

Developments in status of ICES assessed stocks (1988–2007)

Two additional types of analysis are included here which examine the trends in F and SSB separately. In the first of these, the output F and SSB metrics for all stocks covered by ICES in the OSPAR Region for which there was an agreed assessment in 2008 (Table 5.1) have been divided into two time periods. These periods broadly cover the QSR 2000 and QSR 2010 data gathering periods (1988-1997 and 1998 – 2007 respectively). Spearman Rank correlation has then been applied to these data sets to test whether there were significant (at $p = 0.05$ level) positive or negative correlations indicating an increase or decrease in the two time periods. Simple bar graphs are then used to indicate the number of stocks in each period falling into each of three categories; increase, decrease or no trend. By comparing the left and right plots, a signal of general improvement in fishing mortality rates is interpreted as a larger number of stocks falling into the decrease in F category (upper 2 panels in each case) and broadly speaking a larger number of stocks falling into the increase in SSB category (lower 2 panels in each case).

Table 5.1: List of stocks, by OSPAR Region, for which there was an agreed assessment in 2008 and which have been used in the assessment of status based on fishing mortality and spawning stock biomass. The data is presented in Figures 5.10 – 5.16.

OSPAR Region	Stock		OSPAR Region	Stock	
	Species	Location		Species	Location
I	Cod	Arctic	II	Sole	West Channel
I	Cod	Iceland	II	Whiting	IV
I	Haddock	Arctic	III	Blue whiting	Widely distributed western and northern waters
I	Haddock	Iceland	III	Cod	Celtic Sea
I	Atlanto-Scandian herring	Widely distributed northern waters	III	Cod	VI
I	Herring	Va	III	Haddock	Rockall
I	Saithe	Arctic	III	Haddock	VI
I	Saithe	Iceland	III	Hake	Widely distributed western and northern waters
II	Cod	IV	III	Herring	VI
II	Haddock	IV	III	Horse mackerel	Widely distributed western and northern waters
II	Herring	IIIa22	III	Mackerel	Widely distributed northern, western and southern waters
II	Herring	IV	III	Plaice	Celtic Sea
II	Norway pout	IV	III	Plaice	Irish Sea
II	Plaice	IV	III	Sole	Celtic Sea
II	Saithe	IV and VI	III	Sole	Irish Sea
II	Sandeel	North Sea	IV	Horse mackerel	Southern waters, Iberia
II	Sole	East Channel	IV	Sardine	VIII
II	Sole	IV	IV	Sole	Biscay
II	Sole	Skagerrak			

Figure 5.10 shows the results for the 37 stocks in the OSPAR region as a whole for which suitable assessment data were available. Results show that for fishing mortality rate, F, the majority (27 out of

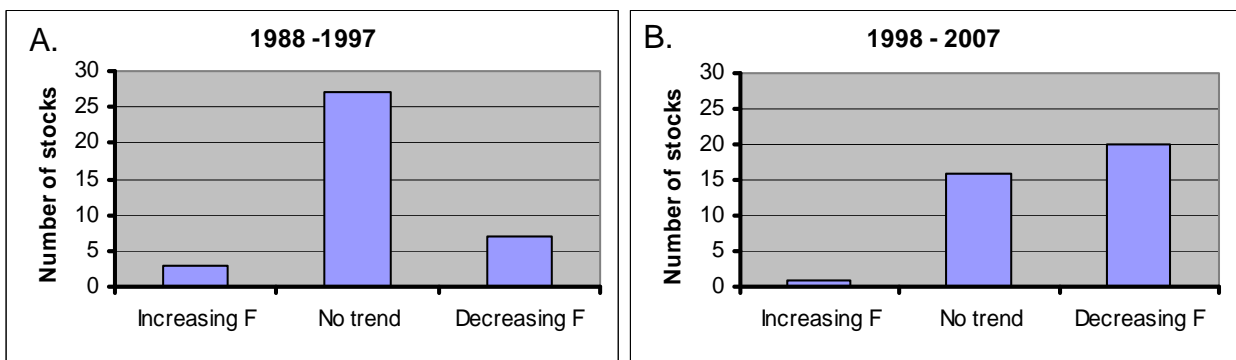
37) of stocks in the first time period exhibited no obvious trend whereas in the more recent period (1997 – 2008), there has been a noticeable increase in the number of stocks with a significant negative correlation. This could imply that fishery management measures applied have been having an impact on reducing F.

The three stocks in the earlier period which showed an increasing F, Atlanto-Scandian herring in Region I and mackerel and horse mackerel in Region III, all showed an improvement in the second period with the horse mackerel and Atlanto-Scandian herring both showing a decreasing F in the second period.

The situation with the five cod stocks studied (Table 5.1) improved in the second period with all the cod stocks across the OSPAR maritime area showing a decreasing F over the period 1998 – 2007. In the previous period only Icelandic cod showed a decreasing F.

Across the OSPAR Maritime Area there has been a shift in SSB towards more stocks with ‘improved’ increasing biomass but this is less pronounced than the observed changes in F and suggests that the fisheries management measures have had less impact on this metric (Figure 5.10C and D).

Overall OSPAR Area – Fishing Mortality (F)



Overall OSPAR Area – Spawning Stock Biomass (SSB)

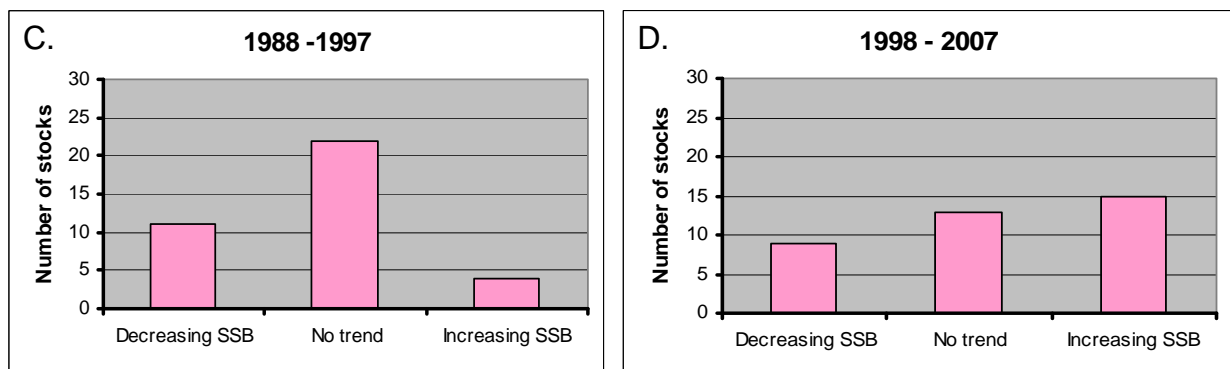


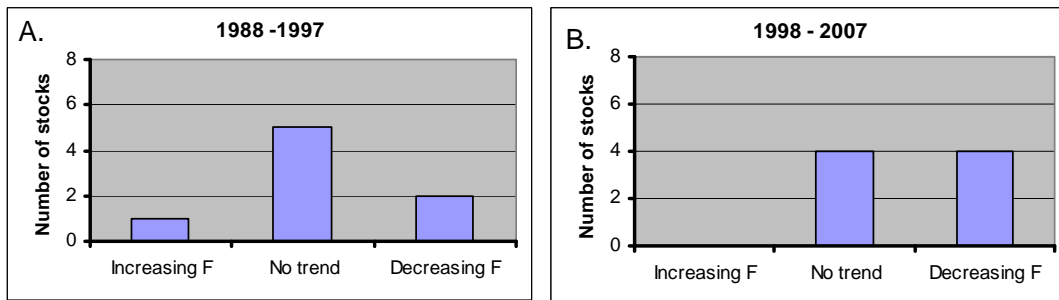
Figure 5.10: Number of stocks with significant increasing or decreasing trends in fishing mortality (F) and spawning stock biomass (SSB) for the OSPAR Maritime Area over two time periods, 1988 – 1997 and 1998 - 2007. The data assess 37 stocks across the OSPAR Maritime Area. These time periods correspond approximately with the data collection for QSR 2000 and QSR 2010 respectively. Spearman rank correlation applied to data obtained from ICES assessments 2008.

The overall trend for the OSPAR Maritime Area is generally replicated in each of Regions I – IV with more stocks showing reducing F in the recent time period. In Region I, for which 8 stocks were

analysed covering cod, haddock, Atlanto-Scandian herring, herring and saithe (Table 5.1), no stock showed an increasing F in the period 1998 – 2007 while in the earlier period Atlanto-Scandian herring had shown an increasing F (Figures 5.11A and B). At the same time four of the eight stocks, Arctic cod, Icelandic cod, Atlanto-Scandian herring and herring from ICES area Va, showed a decreasing F.

Thirteen stocks in Region II were investigated covering cod, haddock, herring, Norway pout, plaice, saithe, sandeel, sole and whiting. Sole from the Western Channel showed an increasing F in the more recent period (1998 – 2007). However 5 stocks (cod, Norway pout, plaice, saithe and sole from area V) showed a decreasing F in the period 1998 – 2007 relative to only 3 stocks in the period 1988 – 1997 (Figure 5.12A and B). For both periods, the dominant category was the ‘no trend’ in F.

OSPAR Region I – Fishing Mortality (F)



OSPAR Region I – Spawning Stock Biomass (SSB)

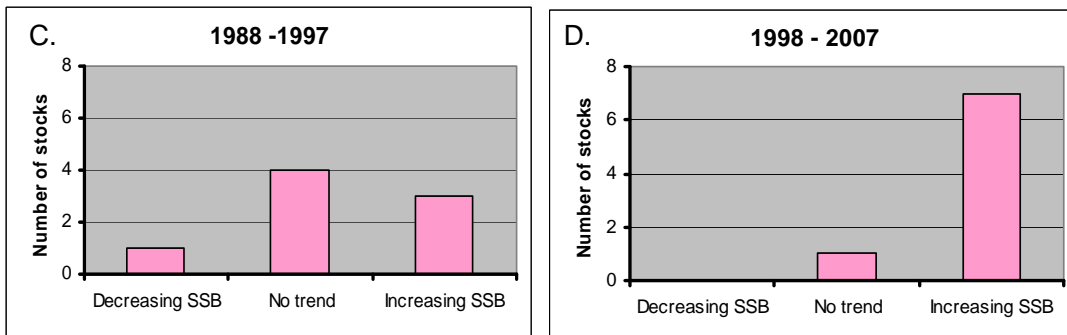
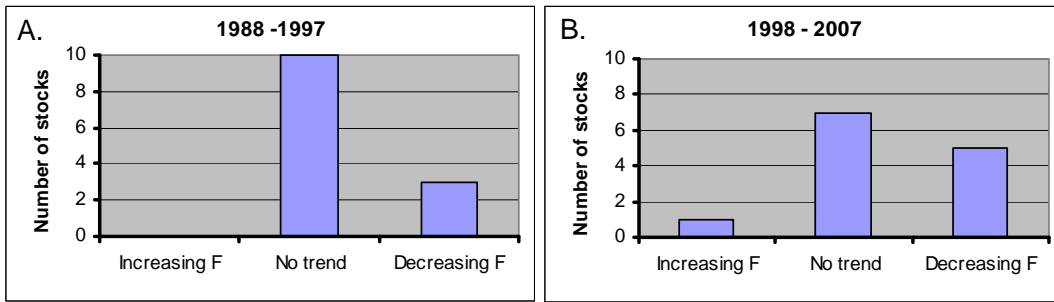


Figure 5.11: OSPAR Region I. Number of stocks, from a total of 8 stocks within Region I, with significant increasing or decreasing trends in F and SSB over periods 1988 – 1997 and 1998 - 2007. Spearman rank correlation applied to data obtained from ICES assessments 2008.

OSPAR Region II – Fishing Mortality (F)



OSPAR Region II – Spawning Stock Biomass (SSB)

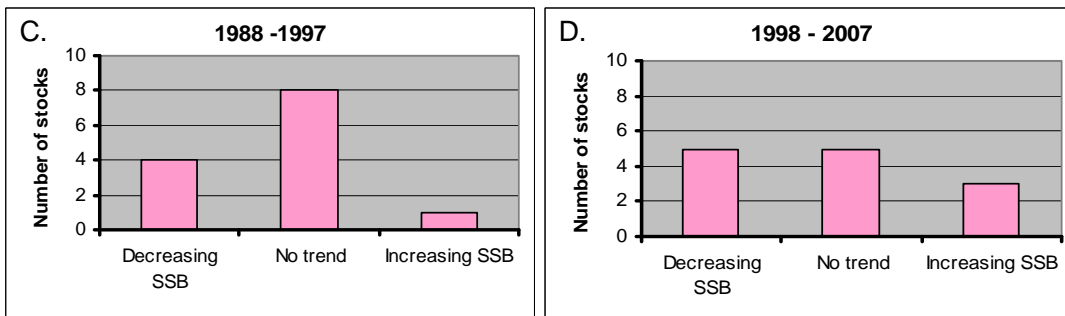
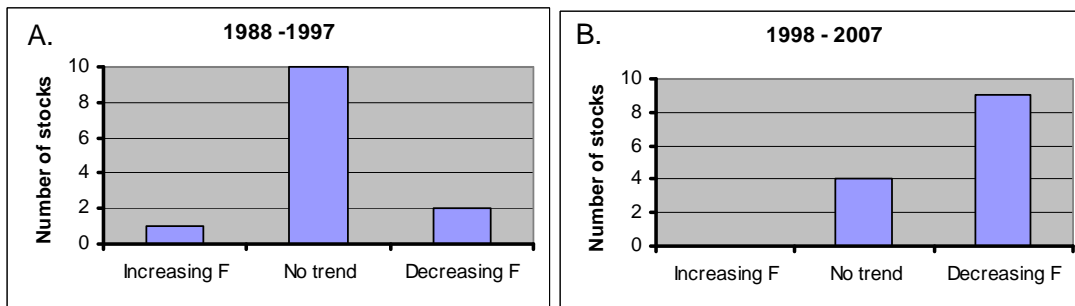


Figure 5.12: OSPAR Region II. Number of stocks, from a total of 13 stocks within Region II, with significant increasing or decreasing trends in F and SSB over the time periods 1988 – 1997 and 1998 – 2007. Spearman rank correlation applied to data obtained from ICES assessments 2008.

OSPAR Region III – Fishing Mortality (F)



OSPAR Region III – Spawning Stock Biomass (SSB)

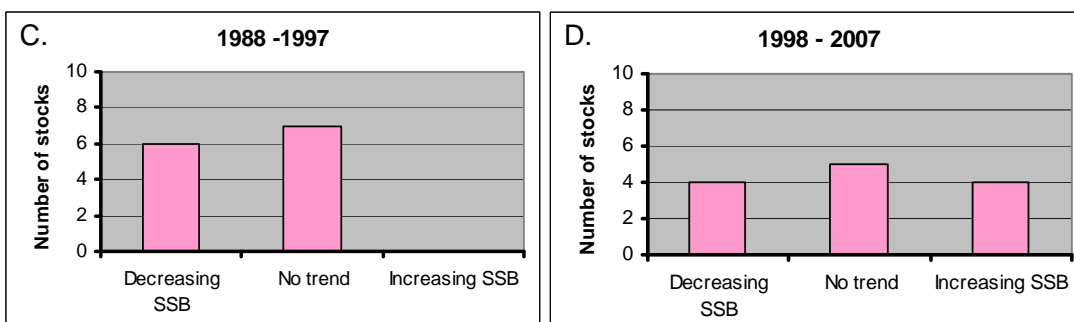
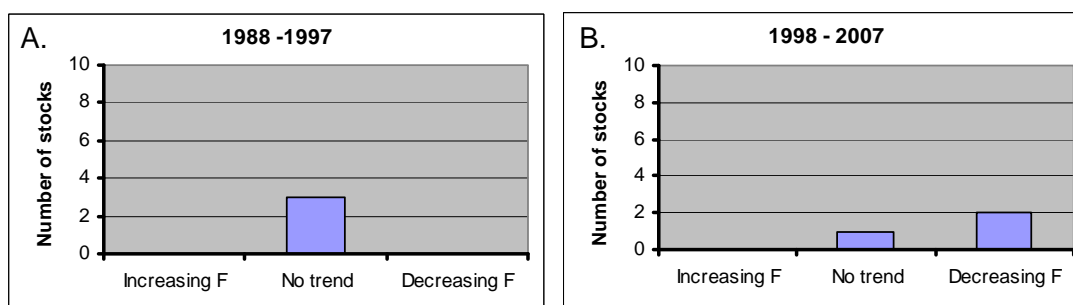


Figure 5.13: OSPAR Region III. Number of stocks, from a total of 13 assessed stocks in Region III, with significant increasing or decreasing trends in F and SSB over the time periods 1988 – 1997 and 1998 - 2007. Spearman rank correlation applied to data obtained from ICES assessments 2008.

OSPAR Region IV – Fishing Mortality (F)



OSPAR Region IV – Spawning Stock Biomass (SSB)

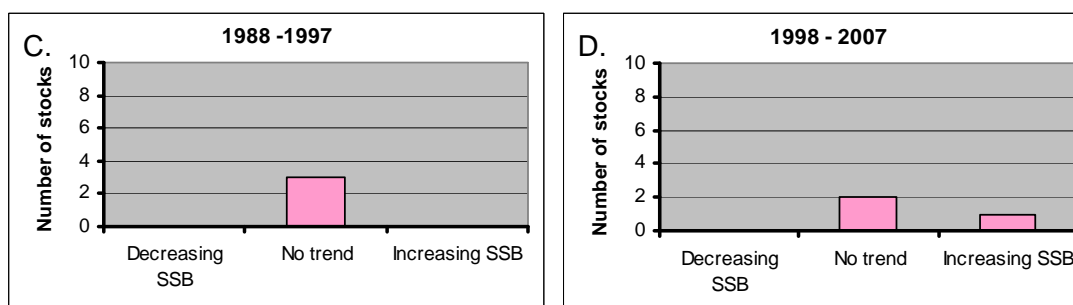


Figure 5.14: OSPAR Region IV. Number of stocks, from a total of 3 assessed stocks, with significant increasing or decreasing trends in F and SSB over the time periods 1988 – 1997 and 1998 - 2007. Spearman rank correlation applied to data obtained from ICES assessments 2008.

Region III, for which again 13 stocks were included in the analysis (Table 5.1), gave a more favourable picture for the period 1998 – 2007 than for 1988 – 1997 (Figure 5.13A and B) for fishing mortality. None of the stocks showed an increasing F. The two stocks which had shown an increasing F in the earlier period (horse mackerel and mackerel) showed either no trend over the period 1998 – 2007 (mackerel) or a decreasing F (horse mackerel). None of the stocks in Region III showed a deterioration in their 'status' going from the earlier to more recent period. Indeed, the majority of stocks showed a decreasing F for the period 1998 – 2007 (Figure 5.13).

Only three stocks were assessed from Region IV (Table 5.1). The general improvement in status between the two periods is evident with both sardine and sole showing a reducing F in the period 1998 – 2007 (Figure 5.14A and B).

The Regional analysis of SSB provides a more variable picture. In OSPAR Region I, there has been a more substantial rise in the number of stocks with increasing SSB in the recent period (Figure 5.11C and D). Elsewhere the picture is more like that of the overall OSPAR Maritime Area. Within Region II although there was an increased number of stocks showing an increasing SSB in the more recent period, there was also an increased number showing a reduced SSB in the second period relative to the first period (Figure 5.12C and D). Only sole in area IV and whiting in area V did not change status with the whiting showing a decreasing SSB in both periods and sole showing no trend in both periods.

For Region III, none of the analysed stocks showed an increasing SSB in the first period (Figure 5.13C). However, in the period 1998 – 2007, 4 stocks showed an increasing SSB including blue whiting, hake, horse mackerel and Irish Sea plaice (Figure 5.13D).

Overall this analysis tends towards showing an improved situation in the period 1998 – 2007 relative to the period 1988 – 1997 (Figure 5.15).

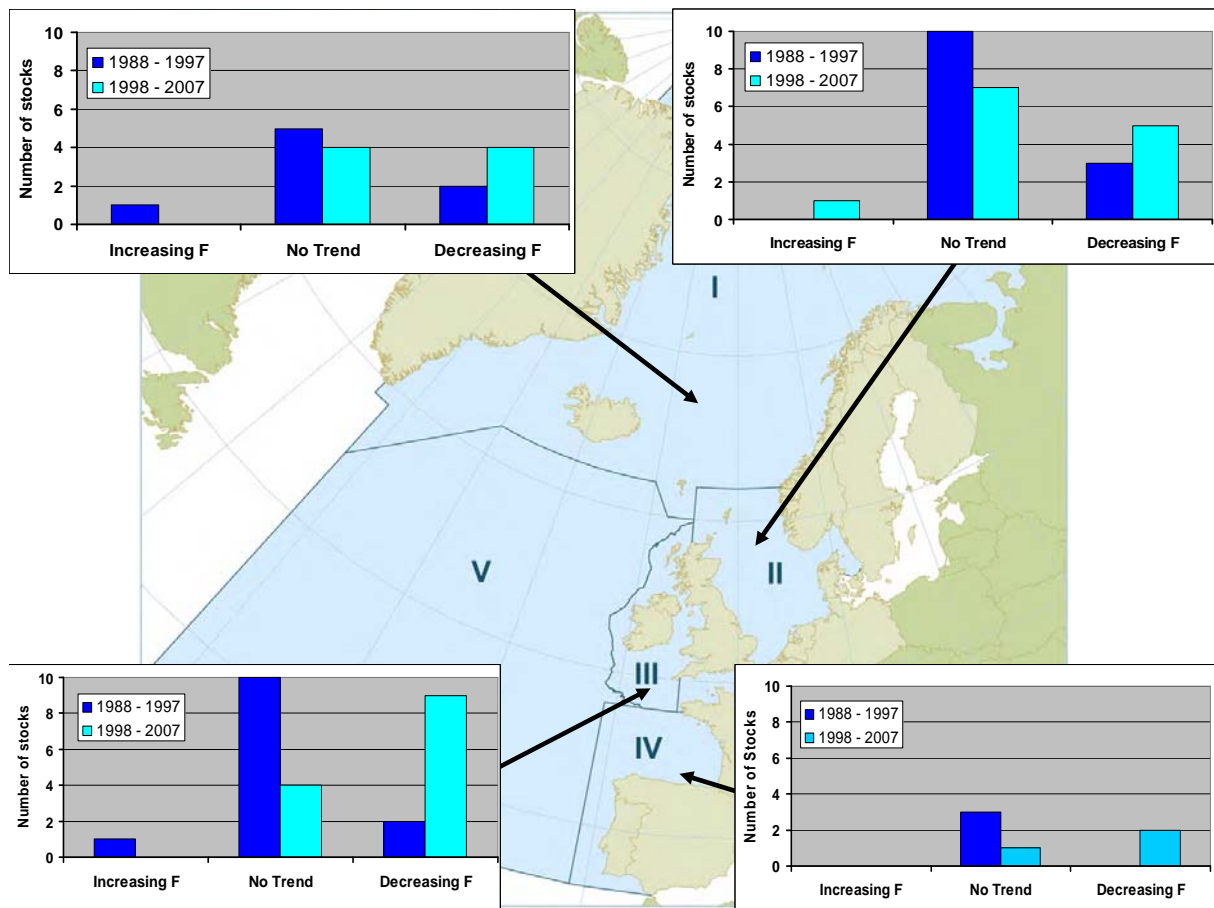


Figure 5.15: Summary of the comparison of changes in fishing mortality (F) for the periods 1988 – 1997 and 1998 – 2007 for OSPAR Regions I – IV. This particular analysis is consistent with an improving situation across the OSPAR Maritime Region as a whole. OSPAR countries are highlighted in tan on the map. The Roman numerals represent the OSPAR Regions.

The second analysis addressed the question ‘is there a difference in state between the last QSR (QSR 2000) and the present one (QSR 2010). The approach involved fitting smoothers through each of the available time series of F and SSB (using a LOWESS approach implemented in R – Rob Fryer pers comm.) and then testing for a significant difference between the fitted value at the end of the recent QSR data period (2007) and the end of the previous QSR data period (1997). Results are shown in Figure 5.16 for the fishing mortality time series and Figure 5.17 for the spawning stock biomass time series. The results are presented for the overall OSPAR Maritime Area and by OSPAR Region. Results tend to confirm those of the first approach suggesting reasonable progress in reducing fishing mortality (a low proportion of stocks with increasing F and over 50% in several areas showing decreasing F). Progress on spawning stock biomass is not so obvious (higher proportion of stocks with decreasing biomass and, apart from in OSPAR Region I, a lower proportion with increasing biomass).

Presentation of the results in this way is rather different from that which compares stock state with reference points. A number of the stocks here remain outside safe biological limits according to the ICES precautionary approach. On the other hand, this analysis helps to show the direction of travel in key stock parameters and, particularly in the case of fishing mortality, suggests that recent efforts in fisheries management are having the desired effect of pushing exploitation rates downwards. The slower response of SSB to these measures is perhaps indicative of the environmental influence and possibly other factors.

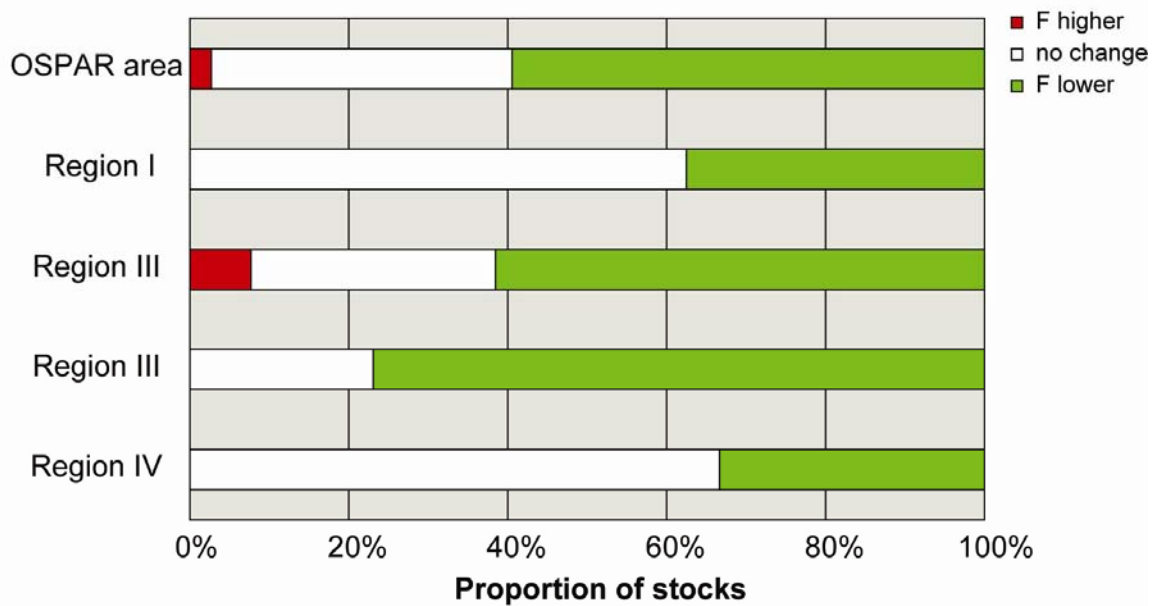


Figure 5.16: Proportion of stocks where fishing mortality (F) is significantly different in 2007 compared with 1997 (significantly higher – red; significantly lower – green) for OSPAR Regions I - IV and for the overall OSPAR Maritime Area (OSPAR). The stocks included in this analysis are detailed in Table 5.1.

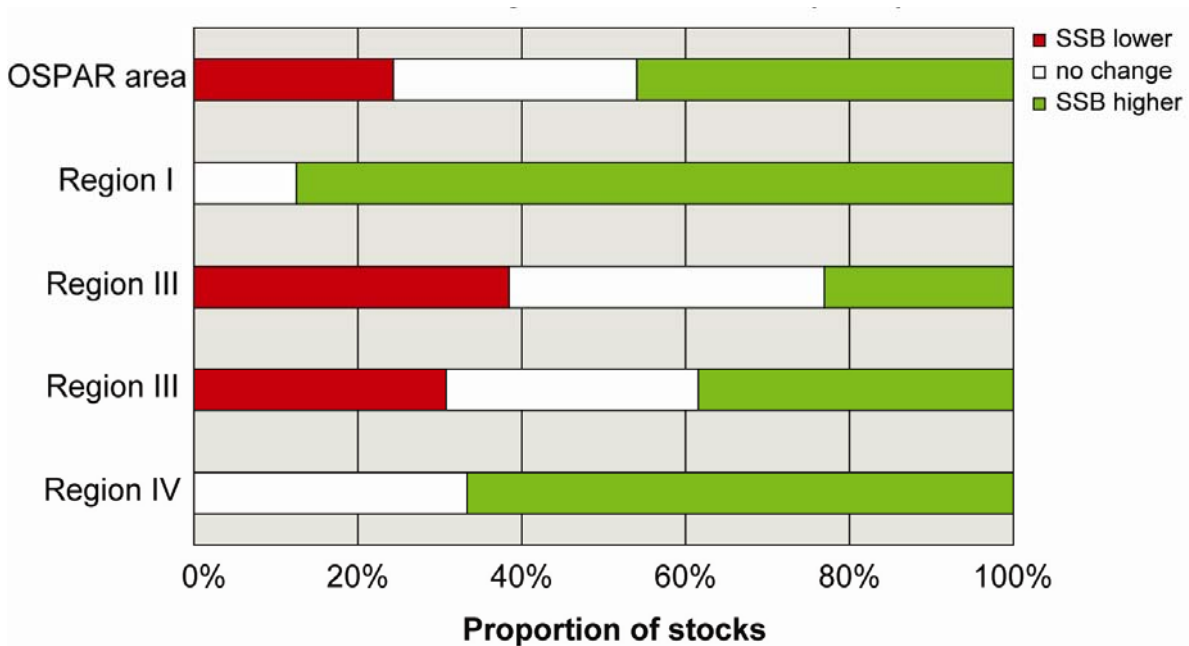


Figure 5.17: Proportion of stocks where spawning stock biomass (SSB) is significantly different in 2007 compared with 1997 (significantly higher – green; significantly lower – red) for OSPAR Regions I - IV and for the overall OSPAR Maritime Area (OSPAR). The stocks included in this analysis are presented in Table 5.1.

The number of stocks that were included in this assessment was 37 with there only being 3 stocks from Region IV. However larger numbers of stocks were assessed for Regions 1 (8 stocks), Region II (13 stocks) and Region III (13 stocks). ICES provide advice on a considerably larger number of stocks and, indeed, there are more than 37 stocks exploited across the North-East Atlantic. Figure 3.2

summarised the ICES scientific advice provided over the period 2003 – 2009 for between 87 and 89 stocks. This is presented on the basis of whether or not stocks are within safe biological limits. However, approximately 60% of stocks were designated as being of unknown state. This lack of knowledge will be further highlighted when discussing the state of stocks compared to maximum sustainable yield (MSY).

↪ *Go to full QSR assessment report on environmental impact of fishing (publication number 465/2009)*