Fishers Networking as Resilience Measure of Small-Scale Fisheries by Women in Homa-Bay County, Kenya

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Abstract

Resilience in nutritional standards and quality livelihood appear prominently among the United Nations' Sustainable Development Goals. The fishers networking as a resilience factor is essential for ensuring sustainability through continuity, and availability of business needs as a way of ensuring enterprise sustainability. On this dimension, networking remains a resilient measure in addressing forms of enterprise disruptions, thus maintaining functionality and objectives. In networking, fishers create diverse linkages among themselves and all stakeholders along the small-scale fisheries value chain. This investigation aims to explore how building networking among small-scale fishers becomes a resilient measure for small-scale fisheries. The objective of this study is to examine the contribution of fishers networking as a resilient measure of small-scale fisheries by women in Homa-Bay County, Kenya. Applying the mixed method approach, the study analyzed quantitative and qualitative data collected from 342 small-scale women fishers. The findings from both data sources were triangulated and became the basis of the study findings. Both Descriptive and inferential analysis were used in the study. Fishers networking had a moderate and significant relationship with the sustainability of small-scale fisheries. The findings revealed that $r=0.591$, $R^2= 0.349$, $F(1,341) =184.93$, at $P=0.000<0.05$, confirming that fishers networking had a statistically significant contribution on the resilience of small-scale fisheries the coefficient of determination, $R^2= 0.349$, indicating that fishers networking activities explain 34.9% of variations in the resilience of fisheries by women. The paper contributes to the literature on the voluntary guidelines for securing sustainable small-scale fisheries, poverty reduction among small-scale fishers, and nutritional and fisheries policy in developing nations. Furthermore, it adds to the literature on networking by highlighting the importance of fishers engaging in a dialogue with one another, the market, policy and community.

Key words: Fishers networking, resilience, small-scale fishers

1.0 Introduction

Resilience in poverty and hunger reduction, and quality livelihood take centre stage within contemporary sustainable development policy objectives (FAO, 2015). In 2018, FAO estimated that over 60 million people were employed partly or on a full-time basis along the small-scale fisheries value chain (FAO, 2019). This figure represents 90 per cent of all those engaged along the capture fisheries value chains. An additional 53 million people were occupied in livelihood fishing and processing at least annually, adding to a total of 113 million people who are either employed in small-scale fisheries or engaged in subsistence activities in the sector. Furthermore, these 113 million people had an estimated 379 million household members, totalling 492 million people who were considered to depend on the small-scale fisheries sector (FAO, 2022). The sector is strategic in the context of food security, poverty eradication, and general source of livelihood, (FAO, 2015).

In terms of nutritional value, research established that small fish species are the most nutritious, and thus have the capacity to address nutrition deficiencies(FAO, 1995, 2018, 2021; FAO et al., 2021). Furthermore, it is on record that small species are the source of 50 per cent of the recommended nutrient intake (RNI) for over 150 million women in Africa (FAO, 2021). Fortunately, small fish species are the most often available for rural populations and the most affordable among other fishes. The small-scale fisheries sector becomes one of the key drivers in the realization of zero hunger, gender equality, reduced inequalities, and life below water. Indeed, it is generating income for millions of people and driving progress towards the Sustainable Development Goals (SDGs) (Kalikoski et al., 2019).

The resilience of small-scale fisheries cannot be understood or equitably enacted without considering the gender dimension in the sector. According to the gender-disaggregated data, at least 45 million women take part in the small-scale fisheries value chain and survival activities globally(Ameyaw et al., 2020; Kalikoski et al., 2019; Tilley et al., 2021; Weeratunge et al., 2010; world Fish Centre, 2020). This represents 40 per cent of all those estimated to engage in the sector. Along the small-scale fisheries value chain, women account for 15 per cent of the pre-harvest labour force (gear fabrication and repair, bait and ice provision, boat building, etc.), 19 per cent of commercial harvest labour (including vessels and non-vessels-based activities), 50 per cent of post-harvest labour (e.g. Processing, transporting, trading, and selling).In addition, women account for 45 per cent of those engaged in small-scale fisheries for subsistence.

However, despite their diverse contributions and solid support to the sector, women are overrepresented in informal and unrewarded activities that aid small-scale fishing businesses and operations (Alami & Raharjo, 2017; Jentoft et al., 2018; Scholtens, 2016). Their activities are rarely accounted for in official fisheries statistics, they are poorly represented in management, governance and decision-making. The situation is worse in developing countries, especially in sub-Saharan Africa where culture and women's subordination dominates. Indeed, women, fall within the marginalized category where they have limited networking which could be a resilience factor in their small-scale fisheries undertaking. They disproportionately gain from the fish business, thus compromising their sustainable income and household nutrition- values. In addition, their fisheries are considered as extended household engagement, fall sort of being sustainable, and become poorly rewarding. Furthermore, there has been limited research on drivers of women fishers' enterprise resilience and sustainability, especially in eastern Africa, in Kenya and Homa-Bay County in particular. The objective of this study is to examine the

contribution of fishers networking as resilience measures of small-scale fisheries by women in Homa-Bay County, Kenya.

2.0 Literature Review

The sustainability perspective is a contemporary dimension of the global development paradigm. Poverty reduction, food security, nutritional value intake, gender equity and quality livelihood are embedded in the fabric of sustainable development goals(Cámara & Santero-Sánchez, 2019a; Cochrane et al., 2004; Vincent-Akpu, 2013). Sustainability in small-scale fisheries is called for as a practice to salvage low-income households from livelihood deficiency (Vincent-Akpu, 2013). Furthermore, sustainability practice does not affect the viability of other wild species that form part of the ecosystem of the fishing communities (Cámara & Santero-Sánchez, 2019b; Penca et al., 2021b; Torre et al., 2019b). Thus, sustainability in fisheries is a practice that integrates bio-ecological, technological, environmental, economic, managerial, and social dimensions that improve the well-being of the fisheries stakeholders (Penca et al., 2021b). Sustainability in small-scale fisheries among women has the potential to support the livelihood of households in a society in the context of food security nutritional supply, income, and employment generation (FAO, 2014). This is more so for those who engage in small-scale fishing within the inland waters, where women fishers dominate.

Sustainable development theory posits that society and its components ought to serve the needs of not only the current but also future generations. This concept is primarily based on the interdependence between human societies and the natural environment. It occurs when a society maintains or improves the material and social conditions for human health and the environment over time without exceeding the ecological capabilities that support them. Furthermore, the discourse posits that sustainability performance integrates economic, environmental, social, and governance factors into its business scope(Cambra Fierro & Ruiz Benítez, 2011; Domanović et al., 2020; Doria, et al., 2019). This implies that the imperatives of the present such as economic, environmental, social, governance, and technology ought not to negate those of the future.

Networking is an important pillar in contemporary times and the immediate future. Accordingly, networking as a concept of enterprise growth and development has the potential to link up different women players in the enterprise to address the challenges of the present business without compromising on the future needs of the entrepreneurs. It cannot be ignored while addressing sustainability in small-scale enterprises such as fisheries. Indeed, networking becomes a synergy factor in balancing or harmonizing social, environmental, and economic interests considering the livelihood benefits that accrue from the fisheries. The fishers' networking is embedded in the theory of social capital aligned with the works of Bourdieu (1986), Coleman (1988), and Woolcock (1998)**.** The concept expresses the sociological essence of communal energy, focusing on the solution to the problem that requires a common approach and voluntary collective action. The focus contends that forms of networking are resources that yield reproductive benefits to groups or individuals in an enterprise or an organization (Häuberer & Jerabek, 2011). The scholars argued that network groups exist as nodes of convergence and interactions which results in social-economic ties, linking groups and individuals who share similar business beliefs and values. The social capital theory posits that there exists a relationship in the form of networks among and between individuals, groups, organizations, and the entire society (Matthews & Besemer, 2015). These networks symbolize structures comprising a set of actors or ties bringing linkages to different nodes.

The challenges facing Kenya's fishery sector are enormous, ranging from climate dynamics and inconsistencies, overfishing, constant declining fish stocks, and ineffective networking in the fisheries value chain. Furthermore, increasing fishing pressure due to increasing illegalities on account of weak enforcement management measures, encroachment of fishers into fish breeding areas, inadequate infrastructure for fish processing, quality, and safety assurance, as well as climate change. Collectively, they have caused a far-reaching impediment to the sustainability of small-scale fisheries by women entrepreneurs who are the majority in the supply chain (Anderson et al., 2015; G.O.K, 2008; KMFRI, 2018). However, despite their diverse contributions and solid support to the sector, women are overrepresented in informal and unrewarded activities that aid small-scale fishing businesses and operations(Alami & Raharjo, 2017; Jentoft et al., 2018; Scholtens, 2016). Their activities are rarely accounted for in official Beach Management units (BMUs), they are poorly represented in fisheries management committees and governance matters at the sub-county or county level. Furthermore, their activities are not coordinated, they hardly speak in the same voice and are at the mercy of the market.

On this account, women encounter significant barriers to meaningful participation in small-scale fisheries business and upholding the sustainability of the enterprise in the County (Awino, 2013; Odoli et al., 2019). The situation is worse in Homa-Bay County, where culture and women's subordination dominate. According to Kizito et al. (2017), women stand to disproportionately gain from the fish business, thus compromising their sustainable income and household nutrition- values. This study, therefore, advances the argument that small-scale fisheries by women ought to be alive to the fact that they balance their exploitation of networking resources for the sustainability of their enterprises for present and future livelihoods.

3.0 Research Methodology

The research adopted a mixed method design which gathered both qualitative and quantitative data. The target population of the study was the women fish entrepreneurs, unit of analysis was women fishers registered in the Beach Management Units (BMUs) in Homa Bay County. 137 BMUs were identified with a total of 2,385 women fish entrepreneurs registered. The target population was distributed as follows; Suba-South Sub-County has 412 women fish entrepreneurs, Suba-North Sub-County has 780 women fish entrepreneurs, Homa Bay Town Sub-County has 692 women fish entrepreneurs and Rachuonyo North Sub-County has 501 women, fish entrepreneurs (Table 1).

Table 1: Target Population Frame for Women fishers and Beach Management Units

Sub-County	No.women entrepreneur	Beach Management Units
Suba-South	412	31
Suba-North (Mbita)	780	42
Homa-Bay Town	692	34
Rachuonyo North	501	30
Total	**2,385**	**137**

Source: Homa Bay County Beach Management Unit Registration Roll (2021)

The proposed research used multi-stage, stratified, and simple random sampling techniques. Given that BMUs are the unit of observation, in the first stage, the 137 BMUs were sampled using the small population sampling formula/technique recommended by Nassiuma (2000);

$$S = \frac{N(Cv)^2}{(Cv)^2 + (N-1)e^2}$$

Where S = the sample size
N = the population size
Cv = the Coefficient of Variation
e = standard error
Therefore, the sample of the BMUs was;

$$S = \frac{138\ (0.21)^2}{(0.21)^2 + (138\text{-}1)\ 0.02^2} = 61.53488 \approx 62 \text{ Beach Management Units}$$

The sample size of Beach Management Units along with the Sub-Counties in Homa Bay County will be 62 BMUs. (See Table 2).

Table 2. Sample Frame for BMUs

Sub-County	BMUs	Sample Size
Suba-South	31	14
Suba-North	42	19
Homa-Bay Town	34	15
Rachuonyo	30	13
Total	**137**	**62**

Source: Homa Bay County Beach Management Unit Registration Roll (2021)

In the second stage, women fish entrepreneurs are the unit of analysis, out of the 62 BMUs sampled. Since 2385 women fish entrepreneurs is a large population size, of>1000, the researcher adopted Yamane's (1967) formula to obtain the sample as shown below.

$$N=\frac{N}{N\,(e)2}$$

Where n is the sample size

N is the Population

e is the tolerance at a desired level of confidence, at a 95% confidence level

$$N=\frac{2{,}385}{2{,}385\ (0.05)2} \cong 342.3493 = 342$$

Based on the total number of 2,385 women fish entrepreneurs in Homa Bay County, the researcher arrived at a sample size of 342 women fish entrepreneurs, (see Table 3).

Table 3: Sample Frame for Women Fish Entrepreneurs in the BMUs

Sub-County	BMUs	The population of Women Fish Entrepreneurs	Sample Size
Suba South	15	412	59
Suba North	17	780	112
Homa Bay Town	15	692	99
Rachuonyo	15	501	72
Total	**62**	**2,385**	**342**

Source: Homa Bay County Beach Management Unit Registration Roll (2021)

From every stratum, every unit of the study population had an equal opportunity to be studied. Thus, the researcher used a simple random sampling technique to pick the respondents from each stratum to ensure that every respondent has an equal chance of being selected and that each stratum is adequately represented to take care of variation within the population.

Random sampling is unbiased and representative. In addition, the research gathered qualitative data with the help of focus group discussions and key informant interviews.

4.0 Results and Discussions

The study employed descriptive and inferential analysis. In descriptive analysis, measures of central tendency were used. The Pearson coefficient of correlation (Pearson r) was equally used in the study. Inferential statistics analysis was conducted using simple linear regression analysis. This was to test the hypothesis and assess the contribution of networking to the Sustainability of small-scale Fisheries by women. The study modelled network as the independent variable and sustainability as the dependent variable. To enhance the estimation of the hypothesized linkage between networking and sustainability resilience. Concerning the response rate, of the 342 questionnaires that were distributed to small-scale women fishers, 330 questionnaires were returned in the first round. An additional 12 questionnaires were completed in the second round of follow-up, giving a response rate of 100%. This rate conforms to Bernt's (1914) assertion that a response rate above 70% is excellent and adequate for analysis and reporting.

The study sought to establish the demographic characteristics of the study population by first examining the age of the respondents. The results in Table 4 show that those whose age falls at 30 years and below accounted for 10.2%, while most of the respondents (40%) were aged between 40 and 49 years. 27.7% were aged between 31 and 39 years while 22.1% were aged 50 years and above, this means that the greatest number of middle-aged (40 to 49 years) women engaged in small-scale Fisheries in Homa Bay County. The age distribution cut across bringing together the youthful, middle age and elderly women in the business. This could be partly on account of networking and collective action that benefits the business membership in matters relevant to marketing and price setting among others. In the works by Sappleton (2009), it was established that women who operate enterprises in traditional sectors such as fisheries demonstrate a high-level community engagement (networking), solidarity, and trust which has the potential to strengthen and bring longevity to their enterprises.

Table 4: Age Distribution

Category	Frequency	Percentage
Below 30 years	35	10.2%
31 – 39 years	95	27.7%
40 – 49 years	137	40.0%
50 years & above	75	22.1%
Total	**342**	**100.0%**

Source: Research Data (2023)

The respondents were asked to indicate the period they have been engaged in the fishing enterprise. This looks into the years they have been working as fish entrepreneurs. Table 5 illustrates the period of engagement.

Table 5: Period Engage in Fishing Enterprise

Period took in the fish enterprise	Frequency	Per cent
Less than 2 years	18	5.3
2-4 years	50	14.6
5-7 years	55	16
8-10 years	78	22.8
Over 10 years	141	41.2
Total	**342**	**100.0**

Source: Research Data (2023)

The results in Table 4.4 show that the majority (41.2%) of fishers indicated over 10 years of engagement with the enterprise, 22.8% indicated 8-10 years, 16% indicated 5-7 years, 14.6% indicated 2-4 years, while a few 5.3% indicated less than 2 years of engagement. Probably, benefits arising from diverse information sources and sharing, and collective action and informal training in the small-scale fish business could be partly the reason making women stay in the business for longer periods. In the words of Vosta (2014), the lengthy period of engagement is normally built on account of trust and bonding social capital.

The respondents were asked to indicate the number of years they have spent in school or other training institutions. Table 4.5 indicates the frequency of the responses.

Table 6: Number of schooling years

Schooling/Training Years	Frequency	Per cent
Between 1-8 years	110	32.1
Between 9-12 years	170	49.7
13 years and above	62	18.1

Total	**342**	**100.0**

Source- Primary Data (2023)

According to the results in Table 6, 32.1% of the respondents indicated to had attended basic school/training and stayed between 1-8 years in school. 49.7% indicated between 9 to 12 years in high school or other forms of training institutions, while 18.1% indicated have attended more training after formal school. This could partly imply that the fisheries business could be one of the readily available opportunities and its occupation is on account of relevant networking among women fishers as well as the literate women looking for opportunities for income generation. In a similar context, Hassan and Almubarek (2016) explained the role of information and networking spill-overs in the success of business among educated and semi-illiterate people.

Table 7: Mean, standard deviation, and coefficient variation for women fishers networking

Statement	N	Mini	Max	M	SD	CV%
Participating in group activities has expanded the market for my fish products	342	1	5	4.50	0.84	18
My contact with other women fishers has increased the fishing business	342	1	5	4.44	0.86	19
My Connections with other fishers have increased my customers	342	1	5	4.46	0.83	18
Interactions in the BMUs have influenced my Sales Volume	342	1	5	4.53	0.78	17
Because of connections, my Business has grown to a higher level	342	1	5	4.49	0.84	18
I have recorded Increased Business Income due to my contact with other fish businesswomen	342	1	5	4.06	0.99	21
Composite Mean				**4.41**	**0.86**	**19**

Source: Primary data (2023)

Table 7 presents findings that demonstrate the mean range between 4.06 and 4.53. This reveals that women-owned small-scale fish entrepreneurs embrace the significance of group networking for their enterprise resilience. The highest mean value (M=4.53, SD =0.78) implied that group networking remains instrumental in the realization of sales expansion among the small-scale fish entrepreneurs owned by women. Even though, the role of networking in determining increased business income reported a relatively low mean of (M=4.060, SD = 0.860), most likely it pointed out that networking is not highly instrumental in supporting increased business income.

Correlation analysis was used in the study to measure the relationship between networking and resilience. It describes the direction, strength of the relationship, and the level of significance. In this study, the correlation analysis used the Pearson product-moment technique to determine the relationship between fishers networking and the resilience of small-scale fishers owned by women. The results are summarized in Table 8.

Table 8: Correlation Matrix for Fishers networking and sustainability of small-scale fisheries

		Fishers networking	Profit reinvest	Fish waste recycling	Security of Tenure	Knowledge in Fisheries	Technology in fisheries	(composite) Sustainability of small-scale fisheries
Fishers networking	Pearson Correlation	1	.436**	.497**	.310**	.416**	.335**	.591**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000
	N	342	342	342	342	342	342	342

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Research Data (2023)

The correlation results in Table 8 indicate positive and significant coefficients between Fishers' networking and indicators of the sustainability resilience of small-scale fisheries. Fishers networking was found to have a moderate and statistically significant relationship with Profit reinvestment (r = 0.436, p-value< 0.01), fishers networking had a moderate and significant relationship with both fish waste recycling and knowledge in fisheries having (r =.497, p-value< 0.01) and (r =.416, p-value< 0.01) respectively. However, fishers' networking had a weak, positive, and significant relationship with the security of tenure, having (r =.310, p-value< 0.01). Fisher networking had a weak, positive, and significant relationship with technology in fisheries, having ((r =.335, p-value< 0.01). Finally, overall, fishers' networking had a moderate and significant relationship (r= .591, p-value<0.01) with the composite Sustainability of fisheries.

The objective of the study was to examine the contribution of fishers' networking as a resilience measure of small-scale fisheries of women in Homa-Bay County, Kenya. The literature and empirical evidence suggested that fishers' networking would be associated with the sustainability resilience of women's fisheries. To analyze the objective, the following hypothesis was tested using a simple linear regression model. The hypothesis is that Fishers' networking does not significantly influence the sustainability resilience of small-scale fisheries by women in Homa Bay County. The results are presented in Table 9.

Table 9: Regression Results of Contribution of Fishers networking on Sustainability resilience of fisheries

Summary of the Model						
	R	**R^2**	**Adj. R^2**	**SEE**		
	.591	.349	.347	.31020		
Analysis of Variances (ANOVA)						
		Sum Squares	**Df**	**Mean Square**	**F**	**P-Value**
	Regression	17.795	1	17.795	184.932	.000
	Residual	33.197	341	.096		
	Total	50.992	342			

Regression Coefficients						
		Unstandardized Coefficients		Standardized Coefficients	t	P-Value
		B	SE	Beta		
	(Constant)	2.264	.123		18.355	.000
	Fishers Networking	.376	.028	.591	13.599	.000
a. Dependent Variable: Sustainability resilience b. Predictors: (Constant), Fishers networking						

The study findings in Table 9 showed the effect of the fishers' networking activities on the sustainability of women's fisheries.

The study found a moderately strong influence between fishers' networking activities and the sustainability resilience of women's fisheries (R=0.591). The coefficient of determination, R^2= 0.349, indicates that fishers' networking activities explain 34.9% of variations in the resilience of women's fisheries. The **β** coefficient indicated that fishers' networking activities had a statistically significant influence on the resilience of women's fisheries (**β=0.591, t=13.599, p<0.05).** The regression results indicated that a unit increase in fisheries networking activities causes an increase of 59.1% in the resilience of women's fisheries. This further indicates that fishers' networking positively and significantly influenced resilience. The overall F-statistic was F (1,341) =184.93, p<0.05, suggesting that there was a statistically significant relationship between fishers' networking activities and resilience.

Using the statistical findings, the regression model can be substituted as follows;

SUS=2.264+0.591NT

Whereas, SUS Sustainability resilience of fisheries by women.
NT Fishers networking activities.

Drawing from the above findings, it can be established that there was a significant positive relationship between fishers' networking activities and the resilience of fisheries. This led to the rejection of the null hypothesis which stated that Fishers' networking does not significantly influence the sustainability of small-scale fisheries by women in Homa Bay County. The current outcomes from this study are comparable with the previous findings documented in empirical literature relating to the relationship between networking and sustainability. Analogous findings are reported by Abbas et al., (2019) who posited that networking offers a platform that figures out and shapes venture connectivity resulting in enterprise sustainability. While Díaz-Reviriego, et al., (2017), established that the networking dimension of social capital remains a driving force towards disseminating fishing knowledge essential for business longevity and maximizing fish resource utilization. Furthermore, in the local context, the findings concur with Malit et al. (2021) who pointed out, the role of networking in determining market outlet choices and fish value chain sustainability.

Resilience in small-scale fisheries in this context is a practice to salvage low-income households from livelihood deficiency. Furthermore, it appears to influence the viability of other wild species that form part of the ecosystem of the fishing communities. Resilience in small-scale fisheries among women has the potential to support the livelihood of households in a society in the context of food security nutritional supply, income, and employment. Indeed, society and its components ought to serve the needs of not only the current but also future generations. In this context, networking as a pillar of enterprise progress has the potential to link up different women players in the fish enterprise value chain and address the challenges of the present business without compromising on the future needs of the entrepreneurs and society at large. Networking cannot be ignored while addressing resilience in small-scale fisheries. Indeed, networking is a synergy factor in coordinating social, environmental, and economic interests considering the livelihood benefits that accrue from the fisheries. The contests facing the fishery sector are enormous, ranging from climate dynamics, overfishing, constantly declining fish stocks, and ineffective fisheries value chain. Furthermore, increasing fishing pressure due to increasing illegalities on account of weak enforcement management measures, encroachment of fishers into fish breeding areas, inadequate infrastructure for fish processing, quality, and safety assurance, as well as climate change seems to have a partial solution through effective networking. Collectively, networking may address such inconsistencies of small-scale fisheries by women entrepreneurs in the supply chain.

The study brought to light various issues and sentiments that require further investigation. On this account, some of the implications and limitations of this study open up recommendations for further studies. While this study successfully established the contribution of networking to the sustainability of small-scale fisheries by women, it equally presented enormous prospects to direct future research. Further research can also investigate other variables that could moderate this relationship, and may equally take the initiative to navigate the possibility of the presence of mediating variables in establishing the relationship between networking and sustainability in small-scale fisheries by women. Given that this study focused on small-scale fisheries in Homa-Bay County, Kenya, it is recommended that a similar study be replicated covering large-scale fisheries, especially in marine and ocean waters. Indeed, the study can also be replicated in other developing countries to establish if similar results can be obtained. There is a need to expand research on the dimensions of sustainability predictors beyond the four dimensions of social capital used in this study. This should include factors such as women's culture and women’s subordination.

The findings from this study provide a strong indication that the resilience of small-scale fisheries is influenced by fishers networking. This implies that players in the sector should align their operation context to embrace networking dimensions as drivers of their practice to achieve resilience. Players should put in place and emphasize networking-related practices. In addition, problems affecting the sector such as unpredictable fluctuating prices, and poor storage and transportation facilities can be approached through collective effort or by sharing relevant information through networking. These practices would enhance resilient returns, and build more knowledge for the management of fisheries.

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