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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.

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 hypothesize 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 overexploitation 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

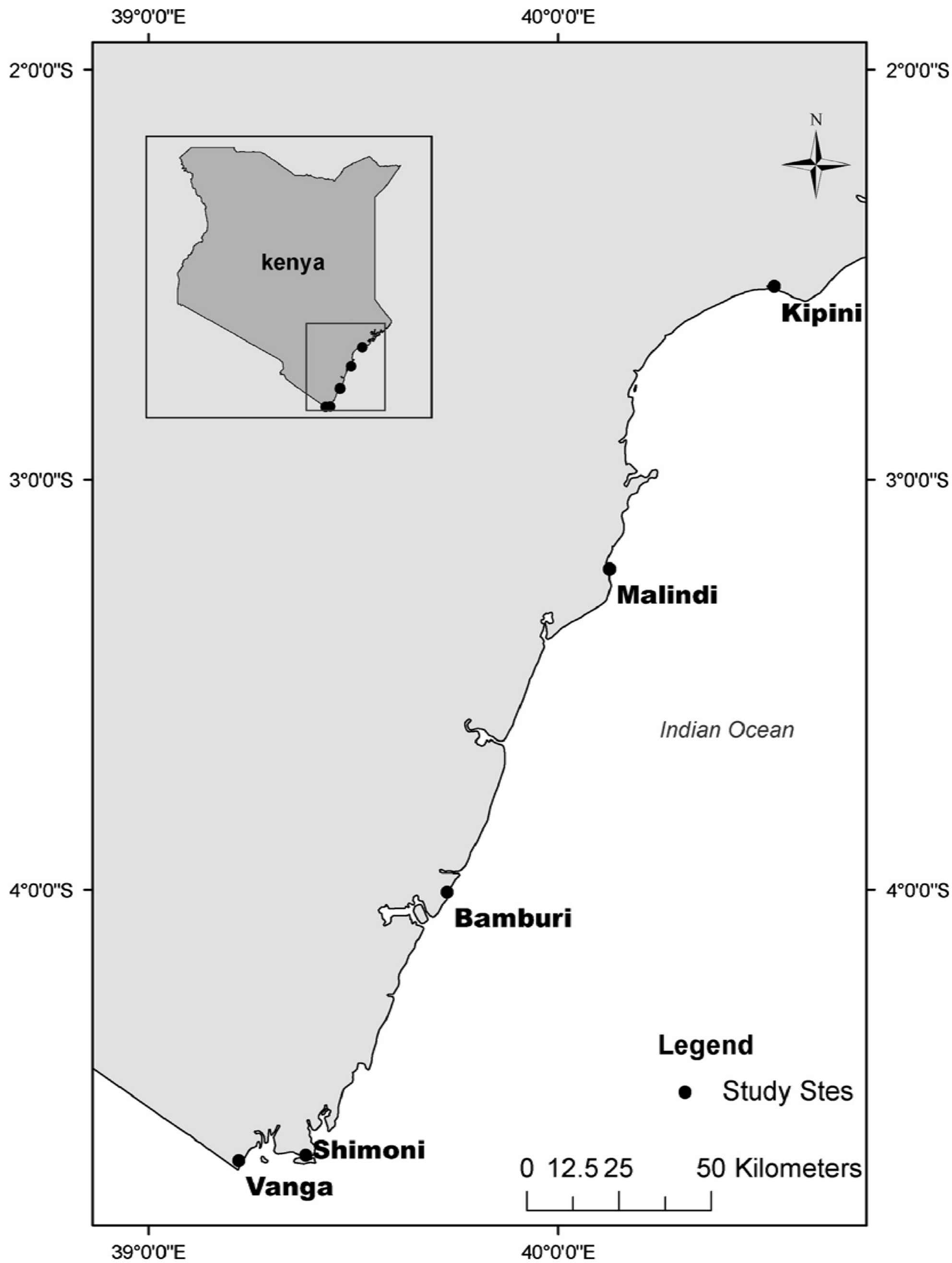

Fig. 1. Map of the study sites.

Table 1
Socioeconomic characteristics of sea cucumber and octopus fishers and traders at five sites on the Kenyan coast.

Characteristic	Description	Kipini	Malindi	Bamburi	Shimoni	Vanga	Average
Octopus fishers	Minimum age	24	25	28	23	20	24
	Maximum age	63	45	57	72	67	60.8
Sea cucumber fishers	Minimum age	31	–	–	25	25	27
	Maximum age	31	–	–	45	65	47
Octopus traders	Minimum age	32	21	27	20	26	25.2
	Maximum age	49	45	75	59	45	54.6
Sea cucumber traders	Minimum age	36	22	27	30	28	28.6
	Maximum age	52	45	45	49	40	46.2
Formal education level	None (%)	25	20	15	15	21	19
	Primary (%)	64	72	77	85	79	75
	Secondary (%)	11	8	8	0	0	5
Gender	Male (%)	82	88	60	100	94	85
	Female (%)	18	12	40	0	6	15

relatively large quantities (up to 270 kg of sea cucumber or 500 kg of octopus), which they were able to transport to regional or national markets using organized transport provided by processing companies (mostly dealing in octopus) or public transport (to transport mostly sea cucumber) after accumulating the stock. One caveat is noteworthy however; both small- and large-scale traders particularly in the octopus fishery operate at sometimes overlapping levels of the chain (based on the quantities they are able to accumulate and trade in) and consequently, deviation from the categorization used is to be expected.

2.3. Fisher and trader incomes

Fisher net income was calculated as

$$I_f = (q_s * s_p) - c_t, \quad (1)$$

where q_s is the quantity (kg) sold on an average day for each fishery type, s_p is the average fish selling price (Ksh) and c_t is the sum of all costs. Costs commonly incurred by fishers included vessel hire (if fishers used but did not own one), net repair costs, fishing fuel costs, local fishing organization (beach management units (BMU)) membership subscription fees, and licenses (fishing, vessel, etc.) fees. These costs were broadly categorized into BMU subscription fee, cost of licenses, and any other costs (because of the limited number of costs reported by respondents). A complete estimate of costs was however not attainable because fishers and traders did not maintain accurate records, which is common in small-scale fisheries with limited regulation such as income taxation [33]. However the reported categories likely represent the most common costs, which were standardized to reflect an average total daily operating cost.

Trader income was similarly calculated as

$$I_t = (q_s * s_p - q_b * b_p) - c, \quad (2)$$

where q_s is the average quantity (kg) of fish sold per day, s_p is the average selling price (ksh), q_b is the average quantity (kg) of fish bought in a day, b_p is the average buying price (ksh) and c is the average total costs/day. Measured costs included trading licenses, transport, and wages, which were converted to reflect daily costs. The calculated incomes (Ksh) for fishers and traders were converted into United States dollars (US$) by dividing the amount in Ksh with average exchange rate between 1 September 2010 and 30 April 2012 (79.5) based on historical exchange rates' converter [46]. A Kruskal–Wallis test was performed to test for the difference between incomes of fishers and traders (small-scale and large-scale) within respective fishery separately. For further tests of significance between individual groups, Mann–Whitney U tests were done.

2.4. Income inequality

Lorenz concentration curves were constructed to illustrate income distribution for fishers and traders by fishery. Gini coefficients were also calculated to measure income inequalities [47]. The Gini coefficient is often defined in reference to the Lorenz curve [48,49] which results from a plot of cumulative proportion of the population to the cumulative proportion of income (see [49,50] for a more extensive illustration of the relationship between the Gini coefficient and the Lorenz curve). The Gini coefficient is essentially the ratio of the area between the Lorenz curve and the 45-degree line to the area represented by the triangle below the 45-degree line. The 45-degree line is also referred to as the line of perfect equality or egalitarian line [50]. The Gini coefficient was therefore calculated to determine the income inequality among octopus and sea cucumber fishers and traders as

$$G = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} |Y_i - Y_j|}{2n(n-1)\mu} \quad (3)$$

where Y_i and Y_j are individual incomes with a mean of μ and where n is the total number of observations [51]. Income is said to be perfectly equally distributed whenever the value of the Gini coefficient is equal to zero [52], in which case the Lorenz curve would follow the line of perfect equality. A Gini coefficient value greater than 0.35 is said to be high [53], indicating inequitable distribution of incomes where wealth is concentrated among a few individuals [54].

3. Results

3.1. Structure of the value chains

Collection of sea cucumber is done by hand or using spears in shallow waters, and via free diving or SCUBA in deeper waters [28]. After landing, the sea cucumber is sold to small-scale traders at different prices depending on species. The small-scale traders then process the sea cucumbers by gutting, boiling and drying before transporting and selling to large-scale traders, processing companies and foreign consumers based in Mombasa. The only large-scale traders in this value chain were a few Chinese nationals. These traders did not have direct contact with sea cucumber fishers but received all products via small-scale traders. Small-scale traders interviewed reported that only subcontracted small-scale traders were allowed to sell to these Chinese traders who then, reportedly, exported the sea cucumbers. Three key informants interviewed informally indicated that large-scale traders performed additional processing before exporting, however, as these larger-scale traders were not available for interview, the nature of the value addition performed by these actors, and by the processing companies remains unclear. None of the actors (fishers or traders) reported selling sea cucumber to local consumers. Furthermore, traders who sold to Chinese nationals did not deal in high value specimens e.g. *H. fulgoscilva* and *H. scabra* alone as even the small low value species were traded.

Octopus, which is fished mainly using spears or spearguns, is sold to local consumers and to a variety of traders unprocessed. Both small and large-scale octopus traders reported buying octopi directly at the landing sites and some of the large-scale traders engaged agents to collect octopus from fishers on their behalf. Both small- and large-scale traders also reported selling octopus to local consumers and processing companies as did the fishers. This overlap particularly in trading at a similar node by small and large-scale traders is reflected in the octopus value chain structure.

In summary, the structure of the value chains differed substantially between octopus and sea cucumber fisheries. While in the sea cucumber value chain producers were linearly linked to the global market via the small-scale traders (Fig. 2b and d), about here, the octopus fishery value chain was more dispersed across a larger number of actor groups (Fig. 2a and c), about here. In essence, while octopus fishers sold octopus to local consumers, small- and large-scale traders, and processing companies, small-scale traders were the only means by which the sea cucumber entered the sea cucumber value chain to other downstream actors.

The proportions of traded volumes among actors for each fishery and distribution of value[1] among actors along the chains

[1] Because of the lack of official statistics we are not able to assess the total volumes of the two fishery types handled by any market segment or exchanged at each value chain node, but are reliant on estimating it as a % of the volume reported by all respondents.

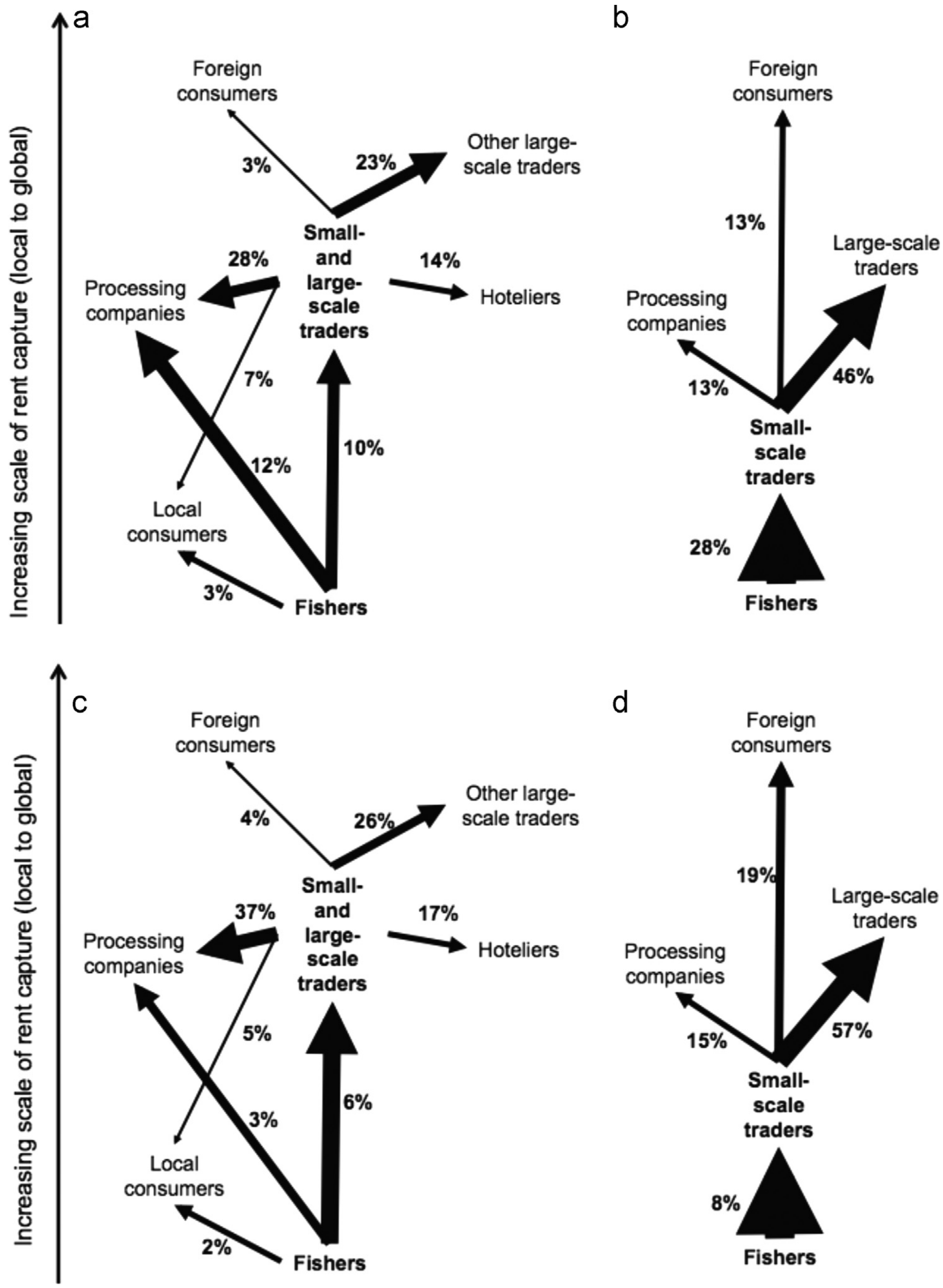

Fig. 2. Fish value chains for octopus volume (a) and value (c) and sea cucumber volume (b) and value (d). Arrows show direction of trade flow. Arrow width represents the proportion of sales (in weight or value) for interviewed fisher and trader groups shown in bold (octopus fishers, small- and large-scale octopus traders, sea cucumber fishers, small-scale sea cucumber traders). For example, in (a), of the entire volume of octopus that fishers sell (volume), roughly 30% is sold to small- and large-scale traders, 50% to local processing companies, and 20% to local consumers. In (c), of the entire value of octopus sales received by fishers, roughly 60% is obtained from traders, 20% from processing companies, and 20% from local consumers. Percentages represent each link as a percentage of all links within each chain. For example, in (a), 10% of all of the measured weight was sold by fishers to small- and large-scale traders.

also differed somewhat (Fig. 2). While octopus fishers contributed 25% of the volumes traded in the system (Fig. 2a), the sea cucumber fishers contributed 28% (Fig. 2b). The fact that a larger portion of the volumes traded flows through traders is because they purchase their stock from many sources and are not limited to the five landing sites examined here, whereas fishers were only sampled at the five specified sites. For values, the proportion of the total value traded accruing to octopus fishers was 11% (Fig. 2c) while that accruing to sea cucumber fishers was 8% (Fig. 2d). Since volumes handled by traders were larger relative to those handled by fishers (and prices that traders sold fish were also higher), the value accrued to traders was also higher (89% and 92% for octopus and sea cucumber small and large-scale traders respectively). An analysis of the entire value chain by tracking the commodity up to consumption (which was not possible in the current analysis because of time and resources) would be very informative particularly in understanding the proportion and distribution of rent capture at each node and by each actor category.

3.2. Markets and prices of different fisheries

The price at which actors sold either octopus or sea cucumber was dependent on the node at which exchange took place. While the price octopus fishers received did not differ markedly depending

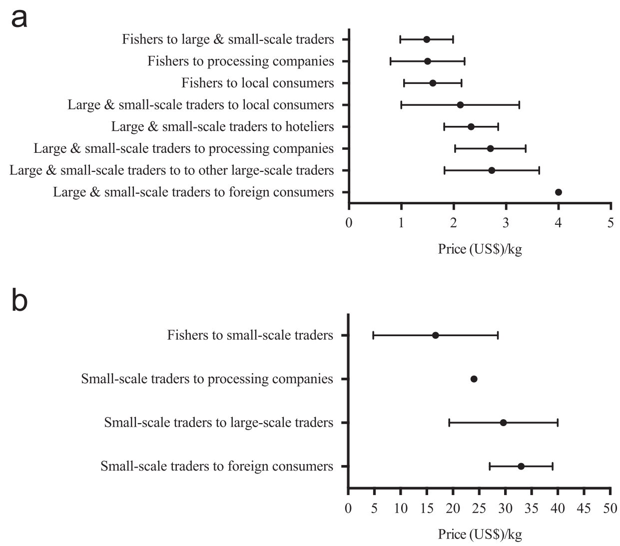

Fig. 3. Differences in (a) octopus and (b) sea cucumber sale prices received by fishers and traders from different customers. The bars represent standard errors.

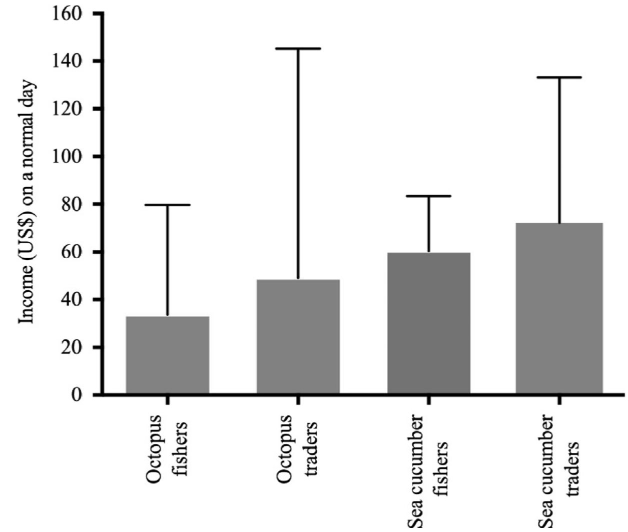

Fig. 4. Income difference among sea cucumber and octopus fishers and traders. Error bars represent standard deviation.

on whom they sold to (local consumer, traders or processing company), traders who sold octopus to local consumers received a lower average price than those targeting hotels or processing companies, although there was a significant overlap in the price range (Fig. 3), about here. In the sea cucumber fishery both traders and fishers were somewhat constrained in their choice of customers given the niche market of the product. Such a constraint limited fishers to dealing only with small-scale traders (who sell on to large-scale traders and processing companies). Small-scale traders had more choice and it appears that targeting larger-scale traders or foreign consumers (Chinese nationals based in Mombasa) provided the highest prices. Generally, sea cucumbers commanded higher prices than octopus, with extreme values as high as ten times the price of octopus, which explains, in part, the large confidence intervals in Fig. 3.

3.3. Fisher and trader incomes

Results show that, on average, fishers had lower daily income compared to traders (Fig. 4), about here. Octopus fishers received the lowest average income (of US$34 per day) of all groups. Overall, sea cucumber traders received the highest average daily incomes of US$72 followed by sea cucumber fishers. Based on the Kruskal–Wallis test, a significant difference was found between octopus fishers and traders (small-scale and large-scale) incomes ($P<0.05$), as well as between sea cucumber fishers and traders (small-scale and large-scale) ($P<0.05$). Mann–Whitney U tests showed that, in both fisheries, this difference was an effect of the higher incomes of large-scale traders, as incomes between fishers and respective small-scale traders were not statistically significant ($P>0.05$).

3.4. Income inequality

Comparatively higher income inequalities were observed in the octopus fishery (0.63) compared to sea cucumber fishery (0.37) (Fig. 5a), about here. Comparison of actor groups across the two fisheries indicated that incomes were more equally distributed among sea cucumber fishers ($G=0.23$) than among octopus fishers ($G=0.60$). Similarly, incomes of sea cucumber traders were more equally distributed (0.42) than for octopus traders (0.66). However, the greatest difference in income inequality (between fishers and traders in the octopus fishery on one hand and sea cucumber on the other) was found in the sea cucumber fishery (Fig. 5b).

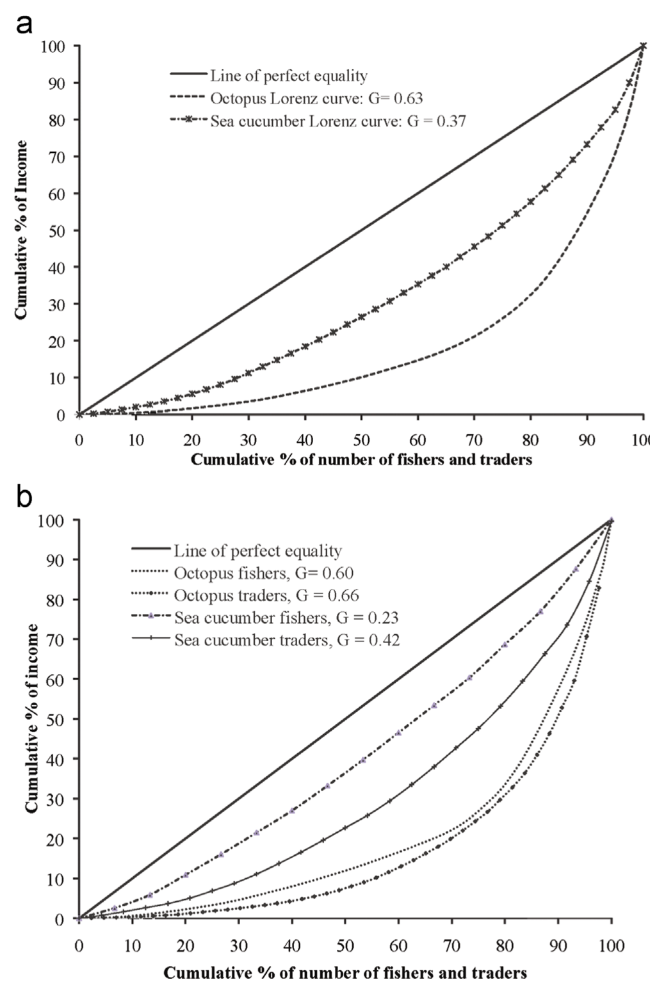

Fig. 5. Income inequality (a) between octopus and sea cucumber fisheries and (b) among octopus and sea cucumber fishers and traders. *G* is the Gini coefficient.

4. Discussion

The structure of the value chain can vary in complexity depending on the diversity of actors and the specific actions they perform to add value to the product (as it moves from production to consumption) [31]. The sea cucumber value chain examined here was characterized by a strong linear structure where small-scale traders occupy a central position with relatively higher power. This power emerges from the fact that the large-scale Chinese traders who provide the key gateway to global trade networks restrict the access to this market through subcontracting, which effectively eliminates the possibility for fishers to sell to these traders directly. Furthermore, the need for a certain amount of processing may pose a barrier for many actors to engage in this trade, as it requires knowledge of the nuances of processing required for each species and for maximizing the quality of the product [55]. The sea cucumber value chain thus appears to be directly integrated into the global trade for sea cucumbers.

The octopus value chain in contrast has a variety of actors, with multiple different trader categories, and caters for local markets, domestic up-market (through hotels) and export markets. The structure does not reveal actors controlling a bottleneck, as observed in the sea cucumber fishery. This explains the more diffuse nature of the octopus value chain structure and suggests that the chain thus functions as an income generator for a larger group of people as it allows a diverse group of actors to participate. While this participation may have positive livelihood implications for a large group of people, its implication on the fishery itself is beyond the current analysis.

Although all the sea cucumbers and octopi flowing through the value chain stem from fishers (as they are solely responsible for extracting products from the sea), traders are more likely to source products from multiple landing sites and thus end up controlling a much larger share of the total volumes traded. This indicates the power potentially associated with this small number of traders and the high level of market concentration in both fisheries. The control of a larger share of volumes by traders (and therefore capturing higher value relative to fishers) is attributed to the fact that they (traders) have established a vast network of buying stations, agents, and marketing relationships with fishers that span multiple landing sites all along the Kenyan coast.

While comparing the absolute prices between products from two such different fisheries as sea cucumber and octopus is not easy, it is nonetheless important to note that the prices for octopus and sea cucumber in this study differ by at least one order of magnitude. Several factors generally affect price, such as the characteristics of the consumer markets and the scarcity of supply. Sea cucumber commands an increasingly high price on the global market because its consumption is driven by cultural beliefs and traditions; particularly surrounding elements of traditional medicine and the notion of social status [55,56]. This, in combination with a growing affluent consumer market both in China [57] and throughout the world via a highly dispersed Chinese diaspora population [58] has created a strong demand for sea cucumbers which is increasingly globally sourced [26], and reflected in the higher prices observed in this study. The octopus on the other hand has different market characteristics. It is largely sold for domestic consumption and while it does have a limited export market in Kenya prices obtained by the level of actors examined here do not reflect this.

The current results are in line with the literature examining income levels between fishers and traders which suggested that fish traders generally earn more income than fishers [11,12,59]. However the magnitude of this difference depends on the type of trader (small- or large-scale) and the fishery type dealt in. In essence, small-scale trader incomes were not significantly different from that of fishers but comparison across fishery types revealed quite significant differences in incomes among actors operating at similar nodes in the value chains (Fig. 5). Considering that there are a relatively large number of small-scale traders compared to the few large-scale traders, the differences in income among and between the two groups is an indication of heterogeneity among traders as a group which illustrates the obscurity often inherent in aggregate income analyses.

A recent review of the literature relating to international fish trade and local livelihoods posited two opposing views [23]. The first is that trade in fish is important for economic development of developing (African) nations [60,61], and the second is that fish trade impacts negatively on food security and livelihood options for the poor [62,63]. The subsequent analysis [23] found no conclusive evidence to support either of the two narratives. While somewhat different in scope and focus, the current study set out to examine a related topic, namely whether global market integration of a fishery was associated with higher levels of income inequality than for a similar invertebrate marine product primarily for domestic consumption. Findings suggest that this is not the case. In fact, contrary to expectations, higher inequalities, both among fishers and among traders, were found in the octopus fishery.

This contradictory finding suggests that a more nuanced view of how market integration may in fact affect income distribution and market structure in small-scale fisheries is needed. The market structure of the octopus fishery was much more dispersed than for sea cucumbers and thus appears to promote the involvement of a more diverse set of actors. However, it was also much more unequal in terms of income distribution, suggesting that while more actors may be involved in this fishery, the disparity between them is high. Previous work has found that at major landing sites on the Kenyan coast, there are a few established processing and export companies who have subcontracted agents to buy fish, particularly octopus from fishers and traders on their behalf [41]. Some of these companies also provide fishing equipment to fishers and employ them to fish on their behalf. Therefore the few actors controlling the procurement and marketing of octopus are likely to have an impact on income distribution within that fishery and therefore may be responsible for the high inequalities. Nevertheless, similar studies throughout the tropical marine artisanal fishery are needed to determine if these findings are unique to the fisheries studied here or a more general property of implications of global fish market integration.

Contrasting this, the sea cucumber fishery, with its linear structure, low diversity of actor types and restricted access to global trade networks, may provide fewer opportunities for an absolute number of trading actors. However, the inequalities among those who have managed to engage this somewhat more exclusive value chain appear to be less pronounced. The extent to which processing requirements of sea cucumbers at the small-scale trader level reflects the standards and requirements for value adding further up in the value chain remains to be established and therefore the reason behind income inequalities between small-scale and large-scale traders cannot be completely determined. Nonetheless, the relatively large differences in income inequality between fishers and traders in this fishery are likely an indication of value addition particularly by small-scale traders. These traders (small-scale) buy sea cucumber as a wet product from fishers and processed them by gutting, boiling and drying, sometimes for several days before transporting the processed product for sale. Evidence that both exporters and importers add value to sea cucumber [55] suggests that both fishers and small-scale traders in fact reap rather nominal benefits from a highly lucrative trade. Nonetheless, at the level of the small-scale fishery it appears that the sea cucumber trade, despite its strong market integration, has not created large inequalities amongst the market actors involved.

5. Conclusion

In summary, this study has shown that the often cited relationship between increasing market integration and income inequality

[13,21,22] may require a re-evaluation and a more nuanced treatment. While value chains characterized by more diverse actors may have positive livelihood implications for a large group of people, equal income distribution amongst the actors in each node should not be assumed. Furthermore, while no support for greater income inequality associated with greater market integration is found, greater global market integration may lead to large differences in income inequality between fishers and traders depending on the level at which the greatest value is created. The observed differences, in incomes, between fishers and different trader categories, suggest the need to further disaggregate analyses of actor groups in future studies of fishery income distribution.

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