



**HAL**  
open science

## Valuing sea-trout angling: a contingent experiment in western France

Francois Bonnieux, Dominique Vermersch

► **To cite this version:**

Francois Bonnieux, Dominique Vermersch. Valuing sea-trout angling: a contingent experiment in western France. 3. EAERE Annual Conference, Jun 1992, Cracovie, Poland. 12 p. hal-01594101

**HAL Id: hal-01594101**

**<https://hal.science/hal-01594101>**

Submitted on 7 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

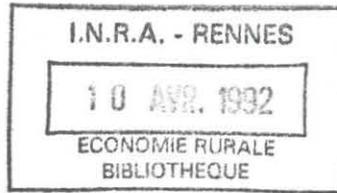
L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

59553

FB02/04/92



**THIRD ANNUAL EAERE MEETING,**

*CRACOW 16-19 June 1992*

**VALUING SEA-TROUT ANGLING : A CONTINGENT  
EXPERIMENT IN WESTERN FRANCE**

*F. BONNIEUX and D. VERMERSCH*  
Institut National de la Recherche Agronomique  
65, rue de St-Brieuc  
35042 RENNES CEDEX, FRANCE

This paper deals only with sea-trout fishing in France. There is no commercial fishery (e.g. in river mouths with nets) so fishing is restricted to game angling in freshwater for recreational purposes only. There are relatively few people involved in this activity : 3300 in 1990 but expenditures per angler are great so game angling has significant economic impacts.

We present some results of a valuation experiment conducted on the Touques river located in Western France. It is famous for sea-trout and 40 % of sea-trout anglers will fish in this river. The research combines an onsite survey and a mail survey. The onsite survey was run during the 1990 fishing season. The questionnaire was designed to provide background information and to implement the travel cost approach on microdata. The general objective of the mail survey was to derive an *ex ante* assessment of several proposals dealing with fishery management. The valuation experiment was founded upon the CVM.

INRA-ESR  
REN-FB n°60

The main findings of the onsite survey are summarized in the first paragraph whereas the rest of the paper is devoted to the contingent component of the research.

## 1. ONSITE SURVEY RESULTS

Information on the survey was given in local newspapers and T.V. As a matter of fact the fishermen welcomed the interviewers. The questionnaire is quite long and it was expected the face-to-face interview would need no more than 20 minutes. But most individuals wanted to add comments which are often valuable, so it usually took 30 minutes. It reviews anglers' characteristics, fishing experience and effort, and expenditures. Let us notice that the only question for which non-response is significant involves income. People were asked to locate their family income on a ladder and 25% refused. But for the other 75% answers are consistent with age and occupation.

The main results of the onsite survey are reported in table 1. Sea-trout angling is a male recreation (only one lady was met) and people surveyed are wealthy compared with the French population. The value of equipment and the length of a fishing day are high. On the average anglers fish in the Touques 24 times per season so the number of hours per fishing season equals 120. But there are significant differences between residents and tourists. Residents travel relatively short distances and visit the river more often than tourists who spend more time on the river, fishing for a week-end or a week. That is, the tourists substitute length of trips for the number of trips in a fishing season. This behaviour is well known in recreational economics (Bell and Leeworthy, 1990). Average round-trip distance is close to figures obtained for salmon angling in France (Bonnieux et al, 1992) and reported elsewhere, for example to participate in angling activities in Maryland (Walsh, 1986, p. 14).

Table 1. Sea-trout angling basic data

	Sea-trout
number of anglers 1990 <sup>1</sup>	1300
sample size	177
sampling rate	.14
ANGLERS' CHARACTERISTICS (average)	
age (years)	40
training (years)	7
effort- number of hours per fishing day	5
equipment (F) <sup>2</sup>	5140
round-trip distance (km)	176
yearly total fishing fees (F) <sup>3</sup>	959
cost of a fishing season (F) <sup>4</sup>	5759
Consumer surplus per day (F)	160

(1) Approximation.

(2) Including reels, rods and lines.

(3) Including licence, fishing society fees, special fees for salmon and sea-trout

(4) Including transportation costs, food, lodging, fishing and depreciation of equipment.

F: French Franc 1F = .18 US \$

Anglers are not very successful in terms of fish caught : 3.5 per year, but 48 % did not catch any trout ! In any case they enjoy their experience since 90 % plan to come back next year and only 30 % fish in a river substitute. So it is quite clear that the quality of fishing experience have many attributes.

In most cases the trip is intended for angling only since multiple objective visits only concern 4 % of people surveyed. Sea-trout angling is expensive in terms of equipment, fees and transportation costs but cheaper than salmon angling (Bonnieux et al. 1992). The average cost of a fishing season equals 5 769 F but there is a significant difference between residents and tourists : 4 855 F and 9 450 F respectively. These figures are consistent with values concerning comparable situations. Radfort et al. (1991) have considered salmon and sea-trout angling in England and Wales. They got 4 270 F per season but regional averages range from 2 960 F to 10 460 F.

Consumer surplus per fishing day has been obtained using the travel cost method. Price per trip to the Touques river includes car operating costs plus food and lodging expenditures. Distance traveled has been also considered to take into account the opportunity cost of traveling time. Moreover the fishing demand equation incorporates angler's income, value of equipment and the

existence of a river substitute. the average surplus reported in table 1 is very closed to surpluses given elsewhere. For example in Norway, Navrud (1991) has obtained values ranging from 100 F to 250 F for trout and salmon.

## 2. OUTLINE OF THE CONTINGENT VALUATION EXPERIMENT

The main issue concerns new opportunities to improve fishing experience. Until the 1990 season, only 26 km of the Touques banks, upstream from the mouth, were devoted to recreational fishing. The building of a fish ladder could give new opportunities to increase the length of banks available for angling since trouts will proceed further 45 km up the river. But these banks are privately owned so angling societies wish to obtain an access to the river in order to increase recreational angling supply and therefore improve the fishing for their members.

One possibility would be to buy a narrow corridor along the river provided enough money is collected. Thus the CV study emphasizes this point since people were asked to voluntarily participate in a fund to buy 5 km of river banks. A questionnaire has been successfully tested on site during the last stage of the on-site survey in October 1990 and 50 individuals were asked and answered questions. Then we sent a questionnaire to each angler surveyed before October who had given his address, 97 questionnaires were mailed and 47 returned (response rate 48%).

Pooling together both subsamples provides a sample of size 97. A majority of 75 anglers wish to benefit of greater facilities in order to be able to fish upstream from the fish ladder and 51 agree to participate in a fund to buy 5 km, knowing they would be entitled to fish freely for three years. The payment card elicitation method has been used in order to assess the willingness to pay for 5 km. All anglers give an amount greater than zero, the average amount equals 578 F. There is an iteration in order to assess the average amount to buy 5 km more. 40 were willing to pay and the average amount equals 567 F. Unfortunately the sample size was too small to run a new stage but it is interesting to notice that the number of positive answers decreases.

A secondary issue has been also considered. There are some problems with poachers who use nets to catch fish in the river mouth. So surveyed anglers were asked about their willingness to pay to hire more river-keepers. It

is interesting to notice that protest answers are significant, 40% of the sample refuse to pay because they already pay taxes for police control so a private body (the fishing society) should not take the role of the state. However 50% give positive amounts ranging from 20 F to 500 F per year. The average amount equals 160 F.

Let us focus on the first scenario for which there is no protest answer. People are very familiar with the point because there is still a game angling market. They still pay something : a license to combine angling societies and specific fees to get access to river banks. So it could be argued that hypothetical bias is not a severe problem in this experiment. The deal we proposed them is a simple extension of the actual market. It involves an increase in the supply of a rationed good : river banks available for angling.

Basically anglers were faced with a dichotomic choice as they were asked to accept or reject voluntarily participation in a fund. So in the first step of the experiment the dependent variable is a yes/no answer. A probit and a logit model have been estimated and results are reported in table 2 with 6 independent variables. Two variables, income and years of training, help to describe anglers. Value of equipment is a proxy for fishing effort, and catches (number of sea-trout caught during thr 1989 season) are an indicator of fishing experience in the Touques river. We have defined a dummy variable to take into account substitute rivers and we have also considered the distance traveled to angling place as a potential factor influencing demand.

Table 2. Sea-trout angling demand: probit and logit models.

Variables	Probit	Logit
Intercept	0.657 (1.7)	1.00 (1.4)
Dummy: site substitute	0.318 (0.6)	0.581 (0.6)
Trip distance (km)	0.008 (1.7)	0.014 (1.6)
Value of equipment (F)	0.017 (0.7)	0.024 (0.5)
Catches	-0.002 (-0.3)	-0.0049 (-0.3)
Monthly income: 17 classes (increasing with income)	0.0001 (0,3)	0.0002 (0,2)
Years of training	-0.023 (-1.0)	-0.034 (-0.8)
Log likelihood	-24.95	-25.15

asymptotic t values in parentheses

Both models provide similar results. They are statistically poor but the signs of the coefficients look correct. There is good reason to believe that the demand for game angling rises with income so the positive coefficient for this variable was expected. Moreover anglers who own many reels and rods (the average is 2.6 for each type of equipment but 20% own more than 5) make a greatest fishing effort. Therefore the value of equipment, which is a proxy for fishing effort, positively affects demand.

The positive signs for the dummy variable for substitute sites and for the distance are consistent. First, anglers who fish in substitute rivers are expected to have greater requirements in terms of fishing experience. Second, anglers living far from the Touques will stay for a week-end or for a vacation in the Touques area. For both categories the length of banks available for angling is limited so they are likely to ask for extra km, so the underlying explanatory variables positively affect angling demand.

The negative sign of the years of training variable requires some explanation. First let us notice this variable is positively correlated with the angler's age. However sport fishing demands great physical effort. Some of the comments support this point and indicate that senior citizens sometime move to other types of fishing. The current availability of banks fullfills their

requirements. Finally we have a negative sign for the catch variable, this result is obviously inconsistent with our expectations.

### 3. WTP FOR SEA-TROUT ANGLING

Probit and logit models do not use all the information available, so to go further let us first consider anglers who are willing to pay a positive amount to increase angling supply. A positive WTP implicitly means a greater demand. For those who reject the deal there is empirical evidence that some of them are unsatisfied with their fishing experience and that others only fish a small portion of the river. The comments they made show they would like to reduce the fishing fees. Thus for this category a negative WTP would be logical but they do not have the opportunity to give it.

The length of river banks available for angling cannot be chosen by the individual angler. The problem with measuring household welfare when there are quantity constraints arises from the absence of an observable set of prices with which to value changes in the consumption bundle. To deal with this issue let us consider the dual minimization problem, where the angler must minimize the expenditure required to obtain a given level  $u_0$  of utility at given prices. That is,

$$\begin{aligned} \text{Min}_x \quad & p'_x \cdot x \\ u(x, z, m) \geq & u_0 \quad [1] \\ z \in & Z_f \subset R^+ \end{aligned}$$

where  $x$  is the vector of private goods and  $p_x$  the vector of prices of private goods.  $Z_f$  is a subset of the commodity space which includes rationed goods. There is only one quantity constraint so  $Z_f$  dimension is one and  $z$  equals the length of river banks available for angling. The vector  $m$  represents angler's characteristics such as age, fishing expensive, catches, income ...

Providing that the utility function is well-behaved we can define the constrained expenditure function  $e(p_x, z_0, m, u_0)$  where the subscript 0 denotes the initial situation, so  $z_0$  equals 26 km. then total expenditure equals,

$$e_0 = e(p_x, z_0, m, u_0) + Z_0 \quad [2]$$

where  $Z_0$  equals the amount of specific fees to fish in the Touques, enjoying 26 km of river banks.

To enjoy an increase in the quantity constrained good  $z$  such as  $z_1 > z_0$  the individual angler is willing to pay  $Z_1$ . That is :

$$e(p_x, z_0, m, u_0) + Z_0 = e(p_x, z_1, m, u_0) + Z_1 \quad [3]$$

then

$$WTP = Z_1 - Z_0 = e(p_x, z_0, m, u_0) - e(p_x, z_1, m, u_0) \quad [4]$$

So the angler's answer is the difference between two expenditure functions, but it is important to notice that he is not necessarily in long run equilibrium. This is the rationale to consider the potential occurrence of negative WTP.

Following Carson (1991, p. 123) equation [4] is expressed in an equivalent form known as the income compensation function. It is given by

$$WTP(\Delta z) = f(p_x, z, m, e_0) \quad [5]$$

where  $\Delta z = z_1 - z_0$ .

Then the sample of people surveyed has to be broken down into two categories. The first subsample refers to anglers who are willing to increase the fishing fees they still pay. Face to an hypothetical increase in the length of river banks available for angling they reveal a demand increase for the rationed good ( $\Delta z > 0$ ) because the quantity constraint is binding. So they are willing to pay  $Z_1$  instead of  $Z_0$  knowing that total expenditure is constant, see [3] then,

$$WTP = WTP(\Delta z) \quad \text{if } Z_1 > Z_0 \quad [6]$$

In the second subsample a nul WTP is observed. In order to enjoy an increase of river bank supply, anglers would have to give up private goods. Moreover the quantity constraint is not necessarily binding and some of them are willing to decrease the fishing fees they have to pay but they do not have the opportunity to give a negative WTP. For the latter an increase of  $z$  implying an increase in the specific fishing fees would result in :

$$e(p_x, z_1, m, u_0) + Z_1 > e(p_x, z_0, m, u_0) + Z_0 \quad [7]$$

and equation [3] would be violated. Therefore :

$$WTP = 0 \quad \text{if } Z1 < Z_0 \quad [8]$$

To deal with both categories let us write,

$$WTP = \begin{cases} WTP(z) & \text{if } Z1 > Z_0 \\ 0 & \text{otherwise} \end{cases}$$

Thus we will specify a tobit model with a specific threshold for each observation. The model uses the first category of anglers to derive what would be the optimal WTP, so the underlying logic takes into account negative WTP which are not observed but which do exist.

#### 4. RESULTS AND COMMENTS

The model was estimated by the maximum likelihood with a Newton-Raphson algorithm. Standard errors of coefficients were computed from the inverse of the observed information matrix. Results are reported in table 7,  $x^*i$  being expressed in logarithm.

Table 3. Sea-trout angling demand : tobit model

Variables	First 5 km section		Second 5 km section
	Model 1	Model 2	Model 3
Intercept	5,81 (17,1)	6,36 (17,7)	5,01 (10,4)
Dummy : site substitute 1 = yes, 0 = no	0,27 (1,04)	.	0,27 (1,3)
Trip distance (one way in km)	0,0020 (2,5)	0,0026 (2,7)	0,0018 (2,1)
Value of equipment (F)	0,175 (2,2)		
Catches (in 1989)	0,030 (2,2)	0,031 (2,2)	0,039 (2,9)
Montly income : 17 classes (increasing with income)	0,033 (1,3)		0,053 (1,7)
Years of training	-0,025 (1,9)	-0,0135 (1,2)	-0,024 (1,8)
Age (years)		0,0148 (1,9)	0,0269 (2,8)
Food and lodging expenditures (F)		-0,0003 (1,6)	
Dummy : visit type 1 = with lodging, 0 = without lodging		-0,367 (1,5)	
Log likelihood	-34,69	-44,29	-28,06
Average WTP (F)	363	277	354

Asymptotic t values in parentheses

The results reported in table 2 and in table 3 can be compared since they are based on the same sample and the same independent variables. The tobit model seems better because all signs are consistent and t-ratios are greater. As expected a positive correlation of catches on angling demand is obtained. A comparison between model 1 and model 2 help to clarify the understanding of the angler's behaviour. In a first stage he decides to travel to the river and in a second stage he determines the duration of his visit, so there a negative sign for the visit type variable and also for food and lodging expenditures. Angler's age is a proxy for income and positively influences WTP in models 2 and 3.

Models were used to estimate average WTP for the first 5 km section and the second one. We got amounts per angler which are smaller than the values given above and based upon a sample mean. It is consistent as the tobit model implicitly takes into account negative WTP.

Table 4. Aggregate WTP per km and per year (F)

Rent	First 5 km section			Second 5 km section	
	Sample mean	Model 1	Model 2	Sample mean	Model 3
15000 à 20 000	26 300	16 500	12 620	20 200	12 650

If we assume the surveyed individuals to be representative of individuals angling in the Touques river, it is possible to assess aggregate amount for extra km. Values reported in table 4 are not very robust because sample size is quite small they make sense since they are consistent with the yearly rent (including restoration, cleaning up and maintenance).

We think that hypothetical bias is not a serious problem in this study because there is already a market for game angling. People are not confronted with an imaginary situation therefore we can expect they behave the same way in actual market. The most difficult point concerns non-responses which in this survey correspond to a strategic behaviour. To deal with that, we intend to improve the model specification, using a generalized tobit model.

## REFERENCES

- Bell F.W., Leeworthy V.R. [1990], "Recreational demand by tourists for salwater beach days", *Journal of Environmental Economics and Management*, 18, pp. 189-205.
- Bonnieux F., Desaignes B., Vermersch D. [1992], French experiments in contingent valuation : two case studies, in Navrud. (ed), *Valuing the environment, the European experience*, to be published by Oxford University Press.
- Carson P.T. [1991], Constructed markets, in Braden J.B., Kolstad C.D. (ed), *Measuring the demand for environmental quality*, North-Holland, Amsterdam.
- Navrud S. [1991], The use of benefits estimates in environmental decision making in Norway, in Barde J.P., et Pearce D.W. (ed), *Valuing the environment: six case studies*, Earthscan, London.
- Radford A.F., Hatcher A.C., Whitmarsh D.J. [1991], *An economic evaluation of salmon fisheries in Great Britain*, report prepared for the Ministry of Agriculture, Fisheries and Food, London.
- Walsh R.G. [1986], *Recreation economic decisions: comparing benefits and costs*, Venture Publishing Inc. State College, Pennsylvania.