Marine Strategy Framework Directive Consultation: UK Initial Assessment and proposals for Good Environmental Status

Impact Assessment Annex D

North Sea whiting

Input Data

The information required for the stock projections is taken from the ICES 2011 assessment and forecast for the North Sea whiting stock.

Stock and recruitment

Figure 1 presents the whiting time series of recruitment at age 1 used by the ICES WGNSSK working group. There is no strong linkage between recruitment and stock biomass; recruitment to the whiting stock is characterized by two features:

a) strong autocorrelation in the time series, in that the level of recruitment in any year is very likely to be similar to that in the previous year
b) periodic changes in abundance to a new level

Figure 2 presents the approach taken by ICES to simulating the recruitment dynamics of whiting during the evaluation of the current EU-Norway management plan. Three stock and recruitment models are used to simulate the three levels at which whiting recruitment is recorded. All of the models assume a constant level of recruitment when spawning biomass exceeds a set threshold (the lowest recorded value).

Recruitment is generated by selecting a model (recruitment abundance level) at random, and then generating a series of annual recruitments before selecting a new model. Recruitment is therefore largely independent of spawning stock abundance apart from at very low stock sizes at which the parsimonious assumption of a decline to the origin is assumed.

The simulation reflects the current uncertainty as to the future dynamics of the North Sea whiting and has been used to evaluate potential whiting management plans, however it is limited in that, historically (1960's – 1980's), the whiting stock was at significantly higher abundance levels than recently. ICES has noted that due to a lack of consistent information that period cannot currently be modelled. Consequently the simulations assume that the current environmental conditions continue and that whiting remains at a low productivity level compared to historic biomasses.

Fishing mortality scenarios

Fishing mortality for whiting is currently (F=0.27) below that of the EU-Norway management plan for the stock F = 0.3 (there is no Fmsy fishing mortality defined for

the stock). Consequently North Sea whiting fishing mortality could be increased to meet management objectives.

However, the dominant the whitefish mortality rates in the North Sea are not independent for each stock, in particular the fishing effort that can be exerted on whiting and haddock is driven by the effort management used to control the North Sea cod mortality rates. Consequently, four potential fishing mortality scenarios are explored (Figure 3):

1) No change in the whiting exploitation level – status quo fishing mortality at the current level (the black line in Figure 3).
2) The blue line in Figure 3 assumes that the fishery develops a fishing method or strategy by which it can decouple the realised whiting fishing mortality rate from that of the cod management plan and can achieve the target value in the agreed EU-Norway management plan – whiting mortality can therefore be increased to the target of 0.3.
3) The currently agreed EU-Norway North Sea cod management plan requires that cod fishing mortality is reduced by 10% annually until the management target of F=0.4 is achieved. Within EU waters this is being enacted by effort reductions across the whitefish fleets, consequently the scenario presented in green line of Figure 3 reduces whiting fishing mortality in line with the cod management effort reductions to achieve a target rate of F=0.4.
4) Within its Fmsy advice ICES has an extremely optimistic target for cod mortality of F=0.19. Consequently it could be envisaged that at some stage the EU – Norway plan might be revised to reflect this; the effect of the potential reductions on whiting mortality rates is represented by a continuation of the reductions by 10% annually until the cod target is reached (the red line in Figure 3). As can be determined from Figure 3 this results in very low whiting mortality rates F<0.1.

Note that options 1 and 2 assume that a mechanism is found that allows the fishery for whiting to be decoupled from the cod fishery dynamics, options 3 and 4 assume the current linkage is maintained and that the cod plan drive the fishery actions.

Discarding scenarios

Currently there is substantial discarding of whiting within the European fisheries exploiting the North Sea which reduces yield. The majority of discarding is at the youngest ages and these have low yield potential and value. Discarded fish are assumed dead in the model which is reasonable. A discard ban is being discussed with the aim of introducing it by 2018 and thereafter presumably undersized fish caught in a mixed fishery will be landed. Assuming that the industry does not change its selectivity for cod, to avoid discarding small fish, due to the potential loss of haddock and whiting (the main drivers for the current selection pattern of the gear), two potential scenarios could be envisaged:

1) Business as usual; discarding continues unchanged
2) A total discard ban is effective and yields are increased by landing the small fish that would have been discarded.

In the target MSY scenario, it is assumed that a discard ban becomes operational in 2018 and is 100% effective. Independent fishery selection patterns are used for the

larger landed fish and smaller discards consequently the discard tonnage can be transferred to landings in the year that any discard ban is required without the need for further simulations runs.

Output

Percentiles of fishing mortality, spawning biomass, recruitment, discards and landings for a run of the model for 30 years are included for the options:

a. Status quo fishing mortality in the future
b. The management plan mortality at F=0.3
c. A 10% annual reduction in effort until cod achieves F=0.4
d. A 10% annual reduction in effort until cod achieves F=0.19

An assumption of a move to a discard ban can be made by adding the discards to the landings in any year within each set of scenario simulation results.

Figures 3 – 6 present realised fishing mortality, spawning stock biomass, discards and landings outcomes for each scenario. The scenarios in which whiting mortality rates can be decoupled from that of cod result in higher discards and landings and lower levels of spawning biomass. All of the scenarios keep SSB above the recent low levels.

The scenarios in which whiting mortality rates cannot be decoupled from that of cod result in lower discards and landings as the fishing mortality is reduced well below the target levels. The loss of whiting annual landings resulting from fishing the cod at F = 0.19 is 56% and from fishing cod at F= 0.4 is 22%.

Discussion

The recruitment model used in the simulations reflects the current uncertainty as to the future dynamics of the North Sea whiting productivity. Historically, as can be seen from Figure 6, the stock was more productive, recruitment levels higher and landings also. Consequently there may be the potential for the stock to rebuild to very high levels if the environment returns to more favourable conditions. The simulations have been run forward to reflect the current conditions and consequently the estimated proportional losses from the whiting production as a result of the cod management at the two levels of Fmsy, are likely to be reasonably well determined but the absolute values uncertain.

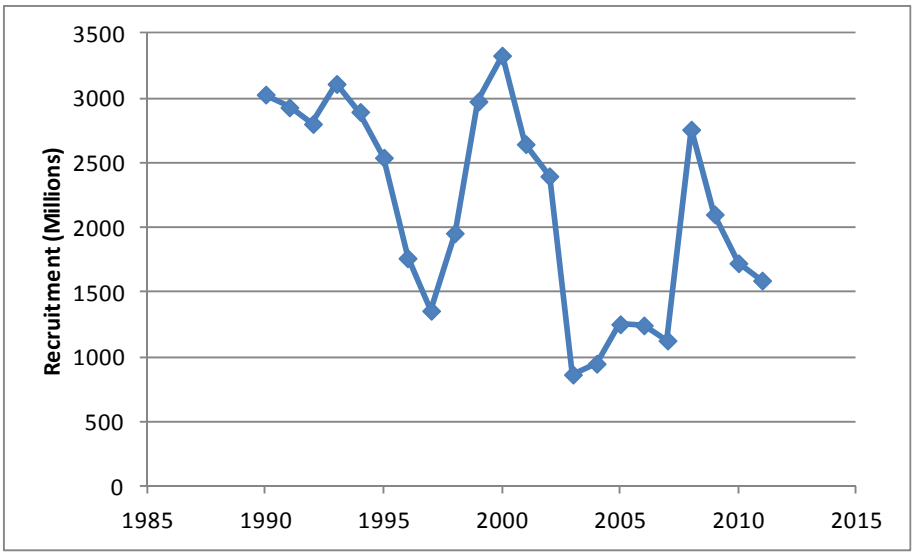

Figure 1. The time series of North Sea whiting recruitment at age 1, illustrating the correlated recruitment which remains relatively constant for a number of years before switching between differing levels. This is more likely to be and environmentally process.

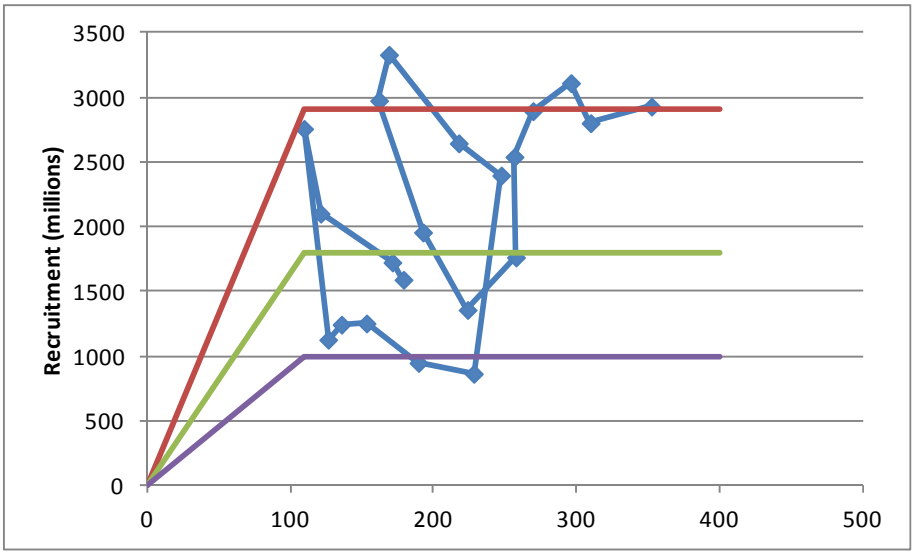

Figure 2. The fit of a three models that assume constant recruitment at high intermediate and low levels and which below the lowest SSB a precautionary assumption of a decline to the origin is considered. Within the simulation model two random draws are used to select one of the three models and then the time period for which recruitment remains at that level.

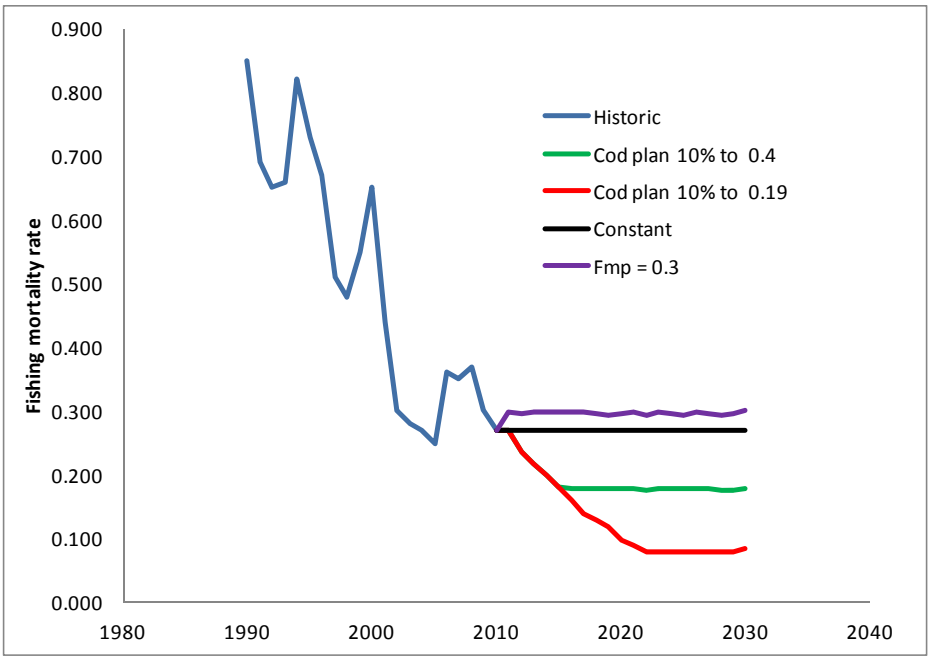

Figure 3. North Sea whiting historic and representative future fishing mortality scenarios; black – continued exploitation at the current level, purple an increase to the agreed management plan target, green – 10% reductions following the cod plan requirement to reach a cod F of 0.4; red - 10% reductions following the cod plan requirement to reach a cod F of 0.19.

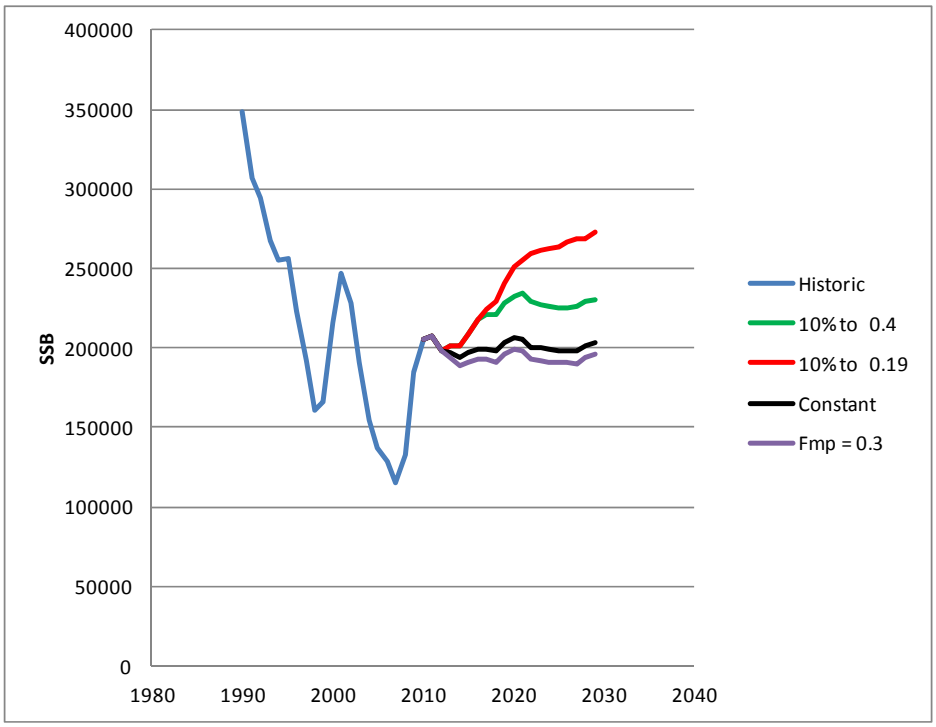

Figure 4. North Sea whiting historic and projected spawning stock biomass; black - continued exploitation at the current level, purple - an increase to the agreed management plan target, green - 10% reductions following the cod plan requirement to reach a cod F of 0.4; red - 10% reductions following the cod plan requirement to reach a cod F of 0.19.

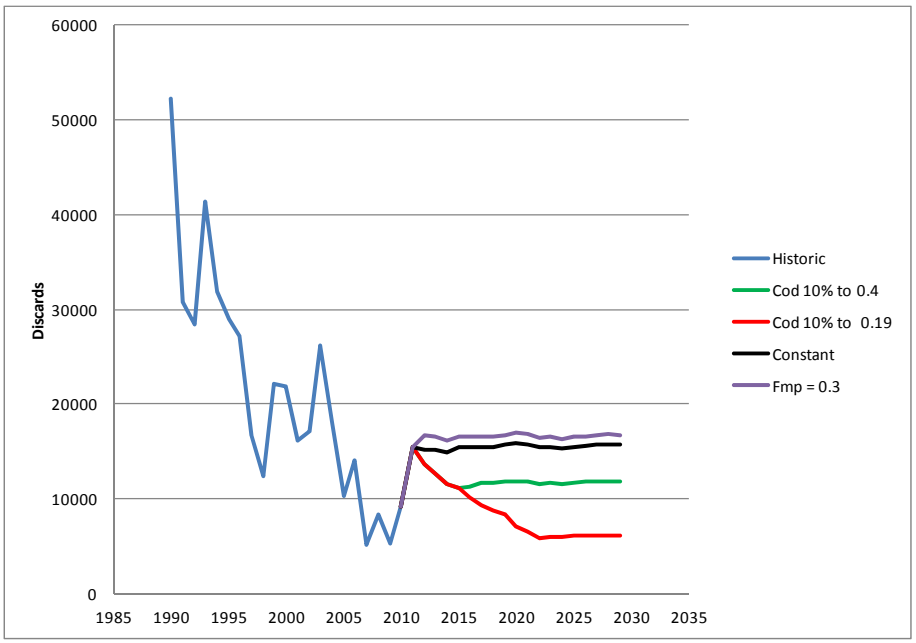

Figure 5. North Sea whiting historic and projected discards assuming no discard ban; black - continued exploitation at the current level, purple - an increase to the agreed management plan target, green - 10% reductions following the cod plan requirement to reach a cod F of 0.4; red - 10% reductions following the cod plan requirement to reach a cod F of 0.19.

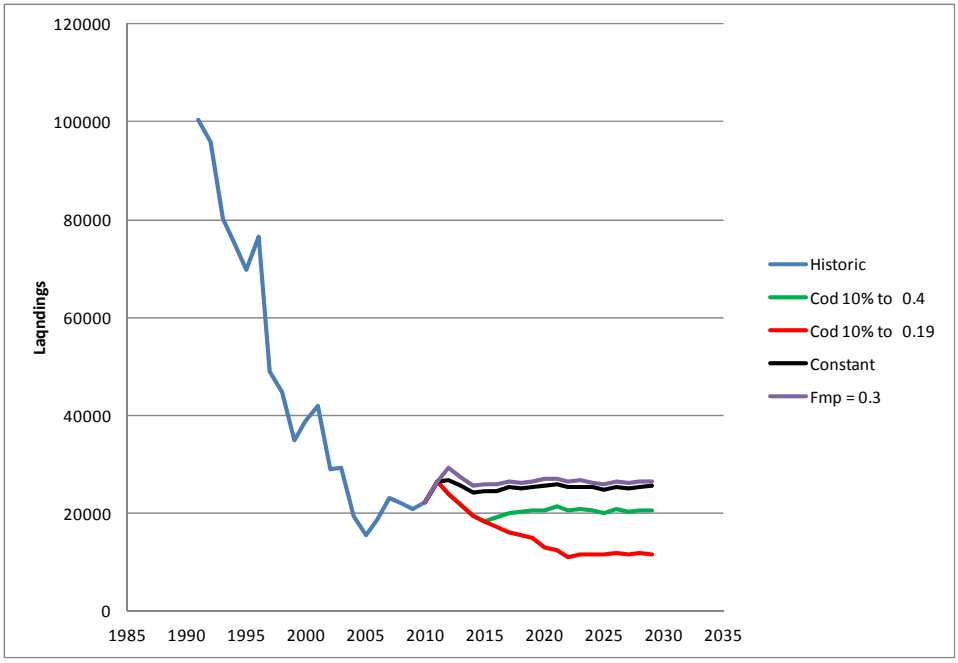

Figure 6. North Sea whiting historic and projected landings assuming no discard ban; black - continued exploitation at the current level, purple - an increase to the agreed management plan target, green - 10% reductions following the cod plan requirement to reach a cod F of 0.4; red - 10% reductions following the cod plan requirement to reach a cod F of 0.19.