviews in developing countries*. Retrieved from http://pdf.usaid.gov/pdf_docs/PNAAX226.PDF
- Marchal, P., Ulrich, C., & Pastoors, M. (2002). Area-based management and fishing efficiency. *Aquatic Living Resources*, 15(2), 73-85. doi: doi:10.1016/S0990-7440(02)01157-9
- Mejía-Falla, P. & Navia, A. (2011). *Estadísticas pesqueras de tiburones y rayas en el Pacífico colombiano*. Informe Técnico. Fundación SQUALUS, Colombia. Retrieved from http://squalus.org/pdf_inpublicaciones/info_tec_1.pdf
- Memorial University of Newfoundland. (2012). *Ethics of research involving human participants*. Retrieved from <http://www.mun.ca/policy/site/policy.php?id=139>
- Murray, G., Neis, B., Schneider, D., Ings, D., Gosse, K., Whalen, J., & Palmer, C. (2008) Opening the black box: Methods, procedures, and challenges in the historical reconstruction of marine social-ecological systems. In J. Lutz & B. Neis (Eds.), *Making and moving knowledge: Interdisciplinary and community-based research in a world on the edge* (pp. 100-120) Montreal: McGill-Queen's University Press.
- Navia, A. F., Mejía-Falla, P. A., López-García, J., Muñoz, L. A., & Ramírez-Luna, V. (2010). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su administración. Fase 2*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_5.pdf

- Neis, B., Schneider, D., Felt, L., Haedrich, R., Fischer J., & Hutchings, J. (1999) Fisheries assessment: What can be learned from interviewing resource users? *Canadian Journal of Fisheries and Aquatic Science*, 56, 1949-1963. Retrieved from http://myweb.dal.ca/jhutch/publications_pdfs/1999_nei_sch_cjfas.pdf
- Neis, B., & Kean, R. (2003). Why fish stocks collapse: An interdisciplinary approach to understanding the dynamics of 'fishing up.' In Byron, R. (ed.), *Retrenchment and regeneration in rural Newfoundland* (pp. 65-102). Toronto: University of Toronto Press.
- Ramírez-Luna, V., Gómez, L. S., Tobón, A., Mejía-Falla, P. A., & Navia, A. F. (2008). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su co-manejo. Fase 1*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_8.pdf
- Ruddle, K., Hviding, E., & Johannes, R. E. (1992). Marine resources management in the context of customary tenure. *Marine Resource Economics*, 7(4). Retrieved from <http://ageconsearch.umn.edu/bitstream/48631/2/18824661.pdf>
- Sea Around Us Project. (2011). *Landings by species in the waters of Colombia* (Tabular data). Retrieved from <http://www.seaaroundus.org/eez/170/1.aspx>
- Tobias, T. (1993). Stereotyped village economies and the Pinehouse harvest research. In Inglis, (Ed.). *Traditional ecological knowledge: Concepts and cases* (pp. 87-98). Ottawa, Ont., Canada: International Program on Traditional Ecological Knowledge.

- Tobias, T. (2000). *Chief Kerry's moose, a guidebook to land use and occupancy mapping, research design and data collection*. Canada: Union of BC Indian Chiefs and Ecotrust Canada.
- Tobias, T. (2009). *Living proof. The essential data-collection guide for indigenous use-and-occupancy maps surveys*. Canada: Union of BC Indian Chiefs and Ecotrust Canada.
- Wielgus, J. Zeller, D., Caicedo-Herrera, D. & Sumaila, R. (2010). Estimation of fisheries removals and primary economic impact of the small-scale and industrial marine fisheries in Colombia. *Marine Policy* 34(3), 506–513. doi: 10.1016/j.marpol.2009.10.006

3. Pre- and post-implementation processes of Exclusive Fishing Zones for Artisanal Fishers: lessons from Northern Chocó, Colombia

3.1. Abstract

This case study of an Exclusive Fishing Zone in Colombia (the Chocó-EFZ) draws upon interviews with key informants and with artisanal fishers from two communities to explore the factors that shaped the pre- and post-implementation processes and that have influenced knowledge of, engagement with, and responses to the Chocó-EFZ. Findings of this research show that conflicts between sectors and perception of corruption triggered the Chocó-EFZ implementation process. This process involved the participation of all sectors (industrial, artisanal, and government) but levels of involvement, knowledge, and understanding were uneven between and within sectors. The Chocó-EFZ seems to have been somewhat effective at mitigating conflicts between artisanal fishers and industrial shrimpers but has been less successful at mitigating conflicts between the former and industrial tuna seiners. The Chocó-EFZ is supporting an existing informal community-based management (in Huina) as well as promoting the development of a co-management regime (in Bahía); however it is facing some challenges posed by gillnetters and beach seiners in both communities. The main elements jeopardizing the continuation and modification of the Chocó-EFZ are the power struggle among stakeholders, the failure on the part of government to make the Chocó-EFZ permanent (as of 2013) and to expand its seaward boundary, and the debate related to the definition of territory including what belongs to whom and who should decide when granting fishing rights to one sector.

3.2. Introduction

Exclusive Fishing Zones (EFZs) are a type of place-based management tool often used to reduce conflict between sectors by allocating fishing rights to one sector or user group and excluding others. Some situations where these have been tried include those where conflicts occur between large scale and small scale fishermen from particular areas (e.g. Castilla & Fernández, 1998; Gelcich et al., 2010); between locals and outsiders (e.g. Davis et al., 2006); between aboriginal and non-aboriginal groups (Bourillón-Moreno, 2002); and to prevent gear conflicts (LeDrew, 1988; Bailey, 1997; Hart, 1998).

Research has looked at the legal framework through which EFZs are implemented and at the outcomes after EFZs have been implemented (Castilla & Fernández, 1998; Hart, 1998; Kaiser et al., 2000; Gelcich et al., 2010). Little attention has been paid to the processes through which EFZs are developed, the conditions that trigger such initiatives, or to the factors that shape their design and lead to their implementation including the historical interactions between sectors. Interactions between sectors (fishers, spokespeople, and government) are a critical factor influencing process and outcomes, as shown by LeDrew (1988), Hart (1998), Bourillón-Moreno (2002), and Davis et al. (2006). This research suggests that delayed and constrained implementation of EFZs linked to pressure from excluded parties and reluctance to intervene on the part of government can influence the potential of EFZs to contribute to conservation, protection of artisanal fisheries, and their long-term contribution to rebuilding fisheries.

Research on the pre-implementation processes associated with co-management regimes (Chuenpagdee & Jentoft 2007; Gelcich et al. 2010) and with marine spatial planning processes (Pomeroy & Douvere, 2008) indicate that learning about the

conditions and diversity of stakeholders involved makes it possible to evaluate the complexity of the situation out of which these develop, how the management approaches might be further developed, and their likelihood of success. Furthermore, a recent study shows that the pre-implementation process of area-based management tools such as MPAs might not only involve stakeholders' interactions but also political and economic issues that go far beyond the MPA itself (Chuenpagdee et al., 2013). Analysis of the pre-implementation processes associated with the establishment of particular EFZs has the potential to contribute in similar ways to our understanding of the opportunities and constraints associated with these place-based management tools.

This chapter contributes to the limited literature on pre- and post-implementation processes associated with EFZs and their significance for the operation and sustainability of these initiatives. It does this by providing a detailed case study of an EFZ instituted in Chocó Province on the Pacific Colombian coast (Chocó-EFZ hereafter) in 2008 that was still in existence in 2013. The chapter seeks to answer the following questions: 1) What background conditions and drivers triggered the processes that led to the establishment of the Chocó-EFZ? 2) Who was involved in initiating the negotiations and in communications? 3) How did processes of participation and preparation influence the present form of the Chocó-EFZ? 5) What evidence do we have that the Chocó-EFZ is achieving its goals? 6) What factors are likely to support or constrain the continuation of the Chocó-EFZ? The analysis adapts the governance framework that Chuenpagdee and Jentoft (2007) devised to explore the conditions and actions taken prior to co-management implementation ("step zero" p. 657) in several parts of the world. One of the most important lessons that Chuenpagdee and Jentoft (2007) drew from their research is

that “co-management is a path dependent process” (p. 664). This means that the decisions taken during the initial stage of the process may influence the way it later evolves (Chuenpagdee and Jentoft, 2007; Chuenpagdee et al., 2013).

The Chuenpagdee and Jentoft (2007) framework consists of the following elements:

- 1) *Conditions and drivers*: what is the situation in the fishery when the co-management idea comes about (e.g. overfishing, conflicts between users, use of destructive methods or gears, declining of catches);
- 2) *Inspiration and conception*: who introduces the idea and who supports it [e.g. governmental and/or non-governmental organizations (NGOs), community members];
- 3) *Initialization and communication*: who champions the idea of co-management and what are the initial steps taken in order to communicate it to other people;
- 4) *Participation and preparation*: who should participate (e.g. experts), what external resources (human and economic) should be used, what documents should be developed (e.g. agreements, guidelines);
- 5) *Reflection and adaptation*: what are the lessons learned, what can be considered “to be a good starting move” (p. 664), what other elements should be taken into account before implementing co-management.

Using stage 1 (conditions and drivers) I examine what triggered the pre-implementation process of the Chocó-EFZ. Combining stages 2 (inspiration and conception), 3 (initialization and communication) and 4 (participation and preparation) I discuss who was involved in introducing, initiating, communicating, and participating in the negotiations that led to the implementation of the Chocó-EFZ and how negotiations influenced the present form of the Chocó-EFZ. I finish with stage 5 (reflection and adaptation) through which I analyze whether, from the interviewees’ point of view, the Chocó-EFZ is contributing to mitigating conflicts between sectors and encouraging

participation by artisanal fishers in co-management. I also examine what interviewees think is likely to support or constrain the continuation of the Chocó-EFZ including a debate about the term “exclusive zone” and its implications for the future of the Chocó-EFZ. To complement the discussion about the “exclusive zone” term and to show how disagreements between stakeholders related to the Chocó-EFZ go beyond economic interests, I use the “legal pluralism” approach (Bavinck, 2005), which draws on gaps in the “conflict of interest” approach. Bavinck (2005) argues that conflicts are always about more than interests because “conflicts connect to dimensions such as law, culture, and social organization” (p. 806). The legal pluralism approach highlights the fact that “[the conflicting parties] may disagree about basics, such as what belongs to whom, and why, and who decides.” (p. 817). I discuss how the disagreement on basics between the artisanal and industrial sectors may determine the future of the Chocó-EFZ.

The Chocó-EFZ on the northern Coast of Colombia

The Chocó-EFZ is the most recently EFZ established in Colombia (Resolución 2650, ICA, 2008) (Resolución hereafter). It was established by the fisheries authorities in 2008. The legal framework (Ley 13, 1990) for the Chocó-EFZ states that EFZs are one of several fisheries management instruments including seasonal closures and fishery reserves implemented in order to manage and use natural resources while guaranteeing sustainable development and conservation. As well as mitigating conflicts by granting fishing rights to the artisanal sector, the goals of the Chocó-EFZ also include encouraging participation by local fishers in co-management, and promoting food security of the artisanal fishing communities (ICA, 2008). The Resolución included some elements that

were not part of earlier EFZs. These novel elements include: a) the adoption of the FAO (1995) international principles including the Precautionary Principle and the recognition of artisanal fisheries as a source of employment, income, and food security and, b) the involvement of stakeholders other than the fisheries authorities in the request for the Chocó-EFZ. These stakeholders included the local municipal authorities, fisher organizations, and the local Community Council “Los Delfines”. The Resolución also suggested that local fishers could participate in the fishing monitoring program and it created a Verification Committee comprised of representatives of the Government, artisanal, and industrial fishing sectors to oversee the post-implementation process (ICA, 2008).

The Chocó-EFZ covers an area of 803.25 km² (Ramírez et al., 2008), extending from the coastline out 2.5 nautical miles (NM) seaward; it incorporates two major urban centers (Juradó and Bahía Solano) and 22 villages (ICA, 2008; Ramírez-Luna et al., 2008) (see Figure 1.1. in Chapter 1).⁹ Inside the zone gillnets, beach seines, and the industrial (deep water shrimp trawl and tuna fisheries) and commercial exploratory fisheries are banned, while artisanal longlines and handlines, and sport fisheries are allowed inside and outside the zone.

Unlike previous EFZs in Colombia, the Chocó-EFZ was initially implemented for the period of one year (ICA, 2008). In order to conduct more research, especially on the impact on the artisanal and industrial shrimp fisheries, the time frame for the EFZ was

⁹ In May 2013, the Chocó-EFZ was established permanently and its area was extended south and northward (AUNAP, 2013). This thesis examines the events that took place before the implementation of the Chocó-EFZ until January 2013. [AUNAP (2013). *Acta de reunión del comité de verificación de la zona de pesca de pesca artesanal del norte del Chocó -ZEPA-*. Meeting minutes. Copy in possession of author]

extended for a second year (2009-2010) (INCODER, 2009), then for an additional two years (2010-2012) (INCODER, 2010). It was recently extended for one more year (2012-2013) (AUNAP, 2012).

During the first two years of the Chocó-EFZ, two studies were conducted by the SQUALUS Foundation (an environmental NGO) in order to assess the impact of the Chocó-EFZ on the artisanal fisheries. These studies generated a baseline of information on the artisanal fisheries inside the Chocó-EFZ and in surrounding waters (Ramírez et al., 2008; Navia et al., 2010). Navia et al. (2010) found that most communities located inside the Chocó-EFZ (especially southern communities) depend heavily on the artisanal fishery. Additional activities they engage in include agriculture, cattle farming, and tourism. In terms of biological services, Navia et al. (2010) found that the Chocó-EFZ might be an important nursery area for several fish species. Ramírez et al. (2008) and Navia et al. (2010) recommended the extension of the Chocó-EFZ further seaward. Despite scientific support, the geographical configuration remained the same and the zone was extended for a limited period (two more years) (INCODER, 2010). This suggests that there are information gaps that need to be filled in order to obtain a better understanding of the decision-making process on the Chocó-EFZ. In order to fill those gaps this chapter adds the historical perspective to the studies carried out by Ramírez-Luna (2008) and Navia et al. (2010).

The remainder of this chapter explores the pre- and post-implementation processes associated with the Chocó-EFZ taking into account the factors that triggered the process and that shaped its development, who was involved and in what capacity, how interactions among stakeholders shaped the conditions under which the Chocó-EFZ was

designed, established, as well as the outcomes after implementation. It does this by drawing on insights from research on fisheries governance and by adapting the “pre-implementation of co-management” approach developed by Chuenpagdee and Jentoft (2007).

3.3. Methods

The chapter draws on data from face-to-face, semi-structured interviews with key informants from different sectors and from Local Fisheries Knowledge (LFK) career-history interviews with artisanal fishers from Bahía and Huina (see Chapter 2 for a detailed discussion of these methods). The chapter also includes documentary sources related to the Chocó-EFZ including technical reports, meeting minutes, government resolutions, letters, scientific research, newspapers, magazines, and personal communications.

Between July 2010 and February 2011 I visited the localities where government and fishing sectors are headquartered (Bogotá, Bahía, and Buenaventura) and conducted interviews with key informants. Also in Bahía (large urban centre) and in Huina (small village more fishing-dependent community), both within the Chocó-EFZ (see Figure 1.1. in Chapter 1), I conducted interviews with artisanal fishing households. Key informants were chosen based on the list of stakeholders mentioned in the Resolución, minutes related to the Chocó-EFZ (ICA, 2009a), technical reports (GIC-PA, 2001) and on my experience with the EFZ gathered through involvement with two studies that followed the establishment of the Chocó-EFZ (Ramírez et al., 2008; Navia et al., 2010). I contacted all the key informants by phone and those living in Bahía were also contacted in person and

invited to a public meeting. Eleven key informants (6 in Bahía, 4 in Bogotá and 1 in Buenaventura) were contacted and all of them agreed to participate. Six informants were affiliated with the artisanal sector through NGOs, the Community Council, fishers' and processors' organizations, and fish trading (currently the representative of the Bahía artisanal fishers). Three informants belonged to the fisheries authorities (national and local offices); one belonged to the ACODIARPE, which represents the shrimp industry; and one was part of the ANDI, which includes Colombian flagged tuna vessels larger than 386 tons carrying capacity.

The key informant interviews asked informants about their background and about their involvement with the Chocó-EFZ process (when and how they first became aware of the process and how long they had been in the process). We subsequently discussed the situations that triggered the process, how the geographical location and configuration were delimited, and how the goals of the Chocó-EFZ (mitigation of conflicts, promotion of food security, and co-management) were defined. The key informant interviews concluded with questions about whether, in their opinion, the goals had been achieved, how fishing sectors had been impacted by the zone, and their thoughts about the future of the Chocó-EFZ. Interviews ranged from 26 to 85 min (mean 56 ± 18 SD).

In Bahía 14 households (13 couples and 1 single fisherman) out of the 15 that were contacted agreed to participate in face-to-face, LFK semi-structured career-history interviews. In Huina all of the 11 households (7 couples and 4 singles) invited to participate accepted to be interviewed. For each interview a research assistant and I were present. The interviews asked male and female about demographic aspects. Using an adapted version of the career-history interview (Murray et al. 2006), the second part of

the interview asked about the use of fishing grounds during their fishing careers including those where they interacted with industrial fishers. I used three types of charts that covered different areas and were used according to the fishers' experience. One chart covered the full Chocó-EFZ (scale 1:132.664) and the other covered the Golfo de Cupica (southern area of the Chocó-EFZ, scale 1:70.000); in both charts the depth contours were laid out at 50 m intervals (range 50-500 m). The third chart included the Bahía de Solano (Solano Bay) and the depth contours appeared at 10 m intervals between the shoreline and the first 50 m after which they appeared at 100, 200 and 500 m intervals (scale 1:25.000 at Latitude 6°18'07.5"N).

I digitized each of the charts manually using ArcGIS 9 Software and constructed a chart displaying the fishing grounds where different types of interactions occurred between the artisanal and industrial fishers (e.g. goods exchange, competition for fish resources, or gear conflicts). This chapter discusses the context of these interactions in terms of where (inside or outside the Chocó-EFZ) and when (after or before Chocó-EFZ establishment) they happened. Toward the end of the interview I asked fishers what they knew about the Chocó-EFZ; what they knew about the process that led to its establishment; and what the exclusive zone should look like. In Bahía interviews ran between 28 and 125 minutes (mean 76 ± 28 SD) and in Huina they ran between 41 and 223 min (mean 92 ± 55 SD). The length of the interview depended on how expressive the interviewees were and the extent of the discussion generated by the questions. All key informant and fishing household interviews were transcribed using NVivo 9 software. Quotes were inserted into the relevant fields. In order to protect the identity of female key

informants they are presented as males in the chapter and to protect fishers' identity, only composite rather than individual charts are included in the thesis.

3.4. Results

3.4.1. The pre-implementation process of the Chocó-EFZ

Using stages 1, 2, 3, and 4 of the Chuenpagdee and Jentoft (2007) framework, this section examines what triggered the pre-implementation process of the Chocó-EFZ; who was involved in introducing, initiating, communicating, and participating in the negotiations that led to the implementation of the Chocó-EFZ; and how the process of participation and preparation influenced the present of the Chocó-EFZ.

3.4.1.1. Conditions and drivers: What triggered the process that led to the establishment of the Chocó-EFZ?

The Resolución states that the Chocó-EFZ was established after three meetings, held in 2008, during which representatives of the government and of the artisanal and industrial fishing sectors discussed and agreed on the establishment of the EFZ (ICA, 2008). The Resolución also mentions documents written by the mayors of Bahía and Juradó (issued in May 2008), the Interinstitutional and Community Committee of the Artisanal Fishery of the Northern Chocó Coast (the GIC-PA), also issued in May 2008, and the Community Council (issued in July 2008). In a letter, the mayor of Bahía asked for the Chocó-EFZ in an effort to mitigate the impact of shrimp and tuna vessels on the artisanal fishery and the mayor of Juradó supported the request arguing that the communities from northern Chocó made their living from fishing (ICA, 2008). The Resolución mentions that, through their

letter, the Community Council had spearheaded the request for the implementation of the Chocó-EFZ. Lastly, the Resolución states that the GIC-PA argued that it was advisable to establish an exclusive zone in Northern Chocó to encourage the artisanal fishers to participate in the management of the fish resources from which they benefit (ICA, 2008).

When asked about what triggered the pre-implementation process, most key informants pointed to conflicts between fisheries. However, they tended to describe different events that had occurred at different points in time. On the one hand, interviewees affiliated with the artisanal fishery and familiar with the GIC-PA stated that the process of the Chocó-EFZ was triggered by the gear conflicts with the shrimpers that started in the late 1990s. In the words of a fish processor:

KI: The [Chocó-EFZ] is something that has been fought for since around 1998, because of the longliners who were the ones fishing offshore [...] the trawlers came and dragged their gear away [...] that was one of the main reasons why the GIC-PA originated, the fishers from Juradó, Bahía, and Nuquí had the same problem with the fishing vessels

Q: With shrimpers?

KI: Yes, because by that time the tuna vessels wouldn't fish over here. (Processors' organization interview #6)

The current representative of Bahía, who has also been a fish trader, also described conflicts in the early 2000s between shrimpers and the longliners who were working for his business. However, according to his account, this situation did not lead to the negotiation of the Chocó-EFZ. According to him and to the government representatives what triggered the process of the Chocó-EFZ was an event in 2007 when a tuna vessel encroached on the artisanal fishing grounds. It was not the encroachment *per se* that triggered the process but the irregular release of the vessel a few hours later when the port

authorities received a call from the national government arguing that the vessel had not broken any regulations. In the words of one of the government representatives:

Then the fight started because a seiner was caught at 6 NM from Bahía Solano. [The vessel] was in inshore waters according to the straight baseline that the Army has established [...] however the law was not applied because [seiners] found a legal way to argue that they weren't on artisanal fishing grounds [...] That's my conclusion, and then the fight starts looking for regulation so that the seiners will respect the artisanal's fishing grounds. (Government officer interview #4)

In 2012, an article in a Colombian newspaper on the conflicts between the artisanal fishers from Bahía and the industrial fisheries (Gutiérrez & Ianinni, 2012), one person interviewed by the newspaper stated that after the tuna vessel was released (the incident that triggered the Chocó-EFZ process), “the war broke out”. Another argued that, “there is a mafia in [the capital city] that issues [the licenses to the foreign and domestic industrial fleet] and that's why [the industrial sector is] winning the fight ... look what happened with the Nazca [the tuna vessel involved in the incident]” (Gutiérrez & Ianinni, 2012). The ANDI (seiners' association) spokesperson did not mention this incident but stated instead that the process started because of the artisanal sector's complaint to the Ministry of Agriculture about conflicts not only with seiners, but also with shrimpers, and “white fishing” boats [“white fish” includes sharks (Carcharhinidae, Sphyrnidae, Alopiidae), dolphinfish (Coryphaenidae), groupers (Serranidae), and brotula (Ophidiidae) (INPA, 2000; Navia & Mejía-Falla, 2011)]. An NGO member, with close ties to the GIC-PA, wondered why, if conflicts had occurred since the late 1990s, the Chocó-EFZ was not established until 2008. From his point of view, the Chocó-EFZ resulted because “someone who [was] in power at that moment had the idea [of the EFZ] maybe as a

strategy to have a presence in the area again” (NGO researcher, Interview #1). The ACODIARPE (shrimpers’ organization) representative did not know what had triggered the process but said that the goal of the Chocó-EFZ was to protect fish species. He argued that there was no need to protect any species in the area and that the most important issue for artisanal fishers was fish trading rather than protecting the fishing resources. ?

The career-history interviews confirmed that there has been a history of interactions with the industrial sector. Fishers indicated that interactions with both shrimpers (domestic fleet) and tuna vessels (foreign fleet) in inshore waters had occurred in the area since the 1950s (although seiners started fishing in offshore waters a few years later until 2000 when they went back to inshore waters). The industrial fishers would provide fish, shrimp, and fuel and locals would give vegetables, fruits, and/or fish. Conflicts with shrimpers (domestic vessels) became more common in the late 1990s, and with seiners (domestic and foreign vessels) in the early 2000s inside and outside the Chocó-EFZ area (Figure 3.2). Conflicts with shrimpers involved gear conflicts in coastal waters (longlines are dragged away) and the capture of longline key fish species as shrimpers’ bycatch. These conflicts occurred more frequently between August and October, which is the high season for longliners and for the deep shrimp fishery. Conflicts with seiners consisted of competition for tuna, especially during May and June, which is the high season for the artisanal sector, characterized by high volumes of tuna and other handline resources in the area. Only two fishers (one from each community) reported cases of seiners fishing in coastal waters. One of them said that the vessel had taken away a floating device that the artisanal fisher (handliner) was using to mark a fishing ground to which he planned to return later in the night in *Cabo Marzo* (Figure 3.2). Some fishers also commented that in

some cases small speed boats that herd the tuna toward the seiners would get very close to shore. All interactions were reported to have happened before the establishment of the Chocó-EFZ (Figure 3.2).

Five fishers from Huina (of 11) were familiar with the existence of the Chocó-EFZ and three of them said that the conflicts with the industrial sector had triggered the process; the other two were not sure. In Bahía, only two (of 12) were familiar with the existence of the zone and thought that conflicts had led to the establishment of the Chocó-EFZ. None of them mentioned the event with the tuna vessel in 2007.

3.4.1.2. Initialization, negotiations, and preparation: Who was involved in initiating and negotiating the Chocó-EFZ, and how did these interactions influence its present form?

Combining stages 2 (inspiration and conception), 3 (initialization and communication) and 4 (participation and preparation), this section first examines who was and who was not involved in initiating, communicating, and participating in the negotiations that led to the implementation of the Chocó-EFZ. It also explores how negotiations influenced the present form of the Chocó-EFZ (preparation phase).

The interviews indicated that the Bahía representative was the main person responsible for initiating the process that actually led to the establishment of the Chocó-EFZ. In the early 2000s, as a fish trader, he had tried to find solutions to the gear conflicts between the longliners working for him and shrimpers. However, he did not initially set out to establish an EFZ. The fish trader went to the port authorities with the idea that they should obligate the shrimp skippers to pay the longliners for the vessels they had damaged. This proposal failed and conflicts continued until around 2003 when guerrillas

threatened the shrimpers (the reasons for this are not clear) keeping them out of the area for 2-3 years. Between 2006 and 2008, the fish trader had the opportunity to attend public meetings related to marine fisheries outside of Bahía. His trips were sponsored by friends from Bahía who were public employees and who supported his efforts to disclose the ongoing conflicts between sectors in Chocó. One of the public meetings that he attended took place in Buenaventura in early April, 2008. During this meeting the Bahía fish trader told the audience, which included the Vice Minister of Agriculture as well as artisanal and industrial fishers, that the industrial vessels were destroying the area, stealing the resource, and destroying fishing gears.

According to him, all the artisanal fishers reacted and said that these conflicts were also occurring around the Buenaventura area (central Pacific coast area). This collective reaction caught the attention of the authorities and set the stage for the following meetings during which stakeholders specifically discussed the conflicts between fishing sectors in Chocó. The interviews indicate that in early and middle period of the discussions the fish trader was invisible to most people. In fact he stated that he would only communicate with his personal network, which included the fishers working for him, his friends who were public employees, and a few people interested in the process. Over time he became recognized locally as a person knowledgeable about fishing conflicts and as a person with the skills needed to negotiate with the industrial sector, which was considered by many to be the “powerful sector.” He was officially elected by local fishers as their representative for the Chocó-EFZ during a public meeting in 2008 after the public meeting in Buenaventura and before the zone was established.

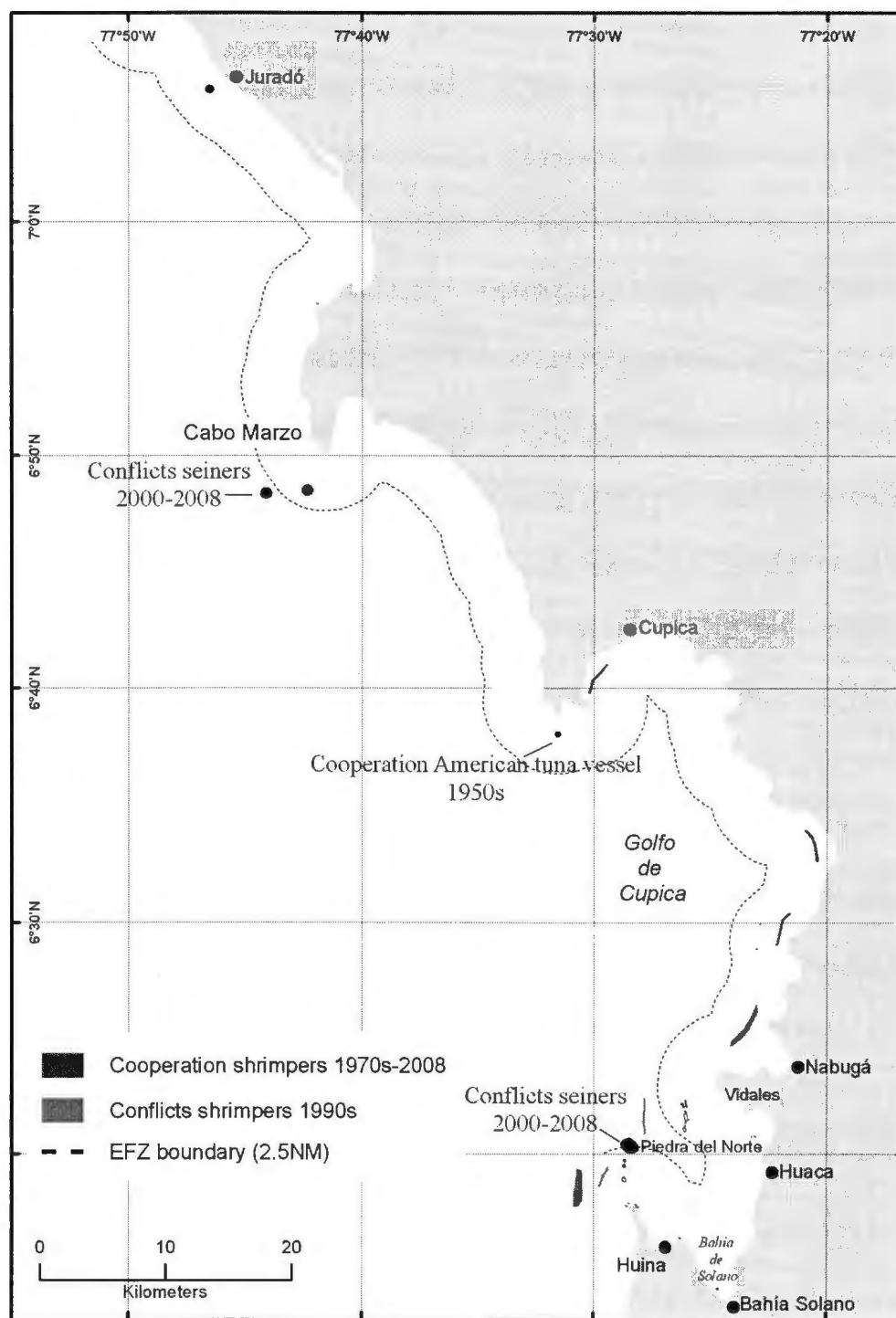


Figure 3.2. Interactions between industrial vessels and artisanal fishers

The representatives of the industrial fishery questioned his involvement and argued that this Bahía spokesperson was not representing the community but rather defending his own interests. Some interviewees affiliated with the artisanal sector also pointed to this situation but added that his actions were positive for the artisanal sector. A private meeting took place in a mainland city in late April 2008 (where a forum on freshwater and marine fisheries was taking place) and was attended by the representatives of Bahía, ANDI, and the fisheries authorities.

According to the Bahía spokesperson, the ANDI representative was not acting as the spokesperson for the tuna sector but for the industrial fishery as a whole. He also said that by then he could not see any difference between shrimpers and seiners in terms of institutions. After a conflicted conversation, the stakeholders agreed to set a border of 5 NM from shore within which industrial vessels would not fish. The third meeting was in Bogotá, in May 2008, and was attended by the same representatives and also by the ACODIARPE spokesperson. This spokesperson was new not only to the negotiations but also as a representative of his organization. The goal of this meeting was to make the final decision about the configuration of the area from which the industrial sector would be excluded. The ACODIARPE spokesperson did not agree with the 5 NM pre-agreement, and argued that the ANDI representative had made decisions without taking into account the negative effect of the zone on the shrimp fishery. This situation, according to some interviewees, was evidence of conflicts within the industrial fishery. The ACODIARPE spokesperson said they would establish direct communication with the Bahía spokesperson to try to reach a different agreement. However, by the time of the meeting in Bogotá, the zone was accepted and discussions focused on the geographical

configuration, regulations, and the composition of the verification committee tasked with monitoring the EFZ. It was decided that the committee would be composed of a member of the fisheries authorities, two representatives of the artisanal fishery, and two representatives of the industrial fishery.

Regarding the participation of local fishers in the feedback meetings in Bahía in 2008, interviews with fishers from Bahía and Huina indicated that only a few of them attended these meetings. Most of the fishers showed scepticism about government initiatives related to fisheries such as the Chocó-EFZ. Most of the interviewees were more than 50 years old and at some point in their careers they had been part of government programs that aimed to improve fisheries infrastructure. From their point of view, these programs had failed due to government corruption and corruption in the community. Frustration and lack of trust in government and community institutions had kept these interviewees away from any new initiative and consequently away from attending meetings, including those related to the Chocó-EFZ.

Interviews with fishers also showed that fishers from communities other than Bahía might not have known what was happening in Bahía. The fisher who was living in the northern town said he did not know about the Chocó-EFZ because in his community people did not know what was going on in Bahía. As a result, he did not participate in feedback meetings. In Huina, given its proximity to Bahía, fishers were familiar with what was happening in Bahía. They were also aware of the Chocó-EFZ because Huina fishers had participated in the discussions about conflicts with the industrial fishery in the past and because communication was more effective among local inhabitants because of

the small size of the village. It is worth noting that fishers were aware of the nets ban but did not make any connection between the ban and the Chocó-EFZ.

Regarding the participation of other stakeholders, the Resolución also included the mayors of Bahía and Juradó, the Community Council, and the GIC-PA. All of them sent letters -but separately- to the fisheries authorities throughout 2008. Although some of the key informants affiliated with the artisanal sector acknowledged the participation of the mayors, it is not clear how the communication between the mayors, the fishers, and the representative of Bahía operated prior to and during the negotiations. Regarding the role of the Community Council as leader of the process, none of the interviewees' accounts indicated that the Council had actively participated in the process of establishing the Chocó-EFZ. On the contrary, some of the fishers and key informants affiliated with the artisanal sector, including the Council member who participated in this project, stated that during the period prior to 2008, the Council members had been involved in cases of corruption. During the time of the interviews (2010) the new members were trying to restore the Council's reputation. One of the NGO researchers stated that the government, through the Resolución, pretended to demonstrate that the Chocó-EFZ had resulted from a bottom-up initiative but this was not true. Rather, the zone had been a top-down initiative but it was convenient to state that community members and institutions had played a role. In contrast, one of the government officers stated that the Chocó-EFZ was worth highlighting because it was the first process achieved by consensus and assessed technically (referring to SQUALUS research).

Lastly, the interviews suggest that the GIC-PA did not participate as an organization in the negotiations leading up to the establishment of the EFZ because it was dormant

during this period. Rather, it was individual fishers who had participated in previous discussions about conflicts between sectors (among other issues) while the GIC-PA was active (1998-2004), and who contributed to the discussions about the zone during the feedback meetings in Bahía (2008). The GIC-PA and the spokesperson of Bahía started separate initiatives around the same time (early 2000s) trying to find solutions to the conflicts between sectors. They never worked together (and did not know what the other was doing) because the spokesperson would not trust the NGO that was leading the GIC-PA. He said that the projects were not adjusted to fishers' needs but to what the NGO wanted to show to the scientific community.

In summary, the interviews with key informants provided some information on the actions of the mayors, Community Council, and GIC-PA, but they did not support the claims made in the Resolución about how the EFZ came about. Interviews also did not fully explain whether artisanal stakeholders came together in order to achieve the Chocó-EFZ; apparently, they acted independently. Other sources of information such as minutes of the meetings would have provided insights; however, it was not possible to access to these because none of the interviewees had copies or knew where the minutes were stored. This might explain why the last meetings during 2012 have been recorded on a digital voice-recorder by people affiliated with the artisanal sector.

Findings related to the preparation phase (stage 4) indicate that the present form of the Chocó-EFZ was discussed during the three private meetings and that the final decision on coverage and borders was made by the government. The key informants familiar with the research conducted by the GIC-PA mentioned that during a workshop in 1999, in which ACODIARPE participated, researchers charted potential exclusive zones

for artisanal fishers based on fishers' knowledge. The potential EFZs incorporated the Golfo de Cupica (up to 24NM), which is partially covered by the Chocó-EFZ; they also incorporated southern areas of the Chocó coast not currently covered by the Chocó-EFZ, but did not include the northern area (Juradó) currently covered by the Chocó-EFZ (Matallana, 2000). However, the zones proposed by the GIC-PA in 1999, were not ratified by the government and apparently, these studies were never used during the negotiation of the boundaries of the Chocó-EFZ. Furthermore, the ACODIARPE representative did not seem to acknowledge the GIC-PA workshops that took place in 1999.

Interviewees described the proposals that had been submitted by the different sectors. Regarding the 2.5 NM, some interviewees stated that, although stakeholders had agreed to set a border of 5 NM, in the following meeting negotiations changed, and the Bahía representative requested between 5 and 7 NM and the ANDI spokesperson suggested 1 NM. Eventually, the government made the decision. According to a government representative:

Negotiations started with 5 NM but because of the pressure at the meeting it was set at 2.5 NM; there wasn't any technical or legal support for the 2.5 NM [boundary]. (Government officer interview #3)

On the question of why the northern boundary of the Chocó-EFZ was set at Punta Ardita and the southern boundary at Punta Solano, there was an array of answers from the different key informants. A government officer indicated that it could not be larger because, on the one hand, effective surveillance and enforcement would not be feasible,

and, on the other hand, the government “could not give away [to the communities a larger] area all at once” (Government officer interview #7). The Community Council member indicated that it was easier to negotiate an exclusive zone in an area where conflicts were more manageable (compared with southern areas) and that the plan was to extend the Chocó-EFZ to adjacent areas. Another government officer indicated that the Chocó-EFZ included the highly productive area where encounters with tuna vessels occurred more frequently than in southern areas. NGO researchers said that Bahía was the administrative centre of the northern coast and historically, it had captured the attention of governmental institutions. Another explanation, also by an NGO researcher, was that these boundaries reflected the influence of the Bahía spokesperson and were linked to his economic activity.

On the question of why the Chocó-EFZ was initially established for the period of only one year (2008-2009) and later extended for a second year (2009-2010) and then for an additional two years (2010-2012), one informant from the artisanal sector answered that in 2008 it was proposed that the Chocó-EFZ would last two years but only one year was accepted. In 2010, the representatives decided that one year was not enough for conducting research and so it was decided to sustain the Chocó-EFZ for two more years. The informant from the shrimp sector suggested that they had agreed on a short-term timeframe in order to prevent the closure from being implemented permanently. The tuna sector stated that it had been established for one year because it was a pilot project.

Regarding the term *exclusive zone*, the Bahía spokesperson said he did not use this term when he got involved in the process in 2008. He explained that the name was

recommended by a friend of his (an outsider and researcher), who knew about the exclusive zones implemented elsewhere in Colombia.

The exclusive zone for artisanal fishers originated because [a friend] told me “there are areas that can be named “exclusive zones for artisanal fishers” and there are three in Colombia” [...] I didn’t know that [...] and then I said, “this could be named like that” and that’s how the exclusive zone for artisanal fishers was born. (Bahía spokesperson interview #5)

The findings about the pre-implementation phase of the Chocó-EFZ show that sectors have different perceptions about conflicts. Interviewees affiliated with the artisanal sector and government were aware of the history of clashes between the artisanal and shrimp fisheries (since the late 1990s), and between the artisanal and tuna fisheries (since 2000). In contrast, the tuna sector spokesperson denied the existence of such conflicts and the shrimp sector representative (new to the process and as the representative of his organization) was not sure about conflicts and claimed that his organization was misinformed about the Chocó-EFZ.

Findings also show that the GIC-PA and the fish trader, in separate ways, made efforts to find solutions to the gear conflicts between the longliners and shrimpers; the fish trader would not join the GIC-PA because he did not trust the NGO that was leading it. The actions that the GIC-PA or the fish trader took in the late 1990s-2004, however, did not lead to the negotiations for the Chocó-EFZ. Rather, it was the encroachment by a tuna vessel on the artisanal fishing grounds in 2007 and the concerns about corruption related to the Chocó-EFZ associated with monitoring and enforcement that triggered the process that finally led to the creation of the Chocó-EFZ. It was after this incident that the fish trader (representing the artisanal sector), ANDI, ACODIARPE, and the fisheries

authorities got together in 2008 in order to discuss the conflicts between sectors in Chocó waters. Other stakeholders including the Community Council, mayors of Bahía and Juradó, and GIC-PA (as an active organization) contributed to the request for the Chocó-EFZ (according to the Resolución). However, the data from the interviews were not consistent with Resolución statements or fully explain how the communication was between stakeholders previous to and during the negotiations of the Chocó-EFZ.

Lastly, findings on the pre-implementation stage indicate that the GIC-PA was recognized by most of the key informants affiliated with the artisanal sector, while the fish trader, who would communicate only with his personal network, was invisible in early 2000s. Over time he gained recognition and in 2008 after the negotiations started, he officially became the spokesperson for the artisanal sector. The industrial sector representative accused him of using the Chocó-EFZ to protect his business interests, while the artisanal sector representatives stated that his actions were positive for the artisanal sector. The configuration of the Chocó-EFZ when it was established in 2008 was not the result of recommendations from a scientific assessment, consultations with fishermen or of a consensus between sectors. Rather it resulted from pressure exerted during meetings for which minutes were not accessible.

3.4.2. The post-implementation process of the Chocó-EFZ

This section uses stage 5 (reflection and adaptation) of the Chuenpagdee and Jentoft (2007) framework to analyze the interviewees' thoughts regarding the achievement of the goals of the Chocó-EFZ and other relevant topics. This section also explores how interviewees' opposition or support might shape the future of the Chocó-EFZ.

3.4.2.1 Mitigation of conflicts between artisanal and industrial fisheries

When asked whether the Chocó-EFZ was effective in mitigating the conflicts between artisanal and industrial fisheries, key informants affiliated with the artisanal sector and some fishers answered that shrimp fleets were not sighted as frequently in the area as they had been prior to the establishment of the Chocó-EFZ. Some of them were sceptical and stated that shrimpers might be fishing in areas away from Bahía where there is no surveillance.

When asked where the shrimpers had gone, some interviewees from the artisanal sector replied that they might be fishing in southern areas. If this is the case, the Chocó-EFZ might be causing increased fishing effort and conflicts in southern areas. However, the ACODIARPE representative said that shrimp vessels were anchored in Buenaventura's port because it was not profitable to go fishing elsewhere. Consequently, he claimed, the Chocó-EFZ was leading to unemployment among workers in the shrimp fishery, including in shrimp processing. He added that the Chocó-EFZ's negative impact on their sector had been augmented by the fact that they were not allowed to catch a resource that is not caught by local fishers because they do not have the gear; therefore, the resource and the economic benefits were being wasted. During a meeting after the Chocó-EFZ implementation, the fishers' spokesperson stated that, although local fishers do not catch shrimp, it was an important resource because it was a key prey for Pacific bearded brotula (*Brotula clarkae*) (hereafter brotula), an important commercial species for longliners. The ACODIARPE's representative agreed to conduct research on this topic (ICA, 2009a, p. 5). Navia et al. (2010) confirmed this fact, yet, the shrimp sector is still demanding more research.

As for tuna vessels, artisanal fishers and key informants from Bahía indicated that the Chocó-EFZ would need to be larger (up to 12 NM) in order to eliminate resource competition with tuna vessels since seiners had always fished in the first 5 or 6 NM and would come closer to the shoreline (around 2.5 NM) when chasing tuna schools. Some fishers stated that the power imbalance between the artisanal and industrial sectors, especially with the tuna sector, was a major obstacle to the expansion of the Chocó-EFZ. One fisher said:

They [industrial vessels] won't accept that more ground is taken away from them or that the zone is permanent. Money is what rules here and there [...] who is part of the industrial sector? The senators, industry's partners who make a lot of money in order to build their industry. (Bahía, Male Fisher Interview #1)

A key informant and a fisher used a metaphor to express their perceptions of the negotiations with the seiners. They said that it was a, “tough fight, it’s the egg against the rock;” the former referring to the artisanal sector and the latter to the tuna sector. In 2011, during an informal meeting called by a sport fisher, attendees were planning to “ambush” a tuna vessel while it was anchored in Bahía getting its paperwork checked by Colombian authorities (as most are foreign flagged). The goal was to attract the regional and national authorities’ attention to the issue of conflict with the tuna seiners. As the meeting developed the attendees decided to call for a meeting to be attended not only by fisheries authorities and other members of the GIC-PA but also by representatives of other community institutions (church, coastguards, schools, and police, among others). Other topics to discuss included lack of enforcement of the norm that states that industrial

vessels must employ local fishers and access to the Vessel Monitoring System (VMS) data in order to allow the artisanal sector to track vessels' trips.

The ANDI representative confirmed that tuna vessels fish in the first 5 or 6 NM but denied that they fish close to the 2.5 NM-boundary because nets would get entangled in rocky areas. From his point of view, the Chocó-EFZ design was appropriate to prove that seiners do not fish inside the Chocó-EFZ and therefore there is no competition for tuna with artisanal fishers. He added that a zone 5 or 7 NM wide was "absurd". From his perspective, the Chocó-EFZ design is appropriate to prevent conflicts with seiners and should not be modified.

The artisanal sector representatives argued that the Chocó-EFZ would not be necessary if the Resolución 1856 (INCODER, 2004) was fixed. The resolution established that the shallow water shrimp and small pelagic fisheries are allowed between miles 1 and 12; deep water shrimp and other pelagic fisheries between 12 and 30 miles; and other pelagic and tuna fisheries between 30 miles and the edge of Colombian waters. The big shortcoming of the resolution is that in a separate article it states that the industrial fishery is prohibited within the first mile. The artisanal sector argued that this article contradicts all previous zoning and excludes the industrial fisheries only from the first nautical mile. The artisanal sector brought this topic to the negotiation table during a meeting about this resolution (not about the Chocó-EFZ) but the fisheries authorities stated that in order to modify the resolution research on species distribution and oceanographic conditions were needed (ICA, 2009b, p. 3).

3.4.2.2. Participation of artisanal fishers in co-management

The Resolución states that the GIC-PA argued that it was advisable to establish an exclusive zone in Northern Chocó to encourage the artisanal fishers to participate in co-management (ICA, 2008). However, most of the key informants did not have a clear idea about what co-management was about or about the relationship between co-management and the Chocó-EFZ. The Bahía representative stated that co-management had been a topic mentioned in documents but was not discussed during meetings. Discussions with key informants about co-management focused on the prohibition of the use of gillnets and beach seines within the Chocó-EFZ and on the concept of responsible fisheries. One of the informants affiliated with the artisanal sector said that the industrial sector had demanded the exclusion of gillnets from the Chocó-EFZ. Other interviewees, also informants affiliated with the artisanal sector, stated that the exclusion of gillnets was an initiative proposed by the artisanal fishing sector.

Most of the key informants from government and from the artisanal sector indicated that the gear exchange project, which was implemented in 2011, was a way to ensure that nets would be eliminated from the Chocó-EFZ. Nets would be exchanged for other fishing gears for the construction of longlines and handlines (e.g. different types of hooks, ropes, or nylon), as well as cast nets, portable coolers, and knives (FONADE, 2010). However, despite government efforts and fishers' awareness of the damage caused by nets, interviewed artisanal fishers indicated that some of them refused to exchange their nets and were still using them inside the Chocó-EFZ. One of the NGO researchers stated that giving up gillnets was part of a larger movement related to Ley (Law) 70 (1993). Ley 70 recognized the entitlement of black communities in the Pacific Basin to traditional territories but this

came with responsibility for the management of the resources within those territories. It also included an obligation to prevent the use of harmful practices such as the use of nets. It is worth noting, however, that Ley 70 (1993) does not include the sea in these territories. The Community Council member stated that during the time of the interviews (2010) the Council, with the support of lawyers, was demanding the government include the sea as part of the black communities' territories. From the Council member's point of view, the Chocó-EFZ could be extended to at least 5 NM in order to protect these waters. In addition to biological, ecological, and socioeconomic reasons, the third study conducted after the Chocó-EFZ implementation included legal and cultural arguments in their demand for the permanent establishment of the Chocó-EFZ (GIC-PA, 2012). They stated that the Chocó-EFZ was protecting the territories and the traditional fisheries knowledge of black communities (GIC-PA, 2012).

One of the NGO researchers interviewed for the study recognized that enforcement had not been easy and suggested that the gear exchange project needed to be complemented with fines, awareness campaigns, and economic incentives, for instance, increasing the price of the species caught with hooks. Efforts to ensure a better price for fish caught with hooks were already being undertaken. Another NGO researcher, also interviewed, had been holding workshops in Bahía to discuss with fishers the meaning of responsible fisheries. One of the workshops (2011) was attended and co-funded by a restaurant (located in the capital city) that would only buy fish from artisanal fishers. Since 2010 some Bahía fishers' organizations have been selling handline species (fresh fish) to the restaurant including snapper (*Lutjanus* spp.), rainbow runner (*Elagatis*

bipinnulata), longfin yellowtail (*Seriola rivoliana*), and tuna (mainly *Thunnus albacares*), which comprises more than half of the volume. The researcher explained:

[...] when [the attendees to the workshop] introduced themselves as fishers [who are] naturally responsible, well, I asked “what do responsible fisheries mean to you all? How are you fishing? What are you doing?” [...] We discussed for about one day how they understood this and how we’d explain it to the customers at [the restaurant]. (NGO researcher interview # 1)

Another key informant from the artisanal sector said that while the GIC-PA was active (1998-2004), many of the artisanal fishers had discussed the need to manage their area in a sustainable and profitable manner by fishing less and selling the fish at higher value. He said:

I think that [...] an [environmentally friendly] market will never ask you for large volumes [...] now [the fishers’ organizations] are selling to [the restaurant] which is a very good client. [The restaurant] says “I need 500 kg a week and I will pay you a good price” then I say the 500 kg can be split into 4 [the number of organizations] so each one catches 120 kg a week. If I catch an additional ton it will be worth less than the 120 kg. Then the fisher is becoming aware that it’s better to catch the 120 kg and we’ll have [fish] for a long time. (Fishers’ organization interview # 8)

Interviews with fishers showed that, although they were aware of the damage caused by the nets, there were different situations that prevented some of the gillnetters from giving up this gear or made them less willing to do so after the implementation of the Chocó-EFZ. Some fishers had expected to get boats and motors in exchange for their nets but government argued that boats and motors might be used in activities other than fishing and offered hooks and other fishing technology (battery, containers, lamps, among others). Fishers were not satisfied with this agreement. The main issue was that some fishers owned a large number of gillnets and thought that if they did not receive high-

value gears such as motors or boats in exchange, they would receive too many hooks in order to compensate for the cost of their gillnets. Thus, they would not know what to do with those unused hooks; fishers were aware that reselling them would be illegal. Other fishers argued that the longline fishery was no longer profitable because low prices no longer compensated for the effort involved with longlining. One said that it was not fair that the industrial fishers were allowed to use nets while locals were not but said he was willing to give up gillnetting in key rocky areas to protect valuable species [e.g. pacific red snapper (*Lutjanus peru*)]. He also argued that beach seines were not harmful as they were used only on beaches and recommended setting 3" as the minimum mesh size. The fisher from the northern town did not know about the gear exchange project. According to the research assistant, due to budget constraints fishery officers had not visited the rest of the towns located within the Chocó-EFZ in order to tell these fishers about the establishment of the zone and the regulations. This situation shows efforts concentrate in the Bahía area and there are problems with communication and enforcement in most towns within the Chocó-EFZ.

In Huina in early 2000s, a fisher started making efforts in order to promote sustainable fisheries in his community. None of the key informants seemed to be aware of this. First, this fisher sent a letter to the fisheries authorities providing details on where and how gillnets and beach seines were being used by local artisanal fishers. He also described the impact of scuba divers who were fishing for commercial purposes as opposed to recreational purposes and contributing to over-exploitation and causing conflicts with local handliners. Finally, this fisher expressed concern about the impact of the industrial fishery. He called for the implementation of an exclusive zone for artisanal

fishers, sport fishers, and recreational diving, (Huina fisher, letter to the fisheries authorities, n.d.; Appendix I). Apparently, he never received a response from the fisheries authorities. The same fisher started to promote banning the use of gillnets in rocky areas among Huina fishers in 2001; by 2010 only one (out of 5 gillnetters) was still using gillnets, but this fisher had moved out of the Chocó-EFZ and was fishing on the surface rather than the bottom in order to minimize negative impacts (see Figure 4.3. in Chapter 4). This gillnetter stated that the short term agreement was not to use gillnets as a deep water gear (as it was used for catching red snapper) and, in the longer term, that all fishers would completely give up gillnets. In 2011 all gillnetters in Huina received hooks in exchange for their nets. The fisher who was using the surface gillnet built a *colgante* (a modification to longline, see Table 4.1 in Chapter 4.4 for further detail on *colgante* design) (T. Villalba, personal communication, November 21, 2011). Beach seines however, were still being used in Huina, some by fishing and non-fishing families that would share the catch. Another beach seine belonged to a retired fisher who rented the gear to a group of young fishers; thus he was still making a living from the beach seine. The fisher who promoted the ban argued that beach seines were being used in rocky areas, destroying habitats, and catching small size fish. He explained that beach seines were used in combination with diving to minimize gear damage.

According to the ACODIARPE spokesperson, the regulation of gillnets is not enough to protect fish resources. He argued that a longline with 7,000 hooks could impact fish stocks as much as nets and therefore the number of hooks should also be regulated. Furthermore, he stated that fishers using these gears and fishing in offshore waters (similar to the “white fishing” industrial fishers) should not be called artisanal fishers.

3.4.2.3. Support for and constraints to the continuation of the Chocó-EFZ

When asked about the continuation of the Chocó-EFZ, key informants had different expectations. Interviewees affiliated with the artisanal sector indicated that, with more research, involvement of artisanal fishers, the support of the GIC-PA and of organizations from the other coastal provinces, and with the involvement of the local and national governments, they expected the Chocó-EFZ to be extended further seaward (up to 7 NM) and southward (including adjacent areas or even along all of the Pacific Coast). They also expected the Chocó-EFZ to become permanent or at least to remain in place for four more years.

One of the government officers and an NGO researcher listed research on the effectiveness of the Chocó-EFZ and improved management as the main requirements for the continuation of the Chocó-EFZ. Identified research needs included: a) implementing a fishery monitoring program to assess the effect of the Chocó-EFZ on the fish size and catch rate trends; b) constructing indicators to measure changes in fishing practices (e.g. decrease of gillnet panels) and changes in the wellbeing of local communities; c) identifying key juvenile and larval areas within the Chocó-EFZ; d) implementing a strategy of control and surveillance including a greater commitment from the coastguard to control fishing activities (the coastguard is mainly focused on controlling drug trafficking); and, e) assessing how frequently industrial vessels are sighted and where exactly they are fishing. The GIC-PA (2012) addressed some of these research needs related to the artisanal sector. They suggested positive outcomes of the Chocó-EFZ in terms of increased landings for artisanal fishers, including of some of the species that would have been impacted by the industrial fishery including brotula, roosters

(*Hyporthodus acanthistius*, *Epinephelus cifuentesi*, *Paralabrax* spp. and other members of the Serranidae family), and tuna (*Thunnus albacares*) (GIC-PA, 2012). The study also showed increased fishers' incomes and improved protection of traditional fishing grounds (GIC-PA, 2012). They highlighted the potential ecological benefits of the Chocó-EFZ including protection of nursery areas, recovery of the marine ecosystems, and indication of fish spillover (GIC-PA, 2012).

The NGO researcher added that, through genetic studies, his organization was trying to find out the relationship between the tuna captured by the industrial fleet and by artisanal fishers trying to clarify whether they are catching the same stock. But receiving permission from the tuna sector to collect tissue samples on board was a difficult task. In fact, the ANDI spokesperson showed no interest in allowing any monitoring other than that carried out by scientific observers from the Inter-American-Tropical-Tuna-Commission (IATTC). He argued that data on seiners' trips (e.g. where the seiners have fished) collected by the IATTC was enough and anyone could access it. He also mentioned that the tuna sector expected research to confirm that seiners did not interfere with the artisanal fishery. From his point of view, research conducted inside the 2.5 NM would confirm that seiners do not fish within the Chocó-EFZ and therefore seiners and artisanal fishers do not compete for the tuna resource.

Another interviewee from government identified field of research important to the future included the assessment of the spillover effect of the Chocó-EFZ for the tuna stock. If this effect was proven, some argued, then Colombia would be in a position to negotiate directly with the IATTC:

If Colombia fully understands and we [Government] [...] determine that the [Chocó-EFZ] is a special area [...] to guarantee the recruitment [of tuna] for their [industrial] fishing grounds, [then] Colombia would have the power to negotiate with the [IATTC] and we would automatically get more support to make management decisions regarding the [Chocó-EFZ] and [we could] extend it [further seaward]. (Government officer interview # 3)

Regarding research on the shrimp fishery, this government officer said that it was necessary to calculate the area of effective trawling within the Chocó-EFZ, that is, excluding the areas that vessels might use for going from one ground to another. If the effective trawling area used by shrimp vessels was not greater than 5% of all the area covered by the Chocó-EFZ, then the shrimpers would be definitely excluded from the Chocó-EFZ because, from his point of view, 5% would be an insignificant portion for shrimpers. GIC-PA (2012) suggested that the Chocó-EFZ was not affecting in a significant way the interests of other industrial fisheries, referring to both tuna and shrimp fisheries. Another government officer argued that there should not be any bias towards the artisanal sector and all fisheries should be systematically studied. The ACODIARPE representative stated that any measure taken by the government must aim at protecting species but not at allocating privileges to one sector while harming another sector.

In 2012, just days before a decision was made regarding the Chocó-EFZ, the Bahía representative sent a letter to the fisheries authorities in which he cited a study conducted by INVEMAR (a governmental research agency). Among other aspects of the fishery, this study examined the current exploitation status of deep-water shrimp on the Pacific coast and gathered information on reproductive cycles that would support conservation measures (Rueda, 2010). In the letter, the spokesperson argued that Rueda (2010) had

found that the Chocó-EFZ might be protecting nursery grounds for shrimp. Based on this study, Navia et al., (2010), and the GIC-PA (2012), and Bahía spokesperson requested the permanent implementation of the Chocó-EFZ. However, this did not happen and the Chocó-EFZ is still a temporary measure (AUNAP, 2012). An ongoing project also by INVEMAR is looking at catch and bycatch composition of the deep-water shrimp fishery inside the Chocó-EFZ as well as on the Pacific coast (INVEMAR, 2012). During a presentation of preliminary results from this project in Bahía, one of the attendees (all of them affiliated with the artisanal sector) argued that the project should be also looking at brotula feeding habits in order to confirm that brotula feed upon shrimp. This would be an important finding considering that brotula is a key resource for artisanal longliners within the Chocó-EFZ (Attendee #1, personal communication, November 26, 2012). Another attendee said that the artisanal sector rejected this particular project because it might suggest that the shrimp resource inside the Chocó-EFZ is not being exploited by artisanal fishers thereby opening the door for shrimp harvesters to fish inside the Chocó-EFZ (Attendee #2, personal communication, November 26, 2012).

Interviewees' responses related to the future of the Chocó-EFZ suggested there was disagreement among key informants about the term *exclusive zone*. One government representative stated that the nomenclature exclusive zone was built into the law and that the law itself would have to be modified in order to modify the term. The other officer indicated that the term was not part of Colombian law and suggested adopting the term "multiple-use area under fishery management". This change would mean that there would not be any exclusive access for any fishing sector. Similarly, the tuna sector representative stated:

During the last meeting [2010] it was considered that it's not appropriate to talk about an 'exclusive zone for the artisanal fishery' but rather about a 'special zone for the management of fishing resources' [...] because the sea can't be split up for one or another activity. Everybody has the right to carry out their activity with no interference. (ANDI representative interview #2)

The ACODIARPE spokesperson argued that the most important issue for artisanal fishers was fish trading and that from that perspective there could not be any exclusive access. He said:

[The Resolución] is ambiguous because on one side it's said that it's for conservation but when one enters into the discussion with the people from [Bahía] one realizes that [the Resolución] is about trading and if that's the case then there can't be exclusivity and one starts to question what this is about [...] if that goes on like that, believe me the lawsuits may be serious. (ACODIARPE representative interview # 11)

In contrast, two interviewees involved with the artisanal fishery believed that the adjacent marine waters and the resources belong to the local communities and should not be damaged or taken away by the industrial fishery. They mentioned that the sea should be part of the territories that were given to the communities through Ley 70 (1993).

The research findings on the post-implementation stage of the Chocó-EFZ show that, from the point of view of the artisanal sector, the zone design seems to be appropriate for mitigating conflicts with shrimpers but not with seiners. In contrast, the ACODIARPE representative argued that the Chocó-EFZ is jeopardizing employment among workers in the shrimp fishery, including in shrimp processing. For the ANDI representative, the Chocó-EFZ design was appropriate to prove that within the first 2.5 NM seiners and artisanal fishers do not compete for the tuna resource. The tuna sector is perceived by the artisanal sector as a powerful sector that would control the future of the

Chocó-EFZ. This led some stakeholders to suggest violent ways to attract the regional and national authorities' attention to the issue of conflict with the tuna seiners.

Findings also show that there was no consensus among interviewees regarding the relationship between the Chocó-EFZ and co-management. Discussions about the different reasons that prevented some of the gillnetters from giving up this gear, regulating the use of longlines (claimed by ACODIARPE representative), and understanding what is involved in being a responsible fisher (promoted by NGOs) seem to be steps taken after the Chocó-EFZ implementation toward the participation of local fishers in protecting their resources. In Huina the existence of a local, informal community-based management regime seemed to be effective when excluding gillnets but not beach seines.

Except for the tuna sector, which considers that the Chocó-EFZ design is appropriate, there was consensus among key informants about the need to conduct assessments in order to determine the future of the Chocó-EFZ. Nevertheless, all scientific assessments conducted since the establishment of the Chocó-EFZ have been considered to be insufficient by stakeholders for deciding its future. None of the research designs have resulted from a consensus between sectors (shrimp and artisanal sectors) but each sector, through a research agency (either governmental or non-governmental), has developed its own project. Thus, all sectors perceive a bias in the research toward the other sector. This lack of consensus and trust has kept sectors demanding more research in order to make a final decision regarding the timeframe and configuration of the Chocó-EFZ.

3.5. Discussion

This chapter has shown how the complexity of the conditions and the diversity of stakeholders shaped the way that the pre- and post-implementation processes associated with the Chocó-EFZ unfolded. The development of the Chocó-EFZ also was a path dependent process, as both process and progress evolved as the exclusive zone was negotiated and implemented (Chuenpagdee and Jentoft, 2007).

The discussion section is divided into two sections: pre-implementation and post-implementation process of the Chocó-EFZ. The first section bears on questions about the pre-implementation processes that led to the establishment of the Chocó-EFZ including who initiated discussions, communicated and participated in the negotiations, and how these negotiations influenced the design of the Chocó-EFZ. The second section explores perceptions about the goals of the EFZ including whether it is achieving its goals regarding conflict mitigation and co-management, and what factors are likely to support and prevent the continuation of the Chocó-EFZ and shape the potential for future changes such as an expansion in the seaward boundary to 5NM or further offshore.

3.5.1. The pre-implementation process of the Chocó-EFZ

Conflict between sectors has been the main trigger for the establishment of EFZs elsewhere. For instance EFZs have been used to mitigate conflicts between large scale and small scale fishermen from particular areas (e.g. Castilla & Fernández, 1998; Gelcich et al., 2010); between locals and outsiders (e.g. Davis et al., 2006); between aboriginal and non-aboriginal groups (Bourillón-Moreno, 2002); and to prevent gear conflicts (LeDrew, 1988; Kaiser et al., 2000). Conflicts have also triggered the implementation of

co-management regimes (e.g. Sverdrup-Jensen & Nielsen, 1998; Nielsen et al., 2004; Chuenpagdee & Jentoft, 2007).

As with other EFZs, the Chocó-EFZ was established in order to mitigate conflicts between the artisanal and industrial fishing sectors. However, industrial and artisanal fisheries are not homogeneous and this case study has shown that conflicts between them, in terms of their origin and spatial and temporal scales, are also not homogenous. Consequently, each type of conflict added different elements to the pre-implementation processes associated with the Chocó-EFZ. One conflict involved industrial shrimpers and artisanal longliners and was primarily a gear conflict where shrimpers were damaging longline gear; another conflict involved the capture of longline key fish species as bycatch. Conflicts between shrimpers and longliners started in the late 1990s and precipitated negotiations between these two sectors facilitated by the GIC-PA, but these negotiations, which included discussions about an EFZ, did not lead to the establishment of the Chocó-EFZ and the conflicts continued. Conflicts between tuna seiners and handliners started after 2000, there is no evidence of negotiations resulting from these, but there is evidence that a specific event involving a tuna vessel in 2007 triggered the process that led to the implementation of the Chocó-EFZ.

This study found that involvement of shrimpers and seiners started at different points in time and under different circumstances. The ANDI (the tuna sector) got involved before the ACODIARPE (the shrimp sector) and it initially represented the industrial sector as a whole. In subsequent meetings however, it became evident that shrimpers' and seiners' interests and perceptions of the conflict varied. The ACODIARPE representative indicated that the shrimp sector had not been taken into account when the

ANDI, government and the artisanal sector agreed on the exclusive zone boundary, which would have a negative socio-economic impact on the shrimp sector. Since then, both the ACODIARPE and the ANDI representatives have attended the annual meetings during which decisions are made regarding the future of the Chocó-EFZ.

Studies on stakeholders' involvement in marine resource management (e.g. Renard, et al., 2001; Pomeroy & Rivera-Guieb, 2006; Pomeroy & Douvere, 2008) and in EFZs (Hart, 1998; Davis et al., 2006; LeDrew, 1988) support the importance of learning about the historical and cultural relationship between users and the resources; because this relationship influences the success of the marine spatial planning process (Pomeroy & Douvere 2008). Interviews indicated that the long-standing dependence of shrimpers on the resource (since the 1950s) has made it difficult to definitively exclude them from the Chocó-EFZ and this has shaped post-implementation negotiations related to the Chocó-EFZ. Interviewees from the industrial shrimp sector showed a strong opposition to the permanent establishment of the Chocó-EFZ. The most recent Resolución extended the Chocó-EFZ for only one more year (not two as with the previous one) and stated that before modifying the zone, it was necessary to fill in the information gaps regarding overlaps in fishing grounds for shrimpers and longliners (AUNAP, 2012). However, none of the studies looking at the deep water shrimp fishery (Rueda, 2010; INVEMAR, 2012) have satisfied the artisanal or the shrimp fishery and both keep demanding a more detailed research (e.g shrimp feeding habits, socioeconomic impact of the Chocó-EFZ on the shrimp sector).

The tuna sector has a recent history (post-2000) on inshore grounds. Despite its relatively recent arrival, however, this sector has substantially influenced the Chocó-EFZ

design, particularly in terms of the distance of the boundary from shore. The ANDI spokesperson argued that the 2.5NM boundary was appropriate since conflicts between seiners and artisanal fishers do not occur inside this boundary and dismissed extension as “absurd”. From the point of view of the artisanal sector, government corruption and corruption among tuna sector businessmen have shaped the Chocó-EFZ process. The tuna sector in Colombia can be described as an “organized interest group willing to invest in lobbying activity aimed at opposing [...] proposals that could negatively affect [them]” (Peña-Torres, 1997, p. 262). Peña-Torres (1997) explored how this lobbying activity, among other factors, has shaped the Chilean fishery regulations, causing inefficiency in the institutional arrangements associated with the Chilean marine industrial fisheries. This situation is also sometimes associated with corruption. As in the Pacific Islands region (Hanich and Tsamenyi, 2009), Colombia suffers from “political instability and significant weaknesses in [its] government and institutions. These [...] weaknesses combine to leave [the country] particularly vulnerable to corruption in the fisheries sector” (p.386). In fact, the level of corruption in Colombia has been ranked as high when compared with other countries (Kaufmann et al., 2009; Transparency International, 2011). The lobbying activity by the Colombian tuna sector and a possible “web of corrupt linkages” (Moorsom, 1984 p. 44) between politicians and businessmen could potentially explain the inaction on efforts to extend the seaward boundary of the Chocó-EFZ. This is also reflected in the fact that none of the Chocó-EFZ resolutions have specified the need to assess the tuna and artisanal fisheries in order to identify conflicts and modify the Chocó-EFZ as appropriate. This makes it impossible to regulate the industrial tuna fishery and assess the fishing dynamics outside the Chocó-EFZ unless parties voluntarily agree.

Chuenpagdee & Jentoft (2007) have argued that "... conflicts do not necessarily [...] cause a demand for co-management" (p. 660), but rather that someone must first define the conflict and then perceive that co-management can help to resolve such conflicts. In their research, Chuenpagdee & Jentoft (2007) found that, in partnerships or independently, government officers, international agencies, NGOs, and community members are among those initiating most co-management regimes. Some research on EFZs indicates that these have resulted from the modification of laws after complex institutional transformations (Bourillón-Moreno 2002; Gelcich et al. 2010). Other studies show that EFZs have resulted from agreements first reached by committees formed by representatives of different sectors and then implemented by the government (LeDrew 1988; Hart, 1998; Davis et al., 2006).

Based on the Resolución that established the Chocó-EFZ, the process of the Chocó-EFZ also has been linked to decisions made by a committee and to discussions about traditional rights for black communities that resulted from institutional transformations occurring in Colombia since the early 1990s (Ley 70, 1993). The Chocó-EFZ committee included representatives of the government, artisanal and industrial sectors, and request was made by institutional stakeholders such as mayors and the GIC-PA along with the Community Council, which is the black community's authority created by Ley 70 (1993). Interviews with key informants related to the Chocó-EFZ provided detailed information regarding who participated as well as their level of participation during the process.

First, findings showed that the mayors, the Community Council, and the GIC-PA participated separately and through letters rather than at the meetings where actual negotiations took place. There is no evidence of direct communication between them.

Furthermore, the Council did not have a good reputation among interviewees (informants and fishers) and the GIC-PA was dormant during the pre-implementation process. It was GIC-PA ex-members who were involved in the feedback meetings in Bahía. Interviews also revealed that during the negotiations the artisanal sector was represented by a fish trader, the Bahía spokesperson and he did not have any relationship with the institutions mentioned in the Resolución. This indicates that participation involved a committee and other stakeholders in different ways. Yet, the process was not widely understood among interviewees and only those participating in the meetings actually know how the Chocó-EFZ came to be.

In separate paths and years back before the idea of an exclusive zone took form, both the fish trader (eventually Bahía spokesperson) and the GIC-PA (while it was active 1998-2004) were aware of artisanal fishers concerns about gear conflicts with the shrimp fishery and the associated potential risk to their livelihoods. The fish trader and the GIC-PA were interested in resolving the problem, perceived that it was within their capacity to resolve it, found the required resources (support of other individuals and organizations), and sought to take control of the problem. All of these things are among the conditions needed to start the initiative (Chuenpagdee & Jentoft, 2007). But the way to communicate their ideas and to get the community involved was different. The GIC-PA was more effective at involving the community and effective communication is a key factor in developing initiatives since it gets people to identify the existence of a problem and gives them an opportunity to provide input into solutions (McCay, 2002; Chuenpagdee & Jentoft, 2007). The GIC-PA as a “multistakeholder organization” (McCay, 2002, p. 373) brought together fishers, processors, ice-makers, NGOs (with multidisciplinary teams),

government, and academic agencies related to the fisheries in northern Chocó. From the early stages of its creation, the GIC-PA identified the need for negotiations with the shrimp industry. They also held numerous meetings and workshops in order to develop an artisanal fisheries management plan that would address not only the effects of the shrimpers' damage to longlines but also the impact of trawlers on fish populations and issues of food security of local communities and initiated discussions about an exclusive fishing zone for artisanal fishers (Matallana, 2000; GIC-PA, 2001).

In contrast, when the fish trader (Bahía spokesperson) got involved with the conflicts after 2000, he limited his actions to the advocating on behalf of the group of fishers who were working with his business (a small group of longliners in Bahía), focused on a specific problem (the damage of longlines), and looked for help initially only from the Port Authorities. Years later his network expanded to include a few individuals affiliated with the artisanal sector interested in the process and the public employees who funded him to go to meetings. For many local people he was invisible at this stage of the process; he became visible years later through his participation in the public meetings after the negotiations that led to the EFZ started in 2008. He then became the official spokesperson for the artisanal sector. As with the development of some co-management initiatives (Chuenpagdee & Jentoft 2007) EFZ discussions had an informal beginning with confined communication that developed into more formal proceedings and settings with the trader playing a leadership role. Communication remained confined raising "suspicion among the uninvolved that the initiators may have hidden agendas" (Chuenpagdee & Jentoft, 2007, p. 659). In the Chocó-EFZ concerns about "hidden agendas" referred to the belief that the representative of the artisanal sector was

protecting his own interests rather than the community's. Although the fish trader/Bahía representative initiated the negotiations that actually led to the implementation of the Chocó-EFZ in 2008 and the GIC-PA was actually dormant when the zone was implemented, most key informants and fishers emphasized the GIC-PA's role in its establishment, not the role of the trader.

Both the actions of the GIC-PA and the Bahía trader/spokesperson related to mitigating conflicts with shrimpers stemmed to some degree from external forces. The creation of the GIC-PA was headed by an environmental NGO (social and natural scientists/outside). The spokesperson's background included superior formal education and work experience inside and outside of Bahía and related networks. Engagement with outside forces (even if different) gave them ideas about where and how to look for ways to resolve the gear conflicts with shrimpers. Partnerships between local communities and outside agencies (NGOs, universities, among others) have been identified as important factors when bringing in and formalizing new ideas regarding co-management and EFZs (Viswanathan et al., 2003; Chuenpagdee & Jentoft, 2007; Davis et al., 2006; Marín & Berkes, 2010).

3.5.2. The post-implementation process of the Chocó-EFZ

The establishment of EFZs might mitigate conflicts but there is no guarantee that the excluded sector will actually give up fishing on all of the grounds covered by EFZs. The likelihood of encroachment and thus the need to develop control and surveillance strategies are key elements of EFZ effectiveness (LeDrew, 1988; Hart, 1998; Bourillón-Moreno, 2002; Davis et al., 2006). Although fishers and key informants from the artisanal

sector indicated that the Chocó-EFZ had mitigated conflicts with shrimpers, ongoing encroachment in areas without surveillance was a concern among this group of interviewees. Regarding conflicts with seiners, interviewees from the artisanal sector perceived that the Chocó-EFZ was not effective in resolving the competition issue. This situation could be associated with the scale at which conflicts occur. Olsen et al. (2011) compared three spatial scales related to management of lobster (local scale), human activities and uses of sea areas (regional scale), and large marine ecosystems (large scale). These authors concluded that ecological, governance and management complexity increased with increasing geographic scale when implementing these place-based management tools. Applied to the context of the Chocó-EFZ, it could be said that the conflicts between artisanal and industrial fishers occur at different scales, which poses challenges to the effectiveness of the Chocó-EFZ. Conflicts between artisanal longliners and industrial shrimpers (gear conflicts and bycatch impact) occur at a local geographical scale. Both fisheries target low mobility species and conflicts between them occur in coastal, well defined areas, protected by the Chocó-EFZ. At this local scale, the Chocó-EFZ was effective (at least in theory) in excluding the shrimp vessels from these areas, preventing gear conflicts from happening, and protecting low mobility species. This effect is confirmed by the strong opposition of the shrimp sector to the permanent establishment of the Chocó-EFZ given their claims about negative socio-economic impacts on the shrimp sector.

On the other hand, conflicts with seiners occur at a larger geographical scale because they involve targeting tuna (highly migratory species). Industrial fishers target tuna when the stock is in offshore waters and artisanal fishers when the stock (or what is

left) reaches coastal waters. In order to reduce the conflict between the artisanal and tuna seine fisheries, the Chocó-EFZ would have to be large enough to increase the availability of tuna for artisanal fishers. The main obstacle to further expansion of the Chocó-EFZ is the forceful opposition of the representative of the tuna sector. If the zone is expanded in the future, management challenges will increase including, for example, challenges reaching agreement on the new border, monitoring, and enforcement (Olsen et al., 2011).

Most of the key informants did not talk about co-management as a factor in the pre-implementation phase of the Chocó-EFZ. During post-implementation there are two ways EFZs could be contributing to co-management: one way, by benefitting those already involved in co-management (Davis et al. 2006); the other way by creating an incentive for artisanal fishers to participate in co-management initiatives (e.g Sverdrup-Jensen & Nielsen, 1998; Chuenpagdee & Jentoft, 2007). The Chocó-EFZ case study seems to have elements of both: in Huina, the zone is supporting existing informal, community-based management. Informal regimes are often incorporated into a co-management system (Pinkerton, 1994). In Bahía, the zone has led to NGO researchers and fishers in Bahía (those involved in the partnership with the restaurant) initiating discussions about the role that artisanal fishers might play in the management of the Chocó-EFZ. Financial incentives (Grafton et al., 2006) are a possible complementary approach to local management that have the potential to stimulate responsible fishing practices. These have been strengthened (only in Bahía and with fishers' and processors' organizations) through an alliance between the GIC-PA and the private sector (an environmental consultant agency and a restaurant) that started in 2009 and has had positive outcomes including a 200% increase in the value of the catch ("De la cantidad a la calidad", 2012). The

restaurant is a new stakeholder in the Chocó-EFZ that, through active participation, has established a relationship with fishers based on trust. Its short-term goals include developing indicators of sustainability and its longer term goal is to obtain an eco-label for fish that is locally caught. The certification process is expected by some to support the permanent implementation of the Chocó-EFZ on the basis that it is protecting the fishing grounds where local fishers carry out their activity in a responsible manner (Fundación MarViva, 2011).

In Huina, there are some community features that have made local enforcement of Chocó-EFZ regulations more effective and that might offer a foundation for a more community-based management regime in the future that could be incorporated into a larger co-management regime for the EFZ. Huina is a type of 'local community [...] tied to place, history and identity' (Jentoft et al., 1998, p. 429). Its settlement process (since the early twentieth century) has been family-centered, that is, land management has been governed by kinship ties (Mosquera, 1999). Although impacted by the official foundation of Bahía in 1935, Huina has continued to be a tightly integrated community and has experienced slow growth, while Bahía has expanded greatly in size due to the high immigration rate. Communal property rights are not recognized in law in Huina as there is no formal ownership of sea area or authority to exclude others but, as reported by Ostrom & Basurto (2011) in their research on farmer-managed irrigation systems, Huina fishers have developed their own rules in order to regulate the use of gears in their fishing grounds. While in Bahía some gillnetters agreed to give up their nets as long as other netters did, in Huina maintaining yields of mainly red snapper was the incentive that drove a reduction in net use. One more institutional variable supporting community-based

management in Huina is leadership (Jentoft et al., 1998). It was observed during fieldwork that the fisher behind this is a person recognized as a leader within the community. Davis et al. (2006) also found that leadership and credibility were key factors contributing to the development of an EFZ and linked co-management regime and conservation initiatives. Like the GIC-PA and Bahía spokesperson, this fisher was influenced by external forces. He has a post-secondary education, experience in both artisanal and industrial fishing, and has worked with public and private institutions. His broad knowledge and positive relationship with the community have helped him gain respect from Huina's people, which has likely increased acceptance of the net ban.

Nevertheless, Huina fishers have been less successful at eliminating the use of beach seines within the Chocó-EFZ. This failure could be explained by two factors: high social costs and youth expectations. High social costs are associated with two situations, first multiple families including non-fishing families often depend on one seine to obtain their fish; second a retired fisher makes his living by renting his beach seine. These situations pose new questions when defining gear restrictions including how should non-fishing families and non-active fishers be compensated if fishers give up their seines? Are they a different group of stakeholders who should be involved in co-management? Should they be trained in the use of other fishing gears? Should non-fishing activities be promoted as complementary strategy to eliminate harmful gears? Which ones? The challenge of youth expectations is related to another group of beach seiners that includes fishers in their early 20s. Baird (2007) has argued that youth might not expect to continue living in the same village in the future and thus they might not be willing to protect the

resources for the long term. In this case discussions about co-management would need to address youth issues.

The co-management regime associated with the development of the Chocó-EFZ has the potential to integrate the tuna and shrimp fishers into larger management initiatives in the longer term. Studies on industrial fishers' knowledge have shown that they are often aware of problems with overfishing. By valuing their attitudes and incorporating their knowledge into management, it may be possible to bring to the table new perspectives that will in turn increase the success of the management plans (Orbach, 1977; Foster & Vincent, 2010). Furthermore, by involving the tuna and shrimp fishers it is possible that the history of the cooperative relationships between industrial shrimpers and artisanal fishers *on the water* identified in this study (see Chapter 4) could provide positive support for the negotiations that sector representatives are carrying out *on land*.

As concluded by Chuenpagdee & Jentoft (2007), co-management needs to be framed within a legal context that fosters its implementation and prevents uncertainty. Saavedra-Díaz (2012) has suggested a framework to support adaptive co-management in Colombia; furthermore she has proposed a trial implementation of this approach in Bahía. The framework should be built at different levels i.e. local, regional, and national and with input from major stakeholders (government, academia, artisanal fishers) (Saavedra-Díaz, 2012). Lessons can also be learned from other studies that have involved industrial fishers' knowledge (Orbach, 1977; Foster & Vincent, 2010). The Chocó-EFZ case study highlights the need to conduct research in communities such as Huina from which lessons on community-based management can be learned. In-depth research could reveal how the

individuals have invested their time, effort, and resources in developing the community-based management system (Ostrom, 1995).

The studies conducted by governmental agencies (INVEMAR) and by non-governmental agencies (SQUALUS and MarViva) on the Chocó-EFZ have provided the ecological, biological, cultural, and socio-economic information that currently supports the artisanal sector's expectations regarding the permanent implementation of the zone and its expansion seaward. The tuna sector will probably agree with the permanent implementation of the EFZ but not with its seaward expansion beyond 2.5NM, while the shrimp sector opposes the permanent implementation of the EFZ if shrimpers are not allowed to fish inside it during certain periods. The final decision on the future and shape of the EFZ is in the hands of the government. Its decision in 2012 was that the Chocó-EFZ would keep its original configuration for one more year until July 2013 (AUNAP, 2012).

This decision (neither abolishing the EFZ nor implementing it permanently) might be seen as a compromise between the conflicting economic interests of the different sectors. Both artisanal and industrial sectors are interested in the capture and trade of fish resources that occur in a territory used by both sectors. If the conflicts were only economic, then they would be "more manageable if the parties agreed on the rules of the game" (Bavinck, 2005, p. 817). This is the assumption underlying the "conflict of interests" approach to governance (Bavinck, 2005). However, there is more at work than simply different economic interests. Bavinck (2005) proposed a "legal pluralism" approach to arrive at a deeper understanding of the nature of conflicts like those between the industrial and artisanal sectors. The legal pluralism approach highlights the fact that

“[the conflicting parties] may disagree about basics, such as what belongs to whom, and why, and who decides.” (p. 817). From this perspective, reaching agreements about the rules of the game becomes more problematic. One important element is the definition of sea tenure and how several tenants impose claims on similar sea territories (Bavinck, 2005).

In the Chocó-EFZ context, this situation is very clear. The artisanal sector claims adjacent fishing grounds and resources as theirs because their communities (black communities) have inhabited and used the territory for centuries and currently they feel their livelihoods are threatened by the industrial sector. The State has recognized the right of black communities to exercise stewardship over their territories and constructed a legal framework to entitle communities to control these territories (Ley 70, 1993 and subsequent decrees); however, the sea was not included in the definition of territory - something they are currently trying to change. The industrial sector argues that it is inappropriate to favour one group (artisanal fishers) over others; the underlying premise in arguments from this sector is that anyone should be able to make use of the ocean and its resources – i.e. that it should be common property. This debate, with its very different points of departure, is shaping negotiations about what the zone should be called, i.e. “exclusive zone” (as the artisanal sector demands and as supported by one of the public officers); “multiple-use area under fishery management” (suggested by another public officer); or “special zone for the management of fishing resources” as suggested by the tuna sector representative. The most recent version of the resolution has explicitly defined it as an “EXCLUSIVE ZONE FOR THE ARTISANAL FISHERY original

capitalization]” (AUNAP, 2012, p. 1), suggesting that, at present, the artisanal fisher claims have received government support.

Colombian fisheries authorities have used the precautionary approach to justify establishing (ICA, 2008) and maintaining the Chocó-EFZ until 2013 (INCODER 2009; INCODER, 2010; AUNAP, 2012). They have also used an argument about lack of information to justify not permanently implementing the Chocó-EFZ. In his criticisms of the lobbying behaviour of the tuna sector Peña-Torres (1997) argues that the lack of information has been used by the industrial sector to perpetuate the uncertainty faced by the authorities when making decisions about managing fishing resources. Peña-Torres (1997) stated that if this was the only problem, then the industrial sector would invest in research so that it could help the fishing sector “to arrive at a more efficient, cooperative, [and] collective harvesting [sic]” (p. 264). As evidence that this is not all that is going on, he points out that, “better scientific information may imply more stringent restrictions on incumbents’ future fishing efforts” (p. 265). Evidence of this situation in the Chocó-EFZ case can be found in a letter addressed to the fisheries authorities requesting the permanent implementation of the Chocó-EFZ (Bahía spokesperson, letter to fisheries authorities, 2012). The letter contests the “lack of information” argument used by the fisheries authorities during the annual meeting in 2012 attended by the committee that is responsible for monitoring the Chocó-EFZ. The representative provided details of research conducted on the deep water shrimp fishery along the Colombian Pacific coast and argued that there was evidence that the Chocó-EFZ was a nursery area for fishing resources, including shrimp. Despite this, the most recent resolution stated that there is

not enough information on deep water shrimp to justify modifying the zone (AUNAP, 2012).

The “lack of information” argument and the lack of trust among stakeholders in scientific research might remain as an obstacle to future agreements regarding the Chocó-EFZ. The Chocó-EFZ could be an opportunity for a “legitimacy-building process” (Pinkerton & John, 2008, p. 689). This process involves four components: regulatory, scientific, political and moral legitimacy. These components interact and are mutually reinforcing. Stakeholders will only perceive the resulting regulations as “fair, democratically made, transparent, inclusive, and produce good outcomes” (Pinkerton & John, 2008, p. 689) if science is discussed, shared and communicated effectively. As these authors conclude, building legitimacy is a complex and multi-faceted process, especially within a context such as the Chocó-EFZ that involves diverse fish resources (as explored in Chapter 4) and stakeholders (fishers and representatives) with different concerns and perceptions about sea tenure and conflicts between fishing sectors.

3.6. Summary and conclusions

The interviews about the pre- and post-implementation process of the Chocó-EFZ with 11 key informants working with environmental NGOs, governmental and civil organizations, and members of the artisanal, shrimp, and tuna sectors revealed important lessons. First, similar to other examples of EFZs, conflicts between fisheries was a key factor during the Chocó-EFZ pre-implementation process. In the Chocó-EFZ case, the encroachment on the artisanal fishing grounds by a tuna vessel in combination with perception of government and industry corruption added a new ingredient to a history of clashes that

appear to have triggered the discussions that led to the establishment of the Chocó-EFZ in 2008.

Second, as reported in other studies, the Chocó-EFZ was also linked to decisions made by multiple stakeholders that influenced the way the Chocó-EFZ unfolded. In this study case, stakeholders varied between and within sectors, and got involved in the process in different ways and at different points in time. The artisanal sector included participation of individuals (the fish trader) and organizations (the GIC-PA) that differed in the way they searched for solutions and related to the community. Initially, the fish trader limited his communication to his personal network and looked for help only from the Port Authorities. In contrast, the GIC-PA involved not only fishers, processors, authorities, and academia at local and national levels but also the shrimp sector in order to achieve solutions to the gear conflict. This situation made the fish trader invisible while the GIC-PA got wide recognition among the artisanal sector and government. Furthermore, the GIC-PA, although was actually dormant at the time the Chocó-EFZ was established, was given formal credit for spear-headed the discussions. The establishment of the Chocó-EFZ triggered the re-emergence and revitalization of the GIC-PA and provided new scientific resources of potential use to the artisanal fisheries. The GIC-PA and the fish trader had in common that they were influenced by external forces and believed they could find solutions to mitigate the conflicts that would also benefit the long-term sustainability of the artisanal fisheries.

The industrial sector also got involved at different points in time, and, given the nature of the industrial fisheries, they differed in their points of view about the Chocó-EFZ and have not been able to agree on the future of the zone. Within the government,

individuals have also had different points of view about the design of the Chocó-EFZ regarding whether the nomenclature exclusive zone is built into the law.

The third lesson is related to further development of coalitions between the artisanal sector and organizations (new members of the GIC-PA) specialised in legal matters in order to use the community rights issue as support for the permanent implementation of the Chocó-EFZ. These coalitions could potentially lead the shrimp sector to form similar alliances to show the negative effects of the Chocó-EFZ on that sector. The main driver of these coalitions is the debate about the law giving rights to black communities over their territories, especially the need to include marine waters as part of these territories. This would make it possible to exclude the industrial fishery. However, opportunities are constrained due to disagreements between sectors regarding notions of sea tenure and granting of exclusive fishing rights to the artisanal sector. These disagreements might be irreconcilable and have made it difficult to reach agreements on the modification or permanent establishment of the Chocó-EFZ. A legal scholar is needed to examine the debate around the definition of exclusive fishing rights and its implications for the future of the Chocó-EFZ.

Finally, if the tension is well channelled, the Chocó-EFZ could be an opportunity to build a legal framework, within a “legitimacy-building process”, that supports a co-management regime in Chocó and elsewhere in Colombia. The regime should have achievable socio-economic and ecological goals (how close are stakeholders to reaching those goals and what are the available resources); combine place-based and gear-based management tools; be informed by appropriate science based on scientific and local fisheries knowledge. Furthermore, scientific research design should result from a

consensus between stakeholders. This way, outcomes may be supported by all parties and become useful in decision-making regarding the future of the Chocó-EFZ. Nevertheless, efforts to establish new agreements could produce new debates (or extend old ones), particularly if perceptions of corruption, power imbalance, unfairness and economic loss (such as those found among artisanal fishers regarding the net ban), and lack of trust among stakeholders persist.

The reconstruction of the pre- and post-implementation processes associated with the Chocó-EFZ draws on the pre-implementation framework developed by Chuenpagdee and Jentoft (2007). The use of this framework made it possible to understand the steps taken and the decisions made prior to the implementation and how these actions influenced the way the Chocó-EFZ developed after its implementation (path dependent process). The use of a multi-methods approach made it possible to document specific information on past and present events related to the Chocó-EFZ. Key informants (from different sectors and organizations) and fishers (men and women from 2 different communities) provided detailed information and a diverse array of perspectives on the Chocó-EFZ implementation process. This detailed case study highlights the important role that pre-implementation processes can play in the design, effectiveness and longer-term trajectory of EFZs.

Chapter 4 examines the historical relationship between artisanal and industrial fishing dynamics and the current status of fisheries in the waters protected by and surrounding the Chocó-EFZ. It draws on local fisheries knowledge (LFK) career-history interviews with adult members of artisanal fishing households (male and female fishers) from the communities of Bahía and Huina located inside the Chocó-EFZ. Chapter 4 also

draws on data from key informant interviews, informal conversations, literature review, and personal communications. The chapter provides a more detailed account of the conflicts between fishing sectors and contributes to our understanding of the role of the Chocó-EFZ in rebuilding artisanal fisheries and promoting the food security of local fishing households.

3.7. Literature cited

- AUNAP, Resolución 545 (2012). *Por la cual se amplía la duración del área exclusiva destinada para la pesca artesanal en el Departamento del Chocó, denominada “ZONA EXCLUSIVA DE PESCA ARTESANAL – ZEPA” comprendida entre las localidades de Punta Solano hasta Punta Ardita (zona norte del Chocó)* República de Colombia. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2012/48516/r_aunap_0545_2012.html
- Bailey, C. (1997). Lessons from Indonesia's 1980 trawler ban. *Marine Policy*, 21(3), 225-235. doi: 10.1016/S0308-597X(97)00003-1
- Bavinck, M. (2005). Understanding fisheries conflicts in the south - a legal pluralist perspective. *Society & Natural Resources*, 18(9), 805-820. doi: 10.1080/08941920500205491
- Bourillón-Moreno, L. (2002). *Exclusive fishing zone as a strategy for managing fishery resources by the Seri Indians, Gulf of California, Mexico*. Dissertation Submitted to the Faculty of the School of Renewable Natural Resources, University of Arizona.

Retrieved from http://cobi.org.mx/wp-content/uploads/2012/08/2002-c-cie_tesis_doctl_lbourillon.pdf

- Castilla, J.C. & Fernández, M. (1998). Small-scale benthic fisheries in Chile: on co-management and sustainable use of benthic invertebrates. *Ecological Applications*, 8:S124–S132. Supplement. Retrieved from <http://www.esajournals.org/doi/pdf/10.1890/1051-0761%281998%298%5BS124:SBFICO%5D2.0.CO%3B2>
- Chuenpagdee, R., & Jentoft, S. (2007). Step zero for fisheries co-management: What precedes implementation. *Marine Policy*, 31(6), 657-668. doi: 10.1016/j.marpol.2007.03.013
- Chuenpagdee, R., & Jentoft, S. (2009). Governability assessment for fisheries and coastal systems: a reality check. *Human Ecology*, 37(1), 109-120. doi: 10.1007/s10745-008-9212-3
- Chuenpagdee, R., Pascual-Fernández, J. J., Szeliánszky, E., Luis Alegret, J., Fraga, J., & Jentoft, S. (2013). Marine protected areas: Re-thinking their inception. *Marine Policy*, 39, 234-240. doi: 10.1016/j.marpol.2012.10.016
- Davis, R., Whalen, J., & Neis, B. (2006). From orders to borders: Toward a sustainable co-managed lobster fishery in Bonavista Bay, Newfoundland. *Human Ecology*, 34, 851-867. doi: 10.1007/s10745-006-9032-2
- De la cantidad a la calidad. (2012, Mayo 15). *Industrias pesqueras*, pp. 32-33. Copy in possession of author.
- FAO (1995). *Code of conduct for responsible fisheries*. Retrieved from <ftp://ftp.fao.org/docrep/fao/005/v9878e/v9878e00.pdf>

- FONADE. (2010). *Adquisición y entrega de artículos e insumos en Bahía Solano (Chocó), para la sustitución de artes de pesca dentro del proyecto “Fortalecimiento estratégico de la actividad costa afuera”*. Convenio interadministrativo No. 200954. Selección Abreviada - Subasta Inversa SAS 065– 2010. Retrieved from http://www.fonade.gov.co/Contratos/Documentos/2031__20100910043605ANEXO%20nO.%209-%20FORMATOS%20DEFINITIVO.pdf
- Foster, S. J., & Vincent, A. C. J. (2010). Tropical shrimp trawl fisheries: Fishers' knowledge of and attitudes about a doomed fishery. *Marine Policy*, 34(3), 437-446. doi: 10.1016/j.marpol.2009.09.010
- Fundación MarViva (2011). *Hacia la identificación de prácticas de pesca sostenible y la construcción de criterios para la definición de una pesca artesanal ambientalmente responsable*. Workshop proceedings. Copy in possession of author.
- Gelcich, S., Hughes, T. P., Olsson, P., Folke, C., Defeo, O., Fernandez, M., . . . Castilla, J. C. (2010). Navigating transformations in governance of Chilean marine coastal resources. *Proceedings of the National Academy of Sciences of the United States of America*, 107(39), 16794-16799. doi: 10.1073/pnas.1012021107
- GIC-PA. (2001). *Lineamientos generales para el ordenamiento de la pesca artesanal en la costa norte de Chocó*. Grupo Interinstitucional y Comunitario de Pesca Artesanal de la costa norte chocoana. GIC-PA. Technical report. Copy in possession of author.
- GIC-PA. (2010). *Asamblea general del Grupo Interinstitucional y Comunitario de Pesca Artesanal del Pacífico Chocoano GIC-PA*. Nuquí, 15 y 16 de Mayo. Minutes. Copy in possession of author.

- GIC-PA. (2012). *Documento técnico para el establecimiento de la Zona Exclusiva para la Pesca Artesanal (ZEPA), en el Pacífico norte colombiano*. Bahía Solano. Colombia. Copy in possession of author.
- Grafton, R. Q., Arnason, R., Bjørndal, T., Campbell, D., Campbell, H. F., Clark, C. W., & Weninger, Q. (2006). Incentive-based approaches to sustainable fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*, 63(3), 699-710. doi: 10.1139/f05-247
- Gutiérrez, C., & Ianinni, D. (2012, February 18). Las guerras de los pescadores. *El Espectador*. Retrieved from <http://www.elspectador.com/impreso/cultura/vivir/articulo-327360-guerras-de-los-pescadores>
- Hanich, Q., & Tsamenyi, M. (2009). Managing fisheries and corruption in the Pacific Islands region. *Marine Policy*, 33(2), 386-392. doi: 10.1016/j.marpol.2008.08.006
- Hart, P. J. B. (1998). Enlarging the shadow of the future: avoiding conflict and conserving fish. In T. J. Pitcher, P. J. B. Hart, & D. Pauly (Eds.), *Reinventing fisheries management*. (pp. 227–238) London: Kluwer Academic Publishers.
- ICA, Resolución 2650. (2008). “*Por la cual se delimita un área exclusiva destinada para la pesca artesanal en el Departamento del Chocó*” República de Colombia. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2008/47068/r_ica_2650_2008.html
- ICA. (2009a, March 13). *Presentación de resultados del estudio de monitoreo de la zona exclusiva de pesca artesanal*. Meeting minutes. Copy in possession of author.
- ICA. (2009b, July 28). *Zonas de pesca del Pacífico colombiano*. Meeting minutes. Copy in possession of author.

- INCODER, Resolución 1856. (2004). *Por la cual se determinan áreas geográficas en aguas jurisdiccionales del Pacífico colombiano con el fin de ordenar, regular, administrar, controlar y vigilar los recursos pesqueros marinos susceptibles de aprovechamiento, garantizando y asegurando su explotación racional y manejo integral*. República de Colombia. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2004/45749/r_incod_er_1856_2004.html
- INCODER, Resolución 1051. (2009). *Por medio de la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó por el término de un (1) año, contado a partir del 31 de julio de 2009*. República de Colombia. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2009/47434/r_incod_er_1051_2009.html
- INCODER, Resolución 2107. (2010). *Por la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó*. República de Colombia. Copy in possession of author.
- INDERENA, Resolución 726. (1974). *Por la cual se prohíbe la pesca de arrastre en la zona del Litoral Atlántico denominada Golfo de Morrosquillo*. República de Colombia. Retrieved from faolex.fao.org/docs/texts/col29035.doc
- INDERENA, Resolución 1130. (1976). *Por la cual se prohíbe la pesca de arrastre en la zona del Golfo de Urabá*. República de Colombia. Copy in possession of author.

- INDERENA, Acuerdo 24. (1983). *Por el cual se limita el área de pesca de arrastre e industrial en la zona del Golfo de Urabá y se reserva para la pesca artesanal*. República de Colombia. Copy in possession of author.
- INDERENA, Acuerdo 54. (1988). *Por el cual se establece una zona de reserva para la pesca artesanal*. República de Colombia. Copy in possession of author.
- INPA, Acuerdo 12. (1995). *Por la cual se zonifica el Litoral Atlántico colombiano en los Departamentos de Córdoba y Sucre para el control de los recursos pesqueros, se reserva y delimita la zona para la pesca artesanal y se dictan otras disposiciones*. República de Colombia. Copy in possession of author.
- INPA. (2000). *Conozcamos la pesca blanca en el Pacífico colombiano*. Buenaventura: Lito-tipografía Palacio. Copy in possession of author.
- INVEMAR. (2012). *Plan operativo cruceros de prospección pesquera en la ZEPA. Proyecto "Prospección y monitoreo de pesquerías clave en Colombia"*. Santa Marta: Author. Copy in possession of author.
- Jentoft, S., McCay, B. & Wilson D. (1998). Social theory and fisheries co-management. *Marine Policy*, 22(4-5), 423-436. doi: 10.1016/S0308-597X(97)00040-7
- Kaiser, M. J., Spence, F. E., & Hart, P. J. B. (2000). Fishing-gear restrictions and conservation of benthic habitat complexity. *Conservation Biology*, 14(5), 1512-1525. doi: 10.1046/j.1523-1739.2000.99264.x
- Kaufmann, D., Aart, K., & Mastruzzi, M. (2009). *Governance matters VIII: Aggregate and individual governance indicators, 1996-2008*. World Bank Policy Research Working Paper No. 4978. Retrieved from SSRN: <http://ssrn.com/abstract=1424591>

- LeDrew, B. (1988). *A study of the conflict between fixed and mobile gear in Western Newfoundland*. St. John's: Department of Fisheries and Oceans.
- Ley 70. (1993). *Por la cual se desarrolla el artículo transitorio 55 de la Constitución Política*. República de Colombia. Retrieved from <http://www.unhcr.org/refworld/pdfid/46d59b7a2.pdf>
- Marín, A., & Berkes, F. (2010). Network approach for understanding small-scale fisheries governance: The case of the Chilean coastal co-management system. *Marine Policy*, 34(5), 851-858. doi: 10.1016/j.marpol.2010.01.007
- Matallana, M. (2000). Hacia el ordenamiento de la actividad pesquera artesanal en los Golfos de Cupica y Tribugá, Pacífico colombiano. In Fundación Natura, *Proyecto "Comunidades indígenas y negras: desarrollo regional para la conservación de los recursos naturales en el Chocó Biogeográfico - Colombia"* [CD]. Final report. Copy in possession of author.
- McCay, B. J. (2002). Emergence of institutions for the commons: Contexts, situations and events. In T. Dietz, N. Dolsak, P. C. Stern, S. Stonich & E. U. Weber (Eds.), *The drama of the commons* (pp. 361–402) Washington, DC: National Academy Press.
- Moorsom, R. (1984) *Exploiting the sea*. London: Catholic Institute for International Relations.
- Mosquera, G. (1999). Hábitats y espacio productivo y residencial en las aldeas parentales del Pacífico. In J. Camacho, & E. Restrepo (Eds.), *Montes, ríos ciudades. Territorios e identidades de la gente negra en Colombia*. Fundación Natura, Ecofondo, Instituto Colombiano de Antropología. Copy in possession of author.

- Navia, A. F., Mejía-Falla, P. A., López-García, J., Muñoz, L. A., & Ramírez-Luna, V. (2010). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su administración. Fase 2*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_5.pdf
- Navia, A. F., & Mejía-Falla, P. A. (2011). *Guía para la identificación de especies de tiburones y rayas comercializadas en el Pacífico colombiano*. Fundación SQUALUS, Conservación Internacional, Colombia. Retrieved from http://squalus.org/pdf_invpublicaciones/Navia%20y%20Mejia%20Falla%202011.pdf
- Nielsen, J. R., Degnbol, P., Viswanathan, K. K., Ahmed, M., Hara, M., & Abdullah, N. M. R. (2004). Fisheries co-management—an institutional innovation? Lessons from South East Asia and Southern Africa. *Marine Policy*, 28(2), 151-160. doi: 10.1016/s0308-597x(03)00083-6
- Olsen, E., Kleiven, A., Skjoldal, H., & von Quillfeldt, C. (2011). Place-based management at different spatial scales. *Journal of Coastal Conservation*, 15(2), 257-269. doi: 10.1007/s11852-010-0108-1
- Orbach, M. (1977). *Hunters, seaman, and entrepreneurs. The tuna seinermen of San Diego*. London: University of California Press.
- Ostrom, E. (1995). Self-organization and social capital. *Industrial and Corporate Change*, 4(1), 131-159. doi: 10.1093/icc/4.1.131
- Ostrom, E., & Basurto, X. (2011). Crafting analytical tools to study institutional change. *Journal of Institutional Economics*, 7, 317-343. doi:10.1017/S1744137410000305

- Peña-Torres, J. (1997). The political economy of fishing regulation: The case of Chile. *Marine Resources Economics*, 12, 253-280.
- Pinkerton, E. W. (1994). Local fisheries co-management: A review of international experiences and their implications for salmon management in British Columbia. *Canadian journal of fisheries and aquatic sciences*, 51(10), 2363-2378. doi: 10.1139/f94-238
- Pinkerton, E., & John, L. (2008). Creating local management legitimacy. *Marine Policy*, 32(4), 680-691. doi: 10.1016/j.marpol.2007.12.005
- Pomeroy, R. S., & Rivera-Guieb, R. (Eds.). (2006). *Fishery co-management: a practical handbook*. Ottawa: CABI. Retrieved from <http://qe2a-proxy.mun.ca/login?url=http://site.ebrary.com/lib/memorial/Doc?id=10119722>
- Pomeroy, R., & Douvere, F. (2008). The engagement of stakeholders in the marine spatial planning process. *Marine Policy*, 32(5), 816-822. doi: 10.1016/j.marpol.2008.03 .017
- Ramírez-Luna, V., Gómez, L. S., Tobón, A., Mejía-Falla, P. A., & Navia, A. F. (2008). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su co-manejo. Fase I*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_8.pdf
- Renard, Y., Brown, N., & Geoghegan, T. (2001). Stakeholder approaches to natural resource management in the Caribbean. In *Regional conference on community based coastal resource management*. Mérida, Mexico.
- Rueda, M., Rico, F., Angulo, W., Girón, A., Rodríguez, A.L., García, L.M., & Arenas, L.N. (2010). Evaluación biológico-pesquera del estado de las poblaciones de

- camarón de aguas profundas, mediante la aplicación de métodos directos (prospección pesquera) e indirectos (estadísticas de captura y esfuerzo) en el Pacífico colombiano. Informe Final de Proyecto código 031 2007T6650-909-07. MADR. INVEMAR. Santa Marta, Colombia. Retrieved from [http://cpps.dyndns.info/cpps-docs-web/planaccion/biblioteca/pordinario/Proceso %20Ordinario/Fisheries/Informe%20T%E9cnico%20Proyecto%20camarones%20Pacífico.pdf](http://cpps.dyndns.info/cpps-docs-web/planaccion/biblioteca/pordinario/Proceso%20Ordinario/Fisheries/Informe%20T%E9cnico%20Proyecto%20camarones%20Pac%C3%ADfico.pdf)
- Saavedra-Díaz, L. (2012). *Towards Colombian small-scale marine fisheries management*. (Unpublished doctoral dissertation). University of New Hampshire, Durham, NH. Copy in possession of author.
- Sverdrup-Jensen, S., & Nielsen, J. (1998). *Co-management in small-scale fisheries: A synthesis of Southern and West African experiences*. Retrieved from <http://hdl.handle.net/1834/617>
- Transparency International (2011). *Corruption perceptions index 2011*. Retrieved from <http://cpi.transparency.org/cpi2011/press/>
- Viswanathan, K. K., Nielsen, J. R., Degnbol, P., Ahmed, M., Hara, M., & Raja Abdullah N. M., (2003). *Fisheries co-management policy brief: Findings from a worldwide study*. Malaysia: WorldFish Center

4. Can Exclusive Fishing Zones sustain artisanal fisheries? Lessons from the artisanal fishery in Northern Chocó, Colombia

4.1. Abstract

This chapter draws on findings from career-history interviews with artisanal fishers from two communities located within an Exclusive Fishing Zone recently established (2008) on the Colombian northern Pacific coast (the Chocó-EFZ). It explores the relationship between the history of the fisheries in conflict, the design and effectiveness of the Chocó-EFZ including the opportunities and constraints associated with it for sustaining artisanal and other fisheries. Findings indicate that the artisanal and industrial sectors have interacted for decades. Over time, both sectors expanded and intensified spatially, temporally, ecologically, and socially. Consequently, both sectors experienced some of the symptoms of the fishing-up sequence: shifts across species, peaks and valleys, overall decline in fish landings, and conflicts (gear conflicts, bycatch, and resource competition) between sectors and within the artisanal sector. Conflicts and declining catch rates have affected negatively the food security of artisanal fishing households. In order to sustain local fish stocks, and to promote the food security of local communities in the longer term, the Chocó-EFZ must be effective at eliminating shrimp trawling and tuna purse seining within the Chocó-EFZ, constraining the use of artisanal beach seines and gillnets, and mitigating unintended consequences (e.g. food insecurity issues in the shrimp sector).

4.2. Introduction

Exclusive Fishing Zones (EFZs) and Marine Protected Areas (MPAs) are two types of place-based management tools, that is, they are temporary or permanent management tools implemented within specific areas (Norse et al., 2005). Existing research on the role they play in conservation, food security, and rebuilding fisheries, as well as their impact on fishing communities, has largely focused on MPAs (Christie et al., 2003; Gell & Roberts, 2003; Christie, 2004; Hilborn et al., 2004; Jaworski et al., 2006; Cadiou et al., 2009; Mascia et al., 2010; Agardy et al., 2011; McCay & Jones, 2011).

Existing research on EFZs has shown how they are used to reduce conflicts between sectors by allocating fishing rights to one sector or user group and excluding others (LeDrew, 1988; Bailey, 1997; Castilla & Fernández, 1998; Hart, 1998; Bourillón-Moreno, 2002; Davis et al., 2006; Gelcich et al., 2010). Exclusive fishing zones, like MPAs, can also contribute to rebuilding fisheries when they exclude at least one fishing sector in order to mitigate conflicts; for instance when they exclude trawlers to mitigate conflicts between mobile and fixed gear fishers (LeDrew, 1988; Bailey, 1997). By doing this EFZs allow some habitats and benthic fauna sensitive to bottom-fishing disturbance a chance to recover (e.g. Kaiser et al., 2000). Another way to contribute to rebuilding fisheries is by decreasing the number of fishers and intensity of fishing effort (Castilla & Fernández, 1998; Bourillón-Moreno, 2002; Raakjaer et al., 2004; Davis et al., 2006).

The food security of the group(s) to which fishing rights were granted might also be enhanced in the short and longer term by EFZs as it is enhanced by MPAs (Mascia et al., 2010). In the short term food security can be enhanced as a result of reduced competition and in the longer term as a result of increased fish biomass which potentially increases

catch rates for the “winner” sector (as in MPAs, Mascia et al., 2010). In contrast, the food security of the “loser” sector can be negatively affected as a result of reduced catches, incomes, and employment. This situation would have large implications for the EFZ effectiveness in the longer term since those affected groups will tend to break the rules [as in MPAs (Mascia et al., 2010)].

Researchers have paid little attention to the relationship between the effectiveness of EFZs, the past and present status of the fisheries, and the origin and development of conflicts (gear conflicts and competition for resources). Usually, existing (historical) data is limited; a way to address this problem is by using local fisheries knowledge (LFK) and scientific knowledge (Neis et al., 1999; Neis & Kean, 2003). Bourillón-Moreno (2000) findings showed that the use of LFK and scientific knowledge provided a better understanding of the complex dynamics associated with EFZs (history of fisheries and conflicts) and how these dynamics affected their role in rebuilding fisheries. Another aspect that has received little attention is the contribution of EFZs to sustaining fisheries that target highly migratory species. Most of the existing research has explored EFZs that harbour resources of low mobility such as invertebrates (Castilla & Fernández, 1998; Kaiser et al., 2000; Bourillón-Moreno, 2002; Davis et al., 2006).

This chapter contributes to the limited literature on the relationship between the history of fisheries and the role of EFZs in rebuilding fisheries and enhancing food security. It does this by providing a detailed case study of the history of the artisanal and industrial fishing dynamics in two communities located within an EFZ instituted in the

Chocó Province, Pacific Colombian coast (Chocó-EFZ) in 2008 that is still in effect (2013).¹⁰ The goals of the Chocó-EFZ include mitigating conflicts between artisanal and industrial (shrimp and tuna) fisheries by granting fishing rights to the artisanal sector, encouraging participation by local fishers in co-management, and promoting food security of the artisanal fishing communities (ICA, 2008).

This chapter seeks to answer the following questions: 1) What is the history of artisanal and industrial fisheries in the Chocó-EFZ and how their conflicts evolved? 2) What was the composition and status of these fisheries including their role in the food security when the Chocó-EFZ was implemented and how have these changed since that time? 3) Could the Chocó-EFZ play a role in rebuilding fisheries and promoting food security in these households in the future? 4) What would it take for this to happen?

In order to address these questions I use the fishing up sequence approach that Neis & Kean (2003, p.71) used to understand the collapse of Newfoundland cod stocks in the 1990s. The fishing up sequence is a combination of intensification and expansion along three different axes: spatial, temporal, and ecological. The sequence also includes the social axis (B. Neis personal communication, January 11, 2013). Spatial expansion is understood as the displacement of fishers along shore, into offshore areas and into deeper waters in response to the effects of overfishing. Temporal expansion refers to changes in fishing seasons (i.e. the development of winter fisheries); and ecological expansion refers to the tendency to switch effort to different fish taxa or populations not previously

¹⁰ In May 2013, the Chocó-EFZ was established permanently and its area was extended south and northward (AUNAP, 2013). This thesis examines the events that took place before the implementation of the Chocó-EFZ until January 2013. [AUNAP (2013). *Acta de reunión del comité de verificación de la zona de pesca de pesca artesanal del norte del Chocó -ZEPA-*. Meeting minutes. Copy in possession of author]

targeted in response to market changes or reductions in landings of traditional species. Social expansion refers to the tendency to encroach on the fishing grounds of other communities or sectors and related social conflict (B. Neis personal communication, January 11, 2013). Spatial intensification is associated with technological modifications of fishing gears that allow increased effort on traditional fishing grounds; temporal intensification includes such changes as the shift from handlines to gillnets that can extend the fishing period into times when fishers are not on the water; and ecological intensification refers to such things as changes in mesh size that boost landings by targeting small fish or sometimes large ‘mother fish’ less susceptible to other mesh/hook sizes (Neis & Kean, 2003). Social intensification refers to within community conflicts that can erupt as a result of internal changes in fishing strategies and in technologies used (B. Neis personal communication, January 11, 2013). Using this approach I reconstruct the history of ways the artisanal and industrial fisheries in the Chocó region have expanded and intensified since the 1950s; what situations appear to have driven these processes; whether the spatial, temporal, ecological, and social expansion and intensification processes led to changing relations (conflictive and/or cooperative) between artisanal and industrial fisheries and among artisanal fishers. I also examine the relationship between local artisanal fisheries and food security in artisanal households and whether the fishing up sequence driven by both fisheries has impacted the food security of local fishing households. Finally, I use this historical reconstruction to examine how the Chocó-EFZ addresses the issues confronting fisheries in this region including whether and how it is contributing to the sustainability of the artisanal fishery while mitigating

conflicts between the industrial and artisanal fisheries and promoting food security of local fishing households at present and its potential future role.

The next section provides a brief summary of existing research conducted before (GIC-PA, 2001) and after the implementation of the Chocó-EFZ (Ramírez-Luna et al., 2008; Navia et al., 2010) including some results, gaps in the existing research and the main recommendations from this research about the Chocó-EFZ. See *The Exclusive Fishing Zone on the Northern Pacific Coast of Colombia* section in Chapter 1 for background information on EFZs in Colombia and a full description of the Chocó-EFZ goals, geographical configuration, and regulations.

Prior to and since the establishment of the Chocó-EFZ, there has been some research on artisanal fisheries in the communities located within the Chocó-EFZ. In 2001, the GIC-PA examined the status of these fisheries during the 1990s. They described conflicts with shrimp vessels regarding access to fishing grounds, a decrease in fish populations, the need to assess the status of the artisanal fisheries, the lack of organization and training among fishers, problems with poor fishing infrastructure and technology, a need to recognize women's role within the households and in the post-capture process. GIC-PA (2001) discussed the need to implement and to enforce a legal framework adapted to the needs and problems of the area.

During the first two years of the Chocó-EFZ, two studies were conducted by environmental NGOs in order to assess the impact of the Chocó-EFZ on the artisanal fisheries (Ramírez-Luna et al., 2008; Navia et al., 2010). These studies generated a baseline of information for the artisanal fisheries inside the Chocó-EFZ and in surrounding waters (Ramírez et al., 2008; Navia et al., 2010). The research found that

these fishers engage exclusively in artisanal fishing and that at least 700 people depend directly on the artisanal fisheries in the region (Navia et al., 2010). In terms of biological services, Navia et al. (2010) also found that the Chocó-EFZ might be an important nursery area for several fish species.

The GIC-PA (2001) has provided some information on the artisanal fishery in Chocó during the 1990s and Ramírez et al. (2008) and Navia et al. (2010) have provided more recent data on the status of the artisanal fishery in relation to the Chocó-EFZ. This chapter adds an historical dimension to their work and to our knowledge of the Chocó-EFZ. This historical approach can tell us about the general status of the artisanal and industrial fisheries prior to the implementation of the Chocó-EFZ, artisanal relationships with the industrial fishery, the origin of conflicts, trends in landings, and relatedly about the likely contribution of the Chocó-EFZ to the livelihoods of artisanal fishing households including to food security, and to the sustainability of local resources.

The first section of the chapter (*Fishing up after the onset of the commercial artisanal fisheries*) draws on data from Local Fisheries Knowledge (LFK) career-history interviews, with a chart component, with male and female fishers to explore patterns of spatial, temporal, ecological, and social expansion and intensification in artisanal fisheries and the development of conflicts. The section also examines the relationship between the fishing up sequence and the food security of the artisanal fishing households and the negative impact of the Chocó-EFZ on the food security of the industrial shrimp sector. In order to provide a broad view of the industrial fishery on the Pacific coast of Colombia and their impact on the artisanal fisheries in Chocó, the second section of the chapter (*Fishing up sequence in the shrimp and tuna industrial fisheries*) draws on insights from

the Local Fisheries Knowledge (LFK) of artisanal fishers, key informant interviews, and a trawler skipper (informal conversation) who has been involved with the shrimp fishery since the 1970s. The chapter also uses existing quantitative data (Sea Around Us project, 2011), technical reports, meeting minutes, government resolutions, letters, scientific research, newspapers, magazines, and personal communications.

4.3. Methods

The chapter draws primarily on data from face-to-face, semi-structured Local Fisheries Knowledge (LFK) career-history interviews with artisanal fishers. This chapter also draws from interviews with key informants from different sectors (see Chapter 2 for a detailed discussion of the interview methods). In order to conduct the LFK career-history interviews I visited Bahía and Huina, which are two communities located within the Chocó-EFZ. Bahía is a large urban centre, economically diverse (Navia et al., 2010); by 2005, it had a population of 9,255 inhabitants (Federación Colombiana de Municipios, n.d. Bahía Solano). Huina is a small village close to Bahía, more fishing-dependent community, with a population of 176 inhabitants by the late 1990s (Mosquera & Aprile-Gnisset, 2002). I did not visit other communities for safety reasons. In both communities I chose fishing households based on three criteria: male fishers had to be more than 40 years of age, full-time fishers, and both the fisher and his wife had to have spent all of their fishing careers in Bahía or Huina (See Chapter 2 for details on the recruitment process). In order to conduct the key informant interviews, between July 2010 and February 2011 I visited the localities where government and fishing sectors are headquartered (Bogotá, Bahía, and Buenaventura) (see Figure 1.1. in Chapter 1).

In Bahía 14 households (13 couples and 1 single fisherman) out of the 15 that were contacted agreed to participate in face-to-face, LFK semi-structured career-history interviews. In Huina all of the 11 households (7 couples and 4 singles) invited to participate agreed to be interviewed. All fishers met the definition of artisanal fishers by the Colombian legislation (described in Chapter 1). Based on the number of Bahía and Huina male fishers who participated in the 2009 fishery census (Navia et al., 2010), the participants in this project represent approximately 11% of the total population in Bahía and 52% in Huina.

For each interview a research assistant and I were present. The interviews asked male and female about demographic aspects. Using an adapted version of the career-history interview (Murray et al. 2006), the second part of the interview asked about the use of fishing grounds during their fishing careers including those where they interacted with industrial fishers. This was the starting point for developing an account of the fishing history in Bahía and Huina area. The research assistant located the fishing grounds on charts using the data diamond tool proposed by Tobias (2000) for land use and occupancy map surveys. I used three types of charts that covered different areas and were used according to the fishers' experience. One chart covered the full Chocó-EFZ (scale 1:132.664) and the other covered the Golfo de Cupica (southern area of the Chocó-EFZ, scale 1:70.000); in both charts the depth contours were laid out at 50 m intervals (range 50-500 m). The third chart included the Bahía de Solano¹¹ and the depth contours

¹¹Bahía Solano translates "Solano Bay". In order to avoid confusion I am using "Bahía" when referring to the town and "Bahía de Solano" when referring to the bay.

appeared at 10 m intervals between the shoreline and the first 50 m after which they appeared at 100, 200 and 500 m intervals (scale 1:25.000 at Latitude 6°18'07.5"N).

Once all fishing grounds were charted, the third part of the interview dealt with questions related to food security. We discussed what happened to the fish once it entered the household, whether it was processed or consumed fresh, eaten by household members, sold or exchanged, and whether market demand impacted the kind of fish consumed by the family. We also reviewed other economic activities in which they had been engaged. Toward the end of the interview I asked fishers what they knew about the Chocó-EFZ; what they knew about the process that led to the establishment of the zone (discussed in Chapter 3); what the exclusive zone should look like; and if it had contributed to their food security. In Bahía, interviews ran between 28 and 125 minutes (mean 76.42 ± 27.73 SD) and in Huina they ran between 41 and 223 min (mean 92.09 ± 55.43 SD). The length of the interviews depended on how much the interviewees had to say, whether women were also fishers (fished or gathered shellfish regularly during any period of their lifetime), the number of years they had been fishing, the number of fishing grounds and gear types they had used, and the extent of the discussion generated by the questions. Since the number of fish species was the same across the areas and relatively stable over time, this topic did not influence the amount of time spent per interview.

I digitized each of the charts manually using ArcGIS 9 Software and constructed five composite charts displaying the fishing grounds used over time according to type of fishery: handlines, gillnets, longlines, and beach seines. One more chart displayed the fishing grounds where different types of interactions occurred between the artisanal and

industrial fishers (e.g. goods exchange, competition for fish resources, or gear conflicts). This topic is further examined in Chapter 3.

Key informants were chosen based on the list of stakeholders mentioned in the Resolución, minutes related to the Chocó-EFZ, technical reports (GIC-PA, 2001) and on my experience with the EFZ gathered through involvement with two studies that followed the establishment of the Chocó-EFZ (Ramírez et al., 2008; Navia et al., 2010). I contacted all the key informants by phone and those living in Bahía were also contacted in person and invited to a public meeting. Eleven key informants (6 in Bahía, 4 in Bogotá and 1 in Buenaventura) were contacted and all of them agreed to participate. Six informants were affiliated with the artisanal sector through NGOs, the Community Council, fishers and processors organizations and fish trading (currently the representative of the Bahía artisanal fishers, hereafter Bahía spokesperson/representative). Three informants belonged to the fisheries authorities (national and local offices); one belonged to the ACODIARPE, which represents the shrimp industry; and one was part of the ANDI, which includes Colombian flagged tuna vessels larger than 386 tons carrying capacity. During the visits to Buenaventura I also had an informal conversation with a trawler skipper regarding the development of the shrimp fishery on the Pacific Coast of Colombia.

The data from the key informant interviews included in this chapter include the role of the Chocó-EFZ in promoting the food security of the artisanal fishing households. Interviews ranged from 26 min to 85 min (mean 56 ± 18 SD); the informal conversation lasted 52 minutes on average.

All fishing household and key informant interviews were transcribed using NVivo 9 software; quotes were inserted into the relevant fields. In order to protect the identity of female key informants they are presented as males in the chapter and to protect fishers' identity, only composite rather than individual charts are included in the thesis.

4.4. Results

The following section offers an overview of the male and female fishers' profiles including their age, hometowns, other economic activities, type of fishing gears used throughout their careers, and the target species. This information provides insights into the degree of involvement of interviewees with the local fisheries, how their accounts can contribute to understanding the development of the artisanal fisheries over time and how the Chocó-EFZ corresponds to this history.

4.4.1. Interviewee profiles

The male fishers who were interviewed were between 39 and 82 years old (mean = 54.4 ± 14 SD), they had fished between 21 and 70 years (mean = 38.6 ± 11.6 SD). Only two fishers in Bahía (69 and 70 years old) and one in Huina (82 years old) were retired at the time of the interviews. Women were between 34 and 65 years old (mean 48.7 ± 11.4 SD) and they had fished less often than men and in fewer areas. Fisherwomen from Bahía had fished only during the 1980s; one stopped because her husband did not agree and the other due to health issues. In both communities women would go fishing with their husbands (if they had not retired from fishing), by themselves, or with other female fishers (especially in Huina).

Not all of the participants were born in Bahía or Huina but all had been living in one of these communities since their adolescence. Most in-migrants were born in other coastal villages within the same Chocó Province (two of them migrated between Bahía and Huina), and others were born in adjacent and non-adjacent coastal provinces. In general, fishers or their parents had migrated to Bahía (the largest town in northern Chocó), seeking the better living conditions (jobs and schools) offered by this municipality, which was founded in 1935 to attract in-migrants from inland cities to develop agriculture. Other interviewees arrived in these towns because “when one is young one walks a lot” (Huina, Male fisher interview #3) and formed families with locals; another reason for in-migration included displacement by illegal army groups in the late 1990s.

Ten male interviewees had engaged in fishing only, while others (in past or present times) had also engaged in agriculture (7), tourism (2), activities related to fish catching, processing or trading (1), running a grocery shop (1), and public service (1). Fishermen had used different fishing gears over their careers including dynamite (before the 1960s), harpoon (1960s-1980s), handlines, longlines, gillnets, and beach seines (1960s-2010). In both communities the traditional gear was handline and it had been used by all interviewees but one; 17% of Bahía fishers who were interviewed and 30% of Huina fishers had used only handlines, 50% of Bahía and 30% of Huina fishers had used handlines, gillnets and longlines; the remaining fishers had used two gears, usually handline and longline or handline and one type of net (gillnet or beach seine).

In Huina there are two other types of longline in use in addition to the traditional longline: the *calabrote* and the *colgante*. They differ in size, number of and distance

between hooks, position in the water column, and in target species (Table 4.1). The *calabrote* has been used since the 1940s and the *colgante* was designed by one of the Huina fishers (60 years old) around 15 years ago; he believed that if longlines could catch fish on the bottom, they could probably also catch them in mid-water.

Out of the 17 women interviewed, five from Huina and four from Bahía have participated in fishing: 2 have collected shellfish, 6 have collected finfish, and 1 has fished for both. Two women from Bahía and 3 from Huina have only used handlines; the shellfish collectors (both from Bahía) have used buckets and knives (depending on the species); one woman from Huina has used beach seines, although neither she nor husband own the gear.

Table 4.1. Differences between traditional longlines, *calabrote*, and *colgante* (variation found in Huina). All data refer to gears used by the interviewees.

Feature/Type of longline	Traditional longline	<i>Calabrote</i>	<i>Colgante</i>
Hook size ^a	7, 8	1	5
Number of hooks ^b	Up to 2000	100	100
Distance between hooks (fathoms)	2.5 - 3	7	7
Position in the water column	Bottom	Mid-water	Mid-water
Main target fish	Pacific bearded brotula (<i>Brotula clarkae</i>) and rooster (mainly <i>Hyporthodus acanthistius</i>)	Sharks (Carcharhinidae, Alopiidae, Triakidae)	Pacific bearded brotula, and rooster, small sharks (mainly <i>Mustelus</i> sp.), longfin yellowtail (<i>Seriola rivoliana</i>)

Note. ^aSizes are given according to the *Mustad* brand, which is the most popular on the Pacific Coast; #7 and #8 are medium size hooks, #1 is a large hook, and #5 in between. ^bNumber of hooks that make up fishing gears as of 2010.

They have used it along with other fishing and non-fishing families from Huina. Another woman, also from Huina, has fished with hooks (handlines, longlines,

calabrotes), nets (gillnets and beach seines), buckets, and dynamite (back in the 1960s). The longlines, *calabrote*, and dynamite were used when she fished with her father.

Fisherwomen have always fished close to their hometowns (See Figure 4.2), primarily because of their duties as housewives; when they fished far away they did so with their husbands and usually before having children. Women would go fishing or gathering anytime as long as they considered it to be worthwhile, as when there was an abundance of finfish or shellfish (e.g. some spring tides are good or productive for gathering shellfish). For both types of resources, productive seasons occur less frequently than in the past. Today their main activity is as housewives, as well as work in the public service (4 women), agriculture for home consumption (2), storekeeping (2), raising domestic animals (2), seamstress (1), and seasonal production for handicrafts for tourists (1).

These findings show that to different degrees both male and female interviewees have substantial experience in the local artisanal fishery. They have built knowledge and experience using up to six different fishing gears and by visiting different fishing grounds over time. This makes their accounts suitable to explore how the commercial artisanal fisheries have developed since its inception, how it has interacted with the industrial fisheries over time, and how they have been impacted by the Chocó-EFZ.

4.4.2. Fishing up after the onset of the commercial artisanal fisheries

Using the fishing up sequence approach (Neis & Kean, 2003, p.71), this section provides an account of how the commercial artisanal fishing in Bahía and Huina developed between the 1960s and 2010. It explores the history of the hook fishery (handlines and

longlines), the net fishery (gillnets and beach seines), and of the use of artisanal fishing grounds over time and their location with respect to the Chocó-EFZ design.

After the founding of Bahía in 1935 and prior to the 1960s, fish was traded primarily at local level.¹² The fish caught by the interviewees' parents who were engaged in fishing (most of them did agriculture) was mainly for home consumption. People fished from the shore with handlines made with plant fibres and using dynamite. It was the generations of the interviewees (born between 1930s and 1970s) who took up commercial fishing in a serious way. They kept using handlines made with white rope dyed with mangrove seeds; later they combined rope and nylon (which lasted longer); then they used only nylon, and then they used thinner nylon and thinner hooks. These modifications were aimed at reducing the ability of fish to see the gear; fishers used expressions like "the fish became aware [...] the fish became civilized" (Huina Male Fisher Interview # 2) or that the "fish [...] don't see the hook [...] because [hooks] are thinner" (Bahía Male Fisher Interview # 7).

Commercial fishing began in earnest in the 1960s triggered by a combination of factors. Rice trade with inland cities, which had been the main income source, decreased because producers in Bahía and in surrounding areas were not able to compete with other Colombian provinces that were producing better quality rice at lower prices. Around the same time fish trading began to grow due to the construction of the airport and the arrival

¹²During the 1940s and then during the 1970s a few fishers practiced commercial shark fishing with *calabrote*. They were sponsored by foreign traders who sold shark oil for vitamins (in the 1940s) and meat, oil, and fins (in the 1970s). The vitamin trade ended after drug companies started producing synthetic vitamins and consequently fishers stopped using *calabrotes*. It is possible that others continued using them during that time. In recent times it had also been reported to catch sharks in Bahía (Ramírez et al., 2008; Navia et al., 2010) and in other communities (GIC-PA, 2001).

of more outsiders who sold the fish to inland cities. Additionally, locals considered that fishing demanded less effort and was more profitable than agriculture. While Bahía fishers began selling fish to inland cities through in-migrants, Huina fishers began selling fish to tourists -another growing industry¹³- through local restaurants. It was not until the 1990s when electricity became permanently available, however, that traders were able to invest in infrastructure such as fish storage.

Handlines are the traditional gear and the rocky areas are the traditional fishing grounds -all in coastal waters. The main fish families targeted by both male and female handliners are the Lutjanidae (snappers) and Carangidae (jacks). Men also target yellowfin tuna (*Thunnus albacares*), bigeye trevally (*Caranx sexfasciatus*), rainbow runner (*Elagatis bipinnulata*), and fortune jack (*Seriola peruana*); and fisherwomen additionally target blue bobo (*Polydactylus approximans*) or yellow bobo (*P. opercularis*), bluestriped chub (*Sectator ocyurus*), and bigeye scad (*Selar crumenophthalmus*). The fish preferred for households and in the local market has been the “black meat” fish (low value fish) while the “white meat” fish (high value fish) has gone to inland cities. The “black meat” fish caught with handlines includes green jack (*Caranx caballus*), rainbow runner, bigeye trevally, bigeye scad, small sized snappers, and yellowfin tuna. The “white meat” handline fish includes snappers and some jacks. Although tuna is considered black meat, it is largely marketed in inland cities.

Spatial expansion within the handline fishery has not been significant; 70% of the handline fishing grounds charted in this project had been in use since male and female

¹³ Tourism however, has not been fully developed, due to episodes of violence in northern Chocó.

fishers started their careers (Figures 4.1 and 4.2). The remaining 30% includes fishing grounds not used anymore as result of changes in fishers' life cycles.

During their childhoods fishers used streams, beaches, and estuaries; as they grew up or started fishing with more experienced fishers, they “ventured” to new and further grounds, most of them inside the Chocó-EFZ (Figures 4.1, 4.2). One fisher said:

One learns and improves within the bay by fishing small fish. At 10 or 12 years old the adults teach you the grounds: *El Norte* [Bahía de Solano¹⁴, inside EFZ], *La Virgen* [Bahía de Solano, outside EFZ], *Buenavides* [Bahía de Solano, EFZ border], *Huaca* [Bahía de Solano, inside EFZ]. (Bahía, Male fisher interview #14)

It was the introduction of gillnets, beach seines, and longlines -linked to the onset of the commercial fishery- that led to expansion and intensification of the artisanal fishery along the spatial, temporal, ecological, and social axes. Spatial expansion with gillnets occurred in two ways. First, fishers added more panels and used them either together or separately, increasing the spatial area covered by an individual fisher. Second, fishers used gillnets in areas close to the shore that were not exploited by handliners (Figure 4.3). Their contribution to ecological expansion occurred when gillnets targeted species not caught with handlines including pacific sierra, roosterfish, sharks, and snooks.

All of these fish except snooks were sold locally as “black meat” fish. Spatial intensification started with the use of gillnets and beach seines in traditional rocky grounds.

¹⁴For practical reasons, Bahía de Solano refers to grounds located between *Los Vidales* and *Punta Huina* (southern border). Both located outside of the bay. See Figure 4.2.

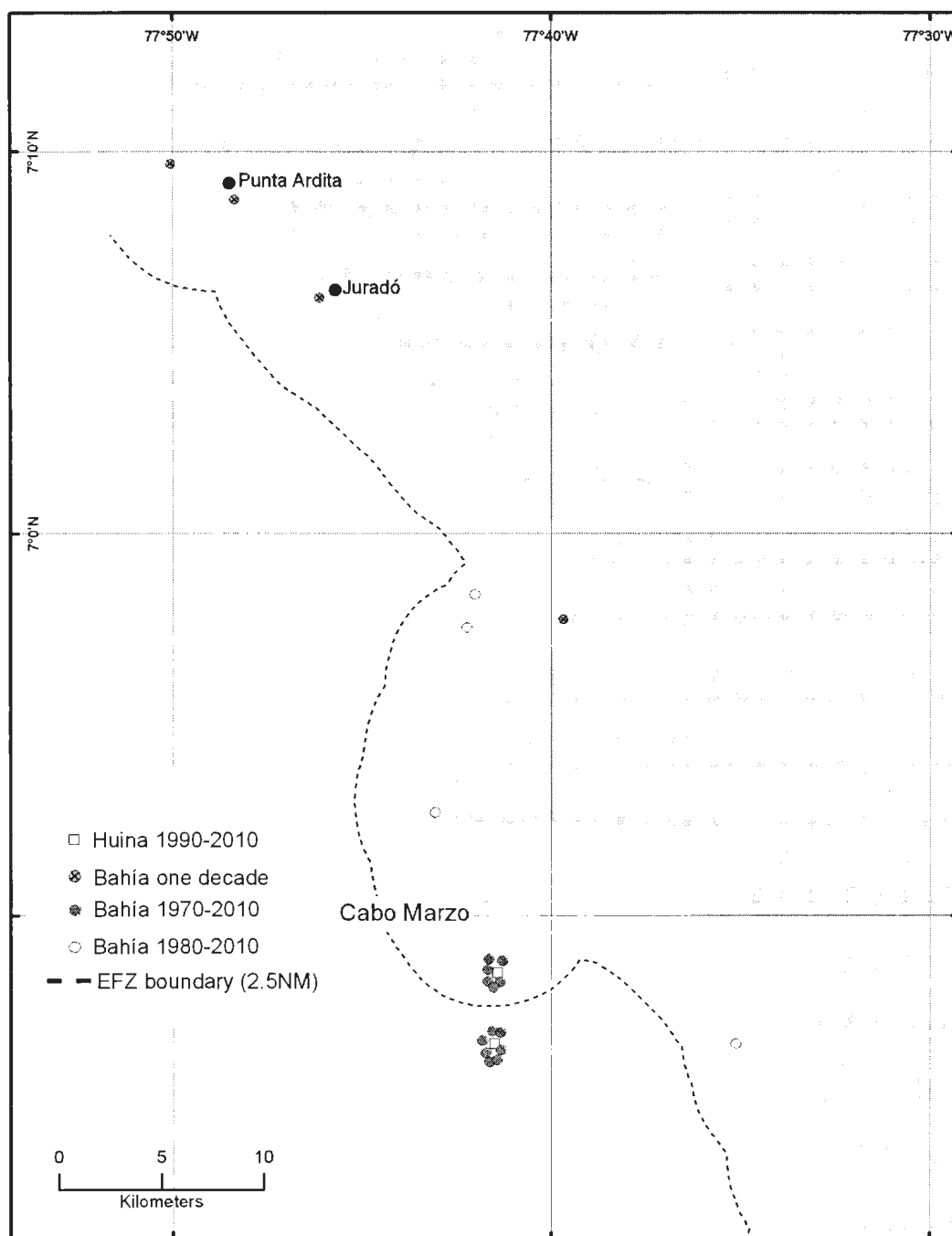


Figure 4.1. Handline fishing grounds inside and outside the Chocó-EFZ. Cabo Marzo area. “Bahía one decade” includes fishing grounds only used during childhood. These childhood grounds located away from Bahía were used by fishers who later in-migrated to Bahía. Grounds used by men only.

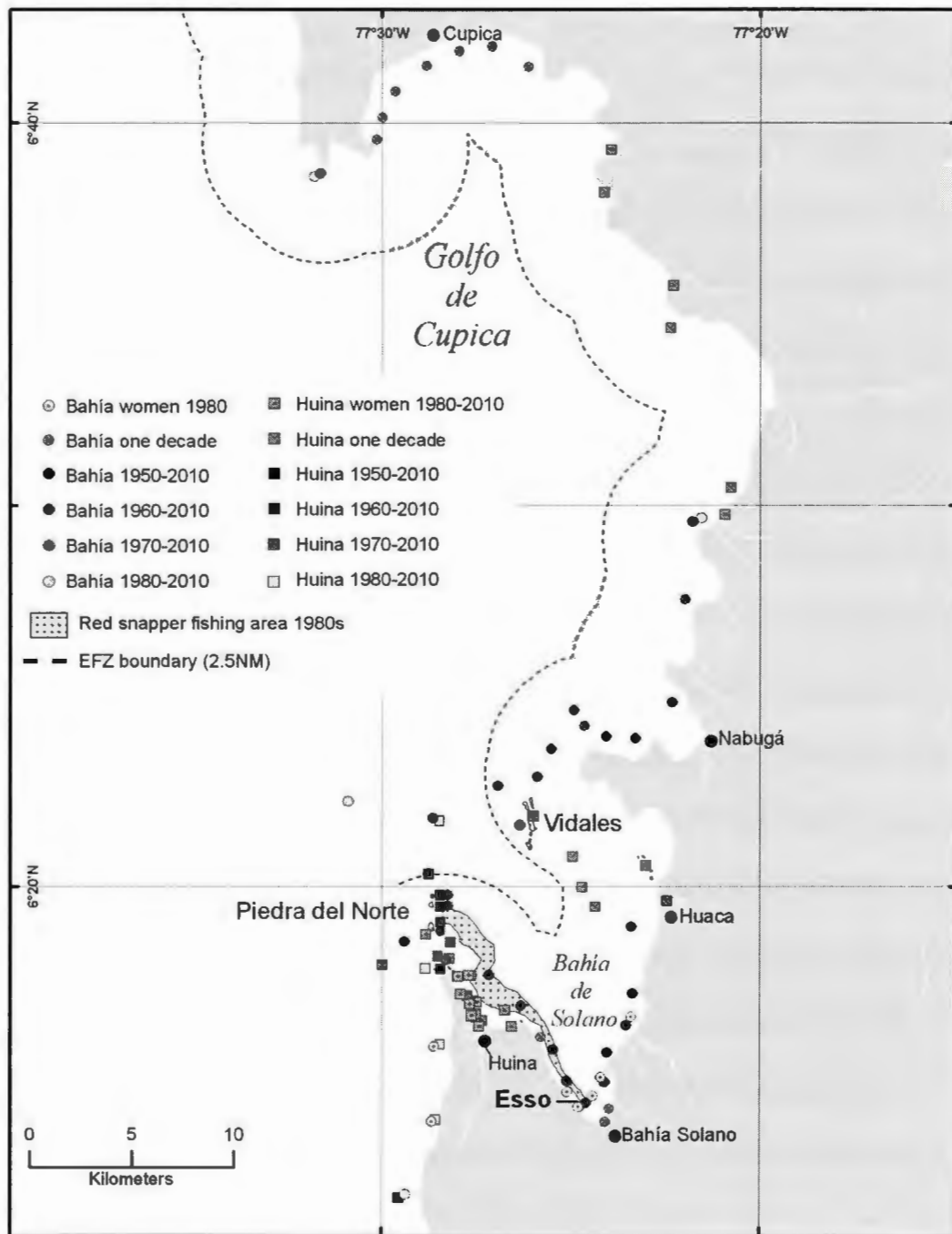


Figure 4.2. Handline fishing grounds inside and outside the Chocó-EFZ. Central and southern area. “Bahía one decade” and “Huina one decade” include fishing grounds only used during childhood. These childhood grounds located away from Bahía were used by fishers who later in-migrated to Bahía.

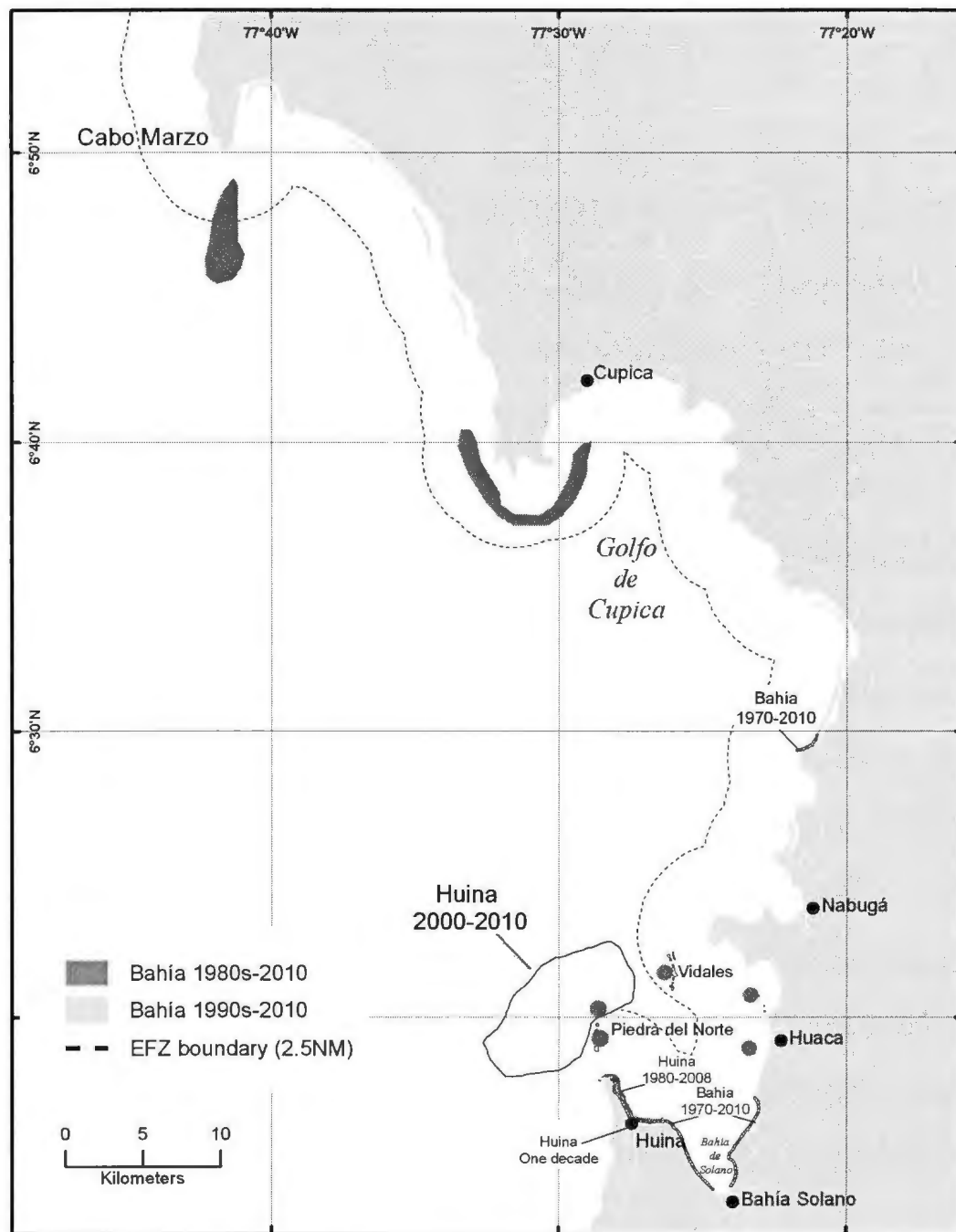


Figure 4.3. Gillnet fishing grounds inside and outside the Chocó-EFZ. Cabo Marzo and central and southern areas. “Huina one decade” includes fishing grounds only used during childhood.

Gillnets had been used in shallow waters around rocky areas to catch sharks and “any fish that passes through” (Bahía, Male fisher interview #12), and in deep waters to target red snapper, a species traditionally targeted by handliners.

Due to the high value of the red snapper, “occasional fishers” also contributed to spatial and social intensification during the high season by increasing the number of gillnets (and people fishing) in traditional rocky areas. There was a consensus among interviewees that the general decrease in catch rates of red snapper since the late 1990s was due to the use of gillnets. Several fishers considered the *Esso* ground (inside Bahía de Solano; see Figure 4.2) to be “fished out”; it was the only traditional handline ground that fit this category. One Huina fisher said that he started to search for other snapper grounds in areas further south outside the Chocó-EFZ (not covered by the charts used in this study). This fisher said:

In that time [1980s] the [red snapper] key fishing grounds were inside the [Bahía de Solano] [...] it was a wide sector from the *Esso* through *Bocococio* [where] you would catch lot of red snapper [...] within that sector wherever you set the gear you caught [red snapper], now you catch it in a few sites [and] very little and very small. (Huina Male Fisher Interview # 9)

Fishers also attributed the general decrease in catch rates, not only for red snapper but also other species, to the increase in the number of fishers and to the presence of spear fishers in rocky areas (social and spatial intensification) and of the industrial fleet (explained further below in the section entitled *Fishing up sequence in the shrimp and tuna industrial fisheries*). There was a consensus in both communities that trips were taking longer. Rather than searching for new grounds, Huina fisherwomen indicated they had stopped fishing two years earlier because the fish they target (green jack) had not

occurred in high abundance since that time and therefore it was “too much sacrifice” to keep fishing. Bahía fisherwomen had stopped fishing in the 1980s due to situations not related to fish scarcity (e.g. health issues or husbands who would not agree with them fishing). In the past during the high season (May through June) women would catch at least 100 individual fish every night using handlines and boats close to the shore. One of them said:

We [women] used to fish more because there was more fish; if they [men] didn't take us with them we fished by ourselves. We went out because we knew we would catch but now [...] I remember that up to 2 years ago [2008] fishing was very good [...] we'd go to sell the fish in Bahía and came back with money in our pockets. (Huina Female Fisher Interview # 7)

According to the research assistant from Huina, the 2011 season was bountiful again and women went back fishing (T. Villalba, personal communication, November 21, 2011). Gillnets also contributed to temporal intensification because they were used simultaneously with handlines and kept fishing when fishers were onshore. Ecological intensification took place when gillnets fished the same species (some jacks and snappers) but at smaller sizes than those individuals caught with hooks.

There was no clear trend in mesh size over time. Small mesh sizes (e.g. 2½”, 3½”, and 4”) were used in the 1960s and 1970s and both small and large mesh sizes (e.g. 1½”, 4”, and 8”) have been used since 2000. Apparently, the small mesh gillnets that were brought to Bahía and then spread to the surrounding communities were the gillnets that were used to target shrimp in the southern Pacific. During the time of the interviews, the most commonly used mesh sizes in both communities were 3” and 4”. The smallest mesh

size reported (only one case since 2000) was 1½”, which was used for bait. The fisher who owned this net said any fish not used as bait was used for household consumption.

Despite the ban on nets (gillnets and beach seines) within the Chocó-EFZ after its establishment in 2008, some fishers were still using them in 2010 (See Figure 4.3). In both Bahía and Huina some fishers stopped using gillnets after the 1990s because the gear was stolen when left unattended in the water and they never replaced it. In Huina only one (out of 5 gillnetters) was still using gillnets by 2010 as part of a deal between locals (examined in Chapter 3). This gillnetter had moved out of the Chocó-EFZ, close to *Piedra del Norte* (Bahía de Solano, See Figure 4.3), and was using the gear as a surface gillnet, moved by the current but attended. In 2011 this fisher received hooks in exchange for his nets as part of a gear exchange program and built a *colgante* (T. Villalba, personal communication, November 21, 2011). In other cases, fishers said they gave up gillnets because they considered it to be a harmful gear.

The use of beach seines also contributed to spatial expansion and intensification; to the former because this gear was used on beaches (Figure 4.4), a ground not previously exploited by any other gear; and to the latter because the gear has also been used on rocky grounds (combined with diving to minimize gear damage). Ecological expansion resulted when beach seines were used to target species not caught by gillnets and hooks (drums, *mojarras*, and catfishes) -all of them sold as “black meat” for the local market. Ecological and social intensification also occurred when seines were used in rocky areas and to fish the same species caught with hooks (jacks and snappers) but at smaller sizes. One of the fishers who seined between the 1970s and 1980s (Figure 4.4) argued that:

During the last 20 years the beach seines have been used in rocky and coral areas, attacking [...] important nursery areas of [spotted rose (*Lutjanus guttatus*) and pacific red snapper] [...] that happens in *Playa Larga* [Bahía de Solano inside the EFZ] [...] [the fishers] dive and take the gear out destroying the ecosystem when mixing diving and seining [...] It'd be fine if the fish was for household consumption when fish is scarce but many people do it for the market. (Huina, Male Fisher Interview #1)

The length and mesh size used in beach seines varied over time but with no clear trend. In the 1950s lengths ranged between 100m and 180m, in the 1980s a few beach seines were between 160m and 360m and after 2000 beach seines length were up to 324m in length. Mesh size went from small (1 ½" and 2 ½") to a larger mesh size (2 ¾", 3") - apparently due to regulations. Like gillnets, beach seines were still being used after the establishment of the Chocó-EFZ and a ban on beach seining.

According to a Huina fisher, there were three beach seines remaining in the community and between 4 and 6 fishing and non-fishing families would share in the catch of a single beach seine. This situation made it difficult to eliminate beach seines because the gear exchange project - the main tool used by the government to convince fishers to give up gillnets and beach seines- did not consider any compensation for non-fishing families. Also, the project did not consider compensation for retired fishers. In Huina one of the beach seine owners had retired from fishing but rented the gear; thus he was still making a living from the beach seine and was not interested in a gear exchange.

The introduction of the longlines led to the use of new fishing grounds with muddy bottoms (spatial expansion) and targeted new species (ecological expansion).

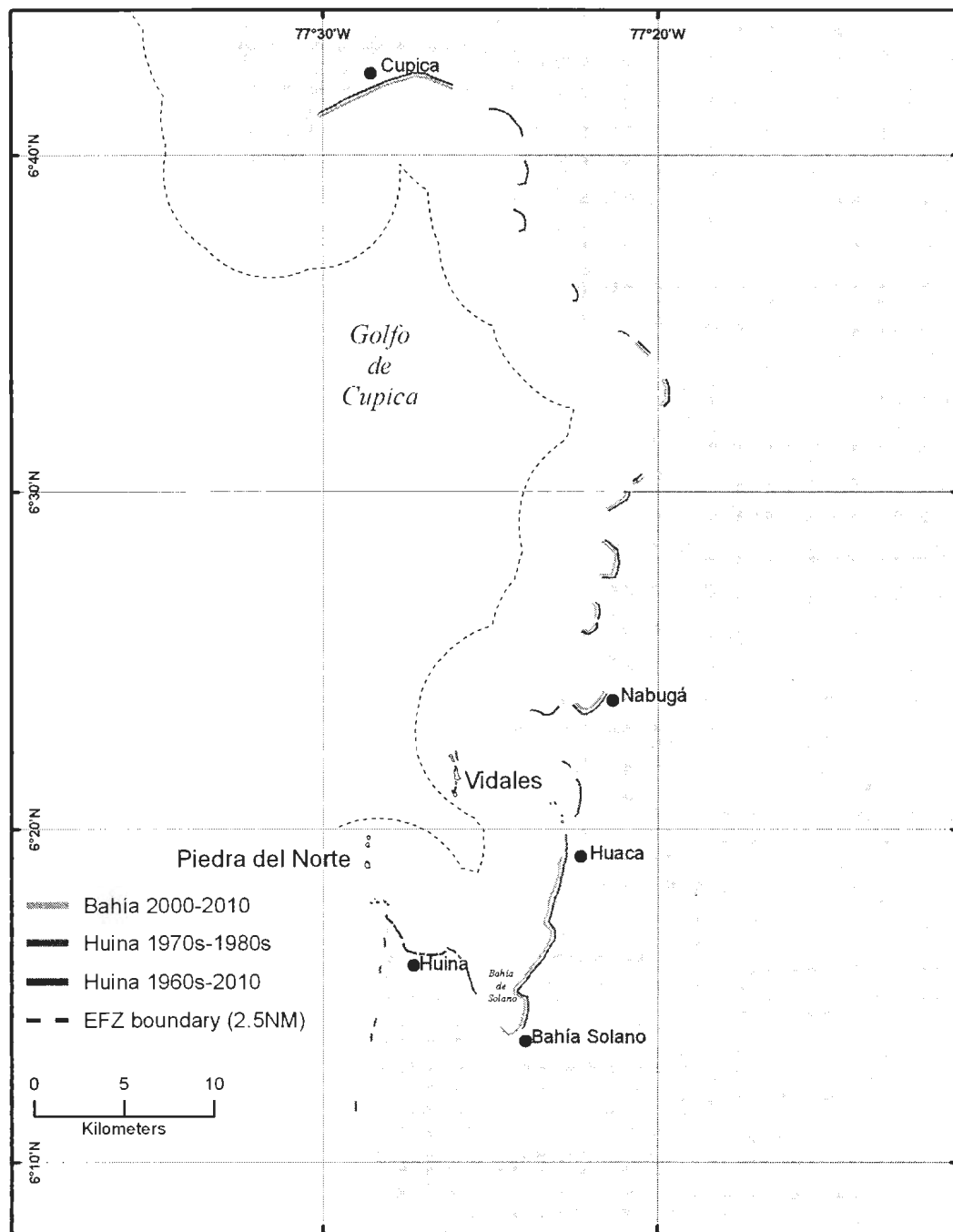


Figure 4.4. Beach seine fishing grounds inside and outside the Chocó-EFZ. Central and southern areas. Huina's beach is also used by women. Since there are only two beaches used in Cabo Marzo area, this area is excluded from this figure.

These species (brotula and rooster) were sold as “white meat” fish while the bycatch was also sold at lower prices [e.g. sharks (mainly *Mustelus*) and rays (*Dasyatis* spp.)] or consumed by fishers’ families [e.g. bighead tilefish (*Caulolatilus affinis*)]. The research assistant in Bahía described this situation:

They [outsiders] brought a gear [the longline] that nobody knew; exploited a resource [Pacific bearded brotula and rooster] that was not exploited [locally]. (Bahía, Research Assistant)

A fisher explained why southern fishers had expanded spatially into their area:

The [fish] production was better here because they had fished out the remaining fish they had in the south and since we did not know the [longline] fishery here, they brought it. (Bahía Male Fisher Interview # 3)

Longlines also contributed to temporal expansion and intensification. Expansion was a product of the use of this gear during the low season in the handline fishery (January-May and again toward the end of the year). Intensification occurred as longlines were usually used simultaneously with handlines and could fish when fishermen were ashore. The use of longlines and handlines allowed fishers to shift between these two fisheries when one was not profitable:

In '98 we discovered a [longline] ground between *El Norte* and *Los Vidales* [Bahía de Solano, inside the EFZ], then catches decreased so we moved to *The Faro* [southern waters outside the EFZ, ca. 7 km south from the previous ground], then we stopped [using the longline]. In 2006, catches [with longlines] decreased again [...] that year the [Pacific red snapper] catches were good, we didn't go far, we caught most volume [with handline] in the *Playa Larga* and *El Bajo* [Bahía de Solano, inside the EFZ] so [we didn't need] longlines [anymore]. (Huina, Male Fisher Interview # 1)

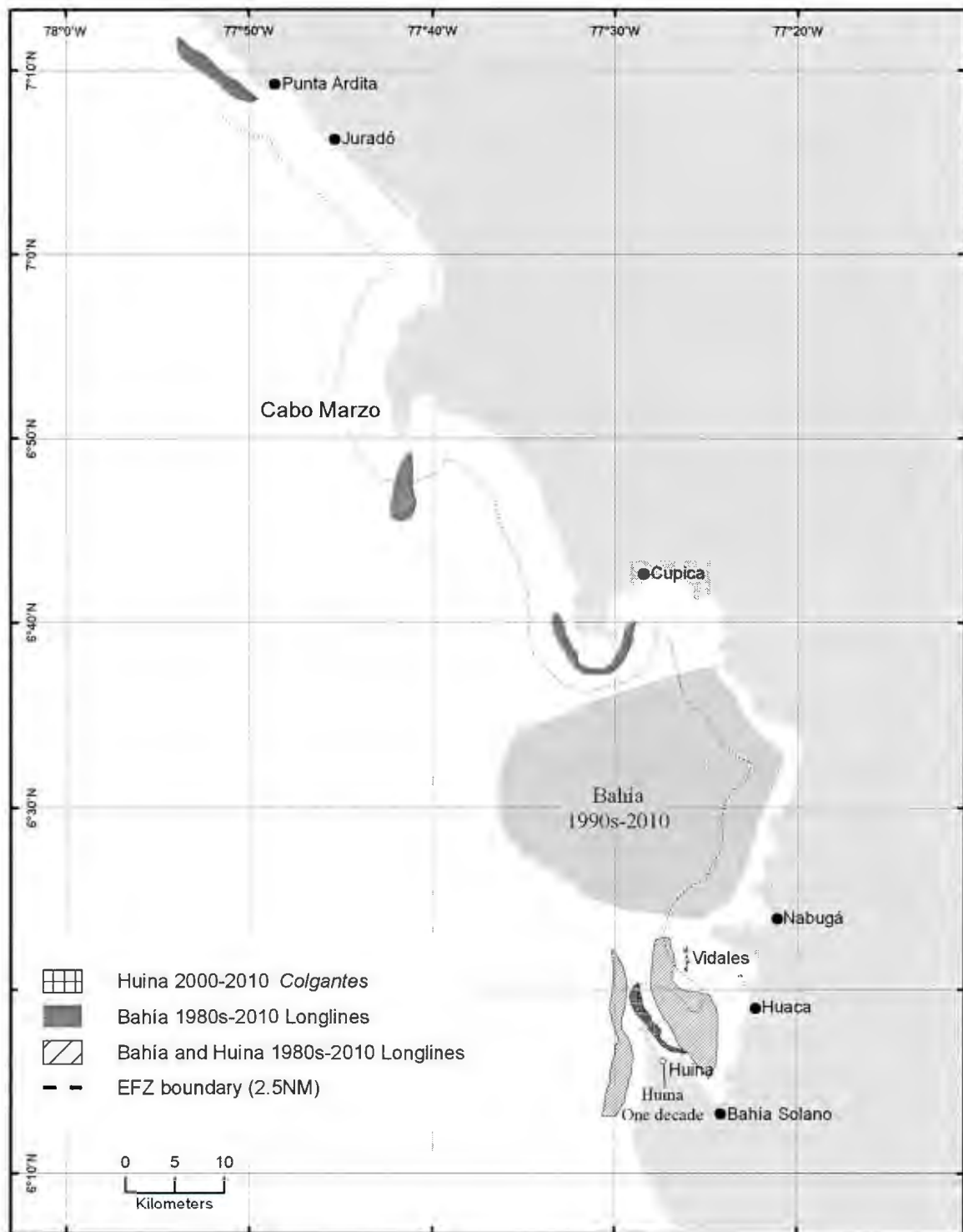


Figure 4.5. Longline fishing grounds inside and outside the Chocó-EFZ. All areas. Grounds used by men only. “Huina one decade” includes a longline fishing ground used only during childhood.

Since the 1980s longline grounds have been located both close to and far from the hometowns of the interviewed fishers occupying large areas, some of which are partially covered by the Chocó-EFZ (See Figure 4.5). Fishers said that they would move within and between these large areas in a matter of days depending on where they could get the best catch rates (seasonal peaks and valleys). In the longer term (decades), spatial intensification has occurred within these areas as a consequence of the increase in the number of hooks that they use in order to deal with the decreased catch rates. Since brotula is a nocturnal species, longlines have always been soaked for 12 hours (from sunset to sunrise); to cope with catch decline, fishers have increased number of hooks over time. When they started using longlines in the 1970s they used around 200 hooks and by 2010 they were using up to 2000 hooks on each line. Based on examples (all of them with hooks) given by the interviewees and standardized to kilograms per hour, longline catches went from 35.71 kg/h in the 1970s to 11.42 kg/h (average) in the 1980s, and have declined much further to 3.29 kg/h (average) since 2000. One of the fishermen said:

We started fishing with longlines [in the 1970s]. The largest had 200 hooks and we caught 200 kg or 300 kg a day. One day we went and set the gear 5 times and caught 300 kg. We went out at 9 am and came back at 4 pm. Now, one sets 2000 hooks and, if lucky, catches 50 kg; the [industrial] shrimpers have hit the *merluza* [pacific bearded brotula] and *ambulú* [rooster] too hard. (Huina Male Fisher Interview #2)

Between the 1970s and early 1990s fishers used few hooks, relatively few panels of nets, and invested less time. One way to cope with declining catch rates over time was by giving up longlines permanently (as opposed to seasonally) because of the high effort

fishers had to invest. In the words of one fisher who gave up his longline after using it during the 1990s but continued using handlines:

I left the longline because fish became scarce and taking the gear out of the water was too difficult. When there's fish [caught by the gear] the longline floats; if not, [the longline] is heavy and it's too hard to take it out of the water. (Bahía Male Interviewee # 9)

Another strategy was to design new gears such as the *colgante* -a modification to longlines- that led to spatial expansion. The *colgante* was designed by an elder Huina fisher after 2000. The *colgante* was set in mid-water on a transition ground between rocky and muddy areas (Figure 4.5) targeting both handline and longline species. The fisher stated that, unlike with longlines, he could handle the *colgante* without any help thus adding to his returns. Another advantage to this gear was that the grounds were close to Huina so he could get to them without a motor. Since longlines and *colgantes* were new fisheries, none of them led to social expansion (encroachment) or intensification (conflicts within the community).

A factor that has contributed to spatial and temporal intensification in recent years is the introduction of larger boats equipped with fish-finding equipment (GPS and echosounder) provided in 2006 by the government's "Fishing Program 2006". Some Bahía fisher organizations -legally formed- received boats with larger capacity (about 4 tons), that were usually more comfortable, more fuel efficient (diesel engines), and were equipped with gillnets and longlines. These vessels allowed fisher organizations to visit more distant grounds such as *Cabo Marzo* more frequently, at any time of the day, and for longer periods of time. In *Cabo Marzo*, the most productive area (same species as in areas close to communities but larger individuals and higher volumes) within the Chocó-EFZ,

fishers would “fill up the boat” faster than in southern waters. However since 2000 and despite substantial increases in their fishing capacity fishers can spend up to 15 days in *Cabo Marzo* and still not catch as much as they used to during the early 1990s when they would “make the trip” in 4 days.

Huina fishers (some of them provided with small boats and without fish-finding equipment) and a few Bahía fishers (non-organized and usually older fishers) preferred to remain around their hometowns (in Bahía de Solano) where they sustained incomes by targeting small volumes of valuable species (e.g. snappers). For these fishers, trip length had also doubled as they used to fish either in the morning or in the afternoon and now they fish the full day.

Food Security of the artisanal fishing households

When asked about household fish consumption, male and female fishers said that they would always leave some fish for their families and would share with neighbours and relatives. Fish would be salted, smoked, or fried for storing when electricity was not available. When electricity became permanently available, households started to use refrigerators and today they process the fish to vary their diet. Access to electricity did not imply more fish consumption because people have always preferred fresh fish. Unless they plan in advance not to fish for some days, the amount of fish stored will be small. There was a consensus in both communities that the decrease in catch rates had affected fish consumption in their families. Six fishers from Bahía and three from Huina indicated that their priority was to leave fish for their families. Hence, they first chose the fish for the household and then sold the remainder. One said, “if I catch little I prefer to leave it at

home rather than selling it” (Huina, Male fisher interview #1). Some fishers said that there had always been fish for their homes but there was less and less left over for sale. Another fisher said, “many times we go fishing and come back with nothing, before we always brought something” (Huina, Male fisher interview #6). Interviewees had other protein sources (beef, pork, eggs, chicken, etc.) not only because of the fish shortage but also to vary their diet.

The key informants who described the incident with the tuna vessel that was the trigger for the establishment of the Chocó-EFZ mentioned that the resulting protests had to do not only with the irregular procedure used to investigate the illegal fishing but also with the tuna scarcity that artisanal fishers had experienced after seiners had been fishing in the area. One informant said:

[...] after the [incident] fishers said that for the next 3 months they didn't have any fish, especially tuna, then there weren't any incomes. (Government officer interview # 3)

Although another key informant did not refer specifically to the tuna vessel, he also described the trail of devastation left behind by the seiners:

I came to count up to 10 vessels [seiners] in May, June, July when the *agallona* [*Cetengraulis mysticetus*] is around and the tuna is behind. As they have better equipment, the surprise was that 8 or 10 of us would go fishing with our gears and would catch nothing (Fishers' organization interview # 8)

Tuna is an important resource in terms of incomes, especially for those fisher organizations that are selling fresh fish to restaurants in mainland cities. The Huina artisanal fisher who addressed the letter to the fisheries authorities argued that artisanal nets and the industrial fishery were a threat to the food security of local communities. He

suggested there should be awareness campaigns, gillnets and beach seines should be prohibited, and that there was a need for a legal framework that would obligate the industrial fleet (referring to the purse seiners) to fish outside 30NM from the shoreline, (Huina fisher, letter to the fisheries authorities, n.d.; Appendix I). In an interview for a Colombian magazine, a Bahía artisanal fisher also argued that the seiners were ruining their waters, and that they would take everything away including their jobs and fish resources without anyone (probably referring to the government) doing something to prevent that from happening (Silva, 2010).

When key informants were asked about the discussions during the Chocó-EFZ negotiations about promoting food security, interviewees affiliated with the artisanal sector had different levels of understanding about this topic. As with co-management (discussed in Chapter 3), some of them did not have a clear idea of what food security meant or about the relationship between food security and the Chocó-EFZ. One stated that food security in the artisanal sector was a topic introduced towards the end of the negotiations for the Chocó-EFZ by a researcher and that the topic was poorly discussed and only mentioned in documents. Other interviewees indicated that, as with other subjects, the food security topic had been discussed during the workshops held by the GIC-PA while it was active in its earlier phase (1998-2004) and it was considered to be a strategic element during the negotiations. In fact, the GIC-PA (2001) identified the need to develop a management plan that would address both food and financial security of artisanal fishing households in Chocó. One of the interviewees identified a direct relationship between food security and the negotiation process:

Food security has always been seen as the foundation of all this process. If the fisher can't catch [fish] any longer then there's going to be a food crisis in town, because [...] 100% [of the income] in this town comes from fishing; it's more important than agriculture [...] Regularly every man in the Pacific gets up in the morning and the first thing he does is buy fish, [which] is something that's widely consumed locally. The day that you get up and go to the market and don't find fish you'll feel very frustrated. (Fishers' organization interview # 8)

One of the government officers said that the State had neither the capability nor the mechanisms needed to measure food security and that it would be the role of the NGOs and of the academic sector to do this. He indicated that both the involvement of the government and the decisions about the Chocó-EFZ had to do with sustaining the fisheries not with whether the fish was sold or consumed. He stated:

If I, with the biological, fishery, and technical information at hand, can say "we're going to guarantee that the catches will be maintained in the long run for this region" [...] I [will be able to] maintain a commercial dynamic [...] If I keep the [Chocó-EFZ] the only ones accessing to the [Chocó-EFZ] are the communities [...] If the guy doesn't want to sell [the fish] then he has it for household consumption [...] food security isn't about guaranteeing that the people have incomes but about guaranteeing that the fisher and his family have fish for consumption. (Government officer interview #3)

Another government officer stated that food security could be interpreted from different perspectives. For instance, food security could entail access to canned tuna (which is cheaper than fresh fish and does not need to be refrigerated) by non-coastal people with low incomes or by people living in isolated towns where food is carried in by pack animals. Another interpretation might focus, he stated, on women heads of households who work in fish plants and who had experienced reduced employment and thus reduced food security due to the negative effects of the Chocó-EFZ on the industrial shrimp fishery. The ACODIARPE spokesperson argued that not being able to fish in

Northern Chocó (considered the best shrimp fishing ground in the area) had reduced shrimp processing employment in Buenaventura from about 36,000 to 2,000 jobs. The shrimp industry had also been negatively affected, he claimed, by the devaluation of the Colombian currency, rising fuel costs, and by the deterioration of the fishing grounds adjacent to the port of Buenaventura due to dredging operations. This informant described the Chocó-EFZ as “the straw that broke the camel’s back”; from his point of view the Chocó-EFZ had a social cost (the food insecurity of plant workers) that had to be systematically assessed. Other sources of information such as minutes of the meetings leading up to the establishment of the EFZ would have provided insights into the perceptions that the different sectors have about the food security including how it became part of the negotiations, and how it shaped the negotiations. However, as note earlier, it was not possible to access these minutes because none of the interviewees had copies or knew where the minutes were stored.

Summary of Results

The reconstruction of the history of the hook (handline and longlines) and net (gillnets and beach seines) artisanal fisheries in Bahía and Huina waters, has provided insight into some of the factors that have contributed to the fishing up sequences in the region. Expansion of the artisanal fishery started with the development of commercial fisheries (1960s). The main drivers of this expansion were in-migration of traders from inland cities and improvements in infrastructure. In-migration of artisanal fishers from central and southern areas of the Colombian Pacific coast (where fishing grounds were fished out) and government also played their role (1980s-2000s). Most local artisanal fishers

went from using traditional handlines in rocky areas to also using new fishing gears that allowed fishers to target new species when they expanded to new fishing grounds including muddy grounds (longlining), areas closer to shore (gillnetting), and beaches (beach seining).

Over time, intensification took place and local artisanal fishers started using traditional grounds (rocky areas) throughout the water column from shallow waters with *colgante* and handlines to deeper waters with handlines and gillnets. The modification of gears (material, size, and design) and introduction of vessels with more capacity equipped with fish-finding technologies (to which some of the fisher organizations had access) also contributed to increasing effort, efficiency and, in the longer term, declining catch rates. The fishing up sequence involved expanded seasons, longer trips, conflicts within the community, a series of ascents and peaks and valleys in catch rates, and an overall long-term decline in fish landings. There were also spatial shifts along coastal waters; it is possible that the narrow continental shelf has limited the ability of most artisanal fishers to expand offshore.

As shown on the charts, most artisanal fishing grounds are located inside the Chocó-EFZ. The Chocó-EFZ excludes grounds located to the seaward (such as in *Cabo Marzo* and *Bahía de Solano*) and waters adjacent to the northern and southern border of the Chocó-EFZ. Those excluded grounds are small areas that have been used for several decades with handlines as well as large areas recently used for longlining.

This section has also showed that enforcement of the gillnet ban within the EFZ has been difficult. It could be said that the Chocó-EFZ not only should be larger in order to protect all the artisanal grounds and associated fish stocks important for the artisanal

fishers but also that strategies should be designed to effectively address ongoing problems with illegal fishing and to enhance the efforts to rebuild local fish stocks. These stocks are largely composed of coastal, non-migratory species associated to rocky, sandy, and muddy habitats. Although tuna is the only migratory species targeted by artisanal fishers, it represents an important source of income. Therefore, the Chocó-EFZ should also consider strategies to protect this resource.

Among stakeholders, there was no consensus about the definition of food security. In practice, however, from the point of view of the artisanal fishery and some parts of the government sector, the food security of artisanal fishing households have been negatively affected by the harmful artisanal fishing practices and also by the expansion and intensification of the industrial fishery in the area (further examined in the next section).

From the perspective of the industrial sector, one of the government, and the ACODIARPE representative, the main threat to food security is the Chocó-EFZ which is affecting the employment and thus food security of shrimp processing workers and indirectly affecting the food security of consumers who depend on the industrial sector for access to seafood.

4.4.3. Fishing up sequence in the shrimp and tuna industrial fisheries

Using the spatial and ecological expansion processes the following section describes the dynamics of the industrial shrimp and the tuna fishery in Chocó waters, their interactions with the local artisanal fishery, and the implications of these interactions for the artisanal fishery. It draws on the interviews with Bahía and Huina artisanal fishers, on an informal conversation with a trawler skipper, and on review of existing literature.

According to the artisanal fishers interviewed in Bahía and Huina and to the trawler skipper, domestic industrial shallow water shrimp fleets started fishing in northern Chocó's inshore waters between the 1950s and the 1960s. Back then and up to 2000s there was some history of exchange of goods between industrial shrimp vessels and local communities. Industrial shrimpers would give away shrimp, fish, or bait (sold sometimes) and locals would offer fruits, vegetables, and fish to the shrimpers. The skipper stated that when this industrial shrimp fishery began they fished all along the coast under a self-regulated system. They would fish during the first semester of the year in the south and during the second semester in the north. This way they would catch only large-sized shrimp. In the mid-1980s, artisanal fishers on the central and southern Pacific coasts (not on the northern coast) started using gillnets to catch shrimp. Interviewees did not provide information about the mesh size of the artisanal nets used to catch shrimp in the 1980s. However, currently, artisanal fishers on the central and southern Pacific coasts use these nets which have a mesh size that is smaller than 2 ¾" (INCODER, 2004). These nets were banned in 2004, however fishers have not given them up and the fisheries authorities are drafting new regulations to definitely ban these nets (P. Mejía, personal communication, January 30, 2013). Although these artisanal fishers (from central and southern Pacific coasts) would sell their shrimp to industrial fishers, competition between both sectors for the shrimp resource and gear conflicts emerged (social intensification). The shrimp catch rates started declining during late 1980s (Figure 4.8) and the self-regulation system ended. As expressed by the artisanal fishers interviewed and by the skipper, fishers from central and southern waters expanded into the northern territories when their traditional grounds were fished out by artisanal gillnetters. Annually, since the

1990s, the Government has implemented temporary closures to regulate both the artisanal (in central and southern waters) and industrial shrimp fishery (along the entire coast) (INDERENA, 1991; INPA, 1994; Ministerio del Medio Ambiente, 1994; INCODER, 2003; INCODER, 2005; ICA, 2008; ICA, 2010; INCODER, 2011). In the beginning, during the 1990s, all fishers complied with the closures but later on when catch rates declined further despite spatial expansion (Figure 4.6), most fishers (especially artisanal fishers) ignored the regulations. In 2010, an artisanal fishers' organization declared they would engage in civil disobedience by not complying with the seasonal closures because there were no economic alternatives while the closure was in place. Despite their opposition, the government implemented the closure ("La veda de camarón arranca el domingo", 2010).

The industrial shrimp fishery expanded ecologically and spatially during the 1980s when, according to the skipper, Japanese fishers introduced a deep water shrimp fishery. It was several years before Colombian fishers also started engaging in the industrial deep water shrimp fishery when trawlers diversified toward the deep water shrimp in the 1990s (Barreto et al., 2001). From 1993 to 1994 the industrial shrimp fleet consisted of 23 boats (Wehrtmann, 2012) increasing effort and catch volumes and in 1995 landings decreased due to a shift in the targeted resource (Madrid 1997 as cited in Barreto et al., 2001; Figure 4.6). The skipper stated that, in central and southern areas, the change to deep water shrimp mitigated gear conflicts with artisanal gillnetters since their grounds were no longer overlapping. The situation was the opposite in northern Chocó, where grounds used by industrial deep water shrimpers and artisanal longliners did overlap and gear conflicts started to occur (social expansion and intensification).

By the 1980s Bahía and Huina artisanal fishers had diversified and expanded their fisheries to include longlining in deeper waters so they and the industrial shrimpers were fishing between 70 and 150 fathoms (Madrid 1997 cited in Barreto et al., 2001) including inside the Chocó-EFZ where the 100 fathom isobath is found all along the coast and within the 2.5NM seaward boundary (Navia et al., 2010).

Additionally, after 2000, the number of industrial vessels targeting deep water shrimp on the Pacific coast increased (Rueda et al., n.d.). This increase might have had a direct effect in Chocó waters. Due to the characteristics of the continental shelf (narrow in the north, wide off the central and south Pacific coasts of Colombia), fishing deep water shrimp in northern Chocó was considered profitable because the shrimp were found in coastal waters while off the central and southern Pacific coasts catches had to be taken in offshore waters. Inshore shrimp grounds in the central Pacific coastal region have been negatively affected by dredging operations in the port because the removed sediments have been deposited on the fishing grounds.

Some Bahía and Huina artisanal fishers pointed to the industrial shrimp fishery as the cause of the decline in abundance of some species such as brotula and roosters, which are species targeted by artisanal longliners in Chocó waters and caught as bycatch by industrial shrimpers; other fishers mentioned the negative effects of industrial shrimpers' ghost nets on the rocky areas, which are the traditional handline grounds for artisanal fishers.

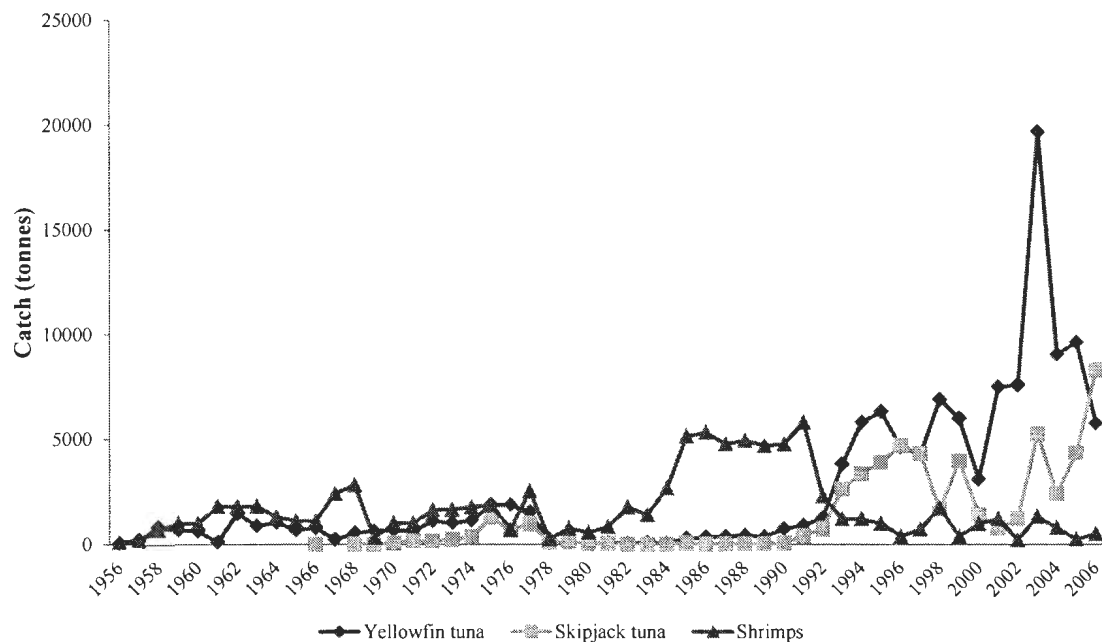


Figure 4.6. Industrial yellowfin tuna, skipjack tuna, and shrimp landings in Colombian waters (1956-2006). Database source: “Landings by species in the Waters of Colombia” Sea Around Us Project.

In Colombia’s inshore and offshore waters industrial domestic and foreign “baitboats” were used back in the 1950s (Constructora NORCO, 1965; Orbach, 1977; FIRMS, 2011-2012). As with industrial shrimpers, local fishers would also exchange local fruits and vegetables with the seiners for fuel, cooking oil, and other supplies. No conflicts occurred during the 1950s. One artisanal fisher described the baitboat fishing method in detail:

They [American tuna vessel’s crew] fished with a special hook that had no barb then they tied it to a piece of rope [...] and then to a bamboo pole, then when they localized the tuna school they threw the *agallona* [*C. mysticetus*] to the water [...] some of them threw the *agallona* and the others fished. (Bahía Male Fisher Interview # 1)

The “baitboats” were replaced by purse seines in the 1960s (Orbach, 1977; FIRMS, 2011-2012). The industrial purse seine technology along with new regulations on catching yellowfin tuna in coastal waters forced vessels to fish in offshore waters in search of this species (Orbach, 1977) the catches of which have historically been higher than those of the less valuable skipjack tuna (*Katsuwonus pelamis*) (Figure 4.8). The need to fish offshore would explain why local fishers did not see these industrial vessels anymore in inshore waters until 2000. Apparently, the increase in the use of “fish aggregating devices” (FADs) to fish skipjack (Miyake et al., 2004) led industrial seiners to fish in coastal waters once again, which led to an increase in skipjack landings in recent times (Figure 4.8). In fact, the tuna industry’s spokesperson stated that the skipjack is mostly caught in Colombian waters by the industrial fleet about 5 NM from the shore between May and June coinciding with the high fishing season for artisanal fishers in northern Chocó. Artisanal fishers said that they frequently see industrial seiners during the high season. Conflicts with industrial seiners are related to the fact that artisanal and industrial fisheries compete for the same tuna resource, especially the yellowfin tuna, one of the most important species for artisanal fishers in the Chocó-EFZ (Navia et al., 2010). Cooperative interactions as well as competition have occurred between seiners and local fishers in recent times as in the past. While fishing 7 NM from the shoreline, seiners sometimes give tuna to the artisanal fishers (it is not clear if sell it to them or give it away) who, in turn, sell it in Bahía. However, this does not seem to happen often and the general expectation among artisanal fishers is that seiners should be excluded from their waters to ensure tuna will be available for them.

In short, artisanal fishers have interacted with industrial shrimpers and seiners for decades (more with the former than with the latter). Back in the 1950s and the 1960s, interactions were mostly positive but over time, as both artisanal and industrial fisheries expanded and intensified, negative interactions became more frequent. Some fishers (mostly longliners) pointed to the industrial shrimp fishery as the cause of decline in some species such as brotula and roosters that are targeted by artisanal longliners and caught as bycatch by industrial shrimpers. Artisanal fishers blamed industrial shrimpers for decreased catch rates with longlines. However, discussions emphasized the negative short-term impacts on catches during the high season when industrial seiners would catch large volumes of tuna and locals would experience tuna scarcity. The impact is greater considering this is the most important season of the year for local fishers as 64.63% of Bahía fishers and 58.82% of Huina fishers engaged in the handline fishery; while 21.95% of Bahía and 14.71% of Huina fishers are longliners (Navia et al., 2010). Consequently, a large part of the community experiences competition with seiners. In his letter to the fisheries authorities (Appendix I), the Huina fisher also emphasizes the impact by the industrial tuna fishery on the artisanal fisheries catches.

The impact of industrial shrimpers on the artisanal longline fishery and the impact of the industrial tuna on the artisanal tuna (handline) fishery also contributed to the expansion and intensification process within the artisanal fishery in order to keep high catch rates that would secure their incomes and household fish consumption. If the Chocó-EFZ is to protect habitats (from industrial trawlers) and fish species (from industrial trawlers and seiners) while mitigating conflicts and promoting food security, it must be effective in restricting the industrial fleet's fishing gears and effort.

4.5. Discussion

The reconstruction of the history of the artisanal fishing activity based upon the accounts of experienced male and female fishers shows that the expansion and intensification of the commercial artisanal fishery in the southern area of the Chocó-EFZ is recent and linked to the development of Bahía as a municipality since 1935. It is also linked to the development of fishing infrastructure, the drop in agricultural incomes, and the arrival of in-migrants from inland cities and other coastal communities seeking better living conditions. Interviews also provided an account of the history of expansion and intensification of the industrial shrimp and industrial tuna fisheries and how these processes led to conflicts with the local artisanal fishers starting in the 1990s and contributed to catch rate declines in the artisanal fisheries; affecting sustainability of local stocks and the food security of artisanal fishing households.

The following discussion is divided into three sections. The first section discusses the factors that contributed to the fishing up sequence after the onset of the commercial artisanal fisheries. The second discusses local perceptions of the potential role of the Chocó-EFZ in rebuilding artisanal fisheries while mitigating conflicts between the industrial and artisanal fisheries. The third section discusses seafood security among local artisanal fishing households and its link to the Chocó-EFZ.

4.5.1. Factors contributing to the fishing up sequence in commercial artisanal fisheries

Although previous generations had fished in the area, it was the generations born between the 1930s and 1970s that took up commercial fishing in a serious way. Regardless of their

origins, most local families were primarily engaged in commercial agriculture and subsistence fishing until the agriculture market dropped in the 1960s and was replaced, to some degree, by the fish trade with inland cities. In a few decades these and subsequent generations have built up LFK influenced by some involvement with other fishers (local and outsiders), other types of fisheries, as well as, to varying degrees, engagement with managers, scientists, new technologies (e.g. fibreglass vessels and GPS technology), and changing market and ecological realities. This movement from LFK to a knowledge system influenced by external factors is described by Murray et al. (2006) as a transition between “small-scale, locally situated, long-term, harvest-oriented [LFK] towards what might be termed globalized harvesting knowledge (GHK)” (p. 564). The interview results presented in this chapter suggest this transition has been uneven and is by no means complete within the Chocó artisanal fishery. The concept of evolution from LFK to GHK (Murray et al., 2006) provides insights into how fishers engage with new conservation measures as well as with scientists and managers when trying to achieve fisheries sustainability. This also holds true for the Chocó-EFZ, as the zone aims at mitigating conflicts, protecting fish stocks, and promoting food security by establishing conservation and management policies as well as a collaborative relationship between fishers, scientists, and managers linked to international and national developments such as the FAO precautionary principle.

The development of commercial fisheries in the early 1960s was largely the result of market changes, increased communication with inland cities, interventions by outsiders and improvements in infrastructure (e.g. airport, cold storage, electricity); an increase in the number of fishers (locals and outsiders); and the introduction of new technologies that

allowed fishers to expand into more distant waters and to access under-exploited grounds and species. Landings of species associated with rocky areas (e.g. red snapper) and muddy areas (e.g. pacific brotula and rooster) evolved over time with initial catch increases, followed by peaks and, in some cases, subsequent declines. Catches kept declining despite increased effort and efficiency (larger boats and storage capacity, an increase in gillnet panels and in the number of hooks in longlines, construction of *colgantes*, among other innovations). Increased effort and efficiency as a response to lower resource abundance was encouraged by government programs in recent years like the “Fishing Program 2006” project (INCODER & IICA, 2008). The program provided larger and better-equipped boats (navigation equipment and 8” mesh gillnets to replace small mesh sizes used on inshore grounds) to encourage fishers to make longer trips and into offshore waters while contributing to comfort and safety. It was anticipated that, in the long term, fishers’ incomes would increase, the artisanal fishery would be more competitive, the food security and wellbeing would be enhanced, and the sustainable use of the fishing resources would be supported (INCODER & IICA, 2008). Similarly in Newfoundland, Neis et al. (1999) described some innovations to increase efficiency (while providing comfort and safety) in the coastal cod fishery before the collapse of the cod stocks. Innovations included modification of fishing gears, improvement of vessel capacity, and use of fish-finding equipment (Neis et al., 1999).

As with knowledge, access to technology varied between and within communities. Modern technologies were only provided to some Bahía fisher organizations. Consequently, not all fishers moved to distant grounds because of the lack of access to suitable infrastructure to make long trips (e.g. large boats, less fuel costly engine).

Another reason to not move far from their communities include the social cost including spending less time with their families. This resistance was common among Huina fishers and older Bahía fishers.

4.5.2. The role of the Chocó-EFZ in rebuilding fisheries

While there was a consensus that the decline in abundance of fished species from traditional rocky areas was caused by the use of artisanal gillnets in deep waters (spatial intensification), a few fishers also pointed to the effect of the industrial fishery on the local fish stocks. The focus on the effects of artisanal gillnets over industrial fisheries could reflect the fact that the majority of interviewees only used handlines and were in conflict with artisanal gillnetters (both users of rocky areas) and a minority also used longlines and would conflict with industrial shrimpers (both users of muddy areas). This indicates that points of view regarding the status of the fish stocks and steps needed for the resolution of conflicts vary according to fishing gears and the extent to which artisanal fishers interact with the industrial fishers. This further shows that among the artisanal fishers there are subgroups whose knowledge and perspectives should be taken into account in order to find an appropriate Chocó-EFZ design (geographical area and regulations). The design should address issues associated with both the rebuilding of fish stocks and the mitigation of conflicts between and within sectors. The Chocó-EFZ design must be based on the conjoint use of scientific knowledge and the LFK of multiple groups of artisanal fishers (Dawe & Schneider, 2013). Tuna and shrimp fishers' knowledge should be also used. There was also some account of trawl skippers' ecological knowledge that supported a self-regulated system that allowed shrimpers to catch only

large-sized shrimp. This system was implemented when this fishery started back in the 1960s and ended when competition with artisanal shrimpers started in the 1980s in central and southern areas of the Pacific coast of Colombia. Some scholars have shown that industrial fishers are also aware of problems with overfishing and by valuing their attitudes and incorporating their knowledge it is possible to bring out new perspectives that might increase the likely success of new management plans (Orbach, 1977; Foster & Vincent, 2010). Management plans might include ways to compensate trawler workers if a total ban of this fishery is implemented. This is relevant in the Chocó-EFZ case, since its extension in terms of nautical miles and its permanent implementation of the zone have met strong opposition by the industrial sector (as shown in Chapter 3).

In terms of the ecological and biological components of EFZs, studies elsewhere have demonstrated that habitats and benthic fauna sensitive to bottom-fishing disturbance can take several years to recover on grounds from which trawling has been excluded (Kaiser et al., 2002; Thrush & Dayton, 2002; Kaiser et al., 2006; Althaus et al., 2009). In the Chocó-EFZ case, the exclusion of bottom trawlers might have a positive effect on artisanal fisheries that target demersal species including brotula and roosters (longline species). The GIC-PA (2012) found that after the implementation of the Chocó-EFZ, catch volumes of these two species showed a positive trend but with peaks and valleys. Some valleys in brotula catches seem to be associated, however, to market changes in inland cities linked to buying imported fish species at lower prices. This supports concerns of artisanal gillnetters that the artisanal longline fishery is not profitable given the low prices of the target species and therefore their refusal to accept hooks in exchange for their gillnets (discussed in Chapter 3).

Reducing the fishing effort on the tuna stocks by establishing MPAs or expanding the EFZ will be more challenging given the migratory nature of the tuna and the multispecies nature of the fishery. Studies on the effectiveness of temporary closures established to rebuild tuna stocks suggest that this type of closure might not be enough to achieve this goal and recommend larger and longer closures as well as gear technology modifications and complementary management tools (Harley & Suter, 2007; Lennert-Cody et al. 2008). GIC-PA (2012) found that yellowfin tuna landings increased the most (among tuna species) after the establishment of the Chocó-EFZ. However, they also warned that artisanal catches were composed of tuna juveniles indicating that both industrial and artisanal fisheries are exerting negative fishing pressure on this species. They suggested that the permanent implementation of the Chocó-EFZ would decrease the pressure exerted by the industrial fleet and that additional measures should be implemented to mitigate the impact exerted by the artisanal sector (GIC-PA, 2012). Nevertheless, the difficulties that the fisheries authorities have had successfully modifying or permanently implementing the Chocó-EFZ show that implementing and enforcing additional measures might be difficult, if not impossible.

4.5.3. The role of the Chocó-EFZ in promoting food security

Conflicts between artisanal and industrial fisheries over resources and fishing grounds are considered to be one of the key threats to artisanal fishers' food security (Bostock and Walmsley, 2009). This is the perception of key informants from the artisanal sector and one part of the government, even though some of them were not clear about the meaning of the phrase "food security". Conflicts with seiners in particular were identified as

causing an immediate negative impact on food security as fishers experienced a sudden drop in catch rates for tuna during the high season. The Chocó-EFZ was considered by artisanal fishers to be the best tool to address this situation.

The role of the Chocó-EFZ in promoting food security (limited to the physical access to fish) seemed straightforward for some key informants regarding conflicts with industrial seiners: the availability of tuna would be guaranteed by keeping the seiners away using the Chocó-EFZ and allowing artisanal fishers to hold exclusive fishing rights, giving them access to fish for either food or revenue or both. The formula gets complicated when, according to the artisanal sector and one of the public employees, the current design of the Chocó-EFZ is not adequate to protect artisanal fishers' access to tuna. GIC-PA (2012) concluded that artisanal tuna landings increased between 2007 (2.6 tons) and 2012 (90.8 tons), having a positive impact on the local economy and on the food security of artisanal fishing households. They requested the Chocó-EFZ to be extended (up to 7.5NM in some areas) in order to fully protect the artisanal fishery.

A major obstacle to this goal is the opposition of the industrial shrimp sector, which argues that the Chocó-EFZ is a threat to food security within this sector due to job loss. However, shrimp bottom trawl fisheries are unsustainable given the habitat and bycatch impacts (Chuenpagdee et al., 2003; Watling, 2005; Foster and Vincent, 2010) and Colombia is no exception (Wehrtmann, 2012). From an environmental perspective (resource sustainability), employment and food insecurity concerns cannot justify continued bottom trawling. Recent efforts to permanently ban this type of gear and to compensate owners and/or offer economic alternatives have recently been introduced in Hong Kong (WWF-Hong Kong, 2010); European waters (European Commission, 2012),

and Ecuador (Ministerio del Ambiente, 2012). Countries such as Colombia, which has no history of banning bottom trawling, can gain from the experience of banning this destructive and unsustainable practice elsewhere.

Some reasons why the food security of the artisanal sector is a priority and can be protected by granting fishing rights to them, include the fact that globally the artisanal fishery might employ approximately 260 million (\pm 6 million) people (Teh & Sumaila, 2013). In Colombia by 2000 the artisanal sector generated 91,000 jobs (post-capture jobs not included) and the industrial sector generated only 17,929 jobs (both capture and post-capture included) (Beltrán & Villaneda, 2000). The artisanal sector also contributes to poverty alleviation as a safety net and by acting as a labour buffer in rural areas (Béné et al., 2010). Compared to the industrial sector, the artisanal sector shows a more positive balance in terms of catches, ecological impacts, and social benefits (Pauly, 1997).

If promotion of food security is to be a goal rather than simply a by-product of the Chocó-EFZ (which seems to be the case from one officer's point of view), studies must pay attention to factors such as: the social and cultural significance of fish as a source of food to communities (Charles, 1992); the buffering effect of an artisanal food supply against external price factors (D. Schneider, personal communication, March 13, 2013); and the fish consumption demand (taking into account population growth), the quality of the fish, and the cash income from fishing that can be used to pay for health, education, and food (Allison, 2011). Quantifying the role of women in the fisheries sector (from fishing to the financial aspects of fisheries) and their contribution to food security (providing regular protein for their families and adding economic value to fishery products through processing and marketing operations) is also crucial in assessing food

security (Harper, et al. 2013). Finally, diversification in terms of the income from other fishing and non-fishing activities carried out by women and men should also be included, as this is considered to be a characteristic of most fishing communities (McGoodwin, 1990) and an adaptive strategy in response to declining catch rates (McCay, 1978).

4.6. Summary and conclusion

This chapter has drawn on 39 local fisheries knowledge career-history interviews with male and female fishers from two communities located within the Chocó-EFZ, from interviews with 11 key informants involved in the Chocó-EFZ process, from an informal conversation with a trawler skipper, and from background reports, documents, databases, and personal communications.

Building on findings in Chapter 3, this chapter provides a historical and detailed account of the fishing up sequences and their role in triggering negative interactions between the artisanal and industrial sectors; as well as within the artisanal sector. Fishing up sequences were partly driven by the onset of the commercial artisanal fishery and the development of the local market (that largely demanded “black meat”) and a national market (largely “white meat”). In-migrants from southern -and degraded- waters of the Pacific coast, technology transfer, and government programs and policies also played key roles in the development of the commercial fishery and in the fishing-up sequence.

Declining catch rates over time in the artisanal fishery related to artisanal gillnetting contributed to the decision to ban this gear within the EFZ. Interviews suggest that the main role of the Chocó-EFZ in addressing the rebuilding of local fish stocks and promoting the food security of artisanal fishing households might be the effective

reduction of competition with tuna seiners and control of several forms of harm caused by different gears. As described by artisanal fishers, forms of harm include habitat destruction and high bycatch by artisanal beach seines and by industrial bottom trawling; harm also includes unsustainable catches by industrial tuna seiners and by artisanal gillnets.

What should the ideal Chocó-EFZ look like in order to protect fish stocks and to mitigate conflicts? There is no one answer to this question given the nature of fisheries and related conflicts, and the diversity of stakeholders engaged with the Chocó-EFZ process (as examined in Chapter 3). Findings from this chapter suggest that the diverse nature of the fish resources involved (migratory and non-migratory) and the existence of subgroups of fishers with different concerns and perceptions about conflicts within and between artisanal and industrial fishers add elements that must be taken into account in order to properly design the Chocó-EFZ and complementary measures.

The results of this reconstruction of the history of the fishing dynamics (1950-2010) within the waters currently covered by the Chocó-EFZ are consistent with a fishing-up sequence similar to that described by Neis & Kean (2003) for Newfoundland and Labrador. The reconstruction showed processes of expansion and intensification along the spatial, temporal, ecological, and social axes within the artisanal and industrial fisheries within the Chocó-EFZ. The reconstruction approach also made it possible to understand the relationship between the past and present status of the artisanal and industrial fisheries, their conflicts, and provided insights into the effectiveness of the Chocó-EFZ. The use of LFK career-history interviews with linked chart biographies allowed the collection of historical data not available from other sources. Interviews with fishers also

made it possible to examine the implications of the Chocó-EFZ for the food security of fishing households and for the rebuilding of local fish stocks. Building on lessons from Chapter 3, this chapter provides additional lessons for anyone interested in understanding the fishing dynamics related to the Chocó-EFZ and seeking to study the effectiveness of EFZs elsewhere.

4.7. Literature cited

- Agardy, T., di Sciara, G. N., & Christie, P. (2011). Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning. *Marine Policy*, 35(2), 226-232. doi: 10.1016/j.marpol.2010.10.006
- Althaus, F., Williams, A., Schlacher, T. A., Kloser, R. J., Green, M. A., Barker, B. A., . . . Hoenlinger-Schlacher, M. A. (2009). Impacts of bottom trawling on deep-coral ecosystems of seamounts are long-lasting. *Marine Ecology Progress Series*, 397, 279-294. doi: 10.3354/meps08248
- Barreto, C., Polo G., & Mancilla, B. (2001). Análisis biológico pesquero y económico de la fauna acompañante en la pesquería de arrastre industrial colombiana. Contribución biológica y económica para la investigación y el desarrollo en recursos pesqueros colombianos y estimación del impacto de la fauna incidental en la pesca de arrastre del camarón. In *Tropical shrimp fisheries and their impact on living resources. Shrimp fisheries in Asia: Bangladesh, Indonesia and the Philippines; in the Near East: Bahrain and Iran; in Africa: Cameroon, Nigeria and the United Republic of Tanzania; in Latin America: Colombia, Costa Rica, Cuba, Trinidad and Tobago, and*

- Venezuela. (pp. 234-270). Fisheries Circular. No. 974. Rome: FAO. Retrieved from <ftp://ftp.fao.org/docrep/fao/007/y2859e/y2859e09.pdf>
- Beltrán, C., & Villaneda, A. (2000). Perfil de la pesca y la acuicultura en Colombia. Instituto Nacional de Pesca y Acuicultura – INPA. Retrieved from: <http://www.ibcperu.org/doc/isis/6621.pdf>
- Béné, C., Hersoug, B., & Allison, E. (2010). Not by rent alone: Analysing the pro-poor functions of small-scale fisheries in developing countries. *Development Policy Review*, 28(3), 325-258. doi: 10.1111/j.1467-7679.2010.00486.x
- Bourillón-Moreno, L. (2002). *Exclusive fishing zone as a strategy for managing fishery resources by the Seri Indians, Gulf of California, México*. Dissertation Submitted to the Faculty of the School of Renewable Natural Resources, University of Arizona. Retrieved from http://cobi.org.mx/wp-content/uploads/2012/08/2002-c-cie_tesis_doctl_lbourillon.pdf
- Cadiou, G., Boudouresque, Ch., Bonhomme, P., & Le Diréach, L. (2009). The management of artisanal fishing within the marine protected area of the Port-Cros National Park (northwest Mediterranean Sea): a success story? *Journal of Marine Science*, 66: 41–49. Retrieved from <http://icesjms.oxfordjournals.org/content/66/1/41.full.pdf+html>
- Castilla, J.C., & Fernández, M. (1998). Small-scale benthic fisheries in Chile: On co-management and sustainable use of benthic invertebrates. *Ecological Applications*, 8:S124–S132. Supplement. Retrieved from <http://www.esajournals.org/doi/pdf/10.1890/1051-0761%281998%298%5BS124:SBFICO%5D2.0.CO%3B2>

- Chuenpagdee, R., Morgan, L. E., Maxwell, S. M., Norse, E. A., & Pauly, D. (2003). Shifting gears: Assessing collateral impacts of fishing methods in US waters. *Frontiers in Ecology and the Environment*, 1(10), 517-524. [http://dx.doi.org/10.1890/1540-9295\(2003\)001\[0517:SGACIO\]2.0.CO;2](http://dx.doi.org/10.1890/1540-9295(2003)001[0517:SGACIO]2.0.CO;2)
- Constructora NORCO (1965). *Estudio referente a las posibilidades de la industria pesquera en Colombia*. Colombia. Copy in possession of author.
- Davis, R., Whalen, J., & Neis, B. (2006). From orders to borders: Toward a sustainable co-managed lobster fishery in Bonavista Bay, Newfoundland. *Human Ecology*, 34, 851-867. doi: 10.1007/s10745-006-9032-2
- Dawe, J. & Schneider, D. (2013). Integrating fishers' knowledge with science: A case study of three species of wolffish (Anarhichadidae) listed under the Canadian Species at Risk Act. *Ecology and Society Special Feature on Rebuilding Fisheries and Threatened Communities*. Manuscript in preparation
- European Commission (2012). *Establishing specific conditions to fishing for deep-sea stocks in the North-East Atlantic and provisions for fishing in international waters of the North-East Atlantic and repealing Regulation (EC) No 2347/2002*. Retrieved from http://ec.europa.eu/fisheries/cfp/fishing_rules/technical_measures/official_documents/com_2012_371_en.pdf
- Federación Colombiana de Municipios. (n.d.). *Bahía Solano. Descifra las cifras de tu municipio*. Retrieved from <http://www.fcm.org.co/fichamnemotecnica/pdf/choco/bahiasolano.pdf>

- FIRMS (2011-2012). Fishery Resources Monitoring System (FIRMS). In: *Fishery Resources Monitoring System (FIRMS)*. Rome. Updated 14 May 2012. Retrieved from <http://firms.fao.org/firms/fishery/459/en#FisheryHistory>
- Foster, S. J., & Vincent, A. C. J. (2010). Tropical shrimp trawl fisheries: Fishers' knowledge of and attitudes about a doomed fishery. *Marine Policy*, 34(3), 437-446. doi: 10.1016/j.marpol.2009.09.010
- Gelcich, S., Hughes, T. P., Olsson, P., Folke, C., Defeo, O., Fernandez, M., . . . Castilla, J. C. (2010). Navigating transformations in governance of Chilean marine coastal resources. *Proceedings of the National Academy of Sciences of the United States of America*, 107(39), 16794-16799. doi: 10.1073/pnas.1012021107
- Gell, F. R., & Roberts, C. M. (2003). Benefits beyond boundaries: The fishery effects of marine reserves. *Trends in Ecology & Evolution*, 18(9), 448-455. doi: 10.1016/s0169-5347(03)00189-7
- GIC-PA. (2001). *Lineamientos generales para el ordenamiento de la pesca artesanal en la costa norte de Chocó*. Grupo Interinstitucional y Comunitario de Pesca Artesanal de la costa norte chocoana. GIC-PA. Technical report. Copy in possession of author.
- GIC-PA. (2010). *Asamblea general del Grupo Interinstitucional y Comunitario de Pesca Artesanal del Pacífico Chocoano GIC-PA*. Nuquí, 15 y 16 de Mayo. Minutes. Copy in possession of author.
- GIC-PA. (2012). *Documento técnico para el establecimiento de la Zona Exclusiva para la Pesca Artesanal (ZEPA), en el Pacífico norte colombiano*. Bahía Solano. Colombia. Copy in possession of author.

- Harley, S. J., and Suter, J. M. (2007). The potential use of time-area closures to reduce catches of bigeye tuna (*Thunnus obesus*) in the purse-seine fishery of the eastern Pacific Ocean. *Fishery Bulletin US*, 105, 49–61. Retrieved from <http://www.biodiversitylibrary.org/item/22574>
- Harper, S., Zeller, D., Hauzer, M., Pauly, D., & Sumaila, U. R. (2013). Women and fisheries: Contribution to food security and local economies. *Marine Policy*, 39, 56-63. doi: 10.1016/j.marpol.2012.10.018
- Hart, P. J. B. (1998). Enlarging the shadow of the future: avoiding conflict and conserving fish. In T. J. Pitcher, P. J. B. Hart, & D. Pauly (Eds.), *Reinventing fisheries management*. (pp. 227–238) London: Kluwer Academic Publishers.
- ICA, Resolución 2650. (2008). *Por la cual se delimita un área exclusiva destinada para la pesca artesanal en el Departamento del Chocó*. República de Colombia. Retrieved from http://www.avancejuridico.com/actualidad/documentosoficiales/2008/47068/r_ica_2650_2008.html
- ICA, Resolución 4020. (2008). *Por la cual se establece una veda para el camarón de aguas someras y camarón de aguas profundas en el Océano Pacífico colombiano*. República de Colombia. Retrieved from <http://www.ica.gov.co/getattachment/edc74c58-6fb0-494f-8cc5-9ce650ea0830/2008R4020.aspx>
- INCODER, Resolución 999. (2003). *Por la cual se establece una veda para el camarón de aguas someras y profundas en el Océano Pacífico colombiano*. República de Colombia. Retrieved from

[http://www.avancejuridico.com/actualidad/documentosoficiales/2003/45385/r_incod
er_0999_2003.html](http://www.avancejuridico.com/actualidad/documentosoficiales/2003/45385/r_incod
er_0999_2003.html)

INCODER, Resolución 00695. (2004). *Por la cual se prohíben unos artes de pesca utilizados para la captura del camarón de aguas someras*. República de Colombia. Retrieved from

[http://www.avancejuridico.com/actualidad/documentosoficiales/2004/45545/r_incod
er_0695_2004.html](http://www.avancejuridico.com/actualidad/documentosoficiales/2004/45545/r_incod
er_0695_2004.html)

INCODER, Resolución 2238. (2005). *Por la cual se establece una veda para el camarón de aguas someras y profundas en el Océano Pacífico colombiano*. República de Colombia. Retrieved from

[http://www.avancejuridico.com/actualidad/documentosoficiales/2003/46109/r_incod
er_2238_2005.html](http://www.avancejuridico.com/actualidad/documentosoficiales/2003/46109/r_incod
er_2238_2005.html)

INCODER & IICA. (2008). *Proyectos exitosos en pesca y acuicultura*. Convenio de Cooperación 02/06 INCODER-IICA. Retrieved from [http://www.iica.int/
Esp/regiones/andina/colombia/Publicaciones%20de%20la%20Oficina/publicacion_in
coder_julio_2008.pdf](http://www.iica.int/Esp/regiones/andina/colombia/Publicaciones%20de%20la%20Oficina/publicacion_in
coder_julio_2008.pdf)

INCODER, Resolución 1051. (2009). *Por medio de la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó por el término de un (1) año, contado a partir del 31 de julio de 2009*. República de Colombia. Retrieved from [http://www.avancejuridico.com/actualidad/documentosoficiales/2009/47434/r_incod
er_1051_2009.html](http://www.avancejuridico.com/actualidad/documentosoficiales/2009/47434/r_incod
er_1051_2009.html)

INCODER, Resolución 2107. (2010). *Por la cual se amplía la duración de la medida en el área exclusiva destinada para la pesca artesanal en el Departamento del Chocó.*

República de Colombia. Copy in possession of author.

INCODER, Resolución 2190. (2010). *Por la cual se establece una veda para el camarón de aguas someras y profundas en el Océano Pacífico colombiano.* República de

Colombia. Retrieved from

http://www.icbf.gov.co/cargues/avance/docs/resolucion_incoder_2190_2010.htm

INCODER, Resolución 3063. (2011). *Por la cual se establece la veda para el camarón de aguas someras y profundas en el océano Pacífico colombiano, como medida de*

ordenamiento, control y vigilancia. República de Colombia. Retrieved from

faolex.fao.org/docs/texts/col107504.doc

INDERENA, Resolución 221. (1991). *Por la cual se aprueba el Acuerdo No. 52 del 12 de noviembre de 1991 emanado de la Junta Directiva del Instituto Nacional de los*

Recursos Naturales Renovables y del Ambiente INDERENA. República de Colombia.

Retrieved from faolex.fao.org/docs/texts/col28927.doc

INPA, Resolución 302. (1994). *Por la cual se establecen las medidas pertinentes para el cumplimiento de la veda de pesca de los camarones en el municipio y la Ensenada de*

Tumaco. República de Colombia. Retrieved from

faolex.fao.org/docs/texts/col28978.doc

Jaworski, A., Solmundsson, J., & Ragnarsson, S. (2006). The effect of area closures on the demersal fish community off the east coast of Iceland. *ICES Journal of Marine*

Science, 63(5), 897-911. doi: 10.1016/j.icesjms.2006.03.001

- Kaiser M., Spence, F., & Hart, P. (2000). Fishing-gear restrictions and conservation of benthic habitat complexity. *Conservation Biology*, 14(5), 1512–1525. doi: 10.1046/j.1523-1739.2000.99264.x
- Kaiser, M. J., Collie, J. S., Hall, S. J., Jennings, S., & Poiner, I. R. (2002). Modification of marine habitats by trawling activities: Prognosis and solutions. *Fish and Fisheries*, 3(2), 114-136.
- Kaiser, M., Clarke, K., Hinz, H., Austen, M., Somerfield, P., & Karakakkis, I. (2006). Global analysis of response and recovery of benthic biota to fishing. *Marine Ecology Progress Series*, 311.
- La veda de camarón arranca el domingo (2010, Diciembre 23). *El País*. Retrieved June 3, 2011 from <http://www.elpais.com.co/elpais/valle/noticias/veda-camaron-arranca-domingo>
- LeDrew, B. (1988). *A study of the conflict between fixed and mobile gear in Western Newfoundland*. St. John's: Department of Fisheries and Oceans.
- Lennert-Cody, C. E., Roberts, J. J., & Stephenson, R. J. (2008). Effects of gear characteristics on the presence of bigeye tuna (*Thunnus obesus*) in the catches of the purse-seine fishery of the eastern Pacific Ocean. *ICES Journal of Marine Science: Journal du Conseil*, 65(6), 970-978. doi: 10.1093/icesjms/fsn075
- McCay, B. (1978). Systems ecology, people ecology, and the anthropology of fishing communities. *Human Ecology*, 6(4), 397-422. doi: 10.1007/bf00889417
- McCay, B. J. (2002). Emergence of institutions for the commons: contexts, situations and events. In T. Dietz, N. Dolsak, P. C. Stern, S. Stonich & E. U. Weber (Eds.), *The Drama of the Commons* (pp. 361–402) Washington, DC: National Academy Press.

- McCay, B. J., & Jones, P. J. (2011). Marine protected areas and the governance of marine ecosystems and fisheries. [Editorial]. *Conservation biology : the journal of the Society for Conservation Biology*, 25(6), 1130-1133. doi: 10.1111/j.1523-1739.2011.01771.x
- Mascia, M. B., Claus, C. A., & Naidoo, R. (2010). Impacts of marine protected areas on fishing communities. *Conservation Biology*, 24(5), 1424-1429. doi: 10.1111/j.1523-1739.2010.01523.x
- McGoodwin, J.R. (1990). *Crisis in the world's fisheries. People, problems, and policies*. California: Stanford University Press
- Ministerio del Medio Ambiente, Resolución 523. (1994). *Por la cual se establece la veda para la pesca del camarón en aguas someras y profundas en el Océano Pacífico colombiano*. República de Colombia. Retrieved from faolex.fao.org/docs/texts/col28804.doc
- Ministerio del Ambiente. (2012). *El MAE analiza beneficios ambientales de la prohibición de la pesca de arrastre*. República de Ecuador. Retrieved from <http://www.ambiente.gob.ec/?p=5398/el-mae-analiza-beneficios-ambientales-de-la-prohibicion-de-la-pesca-de-arrastre>
- Miyake, M.P., Miyabe, N., & Nakano, H. (2004). *Historical trends of tuna catches in the world*. FAO Fisheries Technical Paper. No. 467. Rome: FAO. Retrieved from <ftp://ftp.fao.org/docrep/fao/007/y5428e/Y5428E01.pdf>
- Mosquera, G., & Aprile-Gnisset, J. (2002). *Hábitats y sociedades del Pacífico. La Bahía de Solano*, Volumen I. Cali: Universidad del Valle. Copy in possession of author.

- Murray, G., Neis, B., & Johnsen, J. (2006). Lessons learned from reconstructing interactions between local ecological knowledge, fisheries science, and fisheries management in the commercial fisheries of Newfoundland and Labrador, Canada. *Human Ecology*, 34(4), 549-571. doi: 10.1007/s10745-006-9010-8
- Navia, A. F., Mejía-Falla, P. A., López-García, J., Muñoz, L. A., & Ramírez-Luna, V. (2010). *Pesquería artesanal de la zona norte del Pacífico colombiano: aportando herramientas para su administración. Fase 2*. Fundación SQUALUS, Colombia. Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_5.pdf
- Neis, B., Schneider, D., Felt, L., Haedrich, R., Fischer J., & Hutchings, J. (1999) Fisheries assessment: What can be learned from interviewing resource users? *Canadian Journal of Fisheries and Aquatic Science*, 56, 1949-1963. Retrieved from http://myweb.dal.ca/jhutch/publications_pdfs/1999_nei_sch_cjfas.pdf
- Neis, B., & Kean, R. (2003). Why fish stocks collapse: An interdisciplinary approach to understanding the dynamics of 'fishing up.' In Byron, R. (Ed.), *Retrenchment and regeneration in rural Newfoundland* (pp. 65-102). Toronto: University of Toronto Press
- Norse, E. A., Crowder L. B., Gjerde, K., Hyrenbach, D., Roberts, C. M., Safina, C. & Soule M.E. (2005). Placed-based ecosystem management in the open ocean. In E. A. Norse, L. B. Crowder & M. E. Soule (Eds.), *Marine conservation biology: The science of maintaining the sea's biodiversity* (pp. 302-327) Washington: Island Press.
- Orbach, M. (1977). *Hunters, seaman, and entrepreneurs. The tuna seinermen of San Diego*. London: University of California Press.

- Pauly, D. (1997). Small-scale fisheries in the tropics: Marginality, marginalization, and some implications for fisheries management. In E. Pikitch, D. Huppert & M. Sissenwine (Eds.), *Global Trends: Fisheries Management* (pp. 40-49). American Fisheries Society Symposium 20, Bethesda, Maryland.
- Ramírez-Luna, V., Gómez, L. S., Tobón, A., Mejía-Falla, P. A., & Navia, A. F. (2008). *Pesquería artesanal de la zona norte del Pacífico colombiano: Aportando herramientas para su co-manejo. Fase 1*. Fundación SQUALUS, Colombia.
- Technical report. Retrieved from http://www.squalus.org/redcondictios/pdf/info_tec_8.pdf
- Rueda, M., Higuera-Salazar, H. & Angulo-Sinisterra, J.A. (n.d.). Caracterización tecnológica de la flota de arrastre de camarón del Pacífico de Colombia. FAO, REBYC, Reduction of environmental impact from tropical shrimp trawling, through the introduction of by-catch reduction technologies and change of management (EP/GLO/201/GEF). Retrieved from ftp://ftp.fao.org/fi/document/rebyc/colombia/FishingTechnology_Pacific_Coast_PPR_1.pdf
- Sea Around Us Project. (2011). *Landings by species in the waters of Colombia* (Tabular data). Retrieved from <http://www.seaaroundus.org/eez/170/1.aspx>
- Silva, M. (2010, July 9). Atún de aleta amarilla, de la pesca a la mesa. *Carrusel*. Copy in possession of author.
- Teh, L. C. L., & Sumaila, U. R. (2013). Contribution of marine fisheries to worldwide employment. *Fish and Fisheries*, 14(1), 77-88. doi: 10.1111/j.1467-2979.2011.00450.x

- Tobias, T. (2000). *Chief Kerry's moose, a guidebook to land use and occupancy mapping, research design and data collection*. Canada: Union of BC Indian Chiefs and Ecotrust Canada.
- Thrush, S. F., & Dayton, P. K. (2002). Disturbance to marine benthic habitats by trawling and dredging: Implications for marine biodiversity. *Annual Review of Ecology and Systematics*, 33(1), 449-473. doi: 10.1146/annurev.ecolsys.33.010802.150515
- Watling, L. (2005). The global destruction of bottom habitats by mobile fishing gear. In E. A. Norse, L. B. Crowder & M. E. Soule (Eds.), *Marine conservation biology: The science of maintaining the sea's biodiversity* (pp. 198-210) Washington: Island Press.
- Wehrtmann, I. S., Arana, P. M., Barriga, E., Gracia, E., & Pezzuto, P. R. (2012). Deepwater shrimp fisheries in Latin America: a review. *Latin American Journal of Aquatic Research*, 41. Retrieved from <http://www.scielo.cl/pdf/lajar/v40nSpecIssue/art02.pdf>
- WWF-Hong Kong (2010). *Facts about the trawling ban in Hong Kong waters*. Retrieved from <http://www.wwf.org.hk/en/whatwedo/conservation/marine/sos/abouttrawlban/>

5. Conclusion

This chapter brings together the results and conclusions of the previous chapters. It identifies the lessons learned from the Chocó-EFZ case and the areas for future research. This study reconstructed the histories of the artisanal and industrial fisheries and their interactions in northern Chocó waters, the development of the Chocó-EFZ, and its role in mitigating conflicts, encouraging artisanal fishers to engage in co-management, promoting the food security of artisanal fishing households, and rebuilding fisheries. In order to do so, the study employed a multi-methods approach that used the Chocó-EFZ case study, semi-structured interviews with key informants from different sectors related to marine fisheries and local fisheries knowledge (LFK) career-history interviews, with linked chart biographies, with adult members of artisanal fishing households (male and female fishers). The approach also included historical landings by species in the waters of Colombia by the tuna and shrimp industrial fisheries (Sea Around Us project, 2011), personal communications, and a review of existing documents (technical reports, meeting minutes, government resolutions, letters, scientific research, magazines, and newspapers).

5.1 Pre- and post-implementation processes of Exclusive Fishing Zones for Artisanal Fishers

Key informant interviews and LFK career-history interviews with artisanal fishing households from Bahía and Huina showed that the development of the Chocó-EFZ was a path dependent process, as it unfolded as the exclusive zone was negotiated and implemented. Like other EFZs elsewhere, the Chocó-EFZ was triggered by conflicts between the artisanal and industrial fisheries. The construction of the Chocó-EFZ process however, showed that the nature of the conflicts and the response to mitigate them varied

according to the subsector. One type of conflict involved gear conflict (artisanal longlines are dragged away by industrial shrimpers) and bycatch impact (key longline species are caught as bycatch by shrimpers). These conflicts started in the late 1990s and engaged artisanal longliners (a small group of local fishers; currently less than 22% of fishers in both communities) and industrial deep water shrimpers. Another type of conflict started in the early 2000s; it involved artisanal handliners (currently more than 58% of fishers in both communities) and industrial seiners. Competition for the tuna resource was the core of this conflict, especially during the high season (May-June).

Two independent responses to mitigate conflicts with shrimpers originated within the artisanal sector. One response was initiated by the Interinstitutional and Community Committee of the Artisanal Fishery of the Northern Chocó Coast (GIC-PA), a multistakeholder organization. In the late 1990s, the GIC-PA started negotiations with the shrimp organization (ACODIARPE) and also drafted potential EFZs based on fishers' knowledge and with the participation of ACODIARPE in order to mitigate these conflicts. However, conflicts continued, the EFZs were never implemented, and there is no evidence of any relationship between these negotiations or EFZs and the Chocó-EFZ process. In fact, interviews show the Chocó-EFZ design was not based on any previous studies but resulted from three private meetings and that the final decision on coverage and borders was made by the government. The second response was initiated by a fish trader from Bahía who tried to find solutions to the gear conflicts between the artisanal longliners working for him and industrial shrimpers, by going to the port authorities. He did not initially set out to establish an EFZ, and like the GIC-PA his actions did not lead

to the current Chocó-EFZ. Although the GIC-PA and the fish trader had the same goals, the lack of trust and communication prevented these two paths from coming together.

What triggered the implementation process of the Chocó-EFZ was an event in 2007 with a tuna vessel. This event combined two factors. One factor, *on the water*, was related to encroachment by a tuna vessel on the artisanal fishing grounds. The other factor, *on land*, was the irregular release of the vessel a few hours later arguing that it had not broken any regulations. This event added a new ingredient to the history of clashes between sectors, i.e. the artisanal sector's perception of corruption in the government and tuna sector.

Interviews showed different levels of participation, knowledge, and understanding of the pre-implementation process of the Chocó-EFZ, which occurred in 2008. Participation included the fish trader, who was invisible during the early 2000s because he would only communicate with his personal network. Over time he became recognized locally as a knowledgeable person and with the skills to negotiate with the industrial sector, and eventually, he became the artisanal fishers' representative in 2008. Although the GIC-PA was dormant during the implementation of the Chocó-EFZ, the movement the organization created while it was active (1998-2004) had a large impact on the community. The GIC-PA engaged local fishers (some of the interviewees and younger fishers) in the resolution of conflicts and other fishery issues. This movement, continued by GIC-PA ex-member served as a support for the actions of the fish trader throughout the Chocó-EFZ process.

Letters from the mayors of Juradó and Bahía (both located within the EFZ) and the Community Council from Bahía were also part of the process; however, interviews did

not fully reveal whether artisanal stakeholders came together in order to achieve the Chocó-EFZ; apparently, they acted independently. Furthermore, some interviewees affiliated with the artisanal sector also had a perception of corruption in the Community Council and did not think that the Council had played a role in the Chocó-EFZ process. This shows that the process was not widely understood among interviewees and only those participating in the meetings actually knew how the Chocó-EFZ came to be.

Interviews with fishers regarding their participation in the process made evident two situations. First, the perception of corruption in government and in the community was a common situation over time among the artisanal fishers. Second, communities located away from Bahía were not usually involved in initiatives such as the Chocó-EFZ. These two situations had a negative impact on the participation of fishers in decisions related to fisheries management that ultimately will affect them. These situations also show limitations in communication, monitoring, and enforcement with communities away from Bahía. The revitalization of the GIC-PA after the establishment of the Chocó-EFZ might create ways to restore fishers' trust in institutions and improve connections between the communities located within the Chocó-EFZ.

Participation of the industrial sector in the Chocó-EFZ process included the shrimpers' organization (ACODIARPE), and the tuna purse seiners' organization (ANDI). Their participation started at different points in time and, given the nature of the fisheries, they differed in their points of view about the Chocó-EFZ. The shrimp sector strongly opposed the permanent implementation of the Chocó-EFZ, which has been the first petition by the artisanal sector, arguing that the zone impacts negatively the industrial shrimp sector in terms of food security and job loss. The second petition by the artisanal

sector was the Chocó-EFZ expansion beyond the 2.5 NM. The tuna sector vigorously opposed this expansion, arguing that the design is appropriate and that there are no conflicts between artisanal fishers and seiners within the Chocó-EFZ borders. This left out any possibility of assessing the fishing dynamics outside the Chocó-EFZ that could justify its expansion seaward. From the point of view of the artisanal sector, this act showed how powerful the tuna sector was.

Other important points of disagreement underlying the debate about the future of the Chocó-EFZ include the definition of territory, what belongs to whom, and why, and who decides when granting fishing rights to one sector. Discussions involve whether the zone should continue as an “exclusive zone” (granting fishing rights to the artisanal sector) or should take a different form: “multiple-use area under fishery management” or “special zone for the management of fishing resources” as suggested by part of the government and the tuna sector. In this case, all sectors would hold the same fishing rights and would abide by other types of management measures (e.g. gear restrictions, temporal closures). One result of this debate was the growing number of legal documents generated by organizations specialised in legal matters and that are developing partnerships with the artisanal sector through the GIC-PA. The legal framework that supports the rights of black communities over their territories is a powerful tool that has been used by these organizations to demand the permanent implementation of the Chocó-EFZ as a way to protect their rights, territories, resources, and their traditional knowledge. A legal scholar is needed to examine this emerging field and its implications for the future of the Chocó-EFZ.

The implementation of the Chocó-EFZ did not only regulate the industrial fisheries but also the artisanal gillnetters. Despite government efforts to eliminate most of fishers refused to give up their gears. Gillnetters argued unfairness (why industrial fishers were allowed to use nets) and economic loss (gillnets would be replaced by longlines), which was not a profitable fishery by 2010. This shows that there are some serious limitations in the effectiveness of this formal management approach. This could have happened because of lack of knowledge of local dynamics, a poor relationship between the government and the stakeholders, and lack of compliance of artisanal and industrial fishers with top-bottom regulations. Although gillnetters posed challenges to the enforcement of the net ban within the Chocó-EFZ, it is worth noting that, in northern Chocó the use of gillnets is not as spread as it is in central and southern Pacific waters. Another important difference between north and central and southern waters, which might also play in favour of the Chocó-EFZ, is the absence of artisanal shrimp fisheries in the north. These situations might have favoured the implementation of the Chocó-EFZ and additional regulations. The measure did not find as much antagonism within the artisanal sector as it might find in other parts of the Pacific coast.

Interviews also provided some evidence that the Chocó-EFZ constitutes legal support for an informal community-based management regime found in Huina that has been promoted since early 2000s. Some conditions found in Huina and not in Bahía that favoured the development of the informal co-management system included type of community (tied to place, history and identity), capability to regulate the use of local grounds, and leadership. However, Huina fishers have not been able to ban beach seines given the higher social costs. By the time of the interviews a retired fisher and non-fishing

families depended on beach seine catches. This indicates that strategies to eliminate beach seines would have to consider other groups of stakeholders such as non-fishers and retired fishers.

5.2 Fishing up sequence in artisanal and industrial fisheries in northern Chocó and its relationship with the establishment of the Chocó-EFZ

Results from LFK career-history interviews showed that the development of the commercial artisanal fishery in northern Chocó is recent and it was linked to the development of Bahía. Communities were primarily agricultural, although over time that commercial artisanal fishing developed, communities remain economically diverse. In a few decades (1960s-2000s) fishers built up local fisheries knowledge influenced by some involvement with other fishers, other types of fisheries, engagement with managers, scientists, new technologies, and changing market and ecological realities.

Technological changes included introduction (and subsequent modification to increase efficiency) of beach seines, gillnets, longlines, *colgantes*; as well as larger boats with larger storage capacity, less costly engines, and equipped with fish-finding gears. These changes stimulated expansion and intensification over time leading artisanal fishers to use deeper, more distant, and larger fishing grounds; to take longer trips and to expand fishing seasons; and to initially target new resources and eventually to target the same resources but in smaller sizes. Consequently the artisanal fisheries experienced some of the symptoms of the fishing-up sequence: shifts across species, peaks and valleys, overall decline in fish landings, and conflicts between handliners and gillnetters within both communities.

Knowledge construction and access to technology varied within and between the two communities. Historically, Bahía fishers have been more influenced by outside forces and have had more access to modern technologies than Huina. Also, only fisher organizations would have access to these technologies. Possession of technologies influenced fishers' preferences. Those with large boats and fish-finding equipment would choose to visit distant grounds, while those with small boats and no sophisticated equipment remain close to their hometowns. Regardless of technology, all fishers have had to increase effort and efficiency to cope with catch declines. Coping strategies also included giving up fishing and carrying out non-fishing activities as did fisherwomen. Another strategy was the invention of gears such as the *colgante*. This gear not only allowed using new grounds but also allowed fishing without any help and in near grounds where the fisher could access without a motor, thus increasing his returns.

Interviews with artisanal fishers, with an industrial trawler skipper, and literature review showed that the industrial shrimp and tuna fisheries occurred in Chocó waters since 1950s and 1960s. Back in that time, interactions between artisanal and industrial fishers were mostly positive. Over time expansion and intensification in Chocó waters also occurred within the industrial shrimp (1980s-1990s) and industrial tuna (early 2000s) fisheries. These processes in the industrial shrimp fishery were in part driven by the introduction of the deep water shrimp fishery and degradation of shrimp grounds elsewhere (due to dredging operations) that led them to fish more intensively in northern waters. The industrial tuna fishery, on the other hand, started fishing in inshore grounds again when the use of "fish aggregating devices" (FADs) to fish skipjack increased. This

shows the effect of external factors in the origin of conflicts between sectors in northern Chocó.

Fishing up by industrial fisheries contributed to declining catch rates in the artisanal fishery and led to negative interactions between sectors. Interviews also revealed how conflicts affected the food security of artisanal fishing households. Declining catch rates of handline species (caused by artisanal gillnets), longline species (caused by industrial shrimpers), and tuna (caused by industrial seiners) affected the incomes and fish consumption in artisanal fishing families.

The Chocó-EFZ seems to be playing an important role in protecting habitats, rebuilding fish stocks (especially non-migratory), and promoting the food security of artisanal fishing households when aiming at mitigating conflicts (gear conflicts, bycatch, and competition). It does so by restricting the industrial fleet's fishing gears and effort and regulating the artisanal nets. The Chocó-EFZ must however, design surveillance and control strategies, mitigate unintended consequences (e.g. effort displacement, food insecurity issues in other sectors), and be complemented with other placed-based or gear-based management tools, especially to protect the tuna stock, which seems to be impacted by both industrial and artisanal fishers.

5.3. Future research

Future research should further investigate the evolution of the interactions between stakeholders and the role of the Chocó-EFZ (if expanded in time) in terms of its biological, ecological, and socioeconomic impact, not only on the artisanal but also within the industrial fisheries. Specifically, research might include:

- Legal research towards the development of a legal framework in support of co-management that can include the perspectives, knowledge, and interests of the subgroups within the artisanal sector (spokespeople, handliners, longliners, and netters), industrial sector (spokespeople, shrimpers, and seiners), government, and academia.
- Research on communities other than Bahía and Huina that can contribute to our understanding about how communities perceive top-down regulations and the conditions and resources that favour the origin and development of informal community-based management.
- Quantification of the contribution of women to the fisheries sector and to food security in the communities within the Chocó-EFZ. Quantifying contribution of women will acknowledge their participation rate in fisheries and the significance of getting them actively involved in fisheries management and food security policy.
- Research on other groups of stakeholders that might be negatively impacted by the establishment of the Chocó-EFZ and its regulations. For instance, the non-fishing families and non-active fishers dependent on beach seines, and communities located outside the Chocó-EFZ to where industrial fishery effort might have been displaced.
- Research on the development of the legal issues related to the Chocó-EFZ; for instance the rights of black communities over their territories (land and sea) and the negative impact of the Chocó-EFZ on the shrimp sector.

Appendix A
PARTICIPANT CONSENT FORM FOR INTERVIEWS WITH KEY
INFORMANTS

Project: Understanding the Development of the Exclusive Zone for Small Scale Fishery (ZEPA) Chocó, North Pacific Coast of Colombia, South America and its Potential Consequences for Small and Large Scale Fisheries and Food Security

Researcher: Angela (Viviana) Ramírez. Environmental Science Program, Memorial University, Canada. Researcher of SQUALUS Foundation, Colombia.
Email: vivianar@mun.ca, phone (Colombia): 57-310 509 6536

Supervisors: Dr. Barbara Neis. Department of Sociology, Memorial University, Canada.
Email: bneis@mun.ca, phone: 1-709-737 7244

Dr. David Schneider. Department of Biology, Memorial University, Canada.
Email: david.schneider@mun.ca, phone 1-737 8841/2186

This form is part of the process of informed consent. It should give you a basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any other information given to you by the researcher.

I am carrying out this project as part of my masters degree under the supervision of Dr. Barbara Neis and Dr. David Schneider from Memorial University, and it is being co-sponsored by the SQUALUS Foundation. You are being asked to participate as a key informant in my research on the history of the ZEPA. It is entirely up to you to decide whether to take part in this research. If you choose not to take part in the research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

This project seeks to document the pre-implementation and post-implementation processes associated with establishment of the ZEPA. The project has two main components. The first component involves interviews with key informants like yourself who were involved in the development of the ZEPA. The second component involves interviews with both artisanal and small scale commercial fishers and their wives about their fisheries, the ZEPA and about the changing role of fish in their food security. You are being asked to participate in the first component where I am interviewing people knowledgeable about the seven year period leading up to the signing of Resolution 002650.

Before asking you if you would be willing to participate, I need to explain more fully what I will be asking you to do if you agree to participate, and explain any risks or benefits you might experience if you participate. As you may know, the ZEPA is an achievement of the small scale fishers represented by the GICPA, the Community Council and the mayors. It is intended to protect the fishing resources on which their

communities depend as well as provide an opportunity for locals to participate as co-managers. Thus, the ZEPA is a potential model for other communities that might wish to implement similar conservation measures. So, there is some value for local people and for others in understanding how the ZEPA came to be and what has happened since it was implemented.

Having access to a report summarizing the history of the development of the ZEPA and representatives' knowledge and suggestions for the future would benefit the GICPA and other local groups. Such a report could also benefit harvesters in other parts of the coasts and in inland areas interested in developing similar conservation initiatives. It would also add to the information available to SQUALUS and other groups as they design future research about the ZEPA.

If you agree to participate in this key informant interview, it should take between one and two hours of your time, depending on how much you have to say. I will be asking you about the history of your organization, how you got involved in the ZEPA process, how, based on your observations, the process evolved and resulted in the Resolution taking its current form. I will also want to know whether you have stayed involved in the process since the ZEPA was implemented or not and, if so, why and in what capacity. Finally, I am interested in learning your reflections on the ZEPA since it was established. In particular, I am interesting in your thoughts on what is working and what isn't (if anything) and why and in your thoughts about its future. With your permission, I would like to audiotape the interview to permit me to concentrate on asking the right questions and to ensure that none of the information you provide gets lost. If you agree to be recorded, I will send you a copy of the audio interview on a CD. You will be able to decide what happens to the original recording and transcript at the end of the research project.

The list of names of the people who agree to participate in this study, the recorded interview and transcripts will be shared only with the researchers involved in this study. If you agree to participate, your name will not be used in any reports, other publications or presentations resulting from this research without your consent. However, you should be aware that a local person or someone who knows you and your involvement with the ZEPA well might suspect that you provided a particular piece of information.

If you consent to the use of your name in reports, publications and presentations, you can tell me what information you would like to be on the record and what information should be treated as off the record to be used only as background information by reviewing any reports, publications or presentations where you are quoted by name.

I think the risks to you of participating in the project are minimal. The potential benefits to you are limited to the opportunity you will have to influence the findings from this research.

When the project finishes (in 2011) I will present a draft of the final results and conclusions in a public meeting in Bahia Solano to which all stakeholder groups will be invited. I will ask the technician to elaborate the minute of this public meeting. I will give

a copy to GICPA, Community Council, INCODER (Bahia Solano and Bogotá branches), ACODIARPE and ANDI. When the work is finalized, I will send a copy of a plain language summary of the research results to the study participants. The results (without indicating names) will also be published in both scientific and non-scientific media, so that different audiences can have access and learn from this experience.

You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please contact Angela Ramirez, email vivianar@mun.ca, phone (57) 310 509 65 36. Dr. Barbara Neis, email: bneis@mun.ca, phone: (1) 709-737 7244.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 737-2861.

Consent:

Your signature on this form means that:

- ✧ You have read the information about the research
- ✧ You have been able to ask questions about this study
- ✧ You are satisfied with the answers to all of your questions
- ✧ You understand what the study is about and what you will be doing
- ✧ You understand that you are free to withdraw from the study at any time, without having to give a reason, and that doing so will not affect you now or in the future.

If you sign this form, you do not give up your legal rights, and do not release the researchers from their professional responsibilities.

The researcher will give you a copy of this form for your records.

Your signature

I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records

Name (print) _____ Signature _____ Date _____

Researcher's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

Researcher _____ Signature _____ Date _____

Telephone number _____ Email _____

Appendix B

ARCHIVAL DEPOSIT/ACCESS FORM FOR KEY INFORMANT INTERVIEWS

What happens to the recorded interviews and transcripts once my research project is complete is up to you. However, at the very minimum, transcripts will need to be retained by the researcher in a secure location for at least 5 years after completion of the research and recordings will be destroyed as soon as transcriptions are made. The information you provide in the recorded interview is potentially a very valuable resource for other, future researchers. If you are willing to have a copy of these archived at the SQUALUS Archives for use by students and other bona fide researchers for approved research purposes in the future, please indicate this below. Should you choose to have your recorded interview and transcripts deposited in the SQUALUS Archives, a copy of the master list of names which I have compiled will be deposited with the SQUALUS Director who will keep it confidential subject to the conditions listed below.

In keeping with the conditions on the Consent Form, no one accessing the interview through the SQUALUS Archives would be permitted to use your real name in any published document, public presentation, or other publicly accessible channel without your consent. You can request that future researchers only have access to the interview with your written permission. If you are not comfortable with any of the above options, you can ask to have the interview CD's and transcripts retained only by the research team or even destroyed after the completion of the project and the data analysis. Finally, you may wish to receive a copy of the interview for your own personal files and family records. Please check the option(s) you would prefer below.

I hereby authorize:

OPTION 1: _____ Placement of recording (on CD) and transcript in the SQUALUS Archives.

For those selecting this option, access to the deposited interview materials should be:

- a) at the discretion of the organizational representative with responsibility for these materials _____.
- b) only with my written permission _____.
- c) only after _____ years from the date of this interview.

OPTION 2: _____ Retention of CD and transcript only by the researcher.

OPTION 3: _____ Destruction of the CD and transcript after completion of the research project (five years past publication of results).

OPTION 4: _____ In addition to the options I have checked above, I wish to have a copy of the CD sent to me.

Name (interviewee) Signature Date_____

Name (researcher)_____ Signature _____ Date_____

Appendix C

INTERVIEW SCHEDULE FOR KEY INFORMANTS

I. Membership. In this part, I will ask you some questions about involvement with your organization and the relationship with the history of the ZEPA, etc.

- What is your occupation
- What is your education level (Circle one)
Elementary High School Undergraduate Post-graduate
- What was your organization during the ZEPA process
- What is your current organization (if different from above)
- How long you were/have been in the organization?

II. Participation in the process of the ZEPA. In this part, I will ask about your role in the ZEPA process: when did you get involved, how, if you're still involved, etc.

- Describe your involvement with the ZEPA process. When and how did you first become aware of the process? / Through what organization? By invitation/appointment
- In what year did you become actively involved in the ZEPA process? In what role(s)? – at the start? Did your role change?
- How long have you been involved? In what capacity?
- If not, why aren't you still involved? Has someone replaced you?

III. Pre-implementation process of the ZEPA. I am trying to understand what started the ZEPA process and how it evolved over the years prior to the implementation of Resolution 002650 in 2008

- What can you tell me about what started the process? who was involved? When did it start? What triggered it? How did the process evolve?
- In what year the idea about an exclusive area was born?
- What trigger the need for a ZEPA?
- What was the original idea/goal? Whose idea was it? Why was it proposed and with what purpose?
- What ideas were put on the table? (e.g. those different from a exclusive area)
- What was the initial design of the ZEPA? (the ideas that weren't implemented)
- What were the original rules or regulations proposed?
- How long was it supposed to be in place?
- What was it supposed to achieve?
- The final resolution talks about mitigating conflicts, co-management, food security, who wanted each of these in the Resolution? Why?

- Who was supposed to be responsible for management of the ZEPA in the original vision?
- Did any of these things change (go through each in turn). If so, why?
- What was your role (if any) in shaping the final Resolution?
- How did you feel about the result at the time? Were there things you liked? Didn't like? Can you talk about them?

IV. Post-implementation process of the ZEPA and small scale fishery. In this part, I am interested in finding out about your thoughts about the results of the ZEPA and the relationship with small scale fishery.

- How do you feel about the result now?
- In your opinion is the ZEPA achieving the outcomes (mitigating conflicts, co-management, and food security)?
- If not, what it would take to achieve these outcomes in the short term, medium term and long term. Define how long each term is.
- What would you consider to be the benefits (if any) of the ZEPA – in its current form? i.e. what is working? (Boundaries? Rules? Enforcement? Decision-making? Conservation? Livelihoods? Food security?)
- What are the weaknesses/problems (if any) with the ZEPA in its current form?
- What isn't working? (Boundaries? Rules? Conservation? Livelihoods? Food security? Co-management opportunity?)
- In your opinion who knows about the ZEPA (artisanal fishers, commercial fishers, artisanal fisher's families, commercial fisher's families, processors of fish nobody)
- What do they know and how have they found out.
- Are you familiar with the recent recommendations of the SQUALUS Foundation based on its assessment?
- Thoughts on these recommendations?
- What changes have you observed in small scale fisheries (if any) since the ZEPA was introduced?
 - Fisher's families income
 - New fishing places outside the ZEPA
 - Usual fishing places outside the ZEPA with more frequency
 - Change in fishing gears
 - Targeted different resource
 - Change in catch rates
 - Change on employment for fishers, for processors.
- What alternatives have been offered to fishers who use nets? Training in other fishing gears, training in other economic activities, other.

V. Background of large scale fishery and its relationship with the post-implementation process of the ZEPA. In this part, I am interested in finding out about your thoughts about the results of the ZEPA and the relationship with large scale fishery.

- In what year did large scale vessels start to fish in the area currently covered by the ZEPA?
- Between the year that vessels came and the establishment of the ZEPA, how did the number of large vessels fishing near in the ZEPA area change (if at all)?
- One year before the establishment of the ZEPA, how many (roughly) vessels were fishing in the area covered by the ZEPA?
- Since the establishment of the ZEPA, how (if at all) did the ZEPA change the large scale fishery in the area
 - Stopped fishing inside the ZEPA.
 - New fishing places outside the ZEPA.
 - Usual fishing places outside the ZEPA with more frequency.
 - Change in fishing gears to fish outside the ZEPA.
 - Targeted a different resource outside the ZEPA.
 - Change in catch rate (shrimp/tuna)
 - Change in employment for the crew, for processors.
 - Nothing has changed.
- In your opinion who knows about the ZEPA (Tuna fishers, shrimp fishers, tuna fisher's families, shrimp fisher's families, processors of shrimp, processors of tuna, nobody).
- What do they know and how have they found out.
- What alternatives have been offered to large scale fishers? Training in other fisheries, training in other economic activities, Other.

VI. Future of the ZEPA. Finally, in this part, I will ask your thoughts about the opportunities and challenges of the ZEPA for the future.

- In your opinion what are the opportunities and challenges for the ZEPA.
 - Relationship between stakeholder, how they interact (supportive, conflicting, collaborating, integrating).
- In your opinion, should the ZEPA continue? Why?
- You think it should be replaced by something else?
- What it would be the best way to continue, what it would have to be done.

Appendix D
PARTICIPANT CONSENT FORM FOR INTERVIEWS WITH FISHING
HOUSEHOLDS

Project: Understanding the Development of the Exclusive Zone for Small Scale Fishery (ZEPA) Chocó, North Pacific Coast of Colombia, South America and its Potential Consequences for Small and Large Scale Fisheries and Food Security

Researcher: Angela (Viviana) Ramírez. Environmental Science Program, Memorial University, Canada. Researcher of SQUALUS Foundation, Colombia.
Email: vivianar@mun.ca, phone (Colombia): 57-310 509 6536

Supervisor: Dr. Barbara Neis. Department of Sociology, Memorial University, Canada.
Email: bneis@mun.ca, phone: 1-709-737 7244

Dr. David Schneider. Department of Biology, Memorial University, Canada.
Email: david.schneider@mun.ca, phone 1-709-737 8841/2186

This form is part of the process of informed consent. It should give you a basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any other information given to you by the researcher.

I am carrying out this project as part of my masters degree under the supervision of Dr. Barbara Neis and Dr. David Schneider from Memorial University, and it is being co-sponsored by the SQUALUS Foundation. You both are being asked to participate as local fishery experts in my research on the history of the fishery in Bahía Solano/Huina. It is entirely up to you to decide whether to take part in this research. If you choose not to take part in the research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

This project seeks to document the pre-implementation and post-implementation processes associated with establishment of the ZEPA. The project has two main components. The first component involves interviews with key informants who were involved in the development of the ZEPA. The second component involves interviews with both artisanal and small scale commercial fishers and their wives about their fisheries, the ZEPA and about the changing role of fish in their food security. You are being asked to participate in the second component where I am interviewing fishers and their wives knowledgeable about the history of both small and large scale fisheries, their interactions in the area and the role of fishing in food security.

Before asking you if you would be willing to participate, I need to explain more fully what I will be asking you to do if you agree to participate, and explain any risks or

benefits you might experience if you participate. As you may know, the ZEPA is an achievement of the small scale fishers represented by the GICPA, the Community Council and the mayors. It is intended to protect the fishing resources on which their communities depend as well provide an opportunity for locals to participate as co-managers. Thus, the ZEPA is a potential model for other communities that might wish to implement similar conservation measures. So, there is some value for local people and for others in understanding how the ZEPA came to be and what has happened since it was implemented.

Having access to a report summarizing the history of the development of the ZEPA and representatives' knowledge and suggestions for the future would benefit the GICPA and other local groups. Such a report could also benefit harvesters in other parts of the coasts and in inland areas interested in developing similar conservation initiatives. It would also add to the information available to SQUALUS and other groups as they design future research about the ZEPA.

If you agree to participate in this fisher expert and wives interview, it should take approximately two hours of your time, depending on how much you have to say. I will ask you about when, where, what and with whom you started to fish, have fished and/or is currently fishing. I will ask you why (if any) changes have taken place. I will also ask you about the history of the large scale fishery by asking you when this fishery emerged in the area, and which fishing grounds they used for first time and in the following years, and which resource was captured. I will take into account grounds that are only used by large vessels and also those grounds where you and large scale fisheries have got together. I will ask you what kind of interaction you have had (if any), that is, if it has been conflicting or there has been cooperation (e.g. you have obtained bait).

I will then be asking you and your wife about the place of fish in your household diet during the years since you were married. I will ask you both to indicate on a diagram the different paths of the fish into the household as well as elsewhere (sold at the wharf) and what happens to it once it enters the household (e.g. processed or consumed fresh, eaten by household members, sold, exchanged). I am interested in discussing with you both about the relative importance of fish and its changing role in the food security of their household. Where changes over your lives are identified, these changes will be explored - why did they occur and with what consequences (if any) for their diet and food security. I will ask you to indicate any other economic activities you or any member of your family perform in order to support food security. I will also ask you both to tell me other economic activities that you or any member of your family engages in order to support food security.

I will go on asking you about your perceptions of the ZEPA and of the performance of the representatives responsible for the ZEPA. Related to this, I will ask you about your assessments of opportunities and challenges provided by the ZEPA for small scale fishing households like your own at present and in the future. I am also interested in your suggestions about ways to enhance the effectiveness of the ZEPA in

terms of its ability to contribute to fish conservation, livelihoods of small scale fishers and to the food security of small scale fishing households.

Finally I will ask you to recommend 3 fishing households where, in your opinion, the fishers and their wives are particularly knowledgeable about the fishery in this community in order to carry out more interviews like this with expert fishers and their wives in this community.

With your permission, I would like to audio record the interview to permit me to concentrate on asking the right questions and to ensure that none of the information you provide gets lost. If you agree to be recorded, I will send you a copy of the audio interview on a CD. You will be able to decide what happens to the original recording and transcript at the end of the research project.

The list of names of the people who agree to participate in this study, the recorded interview, transcripts and the charts will be shared only with the researchers involved in this study. If you agree to participate, your name will not be used in any reports, other publications or presentations resulting from this research without your consent. However, you should be aware that a local person or someone who knows you and your involvement with the ZEPA well might suspect that you provided a particular piece of information.

When the project finishes (in 2011) I will present a draft of the final results and conclusions in a public meeting in Bahia Solano to which all stakeholder groups will be invited. I will ask the technician to elaborate a minute of this public meeting. I will give a copy to GICPA, Community Council, INCODER (Bahia Solano and Bogotá branches), ACODIARPE and ANDI. When the work is finalized, I will send a copy of a plain language summary of the research results to the study participants. The results (without indicating names) will also be published in both scientific and non-scientific media, so that different audiences can have access and learn from this experience.

You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please contact Angela Ramirez, email vivianar@mun.ca, phone (57) 310 509 65 36. Dr. Barbara Neis, email: bneis@mun.ca, phone: (1) 709-737 7244.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 737-2861.

Consent:

Your signature on this form means that:

- You have read the information about the research

- ☛ You have been able to ask questions about this study
- ☛ You are satisfied with the answers to all of your questions
- ☛ You understand what the study is about and what you will be doing
- ☛ You understand that you are free to withdraw from the study at any time, without having to give a reason, and that doing so will not affect you now or in the future.

If you sign this form, you do not give up your legal rights, and do not release the researchers from their professional responsibilities.

The researcher will give you a copy of this form for your records.

Your signature

I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records

Fisher's name (print) _____ Signature _____ Date _____

Wife's name (print) _____ Signature _____ Date _____

Witness' name (print) _____ Signature _____ Date _____

Researcher's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

Researcher _____ Signature _____ Date _____

Telephone number _____ Email _____

Appendix E
ARCHIVAL DEPOSIT/ACCESS FORM FOR FISHING HOUSEHOLD
INTERVIEWS

What happens to the recorded interview, transcripts and with the charts once my research project is complete is up to you. However, at the very minimum, transcripts and charts will need to be retained by the researcher in a secure location for at least 5 years after completion of the research and recordings will be destroyed as soon as transcriptions are made. The information you provide in the recorded interview and in the chart is potentially a very valuable resource for other, future researchers. If you are willing to have a copy of these archived at the SQUALUS Archives for use by students and other bona fide researchers for approved research purposes in the future, please indicate this below. Should you choose to have your recorded interview deposited in the SQUALUS Archives, a copy of the master list of names which I have compiled will be deposited with the SQUALUS Director who will keep it confidential subject to the conditions listed below.

In keeping with the conditions on the Consent Form, no one accessing the interview through the SQUALUS Archives would be permitted to use your real name in any published document, public presentation, or other publicly accessible channel without your consent. You can request that future researchers only have access to the interview with your written permission. If you are not comfortable with any of the above options, you can ask to have the interview CD's and transcripts retained only by the research team or even destroyed after the completion of the project and the data analysis. Finally, you may wish to receive a copy of the interview for your own personal files and family records. Please check the option(s) you would prefer below.

I hereby authorize:

OPTION 1: _____ Placement of recording (on CD), transcript and charts in the
SQUALUS Archives.

For those selecting this option, access to the deposited interview materials should be:

- a) at the discretion of the organizational representative with responsibility for these materials _____.
- b) only with my written permission _____.
- c) only after _____ years from the date of this interview.

OPTION 2: _____ Retention of CD, transcript and charts only by the researcher.

OPTION 3: _____ Destruction of the CD, transcript and charts after completion of the research project (five years past publication of results).

OPTION 4: _____ In addition to the options I have checked above, I wish to have a copy of the CD and chart sent to me.

Fisher's name _____
Wife's name _____

Signature _____
Signature _____

Date _____
Date _____

Witness' name (print) _____ Signature _____ Date _____
Researcher's name _____ Signature _____ Date _____

Appendix F
INTERVIEW SCHEDULE FOR FISHING HOUSEHOLDS

I. Demographic Information. In this part, I will ask each of you some personal questions: your age, where you were born, your family, etc.

- Age
- Gender (Circle one) Male Female
- Locality where born?
- Where currently living?
- If born in other locality:
- When did you come?
 Why did you come?
- Father's occupation
- Mother's occupation
- Your education level (Circle one)
 Elementary High School Undergraduate Post-graduate
 Training (Explain)
- Year you were married or started living together
- For those whose parents were involved in the fishery (harvesting, processing, selling), how many generations have your families been in fishery? 1 2 3 >3 generations
- Always in this community? Explain
- Age when you started fishing
- Why did you start fishing?
- Are you part of fishermen's organization? A fishermen's wives organization?
- Any gaps in your fishing career? Yes _____ No _____ If yes, when? how long?
- What proportion of your income do you derive from fishing?
- What other sources of income do you have in your household? (you, your wife, other household members) (agriculture....)

II Fishing Experience. In this part of the interview, I am interested in finding out about your fishing career (how long you have been fishing, vessels and gear you have used, species you have targeted and fishing seasons at the start of your fishing career, in the years leading up to the ZEPA and at present.) When we talk about fishing, I am also interested in any shellfish gathering, fish salting and smoking, etc. you have done over your career (for both of you if your wife is involved with gathering fish, fishing, processing fish). I will also ask both of you what happened to the fish and shellfish you landed – when you were first married and in more recent years. I will ask you to indicate on this chart the areas where you fished over your career including at the start of your career, in the years leading up to the establishment of the ZEPA and more recently, since the ZEPA was established. I will also ask you to indicate when you first saw big tuna and shrimp vessels fishing in this area and where you saw them fishing prior to the ZEPA and more recently.

- Describe your first fishing vessel-length, width at the beam, material made out of, engine (if any), gear (amount, hook or mesh size), fish finder?, compass?, ...other gear?
- When you first started fishing, starting in January, tell me what species you fished for, how long that fishery lasted, show me where you fished, depth fished at, what the bottom is like in that area, tell me why you fished there (continue through the whole year)
- Did you change your vessel at any time over your career? If so, when (use wife's memory to help sort out date), describe second vessel – gear fished from that vessel, engine size, etc. and description of annual round of fishing and mapping of location of fishing during that second period. If changes- why changes?
- In the years leading up to the ZEPA- what vessel were you fishing from, annual round of activity, gear and species for each fishery (amount of gear, engine, fish finding,) description and mapping of location of fishing (same as above)
- Have there been any changes in your fishery since the establishment of the ZEPA? If so- go through the same set of questions getting them to describe this for you...
- Questions to the wife- did you ever fish or harvest shellfish for consumption? To sell- go (same questions with the wife if gleaned or if different from husband)
- When you were first married – what happened to the fish and shellfish when you stopped fishing (if so)– do it species by species over the annual round – proportion sold, proportion given away, proportion consumed, etc.
- On the map, show me the location where you first fished
- Who did you fish with in that location?
- If family, what relation are they to you?
- Regarding to species of fish:
What fish did you look for in that location?
How deep?
- Which fishing gear did you use in that location?
- If nets:
What was the length?
What was the mesh size?
How deep in the water?
- If hooks:
How many hooks?
What was the distance between hooks?
What was the length?
- Is there a specific reason why you chose this ground? Explain your answer
Adjacency, fish specie, weather, profitable, not allowed to fish in any other ground, to avoid competition with locals, with colonizers, other)
- Is there a specific reason why you changed of fishing ground? Explain your answer (Fishing out, weather, profitable, moved to other community, avoid competition with locals, with colonizers, other)
- On the map, show me the location where you first saw tuna vessels fishing? What year was that?

- On the map, show me the location where you first saw shrimp vessels fishing? What year was that?
- Did the location where they fished change between their first arrival and the establishment of the ZEPA? If so, show me how changed on the map and describe it. Tell me only about what you have observed.
- Since the ZEPA- what have you observed about the tuna vessels? Shrimp vessels?
- Have you interacted at all with the tuna vessels over your career (took my gear, bought bait) Did your interactions change over time?
- Have you interacted at all with the shrimp vessels since they first appear? Did those interactions change?
- On the map, show me the location where tuna vessels and you have had a positive interaction (e.g. getting bait from them)
- On the map, show me the location where tuna vessels and you have had a negative interaction (e.g. destruction of fishing gears)
- On the map, show me the location where shrimp vessels and you have had a positive interaction (e.g. getting bait from them)
- On the map, show me the location where shrimp vessels and you have had a negative interaction (e.g. destruction of fishing gears)

III Awareness of the process of the ZEPA. In this part I will ask you about the organizations that represent small scale fishers and women such as GICPA and Community Council. I will also ask you about your knowledge of the process of the ZEPA, including the established regulations and the future.

- I would like you to describe your level of knowledge about the following organizations (Not at all knowledgeable, somewhat knowledgeable, knowledgeable, very knowledgeable, fully aware of the organization and all of its initiatives)

GICPA

Community Council

Women's organizations

- Can you describe some of the things those organizations have done?
- How have you found out? (Direct contact with the organization, attended meetings, friends, family, N/A)
- I would like you to describe your level of knowledge about the ZEPA process. (Not at all knowledgeable, somewhat knowledgeable, knowledgeable, very knowledgeable, fully aware of the organization and all of its initiatives)
- How have you found out about the ZEPA? (Direct contact with the organization, attended meetings, friends, family, N/A)
- Can you describe some of the things that have been established with the ZEPA? *(I will include any situation mentioned by the fisher. Eventually, I will mention nets and conflict with large scale fishery issues if fishers do not bring them up. Though, I will keep track about how many fishers acknowledge and how many do*

not in order to have an idea about how much people is familiar with the process of the ZEPA)

- In general, what, if anything, has changed on your fishing grounds since the implementation of the ZEPA? Describe the changes. There has been any change with the implementation of ZEPA? Explain your answer. (Stock recovery, species protection, habitat protection. decrease of competition, nothing at all)
- In your opinions, should the ZEPA continue in the future? Can you explain your answer?
- The main objectives of the ZEPA are to mitigate conflicts with large scale fishery, involve fishers in co-management and promote food security. In your opinion, which of these objectives is the ZEPA meeting? Which isn't it meeting? Thoughts on why?
- What are the main challenges for the ZEPA in the future?
- What are the main opportunities?
- What would it take, in your opinions, to ensure the ZEPA continues to operate? Achieves its goals? To continue?
- Do you think future generations will benefit from the ZEPA?
- What, if anything, needs to change for the ZEPA to meet its goals

IV Recommendation other fishers. As I mentioned in the consent form, I would like to carry out more interviews like this with expert fishers and their wives in this community. Can you recommend 3 fishing households where, in your opinion, the fishers and their wives are particularly knowledgeable about the fishery in this community?

Would you be willing to provide the names of the three harvesters who fish in the same area as you who, in your opinion, are most knowledgeable about the fishery in that area?

1. _____
2. _____
3. _____

Thank you very much for agreeing to participate in this interview and for your time. I will, as I mentioned earlier, be presenting the preliminary results of this research at a public meeting before I leave town and again next year when it is finished. The meeting will be advertised locally and on the radio. I hope that you will be able to attend.

Appendix G
HUMAN INVESTIGATION COMMITTEE UNDERTAKING OF
CONFIDENTIALITY

Project: Understanding the Development of the Exclusive Zone for Small Scale Fishery (ZEPA) Chocó, North Pacific Coast of Colombia, South America and its Potential Consequences for Small and Large Scale Fisheries and Food Security

Researcher: Angela (Viviana) Ramírez. Environmental Science Program, Memorial University, Canada. Researcher of SQUALUS Foundation, Colombia.
Email: vivianar@mun.ca, phone (Colombia): 57-310 509 6536

Supervisors: Dr. Barbara Neis. Department of Sociology, Memorial University, Canada.
Email: bneis@mun.ca, phone: 1-709-737 7244
Dr. David Schneider. Department of Biology, Memorial University, Canada.
Email: david.schneider@mun.ca, phone 1-737 8841/2186

I understand that as an assistant, I must maintain strict confidentiality of information obtained from participants in research studies.

I understand that not all members of a research team will require confidential information about research participants and that the principal investigator will limit the number of persons on the team who require such information to as few as possible.

As an assistant I agree not to disclose or discuss any confidential information to which I have access except with the appropriate members of the research team.

As a staff member of the research team I agree not to disclose or discuss such information unless specifically authorized to do so by the investigator to whom I am responsible.

I understand that a failure to abide by this requirement could cause individual participants embarrassment. Breach of confidentiality could have serious personal, social and legal consequences for the participant and for the participant's family, friends and associates. I appreciate that an unauthorized disclosure could have consequences for the participant in his or her employment.

I also acknowledge that as part of my employment relationships, if I should make an unauthorized disclosure of information about a participant in a research study, I may be dismissed from my position or suffer formal reprimand. I appreciate that I shall be legally responsible for my actions and, in the event of litigation for my unauthorized disclosure of information, I agree to indemnify my employer for any damages incurred by him.

Printed name of research team member: _____

Position on the research study:

☐ Assistant

☐ Staff member

Signature of research team member: _____

Witness name: _____

Witness signature: _____

Date: _____

Appendix H
LETTER FROM SQUALUS FOUNDATION ACCEPTING THE PRIVACY AND
CONFIDENTIALITY COMMITMENTS ASSOCIATED WITH THE CONSENT
PROCESS

June 16th 2010

Dr. Felt
Chair
Interdisciplinary Committee on Ethics in Human Research -ICEHR-
Memorial University of Newfoundland

Through the present letter I express my agreement to respect the protection of privacy and confidentiality commitments stated throughout the Ethics Application, specifically on the Consent Form and Archival Deposit/Access Form, regarding the information collected by the project "Understanding the Development of the Exclusive Zone for Small Scale Fishery (ZEPA) Chocó, North Pacific Coast of Colombia, South America and its Potential Consequences for Small and Large Scale Fisheries and Food Security". SQUALUS will store in a secure place and follow the conditions chosen by the interviewees regarding the access to the recordings, transcripts and charts, where applicable.



Sincerely,
Mr. Andrés Navia
Director
SQUALUS Foundation

Appendix I
LETTER FROM A HUINA FISHER TO THE FISHERIES AUTHORITIES
REQUESTING REGULATIONS FOR HARMFUL FISHING PRACTICES IN
THE MUNICIPALITY OF BAHÍA SOLANO

This letter was originally written in Spanish. In general the original author's style has been conserved. Some lines have been omitted or modified for clarification.

Doctor
CARLOS ROBLEDO
Director of Fisheries
Ministry of Agriculture
BOGOTÁ D.C.
n.d.

Greetings:

Mister director of fisheries from the ministry of agriculture, by means of this communication, I write to you with all respect.

[I would like] to let you know about some activities related to the fishing sector, which have been occurring periodically on the northern Pacific coast of the country, more specifically in the municipalities of Bahía Solano and Juradó. [These activities] have created among artisanal fishers [including myself] certain concern because [the activities] are causing much harm to the fishing sector and do not allow the fishery to be sustainable in the long term because we are over-exploiting the most important commercial species in the region [...] most of [these activities] can be regulated or banned, so that this sector can develop sustainably in the long term.

I will now describe the activities, their benefits, negative effects, and what needs to be done

Appendix G
HUMAN INVESTIGATION COMMITTEE UNDERTAKING OF
CONFIDENTIALITY

Project: Understanding the Development of the Exclusive Zone for Small Scale Fishery (ZEPA) Chocó, North Pacific Coast of Colombia, South America and its Potential Consequences for Small and Large Scale Fisheries and Food Security

Researcher: Angela (Viviana) Ramírez. Environmental Science Program, Memorial University, Canada. Researcher of SQUALUS Foundation, Colombia.
Email: vivianar@mun.ca, phone (Colombia): 57-310 509 6536

Supervisors: Dr. Barbara Neis. Department of Sociology, Memorial University, Canada.
Email: bneis@mun.ca, phone: 1-709-737 7244
Dr. David Schneider. Department of Biology, Memorial University, Canada.
Email: david.schneider@mun.ca, phone 1-737 8841/2186

I understand that as an assistant, I must maintain strict confidentiality of information obtained from participants in research studies.

I understand that not all members of a research team will require confidential information about research participants and that the principal investigator will limit the number of persons on the team who require such information to as few as possible.

As an assistant I agree not to disclose or discuss any confidential information to which I have access except with the appropriate members of the research team.

As a staff member of the research team I agree not to disclose or discuss such information unless specifically authorized to do so by the investigator to whom I am responsible.

I understand that a failure to abide by this requirement could cause individual participants embarrassment. Breach of confidentiality could have serious personal, social and legal consequences for the participant and for the participant's family, friends and associates. I appreciate that an unauthorized disclosure could have consequences for the participant in his or her employment.

I also acknowledge that as part of my employment relationships, if I should make an unauthorized disclosure of information about a participant in a research study, I may be dismissed from my position or suffer formal reprimand. I appreciate that I shall be legally responsible for my actions and, in the event of litigation for my unauthorized disclosure of information, I agree to indemnify my employer for any damages incurred by him.

This fishery is carried out within bays, coves and areas where it is proven that fish schools occur, which are always composed of juveniles. Soaking time is 12 hours.

Benefits: This fishery is carried out by people who generally have other economic activities (traders and employees from [non-fishing sectors]) and go fishing in order to capture additional income. [T]hese fish are traded in town because they do not meet the size requirements to be traded in inland cities.

The species caught in this fishery with the highest value are: *Lutjanus [peru]* [red snapper], *Lutjanus [guttatus]* [spotted rose snapper] and other pelagic fish which are less valuable [commercially] but very important in this sector.

Negative effects: With this fishery we are catching a very important species [commercially] but we are catching it at a very small size and at a juvenile stage; therefore they are animals that have not reproduced yet; which causes big damage to the species.

On the other hand, the first animals caught with the net rot, because the soaking time is too long.

What needs to be done: Protection for the species, allowing them to reproduce at least for the first time. [This way] the population can grow so the fish can be caught with handline as [we did] back in time because [when they are caught with handline] the fish is worth enough to be traded in inland cities. We can make this happen if the 2"- 3" gillnet is banned in deep waters.

1.2. *Multifilamento* [twine] 4" mesh size [and larger] gillnets.

These gillnets are set in deep waters in rocky and reef areas. Soaking time is 12 hours.

Benefits: This fishery is carried out by artisanal fishers and their catches are always composed of [large] animals.

Negative effects: This fishery damages the marine ecosystem because it destroys the corals. The nets tear and continue catching animals at the site as long as they exist. This negatively affects fishers because the animals that do not die flee the area. This makes fishers' lives more difficult, especially those who make a living by fishing.

What needs to be done: Find a way to raise awareness among artisanal fishers so they will give up their nets. If they do not, then use the ecosystem protection as an argument to ban this fishery.

2. Submarine fishery (scuba diving)

Scuba and free diving are sports created as recreational activities not as commercial activities. In our town, this activity is carried out with spear guns, turning scuba diving into a commercial activity. Paradoxically, commercial scuba diving is banned in Europe, the United States, Central America and some countries in South America. In Colombia [...] very little is known about this activity.

Benefits: This activity is carried out by locals and outsiders who have nothing to do with the fisheries in this region. They take all their catches to inland cities or sell them to local fish traders.

Negative effects: Local artisanal fishers are negatively affected because when they are fishing the divers come over and start spear fishing. Consequently, the fish stop biting the fishers' bait for several days because the divers kill whatever they find.

Verbal fights have already occurred between some fishers and divers. This is very dangerous and soon serious conflicts may occur. Generally, divers target [longfin yellowtail] (*Seriola [rivoliana]*) because of its commercial value; but this species has substantially declined in the last years.

What needs to be done: Learn from the experience in other countries where this fishery has been totally banned.

3. Beach seines

This is a gear designed for fishing on beaches, but lately in our region it has been misused on rocky and reef areas. In these areas fish schools composed of juvenile [...] *Lutjanus [peru]* ([red snapper]) occur.

Benefits: This activity is carried out by artisanal fishers; they sell their catches in the region because fish do not meet the size requirements to be sold in inland cities.

Negative effects: The fish cannot reproduce because the gear attacks these animals in the nursery areas, so they cannot reach adulthood.

What needs to be done: Ban this gear.

There is another type of fishery that needs close attention because [...] it is done by industrial fishing vessels [...] occasionally [...] outside the areas allocated to them.

4. Seiners

Tuna seiners are large vessels and come from other countries, but because they have contracts with Colombian companies, they fish close to shore within the first mile, which is an exclusive fishing zone for artisanal fishers. [Seiners] do not respect the artisanal fisher or the species caught by their nets. [These species] are put back in the sea after they die [...]. These species are very important for sport fishing.

Negative effects: All the artisanal sector is negatively impacted because if, this fishery is allowed near the coast, soon there will be no fish left on this coast and it will be in the same situation as the Atlantic coast [of Colombia].

What needs to be done: Establish a legal framework to obligate these vessels to fish beyond 30 miles in order to protect [the coast] from the predation that it is subjected.

Mister director of fisheries, the goal of this communication is to make you see the need to create exclusive zones for artisanal fishers, sport fishers, and recreational diving; by banning some fishing practices that prevent the fisheries from being sustainable in the long term. This way the food security of a large part of the community can be protected. [I]n the end, it is the community that will benefit if these recommendations are taken into account.

Besides this information, let me invite you to this beautiful Municipality, so you can have the opportunity to go around and verify for yourself the information that I am sending to you.

Yours Sincerely,

(Huina fisher)