Advances in Aquaculture and Fisheries Management Vol. 2 (5), pp. 143-156, May, 2014. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Economic and sociological distinctiveness of fish workers in Western Kenya

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Accepted 25 April, 2014

This paper analyzes and discusses the socio-economic characteristics of fish workers, with a focus on those based on the Kenyan shores of Lake Victoria. In particular, the paper considers the characteristics of fish workers in general and by type of fish work, beach location and income diversification strategy. Although, many characteristics of the fish workers were identified, six characteristics stood out: (1) 20% of the fish workers had secondary education, while 80% had primary or no formal education; (2) a fish worker had an average of seven dependents; (3) 98% of the fishers were males, while 83% of fish traders were females; (4) around 26% of fish workers had diversified their income; (5) 64% of the fish workers lived below the poverty line; and (6) fish workers who diversified income had lower incidence and depth of poverty. The results implied that income diversification is a potential way out of poverty among fish workers.

Key words: Fish workers, socio-economic characteristics, poverty, income diversification.

INTRODUCTION

Fishing communities comprises of both fish workers and their households. Fish workers, on the other hand, can be defined as individuals engaged in fishing and related activities such as fish processing and trade and rely on fish work as their main livelihood activity. Specifically, fish workers can be distinguished into two sub-groups, namely; fishers and fish traders. Fishers generally include individuals who are directly engaged in fishing (for example, vessel owners, managers, operators and crew members). On the other hand, fish traders include those who buy and sell raw and/or processed fish.

Past studies have established that fishing communities in developing countries are among the poorest communities (Panayotou, 1985, 1988; Platteau, 1989; Jansen, 1997; Bene, 2004; Nevin, 2005; Salagrama, 2006). In addition, the rate of poverty of the fishing communities is increasing over time (Salagrama, 2006).

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There is therefore, a need to reduce poverty among these communities. The first step in developing effective strategies for reducing poverty among the fishing communities is to understand their socio-economic characteristics. However, few studies have extensively analyzed their socio-economic characteristics. This study attempts to fill this research gap by undertaking an in-depth analysis of the socio-economic characteristics of fishing communities, with a focus on those living in Western Kenya. The focus on this group is motivated by the strong evidence of high and increasing poverty amongst fish workers (Reynolds and Greboval, 1988; Jansen, 1997; Wilson, 1998; Okeyo-owuor, 1999; Abila, 2000; McCormick and Mitullah, 2002; GoK, 2005b; Omwega, 2006).

In particular, the study analyzes the socio-economic characteristics of fish workers as a whole, as well as, by type of fish work (fishers versus fish traders), by beach location (export beach versus non-export beach) and by income diversification strategies (specialize in fish work and diversify into farm work or non-agricultural work).

Table 1. Sample of fish workers by beach location and type of fish work.

Beach	Fishers	Fish traders	Total
Uhanya	75	76	151
Ogal	76	75	151
Total	151	151	302

MATERIALS AND METHODS

Procedures

The characteristics of fish workers are analyzed using descriptive statistics and tests for differences in the descriptive statistics across various groups of fish workers. The analysis is divided into four levels. The first level involves calculating the descriptive statistics (means and standard deviations) for all fish workers (fishers and fish traders). The second level involves calculating the descriptive statistics for fish workers disaggregated by the type of fish work (that is, fishers versus fish traders). Two-group mean-comparison test (for continuous variables), Wilcoxon rank-sum test (for variables expressed in percentages/proportions) and Fisher"s exact test (for dummy variables) are then used to evaluate whether fish worker characteristics differ significantly across the type of fish work.

In the third level, fish worker characteristics are disaggregated by beach location (that is, export versus non-export beaches). The same tests used in the second level (two-group mean-comparison test, Wilcoxon rank-sum test and Fisher"s exact test) are used to evaluate whether fish worker characteristics differ significantly across beach location. The fourth level involves calculating the descriptive statistics for fish workers disaggregated by income diversification strategy (that is, they specialize in fish work and diversify into farm or non-agricultural work). One-way ANOVA[1] and Fisher"s exact test (for dummy variables) are used to evaluate whether fish worker characteristics differ significantly across income diversification strategies.

In all the analyses, a 10% level of significance was used as the cut-off for determining whether a variable differs significantly across the different groups. The cut-off was chosen considering the sample size of the data used. STATA software was used in all the analyses. Park (2008), Norusis and SPSS Inc. (1994), Fisher (1934) and Morgan et al. (2004) in their studies, give a detailed explanation of the two-group mean-comparison test, Wilcoxon rank-sum test, Fisher"s exact test and One-way ANOVA respectively.

Data

The data used in this study was collected in 2004 from two beaches on the Kenyan shores of Lake Victoria. The two beaches are known as Uhanya and Ogal. Uhanya is a large export beach, while Ogal is a small non-export beach[2]. The large export beach (Uhanya) is well integrated into the Nile perch (*Lates niloticus*) export supply chain and the non-export beach (Ogal) is not integrated into the export supply chain. Consequently, Ogal beach supplies fish to the local markets. Both beaches are in Nyanza province, Western Kenya, an area characterized by high rates of poverty.

The two beaches were selected purposively after consultation with the Western Region Director of fisheries. Two groups of fish workers were surveyed at the selected beaches: (1) fishers, including boat owners, managers and crew members; and (2) artisanal fish traders. At each of the beaches, a list of fishers registered with the Beach Management Unit (BMU) was used as a sampling frame for selecting fishers at random. The sample of artisanal fish traders was obtained from registered traders and traders identified with random sampling through the snowball methods. Structured questionnaires were then administered to sample of fishers and fish traders in the two beaches. The structured survey was accompanied by semi-structured interviews with key informants. Further, a focus group was undertaken with fishers and artisanal fish traders at each beach. The original aim of this survey was to explore the extent and ways in which the local population around the Kenyan shores of Lake Victoria has been impacted by the establishment and growth in Nile perch exports, but this data was also used to analyze the socio-economic characteristics of fish workers, including their degree of income diversification.

The sample consists of 151 fishers and 151 fish traders, giving a total of 302 fish workers. However, six observations were removed from the sample because of missing or outlier income values, leaving 296 observations. Of the six, three observations had missing income values while the remaining three had outlier income values. All the six removed observations were fish traders. Table 1 shows a breakdown of the sample by type of fish work and the beach location, including the six removed observations.

RESULTS AND DISCUSSION

Characteristics of all fish workers

Income diversification, income and poverty

Around 26% of fish workers had diversified income into non-fish work, while 74% specialized in fish work (Table 2). Of the 26% who had diversified their income, 12% undertook farm work, while the remaining 14% undertook non-agricultural work. Seventy-one percent of those who undertook non-agricultural work were involved in small-scale enterprises such as ready-to-eat foods stalls, fruit and vegetable stalls, tailor shops, barber shops and saloons. Other non-agricultural activities were comprised of construction work, boat repair, photography and pastoral work. None of the fish workers undertook both farm work and non-agricultural work. On the average, fish workers earned Kshs10,671 per month from fish work, Kshs 1,252 per month from farm work and Kshs 774 per month from non-agricultural work. The average total income was Kshs 12,698 per month.

Sixty-four percent of the fish workers lived below the

[1] One-Way ANOVA is used for both continuous and percentage/proportion variables since the Wilcoxon rank-sum test cannot be applied to more than two groups.

[2] There may be some fish exports coming from Ogal beach but these fish quantities are considered negligible. As a result, Ogal can be referred to as non-export beach in general terms.

Table 2. Descriptive statistics for all fish workers (fishers and fish traders).

Variable	Mean	Std. dev.	Min	Max
Income diversification, income and poverty				
Income diversification decision into non-fish work (1 if yes; 0 otherwise)	0.260	0.439	0	1
Income diversification decision into farm work (1 if yes; 0 otherwise)	0.118	0.323	0	1
Income diversification decision into non-agricultural work (1 if yes; 0 otherwise)	0.142	0.350	0	1
Small-scale enterprises (1 if owns; 0 otherwise)	0.101	0.302	0	1
Other activities (1 undertakes; 0 otherwise)	0.041	0.198	0	1
Fish income (Kshs/month)	10,671	16,323	100	84,400
Farm income (Kshs/month)	1,252	6,373	0	60,000
Non-agricultural income (Kshs/month)	774	3,809	0	36,327
Total income	12,698	19,003	100	84,400
Incidence of poverty (1 if poor, 0 otherwise)	0.635	0.482	0	1
Depth of poverty (proportion)	0.401	0.368	0	0.997
Individual characteristics				
Gender of the fish worker (1 if male; 0 if female)	0.584	0.494	0	1
Age of the fish worker (yrs)	35.932	11.276	17	68
Education of the fish worker (1 if secondary; 0 otherwise)	0.203	0.403	0	1
Marital status (if married; 0 otherwise)	0.780	0.415	0	1
Number of dependents	6.892	3.703	1	27
Fish work characteristics				
Type of fish work (1 if fisher; 0 if fish trader)	0.510	0.501	0	1
Occupation before fish work				
Student (1 if yes; 0 otherwise)	0.243	0.430	0	1
Farm work (1 if yes; 0 otherwise)	0.247	0.432	0	1
Non-agricultural work (1 if yes; 0 otherwise)	0.368	0.483	0	1
Unemployed (1 if yes; 0 otherwise)	0.142	0.350	0	1
Position in fish enterprise (1 if owner; 0 otherwise)	0.611	0.488	0	1
Experience in fish work (yrs)	9.599	8.697	1	50
Percent of Nile perch in fish enterprise	59.358	43.413	0	100
Percent of omena in fish enterprise	21.149	38.726	0	100
Percent of tilapia in fish enterprise	18.074	32.688	0	100
Higher fish landings (1 if higher; 0 otherwise)	0.064	0.246	0	1
No change in fish landings (1 if no change; 0 otherwise)	0.125	0.331	0	1
Lower fish landings (1 if lower; 0 otherwise)	0.811	0.392	0	1
Locational factors				
Beach (1 if export beach; 0 if non-export beach)	0.507	0.501	0	1
Institutional factors				
Membership of an association (1 if member; 0 otherwise)	0.432	0.496	0	1
Cooperative society (1 if member; 0 otherwise)	0.311	0.464	0	1
Women"s Group (1 if member; 0 otherwise)	0.088	0.284	0	1
Welfare association (1 if member; 0 otherwise)	0.020	0.141	0	1
Both cooperative and women"s group (1 if member; 0 otherwise)	0.003	0.058	0	1
Both women's group and welfare association (1 if member; 0 otherwise)	0.010	0.100	0	1
Access to loans/financial assistance (1 if access; 0 otherwise)	0.514	0.501	0	1
Risk factors				
Higher fish income variance (1 if higher; 0 otherwise)	0.608	0.489	0	1
No change in fish income variance (1 if no change; 0 otherwise)	0.118	0.323	0	1
Lower fish income variance (1 if lower; 0 otherwise)	0.274	0.447	0	1
Sample size	296			

poverty line[3]. This figure compared well with the incidence of poverty of about 65% reported for Nyanza province by the Kenyan government (GoK, 2005a). Moreover, the income of fish workers living below the poverty line on the average was 40% below the poverty line. In terms of income distribution, 53% of fish workers earned a total income of less than Kshs 5,000 per month, 28% earned between Kshs 5,000 and 20,000 per month, while 19% earned more than Kshs 20,000 per month.

Individual characteristics

About 58% of the fish workers were males, while 42% were females. The average age of a fish worker was 36 years, with a standard deviation of 11. Only 20% of the fish workers had secondary education, while 80% had primary or no formal education. Overall, this shows a very low level of education. The low level of education may be partly explained by the fact that about 24% of fish workers dropped out from school to join fish work. The fish workers may have dropped out from school because education is not a major requirement in undertaking fish work. Seventy-eight percent of the fish workers were married, while 22% were single.

On the average, a fish worker had seven dependents, with a standard deviation of four. The large number of dependents may be partly due to the high prevalence of HIV/AIDS which has increased death rates of productive persons, requiring other people (especially, the relatives of the deceased) to care for their children (Abila, 2000; Mwakubo et al., 2007). Recent research conducted on HIV/AIDS in fisheries suggested that fishing communities in developing countries are among the socio-economic groups with the highest prevalence of HIV/AIDS (Ainsworth and Semai, 2000; McCormick and Mitullah, 2002; Allison and Seeley, 2004a, b; Kissling et al., 2005; FAO, 2006; Bene and Merten, 2008). The high number of dependents may also be due to the assertion that larger families are a source of wealth.

The results on the individual characteristics of fish workers are consistent with the findings of Mwakubo et al. (2007) who reported that fishers in the Yala swamp, on the Kenyan coast of Lake Victoria have an average age of 38 years, with an average of seven dependents. They also noted that the formal schooling for the fishers averages about eight years, suggesting that the majority of the fishers have a primary school level of education.

Fish work characteristics

Fifty-one percent of the respondents were fishers, while 49% were fish traders. Before joining fish work, 24% of the respondents were students, 25% undertook farm work while 37% undertook non-agricultural work and 14% were unemployed. About 61% of the fish workers were fish enterprise owners, while 39% were employees. On the average, the fish workers had 10 years of experience in fish work with a standard deviation of nine. A fish enterprise on average consisted of 60% of Nile perch (*L. niloticus*), 21% of omena (*Rastrineobola argentea*) and 18% of tilapia (*Oreochromis*)[4]. These statistics confirmed earlier findings that Nile perch, omena and tilapia dominated the fish catches of Lake perch (Geheb et al., 2008). Six percent of respondents indicated that fish landings had increased, 13% indicated no change in fish landings, while 81% of the fish workers indicated that fish landings had decreased. The perception of decreased fish landings confirmed the statistics of Kenyan government (published by the Kenya National Bureau of Statistics) and results of case studies (for example, Muhoozi, 2002) which show a decline in fish landings.

Institutional factors

Institutional factors were captured through membership of an association and accessibility to loans and other financial assistance. Associations identified in the data set comprise cooperative societies, women groups and welfare associations. Cooperative societies are member-based organizations that mobilize voluntary savings in the form of shares and provide credit to the members (Abila, 2002). Women groups, commonly known as merry-go-rounds, are small groups who meet to make fixed contributions at given intervals (for example, 12 women might meet monthly to contribute a given amount of money each) and by turns, each member gets the pool. Those who are yet to receive the pool are savers and members who have already received the pool are debtors (Vonderlack and Schreiner, 2002). Welfare associations are designed mainly to assist members during periods of tragedy such as floods, famine and bereavement.

In general, 43% of the fish workers were members of an association. Specifically, 31% of the fish workers were members of cooperative societies, nine percent were members of women groups, 2% were members of welfare associations, 0.3% were members of both cooperative societies and women groups and 1% were members of both women groups and welfare associations. Fifty-one percent of the fish workers had access to loans and other financial support when needed.

[3]The poverty line is Kshs 1,238.90/person/month times the number of dependents (Government of Kenya, 2004). The incidence of poverty is the percent prevailed by the fish workers who are below the poverty line.

[4]The averaging of fish enterprises is supported by the evidence in the data that a significant proportion of fish workers diversify across different types of fish. In particular, the data shows that 44% of fish workers specialize in Nile perch, 16% specialize in omena, and seven percent specialize in tilapia, while the rest 33% diversify across the three types of fish.

Risk factors

A breakdown of the risk perception variable showed that 61% of the fish workers reported an increase in fish income variance, 12% reported no change in fish income variance, while 27% reported a reduction in fish income variance.

Characteristics of fish workers by type of fish work

Income diversification, income and poverty

Fishers and fish traders differed significantly in terms of the level of fish income and total income at the 10% level of significance (Table 3). However, they did not differ on the degree of income diversification, farm income and non-agricultural income, the incidence of poverty and depth of poverty. Thirty percent of fishers had diversified their income compared to 22% of fish traders. Fourteen percent of fishers undertook farm work compared to 10% of fish traders. In addition, 16% of fishers undertook non-agricultural work when compared to 12% of fish traders.

The average fish income for fishers was Kshs 9,049 per month when compared to Kshs 12,360 per month for fish traders. Additionally, the average farm income for fishers was Kshs 896 per month as compared to Kshs 1,623 per month for fish traders. The average non-agricultural income for fishers was Kshs 764 per month for fishers when compared to Kshs 785 per month for fish traders. On average, fishers earned a total income of Kshs 10,710 per month as compared to Kshs 14,767 per month earned by fish traders.

Sixty-three percent of fishers were below the poverty line as compared to 64% of fish traders, implying that the incidence of poverty was similar for the two groups. On the same note, the depth of poverty was 40% for both fishers and fish traders. In terms of income distribution (Figure 1), 53% of fishers earned a total income of less than Kshs 5,000 per month when compared to 54% of fish traders. In addition, 30% of fishers earned between Kshs 10,000 and Kshs 20,000 per month as compared to 26% of fish traders. Further, 17% of fishers earned more than Kshs 20,000 per month compared to 20% of fish traders. These statistics indicated that the distributions of income for fishers and fish traders follow an analogous pattern.

Individual characteristics

Fishers and fish traders differed significantly on gender and age at the 1% level of significance. However, the two groups did not differ on education, marital status and the number of dependents. Ninety-eight percent of the fishers were males, while 83% of fish traders were females. The statistics on gender implied that fishing was carried out mainly by men while fish trade was mainly carried out by women. Similar evidence is given by Bene and Merten (2008) who noted that although fish trade is undertaken by both men and women, women have a strong hold on fish trade. The average age of fish traders was 38 years as compared to 34 years for fishers. These statistics indicated that on the average, fishers were younger than fish traders.

Fish work characteristics

According to the fish work characteristics, fishers and fish traders differed in terms of the occupation before fish work, position in the fish enterprise, experience in fish work, percent of Nile perch in the fish enterprise and percent of omena in the fish enterprise at the 10% level of significance or better. However, they did not differ on the percent of tilapia in the fish enterprise and perceptions of fish landings. Before joining fish work, 42% of the fishers were students, 27% undertook farm work while 29% undertook non-agricultural work and 3% were unemployed. In comparison, 6% of the fish traders were students, 23% undertook farm work and 46% undertook non-agricultural work while 26% were unemployed.

About 42% of fishers owned their fish enterprises as compared to 81% of fish traders. This result reflects the fact that owning and maintaining a boat is expensive for fishers, while fish trading (especially, small-scale fish trading) requires little capital to start and is relatively simple, not requiring any special manual or intellectual skills (Bene and Merten, 2008). The average fish work experience for fishers was 11 years compared to eight years for fish traders. Thus, fishers were on the average, more experienced in fish work than fish traders. A fishing enterprise on average consisted of 64% of Nile perch catch, 16% of omena catch and 19% of tilapia catch. On the contrary, a fish trading enterprise on average consisted of 54% Nile perch, 26% omena and 17% tilapia. The statistics on fishing/fish trading enterprises showed that fishers participated more in Nile perch fishing while fish traders participated more in omena trade.

Institutional factors

Fishers and fish traders also differed significantly on the rate of membership of associations at the 1% level of significance. However, the two groups did not differ according to access to loans and financial assistance. Thirty-six percent of fishers were members of associations compared to 51% of fish traders. Specifically, 36% of fishers were members of the cooperative societies. On the other hand, 26% of the fish traders were members of cooperative societies, 18%

Table 3. Descriptive statistics of fish workers by type of fish work.

Variable	Fishers		Fish traders		Two-group mean-comparison test (t value)	Fisher's exact test/rank-sum test (p-value)
	Mean	Std. dev.	Mean	Std. dev.		
Income diversification, income and poverty						
Income diversification decision into non-fish work (1 if yes; 0 otherwise)	0.298	0.459	0.221	0.416		0.146
Income diversification decision into farm work (1 yes; 0 otherwise)	0.139	0.347	0.097	0.296		0.284
Income diversification decision into non-agricultural work (1 if yes; 0 otherwise)	0.159	0.367	0.124	0.331		0.410
Small-scale enterprises (1 if owns; 0 otherwise)	0.113	0.317	0.090	0.287		0.567
Other activities (1 undertakes; 0 otherwise) Fish income (Kshs/month)	0.046	0.211	0.034	0.183		0.770
	9,049	12,270	12,360	19,581	-1.750*	
Farm income (Kshs/month) Non-agricultural income (Kshs/month)	896	5,481	1,623	7,187	-0.980	
	764	3,522	785	4.098	-0.046	
Total income	10,710	14,948	14,767	22,329	-1.844*	
Incidence of poverty (1 if poor, 0 otherwise)	0.629	0.485	0.641	0.481		0.904
Depth of poverty (proportion)[R]	0.403	0.375	0.398	0.362		0.883
Individual characteristics						
Gender of the fish worker (1 if male; 0 if female)	0.980	0.140	0.172	0.379		0.000***
Age of the fish worker (yrs)	34.252	11.788	37.683	10.472	-2.644***	
Education of the fish worker (1 if secondary; 0 otherwise)	0.219	0.415	0.186	0.391		0.563
Marital status (if married; 0 otherwise)	0.801	0.400	0.759	0.429		0.402
Number of dependents	6.993	4.032	6.786	3.336	0.481	
Fish work characteristics						
Occupation before fish work						
Student (1 if yes; 0 otherwise)	0.424	0.496	0.055	0.229		0.000***
Farm work (1 if yes; 0 otherwise)	0.265	0.443	0.228	0.421		0.501
Non-agricultural work (1 if yes; 0 otherwise)	0.285	0.453	0.455	0.500		0.003***
Unemployed (1 if yes; 0 otherwise)	0.026	0.161	0.262	0.441		0.000***
Position in fish enterprise (1 if owner; 0 otherwise)	0.417	0.495	0.814	0.391		0.000***
Experience in fish work (yrs)	11.382	10.027	7.743	6.589	3.675***	
Percent of Nile perch in fish enterprise[R]	64.437	42.168	54.069	44.198		0.033**
Percent of omena in fish enterprise[R]	16.424	34.782	26.069	42.004		0.035**
Percent of tilapia in fish enterprise[R]	19.007	33.040	17.103	32.402		0.269
Higher fish landings (1 if higher; 0 otherwise)	0.086	0.281	0.041	0.200		0.155
No change in fish landings (1 if no change; 0 otherwise)	0.093	0.291	0.159	0.367		0.113
Lower fish landings (1 if lower; 0 otherwise)	0.821	0.384	0.800	0.401		0.659
Locational factors						
Beach (1 if export beach; 0 if non-export beach)	0.510	0.502	0.503	0.502		1.000

Table 3. Contd.

Institutional factors					
Membership of an association (1 if member; 0 otherwise)	0.358	0.481	0.510	0.502	0.010***
Cooperative society (1 if member; 0 otherwise)	0.358	0.481	0.262	0.441	0.080*
Women‟s Group (1 if member; 0 otherwise)	0.000	0.000	0.179	0.385	0.000***
Welfare association (1 if member; 0 otherwise)	0.000	0.000	0.041	0.200	0.013**
Both cooperative and women‟s group (1 if member; 0 otherwise)	0.000	0.000	0.007	0.083	0.490
Both women's group and welfare association (1 if member; 0 otherwise)	0.000	0.000	0.021	0.143	0.116
Access to loans/financial assistance (1 if access; 0 otherwise)	0.497	0.502	0.531	0.501	0.563
Risk factors					
Higher fish income variance (1 if higher; 0 otherwise)	0.556	0.498	0.662	0.475	0.074*
No change in fish income variance (1 if no change; 0 otherwise)	0.106	0.309	0.131	0.339	0.590
Lower fish income variance (1 if lower; 0 otherwise)	0.338	0.475	0.207	0.406	0.013**
Sample size	151		145		

two-group mean-comparison test compares the means of continuous variables; $difference = mean\ (fisher) - mean\ (fish\ trader)$; $H_0 : difference = 0$; $H_1 : difference \neq 0$. Fisher's exact and rank-sum tests are non-parametric tests for dummy and percentage/proportion variables respectively; ***, **, * denote statistical significance at the one percent, five percent and 10 percent levels, respectively; ^{R} denotes variables on which rank-sum tests are applied.

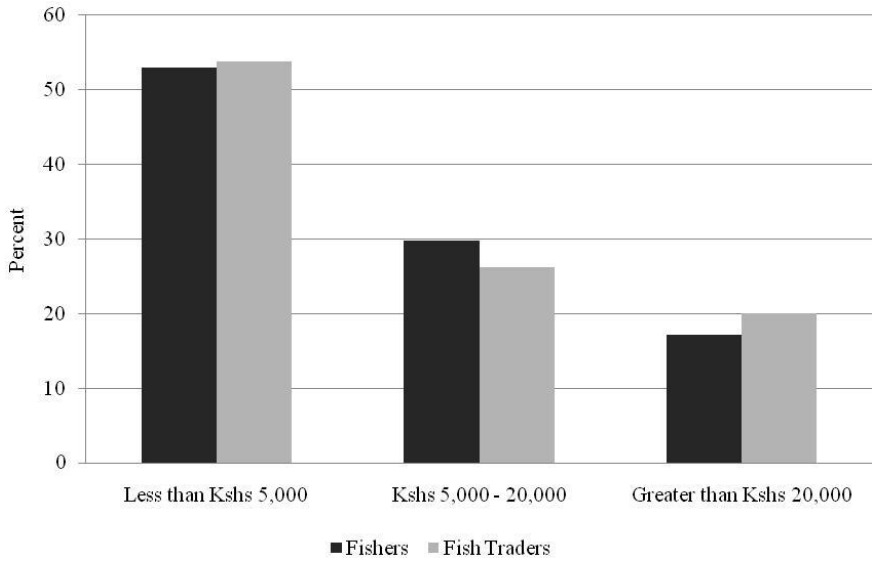

Figure 1. Distribution of total income among fishers and fish traders.

were members of women groups, 4% were members of welfare associations, 0.7% were members of both cooperative societies and women groups while 2% were members of both women groups and welfare associations.

Risk factors

Perceptions of higher fish income variance and lower fish income variance differed significantly across fishers and fish traders at the 10 and 5% levels of significance respectively. However, the two groups did not differ on the perception of no change in fish landings. Fifty-six percent of fishers reported an increase in fish income variance as compared to 66% of fisher traders. On the other hand, 34% of fishers reported a reduction in fish income variance compared to 21% of fish traders.

Characteristics of fish workers by beach location

Income diversification, income and poverty

Fish workers at the export and non-export beaches differed significantly on the degree of income diversification into non-agricultural work, fish income, non-agricultural income, total income, the incidence of poverty and depth of poverty at the 10% level of significance or better (Table 4). However, they did not differ on the degree of income diversification into farm work and farm income. Thirty percent of fish workers at the export beach had diversified their income when compared to 22% at the non-export beach. Eleven percent of fish workers at the export beach undertook farm work compared to 12% at the non-export beach. Nineteen percent of fish workers at the export beach undertook non-agricultural work compared to 10% at the non-export beach.

The average fish income for fish workers at the export beach was Kshs 16,778 per month as compared to Kshs 4,397 per month at the non-export beach. The average farm income was Kshs 1,716 per month for fish workers at the export beach compared to Kshs 775 per month for those at the non-export beach. Additionally, the average non-agricultural income for fish workers at the export beach was Kshs 1,213 per month compared to Kshs 323 per month for those at the non-export beach. On average, fish workers at the export beach earned a total income of Kshs 19,708 per month compared to Kshs 5,495 per month for those at the non-export beach. This means that fish workers at the export beach earned four times the income earned by their counterparts at the non-export beach. The differential income may be due to increased business activity at the export beach as opposed to the non-export beach.

Forty-five percent of fish workers at the export beach were below the poverty line compared to 82% at the non-export beach. This showed that the incidence of poverty at the non-export beach was almost double that of the export beach. A similar pattern was observed in the depth of poverty which was 26% for fish workers at the export beach compared to 55% for fish workers at the non-export beach. In terms of the distribution of income (Figure 2), 31% of fish workers at the export beach earned a total income of less than Kshs 5,000 per month compared to 76% at the non-export beach. In addition, 38% of fish workers at the export beach earned between Kshs 5,000 and Kshs 20,000 per month compared to 18% at the non-export beach. Further, 31% of fish workers at the export beach earned more than Kshs 20,000 compared to 6% at the non-export beach. These statistics show that incomes at the export beach are skewed towards relatively higher levels while incomes at the non-export beach are skewed towards relatively lower levels.

Individual characteristics

Fish workers at the export and non-export beaches differed on education and the number of dependents at the 5% level of significance. However, they did not differ on gender, age and marital status. Twenty-six percent of fish workers at the export beach had secondary education compared to 14% of fish workers at the non-export beach. On average, fish workers at the export beach had seven dependents compared to six for those at the non-export beach.

Fish work characteristics

Fish workers at the export and non-export beaches differed significantly in terms of the experience in fish work, percent of Nile perch in the fish enterprise, percent of omena in the fish enterprise, percent of tilapia in the fish enterprise and perceptions of fish landings at the 10% level of significance or better. However, the two groups did not differ on the type of fish work, occupation before fish work and position in the fish enterprise. The average experience in fish work for those at the export beach was 11 years compared to eight years for those at the non-export beach. This result indicated that fish workers at the export beach had more experience in fish work than those at the non-export beach.

A fish enterprise at the export beach on average consisted of 65% Nile perch, 27% omena and 5% tilapia. On the contrary, a fish enterprise at the non-export beach on average consisted of 54% Nile perch, 15% omena and 31% tilapia. These statistics indicated that fish workers at the export beach participated more in Nile perch and omena fishing and trade compared to their counterparts at the non-export beach. On the other hand, fish workers

Table 4. Descriptive statistics of fish workers by beach location.

Variable	Export beach (Uhanya)		Non-export beach (Ogal)		Two-group mean-comparison test (t	Fisher's exact test/ rank-sum test (p-
	Mean	Std. dev.	Mean	Std. dev.	value)	value)
Income diversification, income and poverty						
Income diversification decision into non-fish work (1 if yes; 0 otherwise)	0.300	0.460	0.219	0.415		0.145
Income diversification decision into farm work (1 yes; 0 otherwise)	0.113	0.318	0.123	0.330		0.858
Income diversification decision into non-agricultural work (1 if yes; 0 otherwise)	0.187	0.391	0.096	0.295		0.030**
Small-scale enterprises (1 if owns; 0 otherwise)	0.153	0.362	0.048	0.214		0.003***
Other activities (1 undertakes; 0 otherwise)	0.033	0.180	0.048	0.214		0.569
Fish income (Kshs/month)	16,778	20,107	4,397	6,960	7.041***	
Farm income (Kshs/month)	1,716	7,898	775	4,252	1.272	
Non-agricultural income (Kshs/month)	1,213	4,745	323	2,444	2.021**	
Total income	19,708	22,832	5,495	9,795	6.926***	
Incidence of poverty (1 if poor, 0 otherwise)	0.453	0.499	0.822	0.384		0.000***
Depth of poverty (proportion)[R]	0.260	0.347	0.546	0.332		0.000***
Individual characteristics						
Gender of the fish worker (1 if male; 0 if female)	0.547	0.499	0.623	0.486		0.196
Age of the fish worker (yrs)	36.260	10.553	35.596	12.000	0.506	
Education of the fish worker (1 if secondary; 0 otherwise)	0.260	0.440	0.144	0.352		0.014**
Marital status (if married; 0 otherwise)	0.767	0.424	0.795	0.405		0.577
Number of dependents	7.320	4.012	6.452	3.312	2.027**	
Fish work characteristics						
Type of fish work (1 if fisher; 0 if fish trader)	0.513	0.501	0.507	0.502		1.000
Occupation before fish work						
Student (1 if yes; 0 otherwise)	0.207	0.406	0.281	0.451		0.175
Farm work (1 if yes; 0 otherwise)	0.253	0.436	0.240	0.428		0.789
Non-agricultural work (1 if yes; 0 otherwise)	0.400	0.492	0.336	0.474		0.279
Unemployed (1 if yes; 0 otherwise)	0.140	0.348	0.144	0.352		1.000
Position in fish enterprise (1 if owner; 0 otherwise)	0.653	0.478	0.568	0.497		0.153
Experience in fish work (yrs)	10.887	8.572	8.276	8.654	2.607***	
Percent of Nile perch in fish enterprise	64.800	45.121	53.767	40.990		0.008***
[R] Percent of omena in fish enterprise [R]	27.400	42.670	14.726	33.139		0.004***
Percent of tilapia in fish enterprise [R]	5.400	20.616	31.096	37.419		0.000***
Higher fish landings (1 if higher; 0 otherwise)	0.013	0.115	0.116	0.322		0.000**
No change in fish landings (1 if no change; 0 otherwise)	0.033	0.180	0.219	0.415		0.000***
Lower fish landings (1 if lower; 0 otherwise)	0.953	0.212	0.664	0.474		0.000***
Institutional factors						
Membership of an association (1 if member; 0 otherwise)	0.480	0.501	0.384	0.488		0.102*
Cooperative society (1 if member; 0 otherwise)	0.333	0.473	0.288	0.454		0.451

Table 4. Contd.

Women‟s Group (1 if member; 0 otherwise)	0.093	0.292	0.082	0.276	0.838
Welfare association (1 if member; 0 otherwise)	0.040	0.197	0.000	0.000	0.030**
Both cooperative and women‟s group (1 if member; 0 otherwise)	0.007	0.082	0.000	0.000	1.000
Both women's group and welfare association (1 if member; 0 otherwise)	0.007	0.082	0.014	0.117	0.619
Access to loans/financial assistance (1 if access; 0 otherwise)	0.487	0.501	0.541	0.500	0.355
Risk factors					
Higher fish income variance (1 if higher; 0 otherwise)	0.780	0.416	0.432	0.497	0.000***
No change in fish income variance (1 if no change; 0 otherwise)	0.067	0.250	0.171	0.378	0.007***
Lower fish income variance (1 if lower; 0 otherwise)	0.153	0.362	0.397	0.491	0.000***
Sample size	150		146		

two-group mean-comparison test compares the means of continuous variables; $difference = mean\ (fisher) - mean\ (fish\ trader)$; $H_0 : difference = 0$; $H_1 : difference \neq 0$. Fisher's exact and rank-sum tests are non-parametric tests for dummy and percentage/proportion variables respectively; ***, **, * denote statistical significance at the one percent, five percent and 10 percent levels, respectively. ^{R} denotes variables on which rank-sum tests are applied.

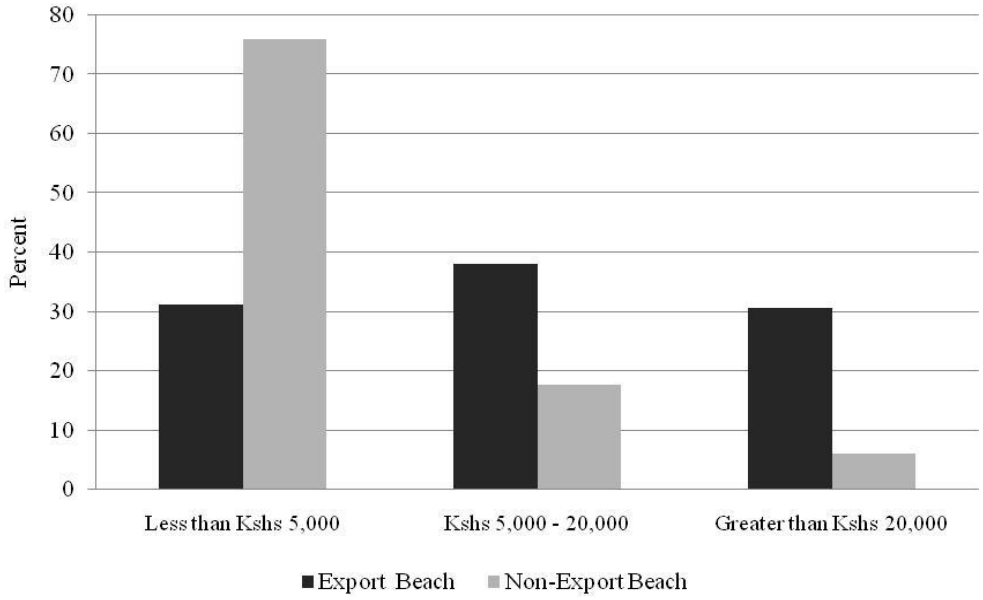

Figure 2. Distribution of total income across the export and non-export beaches.

at the non-export beach participated more in tilapia fishing and trade compared to their counterparts at the export beach. Ninety-five percent of fish workers at the export beach reported a reduction in fish landings compared to 66% at the non-export beach. The reduction in fish landings at the export beach may be due to the high demand for fish which may contribute to over-exploitation of fish resources.

Institutional factors

In terms of the Institutional factors, fish workers at the two beaches differed significantly on the rate of membership

of associations at the 10% level of significance. However, they did not differ according to access to loans and financial assistance. Forty-eight percent of fish workers at the export beach were members of associations compared to 38% at the non-export beach. Specifically, 33% of the fish workers at the export beach were members of cooperative societies, 9% were members of women groups, 4% were members of welfare associations and 0.7% were members of both cooperative societies while women groups and 0.7% were members of both women groups and welfare associations. On the other hand, 29% of the fish workers at the non-export beach were members of cooperative societies, 8% were members of the women group and 1% were members of both the women group and welfare associations.

Risk factors

Risk perception among fish workers differed significantly across the export and non-export beaches at the 1% level of significance. Seventy-eight percent of fish workers at the export beach reported an increase in the variance of fish income as compared to 43% at the non-export beach. Seven percent of fish workers at the export beach also reported no change in fish income variance compared to 17% at the non-export beach. Fifteen percent of fish workers at the export beach reported a reduction in fish income variance compared to 40% at the non-export beach.

Characteristics of fish workers by income diversification strategy

The income diversification strategies include specializing in fish work, diversifying into farm work or diversifying into non-agricultural work. For simplicity of the discussion, fish workers who specialize in fish work are referred to as "fish specializers", fish workers who diversify income into farm work are referred to as "farm diversifiers" and those who diversify income into non-agricultural are referred to as "non-agricultural diversifiers".

Income and poverty

Comparison of the three income diversification strategies showed that fish workers differed significantly in terms of total income at the 1% level of significance, and the incidence and depth of poverty at the 10% level of significance (Table 5). However, the fish workers did not differ on fish income. It can be noted that the average total income was Kshs 10,340 per month for fish specializers, Kshs 21,173 per month for farm diversifiers and Kshs 17,931 for non-agricultural diversifiers. These results indicated that farm and non-agricultural diversifiers had higher total income than fish specializers. Sixty-seven percent of fish specializers, 54% of farm diversifiers and 52% of non-agricultural diversifiers were below the poverty line. The depth of poverty was 43% for fish specializers, 36% for farm diversifiers and 29% for non-agricultural diversifiers. The incidence and depth of poverty was, therefore, lower for farm and non-agricultural diversifiers when compared to fish specializers. The distribution of income across the income diversification strategies (Figure 3) showed that 59% of fish specializers earned less than Kshs 5,000 per month when compared to 43% of farm diversifiers and 33% of non-agricultural diversifiers. In addition, 27% of fish specializers earned between Kshs 5000 and 20,000 as compared to 20% of farm diversifiers and 40% of non-agricultural diversifiers. As well, 14% of fish specializers earned more than Kshs 20,000 when compared to 37% of farm diversifiers and 26% of non-agricultural diversifiers. These statistics suggested that income diversification is associated with higher and more equitable distribution of income as compared to specialization in fish work.

Fish work characteristics

According to the results, fish workers differed significantly across income diversification strategies in terms of the occupation before fish work (that is, farm work), position in the fish enterprise and experience in fish work at the 5% level of significance or better. However, the fish workers did not differ on the type of fish work, percent of Nile perch, omena and tilapia in the fish enterprise and perceptions of fish landings. Twenty-three percent of fish specializers, 46% of farm diversifiers and 17% of non-agricultural diversifiers were farmers before they joined fish work. About 58% of fish specializers were owners of their fish enterprises as compared to 60% of farm diversifiers and 79% of non-agricultural diversifiers. On the average, fish specializers had nine years of experience in fish work, farm diversifiers had 11 years, while non-agricultural diversifiers had 12 years of experience in fish work.

Locational factors

Fish workers differed significantly across income diversification strategies with respect to beach location at the 10% level of significance. 48% of fish specializers, 49% of farm diversifiers and 67% of non-agricultural diversifiers were in the export beach. On the other hand, 52% of fish specializers, 51% of farm diversifiers and 33% of non-agricultural diversifiers were in the non-export beach.

Institutional factors

Fish workers differed significantly on membership of

Table 5. Descriptive statistics of fish workers by income diversification strategy.

Variable	Specialize in fish work		Diversify into farm work		Diversify into non-agricultural work		One-way ANOVA (F-value)	Fisher's exact test (p-value)
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.		
Income and poverty								
Fish income (Kshs/month)	10,340	16,813	10,584	14,373	12,475	15,458	0.300	
Farm income (Kshs/month)	-	-	10,589	15,832	-	-		
Non-agricultural income (Kshs/month)	-	-	-	-	5,456	8,843		
Total income	10,340	16,812	21,173	26,059	17,931	20,327	7.040***	
Incidence of poverty (1 if poor, 0 otherwise)	0.671	0.471	0.543	0.505	0.524	0.505		0.099*
Depth of poverty (proportion)	0.429	0.369	0.359	0.384	0.287	0.329	2.900*	
Individual characteristics								
Gender of the fish worker (1 if male; 0 if female)	0.548	0.499	0.714	0.458	0.667	0.477		0.096*
Age of the fish worker (yrs)	34.817	11.204	39.371	11.705	38.881	10.397	4.230**	
Education of the fish worker (1 if secondary; 0 otherwise)	0.183	0.387	0.314	0.471	0.214	0.415		0.212
Marital status (if married; 0 otherwise)	0.772	0.421	0.829	0.382	0.786	0.415		0.823
Number of dependents	6.534	3.534	8.086	4.468	7.762	3.608	4.080**	
Fish work characteristics								
Type of fish work (1 if fisher; 0 if fish trader)	0.484	0.501	0.600	0.497	0.571	0.501		0.312
Occupation before fish work								
Student (1 if yes; 0 otherwise)	0.256	0.437	0.143	0.355	0.262	0.445		0.363
Farm work (1 if yes; 0 otherwise)	0.228	0.421	0.457	0.505	0.167	0.377		0.009***
Non-agricultural work (1 if yes; 0 otherwise)	0.379	0.486	0.286	0.458	0.381	0.492		0.598
Unemployed (1 if yes; 0 otherwise)	0.137	0.345	0.114	0.323	0.190	0.397		0.558
Position in fish enterprise (1 if owner; 0 otherwise)	0.580	0.495	0.600	0.497	0.786	0.415		0.037**
Experience in fish work (yrs)	8.824	8.003	11.257	9.790	12.262	10.551	3.540**	
Percent of Nile perch in fish enterprise	58.128	43.448	64.000	42.092	61.905	44.952	0.360	
Percent of omena in fish enterprise	21.187	38.700	14.286	32.835	26.667	43.148	0.980	
Percent of tilapia in fish enterprise	19.269	33.571	18.286	31.482	11.667	28.705	0.950	
Higher fish landings (1 if higher; 0 otherwise)	0.064	0.245	0.057	0.236	0.071	0.261		0.925
No change in fish landings (1 if no change; 0 otherwise)	0.137	0.345	0.086	0.284	0.095	0.297		0.704
Lower fish landings (1 if lower; 0 otherwise)	0.799	0.402	0.857	0.355	0.833	0.377		0.712
Locational factors								
Beach (1 if export beach; 0 if non-export beach)	0.479	0.501	0.486	0.507	0.667	0.477		0.081*
Institutional factors								
Membership in an association (1 if member; 0 otherwise)	0.379	0.486	0.629	0.490	0.548	0.504		0.006***

Table 5. Contd.

Cooperative society (1 if member; 0 otherwise)	0.2511	0.4347	0.5143	0.5071	0.4524	0.5038	0.001***
Women"s Group (1 if member; 0 otherwise)	0.0913	0.2887	0.0857	0.2840	0.0714	0.2607	1.000
Welfare association (1 if member; 0 otherwise)	0.0183	0.1342	0.0286	0.1690	0.0238	0.1543	0.491
Both cooperative and women"s group (1 if member; 0 otherwise)	0.0046	0.0676	0.0000	0.0000	0.0000	0.0000	1.000
Both women's group and welfare association (1 if member; 0 otherwise)	0.0137	0.1165	0.0000	0.0000	0.0000	0.0000	1.000
Access to loans/financial assistance (1 if access; 0 otherwise)	0.461	0.500	0.714	0.458	0.619	0.492	0.007***
Risk factors							
Higher fish income variance (1 if higher; 0 otherwise)	0.616	0.487	0.514	0.507	0.643	0.485	0.458
No change in fish income variance (1 if no change; 0 otherwise)	0.123	0.330	0.143	0.355	0.071	0.261	0.632
Lower fish income variance (1 if lower; 0 otherwise) Sample size	0.260 219	0.440	0.343 35	0.482	0.286 42	0.457	0.536

One-way ANOVA tests the hypothesis that the mean of a variable significantly differs across various income diversification strategies. Fisher's exact test is a non-parametric test that evaluates whether a dummy variable significantly differs across the income diversification strategies; ***, **, * denote statistical significance at the one percent, five percent and 10 percent levels, respectively.

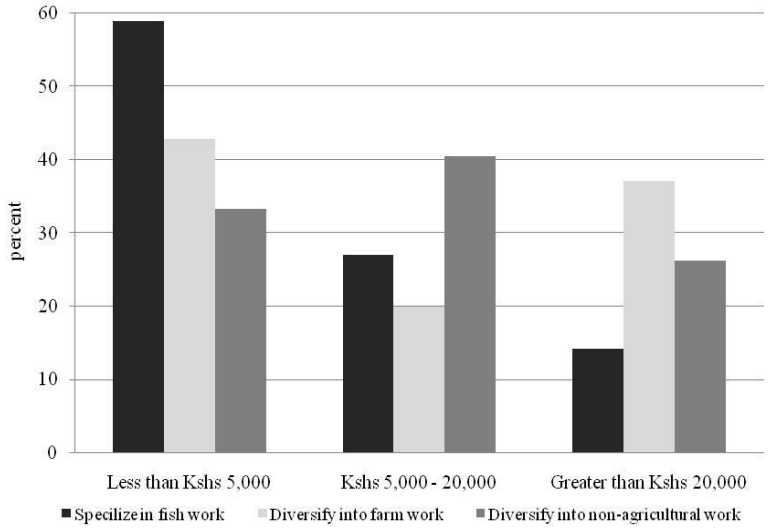

Figure 3. Distribution of total income across income diversification strategies.

associations and access to loans/financial assistance atthe 1% level of significance. Thirty-eight percent of fish specializers, 63% of farm diversifiers and 55% of non-agricultural diversifiers were members of associations. Specifically, 25% of fish specializers were members of cooperative societies, 9% were members of women groups, 2% were members of welfare associations, 0.5% were members of both cooperative societies and women groups, and 1% were members of both women groups and welfare associations. As well, 51% of farm diversifiers were members of cooperative societies, 9% were members of women groups and 3% members of welfare associations. Forty-five percent of non-agricultural diversifiers were members of cooperative societies, seven percent were members of women groups and two percent were members of welfare associations. The results also showed that 46% of fish specializers, 71% of farm diversifiers and 62% of non-agricultural diversifiers had access to loans/financial assistance.

Conclusion

This study analyzed the socio-economic characteristics of fish workers with a focus on those based on the Kenyan shores of Lake Victoria (Western Kenya). The study then discussed the characteristics of fish workers in general, and by type of fish work, beach location and income diversification strategy. Although, many characteristics of the fish workers were identified, six characteristics stood out: (1) 20% of the fish workers had secondary education, while 80% had primary or no formal education;
(2) a fish worker had an average of seven dependents;
(3) 98% of the fishers were males, while 83% of fish traders were females; (4) about 26% of fish workers had their diversified income; (5) 64% of the fish workers lived below the poverty line; and (6) fish workers who diversified income had lower incidence and depth of poverty.

The results implied that most fish workers (74%) rely on fish work as the sole income source and are therefore, vulnerable to declining and unpredictable fish catch. The impact of this vulnerability is reflected by the high poverty levels among fish workers. The results also indicated that fish workers who diversify income have lower levels of poverty. This means that income diversification should be considered as a possible strategy for reducing poverty.

ACKNOWLEDGEMENT

The authors are grateful to the African Economic Research Consortium (AERC) for providing financial support towards this research.

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