PERCEPTION AND LIFE SATISFACTION OF FISHERPERSONS IN THE NHA TRANG BAY MARINE RESERVE

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This study investigates local fisherpersons' perception of the marine reserve in Nha Trang Bay and their life satisfaction after this marine reserve is established. Through 81 random interviews with local fisherpersons who have been dwelling in the Nha Trang Bay Marine Reserve, most of interviewees do not hold the belief that the marine reserve would improve their living standards after a decade of establishment even though they are well aware of the fact that the reserve would have positive impacts on the recovery and conservation of natural environment. The cumulative logit model shows that the life satisfaction of younger fisherpersons or households with larger male labor force is higher than that of experienced fisherpersons or households with a small number of male workers.

Keywords: Reserve, livelihood, life satisfaction, fisherpersons, Nha Trang, Logit mode

1. Introduction

The establishment of marine reserves, on the one hand, aims at conserving marine resources and generating economic benefits from tourisms and education for persons involved (Boersma and Parrish, 1999). On the other hand, there are still some conflicts between marine reserve authorities who strive to preserve common natural resources and local people whose livelihood is sharply influenced because their access to marine resources are constrained (McClanahan et al., 2005a,b and Sesabo et al., 1999). Understanding the attitude and perception of both marine resources users and managers plays a crucial role in execution and administration of conservancy rules. This issue is also concerned by many researchers in the world such as McClanahan et al. (2008), Stump et al. (2006) and Sesabo et al. (1999). Fisherpersons' perception can affect their attitude; they might accept a short-term provisional loss so as to attain long-run benefits, and thus their proper behavior towards conservancy rules will be accordingly established.

In recent years, researches on living standards and life quality, which consider life satisfaction as an entity indicator, attract many economists in addition to psychologists who have been long-time researchers on the scene (Frey and Stutzer, 2001). If an individual satisfaction is expressed through a more prosperous life (Easterline, 2001), it can be employed to measure effects of policies on their life (Frey and Stutzer, 2002 and Graham, 2005).

The establishment of marine reserves is to enforce environmental policies through rules of public resources administration and the prohibition of overexploitation of marine resources. In Vietnam, as Ho Van Trung Thu et al. (2006) put it, the establishment of the Nha Trang Bay Marine Reserve (formerly known as

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Hòn Mun Marine Reserve) was commenced in June 2001 with the support of IUCN (International Union for Conservation of Nature), World Bank, and the Danish DANIDA. Even though there have been a great deal of reports on impacts and effectiveness of the marine reserve thus far, the life satisfaction of local fisherpersons and factors affecting their satisfaction have not been clearly rendered. This paper will employ the cumulative logit model – a non-linear statistic method to shed light on impacts of the Nha Trang Bay marine reserve on the local fisherpersons' life.

2. Theoretical background and research method

a. Concept of life satisfaction:

Studying life satisfaction has long been a subject of psychology; yet since the 1990s, it has attracted many economists who have interest in living standards and life quality (Frey and Stutzer, 2001, 2002). According to Easterlin (2001), life satisfaction is defined as "the degree to which an individual judges the overall quality of his/her life favorably." The life satisfaction can be deemed as a sense of well-being as a whole instead of being limited to certain aspects of the life (Veenhoven, 2005). Easterlin (2001) also argues that economic condition is the origin of life satisfaction. Thus, if there is any change in the personal economic condition, it will affect his or her life satisfaction or prosperity.

b. Logit model:

Based on the utility function, Graham (2005) developed a standard function to measure the life satisfaction. That is:

$W_i = \alpha + \beta x_i + \varepsilon_I$

where W denotes the level of life satisfaction and X is the vector of explanatory variables. When evaluating impacts of socioeconomic factors on the life satisfaction of Vietnam's farmers, Duc (2008, 2009) employed the cumulative logit model to conduct empirical researches of the utility model $U_i = \alpha^* + \beta^* X_i + \sigma\varepsilon_i$ where the utility U is unit of choices, X is the vector of explanatory variables concerning the life satisfaction of interviewed individual i. Because U cannot be observed directly or measured easily, Allison (1999) and Greene (2002) suggested using thresholds Z to represent levels of utility U as follows:

$Z_i = 1$ if $z_1 < U_i$; $Z_i = 2$ if $z_2 < U_i \le z_1$;...; $Z_i = J$ if $U_i \le z_{J-1}$

Allison (1999) also recommended cumulative probabilities defined by:

$$F_{ij} = \sum_{m=1}^{j} p_{im}$$

And the cumulative logit model:

$$\text{Log}\left(\frac{F_{ij}}{1-F_{ij}}\right) = \alpha_j + \beta X_i \quad (j = 1, ..., J-1)$$

$$\text{with } \alpha_j = \frac{\alpha^* - z_j}{\sigma};\ \beta = \frac{\beta^*}{\sigma}$$

According to Duc (2008, 2009), if Z represents the level of responses, i is the interviewee and j is the set of responses, X is the vector of explanatory variables and X'_{ij} is the displacement vector of X, and all logits are simultaneously utilized, the model is rewritten as follows:

$$\text{logit}\ [P(Z_i \le j \mid x)] = \frac{\log P[(Y_i \le j) \mid X]}{1 - \log P[(Y_i \le j) \mid X]} =$$

$$\alpha_{ij} + \beta X'_{ij} = f(X'_{ij})$$

c. Description of the empirical logit regression model:

According to Easterlin (2001), an individual evaluation of life improvement can represent the utility or life satisfaction. Responding to the question "Has your life quality been improved since the marine reserve was established?", respondents are supposed to choose one of options from "absolutely agree" to "absolutely disagree" as per the 5-point Likert's scale. Thus, the cumulative logit model is to be employed to determine factors affecting the life satisfaction.

Per capita income (Capinc) is the first explanatory variable of the model because the life satisfaction has a positive relationship with income (Easterlin, 2001). When other factors are identical and constant, the higher income they earn, the more satisfied they are. Frank (2005)

shows that relative income is also a determinant of life satisfaction. Previous findings by Duc (2009) point out that incomes from fish farming and fishing and other earnings also profoundly affect the life satisfaction of Vietnamese farmers. Therefore, ratios of fishing income (Fishinc), income from aquaculture (Aquainc), and other incomes (Otherinc) are also included in the model as explanatory variables for the satisfaction of fisherpersons in the Nha Trang Bay Marine Reserve.

As Cantril (1965) put it, the attachment to and satisfaction with the current livelihood and personal characteristics have influenced the life satisfaction, which has been examined in the study by Duc (2008) of Vietnamese fish-farmers. Thus, fishing experience (fish_exp) is used in the model as an independent variable in order to fathom effects of fishing experience on the life satisfaction. Alongside the Cantril's (1965) perspective, previous studies prove that factors such as age, educational level, and the number of male labor in households do affect the life satisfaction of farmers (Frey and Stutzer, 2002; and Duc, 2009); and thus they are also included in the model as the independent variables.

The empirical logit model can be described as follows:

Logit[P(*happy* ≤ *j*)] = f(*Capinc, fishinc, aquainc, otherinc, age, edu, men, fish_exp*)

where,

P: Probability of answers receiving the value smaller or equal to j

Happy: improvement in life quality

J=1,...,5: Options ranging from "absolutely agree" to "absolutely disagree"

Capinc: Per capita income of fisherpersons in 2008

Fishinc: Ratio of fishing income to gross income

Aquainc: Ratio of income generated from aquaculture to gross income

Otherinc: Ratio of other incomes

Age: Age of interviewees

Edu: Educational level of interviewees

Men: The number of male labor in households

fish_exp: Fishing experience of householders

For the dependent variable "Happy", the two options "absolutely agree" and "agree" correspond to j=1 and j=2. For j=2, the curve for the cumulative logit regression is identical to the bivariate reflective line with Happy ≤ 2 and Happy>2.

The cumulative logit model for the life satisfaction of fisherpersons can be described as follows:

Logit [P(satisfaction)] = Logit [P(happy≤2)] = $\log\left(\frac{P(happy \le 2)}{1 - P(happy \le 2)}\right)$

The probability of life satisfaction is calculated as per the following formula.

P(satisfaction) = $\frac{e^{\log it[P(happy \le 2)]}}{1 + e^{\log it[P(happy \le 2)]}}$

The software SAS version 9.1 is employed to develop the logit regression model. By conducting the backward selection to leave out inappropriate variables, the most suitable model for the life satisfaction of fisherpersons will be developed.

d. Sampling method:

The research employs both qualitative and quantitative methods. The semi-structured questionnaire is used to collect socioeconomic information from marine reserve managers and fisherpersons as well as their perception and attitude towards the marine reserve management. Direct interviews with fisherpersons are conducted in the morning when they return from an overnight fishing trip. The survey is conducted randomly at five islands in Nha Trang Bay as from February to August 2009. Of 198 fisherpersons residing in the Nha Trang Bay Marine Reserve, there are 81 interviewees (Table 1).

Table 1: The number of interviewed fisherpersons in each island

Islands	Number of surveyed fishing households		Number of interviewed fishing households		Sample ratio (%)
	Household	As %	Household	As %	
Bích Đầm	88	44.44	34	41.98	38.64
Đầm Bấy	22	11.11	8	9.88	36.36
Hòn Một	58	29.29	19	23.46	32.76
Trí Nguyên	17	8.59	8	9.88	47.06
Vũng Ngán	13	6.57	12	14.81	92.31
Total	**198**	**100.00**	**81**	**100**	**40.91**

3. Results and discussion

a. Local fisherperson's perception of effects of the Nha Trang Bay Marine Reserve:

Most of the interviewees are male householders whose average age is 47 (highest 39 and lowest 30). The number of household labor generating incomes is 2.33, ranging from one to seven persons. More than 40% of households have two workers and 53.08% with only one male worker. The number of household members ranges from 2 to 9 persons; and around 53.1% graduated from a primary school or a higher level. Almost all households have at least 10-year experience in fishing. On average, a person has been catching fish for 28 years. The highest seniority of fishing is 54 years. Besides fishing as the primary occupation, around 25.91% of households join in aquaculture; yet the income from aquaculture is very small (around 1.92% on average) in the gross income. Meanwhile, ratio of fishing income makes up 75% of the total income. Other incomes are from small trade, working for wage, small-scale husbandry, and civil servant's salary.

Most fisherpersons are well aware of the fact that the Nha Trang Bay Marine Reserve is beneficial to the locality and surrounding waters (Figure 1). Some 60% of fisherpersons agree that the marine reserve has positive effects on the recovery of natural coral reefs and the density of fish, and help enhance the biodiversity and water quality. However, local fisherpersons do not believe that the marine reserve could improve the livelihood of local community. Programs to generate alternative incomes are considered ineffective. As some fisherpersons put it, some means of livelihoods such as handicrafts, husbandry, tourism services, etc. proposed to fisherpersons in the marine reserve hardly meet the local conditions and fisherperson's capacity.

The belief that the marine reserve project cannot help local fisherpersons improve their life quality and living standards might come from the fact that they have not highly appreciated the project effectiveness. Just around 6.2% of fisherpersons believes that the marine reserve is effectively managed. In fact, sneaky exploitations in the marine reserve are still in existence. Around 40.7% of fisherpersons confirm that fisherpersons inside and outside the marine reserve are in conflict with each other; and 33.3% of them believe that the occurrence of conflict is regular. Moreover, a contradiction emerging since the establishment of the marine reserve is between aquamarine product exploiters and planters.

b. Life satisfaction of fisherpersons in the Nha Trang Bay Marine Reserve:

The satisfaction level of local fisherpersons is differently interpreted in terms of fishing output, fishing grounds, and life quality improvement. When asked if he or she is satisfied with the fishing output, 40% of respondents opt for

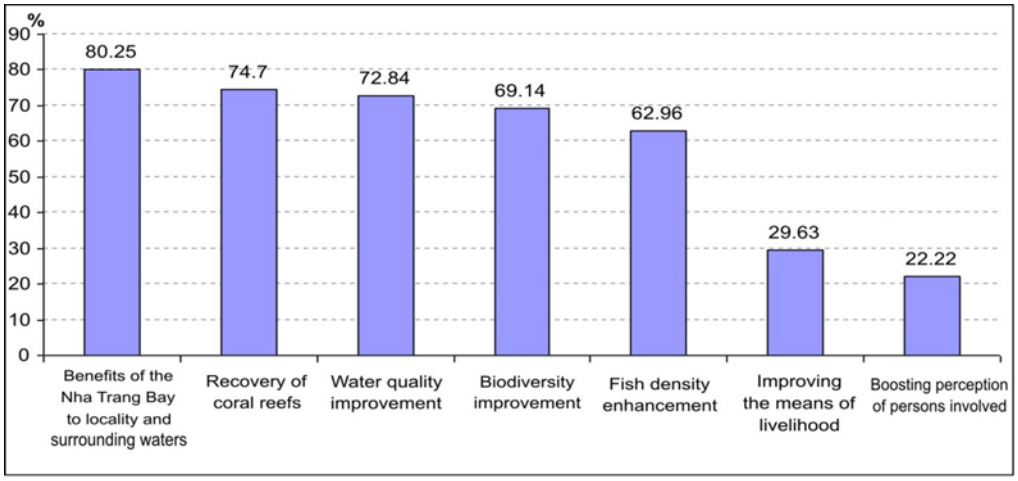

Figure 1: Effects of the Nha Trang Bay Marine Reserve by local fisherperson's evaluation

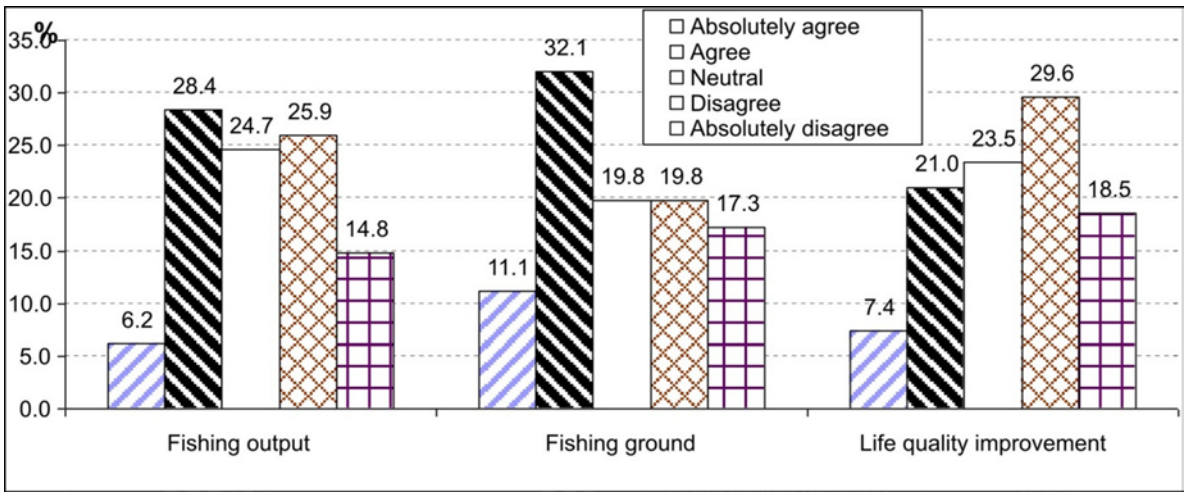

Figure 2: Satisfaction of fisherpersons in the Nha Trang Bay Marine Reserve

"disagree" and "absolutely disagree". For the fishing grounds, just about 43.2% of fisherpersons who own big boats for fishing out to sea express their satisfaction; whereas those without are merely able to catch fish in a restricted ground show their dissatisfaction. This can explain why 48.1% of fisherpersons disagree that their life is improved thanks to the marine reserve (Figure 2). About 18.52% of them state that their life is absolutely not improved at all.

Factors influencing the life satisfaction of local fisherpersons are investigated through the logit regression model. The logit regression results after running backward selection are sized up in Table 2. Such results are also utilized to calculate marginal effects of quantitative explanatory variables on the life satisfaction of fisherpersons.

Table 2: Factors affecting the life satisfaction of local fisherpersons in the Nha Trang Bay Marine Reserve

Parameter	Coefficient	S.E	P-value	Marginal effect
Fishinc	0.0009	0.0008	0.2864	
Capinc	0.0028***	0.0009	0.0045	0.0004
Age	0.1857**	0.0899	0.0388	0.0318
Fish_exp	-0.0814	0.0755	0.2809	
Men	1.5757	1.5238	0.3011	
Fishinc.age	-0.00006***	0.00002	0.006	-0.00001
Age.men	-0.0876**	0.0443	0.0478	-0.01502
Fishinc.men	0.0003***	0.0001	0.0074	0.00005
Fish_exp.men	0.0865**	0.0452	0.0557	0.01483

*, ** and ***: significant at 90%, 95% and 99% level.

Proportional odds test (Table 3) shows that the employment of the cumulative logit model is suitable. Meanwhile, other tests like Likelihood Ratio, Score, and Wald with a large-enough chi-square value prove that the explanatory variables can significantly explain effects on the life satisfaction of local fisherpersons.

Table 3: Testing the fitness of the model

Test	Chi-Square	Pr> Chi-Sq
Proportional Odds Assumption	39.4134	0.0581
Likelihood Ratio	24.5302	0.0035
Score	18.3383	0.0314
Wald	20.5776	0.0147

After testing the fitness of the model and regression results, the most suitable model concerning the life satisfaction of local fisherpersons in the Nha Trang Bay marine reserve can be rewritten as follows:

Logit [P(*happy* ≤ 2)] = - 6.9545 + 0.0028 *capinc* + 0.1857 *age* - 0.00006 *fishinc*age*

0.0876 *age*men* + 0.0003 *fishinc*men* + 0.0865 *fish_exp*men* + ε

As reported by Coughenour and Swanson (1992), the variable "age" has a statistical significance in the model, that is, the older a fisherperson is, the more satisfied he or she is. This result is consistent with conclusion by Duc (2008, 2009) who studies fish farmers in South Vietnam. Yet, according to the model results, such impact is not profound. Probability of satisfaction is greater than 0.3% for fisherpersons older than 10.

Positive impacts of per capita income on the life satisfaction of local fisherpersons which are generated from the establishment of the marine reserve is statistically significant (P<0.01). This is similar to findings by Frey and Stutzer (2001) and Duc (2009) who suppose that income plays an important role in making a better life for people.

Aquaculture has been recommended as a potential measure to reduce fishing pressures on coral reefs (Pomeroy et al., 2006) and an alternative source income for the fishing business that is restricted in the marine reserve (Hoang Tung, 2002). Yet, its effects are eliminated from the model due to the backward selection. This is to say, aquaculture in the marine reserve cannot best meet the local fisherpersons' needs. In other words, income generated from aquaculture is not sufficient to satisfy fisherpersons.

Although effects of income from fishing is not statistically significant enough to explain the life satisfaction of fisherpersons, the interaction between such income and the age and the number of male labor in a family is really significant in the evaluation model and thus can explain their effects on the life satisfaction of fisherpersons. For younger fisherpersons or households with more male workers, income from fishing is higher, and they feel more satisfied with life. The fishing experience positively affects households with larger labor force. For households with less male labor, the more experienced a fisherperson, the lower the probability of life satisfaction.

4. Conclusion

The cumulative logit model can be employed to study the life satisfaction of fisherpersons. For this model, per capita income expectedly plays an important role in the life satisfaction of fisherpersons in the Nha Trang Bay Marine Reserve even though the fishpersons do not believe that the marine reserve can improve their life. Income from fishing, despite not having any statistically-significant effect, interacts with age and the number of male workers in a household, and is supposed to produce positive effects on the life satisfaction. For younger fisherpersons or households with more male workers, income from fishing is higher and they thereby feel more satisfied with life. Yet for households with fewer male workers, the more experienced a fisherperson, the lower the probability of life satisfaction since the establishment of Nha Trang Bay Marine Reserve. In sum, after years of establishment and maintenance, the Nha Trang Bay Marine Reserve must try its best to make local fisherpersons more satisfied with achievements of the nature preservation project.

5. Policy implications

Through the research results, it is suggested that the establishment of marine reserves or coastal ecological tourism areas must generate livelihoods for local fisherpersons to improve their life, and thereby making them more satisfied with the current life. The study also shows that for younger fisherpersons or households with more male workers, income from fishing is higher and they feel more satisfied with life. This is to say, aquamarine economic policies should ensure fishing income for younger fisherpersons so as to maintain their life satisfaction.

This case study can be utilized to evaluate comprehensively social and environmental effects in other nature reserves. In the future, the establishment and maintenance of reserves should be beneficial to not only direct and indirect beneficiaries such as tourists, tourism agencies, managers, and environmentalists, etc. but also local residents whose livelihoods and life satisfaction are directly affected by the establishment of nature reserves. By so doing could we tackle extant conflicts between reserve managers and local residents and amongst users of public natural resources for various purposes. While marine reserve managers strive to conserve natural resources, livelihoods and life satisfaction of local fisherpersons who have been attached to fishing for ages are sharply affected due to the fact that their access to marine resources is constrained.

Presently, besides nature reserves, biosphere reserves, and national parks, etc. (such as Tràm Chim in Đồng Tháp Province, Thạnh Phú in Bến Tre Province, Láng Sen in Long An Province) which have been nationally recognized, Vietnam has been completing dossiers to get some recognized by international organizations like UNESCO, RAMSAR, etc. The harmony between benefits of nature reserves and socioeconomic interests of directly-affected inhabitants is treated as a top priority when evaluating and acknowledging a reserve due to the fact that environmental protection makes a better world wherein people live harmoniously and prosperously■

References

1. Agresti, A. (2002), *Categorical Data Analysis,* 2nd Ed., Hoboken, New Jersey: John Wiley&Sons.

2. Allison, P.D. (1999), *Logistic Regression Using SAS - Theory and Application,* Cary, NC: SAS Institute, Inc.

3. Boersma, P.D. & J.K. Parrish (1999), "Limiting Abuse: Marine Protected Areas, a Limited Solution", *Ecological Economics* 31(2), pp.287-304.

4. Cantril, H. (1965), *The Pattern of Human Concerns,* Rutgers University Press, New Brunswick, New Jersey, USA.

5. Coughenour, C.M. & L. Swanson (1992), "Determinants of Farmers' Satisfactions with Farming and with Life: A Replication and Extension", *Southern Rural Sociology* 9(1), pp.45-70.

6. Duc, N.M. (2008), "Aquaculture and Happiness", *Vietfish International* 5(05), pp.44-52

7. Duc, N.M. (2009), "Contribution of Fish Production to Farmers' Subjective Well-Being in Vietnam – A Logistic Model", *Journal of the World Aquaculture Society* 40(3), pp.417-424.

8. Easterlin, R.A. (2001), "Income and Happiness: Towards a Unified Theory", *The Economic Journal*, 111(473), pp.465-484.

9. Frank, R. H. (2005), "Does Absolute Income Matter?", *Economics and Happiness*, Oxford University Press.

10. Frey, B.S. & A. Stutzer (2001), "What can Economists Learn from Happiness Research?" *Journal of Economic Literature* 40(2), pp.402-435.

11. Frey, B.S. & A. Stutzer (2002), "The Economics of Happiness", *World Economics* 3(1), pp.1-17.

12. Graham, C. (2005), The Economics of Happiness, *World Economics* 6(3), pp.41-55.

13. Greene, W. H. (2003), *Econometric Analysis*, 5th Ed, Prentice-Hall Publisher.

14. Ho Van Trung Thu et al. (2004), *Mid-term Socio-Economic Survey and Multisectoral Collaboration Proposal of AIGS Solution for Local Communities in Hon Mun Marine Protected Area*, Hon Mun Marine Protected Area Pilot Project, Community Development Report No.4.

15. Hoang Tung, (2002), *Improving Local Livelihood through Sustainable Aquaculture in Hon Mun Marine Protected Area*, Hon Mun Marine Protected Area Pilot Project, Aquaculture Report No.8.

16. McClanahan, T.R. et al. (2008), "Management Preferences, Perceived Benefits, and Conflicts among Resource Users and Managers in the Mafia Island Marine National Park, Tanzania", *Environmental Conservation* 35(4), pp.340-350.

17. McClanahan, T.R., J. Maina & J. Davies (2005a), "Perceptions of Resource Users and Managers towards Fisheries Management Options in Kenyan Coral Reefs", *Fisheries Management and Ecology*, 12(2):105–112.

18. McClanahan, T.R., J. Maina & J. Davies (2005b), "Factors Influencing Resource Users and Managers' Perceptions towards Marine Protected Area Management in Kenya", *Environmental Conservation* 32(1), pp.42-49.

19. Pomeroy, R.S., J.E. Park & C.M. Balboa (2006), "Farming the Reef: Is Aquaculture a Solution for Reducing Fishing Pressure on Coral Reefs?" *Marine Policy* 30(2), pp.111-130.

20. Sesabo, J.K., H. Lang, & R.S.J. Tol (2006), *Perceived Attitude and Marine Protected Areas Establishment: Why Households' Characteristics Matters in Coastal Resources Conservation Initiatives in Tanzania*, Working Paper FNU-99.

21. Stump, N.E. and L.K. Kriwoken (2006), "Tasmanian Marine Protected Areas: Attitudes and Perceptions of Wild Capture Fishers", *Ocean & Coastal Management* 49(5-6), pp.298-307.

22. Veenhoven, R. (2005), "Inequality of Happiness in Nations", *Journal of Happiness Studies*, 6(4), pp.351-355.