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DELIVERABLE 5: PROPOSED MANAGEMENT MEASURES AND POTENTIAL ZONING SCHEME FOR ARTISANAL FISHERIES IN THE COASTAL AND MARINE AREA OF BUENAVENTURA

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Summary

The small scale fisheries around Buenaventura mainly target species found in the shallow waters, and mangrove estuaries of the Colombian Pacific. The wider continental shelf and multiple river mouths in this region means that the large pelagic species are further off shore and only a few communities have the boats and fishing equipment to be able to target these resources. Despite their importance to local income and food security the different fisheries of the area have remained poorly studied until recent data collection efforts organized through the Afro-Colombian community councils compiled landing statistics at a village level.

Here we use these data combined with contextual information gathered from site visits, informal interviews with fishers and discussions with community leaders to identify management options that promote the sustainability and local stewardship of the areas artisanal and small scale fisheries.

The marine fisheries of the Buenaventura area can be separated into four general sectors: Net based gears that catch a mixed assemblage of near shore shallow water fish; Bottom set long lines for shallow water predatory fish; Shrimp caught using trammel nets or small powered trawls; Off shore purse seine fishers used to selectively target single species shoals of pelagic fish.

There are important environmental and ecological differences between the Buenaventura area and the conditions that support the artisanal fisheries of the Tribugá Gulf, Chocó, in the northern Colombian Pacific. In the coastal communities of Chocó local efforts are working to ban nets in favor of hook and line fisheries that target large, high value fish such as tuna and snapper. In the Tribugá Gulf the continental shelf is narrow bringing tuna close to the shore and the bottom is rocky providing perfect habitat for groupers and snappers, favoring hook and line techniques. This fishing gear transition, however, is not replicable in the fisheries around Buenaventura. The multiple river estuaries and wider continental shelf means that the fisheries of the Buenaventura area are dominated by a diverse assemblage of bottom dwelling, shallow water, estuarine, fish species connected to sedimentary systems. In the Tribugá Gulf a fisher can be in over one thousand feet of water within three nautical miles of the coast. From the coastline around Buenaventura a fisher can still be in one hundred feet of water seven miles from shore.

Based on the environment which drives the fish ecology here we propose there overarching management objectives for the development of more responsible fisheries in the area:

(1) Support the development of Community Based Fisheries Management that integrates a spatial management plan separating areas for different fisheries, the protection of critical locations from fishing, such as river mouths, and the adoption of a responsible fishing agreement.

(2) Underpin responsible fishing agreements on a community by community basis by providing market incentives to all the fishers in a community to adopt the agreement.

(3) Build supply chain redundancy the market chain to account for the fluctuations in supply and demand that occur with the available species and the increased volume that is symptomatic of the

This strategy reflects the specific conditions in Buenaventura to focus on the existing and emerging threats to the Buenaventura fisheries such as the increasing adoption of small scale trawls “changas” for shrimp fishing and the use of beach seines and tidal seine nets in river mouths that target and catch juvenile fish.

By focusing on Community Based Fisheries Management model it gives coastal communities and fishers primary responsibility for managing their resources. This approach centers around the premise that community collaboration, and local participation can be an extremely productive and accurate means of managing, monitoring, and maintaining coastal resources. The communities around Buenaventura are small and closely knit. Fishing communities around Buenaventura can improve their responsible fishing activities by first working to remove damaging gears from their areas and then develop locally managed marine areas to protect critical locations. Sites of importance such as the mouths of rivers that are critical transit points for fish moving in and out of the mangrove areas can be protected by local fishers under consensus agreements. These relatively simple strategies can help move remove some of the primary threats to sustainability and help develop a sense of local stewardship over the fate of community fisheries.

The use of market incentives to reward fishing communities who uphold gear restrictions and adopt spatial management plans can help underpin the transition to Community Based Fisheries Management. The COOMULPESLAB cooperative is currently offer nearly 20% price incentive to its fisher members. This incentive needs to be connected to a specific code of conduct, defining the principles, values and commitment of the fishers that sign it.

The example from other areas of connecting fishers directly to high end restaurants will need to be adjusted to be appropriate for the local species found in the fishery and the inherent volume and supply variability. The Buenaventura fisheries have abundant, small bodied species rather than the large high value species that are found further north. Diversifying the market chains and developing key buyers that can buffer fluctuations between supply and demand is critical to the success of this market led approach.

For the COOMULPESLAB cooperative we analysed available data to look at the profit from both select fish and lower value species and evaluate whether trying to establish direct to restaurant sales is preferable to working out a commercial relationship with a large fish vendor in Bogota, CENDISMAR. Our analysis shows that there are improved profits that can benefit fishers and additional advantages by building a more resilient and stable cooperative business through establishing an agreement with CENDISMAR.

There are solid foundations in place for implementing the above strategies. Key communities are committed to enacting change and there is a cooperative ready to provide the necessary link and essential economy of scale between remote fishing villages and centralized markets in the major cities.

The approach is replicable and scalable at a village by village approach with each community having its code of conduct agreement and its local management plans recognized both by the community councils and the national government.

The next steps should be to establish the responsible fisher code and have these agreed and adopted by the communities supplying the cooperative. Suggestions for the contents of these codes are included in this document as well as examples used by fishing communities in other areas. An agreement between COOMULPESLAB and Cendismar should be amde so that the coop can continue to offer price premiums to its members in return for adopting the responsible fishing code of conduct. Then communities should work on developing a spatial management plan to protect specific areas of importance to the estuarine and near shore species which underpin their fishery and ensure ongoing monitoring to measure there success.

The Fish and Fisheries

There are three main fisheries that target fish and shrimp in the shallow waters around the Buenaventura area. These are gill net fisheries and bottom set long lines targeting fin fish and trammel nets to catch shrimp. There are also a small number of boats that target pelagic fish further off shore.

The nets – minimum mesh size and spatial protection.

Eighty species of fish were recorded In the BIOREDD landing data for the Buenaventura area. The catch is dominated numerically by inshore and estuarine species of relatively small-bodied fish such as gualajo (*Centropomus medius)* and pelada (*Cynoscion reticulatus*).

These species are the mainstay of the small scale artisanal fishery and management strategies need to reflect their importance by focusing on methods to promote sustainability without trying to convert fishers away from nets. Reducing the catch of juvenile fish by promoting minimum mesh sizes can be further improved by identifying and protecting locations that are critical to key stages of their life cycle. These sites include river mouths which are important migration routes at rising and falling tides. River mouths are often targeted by fishers as they constrict the movement of fish into particular areas as they transition from sea to estuary. Protecting river mouths from fishing is a simple strategy for community management as river mouths are an easily identifiable geographic landmark. In addition work should be conducted with fishers to identify known spawning sites and juvenile areas. Collating this information and then helping communities define specific no take areas by consensus can also help underpin a locally based management approach for sustainable fisheries.

Gill nets are commonly made of nylon and range in mesh size from 2.5” to 4”. Efforts to keep nets above a minimum size of 3” must be led by each fishing community as there is limited outside enforcement. Providing price incentives to fishers who user nets above the minimum size can help offset any potential losses from not catching the larger volume of small fish.

Market led responsible fishing practices should also focus on the prohibition of damaging fishing techniques such as the use of beach seine and tidal nets. Integrating these net regulations with spatial zoning to protect spawning sites and migration routes can help focus fisher attention on the importance of protecting juveniles and critical life cycle stages. This approach to management is likely more viable than trying to convert fishers to completely different gear types.

Many species in the fishery are only caught with nets (Table 1). Further as explained below, long line fisheries when deployed in shallow estuarine conditions have significant conservation concerns and promoting their adoption should not be encouraged in Buenaventura.

Table 1 - Twelve species that are exclusively caught with nets around the Buenaventura area

Local name	English name	Scientific name
Corvina	Weakfish	*Cyncoscion albus*
Pelada blanca	White weakfish	*Cynoscion reticulatus*
Pelada amarilla	Striped weakfish	*Cynoscion striatus*
Gualajo	Armed snook	*Centropomus armatus*
Machetajo	Blackfin Snook	*Centropomus medius*
Robalo	Large Snook	*Centropomus sp.*
Alguacil	Red sea catfish	*Bagre pinnimaculatus*
Barbinche	Chilhuil catfish	*Bagre pannamensis*
Ñato	Steindachner's catfish	*Notarius troscheli*
Rascapalo	Leatherjacket	*Oligoplites altus*
Cubo	Bighead Tilefish	*Caulolatilus affinis*
Merillo	Small Grouper	*Epinephelus spp*

Hook and line fishery – bottom set long lines pose conservation threat

Although the data collected by the communities around Buenaventura did not include gear type in many of the landing records we believe that fishers will be using bottom set long lines due to the environmental conditions found here and the fish assemblages caught. The prevalence of catfish in the landing data, which is commonly caught with long lines, suggests that these gears are being deployed. Local fishers also mentioned that long lines are used.

Bottom set long lines used in this type of environment would normally consist of a main line with up to one thousand "J" hooks spaced at approximately 10 foot intervals. Hooks are baited with small fish often caught by beach seines and tide seines in the estuaries. An artisanal long line fisher will use about 50 lbs of bait on a day long fishing trip.

Bottom set long lines target snappers (lutjanidae), grunts (Haemolidae) and cat fish (Ariidae). Despite being set in similar habitats the long line fishery have a completely different catch composition to net fisheries. In Table 2 we show data collected from a shallow estuarine system similar to Buenaventura as

an example of the differences in catch composition between these two gear types. Nets largely catch weakfish (peladas) as well as snook (Robalo / Gualajo). Bottom set long lines by comparison catch mainly cat fish and rays. Bottom set long lines also catch significantly more juvenile sharks than nets do. The capture of juvenile sharks is of conservation concern as the endangered scalloped hammerhead is commonly caught. These sharks use shallow estuaries as nursery areas.

Table 2 – Example catch data comparing catch composition of gill nets and long lines in an Eastern Pacific shallow sedimentary system similar to Buenaventura..

Common name	Family	Long lines	Nets
Cat fish	Ariidae	51.2%	3.7%
Ray	Dasyatidae	37.0%	0.3%
Weak fish	Sciaenidae	4.3%	26.2%
Shark	Mainly Sphyrnidae	2.9%	0.8%
Grunts	Haemulidae	1.9%	30.3%
Croaker	Sciaenidae	1.0%	13.1%
Jacks	Carangidae	0.0%	9.7%
Other	-	1.7%	16.0%

For the conservation of threatened apex predators such as sharks, it is important to focus management attention on limiting the adoption of these bottom set long lines in the communities around Buenaventura. Reducing long line use in these shallow water areas would help decrease the capture of shark and ray species as well as remove the need to use beach seines to supply the large amount of small fish needed to bait the hooks.

Shallow water bottom set long lines generally catch species of lower value but in higher volume. Responsible fishing guidelines in Buenaventura should limit or prohibit long line use in shallow water areas. Interestingly these guidelines would be the opposite to those of the northern Colombian Pacific, where long lines are promoted over net use. The polarity in recommendations from north to south provides a clear example of the need to adapt what are considered “responsible” fishing techniques based on the prevailing ecological conditions that underpin the local fisheries.

The shrimp fishery – the threat of “Changas”

Shrimp are largely caught using trammel nets. Trammel nets are constructed by joining two sheets of netting together. The outer sheet is made of netting with larger mesh-sizes whilst the inner net is hung very loosely to allow excess mesh to be drawn through the holes in the larger mesh. Nets are deployed to drift with the current and shrimp are ensnared in “pockets” of smaller mesh that form as it pushes through the larger mesh net.

Shrimp fisheries always have associated by catch. Although there is not data available for this specific fishery in the Buenaventura area similar fisheries using trammel nets in this way have a by-catch ratio of about 4 kg fin fish to 1 Kg shrimp. This is much lower than the by-catch associated with towed trawls

that can exceed twice this ratio of fish to shrimp. Much of the small fish caught by the trammel net fishery is also sold into local markets for domestic consumption and very little is normally wasted.

A critical threat to the artisanal shrimp fishery in the area is the adoption of small scale towed trawls called “Changas”. These are drag nets that dredge the bottom when pulled by small motorized craft. The problem with these trawls is they directly impact the sediment and damage the invertebrate fauna that lives in the mud. The invertebrates include worms and bivalve molluscs that are the base of the food chain for many of the fisheries and related biodiversity of the area. Protecting sediment habitat and its associated in-faunal assemblage is critical to the health of the near shore ecosystem.

Towing a trawl also increases fuel usage so fishers using “changas” need to catch more shrimp in order to offset the increased costs compared with those using passive trammel nets. The simple shift in the economic equilibrium of the fishery is the starting point to a downward spiral towards fishery decline where increasing costs push increased exploitation. The habitat damage associated with the more intensive gear can start to limit the productivity of the area, causing negative feedback loops reducing the catch of net fishers and catalyzing the adoption and spread of changas to boost yields.

As part of a responsible fishing agreement, fishers should prohibit the use of changas from their areas. Providing incentives to communities to not start using “changas” before the adoption cycle begins is a time critical management challenge. These incentives can be provided by developing a chain of “responsible artisanal shrimp” that is conscious of both limiting by catch and not using powered trawls. Protecting juvenile grounds is also critical to the management of shrimp fisheries. Certain coastal areas concentrate small size classes of shrimp. Many fishers can normally identify where these areas area. Local agreements to not fish in these areas can help protect the sustainability of the shrimp fishery.

Purse seine fishery – A seasonal component among a range of fisheries

The majority of communities have little or no access to the off shore fish species such as tuna and sierra mackerel. The continental shelf is wide in the area of Buenaventura and fishers can travel eight nautical miles off shore and still only be in one hundred foot of water. This contrasts to conditions in the northern Colombian Pacific where fishers can be in more than one thousand foot of water within three miles of the coast.

Some fishing communities such as Punta Bonita and Pital have adopted purse seines fishing to target off shore stocks. Importantly these are not independent fishers, but groups of fishers that are enabled to reach and catch these pelagic species due to investments made by individuals in the community who bought larger boats and purse seine nets. The purse seine net alone can cost in excess of US$15,000. The investors are paid for the use of the boat and the net by receiving 40% of the catch value after fuel costs have been paid.

On a purse-seine fishing trip twelve fishers take two boats to search for shoals of pelagic fish. The fishers use birds to help guide them to the shoals, which form at the surface as the larger predatory fish chase

small bait fish. Fishers can identify what type of fish is in the shoal by the characteristics of the movement and commotion of the feeding frenzy. In this way the fishery is actually highly selective as fishers can decide whether they want that species or not before deploying the net.

Once the decision is taken to deploy the net one boat encircles the shoal and the other boat is used to pull a long rope to quickly close the bottom of the net. The fishers then start to pull in the net, gradually tightening the circumference of the circle. The second boat provides stabilization to prevent the weight of the net from capsizing the main boat. To do this the second boat keeps its engine under power to pull on the opposite side of the main boat to where the net is being recovered.

Purse seine fishing in this way can catch a large amount of fish in one go. During the main fishing period from November to March catches in Punta Bonita averaged 330 kg per trip (± 68 kg)[1]. Fishers normally only made one trip per week. In the off season fishers may not go out at all. In July and August, the data suggests that the total catch averaged just 18 kg (± 8 kg). These were likely to be exploratory trips checking for the presence of shoals.

The fishery is fuel intensive. Although fishers did not record actual fuel consumption they estimated that a trip uses at least 40 gallons. Fuel in the communities is 13,000 pesos a gallon so the estimated upfront cost for each fishing trip is around 520,000 pesos (US$ 260).

The fishery can be considered as a “high risk: high reward” activity. The fuel intensive nature means that the fishing group risks incurring large debts as they go in search of pelagic species. But both the risk and reward are shared among the group of fishers. Each fisher is assuming a portion of the fuel costs as a debt payable against the catch. If the group fails to catch enough to cover the costs the fishers accumulate the debt until there is a successful catch. The costs of the fishing trips are taken from the catch value before the profits are divided.

After costs the catch profit is then divided: 40% goes to the boat and gear owner and 60% is split among the fishers. An individual fisher ends up receiving a 5% share of the landed catch profit.

Based on the BIOREDD data, using estimated costs and known dock side sale prices a fisher will make about $150 a month working in the purse seine fishery during good months. In off season there is either no income or potential losses of up to $60 per month (see graph 1). It is unlikely that fishers could maintain their households’ simply by working in the purse seine fishery for the few months it is viable.

[1] Figures calculated from BIOREDD data collection

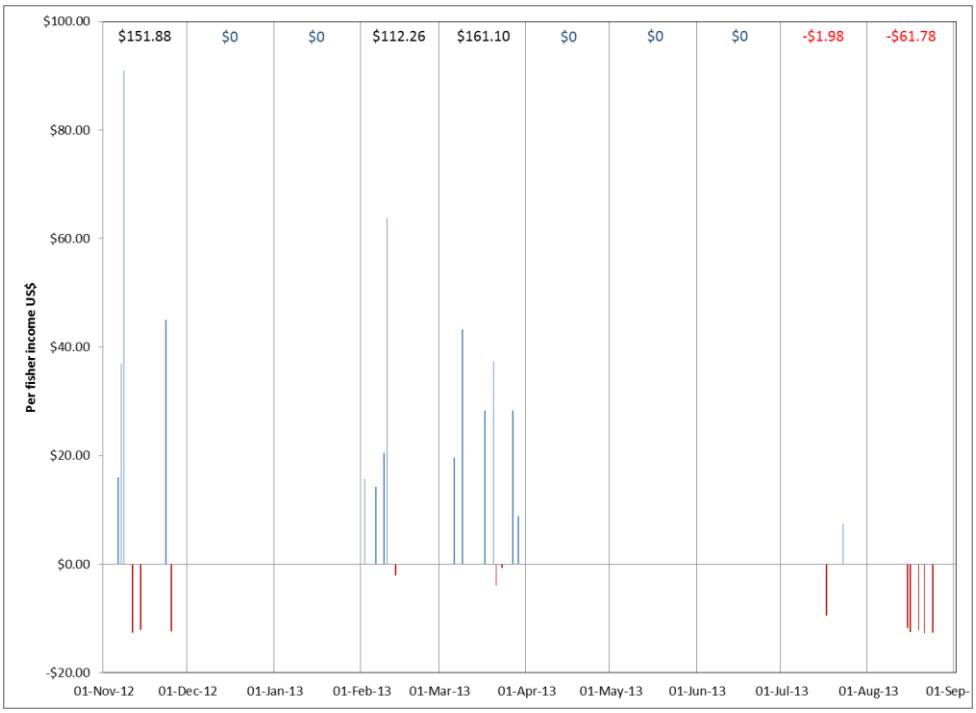

Figure 1 – estimated per fisher income from purse seine fishing in Punta Bonita, Cajambre. Blue lines indicate profits whilst red lines indicate losses. The dollar amount at the top is the total income per month. Figures based on landing figures collected by the community, estimated costs of 40 gallons of fuel and the estimated sale prices for the landed catch.

Given this reality, the pelagic fishery should be viewed and managed as a seasonal component of a more diverse range of fishing activities. Community based management plans aimed at helping fishing groups rotate through various fisheries resources, with different gears depending on the season, would be the best solution for these areas.

With careful community management the purse seine fishery can be a useful component of local incomes. Communities should be encouraged, however, to set specific limits on the number of boats and gears that are allowed. Further, fishers should be wary that they are vulnerable to accumulating large debts to the boat owners especially with ever rising fuel costs. Gradually replacing boats and gears from individual ownership to cooperative ownership may help reduce debt risks as the profits would be more equitably shared.

It must be stressed that despite the high per trip yields when the fishery is successful, the individual fisher income from the purse seine fishery, averaged across a month, is actually very low ~$5 per day. Individual fishers may not fully realize the poor average income derived from the fishery. It is human nature to remember the large payments and forget small ones. This may be especially the case since the debts are “hidden” and simply paid off against future catches. There is a subtle driver for fishers to continue to “gamble” in search of the next big catch.

This fishery does not have the supply stability to be a reliable source for specialized restaurant market. However, it could certainly supply a gourmet product at specific times of year. In the fishing season the

yield is large, likely flooding the market and depressing prices. Focusing on swapping volume for quality would help mitigate this effect.

Off season there is no target fish in the vicinity. Diversifying fishers into other fisheries during the off season and diversifying markets to accept other products at other times seems like the only viable path forwards in this area.

Central Strategies

- Community Based Fisheries Management

Community Based Fisheries Management empowers coastal communities to manage their coastal resources. Devolving management responsibility to a local level works on the premise that the fisheries are generally community based, are strongly rooted in local knowledge, and there is social and cultural cohesion that should facilitate decision making. Building on the existing community dynamics local groups of fishers can be empowered to form priorities, make management decisions and then enact and enforce locally applicable strategies. This stepwise process from defining to solving problems facing fish resources is the core of Community Based Fisheries Management.

Community based fisheries management aims to ensure the conservation and preservation of fisheries health, balanced with the sustainable use of these resources by the community members. By fostering this management approach with information from research and specific tools to help in data collection and decision support, communities can enact management and then begin to measure the efficacy of their actions.

Enforcement of agreed regulations and spatial management restrictions is hard in most fisheries scenarios but by empowering fishery engagement in the management process it strengthens neighbor to neighbor regulation. As being a responsible fisher becomes part of the local custom an ethic and value system as stewards of marine resources for future generation gradually evolves. In essence simple changes are what drive such local scale involvement and ultimately contribute to productive management techniques.

The recognition of rights for local communities to manage marine areas is also important to delineate traditional fishing grounds from the encroachment of industrial fishing vessels. Buenaventura communities seem to have limited political voice because of their spatial removal from decision makers and the poor availability of data to define the importance of their fisheries. By contrast industrial fisheries especially the shrimp trawlers are centered in larger cities, have an association to represent their interests and can make politically compelling arguments based on statistics for fisheries revenue.

To articulate the importance of fisheries to their community, villages must organize themselves to be able to present an evidence based argument to decision makers. Here, data collection activities can help by providing statistics on the number of fishers and fisher dependent households, the productivity of the fisheries and their role in local food security and national protein supply.

Placing data collection in this context, where the information is to support effective representation, provides an incentive for fishers to collect catch data on an ongoing basis. Village groups assuming the responsiblity for community based fisheries management should collect and maintain an up to date registry of active fishers and a record of catch levels and fishing sites that the community uses.

The information collected by each community should be summarized in to simple reports at the end of each fishing season and maintained by the community as a record of their fishing activities. By having multiple villages submit these fishing statistics to the community council the regional importance of these fisheries can be made apparent.

Community data collection and management decision making must operate at two governance scales in this area. Firstly each village must take responsibility for the actions of its fishers. Then community councils can act as an umbrella to help link up villages and support and represent the village fisher groups. A division of responsibilities between village fisher groups and community council groups for the different aspects of fisheries management are summarized in the table below:

Division of responsibility for Community Based Fisheries Management		
Management Function	**Village level fisher groups**	**Community Councils**
Access	• Maintain and update fisher registry • Map fishing grounds and fish resources for community	• Establish spatial management agreements among villages • Represent local fisher interests against encroachment from industrial fishing boats
Harvest Control	• Enforce gear restrictions, no fishing areas and closed seasons at local level	• Agree community wide regulations and general zonation plan for coastal fisheries
Compliance	• Implement locally agreed responsible fishing practices • Build awareness of the local benefits from responsible fishing and stewardship requirements • Develop local enforcement mechanisms with agreed sanctions	• Ratify agreements among villages for responsible fishing practices and fishing areas. • Organize exchanges among communities and publicize best practices or novel solutions to fishing problems
Maintaining data	• Collate local fishing	• Collate data from participating

	knowledge • Ensure village catch statistics are recorded • Maintain summary records for each fishing season • Pass information to community council	villages • Connect information to national government and decision makers. • Provide information to consolidate support for locally managed marine areas
Economic development	• Centralize market chains through community cooperatives • Promote responsible fishing behavior with improved prices • Test new fisheries for novel product development	• Support cooperatives to provide link from villages to markets • Endorse responsible fishing activities
Policy	• Articulate locally specific variation and alternatives for fisheries regulations • Promote policy adoption at local level • Report fisheries concerns and policy issues to community council	• Develop artisanal fisheries plan for Colombian Pacific • Implement consultation process with communities and then present plan to national government

- Central tenets of Village based Code of Conduct for Responsible Fishers

Discussions amongst constituent fishers within villages should focus on the benefits and costs of adopting the following locally implemented management strategies. The aim should be to form a local charter agreed by all fishers in the community which clearly defines what activities are not compatible with local stewardship of the environment. The agreements should clearly specify the advantages in terms of preferential pricing and a set of locally implemented consequences if these agreements are broken by fishers.

Recommended fishing gear restrictions

- To protect juvenile fish and allow them to grow to maturity beach seines and tidal seines should be phased out
- To protect the base of the food chain and reduce waste through by catch powered shrimp trawls should be excluded from community fishing areas.
- To reduce the capture of small, immature fish, the minimum mesh size for gill nets should be at least 3”.
- To conserve endangered shark species and remove the need for large volumes of bait fish transition away from long lines

- To prevent excessive competition in the search of pelagic species limit the number of purse seines in a village and transfer ownership to community groups

Spatial considerations

- To ensure fish can transition from sea to river habitats fishing should be prohibited at the mouths of rivers
- To guarantee that enough fish are left in the sea to produce the next generation 20% of fishing grounds should be zoned as no fishing areas.
- To protect fish at critical life cycle stages spawning sites, migration routes and nursery areas should be identified and protected from fishing

It must be noted that restricting fishing methods ultimately limits the effectiveness of fishing and establishing no take areas limits resource availability. Both of these measures are important from a sustainability stand point but it understandably leads to increases in time, fuel or man-power for fishing and potential drop in total catch, especially in the short term. Incentives need to be in place to benefit fishers when they adopt these responsible methods (i.e. price premiums for fish from the responsible fishers). The price premium should be calculated to be sufficient to offset and preferably exceed any reduction in income caused by reduced fishing power and reduced fishable area. At the moment the price premium is just under 20%.

Market Chain Analysis

The cooperative COOMULPESLAB currently buys fish from its member communities at a price premium above what other buyers in Buenaventura are paying. This premium varies by species but averages an increase of 17% on the dock side sale price for fishers. This premium is not currently tied to any specific action by the fishers to improve their fishery. It is important that this connection between better prices and specific fishing behavior is made as soon as possible. The premium is a crucial tool to help encourage fishers adopt responsible fishing practices.

Table 3 - The purchase dockside price of select and lower value fish species at fish traders in Buenaventura and at the COOMULPESLAB cooperative, the sale price to different markets and example landing data from the fishery to provide relative importance of different species

		Purchase Price (Pesos)			Sale Price (Pesos)		
		Standard Buenaventura	Coop Price	Premium for fishers	CENDISMAR	Restaurants Direct	Landed weight (kg)
Select Species	Corvina	7,500	8,000	7%	12,000	13,000	4,232
	Gualajo	6,000	7,000	17%	11,000	13,000	7,172
	Merluza	9,000	9,000	0%	11,500	13,000	30
	Pargo	7,000	8,500	21%	12,000	14,000	4,848
	Róbalo	10,000	10,500	5%	12,500	14,500	356

	Sierra	5,000	6,700	34%	9,500	12,000	8,132
Lower Value Species	Aguja	2,500	3,000	20%	5,000	-	3,447
	Atún Patiseca	3,500	4,000	14%	6,000	-	6,072
	Bagre	6,000	6,500	8%	9,000	-	3,222
	Jurel	3,000	3,500	17%	6,000	-	264
	Ñato	4,000	4,500	13%	6,500	-	200
	Pelada	5,000	6,500	30%	10,000	-	285
	Picuda	3,000	4,000	33%	7,500	-	2,023

COOMULPESLAB act as an intermediary for their members selling the fish on to different markets. In an effort to continue to improve the revenue for fishers there has been an interest in replicating the model to directly supply niche fish restaurants in main cities. This model was first implemented successfully by fishers in Bahia Solano in the northern Colombian Pacific supplying the chain of Wok restaurants. The model is being replicated in Nuqui through Fishmare to supply other networks of restaurants.

Initial trials by COOMULPESLAB to supply restaurants in Cali were not proving very successful, caused largely by three factors:

1. The catch around Buenaventura has a high proportion of lower value species not currently bought by high end restaurants
2. There are few large restaurant chains similar to Wok so a network of small independent restaurants would be required to absorb the current supply of fish.
3. Small restaurants tend to order less than 50 Kg per week. Dealing in multiple small volumes increases organizational and shipping costs and small restaurants are not resilient against fluctuations in supply.

An alternative to direct supply to small restaurants was proposed. The alternative was to work with an intermediary based in Bogota called Cendismar that could receive a range of fish species, both the restaurant preferred ones and the lower value species, and become a hub to supply different market segments with fish from the cooperative.

Here we quickly review the fishing data and price structure to explain how this alternative chain has an economic advantage to the cooperative as well as providing additional benefits of building supply chain resilience and helping to match client expectations of consistent supply with inherent fluctuations in catch levels.

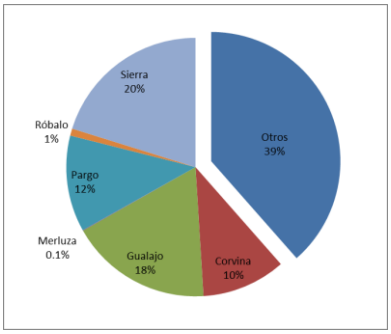

Figure 2 - Catch composition in Buenaventura fishery: 39% of total catch weight is not are high value species

The Supply

Nearly forty percent of the total catch weight in the Buenaventura fisheries is small bodied, lower value species such as cat fish and

pelada[2]. This contrasts with the fishers in Bahia Solano and Nuqui whose species are predominantly large snappers and tunas ideal for supplying niche markets (Fig 2).

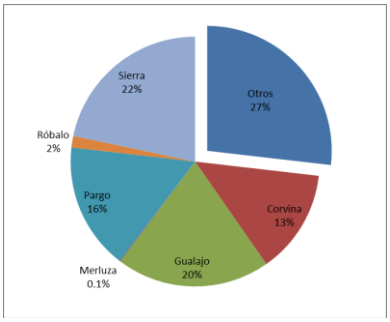

Figure 3 - The proportion of total fishery value derived from the different species

The high value species could, however, be supplied directly to restaurants. These include corvinas, gualajo, Sierra Mackerel and a range of small snapper species. The high value species make up nearly three quarters of the total value of the catch.

Restaurants pay a higher price for the select fish compared to Cendismar. The issue is what to do with the remainder of the catch. The cooperative cannot selectively buy from fishers only those higher value species that it can sell on to the restaurants. The fishers would simply start selling to someone else who would take everything from them as fishers tend to want a "one stop" sale point.

So the cooperative could buy everything anyway and then offload low value species into local markets. The issue with this is that the cooperative offers a price premium to its fishers. If the cooperative sells its fish locally the price is likely to be similar to the existing purchase price the cooperative offers the fishers.

So the central question is: Can the cooperative make more money by selling the select fish to the restaurants whilst absorbing a zero margin on the low value species. Or as an alternative become a supplier to CENDISMAR, accept a lower price for the premium species than the restaurants would offer but have a higher price for the other species than if sold locally.

Important in this comparison is the relative price of getting the fish to the respective buyers. The more complicated logistics of supplying restaurants means that the shipping costs are more than double that of supplying CENDISMAR (3,200 peso per Kg compared with 1,500 Pesos per Kg). Another consideration that cannot be explicitly modelled with the available information is the demand volume of the restaurants. It is believed that there is limited demand at the current time and very little tolerance to unfilled orders if the fisheries do not catch the species the restaurants need.

Results

We use catch data, purchase and sale prices and the per kilo shipping costs to compare the restaurant approach with the Cendismar scenario:

Select species of fish

The increased price offered by direct sale of premium fish to restaurants increases potential profits by an average of 23% compared with selling to CENSIDMAR. This profit is reduced by the elevated shipping

[2] Data from the fisheries statistics collected by BIOREDD

costs incurred when supplying restaurants directly so the coop could expect an increase in profits of around 15% by supplying select species of fish to restaurants compared to selling them to CENDISMARE

Lower value species

Importantly, however, it is the remainder of the catch, the 40% of total weight made up of the low value species, that shifts the economic balance. The restaurants do not take these species and the coop would need to off load them into the national market at the going price for those species. The price incentive of 19% that the coop offers their fishers for these species, is likely similar to the existing profit margin when sold to local markets. So the coop could expect close to zero profit for these species. By contrast CENDISMAR will take these species at improved prices that would offer a 19% return on the purchase price including the cost of shipping.

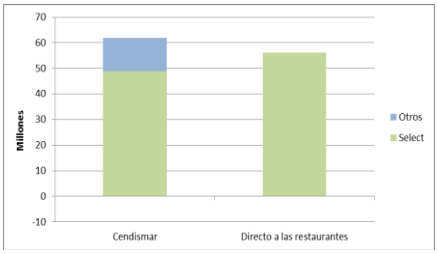

Figure 4 - Total profit from select or other fish species sold to different market chains

When we combine the profit information for both selections of fish, selling everything to CENDISMAR improves total profits for the coop. Total profits are 9% higher using this market chain compared to segregating the premium fish for restaurants and selling lower value ones locally.

Presumably the coop could develop new markets for the lower value species and over time could develop a network of restaurants to absorb its supply of higher value species but at least in the short term, becoming a supplier to Cendismar makes economic sense that can continue to provide the revenue to pay the coop fishers a premium on their existing catch.

Additional Advantages: Building market chain redundancy

Small scale fisheries are characteristically variable in their production. Natural cycles influenced by fish biology and environmental conditions all operating at different time frames can mean that it is very difficult to predict what will be caught on any given day, how good a particular season will be, or how long a poor production period will last.

External impacts like natural disasters, longer term climate cycles like El Nino events, or even geopolitical instability that affects access to fishing grounds can all influence the catch of an individual fisher or a fishing community.

At the other end of the supply chain the demand for seafood also varies. Traditionally peak demand is during lent and holy week, with lesser peaks at other festive times across the year. People tend to buy more fish towards the end of a week compared to the beginning and so there are weekly, monthly and annual trends in consumption. However, trying to predict demand for a specific wild caught fish at any particular time, especially with the limited shelf life of fresh fish, is exceedingly difficult.

This inherent uncoupled supply and demand dynamic is why fish market chains need to have supply chain redundancy, methods to ensure supply if some communities have a poor fishing period, and

mechanisms to absorb excess production without collapsing prices if communities have a “windfall”. Sourcing from multiple vendors mitigates fluctuations in supply whilst post processing of excess fresh fish in to frozen fillets or other value added products enables a market chain to buy when production is occurring and gradually release it to the market as it is required.

This type of intermediary, however, at first seems counterproductive to efforts to shorten supply chains to provide fresh products to consumers whilst improving the revenue to fishers. Projects have often focused on cutting out intermediaries so a greater proportion of the final fish value ends up with the original fisher. But, a certain amount of redundancy built by having intermediaries is critical to ensuring fishing operations can continue, that the fisher has a reliable market and the clients are not repeatedly disappointed by failed delivery.

Building a network of fishing communities that feed into the same supply chain and a range of products that absorb excess production can help avoid the significant waste of time, effort and money involved in a specific community failing to catch the fish it hoped it would catch and not being able to satisfy its clients. Or conversely catching too much fish that swamps their existing clients.

In the proposed solution COOMPULPESAB would develop a market relationship with CENDISMAR to supply both select and lower value species. The cooperative could also continue to develop a direct agreement to supply the large restaurant chain “Takami” and provide a buffer against uncertainty by having CENDISMAR with surplus fish if Takami needed it.

A win-win relationship can form between Cendismar and the coop to build this market segment. Together they can develop a specific brand of fish using the positive ecological (responsible fishing agreement) and social (improved price to fishers) aspects of this supply chain for marketing. Cendismar can work to develop a network of restaurants to supply the fish to as well as develop the alternative products to absorb surplus fish or when the shelf life of fresh fish is reached. The Coop can explore new fish species to supply and work on ensuring that its eoclogical and social commitments are being met by its constituent fishers.

This working relationship can be a strong foundation upon which to build a strong business plan and a supply chain framework that can overcoming many of the problems that emerging cooperative fisheries tend to encounter.