Indian J. Fish., 68(1): 96-101, 2021
DOI: 10.21077/ijf.2021.68.1.99890-12

Preferences of rural youth towards fisheries vocations in Doda District of Jammu Division, Jammu and Kashmur, India

NARINDER PAUL, G. N. JHA AND A. S. CHARAK
Krishi Vigyan Kendra Doda, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J) Doda -182 221, Jammu and Kashmir, India
e-mail: narinderpaul1977@gmail.com

ABSTRACT

The preferences of rural youth towards different fisheries vocations have been assessed using the Thurstone paired comparison technique. Six major fisheries vocations for which trainings were imparted to the rural youth by the Krishi Vigyan Kendra (KVK), Doda during 2016-17; 2017-18 and 2018-19 were identified. A sample of 94 rural youth was randomly drawn from 940 rural youth attended various awareness programmes, training programmes and exposure visits organised by KVK, Doda independently or in collaboration with National Fisheries Development Board (NFDB), Hyderabad and ICAR-Directorate of Coldwater Fisheries Research (ICAR-DCFR), Bhimtal during these three years. Trout culture with the highest scale value of 0.563 was the most preferred fishery vocation by the rural youth and aquarium making was the least preferred with scale value of 0.00. Other vocations *viz.,* carp culture, fish seed production, ornamental fish production and fish feed production were found in between this continuum with varying degrees of the scale distances. The average value of Absolute Discrepancy (AD) estimated was 0.009, which implies that the calculated scale values of the various fisheries vocations had very high level of consistency.

Keywords: Fisheries, Paired comparison, Rural youth, Thurstone paired comparison technique, Training, Vocation

Introduction

Indian fisheries sector provides employment opportunities to 14 million people with 3rd global ranking in fisheries and 2nd in aquaculture (GoI, 2018a,b). It has tremendous potential and is a very crucial sector for the Indian economy as it provides employment opportunities, is a source of nutritional food and foreign exchange. This sector has been growing continuously with improvements in productivity and utilisation of untapped resources in the country. With the total fish production of 12.32 million t, it contributes about 1.21% to the country's GDP and 5.37% to the GDP from agriculture sector (GoI, 2018a, b).

In temperate areas of Jammu and Kashmir, there is vast scope in the fisheries sector due to availability of abundant water resources. There is immense prospects in attracting youth towards various fisheries vocations *viz.,* ornamental fish production, fish breeding and seed production, fish feed production, aquarium making as well as trout and carp farming. To formulate strategies for attracting rural youth towards this sector, it becomes imperative to know the degree of their preferences towards various fisheries vocations.

Thurstone developed the law of comparative judgement (Thurstone, 1927a) which provides the rationale for putting the stimuli in proper order along a psychological continuum. These stimuli may be something in the form of statements, questions, choices or options. A paired comparison is simply a binary choice and is a powerful tool for eliciting judgements and preferences. This method can be used to obtain preferences, judgements, choices and information regarding wide range of stimuli and is an appropriate technique of judgement. With the method of paired comparisons, a set of stimuli or items is judged, usually by presenting all possible pairs of the items to each respondent who chooses for each pair, the item that better satisfies the specified choice criterion (Brown and Peterson, 2009). Moreover, when preference or choice has to be made from a number of objects, it becomes quite imperative not only to understand the most preferred one but also the order of their preferences with the exact magnitude of distances between them. Under such conditions, paired comparison becomes the only practical experimental procedure available to compare and judge several objects at the same time to get a fine judgement. It is a psychological scaling method and makes possible quantitative investigation of all kinds of values and subjective experiences (Edwards, 1969). The method of paired comparison is used primarily in cases when the objects to be compared can be judged only subjectively *i.e.* when it is impossible or impracticable to make the relevant measurements for deciding which of the two objects are preferable (David, 1959).

The method of paired comparisons for recording human judgments has a long history (Brown and Peterson, 2009). A major emphasis to this method was given by Thurstone (Thurstone, 1927b,c) with his psychological scaling proposals. Guilford (1954); Torgerson (1958); David (1959); Bock and Jones (1968) and Nunnally (1976) have also considerably described this method. In this method, the stimuli (items, statements or variables) are presented in pairs in all possible combination and the respondents are asked to select one stimulus over the other from each pair which is judged as the most favourable. As the stimuli are presented to the respondents in pairs and one stimulus is compared to the other; this method is known as the method of paired comparison.

The paired comparisons are widely used by the psychometricians. Moreover, this is physiological scaling method and also provides an estimate of distances between each of the fisheries vocation/stimuli in comparison to the vocation with least preference whose scale value is arbitrarily brought down to the level of zero (Ray and Mondal, 2004). Advantages of paired comparisons as a method for eliciting human judgments include the method's simplicity and its use of comparative judgments. The method of paired comparisons thus uses our inherent familiarity with and ability to, make comparisons (Brown and Peterson, 2009).

Materials and methods

The present investigation was carried out purposively in District Doda of Jammu and Kashmir. Krishi Vigyan Kendra Doda, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J) conducted various awareness programmes, training programmes and exposure visits independently or in collaboration with National Fisheries Development Board (NFDB), Hyderabad and ICAR-Directorate of Cold Water Fisheries (ICAR-DCFR), Bhimtal for rural youth of the District to motivate them towards 6 fisheries vocations *viz.,* carp culture, trout culture, ornamental fish production, fish seed production, aquarium making and fish feed production. Rural youth covered under different programmes and activities of KVK, Doda, having duration ranging from 1-21 days during the years 2016-17; 2017-18 and 2018-19 constituted the population for the present study.

In all, 26 trainings, 11 awareness programmes, 9 vocational trainings and 1 exposure visit were conducted by the KVK, Doda during the three years *i.e.,* 2016-17; 2017-18 and 2018-19. During the period under investigation, 940 rural youth covered all these programmes on 6 fisheries vocations. From the population of 940 rural youth trained by the KVK, a sample of 94 youth (68 male and 26 female) was selected for the present investigation using the proportionate random sampling method.

The psychological continuum of the rural youth regarding their preferences towards these six fisheries vocations has been assessed using Thurstone paired comparison technique (Thurstone, 1927a, b). If there are 'n' number of stimuli, then the number of pairs formed was 'n(n-1)/2'. In the present case, there are 6 numbers of stimuli in the form of vocations. Therefore, the number of pairs is, 6(6-1)/2 which is equal to 15 (Thurstone, 1927a, b).

Thus, a comprehensive stimulus consisting of 15 pairs of the 6 fisheries vocations were formed (Table 1) and to eliminate the response biases, both vocations in each pair and the pairs themselves were randomly arranged using the table of random number. This was also done to eliminate monotonous sequence and to promote thinking on part of the respondents.

The 6 fisheries vocations in the form of a questionnaire arranged in 15 randomly arranged pairs was given to 94

Table 1. Pairs of fisheries vocations used as stimuli for assessing the preferences of rural youth

Pair 1	Carp culture	Trout culture
Pair 2	Fish seed production	Ornamental fish production
Pair 3	Aquarium making	Fish feed production
Pair 4	Ornamental fish production	Carp culture
Pair 5	Trout culture	Fish seed production
Pair 6	Aquarium making	Ornamental fish production
Pair 7	Fish feed production	Trout culture
Pair 8	Carp culture	Aquarium making
Pair 9	Fish seed production	Fish feed production
Pair 10	Trout culture	Ornamental fish production
Pair 11	Carp culture	Fish seed production
Pair 12	Aquarium making	Trout culture
Pair 13	Ornamental fish production	Fish feed production
Pair 14	Fish seed production	Aquarium making
Pair 15	Fish feed production	Carp culture

selected rural youth who acted as the respondents. They were all instructed to judge/rate/select independently one vocation over the other from each pair which they rate the best for establishing a vocation based on their experiences gained during awareness, training or exposure visit or other extension activities they participated. The basic experimental unit was the comparison of two vocations which in the simplest terms he/she prefers.

This method was used because the objects to be judged were subjective and it was impossible to make relevant measurements directly, as no tool was available. It was found to be an appropriate practical experimental procedure to find out where various fisheries vocations lie on the continuum of the preferences of rural youth.

Results and discussion

The schematic representation of the paired comparison data has been presented following Edwards (1969).

F-Matrix of fisheries vocations judged by rural youth

From the observed frequencies, the F-Matrix or the frequency with which each column stimulus was judged more favourable than the row stimulus is presented in Table 2. F-Matrix consists of frequencies corresponding to the number of times that each vocation is judged more favourable than the other by the respondents. The cell entries correspond to the frequency with which column stimulus is judged more favourable than row stimulus. We do not obtain comparative judgments for each vocation with itself. In the present case, there is no comparative judgement for carp culture *vs*. carp culture, trout culture *vs*. trout culture and so on. The cell entries in the diagonal line were therefore vacant but we may assume that if such judgments had been obtained, it would be equal to N/2 *i.e.* 52 (94/2) in each case where, N is the number of respondents involved in judging. To understand the F-Matrix properly, it is evident from data presented in Table 2 that 48 rural youth preferred carp culture over trout culture, 53 rural youth preferred carp culture over ornamental fisheries and so on. F-entries in each column stimulus for various fisheries vocations were judged more favourable than the row stimulus.

P-Matrix corresponding to F-Matrix for preferences of fisheries vocations

P-Matrix is the schematic representation which shows the proportion of times the column stimulus is judged more favourable than row stimulus. It was obtained by dividing each of the cell entries in the F-Matrix by N *i.e.* total number of respondents. Here each cell entry was divided by 94 to get the P-Matrix of the fisheries vocation. As the cell entries in the diagonal line from left to right were supposed to be 50% of the total respondents, this on division by 94 gives a proportion of 0.500 which has been presented in each cell of the diagonal line in the P-Matrix presented in Table 3. The proportion of 0.510 was found in the carp culture over trout culture which is equivalent to 51% and so on. The column sum of values of proportions for each fishery vocation was calculated as 3.468 for carp culture. Similarly, for trout culture, ornamental fish production, fish seed production, aquarium making and fish feed production it was 3.521, 2.936, 3.106, 2.234 and 2.670 respectively.

Rearranged P-Matrix with smallest to highest column sum for preferences of fisheries vocations by rural youth

P-Matrix in Table 3 was then rearranged with the fishery vocation having smallest column sum at the left and that with the largest at the right side. For this purpose the column vocations were rearranged from smallest to highest as from carp culture (3.468), trout culture (3.521), ornamental fish production (2.936), fish seed production (3.106), aquarium making (2.234) and fish feed production (2.670) to aquarium making (2.234), fish feed production (2.670), ornamental fish production (2.936), fish seed production (3.106), carp culture (3.468) and trout culture (3.521). The columns were taken one by one and the row values, from top down for each column were rearranged in the same order. This gave rise to the rearranged P-Matrix which has been presented in Table 4. It may be found that there was no *pij* value (cell value) equal to or greater than 0.99 or equal to or less than 0.01. So, as per the criterion set up by Edwards (1969), the method for the complete data was followed in the present case.

Table 2. F-Matrix for fisheries vocations judged by the rural youth

Fisheries vocations	Carp culture (A)	Trout culture (B)	Ornamental fish production (C)	Fish seed production (D)	Aquarium makring (E)	Fish feed production (F)
Carp culture (A)	47	46*	41	35	29	37
Trout culture (B)	48	47	41	40	23	32
Ornamental fish production (C)	53	52	47	54	36	44
Fish seed production (D)	58	53	40	47	36	36
Aquarium manking (E)	64	72	57	59	47	55
Fish feed production (F)	56	61	50	57	39	47

*46 Rural youth preferred trout culture for establishing fishery vocation over carp culture

Table 3. P-Matrix corresponding to F-Matrix for preferences of fisheries vocations

Fisheries vocations	Carp culture (A)	Trout culture (B)	Ornamental fish production (C)	Fish seed production (D)	Aquarium making (E)	Fish feed production (F)
Carp culture (A)	0.500	0.489	0.436	0.372	0.308	0.393
Trout culture (B)	0.510	0.500	0.436	0.425	0.244	0.340
Ornamental fish production (C)	0.563	0.553	0.500	0.574	0.383	0.468
Fish seed production (D)	0.617	0.563	0.425	0.500	0.383	0.383
Aquarium making (E)	0.680	0.766	0.606	0.627	0.500	0.585
Fish feed production (F)	0.595	0.648	0.531	0.606	0.414	0.500
Sum (∑)	3.468	3.521	2.936	3.106	2.234	2.670

Z-Matrix corresponding to the rearranged P-Matrix

Data incorporated in Table 5 reveals the Z-Matrix corresponding to the rearranged P-Matrix which was obtained by converting the P_{ij} entries to z_{ij} with the help of statistical table of normal deviates. The Z-values for each P-value was obtained from the table and column sum of Z-values for each fishery vocation under study was obtained by adding the respective cell entries taking the sign into consideration.

The column sum for aquarium making, fish feed production, ornamental fish production, fish seed production, carp culture and trout culture was calculated as -2.008, -0.822, -0.164, 0.264 1.205 and 1.370 respectively. Thereafter, the means for each column was obtained by dividing the column sum (∑ Z) by the number of fisheries vocations under study *i.e.* 6. The absolute scale of the vocation in the form of stimulus with the largest negative deviation (0.335) was added to all the column means to make the scale value zero and all others with positive sign. The scale values of the fisheries vocations are presented in Table 4.

A perusal of scale values indicate that the trout culture with the highest scale value (0.563) was perceived as the most preferred vocation by the rural youth and aquarium making as the least preferred vocation with scale value 0.00 and other vocations in between this continuum with varying degrees of distances. However, carp culture formed the second most preferred vocation by the trainees with scale value 0.536 followed by fish seed production with scale value 0.379, ornamental fish production with scale value 0.308 and fish feed production with 0.198 scale value.

Table 4. Rearranged P-Matrix smallest to highest column sum for preferences of fisheries vocations

Fisheries vocations	Aquarium making (E)	Fish feed production (F)	Ornamental fish production (C)	Fish seed production (D)	Carp culture (A)	Trout culture (B)
Aquarium making (E)	0.5000	0.5851	0.6064	0.6277	0.6809	0.7660
Fish feed production (F)	0.4149	0.5000	0.5319	0.6064	0.5957	0.6489
Ornamental fish production (C)	0.3830	0.4681	0.5000	0.5745	0.5638	0.5532
Fish seed production (D)	0.3830	0.3830	0.4255	0.5000	0.6170	0.5638
Carp culture (A)	0.3085	0.3936	0.4362	0.3723	0.5000	0.4894
Trout culture (B)	0.2447	0.3404	0.4362	0.4255	0.5106	0.5000
Sum (∑)	2.2341	2.6702	2.9362	3.1064	3.4680	3.5213

Table 5. Z-Matrix - preferences of rural youth for fisheries vocations

Fisheries vocations	Aquarium making (E)	Fish Feed production (F)	Ornamental fish production (C)	Fish seed production (D)	Carp culture (A)	Trout culture (B)
Aquarium making (E)	0.000	0.215	0.269	0.324	0.468	0.726
Fish feed production (F)	-0.217	0.000	0.078	0.269	0.240	0.380
Ornamental fish production (C)	-0.298	-0.055	0.000	0.187	0.159	0.133
Fish seed production (D)	-0.298	-0.298	-0.189	0.000	0.298	0.159
Carp culture (A)	-0.502	-0.272	-0.161	-0.327	0.000	0.000
Trout culture (B)	-0.693	-0.412	-0.161	-0.189	0.040	-0.028
Sum (∑ Z)	-2.008	-0.822	-0.164	0.264	1.205	1.370
Mean Z divided by 6	-0.335	-0.137	-0.027	0.044	0.201	0.228
Add largest negative deviation	0.335	0.335	0.335	0.335	0.335	0.335
Rank (Scale value) R	0.000	0.198	0.308	0.379	0.536	0.563

Internal consistency check

After obtaining the scale values of 6 different fisheries vocations which reflect the preferences of rural youth on the least to the most favourable psychological continuum, an internal consistency check was applied. This comprised of comparing the observed or empirical proportions (p_{ij}) with those to be obtained in terms of theoretical or expected proportions ($p_{ij'}$). The smaller the difference between empirical (p_{ij}) and expected ($p_{ij'}$) proportions, the higher is the consistency of scale values. If the difference is zero, it indicates perfect consistency. But it is rarely achieved.

The first step in applying the test of internal consistency is to obtain the theoretical normal deviates ($z_{ij'}$) for scale separations or distances of different fisheries vocations. For this, a table was set up where the rows and columns were bounded by the scale values obtained earlier (Table 5 last row). The scale values of the different fisheries vocations written on the left hand side are then subtracted column-wise from the scale values written at the top of the table. The method of computation of theoretical normal deviates ($z_{ij'}$) for entries below the diagonal line is shown in Table 6.

The next step is to compute the theoretical proportions ($p_{ij'}$) value from the value of theoretical normal deviates ($z_{ij'}$). This was done through a reverse process by consulting the same table of normal deviates. For *e.g.* the theoretical normal deviates ($z_{ij'}$) value of -0.536 exists where p value is 0.29 in the row and 6 at the top. For $z_{ij'}$ value of -0.536 therefore, $p_{ij'}$ value of 0.296 has been placed. If the value of $z_{ij'}$ does not tally exactly, the nearest value was taken to generate Table 6 of theoretical proportions $p_{ij'}$ corresponding to the theoretical normal deviates $z_{ij'}$.

After having determined the theoretical proportions ($p_{ij'}$) values for each entry below the diagonal, the differences between the empirical proportions (p_{ij}) of Table 4 and corresponding expected theoretical proportion ($p_{ij'}$) of Table 7 were found. For this purpose, each cell entry of Table 7 was subtracted from the corresponding entry of Table 4 (*i.e.* $p_{ij} - p_{ij'}$). Data incorporated in Table 8 reveals the discrepancies between the observed proportions pij and theoretical proportions pij'.

The column sums of the discrepancies between observed proportions (p_{ij}) and theoretical proportions ($p_{ij'}$) were then obtained without taking the signs into consideration and has been presented in the last row of Table 8. The sum of these values (0.002, 0.024, 0.017, 0.67 and 0.022), *i.e.*, $\sum | p_{ij} - p_{ij'} |$ obtained is 0.132. For computing the Absolute Average Discrepancy (AD), this value was divided by n(n-1)/2 *i.e.* 15, where n is the number of fisheries vocations whose preferences have been sought from the rural youth in the present investigation. By putting the values in the formula the value of AD was calculated (Edwards, 1969):

$$AD = \frac{\sum | pij - pij' |}{\frac{n(n-1)}{2}}$$

Table 6. Theoretical normal deviates ($z_{ij'}$) corresponding to the scale distances of different fisheries vocations of Table 5

Fisheries vocations		Aquarium making (E)	Fish feed production (F)	Ornamental fish production (C)	Fish seed production (D)	Carp culture (A)	Trout culture (B)
		0.000	0.198	0.308	0.379	0.536	0.563
Aquarium making (E)	0.000	-	-	-	-	-	-
Fish feed production (F)	0.198	-0.198	-	-	-	-	-
Ornamental fish production (C)	0.308	-0.307	-0.110	-	-	-	-
Fish seed production (D)	0.379	-0.379	-0.181	-0.071	-	-	-
Carp culture (A)	0.536	-0.536	-0.338	-0.228	-0.157	-	-
Trout culture (B)	0.563	-0.563	-0.365	-0.256	-0.184	-0.028	-

Table 7. Theoretical proportions $p_{ij'}$ corresponding to the theoretical normal deviates $z_{ij'}$ of Table 6

Fisheries vocations		Aquarium making (E)	Fish feed production (F)	Ornamental fish production (C)	Fish seed production (D)	Carp culture (A)	Trout culture (B)
		0.000	0.198	0.308	0.379	0.536	0.563
Aquarium making (E)	0.000	-	-	-	-	-	-
Fish feed production (F)	0.198	0.422	-	-	-	-	-
Ornamental fish production (C)	0.308	0.379	0.456	-	-	-	-
Fish seed production (D)	0.379	0.352	0.428	0.472	-	-	-
Carp culture (A)	0.536	0.296	0.368	0.410	0.438	-	-
Trout culture (B)	0.563	0.287	0.357	0.399	0.427	0.489	-

Table 8. Discrepancies between the observed proportions pij and theoretical proportions pij’

Fisheries vocations		Aquarium making (E)	Fish feed production (F)	Ornamental fish production (C)	Fish seed production (D)	Carp culture (A)	Trout culture (B)
		0.000	0.198	0.308	0.379	0.536	0.563
Aquarium making (E)	0.000	-	-	-	-	-	-
Fish feed production (F)	0.198	-0.007	-	-	-	-	-
Ornamental fish production (C)	0.308	0.004	0.012	-	-	-	-
Fish seed production (D)	0.379	0.031	-0.045	-0.047	-	-	-
Carp culture (A)	0.536	0.013	0.026	0.026	-0.066	-	-
Trout culture (B)	0.563	-0.042	-0.017	0.037	-0.002	0.022	-
∑	-	0.002	0.024	0.017	0.067	0.022	-
Summation taking all values as positive						0.132	

The value of AD obtained is 0.009 which is very low and implies that the scale values for the various fisheries vocations had very high level of consistency.

It can be found that the rural youth of Doda District of Jammu and Kashmir had high preference towards trout farming followed by carp production, ornamental fish production and fish feed production. However, the least preferred fisheries vocation was aquarium making. Moreover, the scale values obtained for the different fisheries vocations under study had very high level of consistency as evident from very low calculated value of AD. It is therefore suggested that while formulating strategies for promotion of fisheries vocations for rural youth, emphasis needs to be given to these vocations in accordance with the degree of their preferences by the rural youth.

Acknowledgements

The authors are grateful to the Extension Division, Indian Council of Agriculture Research (ICAR), New Delhi; NFDB, Hyderabad and ICAR-DCFR, Bhimtal for financial support to KVK for conducting extension programmes for rural youth. Special thanks to all the rural youth covered under the study, for providing timely and valuable responses in a very accountable manner which helped in the generation of data for carrying out the present investigation.

References

Bock R. D. and Jones L. V. 1968. *The measurement and prediction of judgement and choice,* Holden Day Series in Psychology, San Francisco, Calofornia, USA, 370 pp.

Brown, T. C. and Peterson, G. L. 2009. An enquiry into the method of paired comparison: Reliability, scaling and Thurstone’s Law of comparative judgement. *Gen Tech. Rep. RMRS-GTR-216,* U. S. Department of Agriculture and Forest Service, Rocky Mountain Research Station, Fort Collins, Colarado, USA, 98 pp.

David, H. A. 1959. The method of paired comparison, *Proceedings of the 5th Conference on Design of experiments in army research developments and testing.* The US Army Biological Warfare Laboratories, Fort Detrik, Fredrk, Maryland, USA, p 1-16.

Edwards L. A. 1969. *Techniques of attitude scale construction*, Vakils, Feffer and Simons Pvt. Ltd., Mumbai, Maharashtra, India, p. 83-117.

GoI 2018a. *Basic animal husbandry and fisheries statistics, 2018, AHS Series-19,* Department of Animal Husbandry Dairying and Fisheries, Govt. of India, 180 pp.

GoI 2018b. *Handbook of fisheries statistics. 2018.* Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Govt. of India, Krishi Bhawan, New Delhi.

Guilford, J. P. 1954. *Psychometric methods,* 2nd edn. McGraw Hill, New York, USA, 597 pp.

Nunnally, J. C. 1976. *Psychometric theory,* McGraw Hill, New York, USA, 640 pp.

Ray, G. L. and Mondal, S. 2004. *Research methods in social sciences and extension education,* Kalyani Publishers, New Delhi, India, p. 215-228.

Thurstone, L. L. 1927a. A law of comparative judgement. *Psychol. Rev.,* 34: 273-286. https://doi.org/10.1037/h0070288.

Thurstone, L. L. 1927b. The method of paired comparison for social values, *J. Abnormal Soc. Psychol.,* 21: 384-400.

Thurstone, L. L. 1927c. Psychophysical analysis, *Am. J. Psychol.,* 38: 369-389.

Torgerson, W. S. 1958. Theory and methods of scaling, John Wiley and Sons, New York, USA, 460 pp.

Date of Receipt : 07.04.2020
Date of Acceptance : 13.11.2020