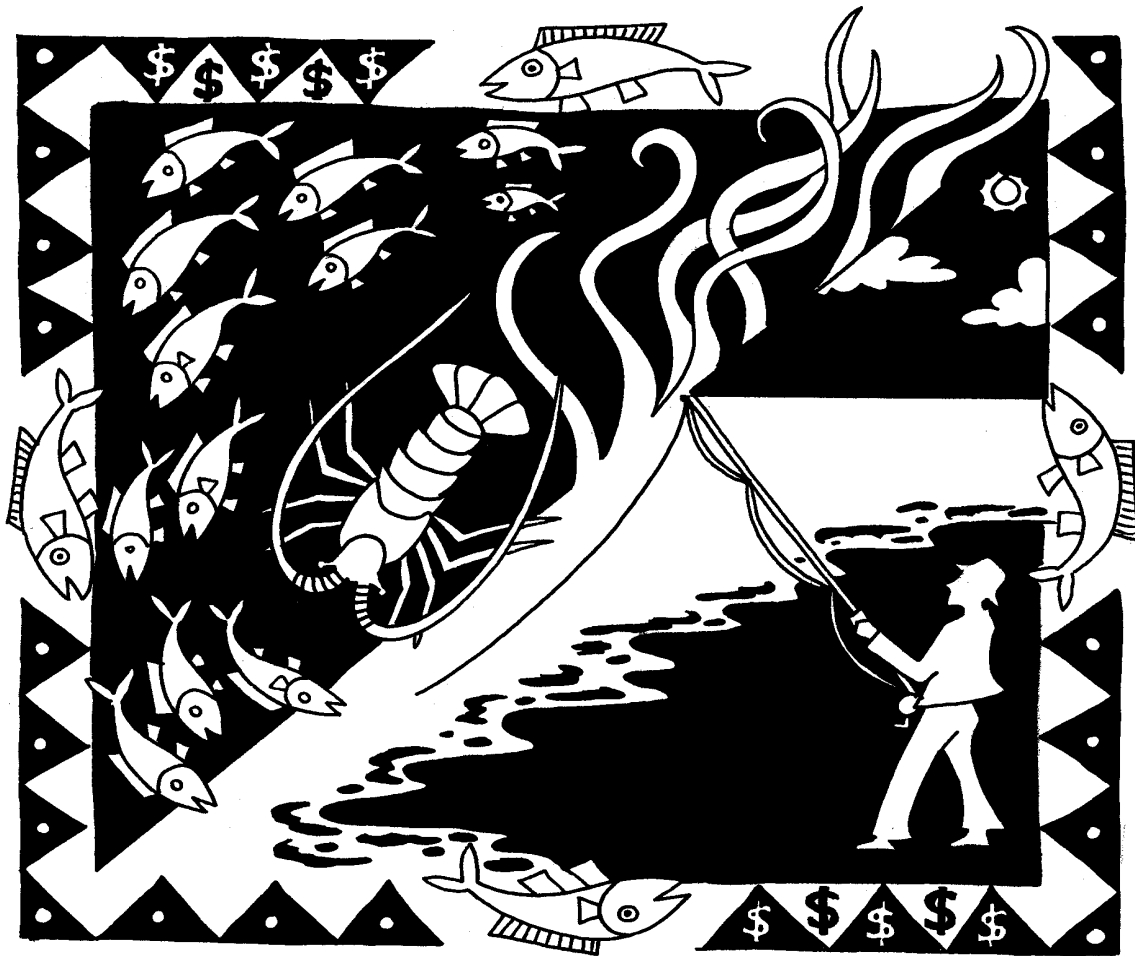

The economic value of Namibia's recreational shore fishery: A review

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This study was supported through funding from the Swedish Government (Sida), the United States Agency for International Development (USAID, through the World Wildlife Fund (US) LIFE Programme, under terms of Agreement no. 623-02510A-00-3135-00), the Overseas Development Institute (with funding from the UK Department of International Development, DFID) and the Namibian Government. The opinions expressed do not necessarily reflect those of these agencies. We are very grateful to the anglers, who gave of their time. Hannes Holtzhausen, S. F. Voges and B. Louw, Vetuunja Kazapua, Sabine Pahl, Roswitha Schommarz, and Loretta Polster assisted with enumeration and interviews. In the Ministry of Environment and Tourism, Permanent Secretary, Tangeni Erkana, Peter Tarr, Chris Brown, Hennie Fourie, and Rod Braby provided support, assisted with the logistics of the field work, and gave access to public campsites. Gunnar Köhlin assisted in securing funding and with essential advice. Helen Suich assisted with editing.

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Abstract

This paper describes the work that has been done to determine the economic values associated with the recreational marine line fishery in Namibia. This highly esteemed fishery involves angling from the shore for bottom-feeding fish, mostly kob, steenbras and galjoen, using bait. Anglers come from South Africa (46 per cent), inland Namibia (38 per cent) and coastal Namibia (16 per cent). In 1997 and 1998 three field surveys among shore anglers were conducted and three valuation approaches were employed. A roving creel survey was used to determine angler numbers and catches. Responses from two questionnaire surveys involving 240 and 626 anglers were analysed to estimate angler expenditures, consumer surpluses, and the price elasticity of demand. Both the travel cost and the contingent valuation methods were used. Some 8,300 anglers spent a total of 173,000 days angling, and each angler spent some N\$3,400 in this activity. Aggregate direct expenditures by anglers were between N\$23 million and N\$31 million. Gross value added associated with this was between N\$11 and N\$15 million. This represents some 3.6 per cent of the whole fisheries sector which itself makes up four per cent of the economy. The aggregate consumer surplus enjoyed by anglers was N\$24 million of which 30 per cent to 50 per cent accrued to foreigners. A crude estimate of the economic impact of the fishery in terms of value added is N\$27 million. Demand for angling is price-inelastic, making it relatively easy to capture rents from the industry. There is a willingness to pay among anglers for investment in the fish resource. Results from the separate valuation activities showed considerable convergent validation. All methods are best employed together, but each alone can provide useful values for policy analysis.

1. INTRODUCTION

The Benguela marine system is characterised by cold but nutrient-rich upwellings, relatively low species diversity, and high production. It forms the basis for a highly esteemed recreational fishery. Anglers mostly fish from the shore, from the beach, in the surf, using bait. Most frequently landed are kob (mostly silver kob, *Argyrosomus inodorus*, but also dusky kob, *A. coronus*), west coast steenbras (*Lithognathus aureti*), galjoen (*Dichistius capensis*) and blacktail (*Diplodus sargus*). To a lesser extent, sharks are targeted, including the copper shark (*Carcharhinus brachyurus*), the spotted gully shark (*Triakis megalopterus*) and the smoothhound (*Mustelus mustelus*).

Access to shore angling on the Namibian coast is restricted to about one quarter of the coastline, some 260 km, stretching from Sandwich Harbour, south of Walvis Bay to the Ugab River in the North. 90 per cent of angling is in the West Coast Recreation Area (WCRA), but additional small sites exist at Torra Bay and Terrace Bay to the north, and Lüderitz in the south. Anglers originate from coastal Namibia, inland Namibia, and South African. Very small numbers fish for subsistence. Recently, in 2001, angling licenses were introduced, and the daily bag limit of 30 fish (or 30 kg of fillet) was reduced to 10 fish (or 10 kg of fillet).

The recreational line-fish resource is shared with a commercial line fishery, which operates inshore, from Walvis Bay, in some twelve vessels. These vessels target the same species off the bottom, but also seasonally seek the pelagic snoek (*Thysites atun*). The resource is perceived to be declining (Kirchner, 1998; Holtzhausen and Kirchner, 1998). There is a need for economic data on the fishery, to inform sound policy development, planning and management.

This paper reviews and compares work done by ourselves, in particular, Kirchner *et al.* (2000), and Zeybrandt and Barnes (2001), on the economic valuation of the recreational shore fishery. This work complemented research into the biology and management of the linefish resource by, for example, Kirchner (1998), Holtzhausen (1999), Kirchner and Beyer (1999), Kirchner and Voges (1999), Holtzhausen *et al.* (2001), and Holtzhausen and Kirchner (2001a, 2001b).

2. METHODS

2.1 Economic values

The values (measured in Namibia dollars (N\$)¹) can be placed in the context of 'total economic value' for natural resources. Total economic value consists of *use values*, which embrace direct and indirect use values, and *non-use values*, which embrace option, bequest and existence values. Pearce and Turner (1990) describe these components. All of our measures of gross output, value added, and consumer surplus given below, reflect *direct use value*. Only the measures of anglers' willingness to pay for conservation of the fish resource reflect other values, in this case, *non-use values*.

In Namibia, a primary macro-economic measure of direct use value is the gross national income (GNI). This can either be estimated as the total value of consumption of all final products in the economy, or as the total value added by all productive activities in the economy. Value added in an enterprise is defined as the return to internal factors of production (labour and capital), and is the

¹ At the time of the studies N\$1.00 was equal to ZAR1.00 or approximately US\$0.20.

gross output less expenditures on external factors (intermediate expenditures). Net national income (NNI) is gross national income less capital asset depreciation.

Central to the recreational fishery is the activity of angling and the total direct expenditures made by the fishers in angling make up the gross output of the fishery. Associated with this output is value added for the fishery, return to the internal factors employed in producing the activity, and a proportion of the output. We had no measures of this proportion for angling tourism, but were able to extract estimates from the broader nature-based tourism sector in Namibia. Empirical data collected during the 1990s (Ashley, 1995; EEU, 1998), showed that gross value added was 48 per cent of gross output, and net value added was 41 per cent of gross output. We applied these proportions to calculate gross and net national income for the recreational fishery.

Instead of simply determining the *value* of the fishery, its *impact* on the economy can be measured. Here, the values generated by the primary direct expenditures, plus also those resulting indirectly, through induced linkages and further rounds of spending are measured. Impact analysis involves estimation of multiplier effects, including those for output, employment and income. At the time of our studies there were no input-output or social accounting matrices, from which multipliers are derived and no estimates of multipliers for the Namibian economy. In one study (Kirchner *et al.*, 2000) we used a crude national income multiplier, to give an estimate of impact.

Price levels for outdoor recreational activities are often set lower than those the users are willing to pay. Any positive difference between the price paid by a user and his/her willingness to pay is the user's consumer surplus, and it forms part of the economic direct use value of the activity. We used the travel cost and contingent valuation methods, described below, to measure this component of value.

2.2 Surveys

The first of three surveys was a roving creel survey, to determine relative angler numbers and catches (Kirchner *et al.*, 2000). Sampling was conducted from October 1996 to September 1997. Sampling was stratified to capture differences between the high season (October to April) and the low season (May to September), as well as to adequately cover six spatial zones. Three zones in the West Coast Recreational Area were sampled 14 times in the high season and nine times in the low season. The Walvis Bay area was sampled 12 times in the high season and three times in the low season. Terrace Bay and Torra Bay were sampled with three and two four-day surveys, respectively, in the high season. Data were analysed to estimate the mean daily number of anglers and mean daily catch, for all angler categories. Lüderitz, where angler numbers are very small, was left out of the study.

The second survey involved a targeted sample of 240 anglers, 80 from each of the three categories: coastal Namibians, inland Namibians, and foreigners (nearly all South Africans), who were interviewed while they were fishing to determine their daily expenditures. The sample was made within the West Coast Recreational Area by two researchers. Subsistence anglers were few in number, very localised, and were left out of the survey. Foreign visitors were asked to estimate costs of fuel, accommodation, bait, tackle, groceries, refreshments and entertainment, in addition to costs of any fishing equipment purchased in the last calendar year within Namibia. Anglers from inland Namibia were asked to estimate the same costs, excluding those for groceries. For coastal residents, the costs of fuel, bait, tackle and equipment purchased within the last calendar year were included in the analysis.

The third survey involved a sample of 626 anglers made at angling destinations, from Walvis Bay in the South to Terrace Bay in the north, to determine trip expenditures and willingness to pay for angling and conservation (Zeybrandt and Barnes, 2001). The survey took place between January and April 1998. Sampling was not systematic or random, but non-selective at sites, with the aim of getting the highest possible number of responses. Stratification of sampling between sites was undertaken, aimed at achieving representative spatial coverage.

The sample contained different proportions of angler categories (foreign visitors, inland Namibians and coastal Namibians) from those measured in the roving creel survey (Kirchner *et al.*, 2000). This sample bias was corrected for by weighting the results for the three segments. The questionnaire used in the third survey was similar to that used by Barnes *et al.* (1999) and Barnes (1996) to survey broader tourism populations and wildlife viewing tourists. It was designed to elicit data, for both travel cost and contingent valuation analysis. In addition to general tourist characteristics and reasons for the visit, respondents were asked to state their travel costs, total costs, specific angling costs such as bait, tackle, rods and reels and the replacement cost of their vehicle/skiboat (if any). Further, the anglers were asked if they were willing to pay for an angling licence and willing to contribute to a coastal conservation trust fund. A team of five enumerators distributed questionnaires, assisted respondents when needed, and collected completed questionnaires. The questionnaire was in most cases handed out to respondents for their own completion, but some regular interviews were held. Refusal rate was very low. From 626 returned questionnaires, 372 were selected for use after cleaning.

2.3 Analysis

2.3.1 Expenditure analysis

Data from the second survey of 240 anglers, were used to estimate mean daily expenditure and expenditure per fish caught, for the three categories of recreational angler. Data from the third survey of 626 anglers were also used to extract details of direct expenditures on the angling experience. Here, the questions had been designed to form the base for the development of travel cost and contingent valuation models. These analyses are explained in detail by Zeybrandt and Barnes (2001) and below.

2.3.2 Travel cost analysis

In travel cost analysis, anglers' costs of consuming the services of the environmental asset are used as a proxy for price. These consumption costs include travel costs, entry fees, on-site expenditures, and the annualised costs of outlay on capital equipment needed for consumption. The basic premise is that the user population is homogeneous in its willingness to pay, and that differences in the costs of consumption (due, for example, to different travel costs) result in different rates of visitation. The visitation rate is used as the quantity measure of the angling experience. The travel cost method is thus an *indirect* method of valuation. By varying the travel costs and visitation rates, it is possible to derive a demand curve that expresses the demand for trips to the recreational area (Kerr, 1986; Hanley and Spash, 1993). The consumer surplus for the activity can be calculated from the demand function.

The travel cost method has not been used much in the context of southern African tourism activities, because it depends for success on assumptions, which are commonly not applicable. It requires that the population of users be homogeneous regarding willingness to pay, that the destination be a sole one (not part of a multi-destination trip), and that the substitutability of the destination be low. In this particular case (recreational angling on the Namibian coast) the angling population is fairly homogeneous (nearly all middle-class, southern African), visits are made

exclusively for angling, substitute sites are remote and somewhat different, and the price elasticity of demand can be expected to be low (McGrath *et al.*, 1997). The Namibian angling population was considered to be suitable for analysis, using the travel cost approach.

Depending on the degree of homogeneity of the sample population regarding travelling distance and social characteristics, an *individual* or *zonal* travel cost model can be used. The individual model uses each individual's travel costs and visitation rate, but requires a relatively homogenous data set, i.e., the observations may not differ too much (Hanley and Spash, 1993; Navrud and Mungatana, 1994; Randall 1994). The sample consisted of anglers travelling from 10 km to 3,000 km, with highly variable costs data, and variable frequencies of visitation. The zonal model is better suited to deal with this variability, as all visitors are divided into zones of origin. Population figures are derived for the zones and numbers of visits per capita, per zone can thus be calculated. A typical zonal visitation rate model is:

$$(VPC)_{zj} = f(TC_{zj}, S_z)$$

where $(VPC)_{zj}$ is visits per capita from zone z to site j , TC_{zj} is trip (including travel) costs from zone z to site j ; and S_z is a vector for the social characteristics of the zone z . It is assumed that the visitors travelling from different zones have the same willingness to pay and the same social characteristics. The zonal model is somewhat sensitive to the selection of the zones used. This can affect the resulting consumer surplus estimates (Hanley and Spash, 1993).

Thirteen geographical zones were identified for the model. These were made up of South Africa's nine provinces, three Namibian coastal zones, and one Namibian inland zone. The populations and mean incomes for the South African zones were derived from data from the South African Centre for Statistical Services (CSS). The populations for zones in Namibia were derived by adding the populations for each city or town in the zone represented in the zone samples. No official estimates of local Namibian incomes were available, so those derived from the questionnaire data. The zones, their numbers of visits, populations, visitation rates, and trip costs are shown in Table 1.

The travel costs included the fuel cost of a return trip to the Namibian coast and the on-site expenditure. We considered that the fuel costs only, rather than full cost of the vehicle (including depreciation of the car, tyres, etc.), was closest to the typical respondent's perception of vehicle costs. A difficult issue regarding travel cost models relates to the inclusion and estimation of opportunity costs for travel time. Hanley and Spash (1993) suggest inclusion of a question about enjoyment during travelling, and imputing opportunity costs only to those not enjoying the travel time. 95 per cent of respondents enjoyed the time travelling, and thus time costs for only 5 per cent of respondents were included in the basic model. Sensitivity analyses with inclusion of 0 per cent, 30 per cent, 60 per cent and 100 per cent time costs were also conducted.

Table 1 Zones used in the travel cost model

Zone	Number of visits	Population (thousands)	Visits per 10,000 inhabitants	Mean zone trip cost (N\$)
Kwazulu-Natal	15	7,672	0.02	3,273
Gauteng	89	7,171	0.12	2,041
Eastern Cape	5	5,865	0.01	2,873
Northern Province	11	4,128	0.03	3,258
Western Cape	86	4,118	0.21	2,008
North West	34	3,043	0.11	1,902
Mpumalanga	17	2,646	0.06	1,669
Free State	9	2,470	0.04	1,766
Northern Cape	30	746	0.40	1,489
Inland Namibia	199	275	7.24	638
Henties Bay	24	10	9.00	122
Swakopmund	47	25	18.80	88
Walvis Bay	45	50	24.00	87

The cost of time for the South African zones was determined by deriving hourly income from mean zonal incomes, as acquired from the South African Centre for Statistical Services. For Namibian zones, mean incomes from questionnaire responses were used. The travel cost was determined by multiplying the distance travelled to and from the coast with the Automobile Association of South Africa's (AARSA, 1998) estimation of cost per km for two-wheel and four-wheel drive vehicles. Time costs were calculated assuming average travel speed of 70 km per hour.

The inclusion of on-site and other non-travel costs such as accommodation and entry fees, is also contentious. Whether these should be included depends on whether they can be deemed to affect rates of participation and, as with travel time, the degree of enjoyment derived from the consumption. It was considered that, along with the cost of travel, these expenditures overwhelmingly *do* affect visitation rates, and therefore should be included in the analysis.

Many travel cost models (e.g. Navrud and Mungatana, 1994) include social characteristics such as gender, income, and other relevant variables to obtain better specification for the model. In this case, it was difficult to acquire such information for all zones, and attempts to develop models with the information acquired, resulted in problems with multicollinearity. Different functional forms were tested. The model that had the best fit was chosen for the following stages of the analysis, i.e., developing a second stage demand function (Kerr, 1986; Hanley and Spash, 1993), and calculating the consumer surplus.

2.3.3 Contingent valuation analysis

Data from the third survey of 626 anglers were also analysed using contingent valuation, to estimate consumer surpluses (Zeybrandt and Barnes, 2001). Unlike travel cost, which is based on revealed preferences, contingent valuation is a *direct* method and is based on stated preferences. In it, the respondent's willingness to pay (WTP) for an increased amount of a specific good, or her/his willingness-to-accept (WTA) to avoid a decrease of a good, are elicited through surveys. It is

generally agreed that willingness to pay is preferable to willingness to accept (NOAA, 1993; Mitchell and Carson, 1989).

We used a variation of the contingent valuation method, which Barnes *et al.* (1999) and Zeybrandt and Barnes (2001) described in some detail. Among general questions on their personal characteristics, origin, trip and trip preferences, respondents were asked how much their *travel* to and from their angling destination was costing, what their *total angling trip* was costing, how much of this they were personally spending within Namibia, and what their annual income was. They were informed that their answers were to assist with planning and could not affect actual prices.

A payment card was used to ask the respondents what they would be willing to pay for a *similar, return, angling trip*. They were first asked whether their current trip was value for money and then whether they would be willing to return on a similar trip. If they said 'yes', (nearly all did) they were asked to identify the cost level (in relation to their present or actual cost) which would *prevent* them from returning. If they said 'no' they were asked to identify the cost level (also in relation to their actual cost) that would *induce* them to return. These cost levels were taken as the maximum willingness to pay for a return trip. For each respondent, a positive difference between willingness to pay for return trips and actual trip cost was taken as an estimate of that individual's consumer surplus for the whole trip. For foreign anglers, the consumer surplus for the Namibian part of the trip was calculated proportionally, based on the ratio between expenditures for the *whole trip* and the *Namibian component* of the whole trip.

The cost of travel and the cost of the overall trip were common to all respondents, and most seemed able to make a good estimate of these. They were first asked for these two costs in that order, before being asked to value any other specific components of the trip such as accommodation. The order of questions was selected with care after the pilot survey, and was thought to reduce the potential for both budget constraint² bias (Mitchell and Carson 1989), and also embedding or part-whole³ bias (Navrud and Mungatana, 1994, and Kahneman and Knetsch, 1992). Focus on the overall trip cost for the willingness to pay question was also thought to reduce the tendency for these biases (Moran, 1994; Navrud and Mungatana, 1994).

Getting anglers to focus on *return* trips in their consideration of willingness to pay was thought to reduce confusion between actual and maximum estimates, which might arise if they were to focus on the actual trip. In as much as desire for return trips is likely to be less than that for first time trips the estimates of actual demand and consumer surplus are likely to be conservative. We consider this of value in reducing any effects of avidity⁴ bias, as described by Thomson (1991).

² Where the respondent answers within a budget constraint which differs from that which the researcher intends to invoke.

³ Where a respondent values a larger or smaller entity than the researcher's intended good.

⁴ Where the survey attracts respondents who are more avid or enthusiastic than the average.

Use of the actual angling experience as the reference point, and the use of the words ‘prevent’ and ‘induce’, was thought to reduce the possibility of strategic⁵, miss-specification⁶, compliance⁷, starting point⁸, range⁹, relational¹⁰ and positional¹¹ bias (Mitchell and Carson, 1989). To avoid possible sponsor bias, respondents were informed that the study was an environmental evaluation of recreational angling. Generally, it was felt that the respondents answered the questions correctly and honestly.

Care was taken with the order of questions, to minimise the possibility of embedding or part-whole bias. In order to corroborate the results from the payment card, we also used an open-ended question, where we asked the respondent to state his/her maximum willingness to pay for the return trip. Later in the questionnaire, respondents were asked to state if they were willing to pay for an annual angling licence, and, if so, how much they would pay. Similarly, they were also asked if they would be willing to pay into a coastal resources conservation fund, to be administered by an agency of their choice, aimed at ensuring conservation of the fish resource. If they said yes, they were also asked how much they would pay. Some econometric analysis was carried out with the data from the questionnaire, to estimate determinants for willingness to pay.

2.3.4 Price elasticity

We derived measures of price elasticity from the data and the demand functions developed using the travel cost and contingent valuation methods. First multiple and then simple regressions were run on the raw variables, to try to determine price, income, angling success and other elasticities. Secondly, the second stage demand functions from the travel cost analysis were used to calculate price elasticities. Thirdly, the variable for willingness to pay, obtained in the contingent valuation study, was manipulated to develop a derived demand function, which was also used to calculate price elasticities. In this case, the range of willingness to pay was divided into 20 equal segments, and a frequency histogram depicting the distribution of responses along the range was drawn. Simple regression on the histogram data was carried out to obtain the price (willingness to pay) to quantity (number of respondents per price category) relationship.

Double log, lin-log, log-lin, linear and reciprocal functional forms were tested for both multiple and simple regression models. In multiple regressions, different combinations of explanatory variables were tested in an attempt to minimise multicollinearity effects. Only models displaying significance, overall and with respect to the coefficients, were retained. Point elasticities, at mean and median price values, were calculated for all other than double log functions.

⁵ Where a respondent gives an answer that differs from his/her true amount in an attempt to influence the provision of the good and/or the respondent's level of payment for the good.

⁶ Biases of this type occur when a respondent does not respond to the correct contingent scenario.

⁷ Where a respondent gives an answer that differs from his or her true one in an attempt to comply with the presumed expectations of the sponsor/researcher, or to please, or to gain status in the eyes of the researcher/interviewer.

⁸ Where the elicitation method or payment vehicle directly or indirectly introduces a potential answer that influences the answer given by the respondent.

⁹ Where the elicitation method presents a range of potential answers that influences the respondent's answer.

¹⁰ Where the description of the good presents information about its relationship to other public or private commodities that influences a respondent's answer.

¹¹ Where the position of, or order in which, different valuation questions for different goods, or levels of a good, suggest to the respondent how those levels should be valued.

3. RESULTS

3.1 Fishery profile

Table 2 shows the general characteristics of the fishery, derived from all three surveys. Data from the roving creel survey revealed that some 8,300 anglers spent some 173,000 days angling on the Namibian coast during the 12 months of the 1997/98 season. The average angler thus spent some 26 days fishing and spent some N\$3,400 doing it. Some 690,000 fish were caught, the mean weight of the daily catch was 6.06 kilograms, and the mean number of fish caught per day was 3.98.

Table 2 General characteristics of the marine shore-angling population (Namibia, 1997/98)

	Value
Total number of anglers per annum	8,271
Total number of angler days per annum	173,111
Percentage foreigners	46%
Percentage coastal Namibians	16%
Percentage inland Namibians	38%
Mean age	45 years
Gender	94% male
Mean size of angling party	4.3 people
Mean duration of stay	10 days
Mean number of days spent angling	8.2 days
Mean number of fish caught per angler day	3.98
Mean weight (kg) of fish caught per day	6.06
Rate the angling as good or excellent	66%
Membership of angling club	12%
Mean number of years angling experience	21 years
Mean number of days fishing per annum	26 days
Mean angling expenditure per angler per annum	N\$3,400
Mean annual income	N\$115,681

3.2 Travel cost model

Five visitation rate models were tested with different functional forms. Of all the model forms tested, the lin-log function had the best explanatory power for each of the five models. This is consistent with earlier research, where the semi-log function has been widely used (Ziemer *et al.*, 1980; Strong, 1983). All independent variables were, as expected, negative (i.e., the lower the travel costs, the more frequently anglers visit the coast). Further, they were all significant at the 99 per cent level of significance ($p < 0,01$). The modelling was thus successful and consistent with theory. Attempts to include other variables, such as income in models were unsuccessful, with very low levels of significance and multicollinearity problems. It is possible that income has little effect on the demand for angling trips.

The base case model we selected for recreational angling can be described by the following function:

$$VPC = 0,004232 - 0,00055 \ln P$$

where *VPC* is the number of visits per capita and *P* is the trip cost. Table 3 shows the angler trip expenditures and consumer surpluses for angler categories determined using the travel cost method. As can be seen the estimates differ markedly between segments. The mean consumer surplus per trip for foreign anglers was more than three times larger than that for the Namibians. Inland Namibians enjoyed a more than two times larger consumer surplus than did the coastal Namibians. However, as percentage of trip costs, the coastal Namibian anglers enjoyed the largest consumer surplus, while the foreign anglers had the smallest.

The inclusion or not of on site and other non-travel costs (accommodation, food, entry fees, costs of capital items) in the model was tested in sensitivity analysis. The consumer surplus estimates were sensitive to their inclusion. This finding points to the need for care in determining which costs to include in travel cost analysis. As explained above, our base case model was based on full inclusion of these costs, since it was considered that they affect visitation rates.

Table 3 Estimates of mean angling trip costs and consumer surpluses for recreational shore-anglers, derived using the travel cost method (Namibia, 1997/98)

Category	Trip cost (N\$)	Consumer surplus per day (N\$)	Consumer surplus per trip (N\$)	Consumer surplus (% of trip cost)
Coastal Namibians	101	149	239	237
Inland Namibians	638	122	639	100
All Namibians	440	-*	491	112
Foreigners	2,051	165	1,947	95

* not available

3.3 Contingent valuation

Table 4 presents results from the contingent valuation study, determined from the values derived using the payment card. Values from the payment card and open-ended questions were broadly compatible, and our findings confirm those of Kealy and Turner (1993), namely, that open-ended questions tend to give lower consumer surplus estimates than close-ended ones. The consumer surplus, in absolute terms, was greatest for foreigners. It was double that of the inland Namibians and more than triple that of the coastal Namibians. Expressed as percentage of expenditure, though, the coastal Namibians enjoyed a surplus of 121 per cent compared with the foreigners' 48 per cent.

Comparison of selected values from Tables 3 and 4 is shown in Figures 1, 2 and 3. In Figure 1, the travel cost and contingent valuation estimates for trip costs are compared. In Figure 2 and Figure 3, the estimates for consumer surplus, and the consumer surplus expressed as a percentage of trip cost, are similarly compared. In all these comparisons there is remarkable consistency of pattern between the values. There is good consistency between techniques in estimation of expenditures, but in the estimation of consumer surplus, the travel cost method tends generally to yield higher values, particularly among foreign visitors.

Table 4 Estimates of mean angling trip costs and consumer surpluses for recreational shore-anglers, made using contingent valuation (Namibia, 1997/98)

Value	Coastal Namibians	Inland Namibians	Foreigners
Angling trip cost (N\$)	267	744	2,325
Consumer surplus (N\$)	322	562	1,116
Consumer surplus per day (N\$)	188	116	95
Consumer surplus (% of trip cost)	121%	76%	48%

Most of the multiple regression models, aimed at estimating *determinants* of willingness to pay, suffered from problems with multicollinearity. However, the results, shown in Table 5, do give some indication on how the variables affect anglers willingness to pay. If an angler was foreign, his/her willingness to pay increased. Female anglers had lower willingness to pay than men, and anglers from inland Namibia, had lowest willingness to pay. Frequency of angling trip and size of angler group did not significantly affect angler willingness to pay. With membership of an angling club, willingness to pay is increased. The number of fish caught, a measure of angling success, appears to have a very small influence on the willingness to pay.

Table 5 Some determinants of willingness to pay, as determined using contingent valuation, for angling trips among recreational shore-anglers (Namibia, 1998)

Variable	Coefficient	p-value
Intercept	6.58	<0.01
Gender (1=female)	-0.53	<0.01
Foreign (1=yes)	0.92	<0.01
Visits per year	-0.01	<0.01
Size of group	-0.02	<0.05
Member of an angling club (yes=0)	-0.15	0.25
Replacement cost of fishing equipment (N\$)	0.00005	<0.05
Success (fish caught)	-0.006	0.31

Figure 1 Estimates of mean angling trip costs for recreational shore angler categories, made using the travel cost and contingent valuation methods (Namibia, 1997/98)

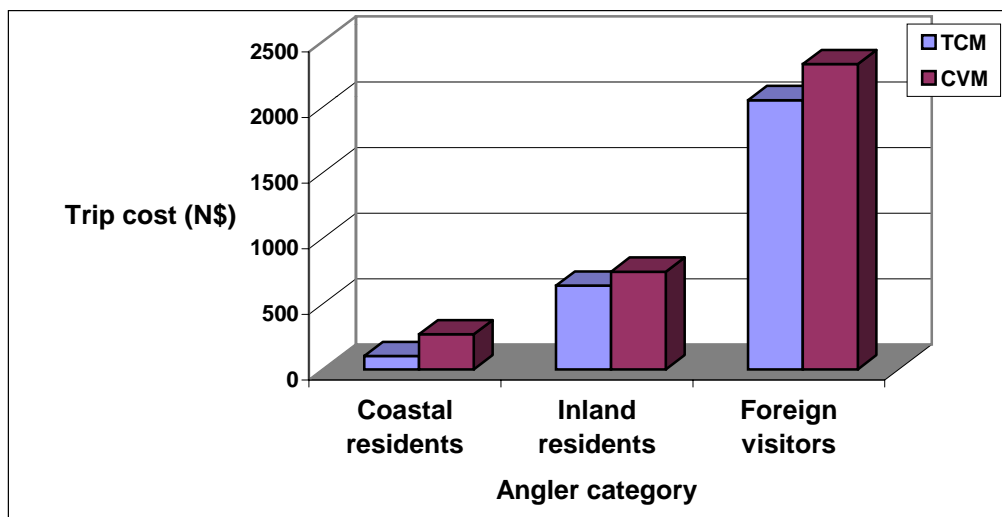


Figure 2 Estimates of mean consumer surplus for recreational shore angler categories, made using travel cost and contingent valuation methods (Namibia, 1997/98)

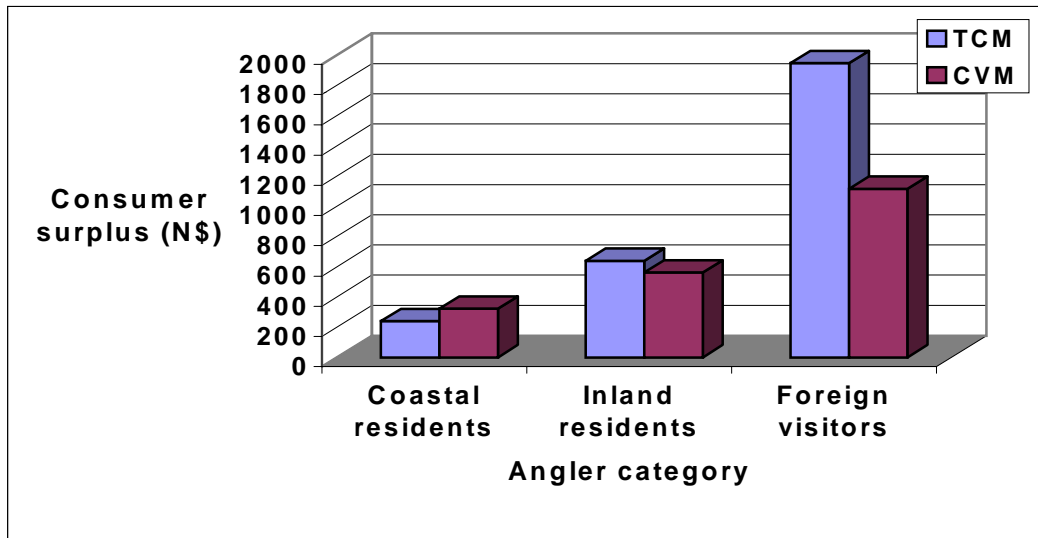
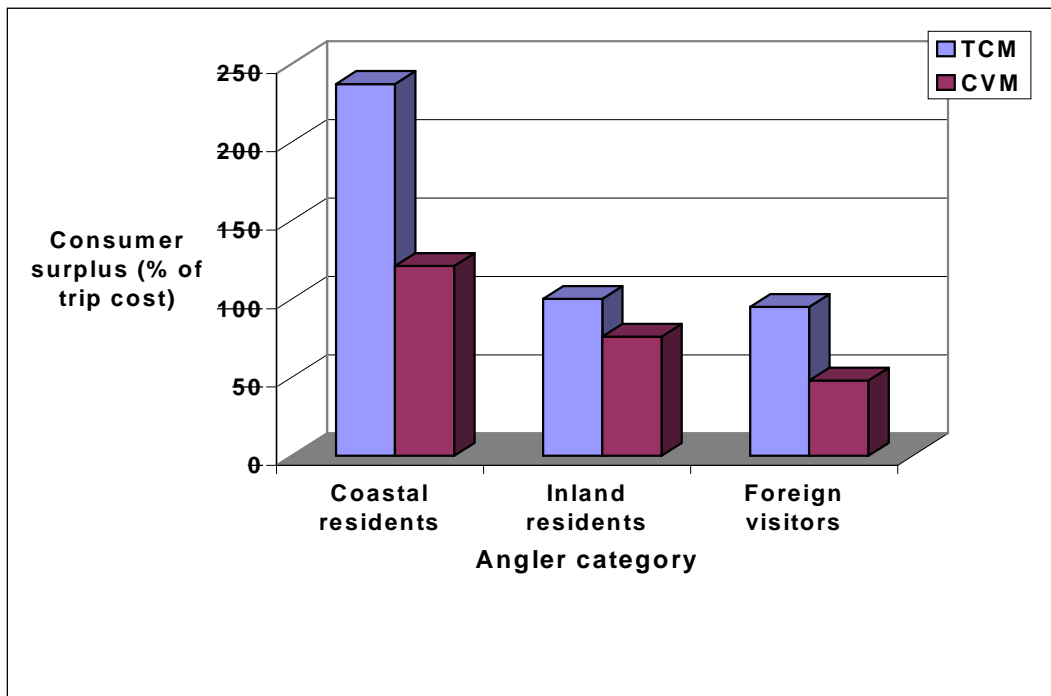


Figure 3 Estimates of consumer surplus, as percentage of trip cost, for recreational shore angler categories, made using travel cost and contingent valuation methods (Namibia, 1997/98)



Regarding the willingness to pay for conservation, 74 per cent of anglers were willing to contribute to a coastal resources conservation trust fund. With zero responses included in the calculation, the anglers' mean willingness to pay to the fund was N\$126 per angler per annum. There was no statistically significant difference in values between Namibians and foreigners. Given the total number of anglers (8,271), a conservation fund could capture some N\$1 million annually. A considerable majority of anglers (also 74 per cent) was, in addition, willing to pay for a fishing licence. If a licence system were established, revenue amounting to some N\$340,000 per annum (N\$41 per angler) could be generated.

3.4 Price elasticity of demand

Multiple regression models constructed from the unaltered data, with number of days fishing per annum as the dependent variable, and including willingness to pay, angling success, angler age, angler experience, club membership, annual income, among others in various combinations as explanatory variables, had extremely poor fit. They were also affected by multicollinearity, and were abandoned. Elasticity estimates were obtained, as explained above, from second stage demand functions developed in the travel cost analysis, and derived price-quantity demand functions developed in the contingent valuation analysis. The lin-log form consistently provided good fit and significance. The second stage lin-log travel cost demand function used is described as

$$Q = 18052.43 - 25.48 \ln P - 1186.61 \ln I - 837.02 \ln C$$

where Q is the quantity of angling trips, P is trip cost, I is angler annual income, and C is angler consumer surplus. This model shows a negative response to rising price, as expected, but (not as expected) negative signs to the income and consumer surplus variables. The derived lin-log demand function constructed from the contingent valuation data is described as

$$Q = 266.09 - 29.43 \ln P_w$$

where P_w is the willingness to pay for angling trips.

The results, shown in Table 6, suggest that demand for shore angling on the Namibian coast is price inelastic. The variation in values, depending on the model used, highlights the need for sensitivity analysis in such exercises. The simple regression models are mis-specified to the extent that other possibly explanatory variables are omitted. Price elasticities derived from simple regressions were consistently higher than those from multiple regressions. True price elasticity is probably lower than indicated in Table 6, but comparison of results derived from the travel cost and contingent valuation models suggests broad consistency.

Table 6 Estimates of price elasticity of demand for angling trips among recreational shore-anglers (Namibia, 1997/98)

	R ²	Point elasticity at:	
		Mean price	Median price
Travel cost models Second-stage demand function Lin-log model ¹	1.00	-0.16	-0.15
Contingent valuation models Derived demand function Linear model ²	0.73	-0.32	-0.21
Lin-log model ²	0.93	-0.71	-0.58
Reciprocal model ²	0.84	-1.03	-1.02

¹ multiple regression

² simple regression

3.5 Aggregate values

The aggregate angler numbers and mean values estimated for anglers were used to calculate aggregate economic values for the recreational shore fishery, and some of these are presented in Table 7. The values derived from the expenditure survey of 240 anglers, as well as those derived from the third survey of 626 anglers through the travel cost method and contingent valuation, are shown.

The values for total direct expenditures, between N\$23 million and N\$31 million, are effectively measures of gross output for the recreational fishery. This gross output and the aggregated consumer surplus added together provide a gross measure of direct economic use value. The part of this measure attributable to Namibia excludes the foreign consumer surplus. The value added to gross national income by the fishery is the proportion of gross output made up by gross value added (between N\$11 million and N\$15 million). Similarly, the value added to net national income is the proportion of gross output made up by net value added. A measure of the impact that the aggregated angler expenditures have on the economy in terms of gross value added is also shown (N\$26.7 million). Figure 4 shows a comparison between the aggregate expenditure and consumer surplus estimates as derived from the three different techniques. There is general consistency in results, although the travel cost method tends to yield relatively lower value for direct expenditure and relatively higher value for consumer surplus.

Figure 4 Estimates of aggregate direct expenditure and consumer surplus for the recreational shore fishery, as determined using expenditure analysis, travel cost method and contingent valuation (Namibia, 1997/98)

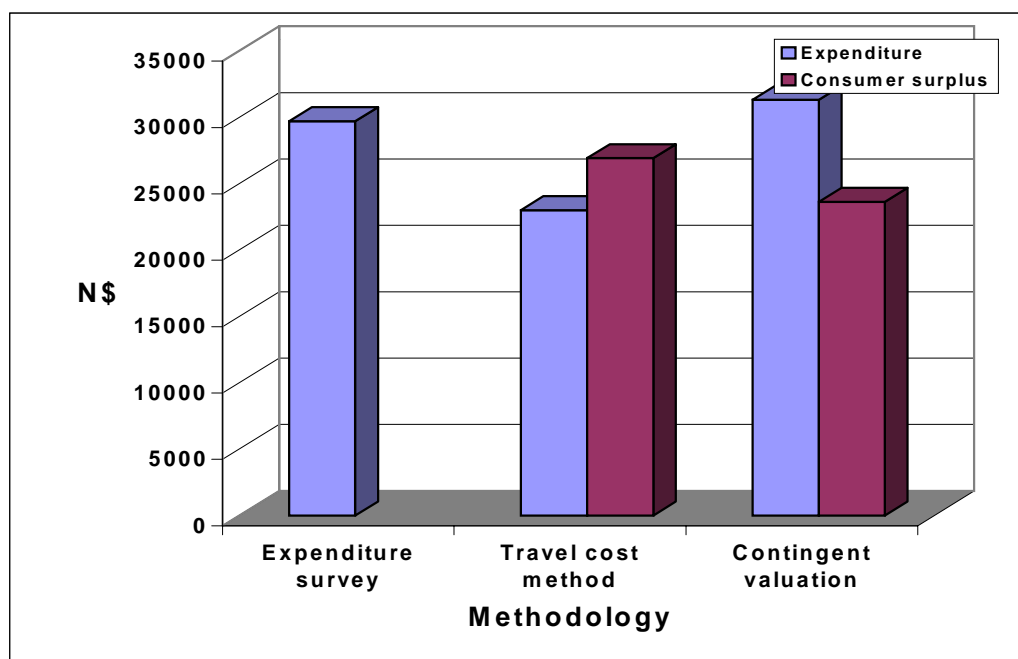


Table 7 Aggregate economic values for the recreational shore fishery as determined using the travel cost and contingent valuation methods (N\$'000, Namibia, 1997/98)

Value	Expenditure survey	Travel cost method	Contingent valuation
Aggregated expenditure	29,700	22,978	31,303
Aggregated consumer surplus	-	26,897	23,611
Consumer surplus accruing to Namibians	-	15,152	16,869
Direct economic use value ¹	-	49,875	54,914
Gross direct economic use Value attributable to Namibia ²	-	38,130	48,172
Value added to gross national income ³	14,256	11,029	15,025
Value added to net national income ⁴	12,177	9,421	12,834
Impact on gross national income ⁵	26,730	-	-

- ¹ Expenditure + consumer surplus
- ² Expenditure + Namibian consumer surplus
- ³ Expenditure x 48%
- ⁴ Expenditure x 41%
- ⁵ Expenditure x 0.9 (crude national income multiplier)

4. DISCUSSION

Comparison of our findings for the Namibian fishery with those from similar research in South Africa (McGrath *et al.*, 1997), is interesting. The catch rate and effort per angler was higher in Namibia, perhaps reflecting the relative remoteness of the Namibian coast. Further comparison of our values with those of McGrath *et al.* (1997) and Brouwer *et al.* (1997), reveals that angler numbers and angler effort, in Namibia's shore-angling fishery are only two per cent and 5 per cent, respectively, of those of South Africa. The Namibian estimate for the impact on gross national income per angler (N\$3,230) is only roughly comparable to the estimate of gross geographic product per angler made by McGrath *et al.* (1997) in South Africa (N\$4 012), but the two are notably similar.

Clearly Namibia's recreational shore fishery is very much smaller than that in South Africa. This could be expected given that only some 25 per cent of the coastline is accessible to angling, and the fact that Namibian national economy is only two per cent of the size of that of South Africa (DBSA, 1994). Fishing success is much higher in Namibia than it is in South Africa, where angling resources have been severely depleted. There would seem to be potential for growth in the Namibian fishery through attracting South African and other foreign visitors. However this needs to be planned with great care.

Management of the stock for the future is vital, and ways in which angler numbers can be increased while fish mortality decreases, deserve consideration. Very liberal bag limits (30 fish per day) have recently been reduced (to 10 fish per day) but they are still much higher than those for recreational angling in South Africa. Attwood and Bennett (1995) found that bag limits in the Western Cape, South Africa, needed to be as low as two to four fish per day to have any meaningful effect on fish mortality. More research is needed on bag limits and the feasibility of promoting 'catch and release' measures. Research is also needed to establish the most economically and biologically efficient allocation of line-fish stocks between the commercial fishery and recreational use.

The gross value added of the recreational fishery (between N\$11 million and N\$15 million per annum) amounts to between 2,8 per cent and 3,8 per cent of the total gross value added in the whole Namibian fisheries sector, which was some N\$391 million in 1996 (Central Bureau of Statistics, 1998). It thus has important value within the whole fisheries sector, which itself contributes some four per cent of the Namibian national economy.

The consumer surplus of foreign visitors is lost to Namibia, unless it can be captured in some way. The recent introduction of a license fee for anglers is one way. As in this study, McGrath *et al.* (1997) found price elasticity of demand for recreational shore-angling in South Africa to be low. This confirms that the introduction of a fee is likely to be feasible, and that it will likely not reduce the size or growth of the fishery. Low price elasticities of demand have been measured elsewhere in Africa by Barnes (1996) and Navrud and Mungatana (1994) for nature-based tourism. Comparison of our results with those of Barnes *et al.* (1999) and Barnes (1996) suggests that consumer surpluses might be significantly larger (relative to trip costs) for anglers than they are in the broader nature-based tourism sector.

The total willingness to pay of the recreational angling sub-sector, i.e., total expenditure plus total consumer surplus, consists entirely of direct use values. The contingent valuation part of the questionnaire was not specifically designed to collect information on non-use values. However, an indication of the non-use values of the fishery can be found in the willingness to pay toward a

coastal conservation trust fund. Anglers were found to be willing to contribute some N\$1 million per annum in aggregate for this. They may wish to conserve the resource for future use (option value), or simply to ensure its continued existence (existence value). The recently enacted national Environmental Investment Fund could serve as the vehicle for non-use value capture.

The results of the research work reviewed here are derived from several different methodological approaches. The roving creel survey was indispensable in providing absolute data on the numbers of anglers, and the catches made by them. The second survey of 240 anglers, entailed a targeted, stratified sampling technique, while the third survey of 626 anglers, was less structured and aimed primarily at maximising respondent numbers. Both yielded almost identical values for direct angler expenditure (Table 7, Figure 4).

The analysis of the third survey data was done using two fundamentally different valuation techniques, the indirect travel cost method and the direct contingent valuation method. Here, comparison of the results shows remarkable consistency in pattern, and regular consistency in values. As a general rule, the travel cost method tended to yield relatively lower trip cost estimates and relatively higher consumer surpluses than the contingent valuation approach used. Sensitivity analysis, carried out on the travel cost models, where inclusion of on-site costs was varied, indicates that their full inclusion yields results closest to those of the contingent valuation. Use of both the travel cost and contingent valuation models to derive price elasticity estimates is possible. Generally, greater variation is evident between estimates from different functional forms, than between estimates from the two types of model. It can be concluded that our use of the two widely disparate methods to value the recreational fishery has shown significant convergent validation of the economic measures.

5. CONCLUSIONS

Angler numbers and angler effort in Namibia's shore-angling fishery are only two and five per cent, respectively, of those of South Africa. Clearly the recreational marine shore fishery in Namibia is very much smaller than that in South Africa. Management of the stock for the future is vital and ways in which angler numbers can be increased, without increasing fish mortality, deserve further consideration. Further reduction of bag limits and promotion of the catch and release ethic may help. The recreational shore fishery contributes somewhere between three and four per cent of the value added in the Namibian fishery sector. It thus has significant value within the sector, which, itself, contributes some four per cent of the national economy. The finding that demand in the recreational shore fishery is price inelastic, means that imposition of new costs on anglers is unlikely to deter them from the activity. The recent introduction of a licensing system will facilitate capture of rents. Anglers were found to be willing to contribute some N\$1 million per annum in aggregate conservation of the resource. Convergence in findings suggests that all the methods used are suitable for use in economic valuation of the fishery. For best results all methods should be employed together, but each alone can provide useful values for policy analysis.

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