The Baseline Scenario

The Baseline Scenario

Impacts of all options within the model are analysed 'relative to a baseline'. This means that any changes, be they positive, negative or neutral are relative to an accompanying baseline estimate.

This section of the report provides a brief summary of the baseline scenario outcomes against which most options to date are analysed.

It is important to stress that the baseline is NOT a prediction or forecast of future outcomes. It is a 'simulation' of what would happen if all the key variables, as measured in the base year (2003), remained constant. In doing this, the model provides a fixed 'reference point' against which the impact of management changes to single (or a package of) measures may be evaluated.

Some additional 'modified baselines' have also been run, to see what changing some of the key assumptions could mean. Some of these modifications offer a closer approximation of reality, but they too follow the same limitations and are NOT predictive tools.

IIF Bio-Economic Model of South West Fisheries
The Baseline Scenario – Summary

The Baseline Scenario

The IIF Bio-Economic model is designed to provide a means of evaluating the impact of different options for managing South West Fisheries on a range of key indicators. To do this it is necessary to have a 'baseline' against which the impact of the different options can be assessed. The baseline scenario provides an estimate of possible outcomes of continuing 'as is', or more precisely, 'as was in 2003' and with key assumptions. Measures of fishing activity including fleet size, fishing effort, prices and costs are kept constant whilst fish stocks alter in response. This is far from what would or does happen, but this allows exploration of how effective a specific option might be for managing fisheries.

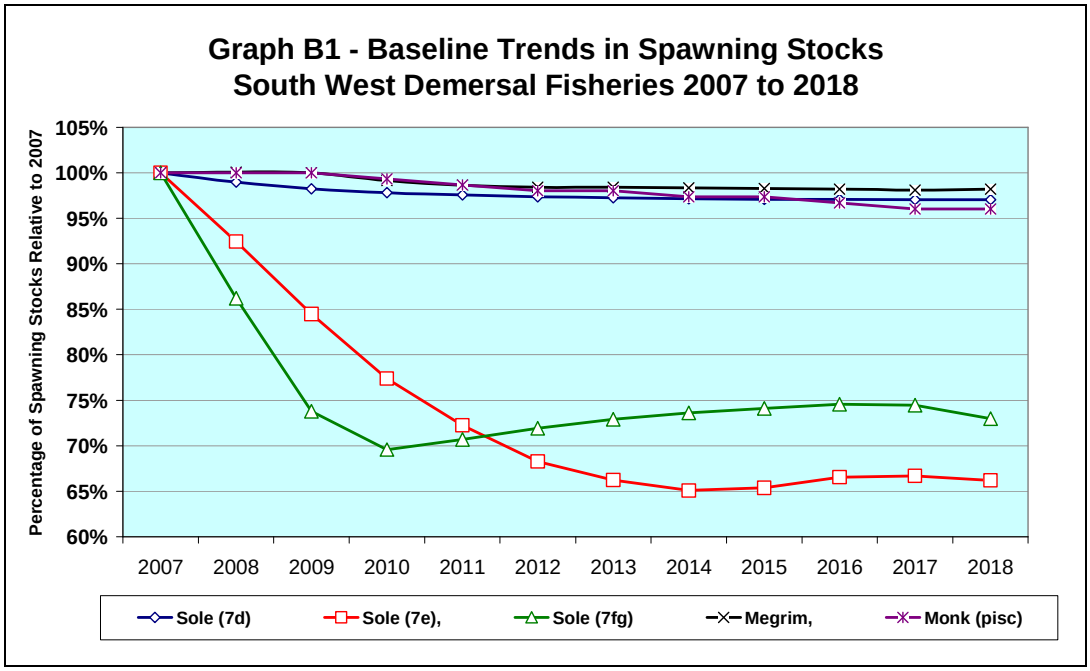
In exploring impacts of different options, the baseline in the remainder of this report is kept as a flat line, allowing us to focus on comparing the impact of different options,

Fish Spawning Stocks – Baseline Forecasts 2007 to 2018

The first set of graphs show how baseline levels of spawning stocks might change, if no actions are taken and key factors such as the size of the fishing fleet and fishing effort remain at current levels, (using 2003 data, which is when the most complete dataset was available). **Recall that these assumptions restrict the model's ability to act as a predictive tool, but provide a starting point for looking at the impacts of various options**. The 100% figure represents 'current' levels of stocks.

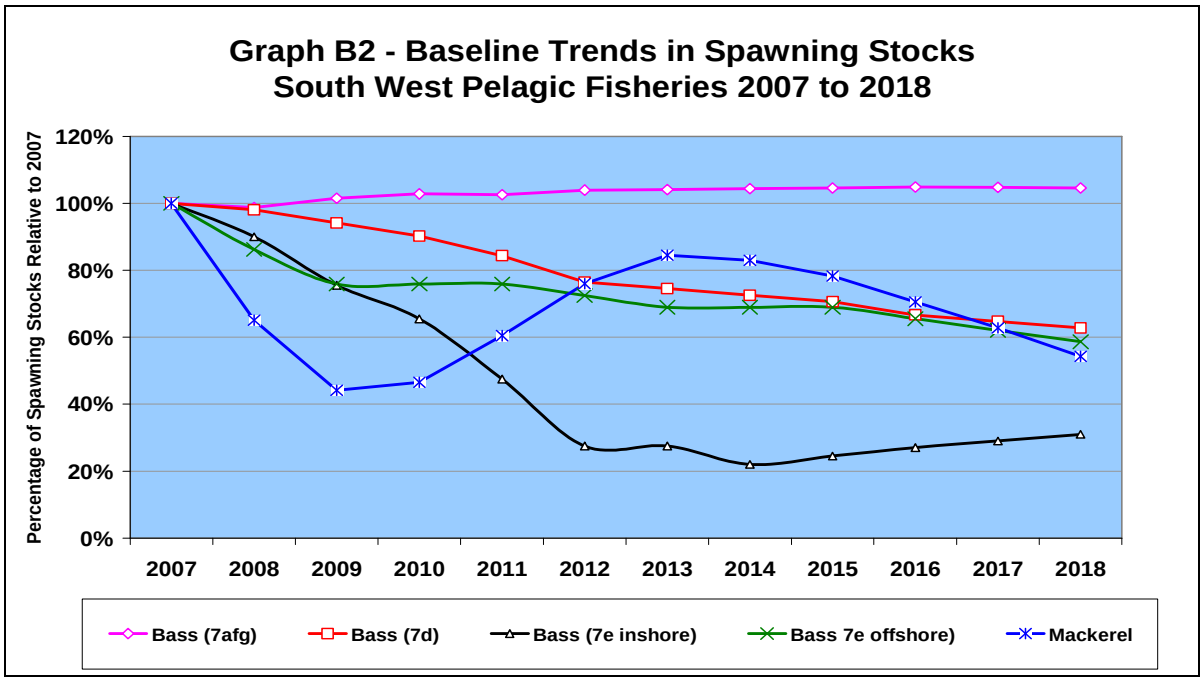
Baseline Spawning Stocks – Demersal Fisheries

Graph B1 shows that baseline spawning stocks in demersal fisheries could decline by between 2% and 35% over the period to 2018, if everything else is kept constant. The greatest impacts are likely to be experienced in areas 7e and 7f and g where stocks of sole could decline by between 25 and 35%. In contrast, stocks of sole in area 7d and stocks of megrim and monkfish will remain relatively stable, excluding other possible influences.



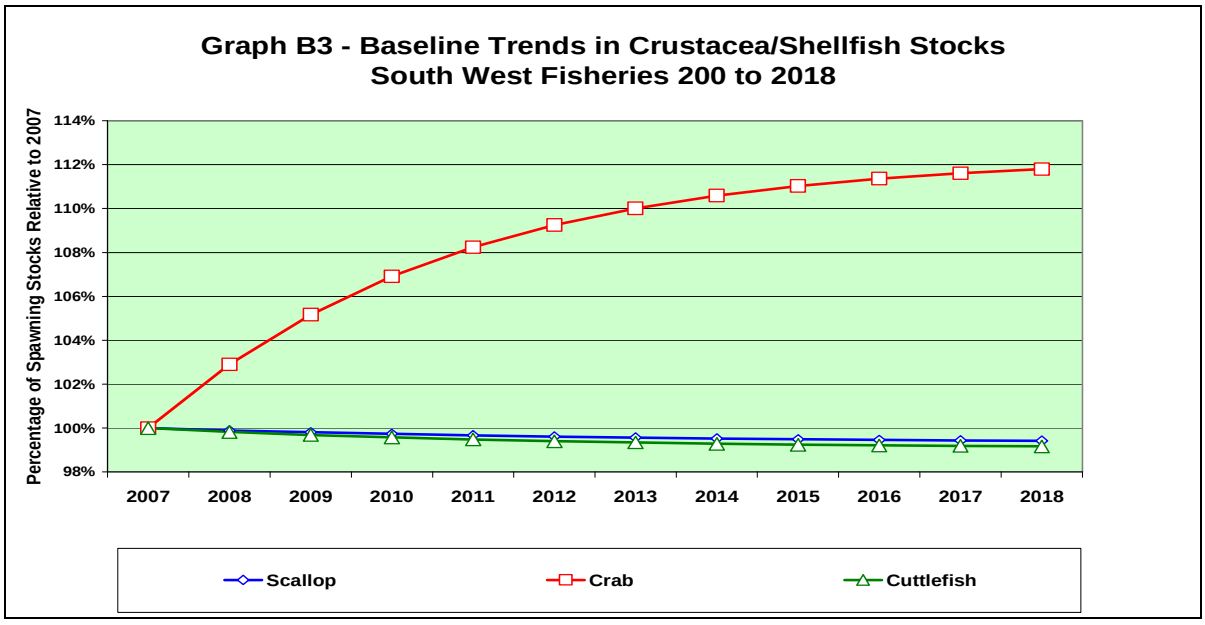
Baseline Spawning Stocks – Pelagic Fisheries

Graph B2 provides a summary of the likely changes in stocks of Bass and Mackerel within the various South West fisheries, if other variables are kept constant. The graph shows that changes in spawning stocks could fall as low as 30% of current levels. Whilst bass stocks in areas 7a, f and g should stay near current levels, they may fall in areas 7d and e, and decline to around 30% of current levels in the inshore area of 7e and to around 60% of current stocks in areas 7d and 7e offshore. Mackerel stocks oscillate slightly over the period ending at around 60% of current stock levels, but on a downward trend.



Baseline Stocks – Shellfish

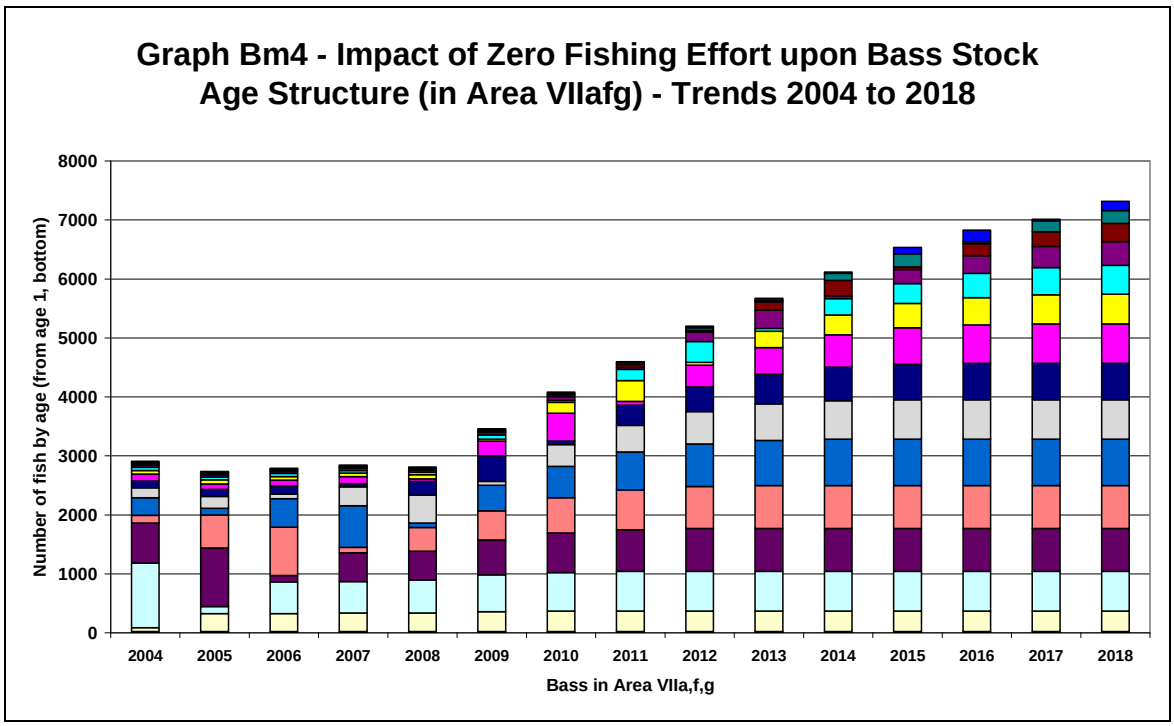
Graph B3 provides a summary of a baseline forecast for stocks of shellfish including Scallops, Crabs and Cuttlefish, if the same assumptions are kept constant. The graph shows that whilst stocks of scallops and cuttlefish should stay relatively stable, stocks of crabs may increase. These changes are all indicative of trends, not predictions.



Modified Baseline Scenarios – Zero Fishing Effort

In addition to setting a baseline for spawning stock biomass, we can also consider other baseline scenarios with different assumptions. These may have as much credence as the once chosen for the IiF runs to date; however, time restrictions has limited their full use here. In the future it would be useful to use some of these alternate baselines for testing impacts of specific options.

One interesting baseline option is to explore zero fishing effort i.e. NO commercial fishing (including foreign fishing) or recreational angling, with fish stocks left to fluctuate naturally. This scenario means we can investigate extremes of stock recovery (i.e. how much could levels improve), but specifically - what specific stocks might do better, and what kind of likely age structures could result. As an example, Graph Bm4 looks at bass stocks in area VIIa,f,g (in each case age 1 is at the bottom of each year's column up to age maximum). The graph shows stocks recovering through all ages, but with higher ages seeing larger recoveries. In bass VIIa,f,g, ages 1-6 are reasonably constant in structure with or without fishing pressure (i.e. 2004-2007 and 2008-2018 respectively). Generally, it is the higher age groups that benefit from zero fishing in this alternate baseline, resulting in bigger older fish. Importantly, this scenario does not include non-fisheries induced impacts, such as climate change and predator-prey impacts, which will also affect future stock levels and age structures. Whilst this is an unrealistic scenario it is a useful reminder of what may be achievable in extremis.

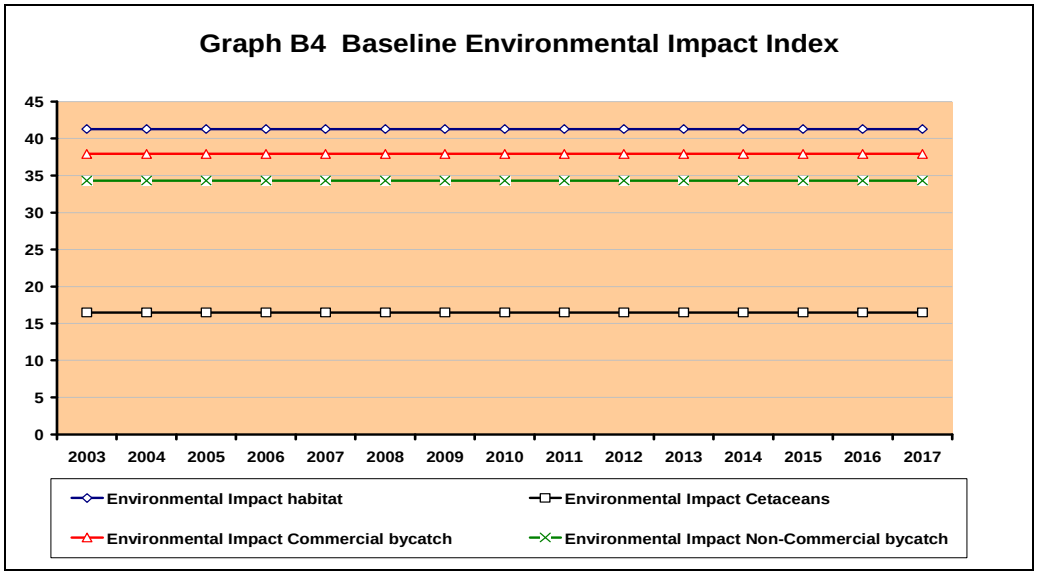


Environmental Impact Index (EII)
In addition to the impact of commercial and recreational fishing upon spawning stocks and fish biomass, there are also impacts upon other aspects of the environment. Using information from an IiFSW commissioned report (see CMER 2007); the EII provides an indicator of the **perceived** impact of different types of fishing activity upon the marine environment[1]. The four indicators explored are all shown as constant in the baseline scenario, where the number of vessels is kept artificially constant. The four impact measures that are analysed with the Bio-economic model are:

1. Environmental Impact upon Habitat
This is the impact of certain types of commercial fishing activity upon the seabed. Fishing for certain species, e.g. sole, scallops, megrim etc., will impact upon the seabed, though this varies tremendously between different gear types and also between different kinds of sea bed habitat, due for example to levels of natural disturbance.

2. Environmental Impact upon Cetaceans
As with the impact upon habitat, certain types of fishing and fishing in certain areas results in impacts on large cetaceans such as dolphins, porpoises and certain types of whale. The extent of impact is determined in part by fishing methods, and the types of net and fishing tackle used. Technical measures designed to restrict the use of certain types of equipment may affect impacts upon cetaceans.

3. 4. Environmental Impact upon Commercial and Non – Commercial bycatch
The nature of the South West fishing grounds, the species fished, and the fishing methods used mean that no matter how targeted fishing vessels are they will always catch marine species that are not targeted or commercially valuable. Placed in a context of European fisheries regulations, the result is catch that is inevitably discarded. Such actions will impact upon long term spawning stock levels and fish biomass, though these impacts are far from straight forward. Options designed to reduce the size of the fishing fleet and fishing effort, streamline regulations, and the introduction of more 'selective' types of gear can impact positively on levels of bycatch.

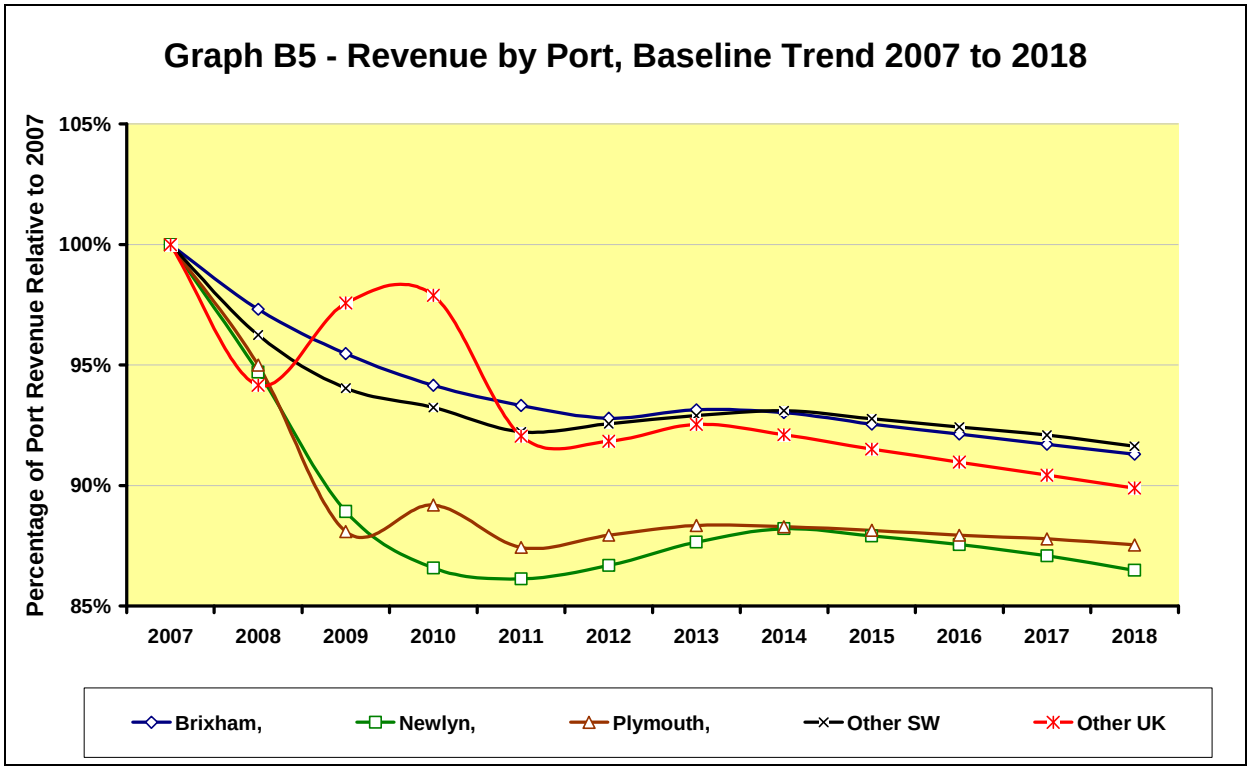


[1] Various stakeholders were surveyed, including fishermen and environmentalists, in an opinion survey, and asked to 'score' the impact of each of the six main types of fishing activity upon each of the four measures. The outcomes were used as the basis of the EII.

Revenue by Port – Baseline Trends

Vessels operate from various ports in the South West region where catches are landed and sold. The largest ports are at Newlyn, Brixham and Plymouth. The baseline graphs in this section show how the value of landings at each port (and other South West ports) may change over the period to 2018, if no actions are taken and if assumptions are kept constant from the 2003 data. The difference in the amount of revenue taken at each port reflects both the size of the fleet based at that port, and the species targeted and caught by these vessels. Prices are assumed to be constant, thus changes in revenue are due solely to catch and not changes in price at time of sale.

Graph B5 shows the value of revenue from landings generated at each of the main ports throughout the South West region. The graph shows the value of revenues earned at Brixham, Newlyn and Plymouth individually and then the value of revenue combined for all South West ports. As might be expected, gradually declining fish stocks mean that revenues slowly decrease as a direct correlation. This decline in revenue is expected to be spread evenly across the region's ports falling to between 86% and 93% of the level for 2006. The slight difference reflects the type of species caught by vessels operating out of the ports.

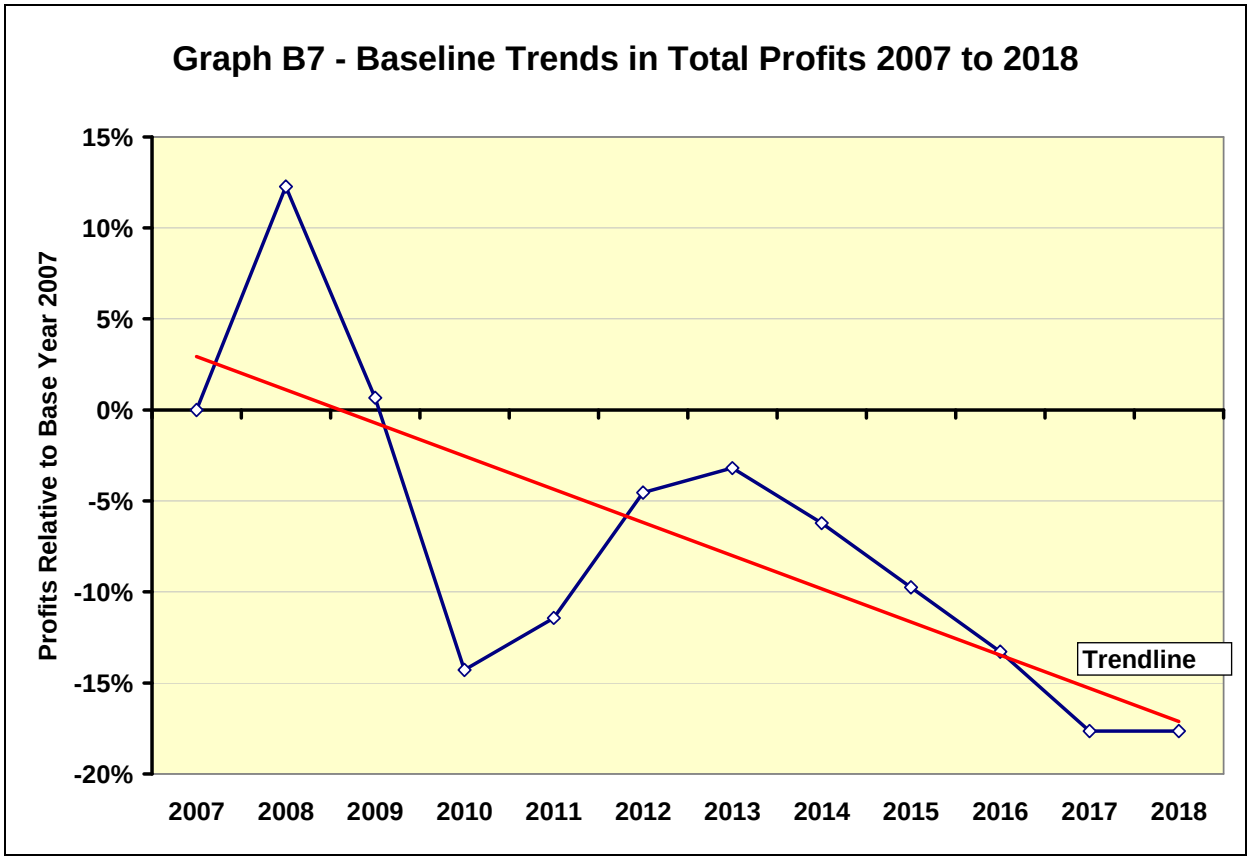


Fleet Profitability

In addition to the impact of changing fish stocks on catch and revenues, the IIF Bio-Economic model provides estimates of trends in fleet profits. Within the model net profits are the residual after costs, e.g. fuel, insurance, ship repair and wages/crew share, have been subtracted. The amount of profits results from a combination of factors including the size of the UK and foreign fleets, fuel costs, the amount of fishing effort, fish stocks, types of fishing gear used, and the prices gotten for catch when sold. The projections are not true prediction but an **indicator of trends**.

The model cannot provide exact 'forecasts' of the amount of profit that will be made as there are many unknown variables in the profit equation (noted above). By holding these values 'constant' over time and changing just the option variable .e.g. number of days at sea or number of boats in the fleet, the impact on profits can be analysed. In the 'baseline' profit scenario shown below all key variables are held constant to 2018. In reality, the values of many factors will change over time e.g. fuel prices have fallen recently.

Given these caveats, Graph B7 shows a baseline estimate for net profits to 2018. The graph shows that the impact of declining fish stocks on profits will be a slow decline in revenues and profits. The graph shows some minor variations over time, but the trend line shows the overall direction. Real world' changes such as lower/higher fuel costs or lower/higher sale prices will change the absolute amount of profits earned (moving the trend line up or down) but will not affect the overall 'shape' of the trend relative to the base year.



Recreational Angling

In addition to commercial fishing, recreational angling provides a significant, but often neglected, input into the regional economy of the South West. This is highlighted in the report by Nautilus Consultants,[2] prepared as part of Invest in Fish South West.

Table 1 - Expenditure on Recreational Fishing by Angler Type and Industry Sector 2003

Expenditure Category	Residents Expenditure (£m)	Visitor Spending (£m)	Total Receipts (£m)
Gear	39.60	8.80	48.40
Transport	8.80	11.55	20.35
Parking	1.10	2.20	3.30
Food	3.30	4.95	8.25
Accommodation	4.40	8.80	13.20
Competitions	3.30	0.00	3.30
Club fees	2.20	0.00	2.20
Magazines	1.10	0.00	1.10
Boats	30.80	9.35	40.15
Insurance	1.10	0.00	1.10
Charter fees	4.40	7.70	12.10
Harbour dues	7.70	0.00	7.70
Other	3.30	1.65	4.95
Total	**£111m**	**£55m**	**£166.10m**

The report states that in 2003 recreational angling was responsible for around £165m to the South West economy, with £110m derived from South West residents and £55m from visitors to the region. This is included within the IiF Model due to its impact on regional output and employment. Recreational angling supports jobs throughout the South West e.g. in sectors such as boat charter hire, bait and tackle shops and hotels and restaurants, see Table 1.

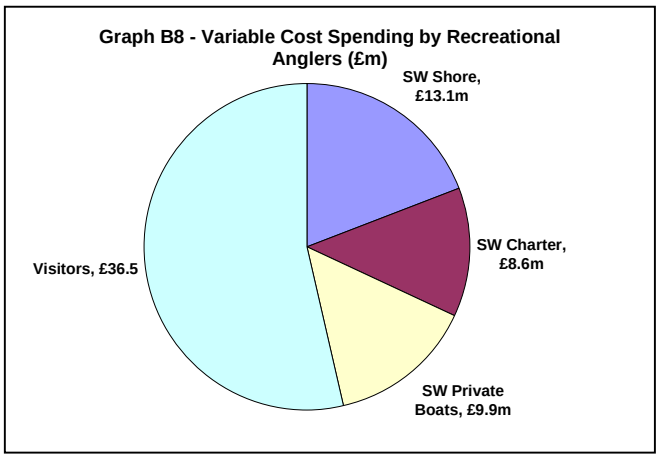
Species	'Trip Elasticity'
Bass	**0.42**
Cod	**0.379**
Mackerel	**0.383**
Plaice	**0.22**
Pollock	**0.22**
Whiting	**0.22**
Others	**0.22**

In the report it is assumed that recreational angling trips are a function of the fish stock and fish size - so that if/as fish stocks improve there are more fishing trips by both South West residents and visitors (and vice versa). Within the model changes in fishing trips are included as 'trip elasticities'. Following consultations, trip elasticities for different species were set as shown. The figures illustrate, for example, that if the bass stock biomass improves by 100% this will lead to a 42% increase in the number of recreational fishing trips.

Any change in the amount of recreational angling trips will lead to a change in expenditure and associated employment. It's assumed that changes in trip numbers will affect expenditure on 'variable cost' items but not 'fixed cost' items (i.e. more trips require more bait and boat hire but not 'fixed' equipment such as rod, reels and privately owned boats). South West resident and visitor spending on these variable cost items is estimated at £33m by residents and £36m by visiting anglers. It's important to recognise that whilst this expenditure helps to support jobs within the South West, only visitor spending is an 'injection' of new money into the regional economy. Spending by residents on angling is part of 'discretionary' local household expenditure. Thus if fish stocks decline then it is assumed that recreational angling will decline, and local residents who previously spent money on this will spend this money on another recreational/leisure pursuit locally. It is possible that keen anglers might take this expenditure elsewhere within the UK or Europe where fish stocks are more abundant, but this is likely to be marginal (due to time/cost constraints). It's also possible that an increase in stocks would attract

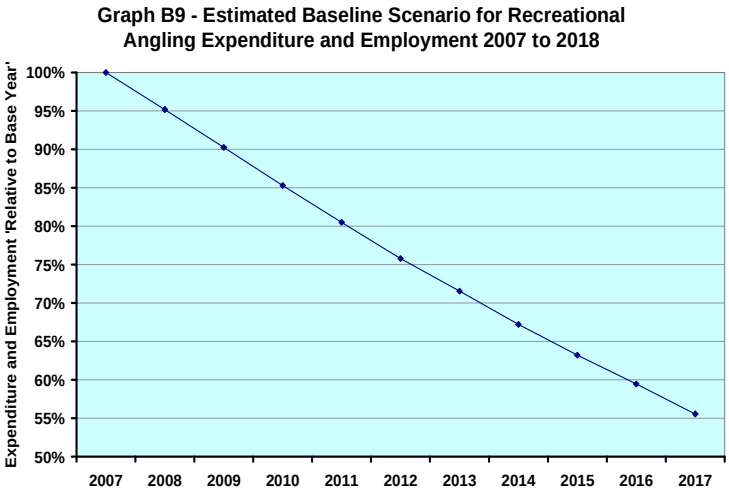
[2] For more information see Appendix Two and http://www.investinfishsw.org.uk/documents/TheMotivationDemographicsandViewsofSWRecreationalSeaAnglers_006.pdf

'new anglers' who would purchase fixed items of equipment as well as spending on variable cost items; however, lack of data does not allow this to be modelled.



The Economic Significance of Recreational Angling

Graph B8 shows that resident and visiting anglers combined spend just under £70m per annum on purchasing day to day items associated with their sport. This expenditure supports employment in many industries directly and indirectly. The CLREA Input-Output model[3] estimates that approximately one 'direct' job (e.g. in charter boat hire or tackle shops) is supported by every £60,000 worth of recreational angling expenditure. It also estimates that every 100 direct job leads to the creation of an additional 111 indirect jobs due to the 'multiplier' effects associated with recreational angling. This means that the total baseline number of jobs supported by recreational angling throughout the South West is between 1,300 and 2,500, dependent upon how the expenditure of resident anglers is treated[4].



The baseline scenario shows that the projected decline in fish stocks will lead to a decline in associated expenditure and employment. Graph B9 shows that with no changes, demand for recreational angling could decline by as much as 50% leading to a loss of output of between £10m and £20m from the region and the loss of between 340 and 660 jobs to 2018. Of course, as illustrated elsewhere, this is not a prediction in real numbers but a general trend.

Baseline Regional Output and Employment 2006

Graphs B8 and B9 show the baseline value of direct[5] revenue and employment generated by commercial and recreational fishing in 2006[6]. The graphs show that commercial and recreational angling generated £115m of direct revenue and supported at least 2,700 Full Time Equivalent (FTE) jobs in the South West. Beam trawling and recreational angling account for the majority

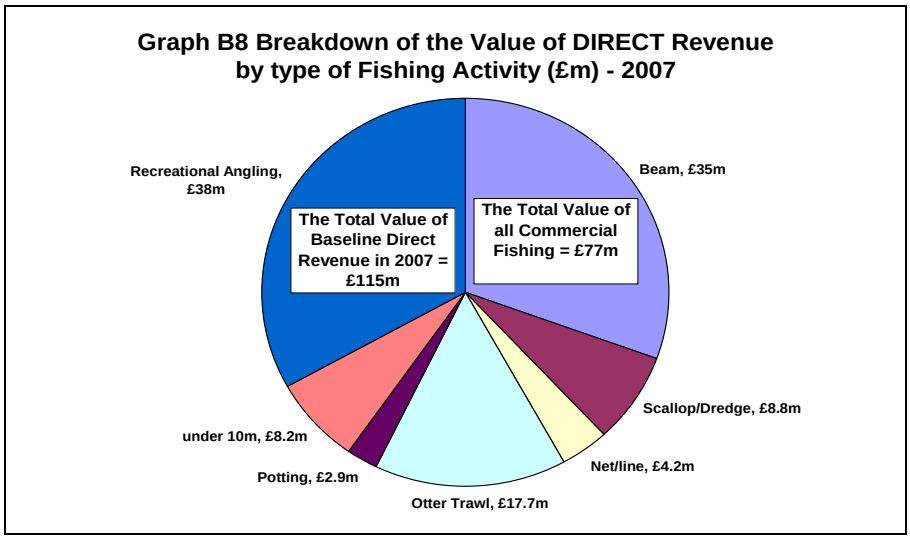
[3] This model is one component of the overall IiFSW Bio-economic model. For elaboration on the contribution of CLREA, University of Portsmouth, see Report 1 Methodology.….

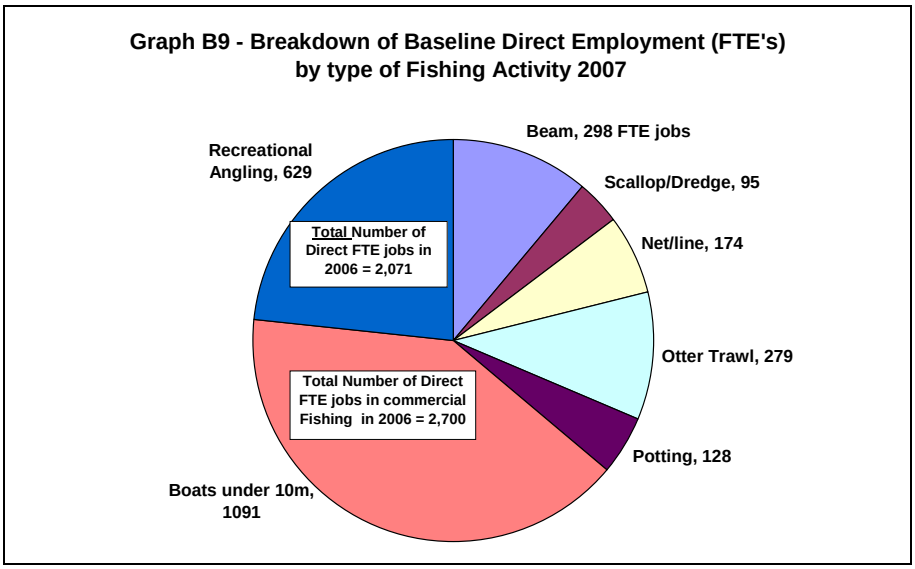
[4] This relates to the argument as to whether 'diverted' expenditure from recreational angling stays within the South West economy as anglers find other leisure interests to pursue or 'leaks' out as anglers pursue their hobby elsewhere in the UK or further beyond.

[5] Direct revenue relates to the income generated directly as a result of fishing activity i.e. the value of the catch and money spent on goods and service directly related to the pursuit of recreational angling.

[6] The information on output and employment is 2006 data rather than 2003 as more up to date information was available on these statistics.

of revenue generated, but small fishing vessels (less than 10m) account for the highest number of jobs due to the number of vessels and their labour intensive nature. Once indirect and induced effects (created by the multiplier process[7]) are added to this revenue and employment, the TOTAL value of output and employment related to commercial and recreational fishing in the South West increases to £234m or 5,300 jobs. ***NOTE: DIRECT revenue and employment increase to £148m and 3,250 jobs, and TOTAL (direct plus indirect) increases to £294m and 6,500 jobs if the expenditure by South West residents on recreational angling is included (see footnote 4).***



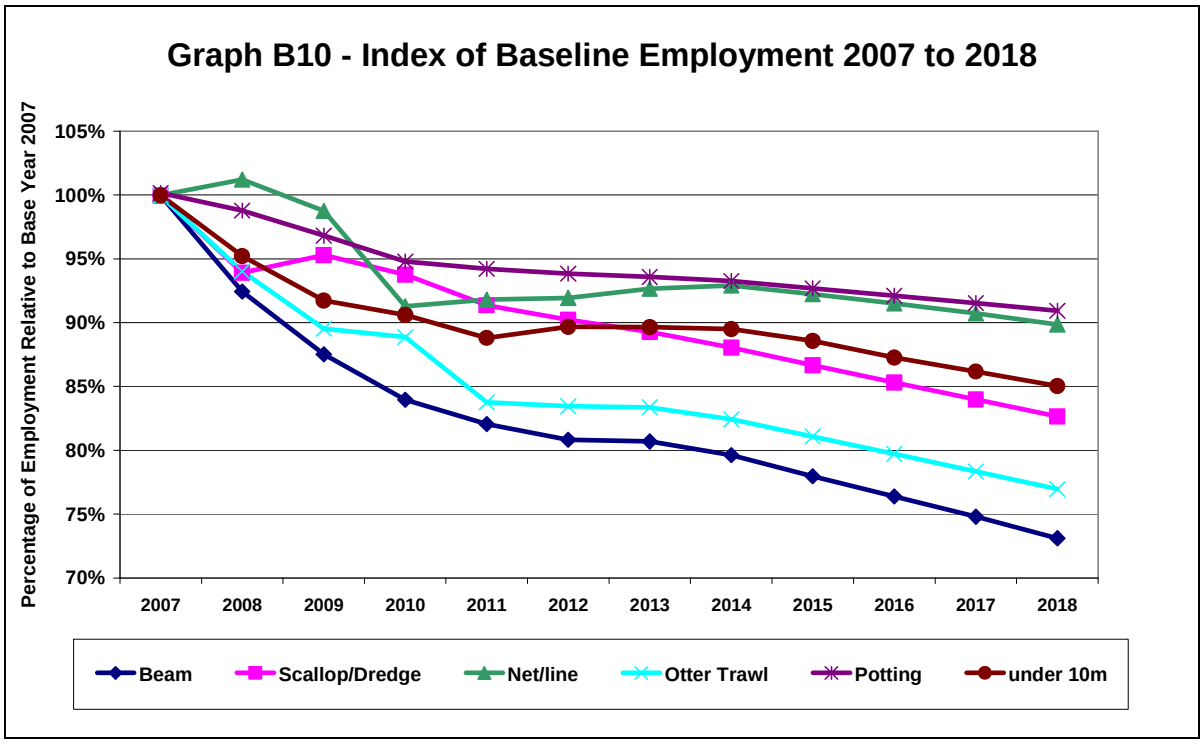


Baseline Trends in Employment

Graph B10 shows that as this baseline for catch levels and revenue slowly declines, there is a slow decline in direct employment in commercial fishing. The decreases in employment are forecast to be highest in beam and otter trawling, and in scallopers and dredgers. The reasons for this are: these types of fishing activity are more 'capital intensive' and thus more likely to reduce crew numbers as new technology and increased productivity enter the industry, although these reductions in crew size can only go 'so far' with constraints on feasibility and safety. Also,

[7] The multiplier process states that 'direct' output from fishing activity will lead to 'knock on' effects on output and employment e.g. in fish processing, wholesale, retail, boat repair etc.

employment is directly related to catch and revenues, so as stocks of certain species decline fishing activities reliant on these species are most likely to see reduced revenues and employment.



Having identified the key trends of this baseline scenario, it is possible to consider impact(s) of alternative or modified baseline scenarios. In future, these alternate baselines will provide additional starting points for exploring scenarios and options for better management.