

Middlemen, a critical social-ecological link in coastal communities of Kenya and Zanzibar

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ABSTRACT

This paper analyzes the middlemen–fishermen link in coastal communities along the coast of southern Kenya and Zanzibar, and explores effects of reciprocal agreements and credit arrangements on social-ecological feedbacks of coastal systems. The existence and generality of such arrangements are mapped and their effect on resource use and ecosystem dynamics is then explored. Data show that credit arrangements are widespread and that fishermen are bound by reciprocal agreements and financial guarantees during periods of lower catches that provide short-term stabilizing social effects. These arrangements create incentives which disconnect resource extraction from ecosystem dynamics and impede development of sustainable use practices. The role of middlemen is seldom accounted for in fisheries governance. Scenarios for the development of small-scale fisheries in the region are outlined and the function of middlemen is discussed considering the influence of external drivers. Policies that incorporate middlemen are recommended to improve the governance of fish stocks and coastal ecosystems in East Africa.

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1. Introduction

Throughout history humans have shaped nature, which in turn has shaped the development of human societies [1]. The concept of coupled social-ecological systems (SES) emerged in an effort to make this dynamic interplay between human and ecological components more explicit, as well as focusing on the feedback mechanisms by which the two are linked [2,3]. Identifying such links is significant for efforts aimed at sustainable resource management in complex ecosystems. Understanding links and feedback mechanisms in social-ecological systems is a rapidly expanding research area and has been addressed from the perspectives of local ecological knowledge among resource users and related management practice and institutions [4,5]; patterns of remittances affecting livelihood diversification and resource exploitation [e.g. 6–8]; property rights affecting conservation incentives and resource management [e.g. 9,10]; and governance structures of resource management systems across levels of institutions, networks and organizations [e.g. 11,12].

This study looks at another such link in coastal SESs, namely middlemen involved in small-scale fisheries. ‘Middlemen’ refers here to the group of intermediaries in direct contact with fishermen at the landing sites, and often commissioned as agents for larger collectors [13,14]. Close relations between small-scale producers and local middlemen or traders have likely existed since the emergence of trade, and economic relations in the form of reciprocal agreement and credit arrangements between the two have been well described, particularly for the rural, agricultural sector [15,16], but also for small-scale fisheries [e.g. 14,17,18]. However, the focus has been almost exclusively on the social implications of such arrangements (e.g. social insurance for fishermen, market effects, and market access). Little attention has been paid to possible effects of agreements between middlemen and fishermen on the capacity of ecosystems to generate services for human wellbeing. The objective of this article is to address this link more explicitly by investigating the effects of credit arrangements between fishermen and middlemen on feedbacks in coastal social-ecological systems in Eastern Africa. As a first step, the existence of credit arrangements and reciprocal agreements among middlemen and fishermen in coastal communities in Kenya and Zanzibar (Tanzania) are mapped, to assess the generality and extent of such arrangements along parts of the Swahili coast. Subsequently, the possible effects of such arrangements on ecosystems are explored through the resulting

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behaviour of fishermen and middlemen. The paper concludes by linking this discussion, and the role of middlemen, to emerging ideas on the effects of globalization on small-scale, artisanal fisheries.

2. Middlemen and reciprocal agreements in small-scale fisheries—a brief background

The relationship between fishermen and local middlemen in artisanal fisheries (primarily in developing countries) has been described from various parts of the world. At a general level, several factors combine to create conditions under which reciprocal agreements between small-scale producers and middlemen become attractive. These include uncertainty in production output, as well as relative inaccuracy and slow dissemination of market information to the producer [e.g. 19]. In this respect, certain conditions distinguish small-scale fisheries from agricultural production. While farmers may in some cases store their produce, storage of highly perishable products like fish is difficult unless fishermen have access to freezing facilities, something which is rare in many coastal, rural communities in developing countries.

Middlemen provide small-scale producers with a link to external markets [20] thereby reducing the time and effort needed by producers to market their goods. Middlemen commonly also provide producers with capital on credit. Credit is extended as a means of securing priority access to products, once harvested, thus insuring a steady supply of goods [e.g. 14,15,18]. This represents a form of labour-tying loans for small-scale fisheries, in which fishermen become tied to middlemen through such loans. Two types of credit exist. The first type is capital extended for investment in the production process, which in farming settings commonly includes provision of fertilizers [15], while in fisheries it may include financial support for investment in new (or repair of) gear [17,18]. The second type constitutes smaller amounts of capital recurrently issued as credit over extended periods of time, and used to cover basic alimentary needs during periods of low income due to e.g. unemployment, crop failure, or low catches [14,15]. Compared to most agriculture, fishing is exceptionally risky. Platteau and Nugent [17] outline three types of risk to which fishing is simultaneously subjected; production risk from uncertainties and environmental fluctuations (this could potentially also include uncertainty in access rights); price risk from volatile supply conditions; and risk of loss of assets, and even human life, due to rough conditions at sea. The inability to self-insure, and the lack of formal insurance and credit markets available to small-scale fishermen, thus makes entering into reciprocal agreements with local middlemen a particularly attractive insurance option [18].

2.1. What do the credit arrangements look like?

The reciprocal credit arrangements described here differ in several respects from formal credit relations. The loans are commonly unsecured, interest-free and made without any explicit term of duration [14,17,18]. Since capital is advanced in exchange for a secured future supply of fish, the foregone interest to the middleman can be seen as a risk premium. One important aspect for such arrangements to be beneficial to middlemen in the long term, however, is that these loans should not be easy to repay once the productive season has begun. The credit-cum-labour-tying arrangement thus benefits the fishermen through access to credit and benefits the lender (middleman) as both a mechanism to reduce the risk of future supply and as an exploitative device [14].

2.2. Effects of reciprocal agreements and credit arrangements

The effects of reciprocal agreements and credit extension have been looked at from various angles. Addressing what he calls stable bilateral transaction patterns over time, i.e. transaction relationships between fishermen and middlemen built on trust but not explicitly including credit extension, Wilson [19] describes how these influence the performance of the market. He suggests that the institutional structures generated by these reciprocal agreements influence the nature of the market information and affect market efficiency, through market clearance dynamics, as well as product quality [19]. Platteau and colleagues, on the other hand, have been largely concerned with the effects of credit and reciprocal agreements on the social resilience of individual fishermen [14,17]. Reciprocation as an important social adaptive process, for both fishermen and middlemen, is at the core of these analyses. Although several authors identify the strong potential of middlemen to channel market demands and to directly influence the organization of production [14,19], virtually no attention has been given to such effects on local fish stocks and patterns of extraction [13]. While the reciprocal agreements described above certainly help constrain the risk of opportunistic behaviour of both parties, vis-à-vis themselves, this constraint may also lock them into a behaviour possibly detrimental to the ecosystem services upon which they rely. This will be explored in subsequent sections.

3. Methods

3.1. Study areas

This study includes communities in two areas of Eastern Africa (Fig. 1), the southern coast of Kenya, and Zanzibar, Tanzania, both of which are typical of the region in a number of ways. A principal livelihood is small-scale artisanal fisheries and the socio-cultural makeup of the population in both areas is similar with predominantly Muslim and Kiswahili speaking, low-income households [21,22]. In addition, the organization of the local marketing chain for seafood is similar in both locations, with the existence of middlemen and a dual market consisting of hotels and restaurants catering to a growing tourism industry as well as a market for consumption by local households.

The small-scale artisanal fishery described here is a multi-species fishery predominantly focused on reef-associated and lagoon-dwelling species, but it also includes larger pelagic species. It is based on traditional or low-tech gear such as handlines and fish traps, but beach seines, gill nets, ring nets and spearguns are increasingly being adopted along Kenya's south coast [5,23]. Most fishing operations are based on dug-out canoes (*mtumbwi*, *ngalawa*) or small, traditional sailing vessels (*dhow*). Catches are landed at small and medium landing sites located in or close to local communities, and typically without any significant infrastructure for fish storage or on site transportation.

3.2. Interviews

This paper draws on several data sets collected during four separate field trips conducted between March 2004 and October 2007. Interviews were conducted with 49 middlemen from four villages/landing sites along the south coast of Kenya (17 respondents), and 8 villages/landing sites around the island of Zanzibar (32 respondents). The sites include Gazi, Sawasawa, Kisimachande, Shimoni (Kenya) and Chwaka, Dimani, Nyamanzi, Fumba, Mazizini, Unguja Ukuu, Mkokotoni, Uroa (Zanzibar)

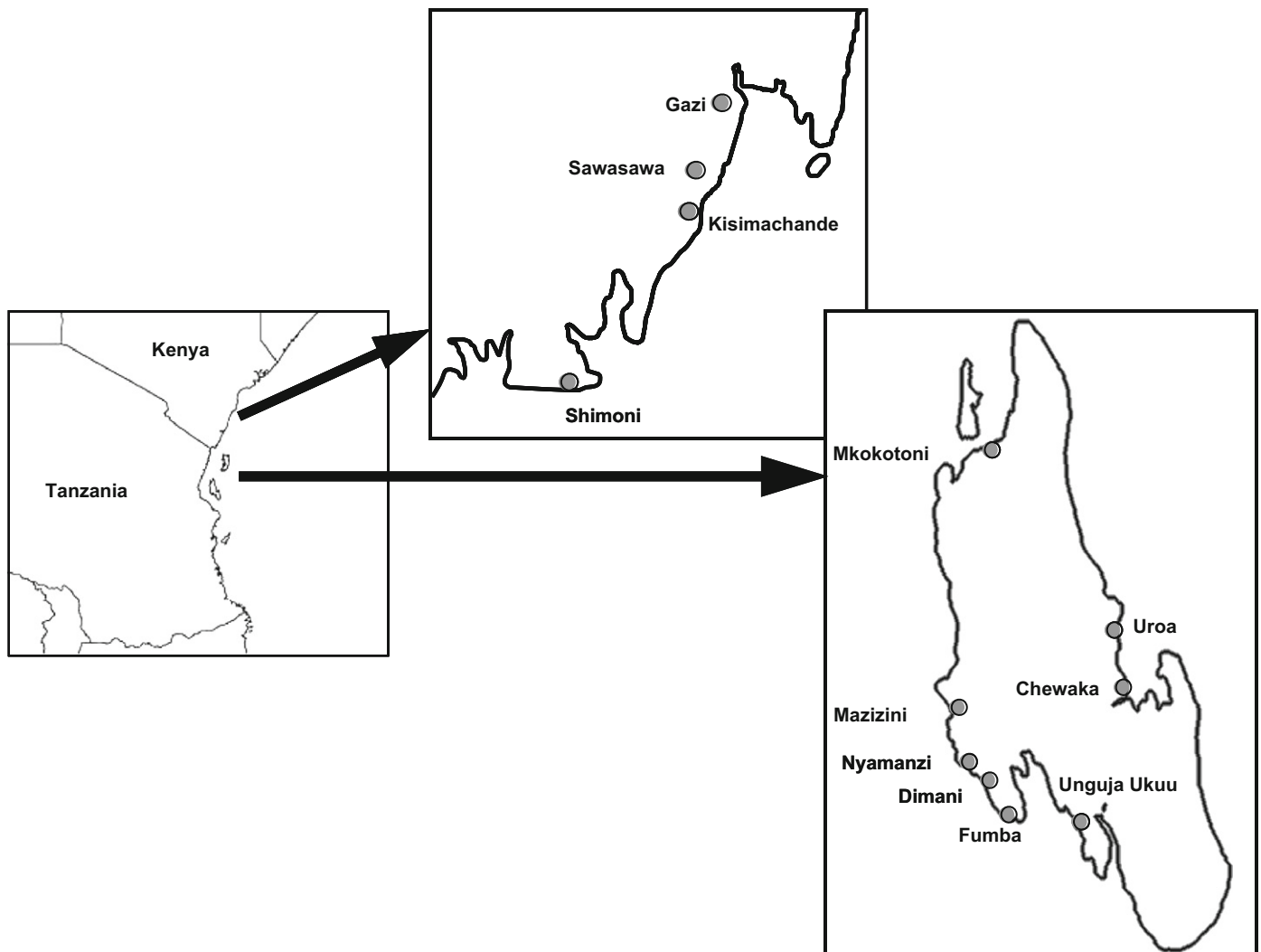


Fig. 1. Study region in East Africa. Sampling was conducted in four villages along the South Kenya coast and in eight villages around the island of Zanzibar, Tanzania (see inset map).

(Fig. 1). In addition, a total of 33 fishermen were interviewed in seven of the same villages on Zanzibar. The sites were selected to provide a representative sample of both smaller and larger landing beaches, as well as villages relatively close to and far from larger fish markets. Additional survey data (unpublished) from a parallel study in Gazi (73 fishermen), and participant observations from four years of fieldwork in this community, are also used to describe and discuss the role of middlemen in detail. Two of the four sites in Kenya (Sawasawa and Shimoni) and five of the eight sites on Zanzibar (Mkokotoni, Dimani, Uroa, Chewaka, and Mazizini) have regular fish auctions. On Zanzibar, auction sites represent the larger landing sites surveyed. Although most of the finfish landed are sold through auctions at these sites, lobsters and shrimps are often traded privately between fishermen and middlemen, outside of the auction. Women are also involved in fish trade, primarily as buyers of fish for the local market or for frying and selling. In other parts of Africa women also play important roles as middlemen [24]. Although a number of fish trading women were interviewed at several sites for the present study, none of them reported being involved in any credit arrangements and are therefore excluded from this analysis.

Interviews with all middlemen and Zanzibar fishermen were conducted using a standardized semi-structured interview. Answers were later coded for analysis. Interviews with

middlemen were designed to elicit information on the following three thematic areas: (i) size of each respondent's operation, market preferences guiding the species composition of sales and purchases, and changes in the fishery over time (catch landings and composition, gear use, number of fishermen and middlemen operating in the area); (ii) the nature of the informal institution (mode of repayment of loans, interests, contracts, generality of arrangements on a wider regional scale as perceived by respondents); and (iii) the role and function of the institution (size, frequency and extent of loaning activity and links to the dynamics of natural resource extraction). Interviews with fishermen focused on their fishing operations, markets, and changes in the fishery over time corresponding to theme (i) above, and also included questions on the nature of credit arrangements, size and frequency of loans, and links to the dynamics of natural resource extraction which corresponds to a combination of themes (ii) and (iii). Interviews lasted 45–75 min and were conducted at the respondent's house, at the landing site, or at the house of the village chairman, depending on the preference of the respondent. Respondents were selected as randomly as possible through a process in which the local chairman or beach recorder (*Bwana Diko*) was first approached to ask for permission to conduct interviews in the area and to explain the nature and purpose of the study. As interviews were often conducted in conjunction

with fish landing activities and auctions, both middlemen and fishermen were interviewed on the basis of availability and willingness to participate in the study. All interviews were conducted in Kiswahili and simultaneously translated to English using a local interpreter well acquainted with the nature and purpose of the study.

4. The nature of the reciprocal agreements in South Kenya and Zanzibar

Of all the middlemen who were interviewed, 78% reported engaging in credit activities, providing loans to fishermen on an as-needed basis (Table 1). In line with informal credit relations described elsewhere [e.g. 14,18], the loans which are issued are strongly based on trust. No contracts are written (if not recurring or for loans taken to invest in boats) and no interest is charged, in accordance with traditional Islamic conduct. However, loans are used by middlemen to tie fishermen to their operation thus securing income, and loans are seen by many respondents as a means of business investment. The primary method of repayment is through fish sales, as reported by over 90% of all middlemen (Table 1), and fishermen tied to a middleman are bound by strong social norms and a mutual agreement to sell their fish to that specific dealer. Most Kenyan respondents claimed that only in cases when the dealer is not available or cannot purchase the entire catch may fishermen sell to other middlemen, while in Zanzibar fishermen receiving credit from a middleman will either sell their fish at the auction and repay their loans with cash, or fish are sold directly to the middleman, outside of the auction, to repay debts. In summary, it appears that the characteristics of the reciprocal agreements and credit arrangements in Zanzibar and along the south Kenyan coast are comparable to those described for similar small-scale fisheries in other parts of the world [14,17,18].

Across both regions surveyed, at least 53% of the middlemen reported an increase in extended loans during the season when the sea is rough due to prevailing monsoon winds. The number was significantly higher in Kenya, however, with 82% reporting a higher frequency of extended loans during the North East Monsoon, and 59% indicating that demand for loans during the

rough season has increased over time, mainly as a result of increasing numbers of fishermen and lower catches.

The size of loans differed between respondents. Some middlemen operate on a very small scale with only a few fishermen tied to them. Others are engaged on a much larger scale with as many as 40 fishermen tied to their operations. Consequently, the range in size of loans extended varies (Table 1). But credit extended to fishermen also varies based on the type of species they target, particularly amongst Kenyan respondents. Fishermen who target high-value species like tuna, kingfish (Family Scombridae), or lobster are granted access to larger loans, which are not available to other fishermen. In fact, over 85% of Kenyan middlemen reported using credit as a means to actively recruit migrant, foreign fishermen. This results in most Kenyan middlemen operating on a larger scale, having two different categories of client fishermen. One category consists of local fishermen for whom loans ranging from Ksh 100 to 1000 (USD 1–10) are available while the other is represented by foreign, migrant fishermen with access to loans ranging from Ksh 3000 to 20000 (USD 45–280). Much of this money is used for travel arrangements, permits, and costs for food and housing during their stay. The reason given for this behaviour is that migrant fishermen, particularly from northern Tanzania, are considered more skilled, have larger vessels and crews, and are able to target deeper water stocks often not accessible to local fishermen due to a lack of appropriate gear.

5. Linking market demands and ecosystem dynamics

In addition to interview data from all sites, Sections 5–7 draw on more extensive data from one of the Kenyan communities studied (Gazi—see Fig. 1). This case is used to explore in more depth the role of middlemen in linking markets and fishing with ecosystem dynamics, but also to point out the extent to which these findings are supported by data from the other communities which were surveyed.

Interviews from all sites revealed that the hotel and tourism industry is a major driver governing the type and amount of fish purchased by middlemen. This market, from now on referred to as the tourism market as it caters to both hotels, restaurants and larger shops, has a big demand for large fish of high quality and commercial value. This type of fish is primarily represented by pelagic and reef associated species like tunas and kingfishes (Scombridae), red snappers (Lutjanidae), jacks and pompanos (Carangids) and occasionally billfishes (Istiophoridae) which all in turn are piscivorous thus representing higher trophic levels (Table 2). Although certain species are preferred by the tourism market the highly dynamic nature of the supply has made size the primary factor determining which market becomes the destination of the landed fish.

The harvests of the small-scale fisheries in both areas studied are predominantly consumed locally. Fish purchased for the local market is commonly all the high-value fish not marketable for the tourism and restaurant industry because of its small size, as well as all other low and medium value fish of all sizes. As reported by respondents this includes a large amount of undersized fish (sub-adults and juveniles) caught with non-selective gears like beach seines. These gears target primarily lagoon dwelling species [25]. Although the local market will absorb virtually all fish landed, regardless of their trophic position or size, favoured species include rabbitfish (Siganidae), seagrass dwelling and reef associated parrotfish (Scaridae), as well as emperors (Lethrinidae). Hence, the combined pressure from tourism and local markets exerts a strong pressure on coastal ecosystems as a whole [26], although the pressure is differentially distributed across different

Table 1
Social norms and rules of credit arrangements as reported by the interviewed middlemen.

| | Kenya | Zanzibar | Total |
|--|-------------|-------------|-------|
| Credit is extended to fishermen | 100% | 66% | 78% |
| • Loans are issued strongly based on trust ^a | 100% | 100% | 100% |
| • No contract is written ^a | 100% | 95% | 97% |
| • No interest is charged ^a | 100% | 100% | 100% |
| • Loans paid back gradually through deduction of fish sales ^a | 100% | 85% | 92% |
| Increased frequency of loans extended during rough season ^a | 82% | 38% | 53% |
| Increased frequency of loans over time ^a | 59% | 31% | 41% |
| Increased size of loans over time ^a | 12% | 50% | 37% |
| Size of loans extended by middlemen—small | \$ 1–70 | \$ 1–17 | – |
| —large | up to \$280 | up to \$350 | – |

\$ refers to US Dollars.

^a % of all respondents who extend credit.

Table 2

Linking the ecological functions of reef-fish families, and species targeted by the middlemen in the surveyed communities, to their vulnerability and primary market.

| Family/species | Trophic position ^a | Ecological function ^b | Vulnerability ^c | Primary market |
|---|--|---|----------------------------|----------------|
| Scombridae (mackerels, tunas, bonitos) | | | | |
| <i>Scombeomorus plurilineatus</i> | Feeds mainly on anchovies, clupeids, other small fishes, squids, and mantis shrimps | Unknown | M–H | T |
| <i>S. commersoni</i> | Feeds primarily on small fishes like anchovies, but also squid and penaeid shrimps | Unknown | M–H | T |
| <i>Acanthocybium solandri</i> | Feed on fishes and squids | Unknown | M–H | T |
| <i>Trachinotus bailloni</i> | Feeds on small fishes | Unknown | M–H | T |
| <i>Euthynnus affinis</i> | Highly opportunistic predator feeding indiscriminately on small fishes, also on squid, crustaceans and zooplankton | Unknown | M–H | T |
| Lutjanidae (snappers) | | | | |
| <i>Lutjanus argentimaculatus</i> | Feeds mostly on fishes and crustaceans | Unknown | H | T |
| <i>L. bohar</i> | Feeds mainly on fishes, but also shrimps, crabs, amphipods, stomatopods, gastropods and urochordates | Benthic feeding, particularly for gastropods, disrupts superficial sediment and has potential importance for bioturbation | M | T |
| <i>L. kasmira</i> | Feeds on fishes, shrimps, crabs, stomatopods, cephalopods, and planktonic crustaceans. Also feed on a variety of algae | Algal grazing controls algal recruitment and growth, which is important for coral recruitment and growth of recruited larvae | M | T and L |
| <i>L. gibbus</i> | Feeds on fishes, and a variety of invertebrates including shrimps, crabs, lobsters, stomatopods, cephalopods, echinoderms and ophiuroids | Echinoderms are important grazers on reefs and in lagoons [29,30]. Aggressive over-grazing has been shown to affect coral larvae survival and at high levels cause bioerosion, as well as decimation of seagrass beds [28,31,32]. Echinoderm predation thus indirectly affects potential grazing pressure [33,34] | M | T and L |
| <i>L. fulviflamma</i> | Feeds mainly on fishes, shrimps, crabs and other benthic invertebrates | Benthic feeding disrupts superficial sediment and has potential importance for bioturbation [35] | M | T and L |
| Carangids (jacks and pompanos) | | | | |
| <i>Caranx melampygus</i> | Feeds mainly on other fishes, also crustaceans | Unknown | M–H | T |
| <i>C. fulvoguttatus</i> | Feeds on small invertebrates and fish | Unknown | H–VH | T |
| <i>C. ignobilis</i> | Feeds mainly on other fishes | Unknown | H–VH | T |
| <i>C. tille</i> | Feeds mainly on other fishes, crustaceans | Unknown | M | T |
| <i>Elagatis bipinnulata</i> | Feeds on invertebrates (larger crustaceans of the zooplankton) and small fishes | Unknown | M–H | T |
| <i>Selar crumenophthalmus</i> | Feeds on small shrimps, benthic invertebrates, and foraminiferans when inshore, and zooplankton and fish larvae when offshore | Not known, but benthic feeding could potentially affect superficial sediment turbation and oxygenation | L | T |
| Istiophoridae (billfishes) | | | | |
| <i>Makaira nigricans</i> | Feeds mainly on fishes but also preys on octopods and squids (Oceanic) | Unknown | M–H | T |
| Siganidae (rabbitfishes) | | | | |
| <i>Siganus sutor</i> | Often occurs among seagrasses and inner reefs to graze on seagrass and browse on epibiontic flora and fauna | If grazing on reefs, could contribute to control of algal recruitment and growth, important for coral recruitment and growth of recruited larvae ^d | M | L |
| <i>S. stellatus</i> | Feeds on benthic seaweeds | When grazing on reefs it contributes to control of algal recruitment and growth, important for coral recruitment and growth of recruited larvae | M | L |
| Scaridae (parrotfish) | | | | |
| <i>Scarus ghobban</i> | Feeds by scraping algae from rocks and corals | Algal grazing controls algal recruitment and growth, which is important for coral recruitment and growth of recruited larvae [36,37] | M | T |
| <i>Leptoscarus vaigiensis</i> | Feeds on seagrasses and algae | Controls seagrass recruitment and growth. Potentially also stimulates seagrass production through grazing [38,39] | L–M | L |
| Lethrinidae (emperors) | | | | |
| <i>Lethrinus olivaceus</i> | Feeds mainly on fish, crustaceans, and cephalopods | Unknown | M–H | L (T) |
| <i>L. harak</i> | Feeds on polychaetes, crustaceans, mollusks, echinoderms and small fish | Benthic feeding disrupts superficial sediment and has potential importance for bioturbation Echinoderm predation thus indirectly affects potential grazing pressure (c.f. <i>L. gibbus</i>) | L–M | L (T) |
| <i>L. erythropterus</i> | Feeds on echinoderms, mollusks, crustaceans, and small fish | Benthic feeding disrupts superficial sediment and has potential importance for bioturbation Echinoderm predation thus indirectly affects potential grazing pressure (c.f. <i>L. gibbus</i>) | M | L (T) |
| <i>Monotaxis grandoculis</i> | Feeds mainly on gastropods, ophiuroids, and echinoids. Pagurids and brachyuran crabs, polychaetes, tunicates, and holothurians are consumed in lesser quantities | Benthic feeding disrupts superficial sediment and has potential importance for bioturbation Echinoderm predation thus indirectly affects potential grazing pressure (c.f. <i>L. gibbus</i>) | M | L |

Note that the functional role refers to the functional role in the ecosystem as identified in the literature. Primary market indicates the primary destination for each type of fish. Species data for this table were triangulated with observations at landing sites and data collected through interviews with fishermen [5], and serve as examples of the species landed within each family. For vulnerability L=low, M=medium, H=high, VH=very high. For primary market T=tourism, L=local, and (T) indicates the primary market is local but depending on size the species may be marketed to tourists in hotels.

^a Based on Fishbase [40].

^b Most fish tend to exert impact on the ecosystem through their choice of food or through feeding behavior. Ecological functions are therefore based on this. 'Unknown' indicates that no specific ecological function is known, other than the species position in the marine food web.

^c Vulnerability indicates an index of extinction vulnerability arrived at through a fuzzy expert system which integrates life history and ecological characteristics of marine fishes to estimate their intrinsic vulnerability to fishing [41].

^d Not enough detailed information exists on *S. sutor* diet to confirm to what extent it also grazes on benthic algae on reefs.

levels of the foodweb and across functional groups known to play key roles in sustaining the resilience of coral reef and lagoon ecosystems [e.g. 27,28] (Table 2).

The fishery along the south Kenyan coast is characterized by seasonal fluctuations over the year, caused by monsoon winds with calm waters and intense fishing activity during the South East Monsoon (SEM) and lower catches during the North East Monsoon (NEM), largely due to vessel and gear limitations. During the SEM higher catches are largely attributable to the calm weather which allows fishing operations using low technology gears to access the entire outer reef area in addition to the lagoon. However, the nature of vessels and gear of many fishermen does not allow fishing in the exposed sea far from the reef crest, and these limitations essentially partition the fishery into a primarily lagoon based fishery and one which is more pelagic. The tourism market demand fluctuates in accordance with the tourist season and higher demand largely coincides with the calmer South East Monsoon period. The local market demand, however, is less flexible. This means that during the North East Monsoon period, when exposed outer reefs are not accessible to most local fishermen, the constant demand is satisfied through continuous fishing and concentrated effort on lagoonal and inner reefs closer to the shores. Species caught in these habitats tend to be Lutjanids, Lethrinids, Scarids and Siganids (Table 2). Hence, the simultaneous demand from the two markets exerts high pressure on both higher and lower trophic levels of the fish community, likely resulting in effects on reef and lagoon ecosystems as shown for many other areas [e.g. 27,42]. Data indicate that such impacts have occurred as 60% of Kenyan middlemen reported a decline in catch landings over the last ten years despite an increase in the number of fishermen. Seventy-seven percent also perceived a decline in the proportion of landings including high-value species, and 53% felt the average size of fish landed had declined over time. This is supported by studies reporting on the degrading status of many of the fringing coastal reefs and lagoon habitats in the area [43,44], despite the lack of statistically significant trends in national catches due to big annual fluctuations [45]. High levels of fishing pressure are also partly due to a large influx of people entering the fishing occupation as a result of high unemployment rates [5].

6. Two critical roles of middlemen for social-ecological resilience

The current role and function of middlemen in coastal, rural social-ecological systems in the communities studied is conceptualized in Table 3. Two main factors define this role and the effect on social-ecological dynamics; the creation of a *direct link to outside markets* and the *provision of credit*. As described above, middlemen effectively channel the different market demands such that the tourism market becomes available to the average small-scale, artisanal fisherman. This, naturally, is beneficial from the perspective of the individual gaining market access and income, and is by no means a new finding [e.g. 15,19]. It does, however, have a direct effect on the level and distribution of the fishing pressure that is exerted over the seasons (described below) as well as influencing which species are targeted (see Table 2). Although prime target species for fisheries are typically large, long-lived, slow maturing (i.e. have a low reproductive output), and are closely associated with certain habitats, such as red snappers and tuna-like species, interviews with middlemen show that there is also a local market for 'less economically attractive' species (i.e. low trophic level species and juveniles/sub-adult fish). The impacts of fisheries, however, extend far beyond over-harvesting of the targeted fish stocks [46]. Fish play

Table 3

An illustration of the feedback mechanisms channeled through middlemen in a Kenyan coastal community.

| | |
|---|---|
| Direct links to external markets causes prioritization of certain species | Effects on which stocks are targeted. Subsequent effects on: <ul style="list-style-type: none"> • Diversity of fish functional groups and likely consequences for ecosystem dynamics |
| Provision of credit to fishermen | Buffers income variations due to seasonal fluctuations in fish catches. Subsequent effects on: <ul style="list-style-type: none"> • Incentives for livelihood diversification creating disconnect between fishing pressure and natural dynamics in climatic cycles • Promotes constant exploitation in vulnerable inshore areas, throughout the year Facilitates entrance of migrant fishermen with likely effects on: <ul style="list-style-type: none"> • Social dynamics at the village level • Effects on fish stocks • Resource extraction patterns by local fishermen |

important functional roles, hence over-harvesting also has implications for ecosystem dynamics [8,27,42]. Captured species may, for example, be responsible for controlling algal growth [27,47], providing suitable substratum for coral larval settlement [27], and avoiding outbreaks of destructive organisms [26,34]. If such ecological functions are eroded the capacity of ecosystems to cope with environmental changes (i.e. resilience to natural and anthropogenic disturbance), and thereby their capacity to generate ecosystem services, can be significantly reduced. Moreover, loss of important ecological functions can also constitute a significant barrier for management and restoration of degraded ecosystems [48]. In the Gazi Bay area in Kenya, outbreaks of sea urchins have been observed several times in recent years resulting in almost complete removal of sea grasses in areas of the lagoon [5]. Interviewed fishermen believed this affected the abundance of fish in the lagoon but the degree to which sea urchin outbreaks are a cause of over-fishing can only be speculated upon (see [5] for further discussion). By linking resource extractors to markets, and by channeling demands that translate into harvesting pressures that affect important ecosystem functions, middlemen play a potentially crucial role for ecosystem based fisheries management. This impact of middlemen has not received much attention previously and in Section 8 their potential role in sustainable fisheries governance is explored in more detail.

The provision of credit is the second factor defining the role of middlemen. It appears to have both positive and negative impacts on the social and ecological dynamics of the social-ecological systems. First, it buffers income variations of fishermen which result from seasonal fluctuations in fish catches and climatic conditions. The obvious effect of this credit is a direct economic benefit to the fishermen obtaining loans, at least in the short term, and loans can be used to invest in maintenance, purchase gear, or simply to support periods of low income from fishing. However, this buffering capacity has secondary effects on social dynamics and attitudes with potential consequences for resource management and ecosystems. One such effect observed in this study is the influence on individuals' attitudes toward the need for diversification of livelihoods over time. Data from a survey with

over 70 fishermen in Gazi shows that a majority (53%) of fishermen report no alternative livelihood or long-term sustainable secondary income source. Availability of credit during low fish harvest periods undermines the perceived need to diversify income sources and sustains a continued fishing pressure throughout the North East Monsoon period. This has the potential to gradually undermine the resilience of the integrated social-ecological systems as livelihood diversity is suggested as an essential component to alleviate poverty and promote sustainable development in rural communities [49].

7. Credit markets and the pathology of natural resource management

Gradual social and economic alienation by resource users from fluctuations in the resource base often results in loss of knowledge of how to respond to these fluctuations to secure sustainable future use. This is a common phenomenon in industrialized societies and is sometimes referred to as the pathology of natural resource management [50]. The significance of understanding ecosystem dynamics for long term sustainable harvests is largely masked by yields which are maintained through technological improvements like new gear or larger vessels [51,52]. The social and economic buffering capacity of credit appears to have had a similar effect in East Africa, creating a sense of environmental independence which affects fishermen's incentives to account for and learn about ecosystem dynamics and change and adjust their extraction efforts accordingly. Barnes [53] describes 'peasant fishermen' in Tanzania who combine farming and fishing according to season. As seen above, the current situation indicates a shift away from this dual livelihood strategy in the Kenyan communities studied, where the fishing occupation has taken prevalence and where personal and occupational identity is strongly related to the fishing profession [5,54,55].

As described above for the south coast of Kenya, there are effectively two types of fisheries: the lagoon based and the more pelagic. Loans could thus have very different impacts depending on their use. On the one hand, they have the potential to mitigate excessive fishing pressure by allowing investment in gear or vessels which transfers pressure from the lagoon. The effects of this are not clear, however. Transferring extraction pressure to more pelagic species may benefit lagoon habitats but, as seen in Table 2, many of the species to which effort would then be directed are already moderately to highly vulnerable to fishing pressure. Alternatively, loans could support transitions into other livelihood options during the low harvesting season as a means to ease pressure on the lagoon and still provide supplementary income. However, since the current credit arrangements provided by middlemen are intimately tied to the extraction of fish, the use of loans for alternative livelihood development is hard to envisage.

Loans currently appear to play a part in disconnecting harvesting pressure from the dynamics of natural fish populations, ecosystems and climatic cycles. This occurs by allowing fishermen enough credit to sustain themselves through periods of low catch and income (albeit continued fishing), thereby promoting constant unsustainable harvest levels throughout the year, yet not enough credit to change gear or income source. This social dynamic is partly explained by the discrepancies in credit availability described above which cause smaller scale local fishermen to be disadvantaged when it comes to accessing credit for larger investments. The disadvantage of local fishermen in this respect can be better understood if looked at in relation to migrant fishermen. The data from Gazi show that an additional effect of credit is the opening of the social-ecological system to

exploitation by foreign fishing operations, and the consequences of this on local development. Gazi is characterized by increasing fishing pressure and a large seasonal influx of migrant fishermen from neighbouring Tanzanian islands. Over 85% of middlemen actively seek to recruit these migrant fishermen by extending credit for travel, permits and living expenses. The reason given for this behaviour is the superior skill and equipment of migrants, and their ability to target high-value species often not accessible to local fishermen due to a lack of gear. In line with the ideas of profit maximization and high return on investment expressed by middlemen, extending credit for such operations is a sound business investment as the foreign crews are unofficially bound by social norms to sell their catch through their agent/middleman. Local fishermen are viewed as a larger risk because they have simpler gear, catch less fish and are thought to have a lower ability to pay back big loans. Consequently only small capital is extended to them. This has developed into a vicious circle sending the system off on a potentially destructive trajectory, when local fishermen who have difficulty accessing substantial capital for investment in gear that would allow deeper water operations instead resort to easily accessible, but destructive and illegal gears despite awareness of the dire consequences. Respondents report that the use of illegal gears like beach seines and spearguns have increased substantially in the area over time. Thus, foreign fishermen proceed to fish in Kenyan coastal waters generating income for their own operations as well as their agent middlemen and, through trickle-down effects, for some local shops, eateries and landlords. This does not, however, benefit the majority of local fishermen who represent a large part of the population. The situation is akin to the poverty trap described by Barrett and colleagues [56]. As local fishermen are excluded from access to the larger credit needed for substantial investments in boats and nets that would allow them to move their fishing efforts to deeper waters, they are thus trapped in a lower income equilibrium where smaller credit amounts are accessible but function merely to mitigate seasonal fluctuations in fisheries resources. Although Barrett and colleagues [56] describe this phenomena from a purely social perspective, the negative ecological effects of this threaten to further erode the resource base and perpetuate and accentuate such a poverty trap.

8. Middlemen in coastal rural fisheries—the weak link or a strong institution?

The informal institution of middlemen in coastal East African communities becomes essential in the context of natural resource management due to its linking function. Much effort has been put into devising management approaches targeted at either the resource extractors or the market (Fig. 2). However, in fisheries management and governance less focus has been directed at the group of intermediaries that effectively channel the flows between the market, fishermen, and fish stocks. This 'ignored link' creates development trajectories which affect the resilience of the social-ecological system. While conceptualizing it here as an 'ignored link', it is important to acknowledge that several scholars have in fact discussed middlemen as a group. Focus in these cases was, however, almost exclusively on their effects on social dynamics as mentioned earlier [9,14,17–19].

Middlemen, like boundary or bridging organizations [57], effectively link actors across different social domains and hierarchical levels. The potential to enhance current ecosystem management strategies by making use of their position to better communicate management objectives to local users and to implement regulations therefore deserves more attention. However, the linking function could also be exploited by external

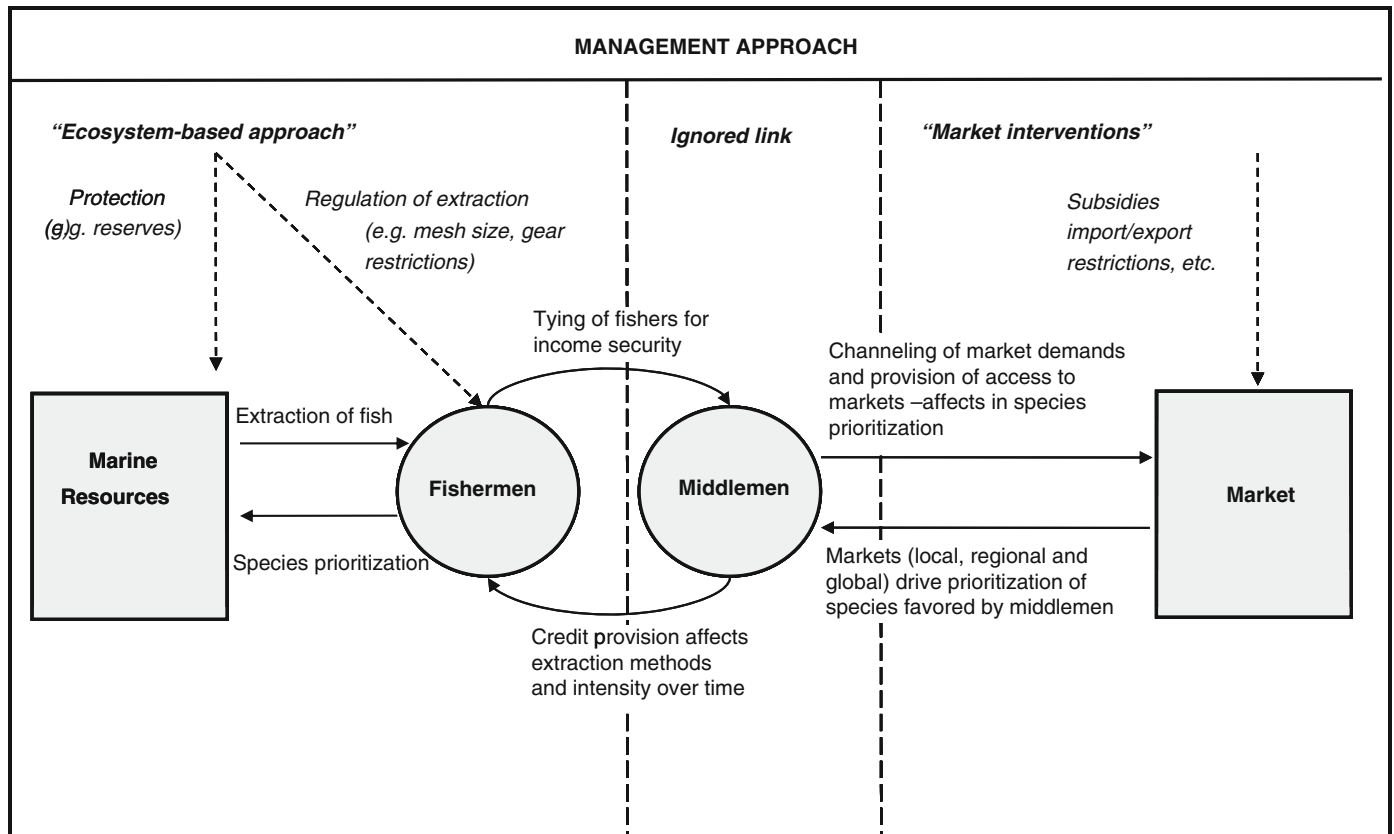


Fig. 2. Conceptual model of the links and feedback loops in a simplified coastal social-ecological system. Examples of different management approaches are depicted in relation to the component/actor group they are designed to target and the process(es) by which regulation is conventionally achieved. These different approaches are not mutually exclusive but are rarely adopted in tandem. The 'ignored link' in focus in this paper is represented by middlemen (fishmongers) and presents an often overlooked component in fisheries management.

Table 4

Description of the role of middlemen in possible future development of small-scale coastal fisheries.

| | |
|---------------------------------------|---|
| Business as usual | <ul style="list-style-type: none"> • high unemployment rates • low availability of alternative livelihood options • credit availability stimulates continuous entry of new fishermen into the trade |
| 'Roving Bandit' syndrome | <ul style="list-style-type: none"> • middlemen targeted by capital-strong external actors/market agents • creation of strong incentives for extraction of certain high-value species destined for global market • no institutions in place to counterbalance economic incentives created by external market agents |
| Towards sustainable management | <p>Middlemen targeted for:</p> <ul style="list-style-type: none"> • extraction related regulation • communication and information dissemination • review of credit system to improve situation for small-scale local fishermen |

actors resulting in less desirable outcomes from a sustainable marine resource management perspective. Below, two potential scenarios for the development of small-scale coastal fisheries are sketched considering above findings regarding the roles played by middlemen. These scenarios are; Business as usual, and the 'Roving Bandit' Syndrome [as described in 58]. Suggestions for how to promote a potentially more sustainable future are then outlined (Table 4).

The first scenario, business as usual, assumes that the role of middlemen, as described here, remains unchanged. High levels of unemployment increase the influx of new fishermen into the trade [5,54], and entry into the fishery is facilitated by relatively easy access to credit for low-cost gear investment (such as spear-guns) through association with middlemen. This increases the pressure on fish stocks and can have further detrimental effects on coral habitat (e.g. spear-guns and beach seines [59]) which potentially challenges ecosystem resilience and may strain existing local institutions for managing the common fishery [54]. Combined, these factors point to a trajectory in which coastal fish resources are increasingly overexploited and the resilience of the linked social-ecological system is gradually undermined (Table 4).

The second scenario is based on a situation described by Berkes et al. [58] as the 'Roving Bandits' Syndrome. This syndrome can essentially be explained as a sequential exploitation of local and regional marine stocks, driven by the demands of a globalized export market and facilitated by highly mobile market agents and exploiters. Given the linking function of middlemen described here, and the effect of feedbacks between the market and resource base channeled through this group (Fig. 2), they have the potential to play a key role in facilitating and accelerating exploitation by 'Roving Bandits'. The linking position of middlemen makes them a target for external agents looking to gain access to local stocks for exploitation. Through their tight links to local resource extractors and their power to channel market preferences to fishermen for exploitation of specific target species, they have a great potential to accelerate local resource depletion. Gibbon [13] provides a detailed account of how credit

arrangements and mobility of traders and their agents allow for artisanally caught prawns to enter the export market. Likewise, middlemen played an important role in the exploitation and export (and subsequent stock collapse) of sea cucumbers in the Galapagos [60], and a similar scenario appears to be developing around sea cucumber trade and fishery in the Western Indian Ocean (de la Torre Castro, pers comm., Stockholm University, Stockholm). Without strong local and national institutions and governance structures to counterbalance the strong but short-term economic incentives offered by temporary access to a global market, there is little hope for slow-responding institutional structures (which are often associated with common pool resource management [61]) to identify and halt the depletion of local stocks before the ‘roving bandits’ have moved on.

8.1. Ways forward

There are several ways in which the institution represented by ‘middlemen’ could be targeted to promote a more sustainable future, with the aim of producing benefits from both a social and ecological perspective. Preventing the development of roving banditry will likely require strengthening of local management institutions, combined with other measures related to trade and international compliance which lie beyond the scope of this article. However, efforts to include intermediaries at all levels of the production chain, such as the ‘Chain of Custody’ approach promoted by the Marine Stewardship Council, is one way forward. It is however, difficult to see the feasibility of such measures in rural areas such as the ones studied here, where middlemen operate largely independently and in competition with one another, without any form of internal, sectoral organization. Measures toward more formal organization of traders and intermediaries would therefore be a necessary first step.

A more immediately feasible approach focuses on the bottleneck occupied by local middlemen in the marketing chain and offers a complementary option to regulatory measures aimed at fishermen. Government controlled monitoring and enforcement of fishing regulations in small-scale fisheries, where fishing is done at all hours of the day and operations are many and dispersed, becomes an often prohibitively expensive and difficult task without either formalized structures for reporting catch landings or sufficient resources. In addition, in cases where tying of fishermen through credit shows tendencies of turning into wage-labour contracts [13], fishermen are merely working for an agent who control operations. Placing restrictions on contracted labourers is arguably less efficient than targeting the whole operation represented by the contractor (middleman). Regulatory measures aimed at middlemen could therefore involve (where not already existing) size restrictions for purchase and resale combined with stricter monitoring of compliance through random sampling of middlemen’s purchases or through tighter control at auction sites. Initiatives such as the Fish Ruler, developed within the European Commission-funded Incofish, project provide a simple and easy to use instrument for monitoring size at first maturity at local landing sites (www.incofish.org) [62]. As size has been shown to be strongly correlated with the intensity of ecological functions provided by fish, such as the maintenance of coral-dominated reefs by grazing and scraping of parrotfish [63], this is a highly desirable goal.

Middlemen could also be used to communicate current management strategies to fishermen. Middlemen as an occupational group have been shown to have a relatively central role in the transmission of knowledge and information about resource extraction, at least in Kenya [64]. Finally, provision of credit can have both positive and negative influences on social-ecological

system dynamics, and a review of existing credit structures would be desirable. The hampered development potential and essential catch-twenty two for locals, characterized by influx of migrant fishermen and related loan schemes, is one example. Not only does this situation undermine local development by channelling capital from fishing out of the country with only minor trickle down effects, but it also affects the incentive structures for sustainable use and ecosystem management. In addition, when local and national conservation issues are raised, the group most often proposed to have the highest stake in sound management, and therefore suggested to carry the brunt of the costs, are the local fishermen. As shown here, these fishermen have the least buffering capacity through alternative income and capital. They are not favoured even by local lenders and, during peak seasons, are often not responsible for a large part of the total fish landed, yet they are called upon to conserve the resource by reducing fishing efforts. Diversifying credit options, through micro-credit schemes, saving clubs or cooperatives, is thus another potentially fruitful way forward, as this would decouple the credit base from the resource extraction. Increased access to larger credit by local fishermen could allow for investment in boats and gears suitable for deeper water operations and could relieve pressure on the lagoon. However, coupled with weak regulation and monitoring, and without attention to already existing fishing pressure and poor knowledge of the vulnerability of targeted fish stocks, such investments run the risk of fleet overcapitalization thereby simply transferring the problem to another part of the system. Attention is therefore needed on how access to credit can best promote sustainable investments in the fishery or alternative livelihoods which do not threaten the integrity of the natural resource base in the long term.

The framework of linked social-ecological systems emerged in an effort to make the interplay between the human and ecological components more explicit and to focus on the feedback integrating these components [2,3]. Implementing this framework in policy requires the ability to identify critical links in the social-ecological system. This study highlights one such link by investigating middlemen involved in small-scale artisanal fisheries along the Kenyan and Tanzanian (Zanzibar) coast. It shows that middlemen are part of the problem of managing fisheries resources but also have the potential to contribute to a solution. The two development scenarios outlined above are based on the current role of middlemen in small-scale fisheries in this region. The feedback mechanisms operating through middlemen make the link critical and persistent. Disregarding such links may lead to incomplete conclusions and recommendations for environmental management and policy. Although this paper is a first step in providing empirical evidence of such social-ecological feedbacks, more research is clearly needed to better understand how middlemen impact specific ecosystem services and how they can help nurture sustainability and resilience of similar coastal social-ecological systems. This will require expansion from a focus on the social and economic domain to governance structures that provide incentives for stewardship of the broader social-ecological system.

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