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Truncated Growth and Compromised Sustainability: The Case of Lake Fisheries in Kashmir

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Abstract

The extensive urbanization and intensive tourism coupled with heavy siltation have adversely affected fisheries in the lakes of Kashmir. The study has found the trends in fish production and the stakeholders willingness to pay (WTP) for growth and sustainability of traditional and choiced *Schizothorax* fish species in these lakes. The logit model has been fitted to 8 sets of stakeholders independently while the Tobit model has been used to identify the variables that influenced the WTP of the stakeholders across the two lakes. Both the models have yielded comparable results. Income, time spent on lakes and traders have emerged significant across primary stakeholders and income, education and consumers have emerged significant in the case of secondary stakeholders with expected signs. On the whole, income has emerged as the single most important variable that determined WTP of stakeholders. This study has addressed the issues involved in fish production in Kashmir lakes in the context of decline in fish production, misplaced priorities in terms of species patronage, use priorities and the policy issues involved.

Key words: Contingent valuation, growth, sustainability, lake fisheries, *Schizothorax* species, Kashmir

JEL Classification: Q22, Q56, Q51

Introduction

Agriculture is the primary occupation of 70 per cent population in Kashmir, of which 15 per cent are involved in fisheries. Fisheries constitute a major source of income in Kashmir and lake fisheries are a multi-dimensional resource and serve many uses.

The Dal and the Wular are the two important lakes of Kashmir. The Wular lake represents the largest freshwater lake of India and the Dal is significant from the view point of tourism. Traditionally, these lakes

have had a flourishing fishery but studies have shown a decline in fish catches in both these lakes. The introduction of carps in Dal lake and heavy siltation in Wular lake, compounded by other externalities, have led to a consistent decline in the production of *Schizothorax*, the local fish species. The introduction of carps, negative externalities of tourism, excessive fertilization of vegetable crops in floating gardens (on the Dal lake), leading to algal blooms, have caused consistent decline as well as destruction of breeding grounds of the local fish species *Schizothorax*.

While on one hand the primary stakeholders — fishers and those who derive income from lake fishery — are in favour of restoration of *Schizothorax* fishery,

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on the other hand, we have to increase total fish production from the lakes to meet the ever-increasing demand of local consumers, irrespective of the species. Under these circumstances the Department of Fisheries, J&K has launched a major initiative to restore and improve fish production in the lakes. But, the efforts seem to be short of the expectations of the stakeholders (Qureshi, 2013)

Keeping the above circumstances in view, we have a situation wherein growth is truncated and sustainability is compromised. The development plan for the lakes of Kashmir lays more emphasis on tourism, especially in the Dal lake. Again the location, the demand-driven cultivation of vegetables on artificially-created islands on the Dal lake, the liberal licensing of houseboats, the introduction of carps in the lakes of Kashmir as well as lack of visible development vis-a-vis the government outlays on development of lake fisheries in Kashmir, appeared to have led to a paradoxical situation of more of (any) fish vs more of local choiced fish species. The present study has addressed these issues with the following objectives:

- (i) To study the trends in fish production in the selected lakes of Kashmir, and
- (ii) To assess the stakeholders willingness to pay (WTP) for sustainable production of *Schizothorax* fish species in the lakes of Kashmir.

Data and Methodology

The Dal and the Wular lakes in Kashmir were purposively selected for the study as these support around 70 per cent of the lake fishery of Kashmir. Contingent valuation (CV) is one of the most accepted methodologies for making an estimate of the WTP of the concerned stakeholders in the process of addressing a particular socio-economic phenomenon. The studies conducted so far using CV have addressed only the primary stakeholders (Devi *et al.*, 2010; Krishnan *et al.*, 1999; Bhandari and Heshmati, 2010). This study is an advancement over the previous studies, as it has addressed multiple stakeholders for similar problems using CV. A total of 360 respondents were selected for the study. The stakeholders were divided into two groups. The primary stakeholders were those who derived their income directly from the fishery of Kashmir lakes and strongly believed in the restoration

of the traditional composition of fishes in the lakes of Kashmir and were willing to pay. The secondary stakeholders were those who had indirect stake over the lakes and their fisheries and had a vested interest in the growth in fish production or a professional/traditional interest in *Schizothorax* fishery. The primary stakeholders were fishers (50 from Dal and 60 from Wular lake), traders (7 from Dal lake and 23 from Wular lake) and hotels and houseboats (25 in Dal lake and 5 in Wular lake). The secondary stakeholders consisted of fish consumers (50 each from Dal and Wular lakes), 30 tourists, 30 staff members of the Department of Fisheries J&K and 30 Faculty of Fisheries, SKUAST-K. The primary data were collected through survey using a pre-tested questionnaire during October 2012 to January 2013. The secondary data were collected from various published sources, officials of DoF, Srinagar, Sopore and Bandipora. Data were also collected from Lakes and Waterways Development Authority, Srinagar.

The CV technique was used to elicit information regarding WTP. It is based on the argument that individual responses to hypothetical markets are comparable to actual markets (Mitchell and Carson, 1989). Hammit (1986) has used it for quantifying consumers WTP for reduction of food-borne risks. The CV estimates are probably the most accurate predictors of peoples' real response behaviour (Mitchell and Carson, 1989) in the assessment of WTP for sustainability and enhanced fish production of Kashmir lakes.

The Model

The WTP of the different stakeholders affected by the increasing pollution in the lakes of Kashmir, was estimated by using a variant of the logit model given below:

$$Z_i = \ln(Odds) = \ln \frac{P_i}{1 - P_i} = a + \beta X$$

where, Z_i is the log odds of WTP/ stimulus index and X_1, X_2, \dots, X_i are the independent variables.

Estimation of the Model

The specification of the Logit model used for the primary and secondary stakeholders is available in Qureshi (2013). Fishers, traders, hotels and houseboats were classified as primary stakeholders. Different

variables were used to capture the WTP of primary stakeholders. Fish consumers, tourists, Department of Faculty of Fisheries, SKUAST-K, the State Department of Fisheries were the secondary stakeholders. The Tobit model included both primary and secondary stakeholders separately, based on the common variables identified among them such as time spent on lakes, education, age and income.

Results and Discussions

Trends in Fish Production

The total fish production in Dal lake ranged from as low as 262 tonnes in 2007-08 to a maximum of 475 tonnes in 2003-04. The fish production in 2010-11 is 336 tonnes. The process of truncated growth in different species of fish can be seen from Figure 1 A-F. It can be seen from Figure 1A that sixth degree polynomial gave the best fit to the data of total fish production in Dal lake (1980-2011) indicating the severity of fluctuations in fish production. The exponential trend line gave the best fit to the data on total carp fish production in Dal lake (Figure 1B) indicating that the total fish production in absolute terms was being held up by the increasing carp fish production in the lake. In Figure 1C, the trend line shows that the rate of decline in *Schizothorax* (local) fish production has been steep as well as pronounced in variation.

Based on the data total fish production, carp production and *Schizothorax* fish production for the period 1980-2011 and the estimated trend lines, it may be concluded that the breeding grounds of the *Schizothorax* have been compromised, adversely affecting the *Schizothorax* fish production at the expense of increased carp production, with 2007-08 as the critical year of no return for the local species. This trend therefore had a tremendous impact on the composition of the total fish production in the Dal lake.

A look at Figure 1D-F, depicting production of total fish, carp and *Schizothorax* fish in the Wular lake and the corresponding trend lines substantiates statistically that fish production in Wular lake has also suffered wide variations over the period 1990-2012.

Contrary to the situation in the Dal lake where carp fish production has risen at the expense of *Schizothorax*, in Wular, the peaks and troughs in fish production of all the three scenarios maybe attributed

more to the heavy siltation in the lake bottom. This trend of carps taking over the breeding grounds of the *Schizothorax* as in the Dal, has not yet happened in the Wular owing to the large size of the lake. It can also be attributed to the construction of the Uri power plant which had blocked the flow of water into the Wular lake for some time and caused heavy siltation of the lake bottom which led to an overall decline in fish production of this lake.

The trade-off between growth and sustainability of fishery in the lakes of Kashmir was compounded by the accidental introduction of the carp fish into the water bodies of the state in 1957. The importance, in terms of welfare loss in a historical perspective as well as in terms of local socio-economic-cultural ethos was compromised by this introduction of carps which led to a rapid decline in the local fish species, namely *Schizothorax*.

The WTP for restoration of the *Schizothorax* fish production in the Dal and Wular lakes was assessed using the logit model. The results are presented under two categories, one depicting the factors that determine the WTP of primary stakeholders (Table 1) and the other gives the WTP of secondary stakeholders (Table 2).

Primary stakeholders

Fishers

Based on the time spent in fishing, the fishers of the Dal lake seemed to be less inclined to WTP than of the Wular lake (Table 1). The Wular lake fishers who spent more time in fishing were 3-times more likely to pay for the sustainability of fishing in the lake compared to those who spent less time in fishing as exhibited by higher log odds ratio. The value of odds ratio indicates the extent to which WTP varies. With the lower odds ratio (0.297) and negative value of β coefficient for the age of Dal lake fishers, the odds in favour of WTP reduced by 70 per cent. Similarly, when the income level of fishers increased beyond ₹ 15000/month, the chances for WTP reduced, the odds in favour of WTP reduces by 96 per cent for Dal lake fishers (odds ratio 0.043). In the case of Wular fishers, the increase of the income beyond ₹ 10000/month, reduced the odds in favour of WTP by 86 per cent (odds ratio 0.142). This shows that the fishers having low income

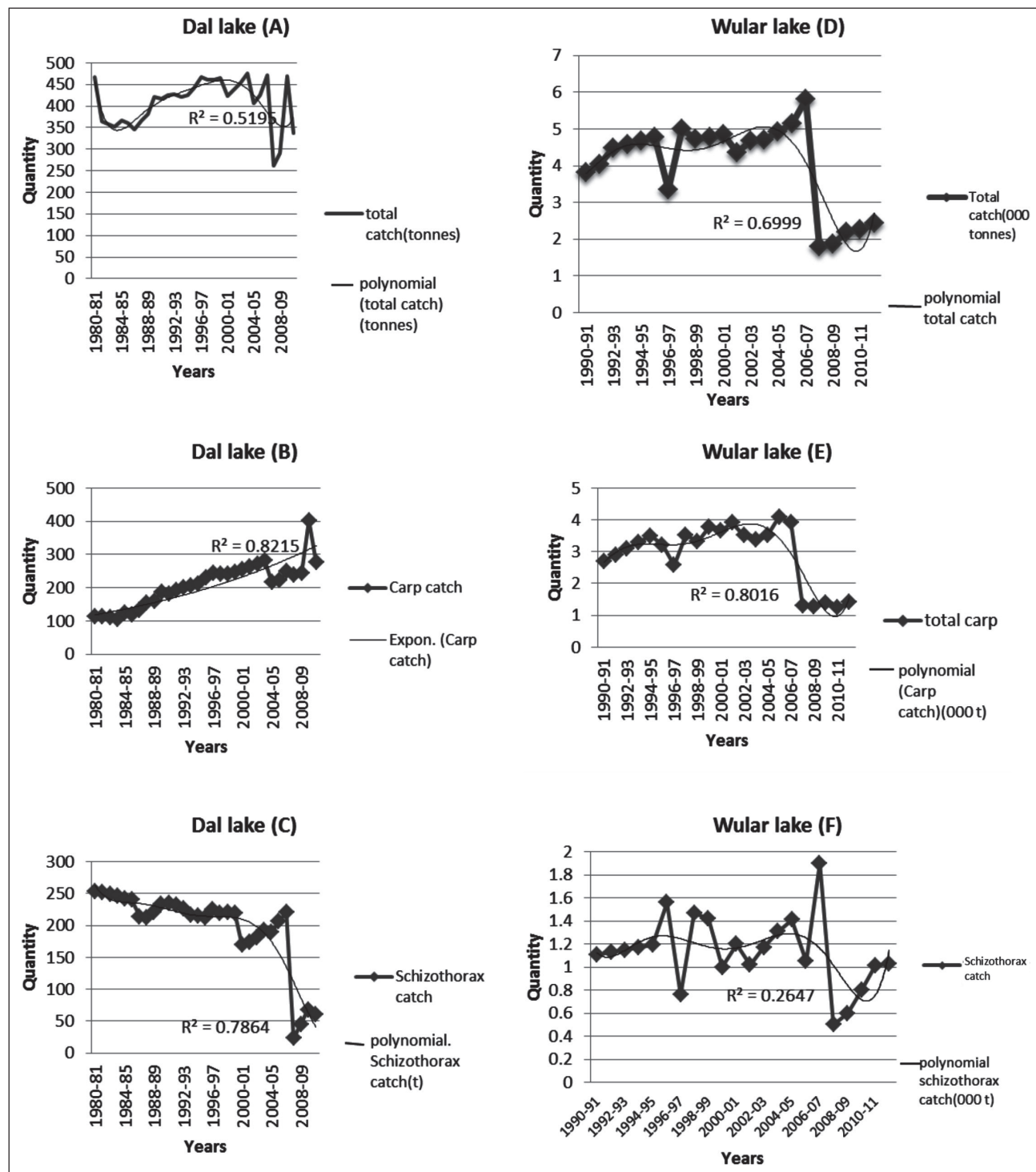


Figure 1. Trends in fish production in Dal lake(1980-2011) (A-C) and Wular lake (1990-2012) (D-E)

A: Estimated trend line for total fish production (t); B: Estimated trend line for total carp production (t); C: Estimated trend line for total *Schizothorax* production (t); D: Estimated trend line for total fish production (000 t); E: Estimated trend line for total carp production (000 t); F: Estimated trend line for total *Schizothorax* production (t)

Table 1. The log odds values of variables and logit models of primary stakeholders

Variables	Dal fishers	Wular fishers	Traders	Hotels/Houseboats
log Odds value				
Income (INC)	0.043	0.142	1.002	9.09
Family strength (FS)	8.94	0.33	-	-
Time spent on lakes (TS)	0.216	3.413	-	-
Age (AGE)	0.297	-	0.801	-
Willingness to spent extra time (WTS)	-	0.162	-	-
Type of stakeholder (TYSTK)	-	-	-	0.027

Models

$$\text{Dal fishers} = \ln \frac{P_i}{1-P_i} = 1.942 - 3.137INC + 2.191FS - 1.532TS - 1.214AGE$$

$$\text{Wular fishers} = \ln \frac{P_i}{1-P_i} = 4.554 - 1.95INC - 1.819WTS - 1.10FS$$

$$\text{Traders} = \ln \frac{P_i}{1-P_i} = -21.813 + 0.002INC - 0.222AGE$$

$$\text{Hotels and Houseboats} = \ln \frac{P_i}{1-P_i} = -25.138 - 3.616TYSTK + 2.207INC$$

where, P_i is the probability of WTP of stakeholders

and not having any other sources of income were more concerned about the growth and sustainability of the fisheries in the Kashmir lakes to sustain their livelihood.

With increase in family size beyond 4, the odds increased in favour of WTP by 800 per cent in the case of Dal lake fishers, while it decreased in favour of WTP by 67 per cent in the case of Wular lake fishers. This could be attributed to the priority of Wular fishers towards taking care of their families presently rather than investing a part of their income for restoration of Wular lake for a better income in future and also because the fishery of Wular lake for carps and *Schizothorax* was stable compared to Dal lake.

The odds in favour of WTP decreased by 84 per cent in the case of Wular lake fishers (odds ratio 0.16) for those willing to spend more time on fishing (WTS). The negative and significant contribution of WTS can also be attributed to the relative unavailability of other avenues of livelihoods in the vicinity of Wular lake. The variables, age of respondents and their fishing experience were not found significant though they had the expected sign.

Traders

The age of traders had a direct bearing on WTP, the higher the age, the lesser was the WTP. It was found

that as the age of respondents increased, the odds in favour of WTP decreased by 20 per cent indicating that the faith in restoration of the *Schizothorax* fishery in the Dal lake was more among the younger traders. Again as the income of the traders increased, the odds in favour of WTP also increased (odds ratio 1.002).

Hotels/Houseboats

With increase in the income of stakeholders engaged in hotels and houseboat businesses, the odds in favour of WTP increased (odds ratio 9.09), implying that they were 9-times more WTP than those with lower income. A comparison of WTP between hotels and houseboats revealed that hotels were 37-times (odds ratio 0.027) more likely to pay as compared to houseboats to ensure the growth and sustainability of fish production in the two lakes.

Therefore, the primary stakeholders at the business end of the lake fisheries had well realized the importance of consistent growth and sustained recovery of *Schizothorax* fishery in the selected lakes of Kashmir.

WTP of Secondary Stakeholders

The results of the logit model to determine the WTP for sustainability of fish production in Dal and Wular

Table 2. The log odds values of variables and logit models of secondary stakeholders

Variables	Fish consumers	Tourists	Faculty of fisheries	Department of fisheries
log Odds value				
Income (INC)	-	1.00	1.00	1.00
Gender (GEN)	0.254	-	1.134	-
Time spent on lakes (TS)	-	-	319.7	-
Age (AGE)	-	1.133	-	0.024
Consumption/month (CONSUP)	2.557	-	-	-
Designation (DD)	-	-	-	3.084
Home town (HT)	-	0.159	-	-
Education (EDU)	1.720	-	-	-

Models

$$(1) \text{ Fish consumers} = \ln \frac{P_i}{1-P_i} = -7.88 + 0.939\text{CONSUP} - 1.369\text{GEN} + 0.542\text{EDU}$$

$$(2) \text{ Tourists} = \ln \frac{P_i}{1-P_i} = -8.928 + 0.00\text{INC} + 2.088\text{HT} + 0.125\text{AGE}$$

$$(3) \text{ Faculty of fisheries} = \ln \frac{P_i}{1-P_i} = -17.019 + 0.00\text{INC} + 7.033\text{GEN} + 5.768\text{TS}$$

$$(4) \text{ Department of fisheries} = \ln \frac{P_i}{1-P_i} = 22.237 + 0.00\text{INC} + 10.337\text{DD2} - 3.73\text{AGE}$$

lakes by secondary stakeholders are presented in Table 2 and discussed below.

Fish consumers

The WTP in respect of the gender of consumer indicated that males were 4-times more likely to pay compared to female consumers (odds ratio 0.254). This may be attributed to the higher education levels of males than of females in the Kashmir valley. Therefore, the male fish consumers were more conscious for the restoration of *Schizothorax* fishery and balanced sustainability of Kashmir lake system. With increase in education level of respondents, the odds in favour of WTP increased by 83 per cent. Also, consumers who consumed more fish per month were almost 3-times more likely to pay than those who consumed less fish per month.

Tourists

In terms of tourists, it was observed that the odds in favour of WTP increased by 89 per cent with increase in their age. The income of tourists was a highly significant coefficient and indicated that they were willing to sacrifice the incremental income in full.

Based on the odds ratio, it was also found that tourists belonging to non-maritime zones were 6-times more likely to pay than those belonging to maritime zones. The fish consumers of inland states of India consume fresh water fishes, while of maritime states normally consume only marine fishes. Therefore, the concern of tourists for the consistent growth and sustained restoration of the *Schizothorax* fishery was evident.

Institutional Stakeholders

As far as faculty of fisheries, SKUAST-K was concerned the significant factors determining the WTP were time spent on lakes, income and gender. The results revealed the importance of lakes to the university and based on the odds ratio, the faculty were 319-times more likely to pay in comparison to others for the conservation and sustainability efforts. The consciousness for sustainability and the consistent performance of lake fisheries were evident from the positive coefficient of income with odds ratio of 1, which implies that if income increases by one unit, there is equal chance of WTP of the faculty members to contribute the incremental income in full towards the restoration and sustainability of *Schizothorax* fishery in the lakes of Kashmir.

Table 3. Hosmer Lemeshow test

Hosmer-Lemeshow Test	Dal fishers	Wular fishers	Traders	Hotels and houseboats	Fish consumers	Tourists	Faculty of fisheries	DoF
Chi-square	1.438	5.916	7.699	14.184	5.297	6.939	4.942	5.376
df	6	7	8	8	7	8	7	7
Sig	.963	.550	.463	.177	.624	.543	.667	.614

Note: Insignificant values of HosmerLemeshowtest indicate that models are good fit.

The female faculty members were 1.134-times more likely to pay than their male colleagues, due to better sense of appreciation of natural beauty, feeling of belongingness and enjoying culinary satisfaction in *Schizothorax* fishes and hence its fishery in lakes of Kashmir.

The odds ratio of 0.024 in the case of staff of Department of Fisheries (DoF) implied that with the increase in age of staff, the odds in favour of WTP are decreased by 98 per cent. As that of SKUAST-K faculty, the coefficient of income for DoF staff was also positive and highly significant with odds ratio equal to unity, indicating that they were willing to sacrifice the incremental income in full for improving the restoration and sustainability of lake fisheries of Kashmir. The results also reflected the consciousness of the staff of DoF towards the growth, conservation and sustainability of fisheries of Kashmir lakes which did not necessarily relate to a direct relationship with position in the order of hierarchy. Therefore, being a field operator than inspector/field supervisor decreased the log-odds of WTP by 10.708 units. Being fisheries guard than Inspector/field supervisor increased the log-odds of the WTP by 10.377 units.

The results of Hosmer Lemeshow (HL) test for the responses of multiple stakeholders are depicted in Table 3. Based on the criteria for evaluating the logit models, the coefficients of HL test were all non-significant, indicating that the models are a good fit. The non-significant chi-square test accepts the null hypothesis that the predicted and the observed probabilities are the same and hence the model was a good fit.

Composite Tobit Model

The Tobit model was employed to measure the significance (extent) and the value (amount) that the

stakeholders were WTP for the restoration and sustainability of *Schizothorax* fishery in the Dal and Wular lakes of Kashmir. The dependent variable in the Tobit model was the contribution that the stakeholders are willing to pay in monetary terms.

The overall WTP for all the stakeholders taken together has been ₹47/month (Table 4). The Table 4 also presents the sample mean of the independent variables such as age, income, education and time spent on lakes by the stakeholders which influenced the WTP for the sustainability of the *Schizothorax* fishery in the Dal and Wular lakes.

Table 4. Sample mean of the dependent and independent variables in the Tobit model

Sample mean	Primary stakeholders	Secondary stakeholders	Average value
Dependent variable			
WTP (₹/month)	40	54	47
Independent variable			
Age (years)	41.2	44.4	42.8
Income ('000 ₹)	41	137	89
Education (No. of years)	5.5	13.0	9.2
Time spent on lakes (hours)	10.2	2.4	6.3

Based on the results of Tobit model, income, time spent and the stakeholder (traders) emerged as significant variable. The results were as per expectations since WTP of the primary stakeholders was basically influenced by their income levels. The coefficients of the Tobit model are not interpreted directly as that of the OLS regression coefficients but as the coefficients of the latent variable. The results reveal that one unit increase in the income of

Table 5. Tobit results of WTP for primary and secondary stakeholders in Kashmir

Variables	Primary stakeholders	Secondary stakeholders
Constant	16.58	-76.48
Beta coefficient value		
Age	0.401	0.478
Income	0.067	1.538
Education	-0.004	12.732
Time spent on lakes	-1.209	0.223
Traders	83.3	-
Hotels/houseboats	-1.6	-
Consumers	-	-190.573

stakeholders will increase the predicted value (latent variable) by 0.067 unit. Therefore, it implies that as the income increases the WTP of the primary stakeholders also increases.

One unit increase in the time spent on lakes decreased the predicted value of the WTP by 1.21 units. It did appear from the results that the influence of negative impact of time spent on lake by the Dal lake fishers exerted a considerable effect on the WTP of the primary stakeholders in the composite model. Therefore, despite the fact that the Wular fishers were willing to spend more time on fishing and the traders were willing to spend more time on their trade, the influence of response of the Dal lake fishers in respect of their WTP for the sustainability and development of *Schizothorax* fisheries in Kashmir lakes was the common denominator that resulted in a negative and significant coefficient of time spent on lakes by the primary stakeholders in the Tobit model.

A comparison across the different primary stakeholders has revealed that the predicted value of WTP for traders was 83.9 units higher than that of the fishers. The WTP of traders (primary stakeholder) has emerged positive and significant in the composite model. This may be related to the emergence of income as a significant and positive variable. The role of the traders in influencing the income and consequent response of the concerned stakeholders to WTP was because of the fact that the traders occupy the pivotal place in the supply of fish in the local markets of Kashmir.

The R^2 value of the fitted model, derived from the correlation coefficient between observed and predicted values, showed that 49 per cent of the variation was explained by the model for both stakeholder-groups.

As in the case of primary stakeholders, the income was positive and significant with respect to WTP of both consumers and institutional stakeholders. The results reveal that one unit increase in the income of stakeholders will increase the predicted value (latent variable) by 1.53 units. The emergence of education as a positive and significant variable in determining WTP in the case of secondary stakeholders has an important bearing on the income variable which also turned out to be positive and significant. With per unit increase in the number of schooling years, the predicted value will increase by 12.73 units. This indicates that education had a major influence on the willingness to pay. It may also be noted that education was not a significant variable in the case of primary stakeholders. This has very important policy implications.

Among the stakeholders who were considered for the Tobit model, the response of the consumers had a negative and significant bearing on WTP. The comparison across different secondary stakeholders revealed that the predicted value of WTP for the consumers was 190 units lower than that of the institutional stakeholders. The sign and size of the coefficients in respect of consumers indicated that the consumers representing people from different strata of the society, were not WTP for conservation and sustainable development of *Schizothorax* fishery in the lakes of Kashmir. It indicated that there could be complacency among the consumers, especially among those belonging to lower income strata who would not really care about the quality of the fish that they purchase in the market so long as the fish were available in the market at reasonable rates. This again has important policy implications in the context of sustainable development of fisheries in the lakes of Kashmir.

The flexibility of the Tobit model to accommodate the actual values enabled the investigator to identify common variables that emerged significant across the primary and secondary stakeholders, respectively. While in the case of logit model it was possible to identify the variables which were responsible for influencing WTP when the values in the model were

actual as well as coded. Therefore, a comparison of the results of these two models revealed that it was income which primarily determines the WTP for the growth and sustainable development of *Schizothorax* fishery in the lakes of Kashmir.

Therefore, it may be concluded that the composite model in the case of both primary and secondary stakeholders displayed the expected results and has helped significantly in the development of policy strategies.

Truncated Growth and Compromised Sustainability

The analysis has indicated a distinct pattern in the perception of stakeholders involved directly or indirectly in the fishery of Kashmir lakes. The concerns expressed by the primary stakeholders are reflected in their WTP and in the variables that determine their attitude to WTP as well as the amounts that they are willing to pay for development and sustainability of *Schizothorax* fishery of Kashmir lakes. The trends in fish production in the selected lakes reflect the fallacy of introduction of exotic species like carps in the water bodies of Kashmir. It caused a slow and steady decline in the initial phases and later an abrupt drop in the contribution of the *Schizothorax* species to the total fish production in Kashmir. This has been well captured by the explosive growth and prominent proportion of this species among fish species marketed in Kashmir.

Conclusions and Policy Implications

The study has attempted to find answer to the question whether growth implies rise in quantity of fish available for consumption or should it reflect a balanced performance of traditional and exotic species (Qureshi and Krishnan, 2012). The logit analysis of the responses of stakeholders in the Wular lake has appropriately reflected the traditional values involved in the management of lake fishery system. The Tobit results based on the composite responses of the stakeholders have also indicated through their WTP and significant variables that influence their WTP, a need for a fresh look at the development priorities of the fisheries in Kashmir lakes. The growth in terms of social welfare which ought to be reflected by

flourishing development of *Schizothorax* fishery, has been replaced by giving priority to increasing total fish production in Kashmir, irrespective of their species produced.

In order to restore the prime place of importance to *Schizothorax* species in Dal and Wular lakes, water quality will have to be improved. The efforts of Lakes and Waterways Development Authority, Kashmir should be focused on the balanced development of the stocks of local species *Schizothorax* and carps which occupy the same water space. Carp culture could be promoted as a separate freshwater aquaculture activity in other derelict water bodies which would yield good income and maintain the supply chain of fish to the markets.

The Tobit analysis has indicated a positive bearing of education on WTP, especially from the point of view of secondary stakeholders, but at the same time, the component of institutional stakeholders influences the positive impact of education on WTP. It has also been seen that the consumers are not quality conscious, may be due to low levels of income and education among poor households in Kashmir. These have played a negative role in the determination of WTP to growth and sustainability of *Schizothorax* fishery in the lakes of Kashmir. It is therefore necessary to provide education, particularly to women in Kashmir.

A well-designed plan of action for the restoration of *Schizothorax* fishery would ensure socio-economic-cultural growth and sustainability of a balanced fishery in Kashmir. There is an urgent need to develop hatchery technology for *Schizothorax*. The institutionalization of lake fisheries in Kashmir through establishment of a suitable end-to-end supply chain needs to be envisaged and implemented.

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