



Market integration and its relation to income distribution and inequality among fishers and traders: The case of two small-scale Kenyan reef fisheries

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ABSTRACT

This study, carried out in five fishing communities along the Kenyan coast, examined fisheries-derived income of fishers and traders in two different invertebrate fisheries (octopus and sea cucumber) and tested if differences in global market integration of these two products could explain differences in income inequalities among actors involved in the two fisheries. The structure of the value chains was mapped, differences in income between fishers and traders tested, and income inequalities among actors in each fishery examined. Although the octopus fishery included a greater diversity of actors and thereby provides income to a larger group of people, income inequality in this fishery was higher among fishers and traders than in the sea cucumber fishery. Thus, the often cited relationship between increasing market integration and income inequality may require a re-evaluation and a more nuanced treatment.

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1. Introduction

Fish has been a major trade commodity for over a thousand years, but the geographic scale and speed with which current seafood trade occurs is unprecedented in history [1]. Nearly 40% of seafood enters the international trade, which grew by 50% between 1998 and 2008 [2]. Marine ecosystem depletion has previously been attributed to fish trade from local to global scales (e.g. [3–5]) and as fish consumption worldwide continues to increase [6], it is likely that the effects of trade on both social and ecological dynamics of fisheries will become more pronounced [7].

While the link between fish exploitation, trade and consumption is an intellectually easy one to make, remarkably little research has been conducted on how economics, particularly at the micro-scale, explain small-scale fisheries dynamics [8] and how such dynamics in turn affect livelihoods and poverty levels, which are known to influence resource exploitation patterns and sustainability of fisheries [9].

Since the mid-1960s fish production has become more market-driven with actors downstream in the commodity chain increasingly determining the price of fish [7,10]. This change is likely to affect how income is distributed among actors along the value chain. Previous work has shown that fishers' incomes tend to be low in both developed [11] and developing countries [12], often as a result of lack of bargaining power relative to more powerful market actors like exporters. While multiple factors affect the sustainability of any individual fishery, income inequality and struggle for food security are believed to significantly affect resource extractive behavior, particularly in developing countries [13–15]. Despite a broad interest in this link between low income and resource exploitation [16–18], distribution of benefits derived from fish trade remains poorly understood [19,20]. Work has suggested that trade in fish appears to contribute to income inequalities [13,21,22] but detailed examination of how market integration affects income distribution among actors involved in the small-scale fisheries in developing countries is still scarce [23]. Furthermore, while seafood trade arguably affects the distribution of income in fisheries [14,15] it is unclear to what degree globalization and market integration affect these relationships, and how barriers to entry and power and influence of actors along the value chain (in terms of volumes handled and value accrued)

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play a role in determining income distribution of local small-scale fisheries' actors.

This paper aims to contribute to this important and emerging field by examining fisheries-derived income of fishers and traders in two different invertebrate fisheries in Kenya; the octopus and the sea cucumber fishery. While documentation of historical trade in octopus in Kenya is sparse, the octopus fishery has been transitioning from one of local consumption to one of international export since the mid-1990s [24]. The sea cucumber fishery, on the other hand, is a fishery targeted almost exclusively for export to Asia, with virtually no local consumption [25–28]. This study thus hypothesizes that differences in global market integration of these two products will explain differences in income inequalities among actors involved in the two fisheries, with greater inequality occurring in the more globally integrated sea cucumber fishery. This hypothesis is tested by (1) mapping the structure of the value chains, (2) examining mean fisheries-related income of fishers and traders in the two fisheries, and (3) examining income inequalities among actors operating in each fishery.

1.1. Value chains as a method for appraising market structure

Value chain analysis is a means of appraising a market structure by describing the full range of activities required to bring a product or service from conception, through the intermediary phases of production (involving a combination of physical transformation or value addition) to delivery of the product to the final consumer [13,29,30]. Therefore, value chain analysis may be used to map the distribution of volumes handled by different trading actors (a term used interchangeably to refer to fishers and traders in this paper) and related value as the product flows through different nodes or segments of the value chain. A value chain node is a point in the value chain where a product is exchanged or goes through major transformation while a market segment is a “vertical chunk” of value chain between two nodes [31]. Value chain analysis has been applied in a diverse array of fisheries research ranging from profit analysis [32], to measuring benefit flows among actors [33], and assessing the ecological effects of trade in coral reef fisheries [34].

2. Methods

2.1. Local context and characterization of the fisheries

Sea cucumber harvest began in Kenya following the arrival of a Chinese national's consumer market in the 1960s [35]. Now, almost the entire fishery output is exported through global trade networks, as local populations do not consume sea cucumber [27,28]. The low abundance of high-value species [27] and increased targeting of sexually immature individuals and species of low commercial value are believed to be a result of overexploitation [36]. The over-exploitation witnessed is attributed to increased consumer demand in Asia [35], which, in turn, has driven up local sale prices; especially of high-value species such as *Holothuria scabra*, *H. nobilis*, *H. spinifera* [37] and *H. fuscogilva* [28]. Documentation of historical trade in octopus in Kenya is sparse. However, available information indicates that while octopus is widely consumed locally, records of foreign export appear beginning the mid-1990s [24].

2.2. Sampling and data collection

Artisanal fishing in Kenya's marine waters is highly dependent on monsoon wind patterns. As such, fishing mainly takes place during the northeast monsoon (NEM) which occurs between

September and April [28] when the sea is relatively calmer. This study relied on primary data obtained from a survey of fishers and fish traders between September 2010 and April 2012 at five coastal landing sites in Kenya; Kipini, Malindi, Bamburi, Shimoni and Vanga (Fig. 1), about here.

The sampled sites are representative of a multispecies artisanal coral reef fishery in Kenya where fishing is typically conducted from the shore to the outer reef over sand, coral and seagrass habitats of the fringing reef lagoon [38] and where small- and larger scale fish traders operate [39]. Upon arrival at respective sites, a list of prospective respondents engaged in the sea cucumber and octopus fisheries was developed with assistance from fisheries officials and local fishermen leaders. Systematic random sampling, where every *i*th person was selected for interview [40], was used and respondents were interviewed using a structured questionnaire. Respondents included fishers and traders engaged in fishing and marketing of sea cucumber and octopus respectively (see Table 1 around here for their characteristics) and questions covered specific information required to develop the value chain and calculate income inequality. A total of 155 interviews were conducted; 115 in the octopus fishery (71 fishers and 44 traders), and 40 in the sea cucumber fishery (15 fishers and 25 traders). While a full value chain analysis would normally encompass a mapping of actors from production to final consumption, this study is limited to actors proximal to the exploitation end of the chains. The reason for this is the unwillingness of processing companies and larger-scale sea cucumber traders to participate. The current analysis is therefore constrained to fishers as well as traders who bought fish directly from fishers and sold at different markets, either to processing company agents (at the landing sites), hoteliers, local consumers or other traders. In addition, the data used in the current analysis is not representative of annual fluctuations and as such any conclusions should be cognizant of this.

2.2.1. Structure of the value chains

The data collected to map the sea cucumber and octopus value chains was based on the survey of fishers and traders in each fishery. For actors in each node in the chain, data was collected on the prices (ksh/kg) of fish bought and sold, and average volumes traded on a normal day (kg/day). This information was used to calculate average volumes and values for each actor group (at each node) in the value chain of each respective fishery.

2.2.2. Markets and prices of octopus and sea cucumber

Fish marketing is complex, involving different categories of actors operating at different levels and either buying for consumption at local villages, hotels or for processing or export companies [34,39,41]. Different categories of traders involved in fish marketing have previously been observed in the Western Indian Ocean region [39,42–44]. Following [39], traders were categorized as either small- or large-scale based on average quantities reportedly purchased from fishers, and marketing infrastructure owned and/or used (e.g. means of transport). Although a trader's market choice is influenced by the market demand [45], the means of transport at the trader's disposal is equally important in influencing decisions regarding market choice particularly for fish type that has both local demand and regional market. For instance, a trader who relied on foot or a bicycle (and accumulated between 1 and 100 kg during a normal day) and sold at local markets (particularly octopus traders) or used public transport to sell at Mombasa (sea cucumber trader) was categorized as small-scale because the means of transport used constrained him/her to deal in relatively small quantities. This was in contrast to the traders categorized as large-scale who reportedly dealt in

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