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Distribution of economic returns in small-scale fisheries for international markets: A value-chain analysis

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ABSTRACT

Small-scale fishers are often believed to receive marginal earnings for seafood relative to other value- chain actors but proportionate incomes across different traded species are rarely compared. This study compares value chains for 15 species of sea cucumbers between Fiji and Kiribati using data collected on sale prices of dried products (bêche-de-mer) from fishers to middlemen and exporters, export prices and market retail prices in China. Pacific islanders comprised almost all fishers, but represented only some middlemen and few exporters. Proportional increases in prices along the value chains differed greatly among sea cucumber species and between countries. Fishers' earnings varied greatly among species. The relative share of the end market value they received was negatively related to product end-market value; on average 50% of the end retail value for the lowest-value species but < 10% for the highest-value species. Most fishers lacked information about market prices. The gross markup of exporters differed greatly between the two countries. Downstream actors reaped increasingly higher proportions of the product value for higher value species. Variation in sale prices between countries and fishers for the same product indicates a potential for higher earnings to fishers. Improved transparency of prices to fishers could empower them to negotiate higher prices, especially for more valuable species. Upgrading of value-chain governance, e.g. through fisher cooperatives or auction systems, could improve efficiency and fisher incomes, potentially reducing the need for high fishing rates. Such interventions will benefit from understanding the value-chain patterns among different species harvested in multispecies fisheries.

1. Introduction

The role that small-scale fisheries (SSF) should play in supporting human development is gaining increasing attention, not least through the recently adopted sustainable development goals (https://sustainabledevelopment.un.org/sdgs). Great progress has been made in improving the management of SSFs through better understanding of the socioeconomic issues facing fishers, especially in low-income countries [1–4]. There are now global calls for greater consideration of the entire value chain of the seafood industry into management [5], and for incorporation of social indicators of wellbeing in fisheries supply chains [6]. But are value chains in small-scale fisheries equitable for fishers, and what interventions appear most important for upgrading value chains to benefit a larger proportion of small-scale operators?

A common belief is that small-scale fishers reap a small share of the economic benefits from traded seafood [7–9]. Yet basic data are lacking to assess the distribution of benefits from seafood trade for many types of fisheries [10,11] and how the benefits might differ among traded species. This is in part because value-chain analyses of multispecies fisheries have tended to aggregate species when examining changes in prices of seafood products along the value chain (e.g. [10,12–14]). This lack of resolution in species, trade and derived income is unfortunate as small-scale fisheries are often multispecies in nature [15,16] and there is an assumption that fishing effort could be reduced, in certain cases, if incomes were improved [17].

A minimum criterion for fisheries management must be that the fisheries and associated supply chains are structured in such a way that they do not incentivize overexploitation, and that they allow those

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participating in the value chain to derive a sustainable livelihood [18]. However, many fisheries around the world today suffer from a lack of transparency, in terms of actor participation, prices, income and other benefit flows. Transparency in value chains broadly concerns the disclosure of information among actors in various segments (e.g. production practices, sourcing materials, and prices). Traders and processors often possess market information exclusively [8] and sometimes create exploitative social relations with fishers [9,19–21]. Improved transparency is not without potential pitfalls, but could be one mechanism to improve the sustainability in global supply chains generally [22]. For example, producers empowered with market information can make better decisions for production and trade (e.g. timing of harvests, negotiating prices). High-profile examples of such initiatives include mobile phone applications that provide East African farmers with up-to-date market prices (http://www.agromarketday.com), or the suite of apps under Abalobi (http://abalobi.info) developed for small-scale fisheries in South Africa.

In addition to improving transparency, different forms of certification of internationally traded seafood are playing an increasing role in improving fisheries sustainability and governance [23]. However, some types of certification might not be useful or pertinent for certain fisheries or seafoods. For example, current eco-label standards such as the Marine Stewardship Council (MSC) have been critiqued for being expensive for small-scale producers [24] and failing to address the least sustainable fisheries [25]. Moreover, certain markets are less concerned with ecological sustainability of seafood and value other seafood attributes more [26,27]. In contrast, Fair Trade certification is a strategy of upgrading that aims to reposition and empower producers by mandating fair pricing standards for products [9], but one which has not had a strong focus on ecological sustainability and which remains to be fully developed in a fisheries context.

However, information on prices of traded seafood along value chains is a fundamental prerequisite for Fair Trade, MSC and other certification schemes and regulated pricing standards. Understanding inequities in fisheries value-chains can also form the rationale for supporting fisher cooperatives or auctioning schemes to promote better financial returns for fishers and market participants. Such interventions are germane where internationally traded seafood is initially harvested and traded by rural artisanal fishers and traders who are both financially challenged and lack the skills or information to negotiate prices with buyers.

For high-value products, there are clear disincentives for transparency by foreign traders. One such example is sea cucumbers [28], which are collected by small-scale fishers worldwide to supply demand by Asian consumers, notably Chinese [29]. Although they are sold as a luxury seafood in Asia [29], the prices offered to fishers in low-income countries often do not reflect the high retail prices in the marketplace [see Supporting Information in 30]. For certain species, trade is restricted under national or international regulations [31,32], so traders can offer low prices in black-market transactions. These inequitable value chain dynamics have both social and ecological sustainability repercussions. Generally, poor financial returns to fishers can keep them in poverty traps in which unscrupulous fishing rates are the only means to secure a basic livelihood. Understanding the economics of fisheries through the value-chain lens is therefore useful to reforming fisheries to alter the benefit distribution so as to promote improved fisher (and small-scale trader) livelihoods and resource sustainability.

This study contributes to these efforts by examining the prices across the various nodes of sea cucumber value chains stemming from artisanal fisheries in two Pacific Island countries, Fiji and Kiribati. These value chains are notoriously complex and fragmented, and have been studied largely through qualitative approaches [11] or the use of surrogate data from other fisheries [32]. Indeed, value chain analysis can be done using various approaches according to research questions and context [8,33]. Here, we use quantitative data on sales prices to examine price markup (gross profit margin) of dried sea cucumbers along value-chains for fifteen different species from fisher to retail stores in China. Our study provides novel data on the huge variability in share of end-market prices that fishers receive depending on the types of species traded, and the relative financial returns to exporters in both countries. The implications for improving transparency and trade arrangements for Pacific Island sea cucumber fishers should be relevant also for other small-scale fisheries connected to international markets.

2. Materials and methods

2.1. Study locations and period

The sea cucumber fisheries in Fiji and Kiribati were operated by small-scale artisanal fishers harvesting a similar suite of species and used broadly comparable methods for processing the sea cucumbers into dried beche-de-mer [34], although shipping routes were apparently longer (i.e. sometimes via Fiji) for products exported from Kiribati. The study locations and data collection methods are described by Purcell and co-authors [35] and briefly reiterated here. Based on advice from national or provincial fishery authorities, 8 and 5 locations (provinces or island groups) were selected within Fiji and Kiribati, respectively, where fishers were collecting and selling sea cucumbers. Within locations, we generally visited 3–6 villages that were known to have fishers who collected sea cucumbers.

We interviewed sea cucumber fishers, middlemen and exporters in Kiribati during 2011, and in Fiji in 2014, on account of research funding and approval in Fiji. The fisheries and exports in these countries operate independently and there was no evidence to suspect significant variations in value chains in Fiji between 2011 and 2014. The two countries had different national fishery management regulations [see 35], and community-based management was a minor part of the fisheries or non-existent.

Market prices of dried sea cucumbers in China were recorded in November 2011. Prices for a range of species were recorded from 11 shops in the Yide-Lu markets in Guangzhou, and the shop owners told us retail prices (stating that prices would be somewhat lower for sales in large [wholesale] volumes). A smaller range of species were sold in Hong Kong, where we recorded prices from 5 retail shops in the Sheung Wan district. More recent data (S. Purcell et al., unpubl. data) suggest that prices for some species would have increased slightly from 2011 to 2014, so our reported ratios between the selling prices of fishers in Fiji and retail prices might be slightly biased (high) for some species.

2.2. Survey methodology and data collection

Although sea cucumbers can be sold fresh or dried, our study examines only data on sale prices of dried sea cucumbers (beche-de-mer). After several processing steps of cooking, salting, smoke-curing and drying, well-processed beche-de-mer do not need further processing or storage costs along the supply chain. Hence, once the beche-de-mer enters the value chain no further processing costs are necessary, although sometimes exporters might briefly re-cook and re-dry the product. By only comparing data on dried products, we also avoided assumptions about weight loss of the products along the supply chain, and vagaries in weight loss due to differences in processing methods (e.g. extent of salt curing or cooking) used by different supply-chain actors. Surveyed fishers used locally-available wood and coconut husks as fuel to cook sea cucumbers and their cost in processing is almost exclusively labour [34]. The economic cost of their labour is not examined in the present study — rather, we examine how the price of their processed products increase along the value chain to consumers in China. Costs to exporters of shipping from Kiribati and Fiji to China vary depending on the shipping route and whether freight is by air or by sea, and we lacked estimates from enough buyers to confidently incorporate those costs. Accounts from a Fijian exporter suggest that shipping by air freight costed US$3 kg^{-1}, whereas shipping by sea costed around US