The Wildlife Trusts

ESTIMATE OF ECONOMIC VALUES OF ACTIVITIES IN PROPOSED CONSERVATION ZONE IN LYME BAY

Report to The Wildlife Trusts

May 2007

HOMARUS LTD.
FISHERIES AND AQUACULTURE SPECIALISTS
ESTATE YARD HOUSE, HIGH STREET
BEAULIEU, HANTS, SO42 7YB, UK.

TEL: +44 (0) 1590 611250
FAX: +44 (0) 1590 611040
EMAIL: ADMIN@HOMAUSAQUAFISH.CO.UK
WEB: WWW.HOMARUSAQUAFISH.CO,UK

TABLE OF CONTENTS

Executive summary 2
1 Introduction **4**
2 Methodology and limitations **5**
2.1 Basic framework 5
2.2 Definition of values 5
2.3 Location of economic impact 6
2.4 Fishery values 6
2.4.1 Time scale 6
2.4.2 Species selected 7
2.4.3 Data sources and calculation methods 7
2.5 Charter fishery and angling values 10
2.6 Diving values 10
3 Estimates of fisheries value of zone **12**
3.1 Port landings and estimates of sources 12
3.2 ICES statistical rectangles 19
3.3 Sightings 25
3.4 Discussion of fisheries value estimates 27
4 Estimates of recreational uses of zone **33**
5 Summary of usage values **38**

Executive summary

This report details a programme of research and analysis undertaken in order to estimate the likely economic value of different uses of a proposed conservation zone in Lyme Bay.

The zone is some 60 square nautical miles ($nm^{2)}$, centred on Lyme Regis. A range of management options for the zone are being considered, including a proposal by English Nature to prohibit the use of scallop dredges in an attempt to conserve the sensitive and nationally important biodiversity found on the Lyme Bay Reefs.

Homarus Ltd were approached by The Wildlife Trusts with the simple brief of establishing likely economic benefits of scalloping versus a range of uses deemed to be non-damaging to sensitive biodiversity found on the reef systems in Lyme Bay, namely: static gear fishing (potting, netting); recreational fishing; and diving.

Data and opinion have been gathered from neutral public sources: primarily the Marine and Fisheries Agency (MFA), Sea Fisheries Committees (SFCs), local Harbour Masters and relevant literature.

It is notoriously difficult to assess values derived from a relatively small sea area such as the proposed closure zone. Scallop fishing values were estimated using three methods: i) Proportional areas, ii) International Council for the Exploration of the Sea (ICES) rectangles and iii) MFA overflight data. Other commercial fishing values were estimated using methods i) and ii) only, and angling and diving using method i) only. Landings values for commercial fishing, and spend per head, per day for angling and diving, have been used as the measures of economic value.

While the best use has been made of publicly available information, the methods are inevitably approximate and the results are likely to be subject to wide margins of error. Nevertheless, they provide general guidance on the relative importance of different activities in the proposed zone.

In light of the limited spatial data available, and to inform the debate further, the extremes, plausible maxima and minima and the probable positions have been discussed for commercial fishing benefits. The results are summarised in the table below.

Estimates of relative economic benefits derived from proposed conservation zone

Activity in zone		**Estimation method**					
		Proportional area	Rectangle based				Overflight sightings
			Max. theoretical	Max. plausible	Min. plausible	Probable	
Scalloping		**£162,000 - £187,000**	**£751,000**	**£415,000**	**£67,000**	**£198,000 - £260,000**	**£145,000**
Other uses	Static gear commercial	£177,000	£1,017,000	£135,000	£40,000	£129,000	
	Angling	£247,000					
	Diving	£85,000					
	Total	**£509,000**					

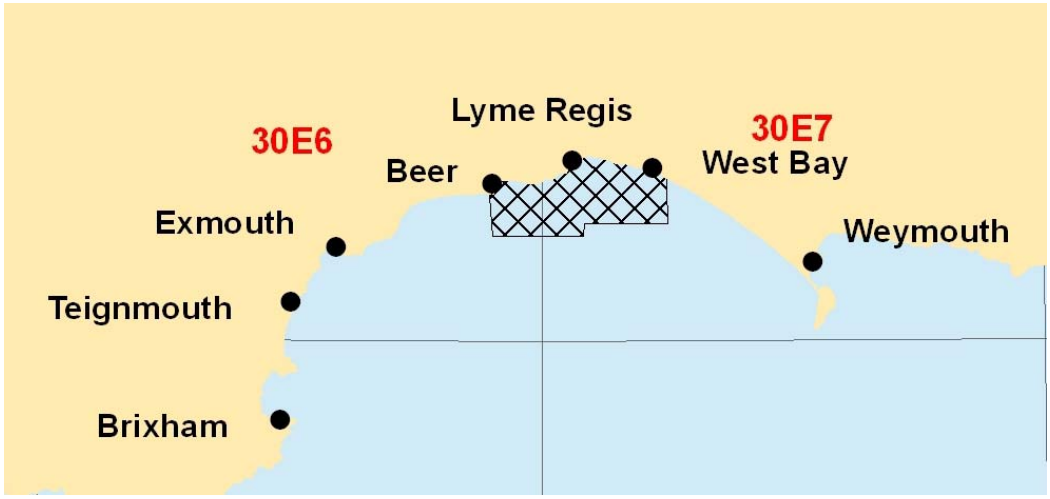
1 Introduction

Readers of this report will be familiar with the ongoing dispute between the fishing industry and nature conservation interests over the merits of using towed gear, in particular scallop dredges, within certain areas of Lyme Bay, off the Devon and Dorset coast. There is significant concern that scalloping is damaging the rich and sensitive biodiversity which is found on reefs in Lyme Bay. A range of management options are being considered, including a proposal by English Nature to prohibit the use of scallop dredges in an attempt to conserve Lyme Bay's unique biodiversity in a conservation zone of some 60 square nautical miles (nm[2)], centred on Lyme Regis.

Homarus Ltd[1] were approached by The Wildlife Trusts with the simple brief of establishing likely economic benefits derived from the proposed zone through scalloping on the one hand, against a range of uses deemed to be non-damaging to the sensitive biodiversity on the other, namely static gear fishing, (potting, netting), recreational fishing and diving. The study brief was to draw on sources of information in the public domain, or from organisations and individuals neutral to the dispute.

This report will not set out the background to the dispute, nor examine evidence of damage and possible approaches to reducing such damage. Rather, it focuses simply on the economic value of the activities within the proposed conservation zone (see Figure 1 below showing the area where scallop dredging is to be prohibited).

Figure 1: Lyme Bay and proposed closure zone, also ICES fisheries statistical rectangles overlapping the zone



[1] Homarus Ltd are independent fisheries consultants and have advised on likely economic values derived from fishing in certain sea areas in a number of situations in the past, for example following oil spills, or in relation to civil engineering works, wind farm developments etc, (see www.homarusaquafish.co.uk).

2 Methodology and limitations

2.1 Basic framework

The assumption underlying this assessment is that scalloping is damaging to the environment and in time, if allowed to continue at present rates, the damage will be such that it will prevent other activities which generate economic benefit from taking place in the proposed zone.

This is of course simplistic and unlikely to be the case in reality, but as mentioned in the introduction , this brief study attempts to measure the relative values of scalloping against other uses in the zone as a simple "balance sheet" exercise. This information can then be used by parties in the dispute to better inform their debate on relative values and hence about management of the situation.

2.2 Definition of values

Given data availability and limitations, two possible measures of economic benefit have been considered as appropriate to this situation. The most useful is 'value-added' made up of wages and profits generated by the activity concerned. Also useful, but more crude, is the total value (i.e. total first sale value or turnover).

Measurements of value-added usually depend on an estimate of turnover, then a costs model to derive the surplus to be paid to employees in the form of wages or to employers in the form of profits. The estimates of value-added available are the socio-economic profile of the fishing fleet undertaken by Seafish[2] in the case of commercial fishing and the "Drew Report"[3] in the case of sea angling. The Seafish report is now somewhat outdated and there is no certainty that the cost models presented apply to the vessels contributing to the landings values of the ports in the area. The Drew report does not show the proportion of income spent on wages, rather it shows business profits and employment generated, so is not directly comparable to the data for capture fishing.

As will be seen later in the report, there are significant margins for error in the likely first sales values estimated form the various activities. There seems little to be gained, therefore, in the refinement of the economic measure from turnover to value-added via further assumptions which are not directly equivalent in the different sectors. The same applies for 'second round' benefits which rely on multipliers which are generalised relative to the very narrow focus of this study. For this reason the study focuses on the simpler measure of turnover.

[2] *2001 Economic Survey of the UK Fishing Fleet*, Sea Fish industry Authority, 2002
[3] Research into the Economic Contribution of Sea Angling, Drew Associates for DEFRA, 2004.

2.3 Location of economic impact

There is a geographical dimension to economic impacts – with parties claiming that one or other of the potential activities in the proposed closure area provides greater benefit for the 'local' economy, i.e. the area immediately adjacent to the closure zone. There are two significant considerations regarding locations of impact:

1. While the argument about the 'local' economy is understandable, in economic terms it is difficult to say that an impact in one small area (Lyme Regis) is 'better' than one spread through a region (the south-west), or nationally (the UK as a whole).

2. Exclusion of one activity from the closure area will not necessarily mean that input to the economy is lost on a wider scale. Scallop vessels, if excluded at Lyme Bay, will most probably direct some of their effort elsewhere and derive (possibly less) economic benefit from doing so. Divers, charter anglers, and others, are likely to undertake their activities at other locations if the resource is unavailable at Lyme Bay.

For these reasons, and for simplicity, the study attempts to assess economic benefit derived from various current uses of the potential closure zone, without defining where the impact accrues, or what alternative impacts there might be if one or other activity in the zone was displaced elsewhere.

2.4 Fishery values

2.4.1 Time scale

In exercises which attempt to measure the value of a fishing area that may be altered or closed, the normal practice is to use landings in the recent past to predict what would be likely to happen in the future, without change or intervention. This is relatively crude. Short-term landings volumes do not necessarily reflect what could be removed from the fishery area on a sustainable basis over the long term.

The fishing methods in question are subject to short-term fluctuations. The scallop industry, for example, is partially opportunistic and follows cycles of identification of scallops at commercial densities which are then fished down by the fleet to sub-economic levels over months or years, before effort is diverted elsewhere. It seems likely that the Lyme Bay fishery is somewhere in the middle of this cycle and would, in the normal course of events, decline as stocks are fished down. Volumes of inshore potting and netting can also have significant short-term fluctuations, through changes in fleet activity or markets for target species. There is also evidence to suggest substitution in the Lyme area in a short timeframe (two to three years) through change in fishing operations by local vessels, (away from potting and into scalloping).

A long-term average is therefore arguably closer to what could be expected in the long-term future, or closer to 'sustainability', than a short-term average. The period of fisheries landings data has thus been examined over 15 years, a period when landings recording systems have been reasonably uniform. Some distributional data has been examined at intervals, notably 1995, 2000 and 2005.

2.4.2 Species selected

The brief clearly requested a comparison of scallop dredging with other forms of less destructive fishing (as well as recreational uses). English Nature have already undertaken significant background research and produced a dossier[4] on local fishing activities. With this background, and discussions with local Sea Fishery Officers, the principle target species and catching methods, and their position in the 'balance sheet', are separated as follows:

Proposed for prohibition	**Proposed for continuation**
Scallops: dredged	Scallops: dive caught
	Crustacean potting (crab and lobster)
	Fixed netting (skates and rays)

2.4.3 Data sources and calculation methods

It is notoriously difficult to assess values derived from a relatively small sea area such as the proposed closure zone. The levels of spatial data collected are not refined enough. The study team did not attempt to access records held by individual vessels (fishing, diving or charter).

This report makes best use of publicly available data and opinion. The methods used are inherently crude and approximate. Nevertheless, the exercise is worth attempting to provide a range of plausible values which might be derived from different forms of activity in the zone. Section 3.4 below discusses the reliability of the estimates, and the possible impacts of changing some of the underlying assumptions.

Fishing in the disputed area is understood to be undertaken by vessels of under 12m in the Southern Sea Fisheries Committee district and under 15.24m in Devon's district. Most of the vessels responsible for the increase in scalloping, said to be under 10m in length. The potters and netters who habitually work the area are generally below 10m. As such, only part of the catches under dispute will have been recorded formally through log sheets and statistical rectangle. Landings from the under-10m fleet rely on voluntary declarations from fishermen, merchants and so on, and are patchy in their coverage of both space and time.

Therefore, three possible methods of evaluating values of the different fisheries have been used.

1. Port landings and estimates of sources

Port landings data as amalgamated from both under-10m and over-10m fleets by the MFA will give at least some indication of the productivity of the grounds in the vicinity of given ports. The proportion arising from an area as small as the proposed conservation zone can only be estimated from local knowledge.

Ports where landings may have in part been derived from the proposed area include Brixham in the west round to Weymouth in the east. Catches derived from the zone which are landed into other ports are likely to be trivial and are ignored.

Landings into these local ports were discussed with officers of Devon and Southern Sea Fisheries Committees along with the approximate likely arcs of operation of the vessels

[4] *Lyme Bay Reefs Dossier* from English Nature to Defra, 14th August 2006.

likely to contribute to landings, by species, by port, on an average basis over the last 15 years. Where opinions on the same port by both SFCs differed, the average of the two estimates has been used.

The approximate fishing areas have been mapped using Geographical Information Systems (GIS), as well as areas of overlap with the proposed closure zone.

2. ICES Statistical rectangles proportion and Vessel Capacity Units (VCU) relationships

Some of the volume of fish and shellfish caught in the proposed closure area will be captured within the EU logbook system used to record catches of over 10m vessels by statistical rectangle. This is the only reliable source of spatial distribution of catches, with the marked limitation that the rectangles are large compared to the area of interest.

Primary estimate

The following assumptions and calculation steps have been used to make a primary estimate of values derived from the zone:

- The proposed zone covers part of rectangles 30E6 and E7, which are themselves small in area thanks to the proximity of the coast, (see Figure 1 for positions of rectangles).

- The areas of the rectangles, and the overlap of the proposed area within them, can be measured.

- Assuming, crudely, that fishing effort is distributed evenly within the rectangle, the proportion of catch arising from the proposed zone can be calculated.

This will give a rough indication of the volumes of different species caught by the over-10m fleet in the proposed zone. Ideally this exercise would also be carried out over a 15-year timeframe. However, two factors militate against this: firstly, handling many years of landings data by species, port and rectangle is cumbersome and outside the time resource for this study, so five-year intervals only have been considered, (1995, 2000, 2005); secondly, the requirement for over-10m vessels to declare non-quota species by rectangle only came into force in 2000. A check has been made on the position in 1995 and for scallops and skates/rays the vast majority of catches is recorded by rectangle, while that for crab and lobster is not, (see section 3.2 and tables under correction method 1 for details of under- and over-10m landings at each port). On balance it has been decided to make use of the 1995 data for two species groups where it exists, even though it means taking an average of three years for some species and two for others.

Refinements

The estimate described above will only provide a picture for the over-10m fleet. Extrapolation to include the under-10m fleet can use two methods.

Correction factor method 1

Firstly, a simple comparison of over-10m landings data and all landings data shows a difference that is attributable to the under-10m fleet. This can be added to the catch made by the over-10s, where spatial distribution of activity is defined by rectangle, on a simple pro-rata basis.

Correction factor method 2

It is generally accepted that MFA landings data misses a significant proportion of fish and shellfish landed, particularly in the under-10m fleet. In an attempt to allow for this, a second correction method has been used which examines the proportion of VCUs in each segment of the fleet able to target the zone (i.e. under- and over-10m). VCU data is given in the DEFRA vessel lists by minor port and is reliable. In making this correction it is assumed, crudely, that the proportion of fleet effort aimed at any of the species under review is equal in the under- and over-10m segments, as is the catch efficiency per VCU. Encompassing the whole fleet able to target the zone in this way hopefully gives an indication of the total output of the under-10m fleet, not just that declared.

The proposed closure zone lies within the 0-6 mile band. In the Devon SFC area there is an upper limit of 15.24m overall length permitted to fish within six miles. In the Southern SFC district the limit is 12m, so only the VCUs within these limits in the minor ports within the relevant county have been considered. In selecting the fleet segment to make a proportional uplift to the over-10m data, a view has also been taken as to the minimum length of vessels likely to access the zone in each minor port. The minimum has been assumed to be none at those ports within the zone to 7m at the ports further afield.

Arc cross-check

In addition, rectangle data can also be used to assess the normal fishing range of the over-10m fleet and so the validity of the fishing arcs estimated by the SFCs. However, this step is only worth examining for the Brixham scallop catch, which has by far the highest volume of any of the ports under consideration, and is believed to be the landing port for much of the scallop under debate. The landings of other species and ports are too low, or estimated to be undertaken predominantly by the under-10m fleet, to warrant analysis.

3. Overflight observations and proportions of national catch

The MFA overfly the UK coast approximately once per fortnight as an effort to monitor and enforce compliance with UK and EU fishery regulations. Sightings of vessels are recorded in a routine manner and logged by position and type of fishing, one of which is scalloping, another potting/netting.

Data has been gained showing the numbers and location of sightings of UK scallop vessels in English, Welsh and Manx waters in 1995, 2000 and 2005. The numbers within the zone and those elsewhere in English, Welsh and Manx waters can be compared. This proportion of sightings (zone:national) can be applied to the recorded national catch to arrive at an estimate of the relative importance of the zone. This method has several weaknesses, but it

has been attempted as a further cross-check on the estimates gained by methods 1 and 2. Again, it has been attempted at three points in time to avoid undue data processing.

This method has not been attempted for potters firstly as there is less dispute about their area of operation and secondly the national catch is derived from a large number of small vessels fishing close inshore. Experience from previous exercises shows that these vessels are unlikely to be picked up in overflight sightings as uniformly as are scallopers.

2.5 Charter fishery and angling values

Fortunately the Drew report on the economic contribution of recreational sea angling in England and Wales provides a recent estimate of spend per angling-day for each of shore, own-boat and charter-boat sea angling.

The number of charter- and own-boat anglers have already been estimated in the English Nature dossier. These were updated through interviews with knowledgeable, but neutral, sources local to the ports likely to be used to access the proposed zone, principally the harbour masters in West Bay, Lyme Regis and Teignmouth. The number of vessel trips were recorded, as well as average numbers of anglers per vessel for sea anglers. Care was taken to structure questions such that an annual picture could be established: often respondents to questions on activity in their area tend to recall and discuss the extremes first. The range of these activities from each port was gained, so as to be able to estimate the degree of reliance on the proposed zone. The contribution of shore-based anglers has been ignored as their behaviour seems unlikely to change, whatever the outcome of management of the proposed zone.

In contrast to commercial fisheries, historical data for angling in the area has not been assessed.. This is because there is less likely to be a sustainability issue, i.e. what is currently practised (including catch and release) is likely to reflect what could continue under certain protection options. Also, there is no source of data describing levels of angling activity over earlier periods.

2.6 Diving values

Investigations have been undertaken with the British Sub-Aqua Club (the UK national body for sports diving). Unfortunately, no equivalent study to the Drew report is available for diving.

As an alternative, data on general tourism spend in Dorset has been assessed[5]. The data is survey-based, using a broad sample of tourists in many locations in Dorset. It seems unlikely to adequately capture economic contribution by divers operating in and around the proposed zone. Therefore, it has been assumed that divers will spend the same as anglers per day in the pursuit of their sport. This seems reasonable, as both sports rely on use of vessels, petrol and equipment at roughly equivalent rates and values. Expenses for accommodation, food and drink would also be similar.

It is further assumed that spend per head in dive club vessels is the same as that in charter boats. Although the charter vessel spend represents a profit element for the owner/skipper, (so is arguably higher than the club members spend on going to sea), club members will have contributed to depreciation of the their club's vessel and cost of transporting it to the site, compensating somewhat

[5] *Dorset and New Forest Full Visitor Survey*, 2005, The Market Research Group, Bournemouth University, 2006.

for the skipper's profit element. The only other possible comparison is own-boat anglers, where the assumption is that the angler meets the full cost of the vessel alone, which is clearly not the case with dive clubs.

The numbers and operating ranges of the vessels concerned were gained through interviews using the same sources and methods as described above for anglers, and cross checked via a local dive shop/dive charter operator in one case.

3 Estimates of fisheries value of zone

The calculations for the three methods of estimating fishing values are shown in the following sections. These are followed by a discussion of the strengths and weaknesses of the methods, and the likely plausible range of values derived from each main method of fishing in the proposed closure zone. It should be noted that not all raw data and calculation steps have been included in the report as they are mainly on large spreadsheets which would make the report very bulky.

3.1 Port landings and estimates of sources

As a starting point, port volumes and values have been collected and summarised. Fifteen-year average volumes for each port are shown below. The table also shows these volumes expressed in value terms using 2005 prices. These prices have been derived from a simple division of total value by total volume for all ports in the 2005 data.

Table 1: Summary of 15-year average landings of species of interest, with values derived from 2005 prices, for all ports around Lyme Bay.

Port	Species							
	Scallop		Crab		Lobster		Skates/Rays	
	Volume (tonnes)	Value (£)	Volume (tonnes)	Value (£)	Volume (tonnes)	Value (£)	Volume (tonnes)	Value (£)
Brixham	2348	3,470,480	122	163,790	1	13,599	203	194,438
Teignmouth	41	61,016	2	2,332	1	11,368	1	960
Exmouth	118	174,014	3	163,790	1	13,599	16	194,438
Beer	1	916	68	90,806	2	22,950	1	1,028
Lyme Regis	83	123,102	14	18,891	1	13,450	16	15,325
West Bay	5	7,588	14	18,750	1	10,353	7	6,333
Weymouth	103	152,908	923	1,240,362	17	193,832	39	37,677

The estimated areas of fishing derived from interviews are shown below by port and species.

Table 2: Summary of likely fishing areas for species/methods of interest from ports around Lyme Bay

Port / species	Location	Notes
Brixham		
Scallops	100 mile arc	Hotspots Lyme Bay, Start Point, Eddystone (though Eddystone catches more likely to be Plymouth landings)
Skate / ray	Not zone	Offshore trawled
Crab / lobster	Not zone	
Teignmouth		
Scallops	West Bay to Teignmouth and 6 miles off	
Skate / ray	10mile arc	
Crab / lobster	10mile arc	
Exmouth		
Scallops	North of line Teignmouth to Portland	
Skate / ray	North of line Teignmouth to Portland	Note mostly trawled
Crab / lobster	North of line Teignmouth to Portland	
Beer		
Scallops	5 mile arc	
Skate / ray	5 mile arc	
Crab / lobster	5 mile arc	
Lyme		
Scallops	10 mile range E&W, 4.5 miles out	This is average of two SFC estimates Southern = 20 miles either side and 4.5 miles out. Devon = all in zone
Skate / ray	Inside 3 miles, 10 miles either side	This is average of two SFC estimates Southern = 20 miles either side and 3 miles out. Devon = all in zone
Crab / lobster	Inside 3 miles, 10 miles either side	This is average of two SFC estimates Southern = 20 miles either side and 3 miles out. Devon = all in zone
West Bay		
Scallops	5 mile arc	Southern = within 3 miles of coast or more than 12 miles off. Difficult to quantify area. Devon estimate used.
Skate / ray	5 mile arc	
Crab / lobster	5 mile arc	
Weymouth		
Scallops	0-6 miles out as far W as West Bay	
Skate / ray	0-3 miles out from West Bay to St Alban's Head	
Crab / lobster	0-3 miles out from West Bay to St Alban's Head	Note fixed gear hotspot round Portland Bill, probably little significant out of zone for Weymouth crust landings.

Figure 2: Brixham fishing areas

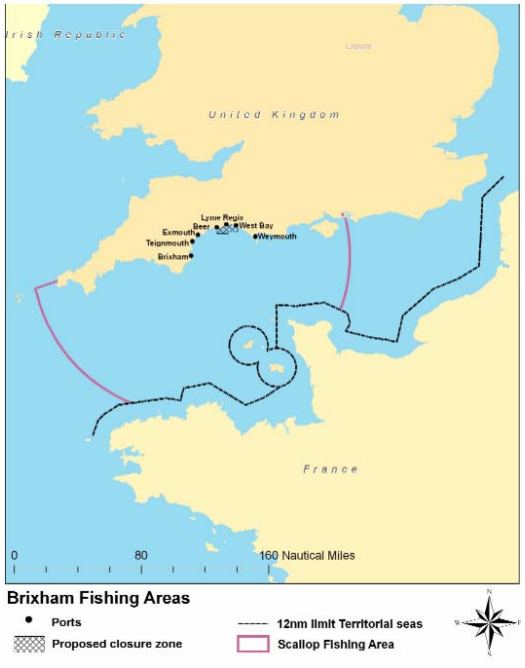


Figure 3: Teignmouth fishing areas

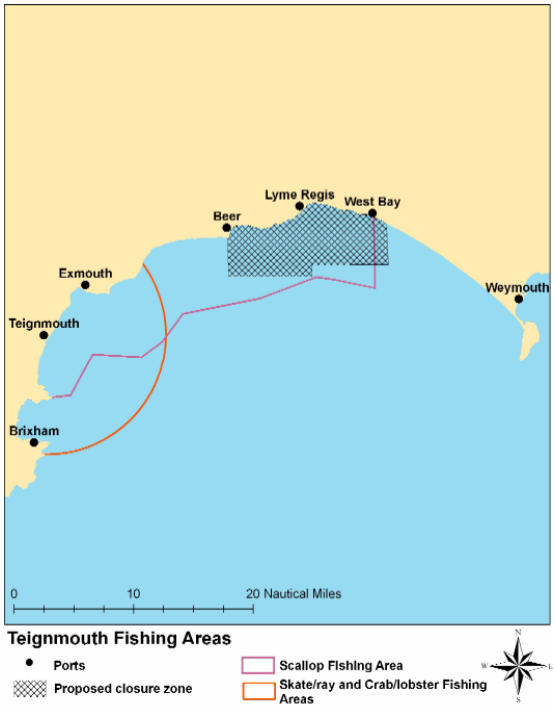


Figure 4: Exmouth fishing areas

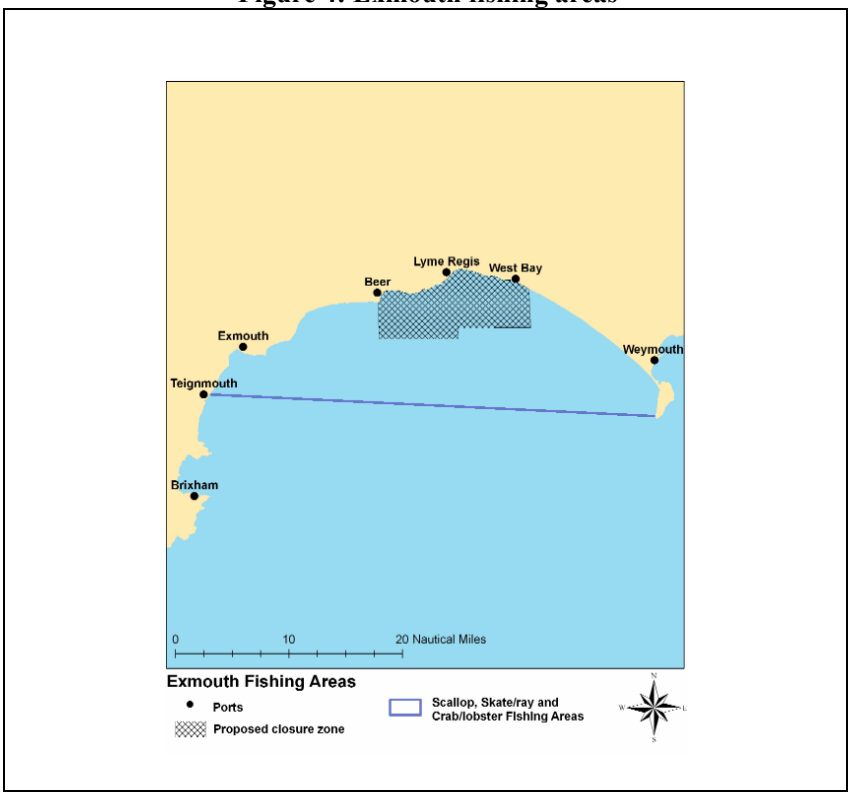


Figure 5: Beer fishing areas

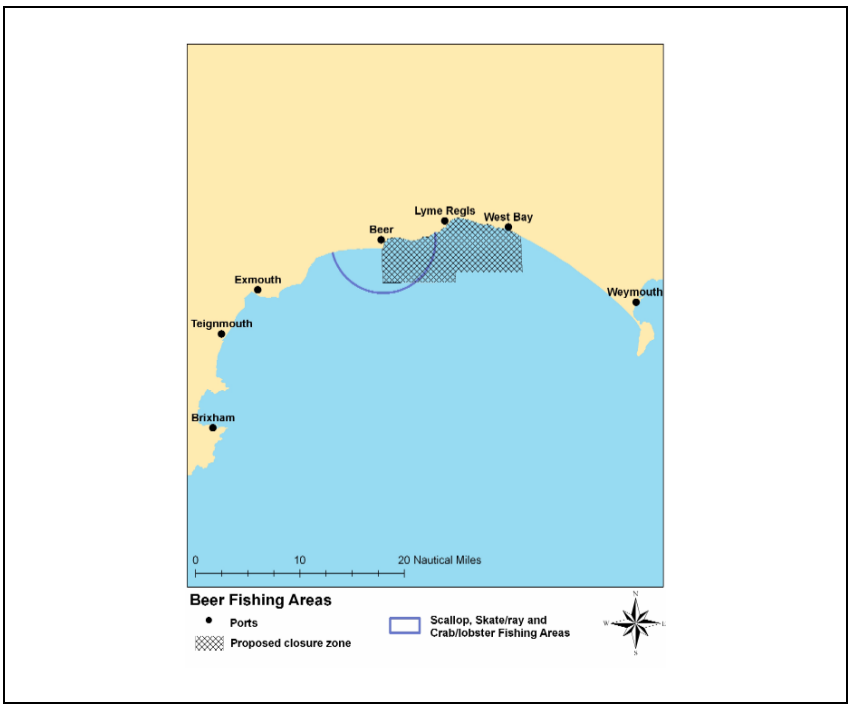


Figure 6: Lyme Regis fishing areas

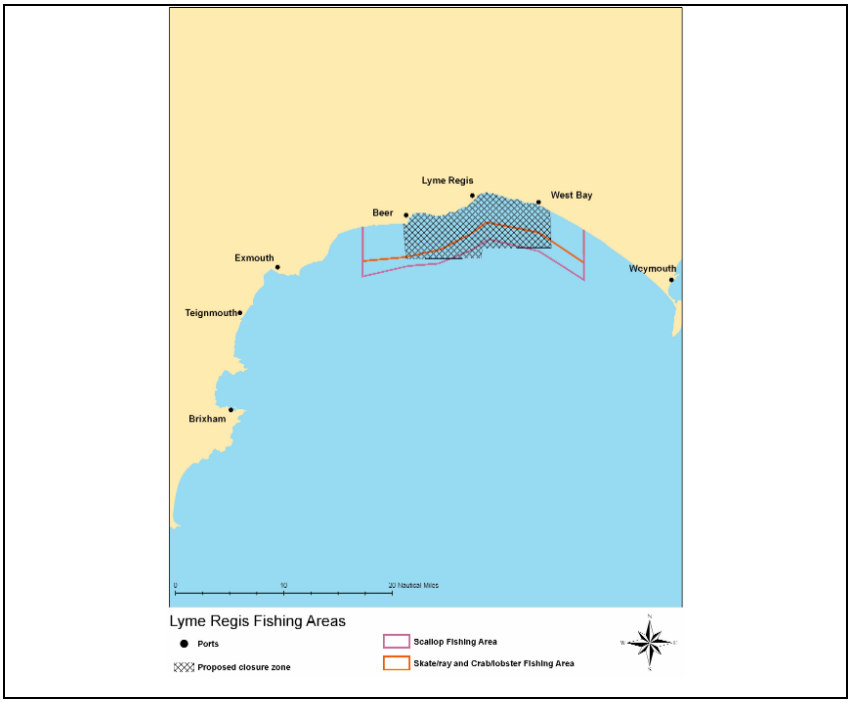


Figure 7: West Bay fishing areas

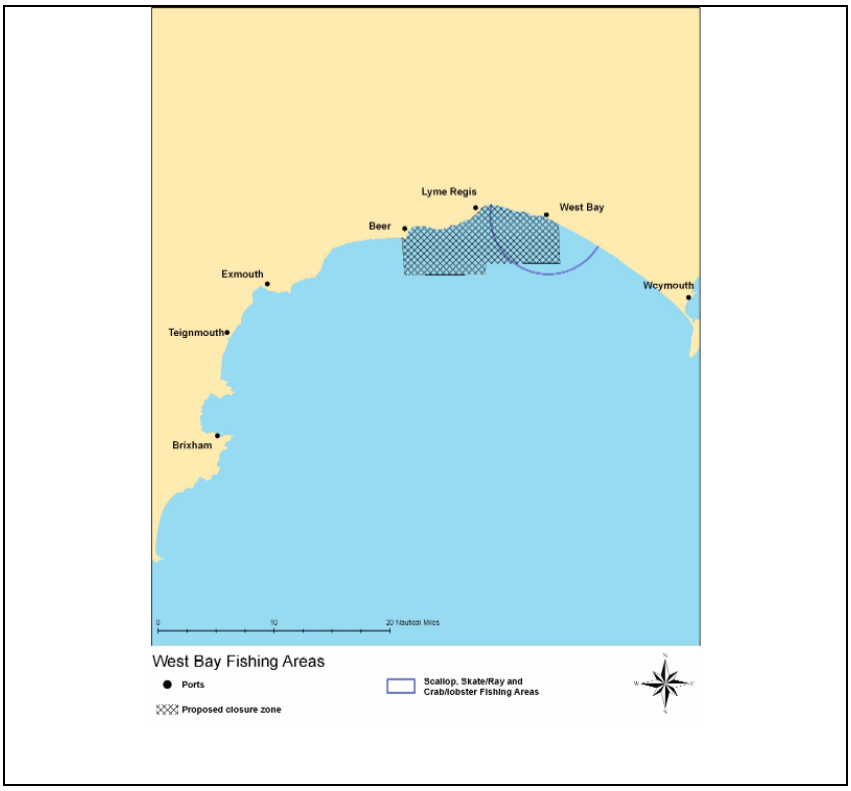


Figure 8: Weymouth fishing areas

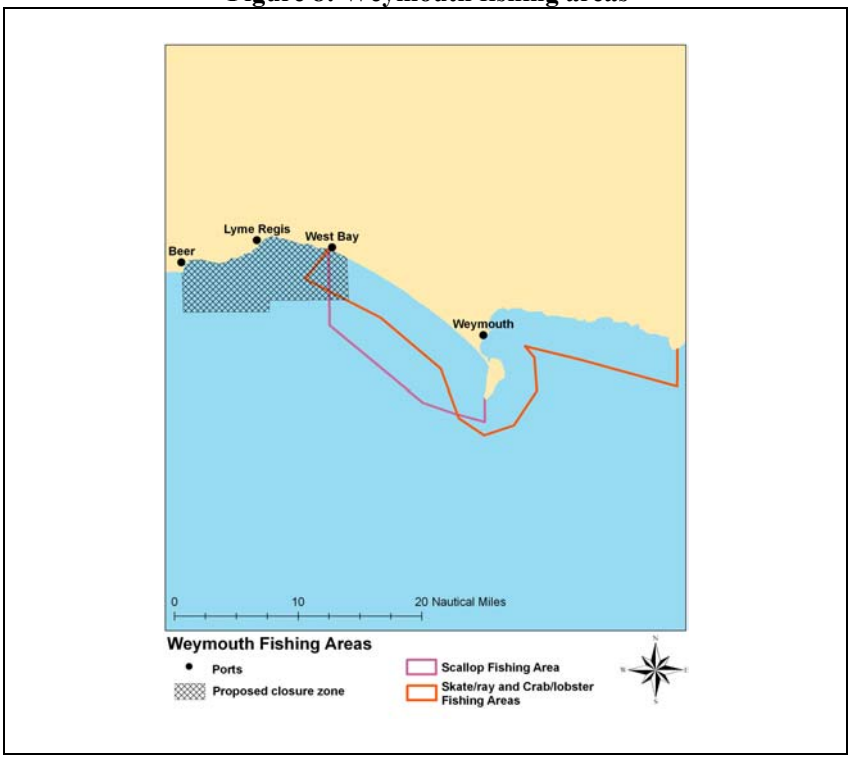


Table 3: Fishing areas, overlap with zone and estimates of commercial fishing values derived from zone

Fishing areas	Total area (nm^2)	Area overlapping proposed closure zone (nm^2)	Proportion overlap with zone	Gross value (£)	Value derived from zone (£)
Brixham					
Scallops	14576	60	0.004	3,470,480	14,286
Teignmouth					
Scallops	174	56	0.322	61,016	19,637
Skate/ray	123	0	0	0	0
Crab/lobster	123	0	0	0	0
Exmouth					
Scallops	314	60	0.191	174,014	33,251
Skate/ray	314	60	0.191	15,021	2,870
Crab	314	60	0.191	3,805	727
Lobster	314	60	0.191	11,368	2,172
Beer					
Scallops	36	19	0.528	916	483
Skate/ray	36	19	0.528	1,028	543
Crab	36	19	0.528	90,806	47,925
Lobster	36	19	0.528	22,950	12,113
Lyme Regis					
Scallops	90	56	0.622	123,102	76,597
Skate/ray	59	37	0.627	15,325	9,610
Crab	59	37	0.627	18,891	11,847
Lobster	59	37	0.627	13,450	8,435
West Bay					
Scallops	34	24	0.706	7,588	5,356
Skate/ray	34	24	0.706	6,333	4,471
Crab	34	24	0.706	18,750	13,235
Lobster	34	24	0.706	10,353	7,308
Weymouth					
Scallops	89	7	0.079	152,908	12,026
Skate/ray	131	5	0.038	37,677	1,438
Crab	131	5	0.038	1,240,362	47,342
Lobster	131	5	0.038	193,832	7,398

3.2 ICES statistical rectangles

The proposed zone is located in part of ICES rectangles 30E6 and 30E7. Figure 1 in the Introduction shows their lay-out relative to the proposed zone. The areas of the two rectangles and their overlap with the proposed zone are as follows.

Table 4: Areas of rectangles and overlap with proposed zone

Rectangle	Total area (nm^2)	Zone overlap area (nm^2)
30 E6	174	15
30 E7	352	44
Total	**526**	**59**

The zone occupies (59/526) = 11.3% of the two rectangles.

Catches from the over-10m fleet from the two rectangles are shown below for years 1995, 2000 and 2005 in the case of scallops and skates/rays, and 2000 and 2005 only for crab and lobster. The average of these two or three intervals is assumed to be representative of the steady state of fishing distribution and indicative of likely levels of future catches.

Scallops

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)
1995	34.26	0.113	3.87
2000	466.37	0.113	52.70
2005	692.26	0.113	78.24

Average volume of three intervals (tonnes)	44.93
2005 price (£)	1,437
Value (£)	**64,565**

Crab

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)
2000	57.4	0.113	6.5
2005	89.3	0.113	10.1

Average volume of two intervals (tonnes)	8.3
2005 price (£)	1,344
Value (£)	**11,141**

Lobster

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)
2000	1.30	0.113	0.15
2005	5.40	0.113	0.61

Average volume of two intervals (tonnes)	0.38
2005 price (£)	11,368
Value (£)	**4,301**

Skate/ray

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)
1995	23.2	0.113	2.62
2000	33.3	0.113	3.76
2005	7.1	0.113	0.81

Average volume of three intervals (tonnes)	2.40
2005 price (£)	960
Average value of three intervals (£)	**2,300**

The above data is only representative of the situation for over-10m vessels. Clearly there will be a contribution from the under-10s and this has been estimated in two ways.

Correction for under-10s – Method 1

This correction method involves comparing over-10m catches with all catches, by species and port, for each of the three selected years, so as to add the contribution from the under-10m fleet. This correction assumes that the under-10s will mirror the distributional fishing pattern of the over-10s, which is, of course, unlikely. This uncertainty is discussed later.

The following three tables show the comparison of the over-10m catches recorded by rectangle, and the remainder for each of the three years. For example, for Brixham in 1995, 2,516 out of a total of 2,534 tonnes of scallops were attributed to the over-10m fleet and catches recorded by rectangle. In all ports for scallops there are only 30 tonnes unattributed. It is assumed these 30 tonnes are from the under-10m fleet and so the landings estimated for the zone above can be increased by a factor of 1.01 to include these. The situation for crab and lobster is very different: the vast majority were unattributed in 1995; by 2000 the situation had changed and over half of the catch was attributed to the over-10m fleet, with landings shown by rectangle. Obviously a minor correction for scallops is almost meaningless, but this method does assist with estimating distribution of effort in other species where the proportion of over-10m catches in the total is lower than scallop. As the crab and lobster catch is largely unattributed in 1995 (possibly through lack of mandatory declaration) the analysis for these species for that year is omitted.

Table 5: Comparison of landings from over-10m vessels and all vessels into ports around Lyme Bay, 1995 (tonnes)

	Scallops			Crab			Lobster			Skate& ray		
	>10m	all	diff	>10m	all	diff	>10m	all	diff	>10m	all	diff
Brixham	2516	2534	17	61	159	98	0	0	0	243	254	11
Teignmouth	0	0	0	0	0	0	0	0	0	0	0	0
Exmouth	36	39	3	0	2	2	0	0	0	10	10	0
Beer	0	0	0	0	23	23	0	1	1	0	0	0
Lyme Regis	5	13	8	0	9	9	0	1	1	12	18	6
West Bay	0	2	1	0	59	59	0	3	3	1	12	11
Weymouth	89	89	0	0	898	898	0	12	12	36	38	2
Total	2646	2677	30	61	1149	1089	1	17	16	302	332	30
Correction factor			1.01			18.96			27.45			1.10

Table 6: Comparison of landings from over-10m vessels and all vessels into ports around Lyme Bay, 2000 (tonnes)

	Scallops			Crab			Lobster			Skate& ray		
	>10m	all	diff	>10m	all	diff	>10m	all	diff	>10m	all	diff
Brixham	3608	3651	43	20	29	9	0	1	0	168	180	12
Teignmouth	61	61	0	0	0	0	0	0	0	0	0	0
Exmouth	175	175	0	0	0	0	0	0	0	23	23	0
Beer	0	0	0	0	57	57	0	1	1	0	0	0
Lyme Regis	59	150	92	0	0	0	0	0	0	11	13	2
West Bay	1	1	0	0	0	0	0	0	0	0	18	18
Weymouth	268	271	3	669	869	199	11	14	4	29	47	18
Total	4171	4309	137	690	956	266	12	17	5	231	281	50
Correction factor			1.03			1.39			1.47			1.22

Table 7: Comparison of landings from over-10m vessels and all vessels into ports around Lyme Bay, 2005 (tonnes)

	Scallops			Crab			Lobster			Skate& ray		
	>10m	all	diff	>10m	all	diff	>10m	all	diff	>10m	all	diff
Brixham	3289	3351	63	31	85	54	1	2	1	121	139	18
Teignmouth	124	124	0	0	6	6	0	0	0	0	0	0
Exmouth	287	388	101	0	0	0	0	0	0	0	13	13
Beer	0	0	0	0	0	0	0	0	0	0	0	0
Lyme Regis	201	201	0	0	0	0	0	0	0	0	4	4
West Bay	0	45	45	0	0	0	0	0	0	0	0	0
Weymouth	54	54	1	329	520	191	22	23	1	0	21	21
Total	3954	4163	209	360	610	250	23	25	2	121	178	57
Correction factor			1.05			1.70			1.10			1.47

The application of correction factors is shown in the following calculations.

Scallops

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch
1995	34.26	0.113	3.87	1.01	3.91
2000	466.37	0.113	52.70	1.03	54.28
2005	692.26	0.113	78.24	1.05	82.14

Average volume of three intervals (tonnes)	46.78
2005 price (£)	1,437
Value (£)	**67,214**

Crab

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
2000	57.4	0.113	6.5	1.39	9.02
2005	89.3	0.113	10.1	1.70	17.15

Average volume of two intervals (tonnes)	13.09
2005 price (£)	1,344
Value (£)	**17,587**

Lobster

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
2000	1.30	0.113	0.15	1.47	0.22
2005	5.40	0.113	0.61	1.10	0.67

Average volume of two intervals (tonnes)	0.44
2005 price (£)	11,368
Value (£)	**5,039**

Skate/ray

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
1995	23.2	0.113	2.62	1.10	2.88
2000	33.3	0.113	3.76	1.22	4.59
2005	7.1	0.113	0.81	1.47	1.19

Average volume of three intervals (tonnes)	2.89
2005 price (£)	960
Average value of three intervals (£)	**2,770**

Correction for under-10s – Method 2

The second correction method involves an uplift based on the proportions of VCUs in each fleet segment likely to target the zone. The total VCUs of the fleet segments able to target the zone in the ports under review are shown below, (see section 2.4.3 regarding selection of vessels for inclusion).

Year	over-10m VCU	under-10m VCU	Correction factor
1995	2800	4615	2.65
2000	4294	4964	2.16
2005	3497	4580	2.31

The correction factors are calculated as an ratio of total fishing power compared to the over-10m fleet which for which rectangle data is available. These factors have been applied to each of the years, where data allows, and an average taken as before.

Scallops

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch
1995	34.26	0.113	3.87	2.65	10.25
2000	466.37	0.113	52.70	2.16	113.62
2005	692.26	0.113	78.24	2.31	180.69

Average volume of three intervals (tonnes)	101.52
2005 price (£)	1,437
Value (£)	**145,881**

Crab

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
2000	57.4	0.113	6.5	2.16	13.99
2005	89.3	0.113	10.1	2.31	23.30

Average volume of two intervals (tonnes)	18.65
2005 price (£)	1,344
Value (£)	**25,063**

Lobster

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
2000	1.30	0.113	0.15	2.16	0.32
2005	5.40	0.113	0.61	2.31	1.41

Average volume of two intervals (tonnes)	0.86
2005 price (£)	11,368
Value (£)	**9807**

Skate/ray

Year	Catch in 30E6 & 30 E7	Proportion zone	Catch from zone (tonnes)	Correction factor	Corrected catch (tonnes)
1995	23.2	0.113	2.62	2.65	6.94
2000	33.3	0.113	3.76	2.16	8.11
2005	7.1	0.113	0.81	2.31	1.87

Average volume of three intervals (tonnes)	5.64
2005 price (£)	960
Average value of three intervals (£)	**5,412**

3.3 Sightings

The MFA overflight sightings for England, Wales and Manx waters for 1995, 2000 and 2005 are shown in the following charts.

Figure 9: MFA sightings of UK scallop fishing vessels in English and Welsh waters, 1995

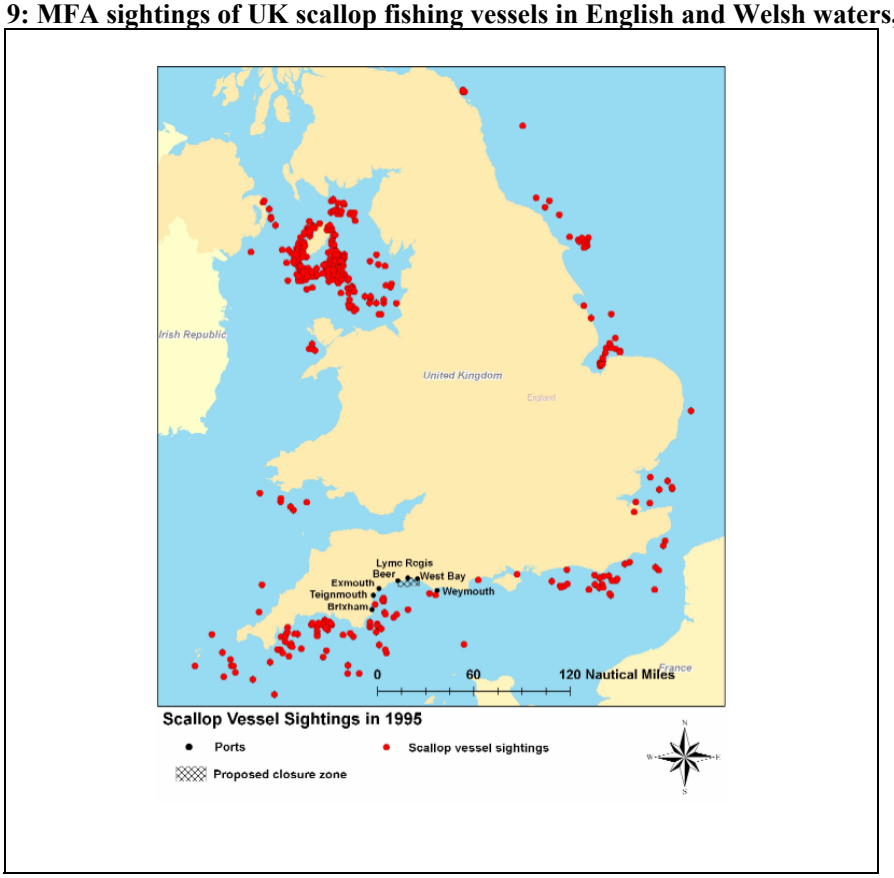


Figure 10: MFA sightings of UK scallop fishing vessels in English and Welsh waters, 2000

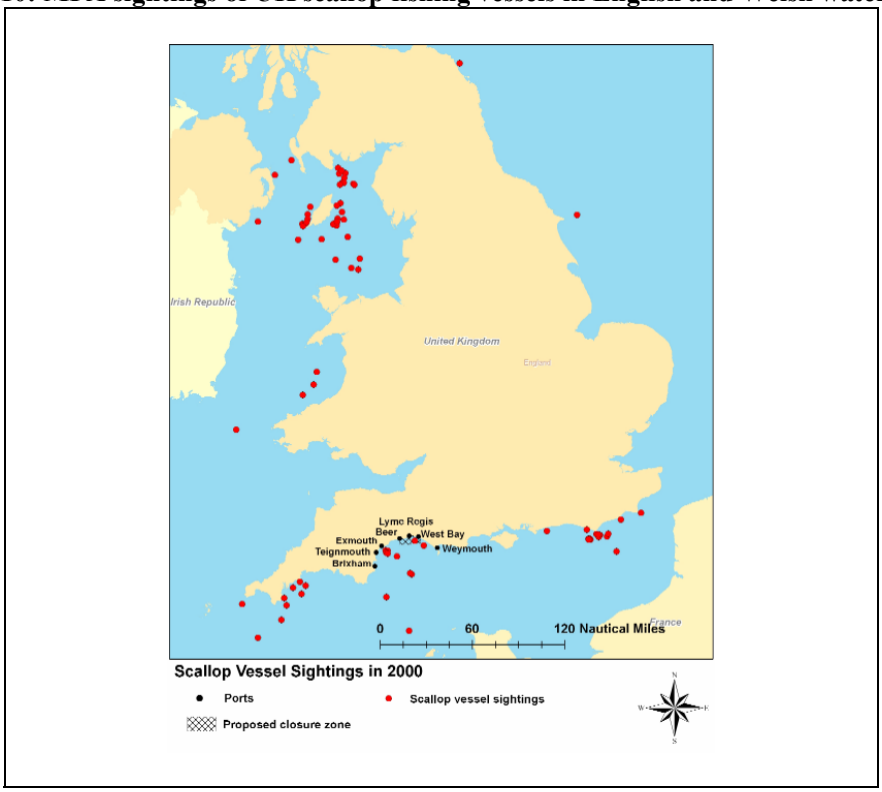
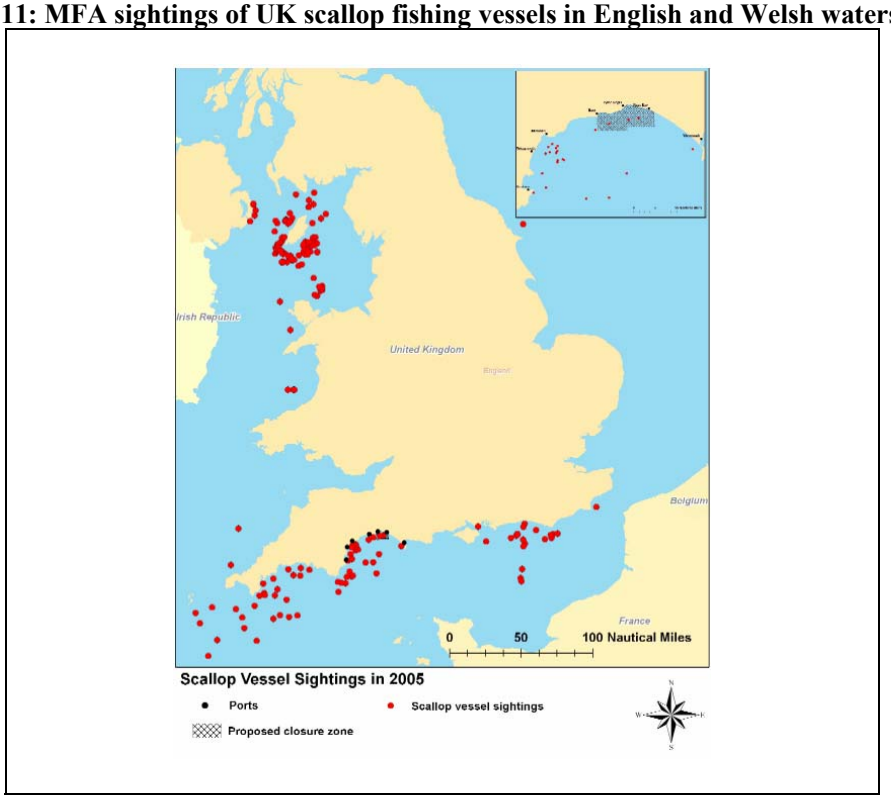


Figure 11: MFA sightings of UK scallop fishing vessels in English and Welsh waters, 2005



National catch, the number of sightings, and sightings within the proposed zone are compared in the table below. Given the density of sightings around the Isle of Man, the catch in Manx ports (not recorded by the MFA) was included in the total.

Table 8: Estimates of scallop catch value from proposed zone based on overflight data

	Landings (tonnes)		
	1995	**2000**	**2005**
England	5,917	9,609	9,803
Wales	229	787	395
IOM	Nd[1]	965	1,016
Total	6,145	11,361	11,214
Sightings	545	84	200
Landings/sighting (tonnes)	11	135	56
Zone sighting	0	1	3
Zone attributable (tonnes)	0	135	168
Average (tonnes)			101
2005 price (£/tonne)			1437
Value (£)			**145,357**

1: Data not available but does not influence result as 0 sightings in zone in 1995

3.4 Discussion of fisheries value estimates

The following table summarises the estimates of fishery values derived from the zone, based on methods and calculations set out so far.

Table 9: Summary of estimated commercial fishing values from proposed zone, by method of estimation (£)

	Proportional area	ICES rectangle			Sightings
		over-10m only	Whole fleet Correction Method 1	Whole fleet Correction Method 2	
Scallops	161,636	64,565	67,214	145,881	145,357
Crab	121,058	11,141	17,587	25,063	
Lobster	37,426	4,301	5,039	9,807	
Skates/rays	18,932	2,300	2,770	5,412	

All methods are inherently approximate and some interpretation may shed light on ranges of possible values derived from the zone. The following discussion aims to examine the limits and narrow down some plausible ranges and probable values.

The estimates of area of fishing are unavoidably generalised. The scallop landings at Brixham are significantly in excess of the other ports in the area. The size of the arc of operation of the Brixham fleet thus has a significant influence on estimates scallop landings from the proposed zone.

The arcs can be compared with landings by ICES rectangles for the over-10m fleet. The following charts show the distribution of catches by ICES rectangle. For simplicity, only those rectangles

contributing to 5% or more of the total have been plotted: there are many more rectangles both within and beyond the 100 mile arc that contribute small amounts to the Brixham total.

Figure 12: Distribution of scallop landings into Brixham, 1995, over-10m vessels only, principal rectangles only, also 30E6 & 30E7

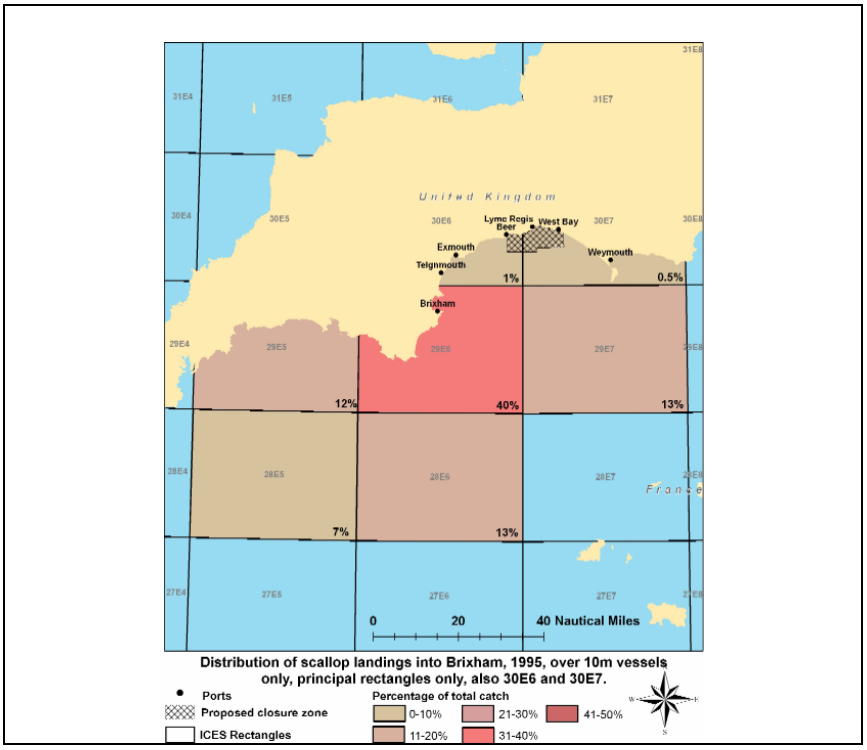


Figure 13: Distribution of scallop landings into Brixham, 2000, over-10m vessels only, principal rectangles only, also 30E6 & 30E7

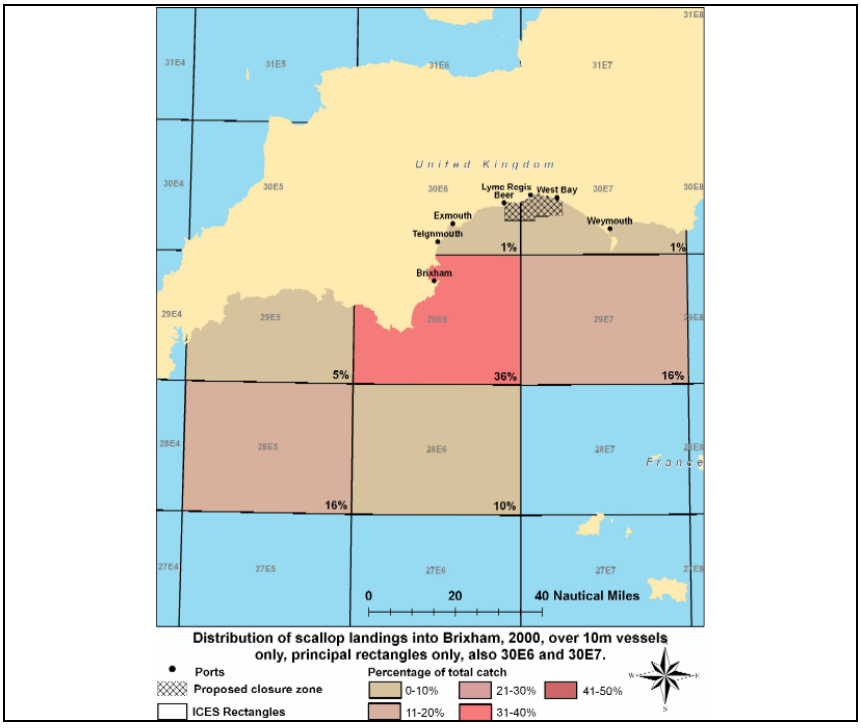
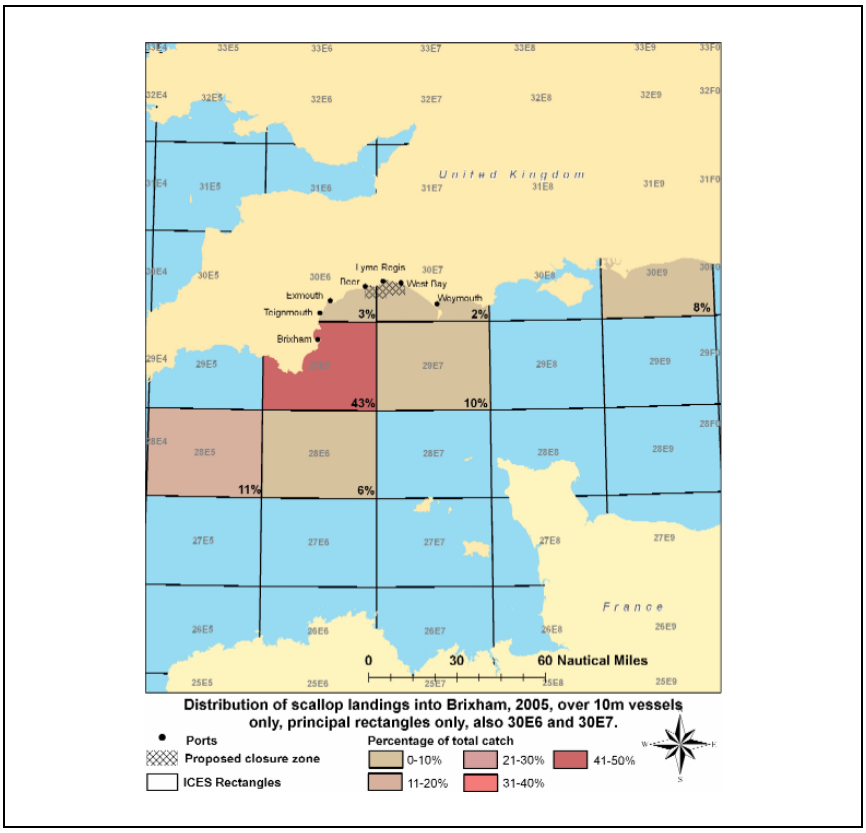


Figure 14: Distribution of scallop landings into Brixham, 2005, over-10m vessels only, principal rectangles only, also 30E6 & 30E7



The maps show that the bulk of the scallops are caught in relatively few rectangles nearest the port. Therefore, it seems that an arc of operation of some 60 miles (roughly Brixham to the south-east corner of rectangle 28E6) is more plausible than the 100 mile estimate used earlier. Reducing the diameter of the arc to 60 miles reduces the area to 36% of its former size, $((60/100)^2 = 0.36)$. Thus the landings value given in Table 3 for Brixham could increase to (£14,286/0.36) = £39,683, and the overall value derived by this method for scallops to £187,033. These maps, together with the sightings maps, show the changing importance of the different fishing areas over time, with increased focus on Lyme Bay in 2005.

The large difference between the proportional area method and the ICES method – especially for crab, lobster and skates/rays – is a result of the assumption that effort is spread evenly throughout the whole rectangle in the latter method. The estimates given by the SFC's are generally for smaller areas than the rectangle for these species.

Regarding the ICES rectangle method, the difference between the correction factors is significant. The landings data suggests that the vast majority of scallops are caught by the over-10m fleet, though there is an increasing total of under-10m scallop landings at Exmouth more recently. The method for uplifting catches in proportion to available VCUs assumes effort is equally distributed across species/methods in the two fleet segments. This is obviously not the case for scallops. It is likely that the under-10m effort is skewed towards crab/lobster, with relatively little directed at scallop. The VCU-derived uplift in the case of scallops is therefore not very meaningful. The coincidence of this figure with that from the sightings method is thus completely fortuitous. The sightings method is a useful cross-check to the other methods, though is weak as it relies on so few

data points. However, under the circumstances, the close coincidence gives a degree of confidence that the other two methods give answers in the correct area.

Value ranges

The distribution of effort is of course not uniform within estimated fishing areas, nor within rectangles. The proposed zone may be of greater or lesser importance than the averages used. There is thus still a wide area of uncertainty as to the true economic value that the zone provides various fisheries. This can not be determined with more certainty without detailed analysis of fishing positions for the various activities, over a long time period. This information is unlikely to exist or to be available over the time period required, and with the uniformity needed to safely assess the economic value at a more refined scale.

It is possible that users of this report may wish to consider the extreme limits of possibilities of what might be derived from the zone, given the data available. Although partially conjecture, it is also perhaps worth also narrowing down from these extreme limits a more plausible set of ranges that are likely to reflect reality. These are discussed below.

Considering scallops, in the most extreme case, all of the scallops reported as being caught in rectangles 30E6 and 30E7 by the over-10m fleet in the ports studied could be derived from the proposed zone. This would give an average contribution of 398 tonnes, worth £571,000 at the 2005 price. Again at the extreme, none of the under-10m catches of scallop are recorded by rectangle and it could, in theory, all be taken within the proposed zone. The average catch (1995, 2000, 2005) of the under-10m fleet in the ports likely to target the zone is 125 tonnes, worth some £180,000. This gives the maximum possible value of scallop landings that could theoretically be related to the zone as £751,000, (£571,000 + 180,000). This is clearly implausible, as the sightings data and general understanding of the situation suggests that other areas contribute to the catch reported within these rectangles. A plausible maximum might be that the proposed zone accounts for 50% of the scallops reported for these rectangles, not some 11% derived from purely pro-rating areas, putting an upper limit at £289,000 for the over-10m fleet, (£571,000 x 50%). The under-10m scallop landings arise at Brixham, Exmouth and West Bay. Given their more limited range, it is possible to assume (at the limit of plausibility) that the zone may provide 70% of all under-10m scallop landings in the area. The total value landings amount to £415,000 in all, ((£289,000 + (£180,000 x 70%)).

Looking at the other extreme, it is difficult to argue that the scallop catch from the zone is zero, or the damage to the biota in the area would not have raised the concern it has. Therefore, a theoretical minimum is not considered. A minimum plausible value might be that the zone is overall equal in importance to the rest of the rectangles, so giving a value of £67,214, (using only the first correction step above to arrive at a whole-fleet basis.)

Given the overflight sightings data, and effort distribution recorded by Devon Sea Fisheries Committee vessel sightings, it seems reasonable to suppose that a two-to-threefold increase in importance of the area compared to the pro-rated average is somewhere near the true situation, i.e. 22-33% of the rectangles' landings being derived from the proposed zone. This would produce a value figure in the range of £126,000 to £188,000 for the over-10m vessels. Assuming that the under-10s dependency is nearer 40% in reality, for the same reasons, then they would derive a further £72,000 from the zone, or some £198,000 to £260,000 for both fleet segments combined.

It is worth reiterating at this point that this report is endeavouring to establish the long-term historical picture, not a snapshot of what has happened in the last year or two. The long-term picture

is thought to be more representative of what could be achievable in 'steady state' production from the zone.

For the other species, (considered as a group which is mutually exclusive to scallops for the purposes of the report), it is difficult to assess much further what the possible range of values derived from the zone might be. A lower proportion of catches is recorded by rectangle, compared to scallops. A lower proportion of catches are recorded by rectangle compared to scallops and that which is, tends to be dominated by Weymouth and Brixham, furthest from the proposed zone.

Using the same approach as for scallops (at the extreme) all of the landings recorded by within 30E6 and 30E7 and all the under-10m vessels with unknown fishing areas might be derived from the zone. The table below shows the value of such a scenario.

Table 10: Maximum theoretical landings value of crab, lobster and skates/rays from the proposed zone

	Crab	Lobster	Skate/Ray	Total
30E6 &E7 for over-10s, (tonnes)	73	4	21	
All areas for under-10s, (tonnes)	534	8	46	
Total catch	608	12	67	
2005 price (£)	1,344	11,368	960	
Value (£)	817,568	135,305	64,534	1,017,407

Clearly it can not be argued that anything like this value is derived from the zone. Most of the value in this table is derived from crab landed at Weymouth and this will have been caught from the full extent of 30E7, east and west of Portland. The proposed zone is on the western limit of crustacean vessels fishing from Weymouth, estimated by the SFC. However, the fact that the zone contains significant cobbled reef and hard ground suitable for crab and lobster, and its proximity to the shore, probably means that it is more important than the general average for the rectangles.

Using a similar approach to that discussed earlier for scallops, and considering the fleet segments separately, a similar calculation to that above shows the over-10m fleet appears to derive catch values of some £164,000 from the two rectangles for these three species on average over a similar time period, (2000 and 2005 for crustacea; 1995, 2000 and 2005 for skates/rays). (The large difference with the total in the table above is due to the removal of a large value of under-10m crab catch at Weymouth).

Given what is known about the crustacean fleet, a plausible maximum scenario is that the zone is threefold more important to the over-10m fleet than the average within the rectangles, giving a value for this segment of some £54,000, (£164,000 x 33%). For the under-10s, a maximum plausible scenario is 80% dependency on the zone for the small ports between Brixham and Weymouth, and 10% at these larger ports at these extremities. This gives a value of £135,000, or some £189,000 for the whole fleet.

At a plausible minimum, given the nature of the substrate and the relatively high level of dependence on the area in the small ports of Beer, Lyme and West Bay, at least uniformity of the area compared to the rest of the rectangles is reasonable. Correction method 2 of the uplift should be applied as this better reflects the considerable capacity in the under-10s likely to be targeted at crab and lobster. The total for all three species from the calculations, set out for correction method 2 in section 3.2, is £40,282.

The assumption concerning the under-10m fleet in the plausible maximum scenario is perhaps somewhat far-fetched, as much of the crustacean landings of the under-10m fleet in the ports surrounding Lyme Bay is dominated by small boats operating out of Weymouth. These will fish within a few miles of Portland, though some will, of course, venture further off, as well as east and west. The best estimate of a probable value under this method is thus to retain the threefold importance within the rectangles for the over-10s, but reduce dependency to 50% for the small ports, and 5% for Brixham and Weymouth. This scenario is close to that described for the plausible maximum, and gives a figure of £129,000. But, given the uncertainties of the situation, it is difficult to be more definitive.

The discussion of scenarios above is based primarily on the rectangle method. Similar principles could be applied to the (SFC-derived) proportional area method, but this has not been done as discussion of many of the same assumptions about the relative importance of the zone compared to other grounds would be repetitious. Indeed the assumptions on distribution of the under-10s, discussed above, critical to the outcome for crustacea and skates/rays, already use some of the understanding of fishing patterns gained from the SFCs.

The following summary, therefore, presents all the scenarios developed from the ICES rectangle method alongside the findings from the proportional area method.

Table 11: Summary of likely ranges of fishing values derived from proposed zone, proportional area and rectangle methods

	Proportional area	Rectangle based			
		Max. theoretical	Max. plausible	Min. plausible	Probable
Scallops	£162,000 - £187,000	£751,000	£415,000	£67,214	£198,000 - £260,000
Other species	£177,000	£1,017,407	£135,000	£40,282	£129,000

4 Estimates of recreational uses of zone

As well as supporting the commercial fisheries discussed, Lyme Bay is also a popular site for a number of leisure activities, most notably charter and recreational angling and diving. Significant activity takes place in the proposed conservation zone.

In order to assess the economic benefit gained from these activities in the proposed zone, a methodology similar to that applied in the proportional area method for commercial fishing has been used. The only difference is that the period examined was the most recent, i.e. 2006, compared to 10- and 15-year historic averages used for commercial fisheries values. This is because data does not exist to support such analysis.

As discussed earlier, the number of charter and own-boat owners (recreational anglers) has been estimated in the English Nature dossier. Through interviews with local, but neutral sources, these numbers were updated. The project team interviewed two local harbour masters (West Bay and Lyme Regis) to gain their perspective on leisure use of the site. (The Teignmouth harbour master was also interviewed, although it was indicated that the proposed zone was outside Teignmouth's leisure activity area.

Through interviews on activity at weekends and week days, and by season (summer/winter) it was possible to estimate the number of vessel trips over a year, for both own-boat and charter-angling, as well as charter-dive and club-dive trips. The respondents were also asked about the numbers of individuals on board and range of areas used for both diving and angling. Although both activities tend to target wrecks or sea-bed features, it was possible to establish typical ranges of operation.

The numbers of anglers and divers and the ranges of operation are summarised in the following table.

Table 12: Estimated types, numbers of trips and range of recreational activities, West Bay and Lyme Regis

Port / activity	Number of boats at port	Number of boat trips by main season (aggregate)	Location
West Bay			
Charter diving	2 boats (5-6 divers per trip)	286 summer 78 winter	20 mile arc from harbour
Dive clubs	(6 divers per boat)	364 summer 60 winter	20 mile arc from harbour
Charter angling	5 boats (up to 12 people per trip - average 8)	455 summer 0 winter	20 mile arc from harbour
Private angling		1820 summer 130 winter	Inside 6 miles, 5 miles either side
Lyme Regis			
Charter diving	2 boats (6 divers per trip)	338 summer 0 winter	Inside 20 miles, 10 miles either side
Dive clubs		130 summer 50 winter	Inside 20 miles, 10 either side
Charter angling	3 boats (up to 12 people per trip - average 8)	468 summer 0 winter	25 mile arc
Private angling		1495 summer 104 winter	Inside 6 miles, 5 miles either side

The areas described above have been plotted and areas of operation and overlaps with the proposed zone measured using GIS. They are shown in the charts below.

Figure 15: West Bay recreational areas

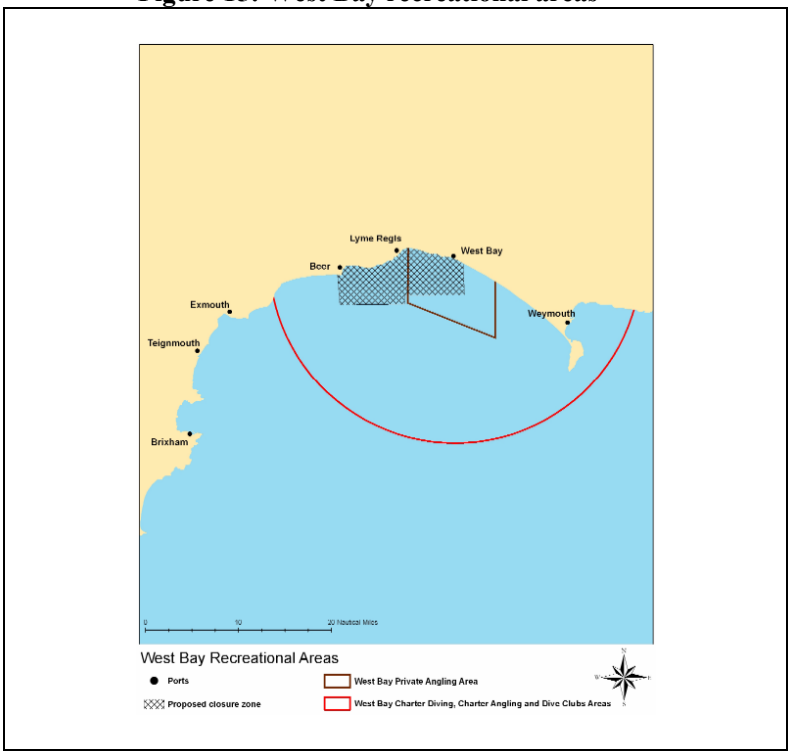
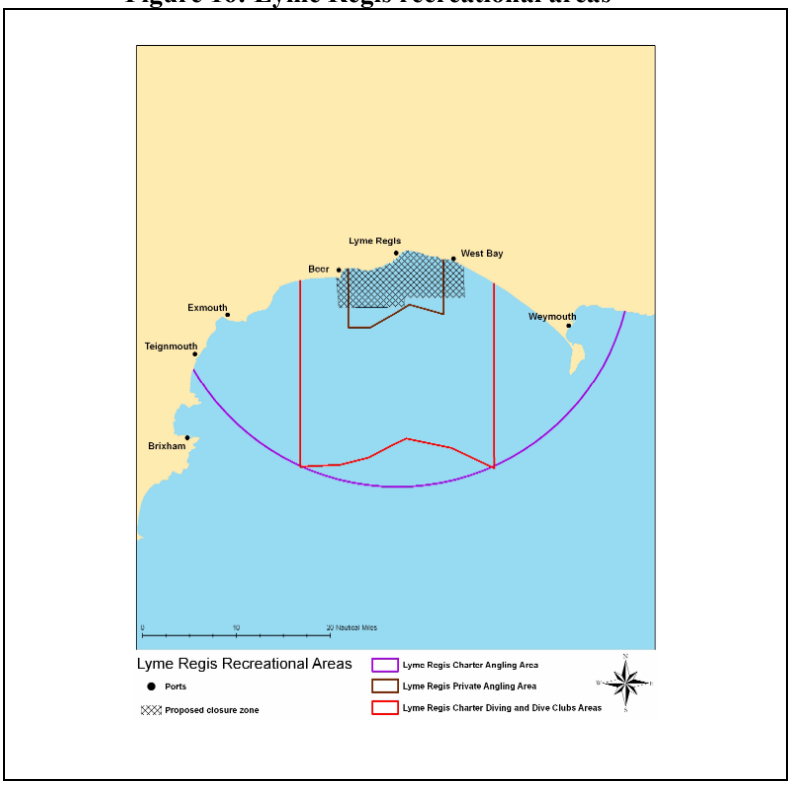


Figure 16: Lyme Regis recreational areas



Through calculations involving average numbers on board per trip, the total number of angler days (charter and own-boat) per year was arrived at. This figure has been then applied to the economic contribution figures given by the Drew report, most notably the average expenditure per day angling.

Table 13: Summary of estimates of expenditure by type of angling (from the Drew report)

Main type of fishing	Expenditure per year (£)	Expenditure per day (£)
Charter boat	1570.40	67.75
Own boat	2566.65	87.90

The total annual spend has been calculated by activity, by port and the proportion of that activity falling within the proposed zone. The results are shown in the tables below.

Table 14: Estimate of annual spend by anglers attributable to the proposed closure zone

Harbour	Activity	Angler days	Spend per head (£)	Total spend (£)	Proportion of overlap by area of operation	Spend attributable to zone (£)
Lyme Regis	Own boat	1599	87.9	140,552	83%	117,127
	Charter	3744	67.75	253,656	8%	21,109
West Bay	Own boat	1950	87.9	171,405	45%	77,132
	Charter	3640	67.75	246,610	13%	31,216
Total				**812,223**		**246,584**

It is possible that the estimate shown is somewhat low. This is because the Drew report categorises angler spend as own-boat, charter-boat or shore based. The data collected for private vessel activity was based on the number of vessel launches as this is what the harbour masters record. One launch has been assumed to be one own-boat angler day in the analysis. It seems likely that anglers will take two to three friends or family rather than go out alone on such trips, though no data is available on numbers. Anglers who are family or friends will spend far less than the boat-owner, but they will also spend money on tackle, bait and possibly accommodation and food .

Given the limited data regarding tourism spend in the south of England, it was decided that the economic contribution given by the Drew report for anglers would be used to as a proxy for the overall expenditure of divers who use the zone in part (see Section 2.6 for further discussion of options of quantifying economic input of divers).

The average number of dive days in the area was estimated using the same sources and method as described above. The results are shown below.

Table 15: Estimate of annual spend by divers attributable to the proposed closure zone

Harbour	Activity	Diver days	Spend per head (£)	Total spend (£)	Proportion of overlap by area of operation	Spend attributable to zone (£)
Lyme Regis	Dive clubs	900	67.75	60,975	14%	8,837
	Charter	2028	67.75	137,397	14%	19,913
West Bay	Dive clubs	2548	67.75	172,627	13%	21,852
	Charter	4004	67.75	271,271	13%	34,338
Total				**642,270**		**84,939**

It is possible that the contribution from diving is somewhat low using this method. As with commercial fishing, the activity is unlikely to be uniformly distributed across the area of operation. Also in common with commercial fishing, it is not possible to shed more light on this factor without considerable spatial information from individual charter operators or clubs. Divers are less likely to go to distant dive spots when the weather is bad. One harbour master mentioned that a typical pattern for dive clubs in the area for a weekend would be to spend a day at a distant wreck, followed by a day on the in-shore reefs. The information does not warrant scenario modelling, except to note the estimate in the table above is probably on the low side.

It is also worth noting that, in the past, some divers have caught scallops in the zone on a commercial basis. It has not been possible to ascertain the value of this activity with any certainty. There are said to have been one nearly full-time and one very part-time vessel operating in recent years. These have not been brought into the equation, but, arguably, perhaps £20,000 might be derived from the zone in a 'steady state' from this activity, provided there are scallops at economic densities.

5 Summary of usage values

As discussed in the Introduction, the aim of this report was to develop a balance-sheet approach to compare the economic value of scalloping in the proposed zone with all other activities.

The results are summarised below by method and category of activity.

Estimates of relative economic benefits derived from proposed conservation zone

Activity in zone		**Estimation method**					
		Proportional area	Rectangle based				Overflight sightings
			Max. theoretical	Max. plausible	Min. plausible	Probable	
Scalloping		**£162,000 - £187,000**	**£751,000**	**£415,000**	**£67,000**	**£198,000 - £260,000**	**£145,000**
Other uses	Static gear commercial	£177,000	£1,017,000	£135,000	£40,000	£129,000	
	Angling	£247,000					
	Diving	£85,000					
	Total	**£509,000**					

Diving for scallops is also considered by The Wildlife Trusts to be incompatible with scallop dredging, so if values of dive-caught scallops are included, their contribution should be added to the 'other uses' part of the table.