

Description of the Pelagic Longline Fishery System in Gouyave, Grenada

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ABSTRACT

In this paper I use a systems approach to examine components and interactions of the pelagic longline fishery in Gouyave, Grenada, using data from participant observation, semi-structured interviews, and a structured quantitative survey conducted between December 2002 and March 2004. I describe the fishery in the context of the socio-economic environment (who is involved, where and how they live) and the fishing industry (fishing activities, management). From this information I identify six major components of this system, the pelagic ecosystem, fisher, community, marketing, private sector, and management. Components are linked by the movement of goods and services such as fish, cash, labour, expectations, and regulations. These findings shed some insight into the need to strengthen major components and their interactions and applying regulations to appropriate components for sustainable fisheries management.

KEYWORDS: Systems approach, pelagic longline fishery, Caribbean

Descripción del Sistema Pelágico en Gouyave, Grenada de la Industria Pesquera del Palangre

En este papel utilizo un acercamiento de sistema para examinar componentes e interacciones de la industria pesquera pelágica del palangre en Gouyave, Grenada, usar datos de la observación de participante, entrevistas semi-estructuradas, y un examen cuantitativo estructurado conducido entre el diciembre de 2002 y marzo de 2004. Describo la industria pesquera en el contexto del ambiente socioeconómico (quién está implicado, donde y cómo él vive) y la industria pesquera (actividades pesqueras, gerencia). De esta información identifiqué seis componentes importantes de este sistema, del ecosistema pelágico, del pescador, de la comunidad, de la comercialización, de sector privado, y de gerencia. Los componentes son ligados por el movimiento los bienes y servicios tales como pescados, cobran, trabajan, las expectativas, y las regulaciones. Estos resultados vertieron una cierta penetración en la necesidad de consolidar componentes importantes y sus interacciones y las regulaciones la aplicación a los componentes apropiados para la gerencia sostenible de las industrias pesqueras.

PALABRAS CLAVES: Acercamiento de sistema, industria pesquera pelágica del palangre, del Caribe

INTRODUCTION

A systems approach deals with the behaviour of complex systems by considering linkages and interactions between elements that comprise the entirety of the system while emphasizing connectedness, context, and feedback. Although the parts can be considered discrete they are not isolated and the nature of the whole is different from the sum of its parts (Capra 1996). The pelagic longline fishery in Gouyave, Grenada can be viewed as a complex fishery system. A system that involves the interaction of fish species, fishers, gear, processors, distributors, marketing, consumers, regulations, and structures or the interaction of a human system (resource users, community, socio-economic environment), natural ecosystems (communities of organisms interacting with themselves and the environment), and management system (policy, planning) (Charles 2001, Manwaring 1994).

The objectives of this paper are to describe components of the pelagic longline fishery system in Gouyave, Grenada and analyze interactions among components to provide a broader understanding of the system and to determine how this knowledge could enhance fisheries management. I begin with a description of the pelagic longline fishery system, the socio-economic environment in the context of whom fishes, where, and how they live. The second section describes the fishing industry. I conclude with a diagrammatic representation of the

longline fishery system showing interactions among relevant components.

METHOD

Information on the pelagic longline fishing industry in Gouyave was documented during the period December 2002 to March 2004 using multiple research techniques such as secondary data sources, observation, semi-structured qualitative, and structured quantitative interviews. Published documents and reports provided background information on community demographics and community infrastructure. Participant observation was used to record household activities and the behaviour of individuals in the community. Semi-structured interviews were conducted with staff at the Fisheries Division on its activities and functions, while structured interviews with fishers on boat operating costs.

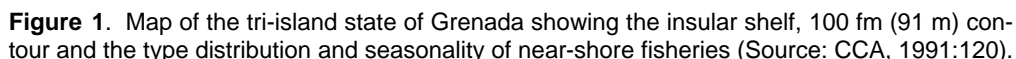
THE LONGLINE FISHERY SYSTEM

The Fishing Community

This section provides a brief insight into the social aspects of the fishery by describing the community, the socio-economic environment, cultural and social characteristics, profile of fishers, and fisher organizations and institutions.

economic activities are fishing and agriculture.

Cultural and social characteristics — The fishing culture is a way of life, attitudes, and socialization, and involves individuals whose economic and social lives are influenced in some way by fishing. It is perhaps the most distinguishable fishing culture compared to the rest of Grenada.



Gouyave fishing community members are loud-mouthed, with an 'in-your-face' attitude, and regular conversations are usually raised and high pitched, as if in an argument (MacDonald 1973). They are proud, innovative, and quick to find solutions to problems. They are also generous (giving of fish, meals, and food crops) to each other and outsiders. The culture of the rest of Gouyave is more similar to Grenada, where people are less aggressive in their mannerisms. The fishing community has clearly defined social rules and practices developed and sanctioned by community members. Social rules include the highest level of economic accomplishment its members can attain, the giving of fish in exchange for goods and/or services, and taking care of the most vulnerable individuals in the community. Social practice includes gaining respect and social status by drinking, womanizing, catching the most fish, and the giving of cash and fish to the needy. Gaining respect is a rite of passage for most, if not all, young males. If they refuse to participate in such practices they will be shunned, teased, and treated as an outsider.

Socio-economic environment — Housing amenities are used here as a proxy for socio-economic environment to compare the differences between Gouyave and the rest of Grenada. The type of building material used in the construction of houses indicates the socio-economic status of the residents; hence, wooden houses are an indicator of low socio-economic standings (CDB 1999). When compared to the national averages, low numbers of wooden houses (34.4%) and high numbers of concrete houses (55.2%) indicates higher socio-economic conditions in Gouyave. Most individuals in Gouyave have an indoor kitchen, toilet, and bathing facilities, and the 27.9% of houses that do not have a toilet use the two public bathroom facilities provided by the government (Table 1). The housing amenities of fishers differ from the rest of Gouyave; their houses are 10% more likely to be made of wood, many with no toilet or bathing facilities.

Profile of fishers — Of the estimated 2,200 fishers in Grenada over 300 operate from Gouyave. Gouyave fishers are similar to Grenadian fishers with respect to levels of education, role in the fishery, and group participation; however, they differ in marital status (Table 2). The age of fishers in 2003 ranged from 15 to over 64 years with median age 42 years. The income from fishing is attractive to young males. In addition, fishers' households have on average three members, with 37.1% with only one individual. Many fishers lived alone in a sparsely furnished small house, while women live with their children in well furnished houses. Fishers generally save at the bank, while only 11% are not able to save.

Table 1: Distribution of housing amenities in Grenada and Gouyave

Housing amenities (%)	Grenada (N=4061)	Gouyave	
		All dwellings (N=529)	Fishers only (N=89)
Walls of the house			
Wood	49.2	34.4	44.9
Concrete	31.8	55.2	42.7
Wood and concrete	18.1	10.4	12.4
Location of kitchen			
Indoor	88.9	85.4	74.5
Outdoor	8.8	3.1	8.1
None	1.5	11.5	17.4
Toilet facilities			
Pit-latrine	55.7	0.2	--
Indoor (water closet)	41.9	66.5	43.8
--	--	5.4	14.6
Outdoor (water closet)	--	27.9	41.6
2.0	2.0		
None			
Other			
Bathing facilities			
Outdoor	49.4	11.0	34.7
Indoor	43.5	62.7	--
None	7.2	26.3	65.3
Sources	CDB, 1999	Grant, 2006	Grant, 2006

Table 2. Profile of fishers in Grenada (all fishers) and Gouyave fishers

Profile (%)	All fishers	Gouyave fishers (N=104)
Education		
Primary	88.8	85.0
Secondary	9.3	9.0
Other	1.9	6.0
Marital status		
Married	39.0	8.8
Single	36.3	36.3
Common-law	24.7	22.5
Visiting relationships ¹	--	32.4
Role in the fishery		
Crew	54.9	55.6
Boat owner/captain	38.3	32.0
Boat owner	6.2	12.4
Fisher group		
No	85.0	86.0
Yes	15.0	14.0

Sources: Finlay, 1990; Straker, 1998 Grant, 2006

¹Visiting relationships are ones in which a male or female have personal homes but visit for sexual relations

Organizations and Institutions

Fisher Organizations — Only 14% of fishers are active members of fisher organizations, the St. John's Fishermen Association and the short-lived St. John's Fishermen Cooperative. After two previously failed cooperatives, the St. John's Fishermen Society (1930s) and the Fishermen Cooperative (1970s), the St. John's Fishermen Association was registered in 1986. The objectives were to promote the social, cultural, and economic interest of its members and represent fishers at the government level in matters related to fisheries management and policy development. The once strong Association has become inactive due to poor collective action, leadership, and the inability to enforce its own constitution. The St. John's fishermen Cooperative Society was initiated in 2003 by two fishers, with assistance from the Department of Cooperatives and the Fisheries Division, to organize and provide guidance to young fishers. However, by the end of that year the group had failed due to internal problems.

Community organizations — There are three active fishing-related community organizations in Gouyave, the Gouyave Improvement Committee (GIC), the St. John's Social and Cultural Organizations (SJSCO), and the Grenada Community Development Agency (GRENCODA). GIC was registered in 2001 as a not-for-profit organization; activities include community infrastructure development and renovation, and in fishing its main activity is to organize the annual June 29 "Fisherman's Birthday" celebration. SJSCO has been active in organizing social and cultural activities in the community and providing assistance to the poor, elderly, and the disabled. Many of the members of the GIC and SJSCO are involved in the fishing industry, and these organizations have been known to collaborate on fisherman's birthday celebration. GRENCODA is a non-sectarian, non-governmental organization for rural development established to assist grass-root initiatives for holistic, environmentally friendly development, self-reliance, and community building. Over the years GRENCODA has supported the fishing industry by raising funds to rebuild the industry after a disaster and has made representation for fishers (McConney 2003).

Social institutions — Institution refers to socially constructed codes and conducts that define practices, assign roles and guide interactions, and the set of rules-in-use for collective action (Ostrom 1992). There are two types of informal institutions, social and bar groups, which are highly structured and organized. These institutions comprise groups which are small in size, there is homogeneity of interest and identity, established rule structure, and members appoint leaders based on their social power. Membership to any group is by invitation only, although

fishers are allowed to become members of more than one group. Fishers have strong affiliation to these groups, as they provide recreational activities, emotional, financial, and technical support (Grant 2006).

The Fishing Industry

This section describes aspects of the longline fishing industry, namely pelagic resources, employment, gear and fleet, infrastructure, processing, marketing, and fisheries management.

Pelagic resource — Pelagic species targeted are yellowfin tuna (*Thunnus albacares*), white marlin (*Tetrapturus albidus*), blue marlin (*Makaira nigricans*), common dolphinfish (*Coryphaena hippurus*), sailfish (*Istiophorus albigatus*), swordfish (*Xiphias gladius*), blackfin tuna (*Thunnus atlanticus*), wahoo (*Acanthocybium solandri*), bigeye tuna (*Thunnus obesus*), and skipjack (*Katsuwonus pelamis*) (Fisheries Division landings statistics, unpublished data). The first six species account for 95% of pelagic landings. The large pelagic fishery relies on bait species such as scad (*Selar crumenophthalmus*) from the beach seine fishery, ballyhoo (*Hemiramphus brasiliensis*) and flyingfish (*Hirundichthys affinis*) from the gill net fishery, and imported squid. Landings data based on annual landings reported to FAO of coastal and oceanic pelagic species from 1990 - 1999 for CARICOM countries shows Grenada had the highest yellowfin tuna and sailfish, of 360 MT and 133 MT, respectively (Mahon and McConney 2004). Over the years, landings of large pelagic species increased from 257 MT (1981) to 1,816 MT (2001), while there is a decline in coastal pelagic species.

Gear — The main gear types for pelagic fishing are surface longline, handline, trolling, seche (a jigging handline technique), and gillnet. Over 82% of fishers are involved in longline fishing. Pelagic surface longline are made from 68 - 227 kg monofilament plastic, with mainline ranging from 3 - 10 km with braided nylon loop inserts every 18 m along the mainline, onto which droplines of five to eight different lengths (3 - 32 m) are attached by branch hangers, and buoylines (3 m) attached after every third hook. Mainline and droplines are deployed from separate manual or hydraulic reels with over 300 hooks depending on vessel type.

Fleet — There are three categories of longline fishing vessels, open pirogue, cabin pirogue, and launcher. These vessels account for 72% of the total fishing fleet. Open pirogues are semi-decked, wooden, between 5 - 7 m long, powered by a single 15 - 40 hp outboard engine, and equipped for multiple-purpose fishing. The fibreglass cabin pirogues are 7-9 m long, powered by two 40 - 60 hp outboard engines, and equipped for longline fishing. Launchers are 9 - 15 m in length, powered by a 130 - 300 hp inboard diesel or gas engine, and equipped for overnight

longline fishing (Grant and Baldeo 2006).

Operating expenses — Capital investment and expenditure vary by boat type, as outlined in Table 3. Most inputs for commercial fishing are exempt from import duty and value added tax. According to Cabinet Conclusion #749/93 all navigation, safety items, and boat repair material are 100% duty and 100% General Consumption Tax (G.C.T) exempt. The government also provides gas rebates (US\$0.31 per gallon) and loans to fishers at a lower interest rate. Banks offer normal commercial lending rates of 12.5 - 15% to fishers for the purchase of fishing equipment. For example, a loan of US\$11,257 over four years would be repaid by a fisher at US\$305 per month.

Employment — The fishing industry employs fishers (72%), vendor (14%), support service workers (11%), and fish processing workers (3%) (Grant *et al.* 2007). Support services include gear supply (hardware stores, the SJFA, and NORDOM Seafoods Ltd.), gear construction (nets, longlines, and reels), boat building and repair, engine repair and maintenance, fish cleaning, boat helpers, and overseas distributors. Much of the maintenance to boats,

engines, and gear is done in the community by individuals trained by the government.

Infrastructure — Gouyave is one of seven official longline fishing sites of the 37 total fishing sites in Grenada. It has a fish market equipped with three cold rooms for the storage of fish, fish vending area, and offices. The community also has landing facility with a jetty to dock vessels, a fisher centre, and 25 fisher lockers/gear sheds. The fisher centre was built in the 1990s with financial assistance from the Japanese government, and is equipped with ice-making machines with ice holds, a walk-in freezer, staff offices, a fishermen meeting room, store room, small workshop space, and standby generator room. Beside the fishermen centre is a gas station where fuel and marine oil is sold to fishers, which is managed by the St. John's Fishermen Association. The international airport in St. George's is critical for the export of fish to regional and international markets. Generally, fishing infrastructure are maintained and managed by the government.

Marketing — Two of the five fish exporters/primary processors in Grenada operate from Gouyave, namely the

Table 3. Income and expenditure of individual longline fishing units by vessel type (figures expressed in US\$)

Items	Open pirogue	Cabin pirogue	Launcher
Number of vessels ¹	64	20	8
Capital cost (new) – includes boat, engine, gear	\$6,000	\$18,000	\$120,000
Number of engine(s)	1	2	inboard
Trip duration (days)	1	1	4
Average longline trips per year	89	74	35
Average expense per trip (fuel, oil, bait, food, ice, boat helper)	\$70	\$130	\$825
Average gas rebate per trip	\$6	\$21	\$139
Average monthly repair and maintenance	\$100	\$160	\$250
Average monthly loan repayment	\$100	\$207	\$550
Average monthly insurance	--	--	\$62
Average income per trip ²	\$350	\$525	\$4,375
Percentage share of income (based on share system)			
Boat owner	50%	50%	50%
Captain	25%	25%	17% ³
Crew 1	25%	25%	17%
Crew 2	--	--	17%

Source: ¹Gouyave boat census 2003; ²R. Baldeo, unpublished data; ³Captains on launchers may receive an extra stipend. Note: Engine/boat repair, loan repayment, and insurance expenses are taken from the owner's share and income from gas rebate is added to the owner's income.

NORDOM Seafoods Ltd. and Caribbean Seafood Ltd. (CSL). Marketing and distribution include local and export sales of fish landed in Gouyave (Figure 2). Large pelagic species are landed at the fish market where they are cleaned, weighed, tagged (for buyers) and stored in the cold room. The exception, yellowfin tuna (YFT) is graded for quality, cleaned, weighed, and chilled for export via processing plants in Gouyave and St. George's town (Grenada Commercial Fisheries Ltd. (GCFL)). Processing plants either receive fish directly from fishers or purchase them through the fish market. Over 23% of large pelagic species landed is exported mainly to the USA. Ex-vessel fish prices in late 2003 were: YFT (grade 1 - high quality, suitable for export) US\$2.06; YFT (grade 2 - suitable for export) US\$1.88; YFT (grade 3 or 'burn' - not suitable for export) US\$1.50; by-catch US\$1.50; and shark US\$0.56. There were 26 active vendors, 15 retail vendors who sold fish in fish markets, four retail distributors assisted by six conductors/drivers who transported fish in the back of vans through communities, and numerous opportunistic vendors. One wholesale distributor purchased 18% of fish landed in Gouyave and sold to restaurants, supermarkets, hotels, and retail vendors throughout Grenada.

Seafood health — To improve health and safety standards fishers, fish vendors, fish processing plant staff, and fish market workers were trained in fish handling and preparation; while, all fish processing plants and fish trading

vessels upgraded to operate under Hazard Analysis and Critical Control Point (HACCP) and Sanitation, Standards, and Operating Procedure (SSOP). To support health and safety standards, the government enacted new legislation governing the storage, export, import, process, test, and inspect fishery products and vessels.

Fisheries management — The Fisheries Division is under the jurisdiction of the Ministry of Agriculture, Lands, Forestry and Fisheries. The Grenada Fisheries Act No. 15 of 1986 obligates the Minister responsible for Fisheries to promote the management and development of the fisheries sector in a sustainable manner. Other legislation and regulations in support of the Fisheries Act are: the Fisheries Regulation SRO #9 of 1987; Fisheries (Fishing Vessel Safety) Regulations SRO #3 of 1990; Fisheries (Amendment) Regulations SRO #24 of 1996; Fisheries (Amendment) Act #1 of 1999; Fish and Fishery Products Regulations SRO #17 of 1999; and Fisheries (Amendment) Regulations SRO #2 of 2001. The Chief Fisheries Officer and ten Fisheries Officers have the task of managing the marine resources in Grenada. The Division has six research and management sections: administration, fisheries biology and Marine Protected Area (MPA) unit, statistical unit, fisheries technology unit, extension unit, and quality control, health, and safety. The Division is also charged under the UN Convention on the Law of the Sea Convention (UNCLOS), the UN Fish Stock Agreement,

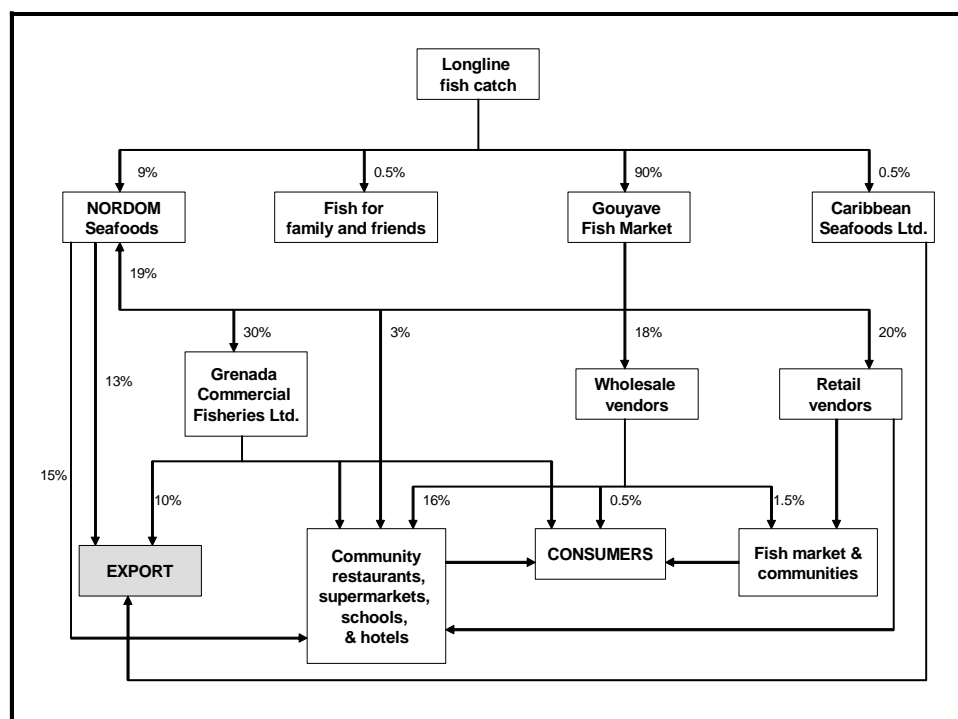


Figure 2. Path diagram of longline fish catch showing percentage of clean weight of fish from fishers to the consumers. Percentages, indication of the amount of product moving along each pathway, are based on 2003 daily landings data at the Gouyave Fish Market.

and other international agreements to work through regional and international fisheries management organizations to manage the fisheries resources.

COMPONENTS OF THE SYSTEM AND THEIR INTERACTIONS

The longline fishery has six major interacting components that enable the pelagic fishery system to function effectively (Figure 3). Components interact by the movement of goods and services such as fish, cash, labour, expectations, and regulations. Below I highlight the components and describe their interactions (only major interactions are discussed).

- i) *The pelagic ecosystem component:* includes the interaction of fish species at different trophic levels and the impact of fishing.

Interactions: Fishers use the appropriate gear and vessel to catch fish and bait from the marine resource.

- ii) *Fisher component:* encompass their living conditions, household characteristics, education and training, livelihood strategies, social life (recreation and entertainment), participation in community organizations, financial situation, and their expectations of self and the community's expectations of them. With regards to fishing this component also includes their skill and knowledge

of longline fishing, seamanship in navigation and safety at sea, and knowledge of fishing equipment/gear/ practices.

Interactions: Fishers invest cash and labour in longline fishing activities and they use their skill and knowledge of the equipment to catch fish and bait

- iii) *The community component:* includes government services (health care, schools, essential services), general living conditions, recreational activities (sailing), entertainment (disco, arcade, gym), community development organizations, support services (grocery stores, hardware, haberdashery), and the norms and values of the community.

Interactions: Fishers expect the community to provide labour (boat helpers, fish cleaners, assistance in hauling boats to shore), in-kind support (domestic services), emotional support, and business services to fishers. In return, the community has expectations of gifts of fish, cash, and other in-kind support.

- iv) *The marketing component:* includes local and export marketing and distribution of fish, health and safety standards to handle fish, quality control at processing establishments, infrastructure development, and fish-price regulations.

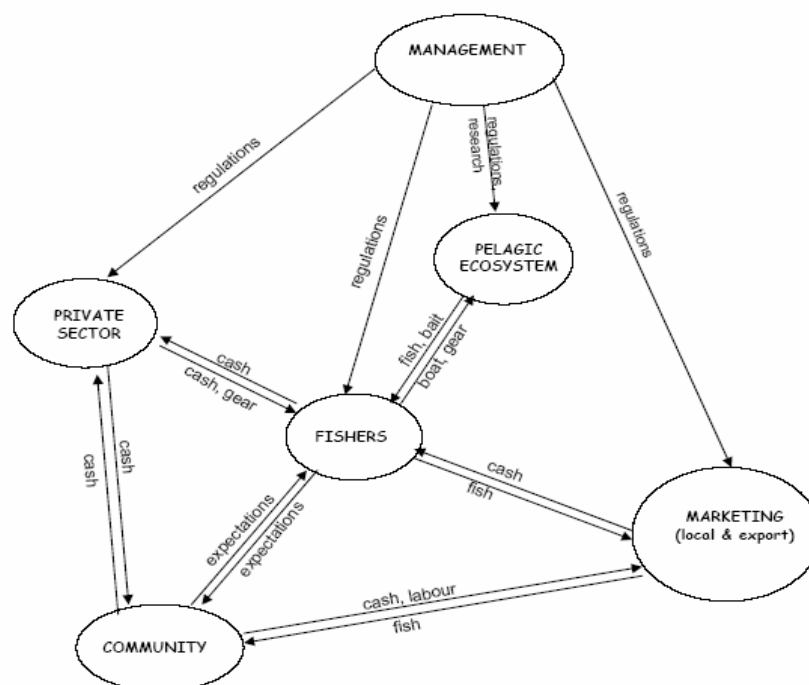


Figure 3. Components and interactions of the pelagic longline fishery system in Gouyave, Grenada.

Interactions: Fish harvested by fishing activities is sold to processors and vendors. The fishing community provides labour to process fish and vendors to distribute it. The sale of fish provides income to fishers, labourers, and processing workers.

- v) *The private sector component:* includes but not limited to (a) financial services to fishers and community members and (b) gear/equipment supplier and maintenance.

Interactions: Suppliers source and provide the necessary fishing gear, equipment, and spear parts (subsidized by government) to fishers. Fishers save with a bank and in return banks provide loans for fishing equipment, housing, and vehicles. The Fisheries Division also provides financial assistance to fishers through the bank. At times, investors and fish vendors lend money so fishers can re-invest in the fishery.

- vi) *The management component:* includes fisheries administration, management, legal framework (fisheries management, regulations, and policy), and industry support (loans, concessions, gas rebate). Likewise, they subsidize fishing equipment and fuel, and maintain fishing infrastructure.

Interactions: The government creates regulations (subsidies, management, policies) directed at fishers, marketing, and pelagic resources. The Fisheries Division and scientist conduct research on the resource and fishing technology.

CONCLUSION

While fish and fishers drive the pelagic fishery system, other components are important as well. The community provides the cultural and social context on which fishing practices are guided (Jentoft 2000), processors and vendors guarantees the distribution of high quality seafood for local and export markets, the private sector ensures fishers are adequately supplied with the necessary equipment, technology, and finance, and the management agency provides the regulatory framework to support the industry.

From a systems perspective, fisheries management could improve if components function effectively, there are strong two-way linkages between components, and appropriate management measures directed to components where applicable. In this case study, the pelagic ecosystem, private sector, community, and management components need strengthening to function effectively. In regards to: the pelagic ecosystem component, pelagic resource status and bait supply need to be assessed to control the level of exploitation; private sector component, ensure loans do not lead to overcapitalization and financial support is directed at fishing and non fishing activities that

can improve economic benefits; community component, ensure the expectation of community members for economic well being and the need to maintain cultural integrity do not place additional demands on the fishery; and management component, build capacity to improve management of the fishery.

Strong links is associated with a feedback mechanism or two-way arrows between components (Figure 3). In this case, more needs to be done to strengthen weak links and create ones where necessary. Links between management component with fishers, marketing, and pelagic ecosystem components needs strengthening. This system could also benefit by creating links between management and community and all other components and management. Communication is one way to improve interaction among components, especially, amongst staff of the Fisheries Division, fishers, and individuals involved in marketing.

Finally, directing appropriate management measures to components where applicable is also important. Monitoring food health and safety standards (marketing component) and general fisheries regulations (fishers component) may not be enough. In conjunction, regulations are also needed to monitor the bait fishery and enforce catch and size limits (ecosystem component) and reduce community's expectations by supporting alternative employment (community component).

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