Journal of Ecosystem Sciences and Eco-Governance (JESEG)
www.jeseg.carsu.edu.ph

Special Issue | PAMS16
PRINT ISSN 2704 4394 | ONLINE ISSN 2782 8522
DOI: https://doi.org/10.54610/jeseg/4.Special_Issue.2022.001

Factors affecting attitude towards risk: The case of small-scale fishers in Guimaras

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Received: July 26, 2021
Revised: December 16, 2021
Accepted: July 13, 2022
Available Online: November 19, 2022

Cite this article: Eluriaga, L. M. T., & Zeller, L. M. L. (2022). Factors affecting attitude towards risk: The case of small-scale fishers in Guimaras, *Journal of Ecosystem Science and Eco-Governance*, **4**(Special Issue):1-11.

ABSTRACT

The presence of risk and uncertainty in the field of capture fisheries warrants an understanding of how small-scale fishers respond to these uncertainties. Previous studies showed that fishers' decision-making process is influenced by various factors, including their risk preference. Studies on this subject are scarce despite the relative importance of risk preference in explaining small-scale fisher's behavior. This study used a multiple price list experiment to elicit small-scale fisher's risk preference in Guimaras province and employed multinomial logit regression to determine socioeconomic factors influencing risk preference. The results showed that small-scale fishers are slightly risk-averse given the mean Constant Relative Risk Aversion (CRRA) coefficient of 0.20. This risk-averse attitude is significantly influenced by monthly household income, being a Pantawid Pamilyang Pilipino Program (4P's) beneficiary, and having outstanding credit. Therefore, the risk-averse attitude of small-scale fishers is an essential consideration in implementing fishery regulations and poverty alleviation programs.

Keywords: *Coefficient of relative risk aversion, multinomial logit, risk preference, small-scale fishery*

1 Introduction

Risk and uncertainty are inherent in the field of capture fisheries (Smith and Wilen, 2005; Eggert and Lokina 2007). These risks factors include the climate, environment, market operation, and institutions (Huppert et al., 1996). The fisheries sector is particularly susceptible to climate-related risks, including increasing severity and frequency of extreme weather events, rising sea surface temperature, ocean acidification, and changing fish migration patterns (Barange et al., 2018). Furthermore, fishery prices are volatile (Dahl and Oglend, 2014), affecting the fishing-related decisions of risk-averse fishers (Brick et al., 2011). Fish stock dynamics are also uncertain (Edwards et al., 2004) and are subject to various environmental disturbances.

Fisher's perception of the uncertainties associated with their livelihood is shaped by many factors, including, but not limited to, their risk preference, opinions, and socioeconomic characteristics (Saqib et al., 2016). This implies that risk behavior has a profound influence on their decision-making process. In fisheries, risk preference elicits essential information on small-scale fishers' fishing-related decisions, adaptation decisions, and compliance to fishery regulation.

However, only a few studies measured the risk preference of small-scale fishers, and results from these previous works remain inconclusive. For example, Brick et al. (2011) found that surveyed fishers in South Africa were moderately risk-averse, while Eggert and Lokina (2007) identified that only 32% of the small-scale fishers as risk-averse among the interviewed small-scale fishers in Tanzania. On the other hand, Nguyen and Leong (2009) reported that fishers in selected communities in Vietnam are less risk-averse than those engaged in other occupations. While among the commercial

fishers surveyed by Eggert and Martinsson (2003), nearly 50% of the fishers were risk-neutral.

Furthermore, risk preference is also affected by different socioeconomic factors such as household size, fishing as the primary source of income (Eggert and Lokina, 2007), age, and education (Alvarado et al., 2018). Moreover, crew size, fishing habits, and fishing hours related to their livelihood can significantly affect their attitude toward risks (Eggert and Lokina, 2007). Based on current literature, commonly employed approaches in measuring risk preference are the survey and experimental methods. The former involves asking questions about individual traits directly linked to risk preference. But this approach of eliciting risk preference showed limited incentive compatibility, resulting in a wide deviation between self-reported characteristics and the actual risk behavior of individuals (Jianjun et al., 2015). On the other hand, the latter approach uses a choice experiment to uncover people's risk preferences. Among the two, the experimental approach is more favored as it allows researchers to control the experiment. Likewise, an incentive mechanism of the experiment ensures that the elicited risk aversion parameter is affected primarily by the participants' attitudes toward risk. Hence, the resulting risk aversion parameter is more reliable and realistic (Holt and Laury, 2002; Jianjun et al., 2015).

The fishery industry in the country is comprised of aquaculture, commercial, and municipal fishery. The two sectors of capture fisheries are distinguished in terms of fishing areas and vessel capacity. As defined in the Philippine Fisheries Code, municipal capture fisheries operate in coastal waters within 15 kilometers from the coastline using vessels less than or equal to three gross tons. In terms of employment, municipal fishing employed the highest number of fishers accounting for more than one million operators out of 1,614,368 fishing operators in the country (BFAR 2016). Municipal fishers are characterized by their high dependence on fishing for their livelihood and food source and their tendency to have a deep cultural inclination in fishing as it becomes "a way of life" for them (Pomeroy, 2012). This high dependence on fishing and poor socioeconomic conditions makes them highly vulnerable to shocks confronting their livelihood (Badjeck et al., 2010).

This study employed an experimental approach to assess the risk preference of small-scale fishers in Guimaras, Western Visayas, Philippines, and examine the effects of different socioeconomic factors on their risk preference. Rampant poverty and high reliance on fishing are prevalent among fishing communities in the island province of Guimaras. In the last 20 years, two major oil spill incidents occurred, disrupting the livelihood of many fishers. Likewise, the fishery and marine resources in the province are not exempted from the threats of climate change, illegal commercial fishing activities, and the use of illegal fishing gear. The local government unit has already implemented several fishery regulations (i.e., marine reserves closed for fishing activity) to protect the marine environment and are also stringent in implementing national ordinances on illegal fishing practices. Therefore, understanding small-scale fishers' risk preference is essential in better experiencing their decision-making behavior, which could have important policy implications, especially on their possible responses to fishery management policies and shocks to their livelihood. Also, the result of this study will be an essential step in accounting for uncertainty and risk aversion in small-scale fishery, which is an emerging challenge in fisheries management.

2 Materials and Methods

Data and Data Sources

The Province of Guimaras in Western Visayas is a small island located in the southeast of Panay and northwest Negros. Guimaras is a 4th class province in the Western Visayas region. It has a total of 239.3 km of coastline. More than half of the barangays are considered coastal (56 out of 98). As of 2018, the province has a total population of 177,543, where at least 50% live in the coastal areas. Based on the provincial BFAR, there are 10,820 registered municipal fisherfolks in Guimaras. Fishing grounds include the Iloilo Strait, Panay Gulf Municipal Waters of Iloilo, Guimaras Strait, Igang Bay, and Sta. Ana Bay. Small-scale fishery plays a crucial role in the province of Guimaras. Aside from livelihood provision to many fishers, the municipal fishery in the province is also an essential source of seafood products. Primary fishing gears used by the small-scale fishers include gillnets, crab pots, longlines, and fish traps, while fish produce is mostly a combination of pelagic and demersal fisheries.

This study covered five coastal barangays that are representative of every municipality. The sample

size was equivalent to 20% of the five barangays' total registered fishers involved in marine capture fisheries. The sample size for every barangay was determined using proportionate sampling. Two hundred eighteen randomly selected small-scale fishers were then interviewed using a semi-structured questionnaire.

The household questionnaire included several sections covering fishing activities, perceptions of small-scale fishers, multiple price list experiments to elicit risk preference, and the socioeconomic profile of the household. The questionnaire was pre-tested in one coastal barangay in San Lorenzo to assess the suitability of the questions.

Multiple price list experiment

This study employed the multiple price list (MPL) experiment to elicit the risk preference of the small-scale fishers. Holt and Laury (2002) proposed this method of producing risk preference which involves asking the participants to choose between two lotteries considered safe and risky. The experimental design used for this study asks participants to choose between Lottery A and Lottery B. Lottery A is regarded as a safe choice since it is a sure game where the probability of winning the monetary payoff is 100%. On the contrary, lottery B is a probabilistic game since there is a 50% chance of winning either 100 PHP or nothing.

The matrix of payment for the experiment is presented in Table 1. There are eight replications, implying that participants must choose between the two lotteries eight times. The payoff for lottery A steadily declines from PHP 100 to PHP 20, but the probability of winning the presented amount is fixed at 100%. For lottery B, the payoff is fixed throughout the game at PHP 100 or 0 and with a constant probability of winning either amount at 50%. A toss-coin game was used as an analogy for respondents to understand better how lottery B works.

The experiment proceeded by asking the participants to choose between the two lotteries. For instance, for the first task, the participants were asked whether they would select lottery A where they could win PHP 100 or rather play a toss-coin game where if the head comes out, they win PHP 100 and nothing if it is tail. Their decision was then recorded. For the second task, they were again asked whether they would choose lottery A to win PHP 80 or rather play a toss-coin game where if the head comes out, they win PHP 100 and nothing if it is tail. This continues until the eighth task.

The experiment was carefully explained among the respondents. They were likewise informed before the experiment that after they made their choices, one task would be played for real, and the amount they could win in the actual game depends on their earlier choice. Thus, they are incentivized, to be honest, and reveal their true risk preference. The small-scale fishers randomly selected the task played for real, and they were paid with whatever amount they had won.

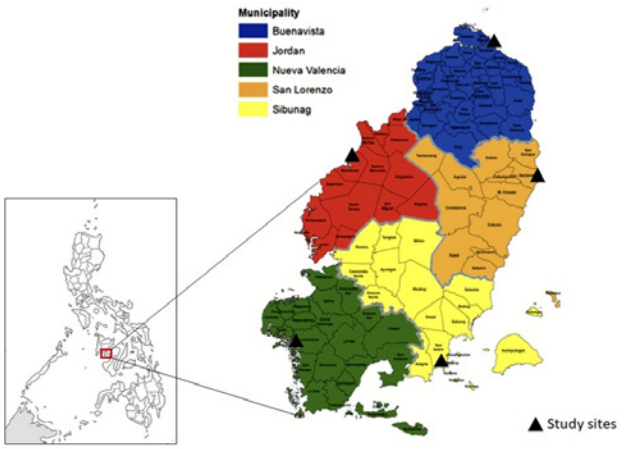

Figure 1. Location map of the province of Guimaras (Island Philippines 2021)

Table 1 presents the corresponding lower and upper bounds of the coefficient of relative risk aversion. These coefficients were already calibrated following the assumption of constant relative risk aversion utility function. Risk preference of the small-scale fishers depends on the coefficient of relative risk aversion, denoted as r in equation 1. A risk-seeking behavior is observed for values of r < 0, risk-averse for r > 0, and risk neutrality for r = 0. Following Holt and Laury (2002), a constant relative risk aversion utility function can be expressed as follow:

$$u(x) = \frac{x^{1-r}}{(1-r)} \qquad (1)$$

where:

x - the payoff in the option

r - the coefficient of relative risk aversion

Table 2 displays the classification of risk preference based on the corresponding CRRA range. The corresponding CRRA coefficient for each small-scale fisher is the midpoint of the range corresponding to where the participant switches from lottery A to lottery B. As noted, higher CRRA coefficients signify a higher aversion to risk. For example, a participant who chooses lottery A in the first five tasks and switches to lottery B on the sixth task has a CRRA coefficient between 0.41 and 0.68 and is regarded as risk-averse.

Multinomial logit of risk preference

A multinomial logit model is used to assess the effects of socioeconomic factors on the risk preference of the small-scale fishers. The dependent variable risk is constructed as a dummy variable with three categories (1 – risk-averse; 2 – risk-neutral; 3 – risk seeker). Following Greene (2012), the probabilities associated with a multinomial logit model with J choices are as follows:

$$Prob\,(Y_i = j|x_i) = P_{ij} = \frac{\exp\,(x'_i\beta_j)}{1+\sum_{k=1}^{J}\exp\,(x'_i\beta_k)}, \quad j = 0, 1, \ldots, J \qquad (2)$$

While the probability for the reference or base category can be calculated as:

$$Prob\,(Y_i = 0|x_i) = [1 - (P_{i1} + \cdots + P_{ij})] \qquad (3)$$

Table 1. Matrix of payments for the multiple price list experiment

Task	Lottery A		Lottery B				CRRA Coefficient	
	A	P(A)	B1	P(B1)	B2	P(B2)	Lower Bound	Upper Bound
1	100	1	100	0.5	0	0.5	-1.71	-0.95
2	75	1	100	0.5	0	0.5	-0.95	-0.49
3	60	1	100	0.5	0	0.5	-0.49	-0.15
4	50	1	100	0.5	0	0.5	-0.15	0.14
5	40	1	100	0.5	0	0.5	0.14	0.41
6	30	1	100	0.5	0	0.5	0.41	0.68
7	20	1	100	0.5	0	0.5	0.68	0.97
8	10	1	100	0.5	0	0.5	0.97	1.37

Source: Torres et al. (2018)

Table 2. Classification of risk preference

Switching point	Range of CRRA coefficient			Classification of risk preference
2	-1.71	r<	-0.95	Highly risk-seeker
3	-0.95	>r<	-0.49	Very risk-seeker
4	-0.49	>r<	-0.15	Risk-seeker
5	-0.15	>r<	0.14	Risk neutral
6	0.14	>r<	0.41	Slightly risk averse
7	0.41	>r<	0.68	Risk averse
8	0.68	>r<	0.97	Very risk averse
Always A	0.97	>r<	1.37	Highly risk averse

Source: Torres et al. (2018)

Having a base category avoids redundancy and ensures that total probability equals one. The model implies that j log-odds can be computed as follows:

$$ln\left[\frac{P_{ij}}{P_{ik}}\right] = X'_i(\beta_j - B_k) = X'_i\beta_j \quad if\ k = 0 \quad (4)$$

The odds ratio is independent of the other choices that follow the disturbances' independence in the original model. The marginal effects of each explanatory variable can also be computed as:

$$\delta_{ij} = \frac{\partial P_{ij}}{\partial X_i} = P_{ij}\left[\beta_j - \sum_{k=0}^{J} P_{ik}\beta_k\right] \quad (5)$$

The multinomial logit model is estimated iteratively using the maximum likelihood procedure, and the resulting parameter is referred to as the MLE estimates. Table 3 presents the definition of the variables for the multinomial model. The multinomial logit model used for this study is as follows:

$$RISK_i = \beta_0 + \beta_1 INC_i + \beta_2 4PS_i + \beta_3 EDUC_i + \beta_4 FISH_i + \beta_5 LIV_i + \beta_6 CRE_i + \beta_7 ORG_i + \beta_8 SEX_i + \epsilon_i \quad (6)$$

3 Results and Discussion

Socioeconomic Characteristics of the Small-scale Fishers

This study interviewed two hundred eighteen fishers involved in municipal capture fisheries. Most of the respondents were male (93%), with only seven percent women. On average, fisher participants were middle-aged with an average age of 45 years. Fishers from Buenavista were the oldest, with the mean age of 48 years, while fishers from San Lorenzo were the youngest given the mean age of 40 years. More than half were married, with an average household size of five. Study participants had low levels of educational attainment given the eight years of average schooling. Also, the average monthly household income was PHP 8,363. This income is lower than the poverty threshold in the region, implying that, on average, sampled fishers can be classified as poor. While the majority (81%) considered fishing as their primary source of income, more than half (61%) of the participants also have other sources of income. Also, the majority (88%) were members of fishery-related organizations.

Table 3. Variables for the multinomial logit regression

Variable Name	Variables	Definition
RISK	Risk	A dummy variable representing small-scale fishers' risk preference 1 – small-scale fisher is risk-averse 2 – small-scale fisher is risk neutral 3 – small-scale fisher is risk-seeker
INC	Household monthly income	Total household monthly income in PHP
4Ps	Beneficiary of 4Ps	Dummy variable of whether fishing household is a 4P's beneficiary or not 1 if small-scale fishing household is a 4P's beneficiary 0 otherwise
EDUC	Years of education	Years of formal education of the small-scale fisher
FISH	Fishing as a primary occupation	Fishing as a primary occupation 1 if fishing is a primary occupation 0 otherwise
LIV	Presence of other livelihoods	Presence of other livelihoods 1 if small-scale fisher has other sources of income 0 otherwise
CRE	Have an outstanding credit	Dummy variable representing whether fishing household has outstanding loan credit 1 if small-scale fisher has outstanding loan credit 0 otherwise
ORG	Membership to organization	Membership to any fishery-related organization 1 if small-scale fisher is a member of any fishery-related organization 0 otherwise
SEX	Sex	Sex of the small-scale fisher 1 if small-scale fisher is male 0 Otherwise

Table 4. Socioeconomic characteristics of the small-scale fishers, Guimaras, Philippines, 2019

	Jordan (n=57)	Buenavista (n=30)	Nueva Valencia (n=35)	Sibunag (n=54)	San Lorenzo (n=42)	ALL (n=218)
Sex (%)						
Male	91.23	93.33	100	92.59	83.10	92.66
Female	8.77	6.67	0	7.41	16.80	7.33
Marital Status (%)						
Married	44.71	62.16	61.70	48.78	58.62	53.07
Single	28.24	37.84	12.77	14.63	13.79	20.71
Widowed	17.65	0	0	7.32	0	6.80
Live-in	9.41	0	25.53	29.27	27.59	19.42
Age (years)	47.18	47.60	46.57	43.43	40.33	44.89
Household size (n)	4.86	4.83	4.94	4.69	4.33	4.72
Years of education	7.77	8.93	7.74	7.48	7.81	7.86
Beneficiary of 4Ps (%)	33.33	20.00	37.14	48.15	38.10	36.70
Household income (PHP/ month)	8,098	9,193	8,740	7,711	8,654	8,363
Fishing as a primary source of income (%)	82.86	56.67	82.86	85.19	92.86	81.65
Presence of other livelihoods (%)	71.93	63.33	51.43	37.04	83.33	61.01
Membership to any fishery-related organization (%)	82.46	90.00	82.86	85.19	100.00	87.61

Risk Preference of the Small-scale fishers

The risk preference of the small-scale fishers was elicited using an experimental approach. The resulting CRRA coefficients from the experiment indicate their risk preference. Table 5 presents the percentage distribution of small-scale fishers across different ranges of CRRA coefficient and risk appetite. Specifically, more than 40% of the respondents have a midpoint CRRA coefficient of 1.17, implying that nearly half of the interviewed small-scale fishers tended to be highly risk-averse. On the other hand, a little more than 20% of the small-scale fishers have a CRRA coefficient of -1.33, belonging to the highly risk-seeking group. This observation is expected given that fishing is generally considered a risky livelihood. Moreover, the catch is always uncertain when fishers go out to fish. There is no certainty that they will catch enough fish to cover their cost. Hence, fishers are already used to risks. However, half of the respondents were risk-averse, while around 39% were risk-seeking. The remaining 11% were indifferent to risk or were risk-neutral. Also, the mean CRRA coefficient was 0.20, implying that small-scale fishers in Guimaras were slightly risk-averse. A slightly risk-averse attitude is unexpected, given the high poverty incidence among small-scale fishers. Being risk-averse means that fishers prefer a smaller amount of certain income than a higher amount of a risky income, implying that study participants make fishing-related decisions that minimize their risks.

The result of this study that small-scale fishers are risk-averse conformed with the findings of the few studies on small-scale fishers' risk preference, such as Brick et al. (2011) and Smith and Wilen (2005). In this study, the proportion of small-scale fishers exhibiting risk-averse behavior is slightly greater than Eggert and Lokina (2007) among artisanal fishers in Tanzania. While the mean CRRA of 0.20 is slightly lower than Brick et al. (2011) among fishing communities in South Africa. Likewise, Eggert and Martinsson (2004) noted that small-scale and commercial fishers are risk-averse.

Table 6 displays the mean CRRA coefficient of small-scale fishers disaggregated per municipality. It can be inferred that small-scale fishers from San Lorenzo had a mean CRRA coefficient of -0.13, indicating risk-neutrality. On the other hand, small-scale fishers from the other four municipalities can be generally considered risk-averse. Result also suggests that small-scale fishers from Buenavista are the most risk-averse among the group since they had the highest mean CRRA of 0.48. Participants from Buenavista were the oldest among the group and had the highest educational attainment. Some studies (e.g., Brick et al., 2011; Alvarado et al., 2018) showed a positive relationship between age and educational attainment and risk-aversion among fishers. However, the one-way analysis of variance (ANOVA) test results showed no significant differences in the mean CRRA coefficient of small-scale fishers across the five municipalities.

The one-way ANOVA test results showed significant differences in the mean levels of some socioeconomic indicators of small-scale fishers across the three risk categories. For example, based on the results presented in Table 7, risk-averse small-scale fishers had lower average fish catch per fishing trip than the risk-seeking and risk-neutral groups. Similarly, they earned the lowest average household monthly income of PHP 7,083 and were the oldest. However, these differences in mean values were not statistically significant. But the difference in average years of schooling was statistically significant between groups, with the risk-neutral small-scale fishers having the highest years of formal education and the risk-averse with the least years of formal education.

Small-scale fishers were grouped into quintiles based on their monthly household income to check whether risk aversion is a decreasing function of income. Table 8 presents the cross-tabulation of small-scale fishers belonging to different quintiles of monthly household income and their risk categories. More than half (59%) of the small-scale fishers belonging to the first quintile tended to be highly risk-averse. On the contrary, a little more than half (54%) of those belonging to the fifth quintile were risk-seeking. Overall, the proportion of the risk-averse fishers was significantly higher in the first quintile (69%) than in the fifth quintile (40%). Since an income loss of the same amount has a more significant impact among poor people than the non-poor, the former tend to exhibit a more risk-averse preference. In turn, such an attitude towards risk hinders them from exploring available opportunities and poses as a constraint in their decision-making process (de Janvry and Sadoulet, 2016).

Table 5. Percentage distribution of small-scale fishers across different risk categories, Guimaras, Philippines, 2019, n = 218

Range of CRRA coefficient			Classification of risk preference	Percentage of the study participants (n=218)
-1.71	r<	-0.95	Highly risk-seeker	24.77
-0.95	>r<	-0.49	Very risk-seeker	3.21
-0.49	>r<	-0.15	Risk-seeker	12.39
-0.15	>r<	0.14	Risk neutral	10.55
0.14	>r<	0.41	Slightly risk averse	1.38
0.41	>r<	0.68	Risk averse	2.29
0.68	>r<	0.97	Very risk averse	2.75
0.97	>r<	1.37	Highly risk averse	42.66

Table 6. Mean CRRA coefficient disaggregated per municipality, Guimaras, Philippines, 2019

Municipality	Mean CRRA coefficient
San Lorenzo	-0.13
Jordan	0.19
Buenavista	0.48
Nueva Valencia	0.27
Sibunag	0.28
Prob>F	0.1249

Table 7. Results of one-way ANOVA test, Guimaras, Philippines, 2019

Risk preference	Mean values			
	Average fish catch per fishing trip (kg)	Total household monthly income (PHP)	Years of education	Age
Risk-averse	4.62	7,084	7	46
Risk-seeker	5.17	9,948	8	44
Risk neutral	5.91	8,752	10	42
Prob > F	0.1047	0.0648	0.0016	0.3284

Table 8. Cross-tabulation of risk preference across different quintiles of monthly household income, Guimaras, 2019

Risk preference	Quintiles of monthly household income					Average (n=218) %
	First (n=49) %	Second (n=46) %	Third (n=42) %	Fourth (n=38) %	Fifth (n=43) %	
Highly risk-seekr	14.29	19.57	21.43	36.84	34.88	24.77
Risk-seeker	0.00	2.17	4.76	2.63	6.98	3.21
Slightly risk-seeker	8.16	13.04	21.43	10.53	9.30	12.39
Risk neutral	8.16	19.57	2.38	13.16	9.30	10.55
Slightly risk-averse	4.08	2.17	0.00	0.00	0.00	1.38
Risk-averse	4.08	6.52	0.00	0.00	0.00	2.29
Very risk-averse	2.04	4.35	2.38	2.63	2.33	2.75
Highly risk-averse	59.18	32.61	47.62	34.21	37.21	42.66

Note: 1st quintile represents the poorest households while the 5th consists of the highest income households

Results of the multinomial logit

A multinomial logit regression was estimated with the three risk categories as the dependent variables to determine whether socioeconomic factors were related to small-scale fisher's risk preference. The model's explanatory variables were first tested for the presence of multicollinearity using the correlation matrix and further validated by computing for Variance Inflation Factor (VIF) and Tolerance (TOL) values of the auxiliary regressions. The correlation matrix mainly showed low and nonsignificant correlations among the explanatory variables. Moreover, VIF values were low, ranging from 1.05 to 1.17. In contrast, TOL values were high from 86 to 95%, validating the result of the correlation matrix for the lack of serious multicollinearity problem among the explanatory variables. A possible heteroscedasticity problem was addressed using the robust standard error procedure since one of the consequences of heteroscedasticity is unreliable standard errors. This method ensured that standard errors and estimated p-values were reliable (Wooldridge, 2013).

The parameter estimates of the model are shown in Table 9. The reference category in the estimation process is the risk-averse outcome. The relationship between the dependent and independent variables is highly significant (Prob> $\chi 2 = 0.000$). Based on the result of the multinomial logit, three variables have a significant influence on the log of odds of small-scale fishers being risk-neutral. These are the years of education, membership to fishery-related organizations, and presence of other livelihoods. Years of education and membership to an organization positively influence small-scale fishers being risk-neutral relative to being risk-averse. On the other hand, the presence of other livelihoods decreased the log of odds that small-scale fishers are risk-neutral.

Regarding factors that influence the log of odds that small-scale fishers are risk-seeking, three variables had a significant effect: monthly household income, being a beneficiary of the 4Ps program, and access to credit.

The signs of the marginal effects are mainly similar to the parameter estimates of the multinomial coefficients (Table 10). It can be inferred that monthly household income and risk aversion were inversely related. Previous studies, e.g., Eggert and Lokina (2007), also had similar results where more wealthy small-scale fishers tended to be risk-seeking. These results conform with the expected utility theory that risk aversion is a decreasing function of wealth, implying that poorer fishers are less likely to engage in risky activities with uncertain outcomes. In the case of fishing activities, this means that poor fishers are less likely to engage in illegal fishing activities (Brick et al., 2011). However, they are also less likely to engage in other economic activities that might be considered risky, such as investing in new fishing gears and exploring other employment activities outside the fishery. According to Eggert and Martinsson (2003), risk-averse fishers earn less because they have lower catches than less risk-averse fishers.

Furthermore, being a beneficiary of 4Ps, a cash transfer program for low-income families, encourages a risk-seeking attitude among fishers. Cash transfer programs like 4Ps provide additional monetary support among poor households. Being

Table 9. Parameter estimates of the multinomial logit regression

Explanatory Variable	Coefficient	
	Risk-neutral	Risk-seeker
Household monthly income	0.00002 (0.00003)	0.00004* (0.00002)
Beneficiary of 4Ps	-0.770 (0.628)	0.722* (0.335)
Years of education	0.291** (0.085)	0.071 (0.052)
Fishing as a primary occupation	-0.034 (0.684)	-0.139 (0.423)
Presence of other livelihoods	-1.244* (0.521)	-0.061 (0.322)
Have credit	-0.926 (0.544)	-0.778* (0.328)
Membership to organization	14.429** (0.594)	-0.468 (0.438)
Sex	0.828 (0.785)	0.314 (0.466)
Constant	-18.053** (1.359)	-0.897 (0.823)
Wald $\chi2(16)$	1284.34	
Prob> $\chi2$	0.000	
Pseudo R2	0.118	

Note: **, * indicates statistical significance at $\alpha = 1\%$ and $\alpha = 5\%$, respectively
Reported inside the parentheses are robust standard errors

Table 10. Marginal effects of the multinomial logit regression

Explanatory Variable	Marginal Effects		
	Risk-averse	Risk-neutral	Risk-seeking
Household monthly income	-0.00001* (0.000)	0.000 (0.000)	0.00001* (0.000)
Beneficiary of 4Ps	-0.165* (0.081)	-0.015* (0.007)	0.181* (0.081)
Years of education	-0.019 (0.013)	0.004** (0.005)	0.016 (0.013)
Fishing as a primary occupation	0.034 (0.102)	0.000 (0.009)	-0.034 (0.102)
Presence of other livelihoods	0.025 (0.078)	-0.066** (0.024)	0.007 (0.078)
Have credit	0.193* (0.080)	-0.008 (0.007)	-0.184* (0.079)
Membership to organization	-0.006 (0.111)	0.208** (0.071)	-0.202 (0.110)
Sex	-0.081 (0.113)	0.010 (0.006)	0.072 (0.113)

Note: **, * indicates statistical significance at $\alpha = 1\%$ and $\alpha = 5\%$, respectively
Reported inside the parentheses are robust standard errors

a 4Ps beneficiary means that fishers are eligible to receive a certain amount of money every month. The certainty of receiving a lump-sum amount may give fishers the confidence to engage in risky activities that may have uncertain outcomes. The subsidy also augments their monthly income, so this relationship conforms with the earlier result that higher incomes led to a risk-seeking attitude. The cash transfer from the 4Ps program might also offset any potential losses that the fishers might incur from engaging in risky activities.

On the other hand, fishers with an outstanding loan are more likely to be risk-averse. Credit is a liability that households need to pay. Thus, fishing households with credits may be discouraged from engaging in activities that have possibilities of them risking their ability to pay their liabilities.

Contrary to the findings of Brick et al. (2011)

that there is a positive relationship between risk aversion and educational attainment, the results of this study find that small-scale fishers with more formal years of schooling tend to have a risk-neutral attitude. Likewise, membership in any fishery-related organization increases the probability of small-scale fishers being risk-neutral. Thus, more educated fishers and members of the fishery organizations are not sensitive to risk at all. Hence, fishing decisions are based solely on the expected returns and not on how risky those decisions are. Conversely, having other sources of income is associated with a decrease in the probability that small-scale fishers are indifferent toward risk. Hence, they are more likely to consider risk in their decision-making process.

4 Conclusions and Recommendations

This study revealed that small-scale fishers in Guimaras are slightly risk-averse using a multiple price list experiment. Previous studies on risk aversion and fishers' adaptation showed that risk-averse fishers are more likely to practice sustainable fishing practices when faced with climate-related risks. Therefore, the outcome that small-scale fishers in Guimaras are slightly risk-averse on average can benefit resource conservation. However, this may also restrict small-scale fishers from exploring other opportunities to improve their socio-economic condition. Many small-scale fishers remain poor because of the various uninsured risks they face. Policy programs that target uplift fishers out of poverty should consider the risks and uncertainties they face, so possible unintended behavioral changes that will counter the programs' goals are minimized. Numerous factors influence risk behavior, including the occupational environment to which people are exposed. Fishing as a livelihood is confronted with many risks and uncertainties, and fishers' risk preference shapes their response to these risks. With the worsening problem of climate change, government agencies may implement fishery interventions (e.g., the establishment of marine protected areas) and regulations (e.g., banning certain fishing gears and closed seasons) to minimize potential adverse impacts on the fishery stock. Small-scale fishers' risk preference may determine the degree of compliance to the implemented regulations since those less risk-averse have higher tendencies of violating ordinances to earn subsistence income. Hence, regulators must devise proper incentives that would entice both risk-seeking and risk-averse small-scale fishers to comply. Furthermore, the welfare impacts of these policies will also vary depending on the risk preference of the small-scale fishers, hence the need to understand the risk behavior of the small-scale fishers.

5 Acknowledgement

The researchers would like to extend their gratitude to the provincial government of Guimaras and all the small-scale fishers who participated in this study.

Statement of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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