

## Acknowledgements

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**RESEARCH INTO THE ECONOMIC CONTRIBUTION OF SEA ANGLING**

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**Abbreviations**

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CE	Choice experiments
CEC	Commission of the European Community
CEMARE	Centre for the Economics and Management of Aquatic Resources
CFP	Common Fisheries Policy
CS	Consumer surplus
CV	Contingent valuation
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EU	European Union
FTE	Full Time Equivalent
HEV	Heteroskedastic Extreme Value [model]
IIA	Independence of irrelevant alternatives
ITCM	Individual travel-cost method
LRI	Likelihood ratio Index
MCA	Maritime and Coastguard Agency
MRS	Marginal rate of substitution
NERC	Natural Environment Rural Council
NFSA	National Federation of Sea Anglers
NRA	National Rivers Authority
ONS	Office of National Statistics
PO	Producer organisation
RP	Revealed preference
SC	Stated choice
Sd	Standard deviation
Se	Standard error
STEAM	Scarborough Tourism Economic Activity Monitor
TAC	Total Allowable Catch
TCM	Travel-cost method
UK BAP	UK Biodiversity Action Plan
WFSA	Welsh Federation of Sea Anglers
WTP	Willingness to Pay
ZTCM	Zonal travel-cost method

## EXECUTIVE SUMMARY

### Background

Existing information about the economic characteristics of sea angling in England and Wales is sparse. This study was established to provide more detailed economic information on sea anglers and sea angling in England and Wales. Specifically, it was set up principally to identify the important local centres for sea angling, its economic contribution both nationally and more locally, and the value of the experience to anglers.

### Methods

Information was obtained from a number of surveys, the main ones being:

- Household Omnibus survey, in order to estimate the number of people engaged in sea angling in England and Wales (10,200 households interviewed);
- Angler survey, in order to understand better their activities; the utility associated with the activity and their expenditure patterns (900 anglers surveyed, partly face-to-face and partly by postal survey of members of angling clubs); and
- Business survey of suppliers to sea anglers in order to estimate the impacts on employment and incomes from anglers' expenditure (130 businesses surveyed).

We also took four contrasting case study locations – Weymouth, Whitby, Hastings and Anglesey – in order to estimate the impact of sea anglers' expenditures on the local economies. The business surveys were concentrated in these areas.

### Location, participation and activity

Sea angling is practised all around the coast of England and Wales. The wide ranging geological makeup of the coastline with its rivers, estuaries and sheltered ports, along with the differing seas and currents provides a huge and diverse range of options for sea anglers. The south western and western shores are affected by the warm Gulf Stream, whilst the English Channel to the south and the cooler North Sea on the eastern coast, all have the potential to provide a large number of species for the sea angler to catch. These are ideal elements, whether sea angling be carried out from charter boat, own boat or from beach or rocky shore.

The household survey indicated that 1.1m households contain at least one member who had been sea angling in the past year. Participation is greatest in the northeast of England, south of England, and Wales. 54% of sea anglers fish mainly from the shore, 23% from private boats and 22% from charter boats. The mean number of days angling per household per year was 11.3 days but 24% indicated that they fished on only one day in the last year. Some dedicated people fish most days. Shore anglers fished more often (13.6 days) than charter boat anglers(4.96 days) or own boat anglers (12.41 days).

Participation is spread across all social classes with 6% of AB households having a fishing member as compared with 5% in C1C2 and 4% in DE. AB households fish less (9.1 days per year) and use boats more (only 41% are

shore anglers) as compared with DE where 59% are shore anglers but they fish on average 15.7 days per year.

We obtained more detailed information on the activities of sea anglers from face-to-face and postal surveys. It is important to note that face-to-face interviews are biased toward the more active angler because their chance of being interviewed is higher. In these interviews, shore anglers fished for 65 days per year on average, charter boat anglers for 31 days, and own boat anglers for 47 days. In the aggregation of economic data we accounted for different activity levels by converting all data to a per day basis.

Most anglers are male (96.7%) and had been fishing for 25.7 years on average. 55% of anglers had incomes in the £10,000-£30,000 range, but 17% had incomes exceeding £40,000. Anglers catch, on average, between 5 (shore anglers) and 13 (boat anglers) fish per trip and retain 32-39% of their catch. Most anglers had observed a trend decline in the number of fish caught and their size. This was more marked over a 15-year period but there was still a decline over the last five years.

15% of respondents had been sea angling outside England and Wales during the last year. Anecdotal evidence from the surveys indicated a growth in sea angling tourism by UK nationals (to the Channel islands, Ireland, USA, Africa) where fishing opportunities were better. At the margin there was some substitution of this for domestic sea angling but we were unable to quantify the scale of this trend. There was also evidence of a growth in sea angling as a corporate 'leisure' activity.

### **Value of the experience to anglers**

The great majority of those interviewed perceived a positive benefit to their health from sea angling. Anecdotal evidence from the surveys suggested that this was related to the sense of relaxation and peace of mind that angling engendered.

Consumer surplus benefits from sea angling were found to be considerable. Consumer surplus (mean value) on existing annual sea angling activity varied from £381 per shore angler to £886 per own boat angler. When aggregated over sea fishing trips for the whole country, the annual aggregate net benefit based on the mean consumer surplus estimates was £594 million.

The consumer surplus per angling day was found to be between £68 and £105 using the travel cost method (TCM). The basic TCM estimated an average consumer surplus of £26 per day per shore angler, £42 per day per charter boat angler, and £104 per day per own boat angler. An annual aggregate value can be obtained by multiplying each day consumer surplus value by their respective numbers of households and by the respective number of sea angling days (13.62; 4.96; 12.41) of these households from the Omnibus survey described in Section 3. This produces an aggregate consumer surplus value of £216 million for shore anglers; £50 million for charter boat anglers; and £336 million for own boat anglers; that is: £602 million in total.

The total value of the angling experience can be measured by summing the actual expenditures per day and the estimates of surplus<sup>1</sup>. *Using the full*

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<sup>1</sup> We assume that the market value of any fish retained is embedded within the surplus estimate.

range of estimates, we derived a total value for the angling experience of between £600m and £1,300m per year (see Table below right hand column).

**Total value of sea angling**

	Expenditure per day angling mean (£/day)	Surplus (range of estimates) (£/day)	Total value (£/day)	Number of households (m)	Days angling (mean per household per year)	Total value (£m)
<b>Shore</b>	21.6	5.7-35.5	27-57	0.61	13.62	224-473
<b>Charter boat</b>	67.7	18.4-90.9	86-159	0.24	4.96	102-189
<b>Own boat</b>	87.9	14.3-108.7	102-197	0.26	12.41	329-635

The choice experiments (CE) estimated the values associated with changes in the diversity and quality of the angling experience. The results indicated positive benefits from an improvement in the angling experience (as measured by fish size and diversity), but benefits from increasing the numbers caught were less clear-cut. All types of angler were willing to pay more for larger fish (£0.22 per 1% increase in size) and for greater diversity in the catch (£11.38 to catch different species from those usually caught). However, only shore anglers were willing to pay for more fish (£0.81 per extra fish caught). Boat anglers had a negative valuation for more fish.

It may be that the skill of boat owners to find stocks (especially those using more powerful charter boats) has reduced the impacts of any loss of total stocks. The satisfaction of boat users is now more concentrated on fish size and ability to target species. Shore anglers have limited options for responding to reduced stocks and the CE results suggest that marginal utility for catch is positive and that an improvement in fish stocks would deliver benefits to this group.

**The economic contribution of recreational sea angling in England and Wales**

The total expenditure by anglers resident in England and Wales was estimated as £538m per year from 12.7m angler days of activity (see Table below). Around half of the expenditure (52%) was by own boat anglers and reflects the importance of capital expenditures on boats and equipment. Shore anglers were the next most important group (37% of the total expenditure). In terms of first round impacts, the spending translates into 18,889 jobs and £71m in suppliers' income. Multiplier effects were not measured.

**National level impacts of sea angler expenditures**

	No of households (m)	DAYS ANGLING (MEAN PER HOUSEHOLD PER YEAR)	EXPENDITURE PER HOUSEHOLD PER YEAR (£, MEAN)	Aggregate expenditure per year (£m)	Employment supported (FTE)*	Income generated (£m)*
<b>Shore</b>	0.61	13.62	295	178	5,652	19.1
<b>Charter boat</b>	0.24	4.96	336	82	3,092	9.0
<b>Own boat</b>	0.26	12.41	1,091	278	10,145	43.3
<b>Total</b>	<b>1.10</b>	<b>30.99</b>	<b>1,722</b>	<b>538</b>	<b>18,889</b>	<b>71.4</b>

Note \*first round impacts only

Angling expenditure by visitors (travelling more than 50 miles from home) was £192m (35% of the total). It emphasises the fact that residents not travelling far from home undertake most sea angling. It compares with a total tourism expenditure by UK residents in England and Wales of £22,331m (UKTS, 2002). Angling spending by visitors was just under 1% of total tourism spending.

Conclusions on the contribution of sea angling to the national economy have to be made with care. Cessation of the activity would not result in the loss of 18,890 jobs. Expenditure would be displaced into other directions with corresponding benefits to employment and income. Similarly any comparison of the economic characteristics of sea angling with those of commercial fishing is potentially open to misinterpretation. They represent quite different types of economic activity (a consumer activity by sea anglers, and a natural resource harvesting activity combined with processing, by commercial fishing).

**Case studies and local economic impacts**

The four case studies illustrated different evolutions of sea angling over time and different contributions of sea angling to local economies. The main factors explaining differences between locations and change over time have been the reliability of obtaining a satisfactory catch and the range of facilities available to support angling. Weymouth was the most competitive location, and angling generated 119 first round jobs. Much of the spend was by local residents, and the contribution on the context of the whole local economy is significant but small. With knock-on effects, it might reach 0.6% of the total 25,900 workforce in the district (Gray, 2003). General tourism is clearly much more important to Weymouth since 38% of employees are employed in distribution, hotels and restaurants.

Whitby and Hastings have been more severely affected by a lack of catch with corresponding negative effects for sea angling and expenditures. Angling on Anglesey supports 46 jobs; visiting anglers and charter boat operations making an important contribution.

To some extent anglers had adapted as best they can to reduction in stocks by selecting different locations, with own boat and charter anglers using their mobility and skills to search more widely for available stocks. There is a trend towards more powerful, better equipped, charter boats in order to increase the available fishing area and provide a more professional service. Lack of fish was clearly having a negative impact on utility and expenditure in some locations, whereas in others (e.g. Weymouth) this was less obvious.

### **Side effects of sea angling**

Sea angling is now enjoyed across a wide spectrum of social classes throughout the country. Participation rates are highest in the southwest, southeast, northeast and Wales. A broad mix of social classes now pursues sea angling. Participation rates are slightly higher in the AB class (5.6% of households) and C1C2 (5.4%) than DE (4.0%). This compares with 1970 when 40% of sea anglers were skilled manual (C2). Boat activity is higher amongst the AB classes.

### **Key trends in the sector**

The identification of trends through comparison of this study with others is not straightforward because of the different survey methods used. Our survey indicated a population of 1.11m households with at least one sea angler, i.e. an adult population of at least 1.11m. The evidence suggests a stabilisation and possible increase in the sea angling population since the early 1990's.

Activity levels appear to have stabilised in the last decade. In 1970 sea anglers fished on average 36 times a year. This fell to 12 times in 1992 (Dunn and Potten, 1994) and our mean was 11.3. However, there is some variation between types of angling with shore anglers most active (13.62 days per year) and charter boat anglers least active (4.96 days per year).

71% of anglers perceived a decrease in numbers caught over the last 5 years, and 62% a decrease in fish size. To some extent anglers have adapted to changing conditions by switching locations, travelling further and using more powerful boats to extend their search.

### **Future prospects for the sector**

Future prospects for the sector depend mainly on demand, fish stocks and facilities. There appears to be a stable or possibly increasing demand for sea angling with higher income groups being more prominent. Projection of the current trends indicates an increasing use of private and charter boats. There is some evidence of increasing corporate involvement in charter boat angling.

Growth in the sector in England and Wales may be inhibited by lack of fish or poor fish quality. At a national level it is not clear to what extent activity is being constrained by available stocks. The value placed on additional fish caught was negative for boat anglers but positive for shore anglers. This indicates that an increase in the numbers caught would provide benefits only to shore anglers. In some regions all types of angling are limited by low stocks.

In some port locations growth in boat angling is limited by port size and facilities. Yachting is the main competitor for port space over much of the south and west coasts. There does not appear to be any real physical limit on shore angling but these anglers are the most vulnerable to any deterioration in fish numbers.

Overall, the prospects appear reasonably stable, but with considerable regional variation, and vulnerability to an increased switching of activity to locations outside England and Wales.

## 1. INTRODUCTION

### 1.1 Background

Recreational sea fishing is increasingly felt to be an important sector of activity from environmental, social and economic perspectives. Its biological impact on otherwise hard pressed fish stocks is thought to be small, yet some have argued that its economic contribution to some coastal communities is now greater than that of commercial fishing. However, at a time when many coastal communities are faced with important structural change, little firm information currently exists on the characteristics and contributions of this sector to society.

### 1.2 Remit and research questions

The project team is at Annex I and the project specification is described in the Project Schedule at Annex II. The remit posed the following question for the study:

- Where are the important local centres for sea angling in England and Wales located?
- What is the economic contribution of recreational sea angling in England and Wales?
- What is the value of the experience to anglers?
- Are there any side effects of sea angling?
- What are the key trends in the sector?
- What are the future prospects for the sector?

### 1.3 Methodology

Existing information about the economics of sea angling in England and Wales is sparse (see 2.2 below). There is no comprehensive quantitative information on the expenditures of sea anglers in England and Wales; the economic impacts of the activity on coastal economies; or the utility derived by anglers when pursuing this interest. In order to obtain more detailed information we set up a series of surveys as summarised in Table 1.1. The main surveys were of:

- Households, in order to estimate the number of people engaged in sea angling in England and Wales, and
- Anglers, in order to understand better their activities; the associated consumer surplus; and the impacts on the economy.

Additional surveys of angling-related businesses and stakeholders were used to obtain further information about the sector and its economic, social and environmental characteristics. The methods used are described in the relevant chapters.

**Table 1.1 Surveys undertaken as part of the study**

<b>Survey</b>	<b>Respondents</b>	<b>Size</b>	<b>Structure</b>	<b>Main purpose</b>
<b>Omnibus (face to face)</b>	Clustered sample of households in England and Wales	10,200	1,700/week in six weekly waves	Identify sea angler population and activities.
<b>Focus groups (face to face)</b>	Angling club members in Tyneside, Alnwick and Devon	c15 per group	Semi-structured group discussion	Obtain qualitative information on sea angling to improve questionnaire design (see below).
<b>Angling club members (postal)</b>	Members of 30 angling clubs	383	Proportional sampling of angling clubs in English and Welsh Associations. Random within clubs	Obtain information on types of angling activity, number of visits, expenditure, consumer surplus.
<b>Anglers (face-to-face)</b>	Sea anglers on angling trips	514	12 locations * 42 per location (regionally stratified).	As above
<b>Case studies (face to face)</b>	Key actors in 4 locations – Weymouth, Whitby, Hastings and Anglesey	N/A	Qualitative interviews with key actors	Produce descriptive information on the characteristics of sea angling, its economic contribution, trends and factors limiting development of the sector.
<b>Business survey (postal, and telephone)</b>	Tackle shops, charter skippers and chandlers	162	Mainly located in case study areas with some wider representation.	Obtain information on turnover, employment and expenditures of important service suppliers.
<b>Stakeholders (postal)</b>	All major interests and information sources	178	None	Obtain views of actors and interest groups on key issues

#### **1.4 Structure of the report**

The report starts with a description of the policy framework relating to sea angling and a literature review. We then describe the results of the Omnibus survey of households. Chapters 4-6 describe the results of the surveys of sea anglers, the economic impacts and utility derived from fishing. Chapter 7 describes the four case studies and Chapter 8 draws conclusions from the study.

There are five other annexes in addition to annexes I and II. Annex III describes the main coastal locations for sea angling in England and Wales. Annexes IV and V are questionnaires used in the angler and business surveys respectively. Annexes VI and VII relate to the stakeholder survey.

## 2. REVIEW OF POLICY AND LITERATURE

### 2.1 Policy context for sea angling

Fishing is regulated under the Common Fisheries Policy (CFP) Council Regulation No 3760/92, within which fishing quotas are imposed as part of a fisheries management strategy. There does not appear to be an official definition of what is commercial as opposed to recreational fishing. However, the working definition is based on whether fish are sold or kept for personal consumption. While recreational angling is regarded as a different type of activity, there is both complementarity and competition between the two. In some cases small fishing vessels also operate charter services for recreational anglers in order to supplement the owner's income, and vice versa. But there is most obviously competition between commercial and recreational fishing for prime fishing sites such as wrecks and, more generally, for the available catch.

#### 2.1.1 Regulation of commercial fishing

Regulation of all commercial fishing vessels entails registration at an administrative port, usually on a regional basis, and at a home port (out of which boats usually operate). The commercial fleet is divided into registration of boats greater than 10m in length and those equal to, or less than, 10m. For fishing vessels greater than 10m there is a statutory requirement to report fish catches of species for which there is a Total Allowable Catch (TAC) quota under CFP regulations. Boats of 10m or less are not obliged to report catches of any species, either under EU or national legislation, although some reporting is done on a voluntary basis.

There is a slightly different grouping of fishermen in terms of how the national quota of the TAC is applied. What is loosely known as the 'sector' are vessels over 10m that are members of a Producer Organisation (PO). In this case the allocation for the sector is given directly to the POs who have responsibility for individual allocation of that quota according to the needs of their members. Fisheries Departments monitor uptake and close PO fisheries once their allocation has been fished.

The remaining group, known as the 'non-sector', comprise boats over 10m that are not members of a PO, and boats of 10m or less. The management of the quota allocation for this group is decided by the Fisheries Departments in consultation with fishermen in this non-sector group. Generally, non-sector vessels fish against monthly catch limits of TAC species, decided at monthly meetings of government and industry representatives. The total UK quota is allocated between these two groups taking into account past fishing record. Any vessel found exceeding these monthly limits may be prosecuted.

In both cases, once annual quota allocations in any fish stock have been met, fishery closures for that species are enforced through licence variations, i.e. a vessel no longer has permission to land a particular fish species.

By contrast, in the sector managed by POs, the licences issued to individual vessels do not lay down any specific catch limits; such limits are the responsibility of the PO to organise and enforce among its members. The Fisheries Departments monitor the uptake of the PO as a whole and will close that PO's fishery once quota allocation has been met. Therefore individual vessels which exceed catch restrictions imposed by their PO are not committing an offence against the conditions of their fishing licence but may

face disciplinary measures by their PO. Thus it is up to the PO to manage their allocation in a manner that suits its members, this might consist of managing catches so that fishing is available all year or conversely to fish intensively until the quota is reached. In practice there is considerable variation in how individual POs allocate the quota between individual members.

### ***2.1.2 Regulation of recreational fishing***

Recreational sea angling is not specifically targeted by regulations but is subject to various types of legislation at a variety of administrative levels, e.g. EU Directives, National Statutory Instruments and local Sea Fisheries Committee by-laws. The relevance of any of these particular regulations will depend on the type and timing of fishing that is carried out. For example, minimum fish size (below which a fish must be returned to the sea) applies to some species under EU legislation, irrespective of whether such fish are caught for commercial or recreational reasons. At a national legislative level seasonal restrictions may apply in some localities, for instance to bass nursery areas, where boat fishing for bass can be prohibited. At the local level by-laws exist to manage fish and shellfish resources allowing more locally specific protection of species where this is deemed necessary.

Thus while there are no regulations targeted specifically at the recreational or charter boat industry such activities may be subject to EU, national and local regulations depending on the type and timing of the fishing activity. Any charter boat operating under an existing commercial fishing licence will obviously have to comply with commercial fishing restrictions outlined in the previous section.

### ***2.1.3 Regulators***

#### *Sea Fisheries Committees*

Sea Fisheries Committees operate around the country and are made up of representatives from Local Authorities, DEFRA appointees drawn from the commercial fishing industry and in the majority of cases recreational fishing interests, and the Environment Agency. These committees are responsible for inshore fisheries management in waters within the 6-mile limit. They make and enforce by-laws for the conservation and management of fish stocks and for marine environmental purposes, as well as enforcing EU and national legislation where relevant.

#### *Fisheries Departments*

DEFRA and the other Fisheries Departments in the UK manage the commercial aspects of fishing. In relation to recreational fishing by boat, the retention of fish caught may be prohibited once a quota allocation for the <10m and 'fishing for pleasure' categories of vessel has been taken in full. This is a rare situation and sea anglers can continue to fish so long as any catch of the stock in question is returned to the sea. Fishing from the shore is not subject to such prohibitions.

#### *Maritime and Coastguard Agency*

All sea-going vessels must be registered with the Maritime and Coastguard Agency (MCA) in order to comply with merchant shipping regulations (as opposed to fishing licences issued by Fisheries Departments). These regulations are to do with safety and operational codes of practice at sea and

apply to all vessels that operate commercially either for commercial fishing or other commercial activities, such as recreational charter boat fishing.

There are exceptions to this registration where boats only operate in waters not categorised as sea, such as harbours and estuaries, in which case they must register with the Local Authority and are bound by various by-laws. There are different types of coding for vessels certified by the MCA so it is not possible to distinguish exactly what sort of activities vessels are involved in. Maritime and Coastguard Agency sources indicate that there are probably around 500-700 registered angling charters operating in English and Welsh waters, (plus an unknown number of additional boats thought to be operating illegally).

#### *Other regulators*

Although regulation of recreational fishing is seen as largely unnecessary because of its small impact on stocks and the difficulty in monitoring, there have been some concerns that in estuaries and coastal waters commercial rod and line fishing for bass, in particular, is disguised as recreational sea angling. Various recreational fishing activities may potentially have effects on fish stock or other environmental impacts, and a draft Code of Conservation has been produced by a consortium of interests to reduce the environmental impacts of recreational sea fishing (EA, 2002).

In addition, the Environment Agency could potentially impose some form of regulation on recreational fishing in estuaries under the Environment Act 1995, whereby the Agency has a general duty to maintain, improve and develop salmon, trout, freshwater fish and eel fisheries under its jurisdiction. In certain areas, the Agency also has powers to regulate sea fisheries under the Sea Fisheries Regulation Act 1966 Act and the Sea Fisheries (Conservation) Act 1967.

Risks posed by fisheries and the use of certain fishing gear to particular ecosystems, habitats and UK Biodiversity action Plan (UK BAP) species at marine sites around the UK coastline could potentially be regulated under the EU Habitats Directive. There are currently 23 marine Special Areas of Conservation designated under the EU Habitats Directive, covering c. 950,000 ha in England and Wales. The Marine Wildlife Bill may also have implications in regard to regulation.

#### **2.1.4 Representation**

Management of commercial fishing through the CFP impacts on recreational sea fishing. Levels of fish stocks are affected by commercial fishing intensity although quota levels are intended to control any reduction in stock levels. In addition to environmental factors, these fish stock levels will affect the probability and size of catch for recreational fishermen thus having an impact on the leisure and commercial charter aspects of recreation angling. There is currently no representation of recreational sea angling interests within the CFP structure yet recreational fishermen are clearly stakeholders in the issue of fish stock management.

The UK response to the EU Green Paper (CEC, 2001) for the 2002 CFP review acknowledged that developing the CFP is a task that involves a wide range of stakeholders, including sea anglers. In relation to stock conservation, sea anglers are recognised as making 'a significant contribution to local fishing communities and the policies adopted need to ensure that this is fully taken into account' (Defra, 2002).

## 2.2 Statistics and previous studies

### 2.2.1 Participation

The General Household Survey (1996) indicated that 5.3% of persons aged 16 and over had gone fishing in the last year. On that measure of participation it was around the 20<sup>th</sup> most popular sport/physical activity, with walking top at 68.2% and swimming at 39.6%. Participation in fishing was more or less constant over the previous 10 years with a possible slight decline in 1996. More recent national statistics on sport do not appear to include fishing, concentrating on participation in the more popular sports (e.g. Social Trends, 2003). None of the national statistics distinguish between different types of fishing.

NERC (1970) commissioned a specific household survey to estimate the number of anglers of different types in England and Wales. This is now 33 years old but is of interest for comparative purposes. It showed that 10% of all households contained at least one angler over the age of 12. 1.28m people went sea angling in the previous year and 2.15m people went angling inland. Sea anglers fished on average about 36 times a year. One in every four sea anglers went fishing at least once a week. In terms of socio-economic grouping, 40% of sea anglers were skilled manual (C2) and 60% from C2, D and E classes.

In the more recent 1980 and 1994 surveys (quoted in NRA, 1994) the number of people aged 12 and over who had been sea angling was estimated at 1.791m and 1.104m respectively. The 1994 definition was those who had been fishing in the previous two years, but regardless of the slight difference in definition, there had apparently been a sharp decline in numbers from 1980 to 1994. In 1994 the predominant social class of sea anglers was C2. 48% said that they were members of an angling club. Expenditure by sea anglers in 1980 was estimated at £213m.

Dunn and Potten (1994) undertook a large-scale postal survey of households in 1992 to estimate the numbers of sea anglers, their activity and expenditure. Postal surveys suffer from potential non-response bias given that the more active anglers may be more likely to reply. They estimated that 1.45m people in the UK undertook sea angling in 1992. Using their regional distribution data this can be converted to 1.175m in England and Wales. The mean number of trips per household was 12 per year and the total estimated expenditure in the UK was £159m. However, the expenditure survey was based on the concept of day trips without any categories for accommodation or non-trip related expenditure (e.g. equipment, boat purchase and maintenance). It therefore underestimates actual annual expenditures.

The most recent participation study<sup>2</sup> is by the Sports Industries Federation (1999) who used an access panel approach. It estimated that 11% (5.8m people aged 10 and over) had been angling in the last year. This compares with an NRA estimate of 3.3m in GB (aged 12 and over). The 1999 study is less reliable because of greater non-response bias. It is not very informative for the present study because it failed to distinguish between different types of fishing.

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<sup>2</sup> The UK Day Visitor Survey does not include sea angling as a specific activity.

Interpreting these estimates of the angler population is not easy because of differences in the definition of an angler and in the survey methods used. However, there is evidence of a reduction in the sea angling population from around 1.8m in 1980 to around 1.1-1.2m in 1992.

### 2.2.2 Economic Impacts

The only detailed study of the economic impacts of sea angling in England or Wales was by Nautilus Consultants (2000). They studied the situation in Wales and subdivided the types of activity into shore angling, charter boat angling and private boat angling. They estimated the number of rod days and sea angler expenditures in the coastal locations by discussion with a number of sea angling specialists (Table 2.1). This approach could be open to error and bias because it is not based on actual questioning of anglers with regard to their activities and expenditures.

**Table 2.1 Estimates of sea angling activity and expenditure in Wales (Nautilus Consultants, 2000)**

	Residents		Visitors	
	Rod days	Expenditure (£m)	Rod days	Expenditure (£m)
<b>On-shore</b>	172,168	2.6	107,058	4.8
<b>Charter boat</b>	83,521	3.8	222,887	15.6
<b>Own boat</b>	19,040	0.5	23,824	1.4
<b>Total</b>	<b>274,729</b>	<b>6.9</b>	<b>353,769</b>	<b>21.8</b>

In summary, they conclude that sea angling in Wales involves the participation of 12,000 resident anglers and 28,000 visitors<sup>3</sup>, with a combined spend of £28m per year. This expenditure is on first hand suppliers (food, accommodation, tackle, charter boats, travel etc.). Most of this economic impact is from visitors, and these contribute £21.8m. Expenditure by anglers using charter boats is the single most important source of revenue at £19.4m.

### 2.1.3 Other economic studies

There are numerous studies on the economics of sea angling in other countries (e.g. Genter *et al.*, 2001; Institute of Technology, 1997; Toivonen *et al.*, 2000). Whilst they indicate the interest in both the economic benefits and impacts of recreational angling, they do not in general inform on issues in the UK. But here are two exceptions. Ireland is an exception because it attracts visiting anglers from the UK and therefore competes for UK angler expenditure. It also has a reputation for good management of recreational fish stocks, and especially bass. An Institute of Technology (1997) survey of sea anglers in the southwest of Ireland indicated that sea anglers were spending £27m per year (and supporting 1250+ FTE jobs), of which £18m

<sup>3</sup> Visitor statistics are based on visitors to local areas in Wales. The 28,000 therefore includes an unknown number of Welsh residents, who travelled away from home to fish in Wales, and does not measure the national injection of expenditure from residents outside Wales.

was derived from tourists. British anglers were the most significant tourist element. The study recommended that policy should focus on the sustainability of the public resource in order to maximise socio-economic benefits to the Irish and local economies by:

- Sustaining and improving the variety and quality of the existing sea angling product
- Improving the usage by broadening the user base.

The Toivonen *et al.* (2000) study on sea angling in the Nordic countries is of interest because they measured anglers' willingness to pay (WTP) for the angling experience. This is a measure of the satisfaction obtained by anglers over and above that revealed in any costs associated with angling. They found that, in Finland, recreational anglers spent £121.9 per year but would be willing to pay an additional £49.7 for their fishing experience. In Sweden the corresponding figures were £195.2 with an additional WTP of £73.7. Thus the consumer surplus was an additional 38-41% of the observed expenditure. In both cases the actual expenditures plus WTP were much larger than the valuation of the catch at commercial prices. The authors argue that the actual expenditures plus WTP measures the true monetary value of recreational fishing to society. These expenditures, rather than commercial catch values, should be used to inform investment and policy decisions.

A number of studies have estimated the recreational value of angling on inland waters (such as Grafham Reservoir, Derwent Reservoir, and the River Trent) England in the 1970s (see Gibson, 1974). Typical of these was the study by Lewis and Whitby (1972) of fishing at the Derwent Reservoir. The study used a zonal travel-cost model, and estimated a consumer surplus of £1.30 per visitor-day for angling. They also estimated a price elasticity of -2.2; which is relatively elastic, but reflects the fact that demand at any specific location is highly dependent upon the cost of access to that location. Income elasticity was estimated as +0.8; lower than expected, but again reflecting the fact that this income elasticity estimate does not cover 'all fishing' but only that at one site.

A recent study by Willis and Garrod (1996) investigated anglers' WTP for improvements in water quality in rivers. For coarse fishing, anglers were more likely to fish more days at a new site where the new site was of good water quality than where the new site was of average or poor water quality.<sup>4</sup> Benefits declined from £6.22 per day for new good water quality sites, to £2.97 per day for a new site of poor water quality. Maximum WTP for a new non-migratory trout site with good water quality was £17.65 per day; whilst WTP for a good water quality new river for game salmon and trout fishing was even higher at £30.26 per day.

Cutis (2002) used a count data model to estimate the value of salmon fishing in Ireland. He estimated a WTP of IR£206 per day of angling in Donegal in 1992, of which the mean travel-cost was IR£68 per day and the remainder

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<sup>4</sup> Water quality in rivers is divided in classes A and B (good quality), C and D (fair quality), E (poor quality) and F (bad quality); with sub-classes within these.

consumer surplus. Another Poisson count model study using Marine Institute (Dublin) data on water based leisure, estimated consumer surplus for sea fishing varied between £8.09 and £13.62 per day.

A number of studies estimating the recreational value of angling have been completed in the USA. Many of these have used travel-cost models or variants of TCMs. Gilling et al (2000) use Poisson and negative binomial count models to estimate the recreational value of red snapper angling in the Gulf of Mexico. Lupi and Hoehn (1997) used a random utility TCM to estimate the value of Great Lake trout and salmon recreational fisheries.

Logit models have also been used to derive values for sport fishing alternatives. Kling and Herriges (1995) estimated welfare measures for the closure of groups of fishing sites in Southern California, using a nested logit model. Compensating variation estimates varied from US\$8.40 to \$16.55 for shore sites, and from \$27.46 to \$44.45 for offshore sites. These variations in average welfare loss resulted from applying a Bayesian approach which placed different conditional restrictions on the priors. Research results are often sensitive to the assumptions of the model employed.

These studies show that considerable consumer surplus exists, over and above actual expenditure on recreational angling. These benefits vary by type of angling, type of fish, and region; whilst participation is affected by distance from an angling site, and by the quality of site characteristics. Markowski and Boyle (2000) undertook a meta-analysis study of 100 recreational fishing valuation studies. This meta-analysis study identified the average effect of different attributes of angling, and the effects of the different research designs adopted by different studies. They found that species, water type, valuation methodology, and sample characteristics significantly influenced welfare estimates. Their results highlight the importance of understanding the underlying data for interpreting both the parameter estimates and the model predictions. In general, Markowski and Boyle (2000) concluded that salmon was consistently a highly valued species and trout moderately valued; but that marine fishing was the highest valued.

### 3. SEA ANGLING IN ENGLAND AND WALES

#### 3.1 Location and types of angling

Sea angling is practised all around the coast of England and Wales. The wide-ranging geological makeup of the coastline with its rivers, estuaries and sheltered ports, along with the differing seas and currents provides a huge and diverse range of options for sea anglers. The south western and western shores are affected by the warm Gulf Stream, whilst the English Channel to the south and the cooler North Sea on the eastern coast, all have the potential to provide a large number of species for the sea angler to catch. These are ideal elements, whether sea angling be carried out from charter boat, own boat or from beach or rocky shore.

Annex III describes the main locations in England and Wales suitable for sea angling. It divides the coastline into segments and each one describes the opportunities for shore and boat angling, and the main species caught.

#### Regional perspective

The angling activity within the segments varies depending on the species of fish available and the accessibility of the angling venue. In the far southwest and the west coast the warmer waters of the Gulf Stream ensures opportunities for an increasing number of warm water species. This is thought to be assisted by the effects of global warming and has a knock on effect all round the coast as the colder water species move northwards and the warmer water species such as the more exotic Breams, and Trigger fish become available.

It was possible to identify the principal locations for boat angling, because there is a definite departure port for boats, but for shore angling the locations are more general therefore they have been based on area rather than a specific place. The Annex III information is summarised in Table 3.1.

**Table 3.1. Principal regional centres for sea angling**

Region	Principal locations for boat angling	Known Charter Boats	Principal locations for shore angling
Cornish Coast	Looe, Mevagissey, Newquay, Padstow.	37	Rame Head, Mevagissy, Falmouth Bay, The Lizard, Mounts Bay, St Ives, Padstow.
South Devon Coast	Plymouth, Dartmouth, Exmouth	36	Plymouth Harbour, Slapton Sands, Torbay, Lyme (West),
Dorset Coast	Lyme Regis, Weymouth, Poole.	41	Lyme Bay (East), Chesel Beach, Portland Harbour, Christchurch Bay (West).
Hampshire & IOW Coast	Lymington, Keyhaven, Gosport, Langstone	55	Christchurch Bay (East), Southampton, Portsmouth & the Solent, Isle of Wight.
Sussex Coast	Littlehampton, Brighton, Newhaven.	50	Chichester, Bognor, Worthing, Brighton, Eastbourne, Hastings, Brighton.
Kent Coast	Folkestone, Dover, Ramsgate.	29	Dungeness, Hythe, Dover, Deal, Whitstable, Medway.
East Coast	Southend, Burnham, Bradwell, Lowestoft.	26	Canvey, Clacton, Aldeburgh, Lowestoft, Cromer.
Humber & Yorkshire Coast	Humberside, Bridlington, Whitby.	34	Skegness, Mablethorpe, The River Humber, Bridlington, Scarborough, Whitby.
Northumberland Coast	Hartlepool, Tyne, Amble, Seahouses.	42	Saltburn, Whitley Bay, Alnmouth, Berwick upon Tweed.

North West Coast	Isle of Man, Morecambe, Blackpool, Liverpool	11	Barrow in Furness, Isle of Mann, Morecambe, Blackpool, Liverpool Bay, River Dee.
North Wales Coast	Rhyl, Conway, Holyhead.	44	Colwyn Bay, Anglesey, Pwllheli & West Wales.
West & South Wales Coast	Aberystwyth, Milford Haven, Swansea, Penarth.	32	Aberystwyth, Fishguard Bay, Carmarthen Bay, Porthcawl, Newport.
North Devon & Bristol Channel	Portishead, Watchet, Minehead, Ifracombe.	15	Severn Beach, Burnham on Sea, Watchet, Ifracombe, Westward Ho, Hartland.

The Cornish and South Devon coastal regions, because of the huge rock formations, estuaries, sandy beaches, and the deeper water offshore, together with the milder climate, provide a more extensive range of species than other regions. The sea angling activity and potential is very large.

The Dorset Coast, because of the relatively shallower water of the English Channel, provides good opportunities, but the species are more restricted and this is the case throughout Hampshire, Sussex to the Kent Coast. However the activity is considerable because of the accessibility of the coast to where most anglers live or are prepared to travel.

Turning north to the East Coast right up through the Humber and Yorkshire Coast, to the North East of England, the species traditionally caught are those preferring colder water such as cod and whiting. Sea anglers are prepared to travel further to obtain a day's fishing the further north they live.

With the Western Coast, from North Devon, Bristol Channel, South West and West Wales to North Wales and the North West, the angling activity follows a similar pattern to that on the East, but warmer water species are available than further north, and the opportunities increase. It is not uncommon to catch bass which thrive on a sea temperature of between 10 and 20 degrees centigrade, as far north as Scotland.

### **National perspective**

It may be interpreted from the previous text that the major opportunities for sea angling in England and Wales are available in the south and west, but that assumes that the angler only wants to catch a wide range of species and whilst that may be the case where the opportunity presents itself, it is not the whole picture.

Major international and national sea angling events are held all around the coast where the balance between financial support and the availability of fish dictate the venue. Key places where such activity has taken place are Plymouth, Weymouth, Poole, Southsea, Brighton, Dover, Southwold, Pakefield, Whitby, Hartlepool, Seahouses, Liverpool, Rhyl, Anglesey, Pwllheli, Milford Haven, Porthcawl and Swansea.

The expectation of catching fish is the main driver, and where the larger or exotic species are not available, anglers have been forced to accept smaller fish and smaller species. Sea anglers with fewer species available adapt to what are available and the incentive to eat the fish become more of an issue, with the result that there is a huge interest in the cod and whiting on the eastern and north east coasts. This in turn supports a healthy charter fleet in the eastern ports and considerable interest by shore anglers.

Any further deterioration of fish stocks will result in the sport declining further. However evidence from other countries, where the fish stocks have been allowed

to recover and to be managed sustainably on the basis of socio economic importance, suggest that the sport recovers and activity rapidly increases along with business opportunities.

### 3.2 Omnibus survey

In order to obtain basic information on participation in angling, a small number of questions were included in an RSGB (2003) General Omnibus Survey of 10,980 adults in England and Wales during the summer of 2003. Five questions were inserted and responses are given below.

***Q1 How many members of your household went sea angling in the last year?***

**Table 3.2 Number in household members who went fishing in the last year**

Number	%
None	94.37
1	3.51
2	0.90
3 or more	0.61
Don't know	0.61
Participation rate	5.02

There were small differences in participation between social classes, with AB (5.6%) and C1C2 (5.4%) having significantly<sup>5</sup> higher participation rates than DE (4.0%).

Regional differences were more marked (Table 3.3). In particular, participation rates were highest in Wales, the North East and South West (8.7%), and lowest in the East and west Midlands. When the participation rates are combined with 2001 household numbers in each region (ONS, 2003) it is clear that total participation is much higher in the southeast and southwest than elsewhere. London and the northwest are also important regions whereas angling is less important in the Midlands.

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<sup>5</sup> Significance tests are at p<0.5

**Table 3.3 Participation rate and level of activity by government region**

Government region	Participation (%)	Number of households participating ('000)	Mean number of days fishing per year
Northeast	7.1	78.1	9.56
Northwest	4.5	129.6	14.86
Yorks and Humber	4.1	87.7	14.43
East Midlands	3.1	54.6	4.91
West Midlands	3.2	70.1	2.97
East of England	4.1	93.5	16.15
London	4.0	125.2	4.87
Southeast	6.1	207.4	10.41
Southwest	8.7	184.4	13.99
Wales	7.4	89.5	15.98

**Q2 Which one of the following was the main method used by members of your household? (Angling from the shore, in a private boat, in a chartered boat)**

54% said that shore angling was the main method with the remainder equally split between charter and own boats (Table 3.4). Shore-base angling is more common in social classes C1, C2, D and E. AB members used own boats more. There were no significant differences between social groups in the use of charter boats.

**Table 3.4 Participation rates in main methods used in sea angling (%)**

	Social class			
	Total	AB	C1C2	DE
Angling from the shore (%)	54	41	56	59
Private boat (%)	23	31	21	21
Charter boat (%)	22	27	22	19
Mean number of days fishing per year	11.32	9.15	10.24	15.66

**Q3 How many days sea angling did your household do in the last year?**

Responses varied from 1 to 200 days. 24% indicated they fished on only 1 day, 14% on 2 days, 10% on 3 days and 5% on 4 days, with an exponential decline to one respondent stating 200 days. The mean was 11.32 days and this tended to vary with region (see Table 3.2) and social class (Table 3.3). Social class D and E fished significantly more days than the other social

classes. Shore anglers fished most (mean, 13.62 days), as compared with 4.96 days for charter boat anglers and 12.41 for own boat anglers.

***Q4 How many of your household members are members of a sea angling club?***

12% indicated that one or more household members were members of a sea angling club. 1.6% had 2 members and 0.7% had 3 or more members.

***Q5 How far do your household members usually travel to go sea angling?***

37% indicated that they usually travelled less than 25 miles, 17% 25-49 miles and 44% 50 miles or more. As might be expected, the percentage travelling more than 50 miles was higher in the inland regions (Midlands: 83-92%) than elsewhere. The smallest proportion of anglers travelling over 50 miles was in the northeast (19%) and southwest (26%).

***3.2.1 National participation rates***

The survey indicated that 5.02% of households participated in sea angling in the last year. With 22.20m households in England and Wales (ONS, 2003: 2001 projection), this gives 1.11m households that participate in sea angling. However, there are more than 1.11m individual anglers because some households contain more than one angler. If the multiple members are included, the total number of anglers increases to 1.45m. This figure is higher than the 1.104m aged 12 or over recorded in the NRA (1994) study but we did not make any distinction on the grounds of age. If we assume that children under 12 do not go sea angling alone, then our results suggest an 'adult' population which is at least 1.11m. This is consistent with NRA (1994). The remaining 0.34m anglers would be mixture of individuals both under and over 12 years of age. These are also expected to be economic agents, not least because of the equipment they require.

***3.2.2 National activity rates***

Sea angling behaviour is diverse with the majority fishing on relatively few days per year (53% fished 4 days or less per year). The mean number of fishing days per year at 11.3 days per year is much lower than the 38 days recorded by NERC (1970) but similar to the 12 days recorded by Dunn and Potter (1994). The evidence suggests that the average number of fishing days has remained fairly constant since 1992.

Membership of angling sea clubs was limited to 12% of households with angling members. NRA (1994) recorded 48% of respondents as members of angling clubs (but not specifically sea angling clubs). The indication is that whilst the number of anglers has not evidently changed, fewer are now members of angling clubs.

***3.2.3 Social and regional effects***

There were some differences in sea angling behaviour between social classes and regions. The evidence suggests that sea angling is no longer the preserve of C2 as indicated in NRA (1994). Now, participation amongst AB members is at the same level as C1C2. It is an activity that seems to transcend social class distinctions possibly because it offers a range of fishing experiences with a corresponding range in cost. AB members clearly spend more because boat ownership is more prevalent in that social group.

Regional differences can be explained mainly in terms of distance from the sea. Participation and activity rates were low for the Midlands and London. A significant proportion of the angling was 'local', with 37% of respondents typically travelling less than 25 miles to fish. However, in terms of spatial transfers of expenditure, 44% typically travelled more than 50 miles either by necessity or choice. This indicates that there are significant transfers to coastal economies from 'tourist' anglers. Anglers from the North West, Midlands and East of England were most prominent in this injection into other regions.

### **3.3 Angling clubs**

Clubs pay an important role in sea angling by organising competitions and other angling activities and trips for members. Some clubs are related to employment, others to social venues (e.g. pubs) while others are located near angling centres. The latter may have permanent club facilities and operate significant social programmes.

The number of clubs is unknown. We know that, at the time of the survey, 516 clubs are members of the National Federation of Sea Anglers (NFSA), 27 are members of the Northern Federation of Sea Angling Societies and 54 are members of the Welsh Federation of Sea Anglers (WFSA). Total membership of these clubs is estimated at 41,100, with an average of 69 members per club. This includes youth and non-active members.

The Omnibus survey indicated that 12% of angling households had at least one person who was a club member; some contained two or more club members. This indicates a total of 314,600 club members in England and Wales. It also indicates that only a small proportion of clubs are members of the larger associations.

### **3.4 Stakeholders survey**

The project brief required consultation with relevant stakeholders. During the course of the project a letter requesting views on six specific issues was sent to 185 persons in 178 organisations. A copy of the letter is at Annex VI and the organisations contacted at Annex VII.

There were 49 respondents (marked with an asterisk in Annex VII), but 33 of these indicated that they had no specific data on any of the aspects of sea angling on which evidence was being sought. However, many of these "nil returns" indicated that they felt the topic was of interest to their organisation and relevant to their responsibilities; a number of them specifically welcomed the research and indicated they would study its findings; and several local authorities felt that recreational sea angling was important to their local economy. Of the 16 substantive responses (indicated with an asterisk in Annex VII), the majority focussed on one or two of the specific issues. These responses are summarised below.

#### **3.4.1 Anglers and Facilities**

None of the respondents provided data on the level of angling activity but most contributed anecdotal comments. Those saying there was an increase in the level of fishing activity numbered the same as those who thought there was a decrease. There was more agreement in the case of boat fishing with several areas indicating that where there had been investment in new marinas and related improved facilities (slipways etc), there had been a

significant increase in the number of boats (many of which were used for angling). However, a number of respondents pointed out that access for shore anglers has deteriorated in some areas, notably to docks and piers previously with public access that have been closed to anglers due to privatisation, health and safety and suchlike.

#### ***3.4.2 Local Economic Impacts***

Although three respondents provide some information no reliable data were obtained.

#### ***3.4.3 Development of the Sector***

There was general consensus that the main factor influencing the future development of recreational sea angling was the quality of the fishing experience. Most respondents described this in terms of the number and/or the size of fish. It was pointed out that improved water quality was an important determinant of fishing quality and that there has been a substantial growth in sea angling in urban estuaries such as the Mersey, Thames, Medway, Tyne, Tees and Wear following significant water quality improvements in these areas. Although fish stocks were regarded as the key factor, several stakeholders mentioned that future development would be much influenced by the level of facilities (car parking, mooring space, slipways and so forth) and their associated costs. There was particular comment regarding the increases in car parking charges by some local authorities that has resulted in a marked decline in anglers at those locations.

#### ***3.4.4 Fish Stocks and Conservation***

No objective data on recreational sea angling catches were provided. The majority of comments received suggested that there had been a decline in the number and size of stocks of most species (with warm water immigrants being cited as an exception). Those species considered to be under greatest pressure were cod and other long-lived species such as rays and monkfish. A number of respondents commented that conservation would benefit from the application of measures similar to those adopted in some overseas fisheries. In particular, references were made to the management of Bass Fisheries in Ireland and the Eastern Seaboard of the USA and several stakeholders suggested that DEFRA should explore the feasibility of implementing similar schemes.

#### ***3.4.5 Environmental Impacts***

A number of comments were received regarding bait digging. Particular concern was expressed concerning the environmental damage caused by the commercial digging for lugworms and the collection of crabs (in South Wales, North Wales and the North East). Although the RSPB pointed out that excessive bait digging in the wrong place with the wrong practices (notably lack of back-filling, large-scale removal by use of bait pumps) can be potentially damaging, they said that such cases can usually be resolved satisfactorily by local management, backed up by provisions in the Wildlife and Countryside Act. In general, they did not regard well conducted, low-intensity bait digging as an environmentally damaging activity.

There were a number of comments concerning the adverse environmental impacts arising from discarded angling equipment (especially hooks and lines) and litter. Although these problems would be alleviated if anglers followed the NFSA Code of Practice, a number of stakeholders pointed out

that many failed to observe this with consequential damaging effects on both wildlife and members of the public.

#### ***3.4.6 Health and Risk Factors***

The Maritime and Coastguard Agency provided us with information on incidents relating to sea angling. In the 18 months from January 2002, 6 people died, 58 people were treated by the NHS, 198 people were rescued and 1,696 people assisted. To put this in context, sea anglers represented around 2% of all incidents.

#### ***3.4.7 Social Impacts***

No hard evidence was provided but stakeholders made anecdotal comments, all of which amounted to positive social benefits from recreational angling. The points made included: "club based activities generate increased community spirit"; "active club members strengthen the democratic ethos in society"; "angling enhances social capital"; "provides anglers with a greater appreciation of the natural environment"; and "angling is a healthy pastime".

## 4. SURVEYS OF SEA ANGLERS

### 4.1 Methods

The aim in surveying sea anglers was to provide information that would contribute data on the activities of anglers, their expenditures and the utility they gain from the sport. Ideally, surveys would have been undertaken with a sample of the sea angling population using a household survey. This would have allowed ready aggregation to the angler population. However, this would have been prohibitively expensive. Instead, we undertook two surveys – (i) a face-to-face survey of anglers engaged in angling, and (ii) a 'postal' survey of active members of angling clubs. The first was an approximation to a sample of the active angling population at any one time. The second was used because it provided a relatively inexpensive method of increasing the sample size.

#### 4.1.1 Face-to-face survey

The aim was to interview 500 anglers stratified by region across England and Wales. The coastline was split into 12 sections (see Annex III) and the aim was to find 42 respondents in each section with an approximate split between anglers as 50% mainly on-shore, 25% mainly own boat and 25% mainly charter boat. This followed the distribution in the Omnibus survey. However, it was not always possible to categorise potential interviewees into one of the three categories because their activity at the time (e.g. on a charter boat) was not necessarily their main form of fishing. Interviews were mainly undertaken in July, August and September 2003. We obtained 514 completed questionnaires.

#### 4.1.2 Club postal survey

Lists of clubs belonging to the NFSA, WFSA and Northern Federation of Sea Angling Societies, and the number of actual or estimated members, were obtained from the Federations. A proportional random sample of 30 clubs was taken and the aim was to select a random sample of 14 active<sup>6</sup> members from the club list, a total of 420. This procedure was intended to give each of the 41,100 club members an equal probability of selection for inclusion in the survey. Questionnaires were sent out via the club secretaries.

A number of the selected clubs declined to take part in the survey or failed to return all the survey forms. The unwillingness to collaborate either reflected a lack of interest on the part of the club secretary or a concern with perceived restrictions imposed by the Data Protection Act in relation to providing us with the membership list. We took further random selections and in total contacted 68 clubs, of which 38 agreed to collaborate. In total, 383 replies were received by October 13<sup>th</sup> 2003. We consider that any self selection bias is minimal because the reasons clubs put forward for declining to be involved would not prejudice the random basis on which selection was made.

The fact that clubs only represent a minority of anglers (see Section 3.3) does not introduce any bias into our analysis. The results for club members were analysed separately where they were significantly different from the larger face-to-face survey of all anglers.

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<sup>6</sup> Active was defined as someone who had been sea angling in the last year.

## 4.2 Focus groups and questionnaire design

Three focus groups were held with anglers in order to obtain information on angler behaviour and to obtain feedback on the design of the angler questionnaire. The organisation of these groups and the results obtained are described in Section 5.5.

## 4.3 Numbers of respondents and analysis of the data

We analysed the responses mainly in terms of the type of survey (face-to-face and postal) and the four main types of fishing undertaken (mainly fish from: shore; charter boat; own/friend's boat; equally boat and shore). The number of respondents in each category is given in Table 4.1. There were proportionately less 'charter boat' anglers, and more 'own boat' anglers and 'equally boat/shore' anglers in the postal sample as compared with the face-to-face survey.

**Table 4.1 Number of respondents and club members by category**

		Shore	Charter boat	Own boat	Equally boat / shore	Don't know	Total
Face to face	<b>Total</b>	267	109	103	35	0	514
	<i>of which:</i> <b>club members</b>	59	44	48	12	0	163
<b>Club postal</b>		166	59	105	52	1	383
<b>Total</b>		<b>433</b>	<b>168</b>	<b>208</b>	<b>99</b>	<b>87</b>	<b>897</b>

32% of face-to-face respondents were club members. Most of these respondents were in only one club – the average was 1.14. Postal respondents (who by definition were club members) were members of 1.5 clubs on average.

It should be noted that the different survey elements were sampling different populations (Table 4.2). The omnibus and postal survey are 'household' type surveys. The face-to-face element sampled anglers active on the day of interview and therefore had a higher intensity of sampling of the more active anglers. Where relevant in the analysis, we examined the effect of club membership/non-membership in the face-to-face responses, and also compared face-to-face with the postal responses.

**Table 4.2. Structure of surveys**

Sample	Population	
	Angler households/ Individuals	Angling club members
Randomised sample of population	Omnibus survey	Postal survey of club members
Quasi random sample of active (on-site) anglers	All respondents in face-to-face survey	Club member respondents in face-to-face survey

#### 4.4 Age, gender and income

Postal respondents were slightly older on average than face-to-face respondents ( $p < 0.5$ ) (Table 4.3) but there were no differences in age between club and non-club members in the face-to-face sample. Differences associated with the type of fishing were highly significant ( $p < 0.001$ ), with own boat owners older on average than others.

**Table 4.3 Age distribution by survey and where fished**

Age	Survey			Where fished				
	Face to face %	Club postal %	Total %	Shore %	Charter boat %	Own boat %	Equally boat/shore %	Total %
<b>16-24</b>	6.4	3.9	5.4	7.9	1.8	3.4	4.6	5.4
<b>25-34</b>	15.0	10.8	13.2	16.9	15.1	6.3	8.0	13.2
<b>35-44</b>	29.0	27.0	28.2	27.7	36.1	21.6	31.0	28.2
<b>45-54</b>	24.9	30.2	27.2	26.3	24.1	30.3	29.9	27.2
<b>55-64</b>	18.3	18.4	18.3	15.0	16.3	27.4	17.2	18.3
<b>65+</b>	6.4	9.7	7.8	6.2	6.6	11.1	9.2	7.7

The great majority of anglers (96.7%) were male but there were small significant differences between postal and face-to-face respondents. 98.6% of the face-to-face sample were male compared to 94.1% in the postal group.

Respondents had been sea angling, on average, for 25.7(sd ±14.8) years. Own boat anglers and boat/shore anglers had been fishing for longer than the other groups (31.9 and 27.5 years respectively).

55% of anglers had incomes in the £10,000-£30,000 bracket, but a sizeable proportion (17.1%) had an income of over £40,000. Income distribution was not markedly different between respondent types or types of fishing (Table 4.4). Although significant at  $p < 0.05$ , differences between groups followed no simple pattern. Own boat anglers had higher proportions of respondents in the upper income brackets, whereas shore anglers had a higher percentage (16.2%) of low-income respondents (<£10,000).

**Table 4.4 Household income distribution by survey and where fished**

Income (£)	Survey				Where fished				
	Face to face %	FACE TO FACE: CLUB MEMBERS ONLY %	Club postal %	Total %	Shore %	Charter boat %	Own boat %	Equally boat/shore %	Total %
<b>1-9,999</b>	13.1	8.9	9.0	11.6	16.2	6.4	7.8	7.7	11.6
<b>10,000-19,999</b>	27.0	26.8	33.5	29.6	33.1	22.4	27.5	32.1	29.7
<b>20,000-29,999</b>	26.4	35.0	25.7	26.1	23.5	34.0	25.5	24.4	26.0
<b>30,000-39,999</b>	15.3	14.6	16.0	15.6	13.0	17.3	18.1	19.2	15.6
<b>40,000-49,999</b>	9.9	6.4	6.1	8.4	8.1	9.0	9.3	6.4	8.4
<b>50000-59,999</b>	4.0	1.9	4.1	4.0	2.7	4.5	5.9	5.1	4.0
<b>60000-69,999</b>	2.4	4.5	1.5	2.0	1.5	3.2	2.0	2.6	2.0
<b>70,000+</b>	1.8	1.9	4.1	2.7	2.0	3.2	3.9	2.6	2.7

#### 4.5 Type and number of fish caught

In relation to pressure on fish stocks, the face-to-face survey gives the best evidence on the types of fish anglers are currently targeting and catching. Respondents were asked what type of fish they mainly caught (Table 4.5). Nearly 70% said that they caught round white fish such as cod and bass.

**Table 4.5 Types of fish normally caught**

Type of fish caught	Proportion of total (%)
Flat white fish (e.g. Flounder)	10.4
Round white fish (e.g. Cod and Bass)	68.8
Oil rich fish (e.g. Mackerel)	20.2
Exotics	0.6

We asked respondents about the number of fish they caught, on average, per trip to their usual fishing area. The mean numbers were 10.9 (face-to-face) and 9.9 (postal) but these were not significantly different. There was a significant effect of the type of fishing on numbers caught ( $p < 0.001$ ) (Table 4.6). Shore anglers caught fewer fish than boat anglers. There was no effect of the type of fish that the respondents mainly caught (flat white, round white, oil rich, exotics).

**Table 4.6 Numbers of fish caught and kept at the usual fishing area (mean per trip)**

	Shore	Charter boat	Own boat	Equally boat/shore
<b>Number caught</b>	5.11 (±0.42)	12.52 (±0.68)	12.94 (±0.61)	10.77 (±0.94)
<b>Number kept</b>	1.62 (±0.24)	4.80 (±0.39)	5.07 (±0.35)	4.19 (±0.54)
<b>% kept</b>	32	38	39	39

*Note: se of mean in brackets*

The numbers kept differed ( $p < 0.001$ ) between the face-to-face (4.80) and postal respondents (2.98). There is no obvious explanation for this difference. There were significant differences ( $p < 0.001$ ) between types of fishing (Table 4.6) with shore anglers retaining fewer fish than boat anglers. However, when expressed as a percentage of catch the differences were small. Shore anglers kept 32% of the catch whereas boat anglers kept around 39%. It might be anticipated that boat anglers would retain a higher proportion because they have greater opportunities to target the type of catch they may wish to retain.

#### **4.6 Perceived trends in fish catch**

Respondents were asked how the numbers of fish they catch at the place where they now fish had changed over the last 5 and 15 years. Most respondents had observed a decrease. After removal of the 'don't know' responses, 83.0% of respondents had observed a decrease over the last 15 years and 70.7% over the last 5 years. A small proportion had observed an increase. More face-to-face than postal respondents had observed a significant decline in catch (Table 4.7). The evidence which is based on perceptions rather than strict quantitative measures, indicates that declines in fish catches are not confined to some historic period but are continuing.

**Table 4.7 Changes in numbers of fish caught in the last 5 and 15 years (%)**

	Change in numbers caught over the last 5 years			Change in numbers caught over the last 15 years		
	Face to face	Club postal	Total	Face to face	Club postal	Total
<b>Increased significantly</b>	0.4	0.8	0.6	0.2	1.3	0.7
<b>Increased</b>	5.8	7.8	6.7	2.3	6.5	4.1
<b>Stayed the same</b>	19.6	22.5	20.8	10.9	8.6	9.9
<b>Decreased</b>	38.3	48.0	42.5	34.6	42.3	37.9
<b>Decreased significantly</b>	30.9	17.0	25.0	37.5	29.0	33.9
<b>Don't know</b>	4.9	3.9	4.5	14.4	12.3	13.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

There was no evidence that shore anglers had observed greater falls in catch than boat anglers, despite the apparently greater flexibility of the boat anglers. However, the data must be interpreted carefully because both shore and boat anglers may have changed their fishing locations over time in order to seek improved catches.

Similar questions were asked about changes in the size of fish caught (Table 4.8). The responses were similar to those for numbers. Again removing 'don't knows', 72.2% had observed a decrease or significant decrease over 15 years, and 62.1% over five years. However, 37.8% indicated no change or an increase in catch size during the last five years, and this suggests that the situation is not universally negative. A higher percentage of face-to-face respondents had observed significant declines in fish size than postal respondents but there were no differences in responses between boat and shore anglers.

**Table 4.8 Changes in size of fish caught in the last 5 and 15 years (%)**

	Change in size of fish caught over the last 5 years			Change in size of fish caught over the last 15 years		
	Face to face	Club postal	Total	Face to face	Club postal	Total
<b>Increased significantly</b>	0.4	0.3	0.3	0.2	0.8	0.4
<b>Increased</b>	4.9	5.5	5.1	4.1	4.4	4.2
<b>Stayed the same</b>	30.4	30.8	30.5	20.4	17.2	19.1
<b>Decreased</b>	37.4	48.8	42.3	32.9	43.1	37.2
<b>Decreased significantly</b>	21.2	10.4	16.6	26.5	22.2	24.6
<b>Don't know</b>	5.8	4.2	5.1	16.0	12.3	14.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

#### 4.7 Health impacts

We asked respondents whether they thought sea angling trips had any effect on their health. The responses were strongly positive, with 83% of the respondents in total indicating some or significant positive effects. Of these 44.6% indicated a significant positive effect on health. Only 1.9% indicated a negative effect.

Responses did not differ between types of angling but there was a difference ( $p < 0.001$ ) between postal and face-to-face respondents. The positive effects on the face-to-face sample were more marked with 50.7% indicating significant positive effects as compared with 36.0% of postal respondents. This is most easily explained in terms of the greater level of angling activity amongst respondents in the face-to-face sample.

However, Maritime and Coastguard Agency data for the period Jan 2002-August 2003 indicate 6 fatalities, 58 anglers requiring NHS treatment, and 198 rescued. It does not therefore appear that the health impacts are entirely positive.

#### 4.8 Days angling per year

##### 4.8.1 Days Sea angling in England and Wales

Respondents were asked how many days they went sea angling in the last year. The range in days fished was from 1 to 365 with a mean of 54.7 in the face-to-face sample and 46.6 in the postal sample. This is a substantial allocation of time although much angling takes place outside working hours including evenings and nights. It is to be expected that anglers interviewed while fishing will fish more days per year than those in a household type

sample because people who spend more days per year fishing are more likely to be interviewed.

There were significant differences between the number of days fished by different types of anglers, with shore and own boat anglers spending more days fishing than others. There was a significant interaction between survey type and type of angling (Table 4.9). Postal respondents who use their own boats, used them much less (mean 45.2 days) than face-to-face respondents (78.0 days). For other types of fishing (shore, charter boat) there was little difference between the samples.

**Table 4.9 Days sea angling (per year)**

	Face to face		Club postal	
	Mean (days)	Se	Mean (days)	Se
Shore	64.0	±3.44	65.7	±4.435
Charter boat	30.3	±5.36	23.3	±7.34
Own boat	78.0	±5.52	45.2	±5.46
Equally boat/shore	46.4	±9.46	52.1	±7.76

**4.8.2 Days Sea angling more than 50 miles from home**

Relatively few days fishing were spent more that 50 miles from home in England and Wales (Table 4.10). The means ranged from 3.56 days per year (own boat anglers) to 13.90 days per year (equally boat/shore anglers). There was no significant difference between the surveys. When expressed as a proportion of total angling days, it was charter boat and equally boat/shore anglers that spent the highest proportion of time away from home (26.0% and 28.1% respectively). Own boat owners spent the least time (6.9%).

**Table 4.9 Days Sea angling more than 50 miles from home (in England and Wales, per year)**

	Mean (days)	se	% of total days in England and Wales
Shore	7.48	±1.02	11.5
Charter boat	6.79	±1.67	26.0
Own boat	3.56	±1.43	6.9
Equally boat/shore	13.90	±2.26	28.1

**4.8.3 Days Sea angling outside England and Wales**

15% of the respondents had gone sea angling outside England and Wales in the last year, on average for 7.9 days. The number of days did not differ with survey type or type of angling.

## 5. VALUATION OF SEA ANGLING BENEFITS

### 5.1 Introduction

The benefits or utility of sea angling are measured in terms of the maximum that anglers are willing to pay for their recreational angling experience rather than go without. This maximum willingness-to-pay (WTP) can be divided into two parts: the expenditure anglers actually incur (e.g. pay in terms of travel costs to gain access to a fishing site); and consumer surplus. Consumer surplus is the utility an individual derives from a good over and above what s/he actually pays to consume the good.

Consumer surplus (CS) from recreational angling can be measured by either a revealed preference method or by some expressed preference method. Revealed preference methods estimate consumer surplus from actual expenditure incurred in trips to an angling point. Expressed preference methods, such as contingent valuation, estimate consumer surplus by asking respondents how much the cost of angling would have to increase before they abandoned the recreational activity or a particular angling trip. Expressed methods, such as choice experiments, can also be used to assess anglers' willingness-to-pay (WTP) for improved sea angling recreational experiences.

### 5.2 Contingent valuation

A typical expressed preference approach is the contingent valuation (CV) method. This could be used to estimate compensating variation by ascertaining the maximum willingness-to-pay (WTP) a sea angler would be willing to pay rather than go without sea angling as a recreational experience. Drawing on the analogy of fishing in rivers where riparian owners charge licence fees, since the Crown owns shore-line rights and the Government regulates fishing in coastal water around the UK, a typical CV question would be

"Suppose the Government introduced an annual sea angling licence fee, which all sea anglers had to pay to fish from the shore or in-shore waters around the UK. What is the maximum that you would be willing to pay per year for such a licence before you gave up sea angling as a hobby?"

Such an approach to assessing the economic value of recreational fishing in Nordic countries was adopted by Toivonen *et al.* (2000). They assessed the economic value of various types of fresh water angling for different types of fish (salmon and sea trout; pike and perch; grayling, brown trout and artic char) by hypothesizing a river or lake currently closed for fishing would be made available at an annual rental fee. An iterative bidding type elicitation format was employed. Of course this estimates the value of a marginal increase in recreational fishing availability, and not the value of intra-marginal angling.

This traditional approach using an annual fee based on property rights over the water was quickly deemed inadmissible as this had not been considered by Government at the time of drawing up the report. Thus the lack of a realistic mechanism to enforce payment for sea angling ruled out a conventional CV approach to estimating the benefits of the existing angling experience. Nevertheless, this did not rule out using an expressed

preference approach (CV or choice experiment approaches) to valuing enhanced sea angling experiences.

The Nordic study estimated the consumer surplus on existing intra-marginal angling by posing a question:

'Thinking about the experience you have had undertaking recreational fishing during the last 12 months, and what it is worth to you to have this experience. Do you think your experience is worth more than you paid? What is the **most** you would almost certainly pay **over and above** what you now spend before you would stop going to the fishing sites you now use? By "almost certain" we mean the amount you are 95% certain you would pay. \_\_\_\_\_ Kr / year **in addition to** what I already pay to have the same recreational fishing experience I have during the last 12 months'.

The current study adopted a similar procedure to estimate consumer surplus for the angler's total annual recreational experience. Following a series of questions to elicit anglers' annual expenditure on different items associated with their sport, they were asked to:

"Think about the experience you have had undertaking recreational sea angling during the last 12 months, and what it is worth to you to have this experience. Do you think your experience is worth more than you paid? **(Please circle one)**

1 Yes	2 No
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If **YES** what is the most you would certainly pay, over and above what you spent last year, before you would stop going fishing in the areas you now use, i.e. you are very confident you would pay this extra amount?

I would pay £ \_\_\_\_\_ / year in addition to what I already pay to have the same recreational angling experience I had during the last 12 months. "

This CV approach is not incentive compatible. By contrast TCM is incentive compatible, since without incurring travel costs to the coast or offshore fishing area, an angler cannot engage in sea angling as a recreational activity. The study thus also used revealed preference as an alternative feasible, incentive compatible, mechanism for eliciting the benefits that sea anglers derive for their current recreational experience.

### 5.3 Choice experiment

The study also tried to elicit values for improved sea angling recreational experiences, which might occur with improved fish stocks. Enhanced fish stocks through conservation measures in coastal waters would improve sea angling catch rates (number of fish caught per trip) and the size of fish catch. Both of these factors are important to anglers, more so for those in competitions.

The CV question elicited consumer surplus for anglers' existing recreational experience. This is a 'holistic' value: it does not estimate the values, or part worth, of the characteristics that comprise this experience. Choice experiments (CE) can be used to value the individual characteristics that comprise sea angling as a recreational experience. This information can be

used to appraise the effects of any policy change that improved fish catch rates, catch sizes, or re-introduction of species into particular water around England and Wales as a result of conservation measures.

Following a series of focus group meeting with shore anglers, boat anglers, and competition anglers, the characteristics of an angling trip that contributed to the utility or value that anglers derived from the trip were agreed to comprise

- Number of fish caught
- Size of fish caught
- Whether they caught different species from that which they usually caught
- And the price of the angling trip

The opportunity to catch different species of fish from those that they normally catch emerged quite strongly at the focus group meeting. Sea anglers periodically take trips to other areas of the British Isles to fish for species not normally caught in their local or usual fishing area.

A choice experiment was constructed to try and estimate the value of these different characteristics of sea angling to anglers.

The experimental design for the CE was based upon four factors:

- Possibility of catching different fish species (a dummy variable): 0 or 1
- Average number of fish caught per day: 2, 4, 6, 8
- Percentage increase in the size of fish: 0%, 25%, 50%, 100%
- Price per day trip: £0, £5, £10, £20, £50

This number of factors and factor levels give rise to 160 different factor and factor level combinations. Since the purpose was to investigate main effects of each of these factors only, 160 different choice cards are unnecessary. Hence an orthogonal design was used to reduce the number of choice cards to be employed in the study. This produced 24 different choice cards.

This design was generally satisfactory, although it exhibited some unbalance in terms of the frequency with which different levels were encountered in the design (see Table 5.1)

**Table 5.1: Distribution of factor levels**

Factor	Level 1	Level 2	Level 3	Level 4	Level 5
Species	14	10			
Number of fish	10	5	5	5	
% Increase in size	10	5	5	5	
Price	5	5	5	5	5

Cards were selected randomly from the 25 alternatives, without replacement, and paired to form 12 paired choice card sets. Since each respondent received 4 choice card sets, the choice cards were amalgamated into 3 blocks, to produce 3 different versions of the questionnaire. Each version was selected randomly and sent to sea anglers in both the face-to-face interview, and in the postal questionnaire, sample surveys.

#### 5.4 Travel-cost model

Revealed preference approaches to value the benefits of sea angling are based upon the cost anglers incur to participate in their recreational activity. Consumer surplus on angling trips (utility over and above expenditure incurred to participate in sea angling) is calculated by observing how trip numbers vary as a function of the cost incurred in reaching the angling site. Since cost of reaching the angling site is the same for each visit, and for the marginal trip this cost equals the marginal benefit of that trip, a consumer surplus is enjoyed on intra-marginal trips. Thus the number of angling trips and the cost of angling trips can be used to value the recreational benefits of angling.

This travel-cost method (TCM) can be operationalised in two ways, as a

- Zonal travel-cost model (ZTCM)
- Individual travel-cost model (ITCM)

ZTCM is based upon the number of trips per 1000 population at given distances from the site. The ZTCM takes a sea angling site, and observes how visits to that site vary with the costs of reaching the site. The cost of reaching a site is largely a function of distance. The greater the distance to the site the lower the number of angling trips, per 1000 population. However, the survey of anglers in this survey sought to obtain a geographically varied sample around the shore of England and Wales. This meant that there were too few anglers to each survey point to undertake a ZTCM for that site. Hence an ITCM was employed.

An ITCM does not use trips per 1000 population as the dependent variable (and zonal averages of travel cost, and socio-economic characteristics of the population, for the independent variables), but the number of trips each individual undertakes. Thus

$$V_{ij} = V(TC_{ij}, SC_i, A_j, S_{ik})$$

Where  $V_{ij}$  = number of visits individual  $i$  undertakes to site  $j$ ;  $TC$  = travel costs (transport and time costs),  $SC$  = socio-economic characteristics of individual  $i$ ,  $A_j$  = attributes of or perceived qualities of fishing site  $j$ , and  $S$  = price to individual  $i$  of visiting substitute sites  $k$ .

The ITCM acknowledges that each angler will have different trip costs, travel time, demographic characteristics, etc., and gathers information on each angler in the sample through a survey. In the ITCM it is assumed that anglers will choose the annual number of trips to a fishing mark on the basis of both travel cost and time involved in reaching the site. Economic theory predicts that the number of trips will be inversely related to travel cost and time, thus producing a demand curve. Consumer surplus is anglers' willingness-to-pay over and above actual travel costs.

## 5.5 Questionnaire design

The questionnaire was designed using an iterative process. Initially, a questionnaire was drawn-up using existing knowledge within the research team. The travel cost / contingent valuation and choice experiments questions were designed and a best guess made as to the questions that would best reflect respondent recreational experiences, characteristics and attitudes which may affect these valuations. The coverage and appropriateness of the questions was then considered within two focus groups (shore-fishing club in Middlesborough and an off-shore club in Alnwick, Northumberland) and one expert group including club chairmen, treasurers and two England team members (Totnes, Devon). In all there were 27 participants involved from a wide range of fishing backgrounds. Following each meeting the questionnaire was incrementally improved and the improvements tested in the following meeting. Following the group meetings the questionnaire then went out for further consultation and appropriate changes made. Further details of the group meetings are outlined below.

### 5.5.1 Recruitment and content for discussion

Participants were recruited through club chairmen and the NFSA, with a small financial incentive being offered to reduce sample selection bias. This incentive was provided at the start of the meetings in order to avoid compliance bias. The meetings lasted between 1.5 and 2 hours and were led by an experienced facilitator. The topics for discussion were carefully predetermined to reflect issues of interest and concerns regarding the questionnaire. These were sequenced within a protocol, which consists of dialogue and a series of open-ended questions. Participants were first asked to complete the questionnaire. Following an introductory discussion of fishing experiences, the discussion mainly followed the structure of the questionnaire, which covered the participants' fishing experiences, attitudes, expenditures and socio-economic characteristics. General issues concerning the questionnaire were considered, including: whether the questionnaire had adequately covered their recreational experience; any difficulties encountered; and if there were any questions they felt uncomfortable with. Careful consideration was also given to the wording used by the participants, whether the range of potential replies and time periods used were appropriate and question ordering. The key valuation questions were given specific consideration, where the participants were requested to state retrospectively how they answered the questions, giving the issues considered. This enabled a check to be made that the participants approach was consistent with the research objectives. At the end of the meetings, participants were given the opportunity to revisit the questionnaire and make any changes they felt necessary using a different coloured pen. As the focus group meetings allowed the participants to deliberate and ask further questions regarding the issues, this tested the adequacy of the questionnaire responses.

### 5.5.2 Findings from the group meetings

Fishing experience was found to be wide ranging, depending on, amongst other things, whether those fishing were involved in off-shore / on-shore fishing, mainly competition or more social type of fishing, whether they have their own boat and whether they are club members. The travel cost and other expenditure of the respondents, as well as the number of fishing trips, and

length of the fishing season are likely to vary considerably depending upon these factors. The issue of most concern was commercial fishing and the perceived affect on fish size and numbers. Expenditure was found to be sizeable, even amongst those on lower incomes and included travel, parking, accommodation, boating and equipment.

Although a number of issues were raised within the group meeting, the questionnaire was generally well received and found to be appropriate. Following rewording, ordering and minor changes to the scenarios presented, the travel cost, contingent valuation and choice experiments were found to be appropriate methods to adopt. Information was also elicited as to the likely meaning of the findings. Comments regarding the travel cost questions suggested a need to consider not only the transport costs but also the parking changes, which may be greater. As travelling to the fishing mark was found to be a social occasion, with car sharing and travelling on the boat, this suggested that the value of time should not be included within the model.

The choice experiments were the subject of the most discussion, with the participants suggesting that the opportunity to catch different species from those in the home areas being perhaps the most important motivation for travelling outside the area, with this bringing new challenges and a different recreational experience. Although participants generally found the choice experiments to be difficult to answer, the scenario considered was felt to be valid. Although those involved most in competition were viewed to be less likely to be willing to travel to gain access to new species, larger and more plentiful fish, this would be reflected in the responses. In the Alnwick group concern was also expressed that the results may suggest that those fishing were primarily interested in catching more fish. However, when it was pointed out that if this is not an issue for respondents then this will be reflected within the results, the participants were happier with the approach.

### **5.5.3 Survey questionnaire**

The survey questionnaire (see Annex IV) consisted of four sections: general questions; choice experiments; expenditure questions; personal questions. The general questions section considered the days spent fishing, the type of fishing conducted and fish caught, perception of changes in fish numbers, journal details for travel cost. This section was followed by the shorter choice experiment section in which the scenario considered was first described and illustrated through an example before asking offering four choice cards. The expenditure section consisted of a detailed expenditure question, which informed a subsequent contingent valuation question. The personal questions related to location of residence, membership and fishing experience, the perception of health effects of fishing, age, income and gender.

## **5.6 Questionnaire Results**

The sample (897 completed questionnaires) was split between one-on-one interviews with anglers on-site (514 responses: 57.3% of the total sample); and a postal questionnaire to members of angling clubs (383 responses: 42.7% of total sample). However, it is worth noting that of the 514 one-on-one responses, 163 (31.7%) were members of an angling club; and that 3 of the postal questionnaires to sea angling clubs were returned by respondents who stated that they were not club members! Hence the number of non-club

respondents in the sample was 354 (39.5% of total responses); whilst the number of respondents who were club members was 543 (60.5% of total responses).

All the monetary values refer to August 2003 prices, the month in which the surveys were undertaken.

**5.6.1 Contingent valuation**

One method of estimating consumer surplus on current recreational experience, was to ask respondents how much more expenditure they would be willing to incur before they abandoned sea angling as a recreational experience. 77% of respondents indicated that, if they had to, they would incur extra expenditure before abandoning sea angling as a recreational activity. Conversely 23% of respondents stated that if they had to pay more to participate in sea angling they would stop fishing at their current fishing site. Hence, 77% of respondents derived utility (consumer surplus) over and above their current expenditure on sea angling.

The proportion of respondents who exhibited consumer surplus varied between club and non-club members. Table 5.2 shows that 69% of club members (370) indicated a consumer surplus greater than zero for their current recreational experience; whilst 89% of non-club sea anglers (316) exhibited positive consumer surplus.

**Table 5.2: Numbers of respondents in sample with a positive willingness to pay for sea angling over and above their current expenditure**

	<b>Club</b>	<b>Non-club</b>	<b>Total n</b>
<b>WTP more for angling</b>	370	316	686
<b>Not WTP more for angling</b>	164	38	202
<b>Total n</b>	<b>534</b>	<b>354</b>	<b>888</b>

For respondents with a consumer surplus greater than zero for their current recreational experience, mean consumer surplus values also varied between club and non-club members (Table 5.3). The mean consumer surplus for club members was £645 whilst that for non-club members was £484. However, the standard deviation in both cases was very large. The large standard deviation reflects the considerable difference in benefits that individual anglers derive from fishing. Standard deviations larger than the mean value are often typical of open ended contingent valuation questions; and reflect the skewed distribution of the WTP responses. It is thus unwise to place much reliance on the mean WTP amounts; and it can be an argument for using the more conservative median value in assessing the benefits of sea angling.

**Table 5.3: Consumer surplus (monetary) amounts for current recreational sea angling experiences by club membership (£s, 2003 prices).**

	Mean	St. dev.	Median	N*
<b>Club</b>	645	1192	250	270
<b>Non-club</b>	484	973	200	247

\* Differences in totals between Tables 5.2 and 5.3 (e.g. 686 willing to pay more in Table 5.2 and 517 responses in Table 5.3) are due to missing values and inconsistent responses (i.e. respondents stating 'yes' to question 18a, and then reporting a zero monetary amount in question 18b) being deleted from the calculations in this Table (and in Table 5.6).

The proportion of sea anglers with a positive consumer surplus (i.e. would be willing to pay more before ceasing to engage in sea angling as a recreational experience) was also calculated by type of angling: shore, boat, etc (Table 5.4).

**Table 5.4: Number with positive WTP by fishing type: shore, boat, etc.**

	Shore	Charter boat	Own/friends boat	Equal shore/boat
<b>WTP more for angling</b>	356	134	139	56
<b>Not WTP more for angling</b>	74	30	67	31
<b>% WTP more for angling</b>	82.8%	81.7%	67.5%	64.4%

Consumer surplus on the current recreational experience of sea anglers varies by fishing type. Consumer surplus estimates for respondents with a consumer surplus greater than zero for their current recreational experience are documented in Table 5.5. The mean consumer surplus for shore fishing was £380; that for anglers predominantly fishing from a charter boat was £552; whilst that for own boat owners was £885. The small number of anglers in the sample who fished equally between shore and boat, renders the mean consumer surplus estimate for this group unreliable. The standard deviation in all cases was large relative to the mean, indicating a wide variation in consumer surplus on existing sea angling recreation between anglers.

**Table 5.5: Consumer surplus (monetary) amounts for current recreational sea angling experiences by fishing type (£s, 2003 prices).**

	Mean	St. dev.	Median	N
<b>Shore</b>	380	758	200	270
<b>Charter boat</b>	552	1,091	200	100
<b>Own/friend's boat</b>	885	1,119	500	110
<b>Equal: shore/boat</b>		2,266	500	36

Again the same caveats apply to Table 5.5: standard deviations are large in relation to means. Thus while the results appear to be intuitively logical, the 'true' mean value might differ considerably from the estimated mean value reported in Table 5.5.

### **5.6.2 Travel cost model**

In contrast to the stated preference or contingent valuation estimates above, the TCM is revealed preference method: it uses actual expenditures reported by anglers incurred in reaching their usual fishing mark, in order to estimate a demand curve from which to estimate the benefits (including consumer surplus).

The data necessitated the development of an individual travel-cost model (ITCM), rather than a zonal travel-cost model (ZTCM). The ITCM estimates each individual's demand for sea angling, in terms of the number of days, or trips, the individual makes over some time period (usually one year).

Since the number of angling trips during one year is a non-negative integer, rather than a continuous variable as assumed in the normal distribution, a count data estimator is appropriate. Various individual travel-cost count data, and truncated normal distribution, models are available. Count data models are typically estimated based on either the:

- Poisson distribution
- Negative binomial distribution

Whilst the Tobit model provides a truncated distribution estimator.

The data set only contains information on active anglers. Thus the Poisson and negative binomial models did not have to be modified to account for anglers who have not made any trips during the last year. However, since the on-site sample survey meant that every angler in that sample had made a least one trip, and the survey of club members similarly sampled 'active' anglers, with the distribution of trips truncated to 1. In fact the distribution ranged from 1 to 365, although there was significant 'bunching' around certain numbers of days: e.g. 4, 12, 20, 24, 25, 30, 40, 50, 100, etc.

### **5.6.3 Recreation demand models**

Various specifications were applied using Poisson, Negative Binomial, and Tobit models: linear, log (dependent), log (independent), and log-log models. All the models were developed both in terms of a (1) basic model relating demand (trips) to the cost of transport to the site; and in terms of (2) an extended demand model including other variables such as fish species, time taken to reach the site, mode of transport used to reach the site, proximity of respondent's home to the coast, age of respondent, and income.

The Poisson model assumes that the mean equals the variance. Deviance and Pearson Chi-Square divided by degrees of freedom was used to detect over-dispersion or under-dispersion in the Poisson regression models. Evidence of under- or over-dispersion indicates an inadequate fit of the Poisson model. The test indicated that the Poisson models exhibited over-dispersion, suggesting the TCM was of a non-Poisson form.

The demand model with the best fit in terms various criteria, including of Log Likelihood, of the remaining two types of model (negative binomial and Tobit)

was the negative binomial model with total days spend fishing (sum of locations 1 to 13 in question 11), as a function of total expenditure to reach the individual’s usual fishing mark (sum of expenditures in question 9).

There was little difference in model results from using number of days derived from Question 1 in the questionnaire, or from using total days derived by summing the number of days spent sea angling across the different locations in Question 11. Indeed, as Table 5.6 shows, the main difference in number of days spent fishing was between those who predominantly used a charter boat for sea angling, and shore, and own boat, anglers. However, there was a large variation in travel costs of reaching a fishing mark between shore and other (boat) sea anglers. The mean cost of travel from home to shore fishing site or boat embarkation point was similar across all types of angling. Charter boat anglers travelled further to the embarkation point, and this accounts for their slightly higher travel cost (1), whilst own boat owners had low travel costs presumably because they only owned a boat if they lived in close proximity to the harbour. However, as Table 5.6 shows for boat anglers, total travel costs including boat fees, incurred in reaching their fishing mark were much higher than for shore anglers. This higher cost affects the consumer surplus estimates.

**Table 5.6: Mean number of fishing days and ‘average’ travel expenditure per trip to reaching fishing mark**

	Days: q1	Days: q11	Travel cost 1*	Travel cost 2**
<b>All sample</b>	57	56	£8.62	£24.36
<b>Shore</b>	67	64	£8.86	£10.99
<b>Charter boat</b>	30	30	£10.02	£43.30
<b>Own boat</b>	62	63	£5.53	£31.74
<b>Equal shore/boat</b>	51	51	£11.44	£34.24

\* Travel cost 1: = travel cost from home to shore fishing site or boat embarkation point

\*\* Travel cost 2: = travel cost from home to shore fishing site or boat embarkation point, plus car parking charges, plus charter boat or own boat cost per trip.

The results of the negative binomial models in Table 5.7 and 5.8 confirm general *a priori* expectations. The coefficient of the cost of reaching the fishing mark (total expend) is negative across all models. This is consistent with demand theory: as price increases the number of trips (consumption) decreases. Fishing trips are positively related to white fish (both flat and round white fish) relative to oil rich fish (such as mackerel) and exotics (fish not normally caught around the British Isles). Although for shore anglers the coefficient is not statistically significant. Time taken to reach the fishing mark has a negative sign, indicating that standardising for cost, increasing time to reach a fishing site reduces the number of trips made in a year. Mode of transport to the shore or embarkation point by car is generally not statistically significant in determining number of days fishing. Proximity to coast increases demand for sea angling, and is a highly significant variable across all the models. Unexpected, neither age nor income were statistically significant explanatory variables of demand for sea angling. The sign on the

age coefficient suggests that demand is a function of age: the younger the person the lower the number of days spent fishing; whilst older respondents fished more days (perhaps because with retirement from work they had more time available to fish). The non-statistical significance of income may reflect the fact that the data is telling conflicting stories: higher income charter boat users fish fewer days; while high income own boat anglers, and low income shore anglers, fish more days. Thus demand for sea angling, estimated from cross-sectional data as in this survey, cannot be explained by income. This does not mean that the demand for sea angling over time is unaffected by long term growth in the real income of households.

**Table 5.7: Results of basic negative binomial count data models, for all anglers, and anglers by fishing type.**

	All anglers	Shore	Charter boat	Own / friend's boat	Equal shore / boat
<b>Intercept</b>	0.2610 (0.0563)	0.2186 (0.0615)	0.1708* (0.2118)	0.8436 (0.1265)	0.4716 (0.1867)
<b>Total expend</b>	-0.0145 (0.0016)	-0.0378 (0.0034)	-0.0238 (0.0050)	-0.0096 (0.0025)	-0.0292 (0.0042)
<b>Dispersion</b>	0.7365 (0.0509)	0.4398 (0.0595)	0.3549 (0.0980)	0.8457 (0.1072)	0.3937 (0.1041)
<b>Log likelihood</b>	-166.20	38.96	-108.26	-10.55	-1.08
<b>N</b>	728	346	143	159	79

Standard error in brackets. \* Indicates none significant at 10% level.

**Table 5.8: Results of extended negative binomial count data models, for all anglers, and anglers by fishing type.**

	All anglers	Shore	Charter boat	Own / friend's boat	Equal shore / boat
<b>Intercept</b>	0.4616 (0.2355)	0.6700 (0.3444)	0.2578* (0.4629)	-0.9321* (0.6980)	0.6826* (0.4329)
<b>Total expend</b>	-0.0095 (0.0015)	-0.0282 (0.0033)	-0.0110 (0.0050)	-0.0092 (0.0025)	-0.0245 (0.0038)
<b>Species</b>	0.3547 (0.1007)	0.1644* (0.1118)	0.7304 (0.2675)	0.5993 (0.2738)	0.1655* (0.2544)
<b>Time</b>	-0.4041 (0.0790)	-0.5996 (0.0936)	-0.3421* (0.2538)	0.1165* (0.1754)	-0.3779 (0.1913)
<b>Car</b>	-0.1514* (0.1807)	-0.4324* (0.2976)	-0.5659 (0.2917)	1.0066* (0.6197)	0.0698* (0.2734)
<b>Proximity</b>	1.2967 (0.0988)	0.9124 (0.1335)	1.0767 (0.1823)	1.2583 (0.21813)	1.0192 (0.2664)
<b>Age &lt;45</b>	-0.2697 (0.0848)	-0.0163* (0.1114)	-0.1716* (0.1895)	-0.2581* (0.1751)	-0.0201* (0.1995)
<b>Income &lt;</b>	0.0792* (0.0973)	0.0571* (0.1235)	0.0573* (0.1863)	0.4605 (0.2173)	-0.2549* (0.2330)
<b>Scale</b>	0.5070 (0.0393)	0.2863 (0.0456)	0.3073 (0.0818)	0.6653 (0.0925)	0.2041 (0.0753)
<b>Log likelihood</b>	-48.50	98.00	-82.77	5.92	15.04
<b>N</b>	728	346	143	159	79

\* = Not significant at 10% level; standard error in brackets.

#### 5.6.4 Consumer surplus

Consumer surplus (CS) is obtained by integrating the demand function over the relevant price (travel cost) range  $P_0$  to  $P_1$ .

$$CS = \int \lambda_i dP$$

The results are presented in Tables 5.9 and 5.10. The relative magnitude of the consumer surplus estimates is what might be expected *a priori*. Shore anglers have the lowest consumer surplus. Charter boat fishing has a higher consumer surplus, whilst own boat owners have the highest consumer surplus.

**Table 5.9: Consumer surplus per day: basic model**

	All anglers in sample	Shore	Charter boat	Own/friend's boat	Equal shore/ boat
Consumer surplus	68.96	26.45	42.01	104.16	34.24

**Table 5.10: Consumer surplus per day: extended model**

	All anglers in sample	Shore	Charter boat	Own/friend's boat	Equal shore/ boat
Consumer surplus	105.26	35.46	90.90	108.69	40.81

In terms of absolute magnitude, the consumer surplus results are high, especially when aggregated across the number of days shore, charter boat, and own boat, anglers spent fishing each year. These TCM consumer surplus estimates are much higher than those obtained from the CV question, reported earlier. However, this is not unusual for a number of reasons. CV responses, particularly open-ended responses are known to be conservative consumer surplus estimates. CV responses can be subject to free-riding and strategic bias. Almost certainly in this case, the bias would be downward, as anglers sought to avoid any suggestion that they would be willing to pay more for their recreational experience. Carson *et al.* (1996) found that CV/RP ratios were <1.0 [where revealed preference (RP) largely comprised TC results, but also included some hedonic price models (HPMs)<sup>7</sup> and preventative and mitigating expenditures]<sup>8</sup>.

### 5.7 Stated Choice Experiment

The stated choice (SC) experiment explored the benefits anglers derived from changes in the number of fish caught, size of fish caught, and being able to catch different species from those usually caught.

Out of 900 questionnaires in the survey, some 47 responses were dropped from the SC experiment analysis due to either omitted SC responses, inconsistent responses, or incorrectly tabulated responses to the choice experiment.

The conditional logit model results are presented in Table 5.11.

<sup>7</sup> A hedonic price model is a regression technique that uses systematic variations in the price of a good (such as housing) to impute values for the various attributes or characteristics associated with the good.

<sup>8</sup> Preventative expenditure is the amount that individuals are prepared to spend to prevent something from happening; and mitigatory expenditure is the amount that individuals pay to mitigate the consequences of some undesirable event.

**Table 5.11: MRS and monetary values for changes in factor levels: all anglers**

Factor	Coefficient	Standard error	Pr >  t	Monetary value
Species	0.4088	0.0646	<0.0001	8.86
Catch	-0.0176	0.0043	<0.0001	-0.38
Size	0.0102	0.0005	<0.0001	0.22
Wtp	-0.0461	0.0023	<0.0001	
Log-likelihood	-3387			
McFadden LRI	0.0965			
N	3412			

The coefficients on species and size are positive, indicating that sea anglers gain utility from catching different *species* from the usual species caught; and that utility increases with a percentage increase in the *size* of fish caught. Species was coded as a dummy variable: 1 for different species, and 0 for usual species caught.

What is unexpected is the negative coefficient on the *catch* factor (number of fish caught per trip). This may be partly due to the levels of this factor: 2, 4, 6, and 8 fish caught per day. Whilst this range seemed reasonable given the information obtained in the focus groups, subsequent information from the actual survey revealed that the average number of fish caught per fishing day often exceeded this range. The average and median number of fish caught per fishing day for all respondents were 9.22 (st. dev. 10.67) and 6 respectively; whilst for shore anglers the mean and median were 5.21 (st. dev 7.70) and 4, charter boat anglers: 12.67 (st. dev. 8.22) and 10, and own boar owners: 14.01 (st. dev. 13.61) and 10.

The results indicate that an angler is willing to pay £8.86 to catch a species of fish not usually caught by him; and £0.22 for each one percent increase in the size of fish caught over and above his usual catch size.

Conditional logit models were also developed for each fishing type: shore, charter boat, and own boat anglers. The results are presented in Tables 5.12 to 5.14.

In Table 5.12 all the coefficients have expected signs and are highly statistically significant. Table 5.12 shows that shore anglers would be willing to pay £11.38 to catch different species of fish from those usually caught; and that they would be willing to pay £0.81p for each additional fish caught. They would also be willing to pay £0.27p for each percentage increase in the size of fish caught above their usual catch size.

**Table 5.12: MRS and monetary values for changes in factor levels: shore anglers**

Factor	Coefficient	Standard error	Pr >  t	Monetary value
Species	0.5566	0.1166	<0.0001	11.38
Catch	0.0399	0.0122	0.0011	0.81
Size	0.0132	0.0009	<0.0001	0.27
Wtp	-0.0489	0.0042	<0.0001	
Log-likelihood	-1064			
McFadden LRI *	0.1258			
N	1108			

\* McFadden Likelihood Ratio Index is an analogous measure to R<sup>2</sup> goodness of fit statistic in ordinary least squares (OLS) regression. In conditional logit models a McFadden LRI of 0.12 is considered to be an acceptable fit (and an LRI of 0.2 to 0.4 a very good fit equivalent to explaining around 70% to 90% of the variance in an OLS regression model).

For charter boat and own boat anglers, the coefficient for number of fish caught (catch) has the wrong sign, but it is not statistically significant. Whilst the model fit for shore anglers was good, the model fit for charter boat and own boat anglers was below the normally accepted criteria for a reasonable model of McFadden LRI of 0.12.

The monetary values for changes in size of catch are identical between shore and charter boat anglers at £0.27 for each percentage increase in fish size (see Tables 5.12 and 5.13), but considerably lower for own boat anglers at £0.17p for each percentage increase in fish size (see Table 5.14). The value anglers place on catching alternative species to those they usually catch is lower for charter boat anglers than shore anglers, and lower still for own boat owners.

**Table 5.13: MRS and monetary values for changes in factor levels: charter boat anglers**

Factor	Coefficient	Standard error	Pr >  t	Monetary value
Species	0.3619	0.1802	0.0446	8.35
Catch	-0.0110	0.0116	0.3436	-0.25
Size	0.0119	0.0015	<0.0001	0.27
Wtp	-0.0433	0.0062	<0.0001	
Log-likelihood	-436			
McFadden LRI	0.1050			
N	444			

**Table 5.14: MRS and monetary values for changes in factor levels: own boat anglers**

Factor	Coefficient	Standard error	Pr >  t	Monetary value
Species	0.2278	0.1672	0.1732	4.38
Catch	-0.0082	0.0078	0.2995	-0.16
Size	0.0088	0.0014	<0.0001	0.17
Wtp	-0.0520	0.0065	<0.0001	
Log-likelihood	-535			
McFadden LRI	0.0913			
N	536			

In order to try to improve the fit of the conditional logit model, a non-linear quadratic specification was applied. However, this did not improve the log-likelihood nor McFadden’s LRI, and the quadratic coefficients were not statistically significant.

The conditional logit model is highly dependent upon the assumptions of the Type 1 extreme value distribution that underlies this model. However, a Hausman test revealed that the IIA issue was not a problem. Nevertheless, alternative logit models were developed which avoid some the strict assumptions of the conditional logit model, namely heteroskedastic extreme value distribution model; and mixed logit (random parameter) models. But these models did not result in an improved model fit compared to the conditional logit model reported in Table 5.11. Moreover, the estimated benefits for changes in factor levels were similar to those derived in Table 5.11 for the size factor: £0.19 for the HEV model, and £0.22 for both mixed logit random parameter models. In addition, both mixed logit random parameter models estimated a value for species of £8.22, which is not too dissimilar from the value of £8.86 reported in Table 5.11.

**5.8 Conclusion**

This study has attempted to estimate a range of non-market benefits associated with sea angling. A variety of valuation methods were required in order to assess these benefits. The consumer surplus from current recreational trips was estimated using both an expressed preference contingent valuation method, and a revealed preference travel-cost method. Values for improved recreational experiences, which might occur with improved fish stocks, were also assessed using the expressed preference choice experiments method.

Consumer surplus benefits from sea angling were found to be considerable. Consumer surplus (mean value) on existing annual sea angling activity varied from £381 per shore angler to £886 per own boat angler. When aggregated over sea fishing trips for the whole country these benefits are sizeable. It is estimated that there are 1.11 million anglers in England and Wales (see

Section 3.2.1), of which 0.61 million are predominantly shore anglers, 0.24 million predominantly charter boat anglers, and 0.26 million own boat anglers. Multiplying these figures by their respective consumer surplus amounts per angler (£381, £552 and £886), produces an annual aggregate net benefit (consumer surplus) of £594 million.

The consumer surplus per angling day was found to be somewhere between £68 and £105 using the travel cost method. The basic TCM estimated an average consumer surplus of £26 per day per shore angler, £42 per day per charter boat angler, and £104 per day per own boat angler. An annual aggregate value can be obtained by multiplying each day consumer surplus value by their respective numbers of households and by the respective number of sea angling days (13.62; 4.96; 12.41) of these households from the Omnibus survey described in Section 3. This produces an aggregate consumer surplus value of £216 million for shore anglers; £50 million for charter boat anglers; and £336 million for own boat anglers; that is: £602 million in total.

The results from the choice experiments suggested potential benefits from improved fishing stocks. However, only those shore fishing would be willing to pay anything to catch more fish (shore anglers were willing to pay £0.81 per extra fish caught). All groups were willing to pay more to be able to catch bigger fish, which amounted to £0.22 per percentage increase. This would suggest that it is the size of fish that would most enhance the recreational experience of improving fish stocks. In addition, the chance to catch new species would enhance the recreational experience, with a willingness to pay of £8.86 for a species not usually caught.

## 6. ECONOMIC IMPACTS OF ANGLING

### 6.1 Expenditures of anglers

Respondents in the surveys were asked about their cash expenditures on sea angling in England and Wales over the last year. A cash approach was preferred on the grounds of simplicity, a more sophisticated approach to capital accounting being impossible to implement. Where angling was not the main reason for a trip (e.g. a family holiday) respondents were asked to include only the additional expenditure associated with angling.

### 6.2 Total expenditure

Neither the mean total expenditure per angler nor per day differed significantly between the surveys, after differences in the mix of angling activities were taken into account. The pooled means were used from the analysis of variance (Table 6.1). Expenditure was, however, significantly affected ( $p < 0.001$ ) by the type of angling undertaken (Table 6.1). Own boat owners had the highest expenditures at £2,566 per year and shore anglers the lowest at £964 per year. The boat owner's spending includes any cash expenditures on boat purchase and maintenance. The standard deviations reveal very large differences between anglers in their annual expenditures. In the case of boat owners, this variation also reflected whether a purchase has been made in the last year. Where this had occurred, the capital cost is included within the expenditure.

**Table 6.1 Mean cash expenditure per angler (combined surveys)**

Main type of fishing	Expenditure per year (£)	Expenditure per day angling (£)
Shore	964.00 (±117.42)	21.65 (±5.73)
Charter boat	1570.40 (±192.01)	67.75 (±9.37)
Own boat	2566.65 (±164.75)	87.90 (±7.99)
Equally boat/shore	1951.89 (±259.74)	55.21 (±12.61)

*Standard error in brackets.*

These annual expenditures relate to different numbers of days activity in the year. For example, charter boat anglers fished on average on 25-30 days per year compared with over 60 days for shore anglers (see Table 4.9). Table 6.1 also gives the expenditures per day angling, and these show that boat owners and charter boat users have higher expenditures per day than other types of anglers, at £67.8 and £87.9 respectively. Shore anglers spent, on average, only £21.6 per day.

It is important to distinguish expenditures from visitors from those by residents since these can imply different economic impacts. In the survey we defined 'visitor' expenditure as that made more than 50 miles from home. The mean expenditures per day spent more than 50 miles from home (i.e. expenditure whilst visitors) are given in Table 6.2. Boat users, and particularly own boat owners are the largest spenders as visitors.

Comparison of these data with those for total daily expenditures (Table 6.1) indicate that most types of angler spend a similar amount or less per day when away from home. This may seem surprising but it reflects important elements of expenditure particularly on capital goods that take place largely from home (see Section 6.3).

**Table 6.2 Expenditure per day more than 50 miles from home**

Main type of fishing	Mean expenditure per day (£)	se of mean (£)
Shore	24.60	7.13
Charter boat	48.76	9.40
Own boat	87.39	12.47
Equally boat/shore	38.18	12.78

### 6.3 Composition of expenditure

Table 6.3 gives a breakdown of the total expenditure of each type of angler by category of expenditure. Food and accommodation are relatively unimportant in the total mix, whereas tackle and transport are major items. As may be expected, the costs of hiring, or owning and maintaining, vessels are major expenditure items for own boat and charter boat anglers.

**Table 6.3 Composition of the total annual expenditures of each type of angler (%)**

Main type of fishing	Tackle %	Transport %	Food %	Accommodation %	Own boat (purchase & operation) %	Charter boat costs %	Other costs %
Shore	43.13	24.66	12.15	4.46	4.22 <sup>5</sup>	2.11	9.26
Charter boat	25.33	11.95	8.64	4.66	18.48	27.87	3.06
Own boat	13.12	8.91	5.24	2.49	65.95	1.50	2.78
Equally boat/shore	23.77	14.02	6.53	3.81	39.69	8.60	3.58

Table 6.4 describes the composition of the total annual expenditures that are made more than 50 miles from home. This only accounts for between 8.4% and 23.9% of the annual expenditures depending on the type of angler. Significant items are tackle, transport, own boat and charter boat costs. Perhaps surprisingly, food and accommodation are relatively small items, only amounting in total to between 2.2% (own boat) and 5.6% (charter boat) of total annual expenditures.

**Table 6.4 Composition of expenditures made >50 miles from home**

Main type of fishing	Tackle %	Transport %	Food %	Accommodation %	Own boat (purchase & operation) %	Charter boat costs %	Other costs %
Shore	18.60	33.13	9.47	16.57	15.09 <sup>9</sup>	2.91	4.22
Charter boat	19.01	21.52	10.99	12.45	1.30	31.93	2.84
Own boat	8.71	22.79	9.79	17.18	29.24	9.90	2.39
Equally boat/shore	23.52	26.17	7.50	16.58	14.55	9.42	2.37

## 6.4 Economic impacts

No disaggregated input-output table for England and Wales exists that would allow analysis of the economic impacts of changes in the expenditures of sea anglers. Instead we adopted an *ad hoc* approach in which the aim was to measure the income and employment effects of the main first round expenditures using a sample of business accounts. Impacts were derived by reference to (i) a survey of businesses used by sea anglers, and (ii) the Annual Business Inquiry (2003).

### 6.4.1 Business survey

A small postal survey of tackle shops, charter boats, boatyards/ chandlers and accommodation and food suppliers was undertaken. Telephone follow-up was used to increase the response rate. The questionnaire (Annex V) was designed to provide information on the relationship between turnover, employment and income in these types of businesses. The aim was to use the results to link angler expenditure to first round impacts on these businesses. We did not attempt to survey businesses providing transport and miscellaneous services since previous experience had demonstrated that it was virtually impossible to obtain replies from sectors where the reason for the survey (in this case sea angling) was not perceived as relevant to the business in question because it represented a minute element in its turnover.

We focussed the survey mainly on the four case study areas (see Section 7) in order to obtain as much information as possible on businesses in these areas. Addresses were obtained from a variety of sources including local information and national advertising. As far as possible businesses were selected because they were known to provide services to sea anglers. 162 questionnaires were sent out, concentrating on tackle shop and charter boats that we thought would be major service providing sectors. Table 6.5 gives the response rates that averaged 36%, a not unexpected rate for surveys of this type. The main reason for non-response was either a refusal to provide financial information or a simple unwillingness to take part, particularly where the respondent had no obvious interest in sea angling.

<sup>9</sup> The fact that shore anglers have expenditure on own boats reflects the fact that anglers were classified according to main types of activity. Some 'mainly shore' anglers will also own boats.

**Table 6.5 Estimates of employment and income coefficients**

Business type	Sample size	Response rate %	Annual Turnover (Mean, £'000)	Employment (Mean, FTEs)	FTE per £10,000 turnover	Net income per £1 turnover *	Purchases within 50 miles (% total expenditure)
Charter boats	54	46	36.5	1.23	0.42	0.38	78.7
Tackle shops	51	35	165.4	2.36	0.19	0.17	19.7
Accommodation and food	39	28	121.0	7.68	0.86	0.18	82.5
Boatyards/ chandlers	18	28	235.0	8.5	0.37	0.1**	20.0
Transport***	N/a	N/a	N/a	N/a	0.18	0.1	5.0
Other***	N/a	N/a	N/a	N/a	0.25	0.1	20.0

Note\* net income is accounting profit including any return to owner/partners/directors.

\*\* Consultant's estimate- too few observations.

\*\*\*Consultant's estimates based in part on Annual Business Inquiry (2003).

The table gives average coefficients relating turnover to net income and employment. These are used later as one method for translating angler expenditures into first round income and employment impacts. The FTE:turnover coefficient may appear high for accommodation and food (0.86 FTE per £10,000 turnover). This reflected the low wages recorded for pub staff and the low turnover in relation to perceived labour input in bed and breakfast establishments.

### 6.5 National level impacts

National impacts on employment were estimated by combining the angler expenditure estimates with the Omnibus survey results for the population of anglers and the impact coefficients of Table 6.5. The expenditures per day (Table 6.2) were used to correct for the higher activity rates of the surveyed anglers as compared with averages for anglers as determined in the Omnibus survey. Table 6.6 gives the estimates based on 1.11m sea anglers. If multiple anglers in households are included, the number of anglers increases to 1.45m (see Section 3.2), and the impacts would be 32% higher. Estimates of economic impacts based on this higher figure would be unrealistically high because they would include substantial numbers of children who may be expected to have lower expenditures than those estimated in the surveys.

**Table 6.6 National level impacts of sea angler expenditures**

	No. of households (m)	DAYS ANGLING (MEAN PER HOUSEHOLD PER YEAR)	EXPENDITURE PER HOUSEHOLD PER YEAR (£, MEAN)	Aggregate expenditure per year (£m)	Employment supported (FTE)*	Supplier net income generated (£m)*
<b>Shore</b>	0.61	13.62	295	178	5,652	19.1
<b>Charter boat</b>	0.24	4.96	336	82	3,092	9.0
<b>Own boat</b>	0.26	12.41	1,091	278	10,145	43.3
<b>Total</b>	<b>1.11</b>	<b>30.99</b>	<b>1,722</b>	<b>539</b>	<b>18,889</b>	<b>71.4</b>

Note \*first round impacts only

In order to explain how these figures are derived, take the shore angler row in the table. The number of households with mainly shore anglers (0.61m) and their activity rates are taken from the Omnibus survey (See Section 3.2.1). The household expenditure (£295m) is the number of angling days multiplied by the mean daily expenditure (from Table 6.1), and the aggregate expenditure is this figure raised by the 0.61m households. The FTE and supplier net income figures are derived by allocating the expenditure into its different components (Table 6.3) and applying the employment and income coefficients from Table 6.5.

Overall, sea anglers support around 19,000 first round jobs in the supply sector, and the estimated additional net income to suppliers is around £71m. At the national level it is own boat anglers who have the greatest economic impact because of their high annual spending. Most of this impact is within coastal economies because 81.5% of domestic respondents in the angler surveys lived within 25 miles of the coast.

It is important that these figures are not interpreted as additional employment generated by, or dependent on, sea angling. If sea angling ceased (due, for example, to an absence of fish), much of the expenditure would be diverted into alternative leisure activities or other types of expenditure and this would generate economic activity. The nature of this displacement would determine whether there was a net gain or loss in employment. Only where expenditure was diverted outside the England and Wales economy would there be a clear loss of employment and income.

### **6.6 Visitor impacts on the coastal economy**

The national level calculations were repeated to estimate the 'visitor' injections into coastal economies (defined in terms of trips and expenditures taking place more than 50 miles from home). These expenditures include transfers within the coastal economy by coastal residents who travel to other coastal locations to fish. The calculations can only be done approximately, because of the limited location information on trips obtained from the Omnibus survey.

The total expenditure by visitors is 36% of the national total (Table 6.7), but employment generated is 44% of the total, a reflection of the different distribution of expenditure by visiting anglers (Table 6.4). The first round employment created by visitor injections of expenditure is around 8,330 FTE jobs and the income effect on suppliers, £31.2m.

**Table 6.7 Impacts of visiting sea anglers on the coastal economy in England and Wales**

	Number of households (m)	Days angling (mean / household per year)	% days more than 50 miles from home	Expenditure on visits per household per year (£, mean)	Aggregate expenditure on visits per year (£m)	Employment supported (FTE)*	Income generated (£m)*
<b>Shore</b>	0.61	13.62	17	57	34	1,370	4.89
<b>Charter boat</b>	0.24	4.96	47	114	28	1,172	6.14
<b>Own boat</b>	0.26	12.41	47	510	130	5,787	20.20
<b>Total</b>	<b>1.10</b>	<b>30.99</b>	<b>111</b>	<b>681</b>	<b>192</b>	<b>8,329</b>	<b>31.24</b>

Note \*first round impacts only

Own boat anglers have the largest impact because they have high annual expenditures and almost half of their fishing is done away from home. Charter boat anglers have the lowest activity rates (mean 4.96 days per year), and this reduces their impact. Shore anglers mainly fish locally and despite their large number this reduces their overall impact as visitors.

### **6.6.1 Multipliers**

The results above only consider first round impacts. Impacts on employment and income would be higher if indirect and induced impacts were included, but measuring these effects was beyond the scope of the study.

### **6.6.2 Visitor and resident effects**

Injections of expenditure by non-residents of England and Wales are minimal and can more or less be ignored since only 1.8% of respondents in the face-to-face survey did not reside in England or Wales. At a national level, tourists from other countries are thus quite unimportant. The main 'visitor' effect is one of transferring spending within the national economy as anglers travel away from home to fish. On so far as these are merely transfers across space they have a limited impact at the national level. The quality and diversity of angling opportunities in England and Wales are important to the extent that they retain spending within the economy and deter trips abroad.

## **6.7 Comparison with other sectors**

Comparator sectors are not easy to identify. 'Terrestrial' angling and sailing have similarities either in terms of the location or local economic impacts. However, we were unable to find any comparable information for these sectors that would allow in-depth comparison. The literature on the valuation of benefits from angling was reviewed in Section 2.2.

It is possible to place sea angling within the context of tourism. The total tourism expenditure in England and Wales in 2002 was £22,331m (UKTS, 2002). Tourists are defined as those staying overnight. We did not categorise sea anglers in this way, but if we define angling tourists as those travelling greater than 50 miles, they spent £192m per year (Table 6.7). This is just under 1% of total tourism spending. The UKTS indicates that there were 0.1m sea angling trips in 2002 by tourists in England, where sea angling was the main purpose of the trip. The spend was £27m, £12m of which was spent in southwest England.

## **7. CASE STUDIES**

### **7.1 Introduction**

Four case studies of sea angling locations used for sea angling were selected in order to depict the variety of contexts that occur in England and Wales and to estimate as far as possible the impacts of angling on the local economies. Cases were selected to give regional diversity, and to contrast different types of sea angling (charter, own boat and on-shore) and a varying importance of commercial fishing. Locations where there were substantial commercial port activities (e.g. Dover) that would totally dominate the contribution of sea angling were avoided. The four case studies selected were Weymouth, Whitby, Hastings and Anglesey. These were not in any sense meant to be a representative sample of all angling locations. A much larger sample than four would have been required to represent the number and diversity of locations (see Annex III).

In each case, face-to-face or telephone interviews were undertaken with the port authorities, and local key sources of information, including charter skippers, angling clubs and tackle shops. The business survey questionnaire was used for business respondents but additional information was obtained in the interviews on angler numbers, trends and factors determining development of sea angling. It was only possible to obtain approximate information on angler numbers due to an absence of detailed local surveys. We used our judgement in combining the evidence that we were able to gather from local businesses and experts. Local information on the split between 'visitors' and 'residents' proved unreliable. This reflects different definitions of what constitutes a visitor and uncertainty over the geographical origin of many clients. We used therefore used our own angler survey data to identify the proportion of angler days from residents and visitors, the latter defined as anglers travelling more than 50 miles from home.

To estimate the economic impact of sea anglers in the different case study areas we combined the angler day estimates with the mean expenditures per day for residents and visitors at national level (Tables 6.1 and 6.3) to obtain annual expenditures for different types of angler.

### **7.2 Weymouth**

Weymouth has a population (2001) of 50,900, and became a popular seaside resort after a visit by George III in 1789. It is now an established tourist centre with activity centred on the beach and harbours. It is a multi-sport area, with fishing, diving and sailing and other seaside activities. Weymouth is also a ferry port for France and the Channel Islands.

Since 1971 there has been 20% in-migration and 28% growth in employment. Claimant unemployment (2.8%) is relatively low as compared to other seaside towns (Beatty and Fothergill, 2003). Total employee numbers are 17,400 and a total workforce of 25,930, in an economy centred on distribution, hotels & restaurants, public services and banking, finance and insurance (Gray, 2003). Together, these account for 79 per cent of employment in the district.

#### **7.2.1 Sea-Angling at Weymouth**

Weymouth is noted for the exceptional diversity of fishing, and the variety of sheltered locations that enable both on and offshore fishing through the year.

Chesil beach provides an important resource for on-shore anglers. Both charter and own-boat angling are important, and some fast charter boats specialise in trips to Guernsey. Weymouth is an important venue for angling competitions. Next year it is hosting a 5-day international event, World Shore Championships 2004 and the World Boat Championships 2004, which are the equivalent of the Olympics in sea-angling circles.

The main species caught are cod and whiting (winter) and bass, bream and sharks (summer), but virtually all the UK species are caught. Weymouth is a prime fishery for bass. Most visiting anglers come in the tourist season (April – Sept) with slightly older age groups visiting in Sept – Oct. However, there is still considerable local fishing during the winter, and some visitors.

### **7.2.2 Charter boats**

There are 11 full time angling charters, and 3 dive boats that do some angling. These offer day trips and longer-stay Channel Island trips for groups and individuals, with mainly wreck and reef fishing. The fleet is modern, and well promoted through cooperative and individual web sites. Most charter boats are booked completely throughout 2003 and some through 2004. Charter boats average around 180-220 fishing days per year. Capacity is limited by the number of harbour moorings and there is little scope for short trips for holiday makers because demand from serious anglers is more profitable.

### **7.2.3 Privately owned boats**

There are 600 permanent moorings in Weymouth Harbour of which about 180 are private angling boats. Of these it is estimated that 75% are residents of Weymouth. There are public slipways for visitors with their own boat.

### **7.2.4 Clubs**

There are three local clubs with a membership of around 450.

### **7.2.5 Commercial fishing and other comparable activities**

Weymouth is primarily a shellfish port with 88 registered fishing vessels (bass boats, scallopers, prawn boats and lobster and crab buoys, with some net fishing) (Table 7.1).

**Table 7.1 Fish landings 2001 (Copine, Portland and Weymouth)**

	Tonnes landed	Value of landings (£)
<b>Demersal fish</b>	75	128,132
<b>Pelagic</b>	4	1,122
<b>Shellfish</b>	2,413	1,534,908
<b>Total</b>	<b>2,492</b>	<b>1,664,162</b>

Source Defra. Main species landed (i.e > 100 tonnes p.a.) – crabs, mussels, scallops and whelks.

Weymouth is an important yachting port with a private yacht marina. Apart from sea angling, important activities associated with the harbour are dive charters, domestic and visiting yachts, and tourism.

### **7.2.6 Other suppliers**

Weymouth has three angling tackle shops, a number of ships chandlers and several boat-related suppliers and maintenance firms. The town has extensive resort accommodation with a large number of hotels and B&B (1397 rooms) as well as self-catering establishments (54) and camping and caravan parks (19). Some hotels and pubs near the quay specialise in catering for anglers.

### **7.2.7 Economic contribution of sea angling**

Gillard (2003) undertook a detailed study of the angling charter boat sector in Weymouth and quotes estimates of the total number of charter angler visits per year as 15,600. The average angler expenditure in total was £122.7 per visit, giving an aggregate expenditure by charter boat anglers of £1.91m per year. We estimate direct employment as charter boat skippers and assistance is around 15 FTEs.

We give indicative estimates for the annual expenditures of different types of angler in Table 7.2. There are an estimated 94,500 angler days contributing expenditure of around £3.6m of which 20% derives from visiting anglers travelling more than 50 miles. Shore anglers spend most in total. Much of the visitors' expenditure is related to the use of charter boats. Some care has to be taken in interpreting the expenditures from different types of angler because we classified anglers by main activities whereas the angler day estimates are for specific types of angling. Thus some of our charter boat group would also engage in shore fishing and vice versa. This could in part explain the difference between our estimate for the expenditures of mainly charter boat anglers (£0.96m) and that of £1.91m on charter boat trips derived by Gillard (2003).

**Table 7.2 Angler days and expenditures per year (Weymouth)**

<b>Angler type</b>	<b>Angler days</b>	<b>% visitor days</b>	<b>Expenditure by residents (£/year)</b>	<b>Expenditure by visitors (£/year)</b>	<b>Total expenditure (£/year)</b>
<b>Shore</b>	64,500	12.7	1,219,079	201,511	1,420,590
<b>Charter boat</b>	16,500	49.1	568,998	395,029	964,028
<b>Own boat</b>	13,500	7.2	1,101,211	84,943	1,186,154
<b>Total</b>	94,500	18.3	2,889,289	681,483	3,570,772

### **7.2.8 Trends and development**

There had been an upward trend in charter boat use of at least 20% in the last five years. There is no evident limit on the shore resource that is very extensive, but charter and own boat angling is limited by the size of the port and growth of the sector is 'at capacity' (Owen, 2003). Provision of car parking near the port for charter boat anglers is thought to possibly limit demand even though the council has introduced a special scheme for anglers.

Skippers did not state that fish stocks limited their business at present, although boats are being forced to travel further (and faster) to locate fish. Owen (2003) states that the size of fish caught and their 'quality' is decreasing. This necessitates having modern boats with associated higher capital costs. Gill netting of wrecks is causing great frustration and inhibits the smooth operation of the charter boats. Banning of gill netting would improve the opportunities for charter boat angling.

Development of charter and own boat angling is mainly limited by the size of the port. The charging and allocation policy for berths in the harbour is one determinant of the rate at which charter boat angling can expand at Weymouth.

### **7.3 Whitby**

Whitby has a long history of shipbuilding, whaling and commercial fishing. However, all these activities have declined or disappeared and much of the local economy is now centred on tourism. Its population in 2001 was 13,594, and its claimant unemployment was the third highest (7.0%) in the 53 towns studied by Beatty and Fothergill (2003). They also calculated that Whitby had the highest net out-migration since 1971 (8%).

Of the people in employment, 1.1% are engaged in fishing and 12.6% in hotels and catering.

#### **7.3.1 Sea-Angling at Whitby**

On-shore and offshore fishing are both available. The sea on this coast falls to 180 feet within only 1 mile of the shore and there are many wrecks around which fish congregate. This provides very good fishing conditions, and Whitby waters hold the British record for the largest cod, catfish and, until recently, the largest tuna caught. The main target species is cod but whiting, mackerel and other flat fish and crab are caught.

Off shore angling is mostly during the summer due to better weather and because some species are further out to sea in the warmer months. Fishing for cod and ling continues into the autumn/winter months.

However, sea angling has declined in the last 20 years, a decline originally triggered off by the collapse of mining, since many miners were sea anglers. Lack of fish to catch is now a major factor.

#### **7.3.2 Charter boats**

There are 19 registered angling charters but the majority only provide part-time employment, and operate for only 10-20 days per year. Trade is from groups and individuals, with three boats specialising in 3-hour trips for holidaymakers in the school holidays. One charter specialises in longer trips and provides overnight accommodation on board. The average number of fishing days that are feasible per year is around 120. This reflects more problematic weather in the North Sea and a lack of demand.

#### **7.3.3 Privately owned boats**

There are a small number of privately owned boats suitable for angling but it is not known how many engage in sea angling.

**7.3.4 Clubs**

There is only one local fishing club (32 members). Shore fishing by club members is mainly end Sept to end of March for cod which come closer in the winter.

**7.3.5 Commercial fishing and other comparable activities**

Whitby is an important trawler and shellfish port (Table 7.3) with 69 registered fishing vessels. There are many private boats and yachts moored at Whitby, currently around 350, of which about 90 are boats suitable for angling.

**Table 7.3 Fish landings 2001 (Whitby)**

	Tonnes landed	Value of landings (£)
<b>Demersal fish</b>	2,110	2,419,309
<b>Pelagic</b>	Negligible	150
<b>Shellfish</b>	425	1,088,556
<b>Total</b>	<b>2,535</b>	<b>3,508,015</b>

Source Defra. Main species landed (i.e > 100 tonnes p.a.) – cod, haddock, lemon sole, whiting and crabs

**7.3.8 Other suppliers**

Whitby has two tackle shops and a number of boat maintenance firms. The town has a large number of hotels and B&B (756 rooms) as well as self-catering establishments (204 rooms) and camping and caravan parks (4), many of which provide facilities for visiting anglers.

**7.3.9 Economic contribution of sea angling**

We were unable to obtain estimates of shore or own boat anglers. However we estimate 11,560 charter boat days and an annual expenditure by these anglers of £706,137 (Table 7.4). 35.1% of charter boat anglers were visitors from more than 50 miles away. Much of the interest in shore fishing is from holidaymakers during the summer. It seems likely that angling particularly around the harbour does contribute to the experience of holidaymakers by creating visual interest even if there is no direct participation. There may therefore be significant spin offs to tourism.

**Table 7.4 Angler days and expenditures per year (Whitby)**

Angler type	Angler days	% visitor days	Expenditure by residents (£/year)	Expenditure by visitors (£/year)	Total expenditure (£/year)
<b>Charter boat</b>	11560	35.10	508290	197847	706137

It is clear that both general tourism and commercial fishing are much more important to the local economy than sea angling, which is a relatively minor activity.

### **7.3.10 Trends and development**

The evidence from the business survey suggests that charter boat angling has declined by around 20% in the last five years. In 1995 WPSAE (1995) reported that the turnover of charter boats was £650,000. This compares with our turnover estimate of around £350,000. There were no comments from anglers about poor catches in 1995 - the main concerns were with comfort and facilities. Most anglers are repeat customers (WPSAE, 1996) and the recent decline is attributed by skippers to poor catches.

Evidence from tackle shops suggests that shore angling has increased in 2003 after a relatively static 5 years. This increase has been fuelled by a keen interest from holidaymakers and excellent weather. However, the difficulty in obtaining catches is undoubtedly affecting more serious shore angling in the area.

The main factor limiting development is stated to be the perception and reality of a reducing probability of catching fish in adequate numbers and acceptable size. Many consider this to reflect falling North Sea (principally cod) fish stocks. The more buoyant part of the sector is the holiday trade (where catch success is a less important determinant of repeat visits) and the long-distance charters, where anglers perceive the probability of locating limited stocks to be higher.

It is commonly believed that with improved stocks and increased catch rates the potential for expansion of sea angling would be considerable given the large Teesside population in the proximity.

## **7.4 Hastings**

Hastings is a seaside resort on the southeast coast of England with a population of 85,027. It is predominantly a service economy with 82% of the employed workforce in the service sector, and public services account for 39% of employees. Sectoral employment according to the population census gives 1.1% employed in agriculture, forest and fishing, and 72% in service sectors. Claimant unemployment is slightly above the national average but close to the mean for seaside towns. The 10-year population change was +2.7% with substantial net in-migration (38%) since 1971 (Beatty and Fothergill, 2003).

Tourism and related industries is a major employer and the Borough Council estimate that in 2001 20.6% of jobs were in this sector.

### **7.4.1 Sea-Angling at Hastings**

Hastings does not have a port and there are no charter boats. Sea angling takes two forms – fishing from the shore and pier, and fishing from boats, predominantly by members of the three local angling clubs who have enclosures on the beach. It is thought that around 80% of the activity is on-shore since angling boats are quite restricted in their use due to tides and bad weather. Local people do most of the fishing although there is on-shore angling by visitors in the tourist season. The re-opening of the pier in 2001 has increased the potential for fishing by holidaymakers.

Target species are mainly cod, dabs and flounder with some mackerel and sole. Sea angling has declined substantially in the last 20 years mainly due to a lack of fish. This decline has continued in the last five years particularly

in beach angling due to poor catches. Many local anglers have substituted carp and trout fishing inland for sea angling.

#### **7.4.2 Privately owned boats**

There are around 106 club and private boats on the beach in enclosures. However, their use is quite limited (see above).

#### **7.4.3 Clubs**

There are five local sea angling clubs with around 1,500 members. However, there is a strong social element to the clubs and it is thought that less than 50% of members are active sea anglers. Even so, there is a substantial local sea angling presence.

#### **7.4.4 Commercial fishing and other comparable activities**

Hastings has the largest fleet of beach launched fishing boats in Europe with 37 registered boats. Of the total value of landings as recorded by Defra about 40% can be attributed to Hastings (£600,000-£700,000) (Table 7.5). The most important species is sole, with some cuttlefish, plaice and cod. The commercial fishing activities add interest for tourists especially through beach outlets for fresh and processed fish.

**Table 7.5 Fish landings 2001 (Hastings, Eastbourne and Seaford)**

	<b>Tonnes landed</b>	<b>Value of landings (£)</b>
<b>Demersal fish</b>	398	889,241
<b>Pelagic</b>	23	14,738
<b>Shellfish</b>	1,094	703,741
<b>Total</b>	<b>1,515</b>	<b>1,607,720</b>

Source Defra. Main species landed (i.e. > 100 tonnes p.a.) – plaice, crabs and whelks

#### **7.4.5 Other suppliers**

Hastings has three tackle shops although less than 50% of the turnover relates to sea angling. Suppliers to the shops are almost entirely not locally sourced.

#### **7.4.6 Economic contribution of sea angling**

Most of the sea angling in Hastings is by local people and mainly on-shore. We estimated on the basis of interviews with local suppliers and informed sources that there were 19,300 angler days and a total expenditure of around £645,000 per year (Table 7.6). Only 5% of expenditure is from visitors travelling more than 50 miles. One reason for the limited visitor numbers is the lack of port facilities and the absence of charter boats for hire.

**Table 7.6 Angler days and expenditures per year (Hastings)**

Angler type	Angler days	% visitor days	Expenditure by residents (£/year)	Expenditure by visitors (£/year)	Total expenditure (£/year)
Shore	15,900	5.40	325,646	21,122	346,768
Charter boat	0	0.00	0	0	0
Own boat	3,400	4.60	285,112	13,668	298,780
<b>Total</b>	<b>19,300</b>	<b>5.26</b>	<b>610,759</b>	<b>34,789</b>	<b>645,548</b>

#### **7.4.7 Trends and development**

It is clear that a major factor in the decline of sea angling has been the lack of catch. This has impacted both on the satisfaction gained from the sport by local and visitors, and the injection of expenditures to the local economy. Hastings does not have the advantages offered by Weymouth (charter boats, port facilities) that allow anglers to more readily search for fish. Without this, there is a critical dependence on fish stocks for on-shore and in-shore fishing.

Sea angling is not mentioned in the 1999 tourism strategy for Hastings and St. Leonards. This is not surprising given its decline and the dependence of any resurgence on increased fish stocks. Were these stocks to increase, there would be some benefit to the local economy. However, without good facilities for charter and private boats, the scope for developing visitor-based sea angling seems quite limited.

#### **7.5 Anglesey**

Anglesey is an island separated from the Welsh mainland by the narrow Menai Straits. There are numerous resorts, picturesque bays and beaches all around the island, and Holyhead is a ferry port for Ireland. It has a population of 66,829. Major employment sectors are agriculture (3.9%), construction (8.5%) and the public sector (30.3%). Tourism is an important source of employment, with 5.9% of all employment in hotels and catering. The STEAM (2003) analysis of tourism on Anglesey indicates 1.05m tourists and 2.86m tourist days, with an expenditure of £79.7m. Of these days, 65% are spent in non-serviced accommodation but only 9% in serviced accommodation, emphasising the importance of self-catering and second homes on the island. Anglesey spans the extremes of low cost holidays and more affluent second home ownership.

##### **7.5.1 Sea-Angling on Anglesey**

There are extensive opportunities for shore based angling all round the island, with the breakwater at Holyhead and a number of points and piers being popular venues. The main charter boat locations are Menai Bridge, Beaumaris, Amlwch and Cemaes Bay.

Angling in Anglesey suffered a marked downturn following the decline in industrial activity and manufacturing in the Midlands and North of England, and the loss of the related angling clubs. More recently there has been a resurgence in angling activity. This seems to be mainly associated with specialised charter and own boats, although a growth in angling by

holidaymakers has also occurred. New corporate and professional packages are becoming increasingly important in the market.

There are such a variety of habitats around Anglesey that over 40 species of fish may be caught, depending on the season and year. The main wreck fishing species are pollack, ling, conger, cod, and coalfish. In-shore fishing species include whiting, dabs, dogfish, gurnard, codling, mackerel, pollack and coalfish. Target shore-based anglers mainly aim for bass and codling.

The quality and range of fish available has decreased over time due to 'over-fishing' in the past, but opinions vary as to the impact on the current demand for sea angling. Amongst holidaymakers this change is unimportant because fish may still be caught in adequate numbers. Wreck fish stocks are satisfactory and do not limit demand. However, inshore fishing for target species anglers may be affected by the quality available.

### **7.5.2 Charter boats**

There are 15 charter boats operating in three markets: specialised wrecking, inshore ground and bait fishing, and short inshore fishing/ pleasure trips. Wrecking trips are the most specialised, requiring fast boats capable of covering 100 miles per day. This appeals to experienced specimen anglers often booking in groups. Most charters operate inshore with group and individual bookings, but there is a significant holiday trade for short angling trips. Skippers also run pleasure trips in the summer. Typically, charter boats only operate for 110 days per year, a reflection of the limitations of weather, day length, tides, and in some cases limited demand.

### **7.5.3 Privately owned boats**

A number of privately owned boats are used for sea angling. The number moored around the island appears to be increasing as does the number of holidaymakers and second homeowners bringing boats to the island. Holyhead and Beaumaris are the main mooring locations.

### **7.5.4 Clubs**

There are 5 angling clubs who mainly engage in shore fishing and own boat angling.

### **7.5.5 Commercial fishing and other comparable activities**

There are 56 registered fishing vessels on Anglesey and catch statistics are given in Table 7.7. Commercial fishing is important to the economy and included trawling and shellfish boats, mainly operating from the north coast. Yachting is a significant leisure activity, particularly in the Menai Straits, but second homes, caravans and general tourism are much more significant sources of income to the economy.

**Table 7.7 Fish landings 2001 (Holyhead, Cemaes Bay and Amlwch)**

	Tonnes landed	Value of landings (£)
<b>Demersal fish</b>	931	1,103,301
<b>Pelagic</b>	Negligible	855
<b>Shellfish</b>	2,219	1,266,848
<b>Total</b>	<b>3,150</b>	<b>2,371,004</b>

Source Defra. In addition, there is an extensive mussel industry in the Menai Straits of which, annually, about £12 million is attributable to Anglesey.

**7.5.6 Other suppliers**

Anglesey has two tackle shops and some other smaller outlets mainly selling bait. There are a 5 boatyards/chandlers on the island, and charter skippers and boat owners are able to get the majority of their equipment and repairs from island suppliers.

**7.5.7 Economic contribution of sea angling**

We give indicative estimates for the annual expenditures of different types of angler in Table 7.8. There is an estimated 33,690 angler days. In total anglers spend an estimated £1.36m per year, with charter boat anglers being the largest source of expenditure. Visitor’s account for 32% of expenditure and much of this is derived from use of charter boats. The expenditure figures may be an underestimate because we have not been able to estimate the number of holidaymakers who fish with lures. In addition there is one tackle shop that attracts many customers not on angling trips. The total expenditure on local suppliers could be up to £1.8m.

**Table 7.8 Angler days and expenditures per year (Anglesey)**

Angler type	Angler days	% visitor days	Expenditure by residents (£/year)	Expenditure by visitors (£/year)	Total expenditure (£/year)
Shore	20,000	30.40	301,368	149,568	450,936
Charter boat	9,100	58.60	255,241	260,018	515,259
Own boat	4,500	6.40	370,235	25,168	395,403
<b>Total</b>	<b>33,600</b>	<b>34.82</b>	<b>926,844</b>	<b>434,754</b>	<b>1,361,598</b>

Nautilus Consultants (2000) estimated higher numbers of rod days per year (72,800 in total) and total expenditure (£3.4m). In some cases their figures appear much too high. For example, Nautilus estimate 26,500 charter boat days in 2000. This figure appears infeasible in relation to the number of boats now operating (15) and the mean number of utilisable days per year (110). In addition, angler expenditure was not estimated by direct interviewing of anglers and this may have introduced some bias in the results.

Whilst only accounting for 0.5% of the total revenue from visitors (as calculated by STEAM, 2003), angling does add an extra dimension to the holiday experience for many holidaymakers. It could well be a factor attracting some second homeowners and holidaymakers to the island although there is no specific information on this aspect. On an island where the alternative range of attractions for holidaymakers may be limited, sea angling may play a more significant role in the holiday experience than in many other resorts.

There is some potential for an expansion of charter and private boat angling on Anglesey with an increasing demand from visitors. There is some concern

with fish stocks and quality but it is not at such a level as to affect demand. Most operators are more concerned with lack of provision of council services to support sea angling, the recently introduced launching fee, and difficulty in access to some on-shore angling locations.

## **7.6 Comparison and conclusions**

### **7.6.1 Context and trends**

The case studies indicate that great diversity exists both in the economic contribution of sea angling to coastal economies and the trends in the sector. Any national level analysis has to be tempered with an appreciation that marked regional differences exist.

The most contrasting aspect of the case studies is that sea angling is declining in some locations (Hastings, Whitby), whereas in others (Weymouth) angling is much more buoyant. Whitby is characterised by long-term economic decline but this was not apparent in the other three cases.

In all the locations there was considerable on-shore fishing, much of it by locals. Shore-based angling appeared to be in decline in most locations (especially Hastings and Whitby) but there was evidence of an increase in interest and activity by holidaymakers (e.g. Weymouth, Anglesey).

Trends in charter boat activity also vary with place. This is particularly important because, per angler, it contributes more to the local economy than shore-based angling. Demand for charter boats has been increasing in Weymouth but declining in Whitby. In Anglesey there has been an expansion in private boat angling.

In general, it is the south coast of England that has become the main focus for angling and charter boat activity. This reflects the more amenable climate, proximity to the population mass in the southeast, and fish stocks are not necessarily a major limiting factor if effort is expended to locate remaining stocks. However, sea angling in non-port locations, such as Hastings, is more vulnerable to reductions in catch because they lack the flexibility to switch to charter boats.

### **7.6.2 Determinants of change**

The key factors explaining recent trends are:

- Catch - lack of fish appears to be the main factor in the continuing decline in Whitby and Hastings, and increased catch would allow some recovery in the activity. The response to reduced stocks in all centres has been to adapt and apply greater effort where this is possible. The growth in faster charters and own boats is the main adaptation that is feasible where stocks are still to be found. On-shore fishing is less able to adapt.
- Demand characteristics – the collapse of industrial and related social structures has been important in Wales and northern England, but less so in the south. Some locations are attractive to more affluent individuals with the development of markets for charter fishing and ownership of private boats. There are more specialised markets developing for corporate and club outings, and for specialised wreck fishing. In the charter boat sector expansion will occur through a combination of good information (via centre-based and individual web sites and brochures) and all-in packages, mainly for groups and

corporate bookings. Weymouth and to a lesser extent Anglesey exemplify this demand for charter boats,

- Facilities – in all four centres there were concerns that facilities for sea anglers and boat owners were to some extent limiting development. We have not explored this aspect in detail but it is likely to be a much less important factor than those discussed above. It will be most important if poor facilities deter visitors, and especially higher income off-shore anglers.

### **7.6.3 Economic impacts**

Impacts in the case study locations were estimated by applying the national level coefficients which link expenditure to employment and income (Table 7.9). This produces estimates of the impact of angler expenditures on the business of first round suppliers. Of the case studies, Weymouth had the largest employment generation (119 FTEs) and £0.41m in suppliers' income. These estimates exclude indirect and induced impacts. The impacts of different types of angler did not differ greatly, although shore anglers were most important because of their high numbers and high aggregate expenditure. Owen (2003) estimates 50-100 jobs resulting from sea angling in Weymouth.

**Table 7.9 Economic impacts of sea angling at four case studies locations.**

Case study location	Type of angler	Expenditure by residents (£/year)	Expenditure by visitors (£/year)	Employment supported by residents (FTE)*	Employment supported by visitors (FTE)*	Total employment (FTE)*	Income generated from residents (£)*	Income generated from visitors (£)*	Total income generated (£)*
<b>Weymouth</b>	Shore	1,219,079	201,511	38.6	8.0	46.6	130,434	28,612	159,046
	Charter boat	568,998	395,029	18.0	15.7	33.7	60,879	56,089	116,968
	Own boat	1,101,211	84,943	34.9	3.4	38.3	117,823	12,061	129,884
	<b>Total</b>	<b>2,889,288</b>	<b>681,483</b>	<b>91.5</b>	<b>27.1</b>	<b>118.6</b>	<b>309,136</b>	<b>96,762</b>	<b>405,898</b>
<b>Whitby</b>	<b>Charter boat</b>	<b>508290</b>	<b>197,847</b>	<b>16.1</b>	<b>7.9</b>	<b>24.0</b>	<b>54,384</b>	<b>28,092</b>	<b>82,476</b>
<b>Hastings</b>	Shore	325,646	21,122	10.3	0.8	11.2	34,842	2,999	37,841
	Own boat	285,112	13,668	9.0	0.5	9.6	30,505	1,941	32,446
	<b>Total</b>	<b>610,758</b>	<b>34,790</b>	<b>19.3</b>	<b>1.4</b>	<b>20.7</b>	<b>65,347</b>	<b>4,940</b>	<b>70,287</b>
<b>Anglesey</b>	Shore	301,368	124,441	9.5	4.9	14.5	32,245	17,669	49,914
	Charter boat	255,241	260,018	8.1	10.3	18.4	27,309	36,919	64,229
	Own boat	370,235	25,168	11.7	1.0	12.7	39,613	3,574	43,186
	<b>Total</b>	<b>926,844</b>	<b>409,627</b>	<b>29.4</b>	<b>16.3</b>	<b>45.6</b>	<b>99,167</b>	<b>58,162</b>	<b>157,329</b>

Note \*first round impacts only. Totals subject to rounding.

Impacts were smaller in Anglesey (45 jobs, £0.16m income). However, as indicated above, this is almost certainly an underestimate. Charter boat anglers are especially important in Anglesey and contribute most to employment. In Hastings, sea angling makes a smaller contribution to the local economy in part because the town lacks harbour facilities for charter and visiting boats. Our data on Whitby was more limited, but the charter boat operation generates around 24 jobs. Overall, in the four case studies, we estimate that there will be around 220-250 FTE jobs and over £750,000 in income to first round suppliers supported by sea angling. These are lower bound estimates because our data almost certainly underestimates the expenditure of holidaymakers associated with angling.

#### ***7.6.4 Visitor impacts***

Local economies benefit most obviously from visitor expenditures since these are clear additional impacts arising from the attraction of sea angling to non-residents. Were sea angling to decline there would be a loss of visitor spend but it is possible that a proportion at least of residents' expenditure on sea angling would be transferred to other local spending. Of the case studies, Anglesey benefited most from visitors and they accounted for 36% of the employment. Charter boat hire is particularly important there. Visitors are also important in Weymouth and Whitby, and again they are mainly attracted by the charter boat activity. Visitors are much less important in Hastings where fishing is mainly by residents although there is some participation by holidaymakers. Our figures in all locations probably underestimate the importance of visiting own boat anglers because they are difficult to locate for interview. The household omnibus survey indicated a higher percentage of visiting own boat anglers than we picked up in our face-to-face survey.

In all these case study locations sea angling by holidaymakers (and especially children) was a popular activity. The impact of this attraction on expenditures is almost certainly underestimated in our analysis. Were sea angling opportunities to decline there would be a knock-on decline on the holiday trade, but without much more detailed analysis of holidaymakers' decision we were unable to estimate the size of this effect.

#### ***7.6.5 Local multipliers***

We did not estimate local multipliers but some information on second round impacts is given in Table 6.5. Charter boats and accommodation do generate high knock-on local impacts but spending in tackle shops and on other suppliers the local retention is small. It is understood that much of the fishing tackle is imported into the UK. At local level, multipliers would be quite low because of leakage beyond the second round. We doubt if the indirect and induced effects would add more than an additional 10% to the impacts estimated above.

## 8. CONCLUSIONS

The conclusions focus on the six research questions posed in the remit (see Section 1.2). These are discussed in turn.

### 8.1 Important local centres for sea angling

Sea angling is practised all around the coast of England and Wales. Angling activity varies depending on the species of fish available and the accessibility of the angling venue. Table 8.1 summarises the principal locations for boat and shore angling.

**Table 8.1. Principal regional centres for sea angling**

Region	Principal locations for boat angling	Known Charter Boats	Principal locations for shore angling
Cornish Coast	Looe, Mevagissey, Newquay, Padstow.	37	Rame Head, Mevagissey, Falmouth Bay, The Lizard, Mounts Bay, St Ives, Padstow.
South Devon Coast	Plymouth, Dartmouth, Exmouth	36	Plymouth Harbour, Slapton Sands, Torbay, Lyme (West),
Dorset Coast	Lyme Regis, Weymouth, Poole.	41	Lyme Bay (East), Chesel Beach, Portland Harbour, Christchurch Bay (West).
Hampshire & IOW Coast	Lymington, Keyhaven, Gosport, Langstone	55	Christchurch Bay (East), Southampton, Portsmouth & the Solent, Isle of Wight.
Sussex Coast	Littlehampton, Brighton, Newhaven.	50	Chichester, Bognor, Worthing, Brighton, Eastbourne, Hastings, Brighton.
Kent Coast	Folkestone, Dover, Ramsgate.	29	Dungeness, Hythe, Dover, Deal, Whitstable, Medway.
East Coast	Southend, Burnham, Bradwell, Lowestoft.	26	Canvey, Clacton, Aldeburgh, Lowestoft, Cromer.
Humber & Yorkshire Coast	Humberside, Bridlington, Whitby.	34	Skegness, Mablethorpe, The River Humber, Bridlington, Scarborough, Whitby.
Northumberland Coast	Hartlepool, Tyne, Amble, Seahouses.	42	Saltburn, Whitley Bay, Alnmouth, Berwick upon Tweed.
North West Coast	Isle of Man, Morecambe, Blackpool, Liverpool	11	Barrow in Furness, Isle of Man, Morecambe, Blackpool, Liverpool Bay, River Dee.
North Wales Coast	Rhyl, Conway, Holyhead.	44	Colwyn Bay, Anglesey, Pwllheli & West Wales.
West & South Wales Coast	Aberystwyth, Milford Haven, Swansea, Penarth.	32	Aberystwyth, Fishguard Bay, Carmarthen Bay, Porthcawl, Newport.
North Devon & Bristol Channel	Portishead, Watchet, Minehead, Ifracombe.	15	Severn Beach, Burnham on Sea, Watchet, Ifracombe, Westward Ho, Hartland.

The Cornish and South Devon coastal regions, because of the huge rock formations, estuaries, sandy beaches, and the deeper water offshore, together with the milder climate, provide a more extensive range of species than other regions. Sea angling activity is substantial. The Dorset Coast provides good opportunities because of the relatively shallower water of the English Channel, but the species are more restricted and this is the case throughout Hampshire, Sussex to the Kent Coast. However the activity is considerable because of ready accessibility for anglers living in the south of England. Species traditionally caught on the east coast are those preferring colder water such as cod and whiting. With the Western Coast, from North Devon, Bristol Channel, South West and West Wales to North Wales and the

North West, the angling activity follows a similar pattern to that on the East, but warmer water species are available than further north, and the opportunities increase.

## **8.2 The economic contribution of recreational sea angling in England and Wales**

We estimated the total expenditure by anglers resident in England and Wales as £538m per year from 12.7m angler days of activity. Spending by anglers resident outside England and Wales can more or less be ignored since only 1.8% of respondents in our face-to-face angler survey fell into this category. Around half of the expenditure (52%) was by own boat anglers and reflects the importance of capital expenditures on boats and equipment. Shore anglers were the next most important group (37% of the total expenditure). In terms of first round impacts only, this translates into 18,890 jobs and £71m in suppliers' net income. (This is net income after deduction of the payments for labour and other purchases). The study did not attempt to measure the multiplier effects, but some of this initial expenditure (particularly on fishing tackle) is imported and would rapidly leak out of the economy.

Our figures are not easily compared with the £28m injection of expenditure by anglers into the Welsh coastal economy (Nautilus Consultants, 2002), not least because different countries are involved. Their figure of 41,100 anglers fishing in Wales seems low compared with our Omnibus estimate of at least 1.1m for England and Wales. In addition, their expenditure figures appear to consist only of trip-related spending, and exclude the important overhead cost element in the annual spend - especially on capital items such as tackle and boats.

Angling expenditure by visitors (travelling more than 50 miles from home) was £192m (35% of the total). It emphasises the fact that residents not travelling far from home undertake most sea angling. It compares with a total tourism expenditure by UK residents in England and Wales of £22,331m (UKTS, 2002). Angling spending by visitors is just under 1% of total tourism spending.

The UKTS indicates that there were 0.1m sea angling trips in 2002 by tourists in England, where sea angling was the main purpose of the trip. The spend was £27m, £12m of which was spent in the southwest of England.

Conclusions on the contribution of sea angling to the national economy have to be made with care. Cessation of the activity would not result in the loss of 18,890 jobs. Expenditure would be displaced into other directions with corresponding benefits to employment and income. Similarly any comparison of the economic characteristics of sea angling with those of commercial fishing is potentially open to misinterpretation. They represent quite different types of economic activity (a consumer activity by sea anglers, and a natural resource harvesting activity combined with processing, by commercial fishing).

### **8.2.1 Local economic impacts**

The contribution of sea angling to a local economy depends principally on the experience on offer, and this reflects the reliability of a satisfactory catch and the range of facilities to support angling. Of the case studies, Weymouth was

the most competitive location, and angling generated 119 first round jobs. Even so, much of the spend was by local residents, and the contribution to the economy is small - with knock-on effects, it might reach 0.6% of the total of 25,900 workforce in the district (Gray, 2003). General tourism is clearly much more important to Weymouth since 38% of employees are employed in distribution, hotels and restaurants.

The other case studies were either less attractive to visiting anglers or were more remote from population centres. Lack of catch was a significant limitation at Whitby, and Hastings suffered from a decline in catch and an absence of port facilities.

### 8.3 The value of the experience to anglers

The great majority of those interviewed perceived a positive benefit to their health from sea angling. Anecdotal evidence from the surveys suggested that this was related to the sense of relaxation and peace of mind that angling engendered. Nevertheless, around 120 anglers are rescued per year, and some suffer injuries.

Consumer surplus benefits from sea angling were found to be considerable. Consumer surplus (mean value) on existing annual sea angling activity varied from £381 per shore angler to £886 per own boat angler. When aggregated over sea fishing trips for the whole country the annual aggregate net benefit based on the mean consumer surplus estimates was £594 million.

The consumer surplus per angling day was found to be between £68 and £105 using the travel cost method (TCM). The basic TCM estimated an average consumer surplus of £26 per day per shore angler, £42 per day per charter boat angler, and £104 per day per own boat angler. An annual aggregate value can be obtained by multiplying each day consumer surplus value by their respective numbers of households and by the respective number of sea angling days (13.62; 4.96; 12.41) of these households from the Omnibus survey described in Section 3. This produces an aggregate consumer surplus value of £216 million for shore anglers; £50 million for charter boat anglers; and £336 million for own boat anglers; that is: £602 million in total.

The total value of the angling experience can be measured by summing the actual expenditures per day and the estimates of surplus<sup>10</sup>. *Using the full range of estimates*, we derive a total value for the angling experience of between £600m and £1,300m per year (Table 8.2, right hand column).

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<sup>10</sup> We assume that the market value of any fish retained is embedded within the surplus estimate.

**Table 8.2 Total value of sea angling**

	<b>Expenditure per day angling mean (£/day)</b>	<b>Surplus (range of estimates) (£/day)</b>	<b>Total value (£/day)</b>	<b>Number of households (m)</b>	<b>Days angling (mean per household per year)</b>	<b>Total value (£m)</b>
<b>Shore</b>	21.6	5.7-35.5	27-57	0.61	13.62	224-473
<b>Charter boat</b>	67.7	18.4-90.9	86-159	0.24	4.96	102-189
<b>Own boat</b>	87.9	14.3-108.7	102-197	0.26	12.41	329-635

The choice experiments were focussed on estimating the benefits from changes in the diversity and quality of the angling experience. This attempted to reflect the gain or loss in benefit from changes in fisheries management. The results indicate benefits from an improvement in the angling experience (as measured by fish size and diversity) but benefits from increasing the numbers caught were less clear-cut. All types of angler were willing to pay more for larger fish (£0.22 per 1% increase in size) and for greater diversity in the catch. However, only shore anglers were willing to pay for more fish (£0.81 per extra fish caught). Boat anglers had a negative valuation for more fish.

The results in relation to fish caught may appear surprising in view of the evidence on falling catches in recent years. However, the results from the surveys and case studies offer a possible explanation. Boat users catch more fish on average than shore anglers. The mean numbers caught (12-13 per day) are double that for shore anglers (5 per day). So boat anglers on average may well be at the point of zero or negative marginal utility to increased catch. It seems that the skill and mobility of boat owners (and especially more powerful charter boats) to find stocks has reduced the impacts of any loss of total stocks. The satisfaction of boat users is now more concentrated on fish size and ability to target species. Shore anglers have limited options for responding to reduced stocks and the CE results suggest that marginal utility for catch is positive and that an improvement in fish stocks would deliver benefits to this group.

#### **8.4 Side effects of sea angling**

In terms of social and cultural effects the main characteristic of sea angling is that it is now enjoyed across a wide spectrum of social classes throughout the country. Sea anglers live in all regions: the participation rate is lowest in the Midlands and highest in the southwest. A broad mix of social classes now pursues sea angling. Participation rates are slightly higher in the AB class (5.6% of households) and C1C2 (5.4%) than DE (4.0%). This compares with 1970 when 40% of sea anglers were skilled manual (C2) and 60% were from classes C2, D and E, and 1994 when C2 was the dominant group (NRA, 1994). Boat activity is higher amongst the AB classes.

The C2, D, and E social groups are most at risk from a reduction in stocks and catch because they are predominantly shore anglers and thus have more limited scope for adjustment of location. Where income levels permit, there is

the option to fish aboard. Fifteen percent of respondents had been sea angling outside England and Wales in the last year. Anecdotal evidence from the surveys indicated a growth in sea angling tourism by UK nationals (to the Channel islands, Ireland, USA, Africa) where fishing opportunities were better.

As regards other displacement effects there was clearly regional displacement of activity in response to regional differences in catch success. Our regional analysis was restricted to the case studies which showed a response on the part of anglers to search for fishing opportunities both domestically, though use of boats and by travel abroad. It and it would require a much more detailed spatial analysis of activity and its change over time to analyse this further.

There were no obvious close domestic substitutes for sea angling. There was some evidence from the business interviews of substitution by 'terrestrial' angling in locations where sea angling had become unrewarding (e.g. Hastings).

As compared with commercial fishing the impacts of sea angling on the resources are insignificant. Commercial fishing is also associated with 100% mortality of the fish whereas the corresponding impact of sea angling is minimal because of the small quantity retained (see Chapter 4). The consultants are not qualified to comment on specific environmental side effects. We quote evidence given to us by the Environment Agency (Colclough, 2003). "The Agency provided evidence to the Royal Commission on Environmental Pollution consultation on the Environmental Effects of Marine Fisheries in November 2002. The Nature Conservancy (Cadman, 1989) studied the impacts of bait digging for lugworm. Impacts on shellfish and crustacea have also been reported as attributable to angling. NFSA and other bodies have developed a Code of Practice to minimise the environmental impacts of recreational sea angling. Sea angling obviously contributes to the overall level of fishing mortality, but with increasing trends towards catch and release this small level of mortality is now decreasing".

### **8.5 Key trends in the sector**

The identification of trends through comparison of this study with others is not straightforward because of the different survey methods used. The household Omnibus surveys used by NRA (1994) and ourselves are much less open to bias than the postal survey used by Dunn and Potten (1994) or the access panel used by Sports Industries Federation (1999). The 1994 NRA estimated 1.104m sea anglers aged over 12 and Dunn and Potten (1994) estimated 1.175m. These appear to be consistent although the latter included all household members including children. Our survey indicated a population of 1.11m households with at least one sea angler, i.e. an adult population of at least 1.11m. The total angler population including children is 1.45m. The evidence suggests a stabilisation and possible increase in the sea angling population since the early 1990's.

Activity levels appear to have stabilised in the last decade. In 1970 sea anglers fished on average 36 times a year. This fell to 12 times in 1992 (Dunn and Potten, 1994) and our mean was 11.3. However, there is some variation between types of angling with shore anglers most active (13.62 days per year) and charter boat anglers least active (4.96 days per year).

These activity rates cannot be compared with historical data because none have been published.

In order to get information on changes in catch as perceived by anglers we asked about changes in the last 5 and 15 years. Most respondents perceived a decrease in numbers caught over time. 71% had perceived a decrease in numbers caught over the last 5 years. 62% perceived a decrease in fish size over the last 5 years, with 38% indicating no change. In our case studies a catch-related decline in sea fishing activity was apparent at Whitby (especially with cod) and Hastings. At Weymouth the trend in activity was quite the reverse. To some extent anglers had adapted by selecting different locations, with own boat and charter anglers using their mobility and skills to search more widely for available stocks. There is a trend towards more powerful, better equipped, charter boats in order to increase the available fishing area and provide a more professional service.

### **8.6 Future prospects for the sector**

Future prospects for the sector depend mainly on demand, fish stocks and facilities. There appears to be a stable or possibly increasing demand for sea angling with higher income groups being more prominent. Projection of the current trends would indicate an increasing use of own boats and charter boats. This is income-related and may also reflect the advantages of mobility in the search for fish (see below). There was some evidence of increasing corporate involvement in charter angling and this could increase as packages are put together by charter boat owners.

Growth in the sector in England and Wales may be inhibited by lack of fish or poor fish quality. In the extreme case of no fish to catch there must be an effect on activity. However, boat anglers are mobile and the range of charter boats has increased to extend the search area. The evidence from the case studies was that some ports had managed to adapt to reduced local stocks whereas with others the search for better fishing locations had proved unproductive. At a national level it is not clear to what extent activity is being constrained by available stocks. The value placed on additional fish caught was negative for boat anglers but positive for shore anglers. This indicates that increased stocks would provide benefits and especially to shore anglers. However, boat anglers might themselves run out of locational options if stock levels were to fall in the future. In some regions all angling activity is limited by low stocks.

In some port locations growth in boat angling was limited by port size and facilities. Yachting is the main competitor for port space over much of the south and west coasts. There does not appear to be any real physical limit on shore angling but these anglers are the most vulnerable to any deterioration in fish numbers.

Overall, the prospects appear reasonably stable, but with considerable regional variation, and vulnerability to an increased switching of activity to locations outside England and Wales.

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