

## i Executive summary

The ICES Working Group on Mixed Fisheries Advice (WGMIXFISH-ADVICE) chaired by Claire Moore, Ireland, met at ICES headquarters in Copenhagen, Denmark, 28 October–1 November 2019 to produce mixed fisheries forecasts for the North Sea, Celtic Sea, and Iberian waters.

Mixed fisheries advice highlights the potential implications of single-stock (total allowable catch and effort) management on the catches of multiple stocks caught together in mixed fisheries. It takes into account past fishing patterns and catchability of the different fleets, and the TAC advice produced by the single-stock advice groups for 2019 to provide quantitative forecast of over- and under-exploitation of the different stocks given mixed fishery interactions. Forecasts were based on the “FCube” (Fleet and Fishery Forecasts) methodology for the Celtic Sea and North Sea, and on the “FLBEIA” (Fisheries Library Bio-Economic Impact Assessment) methodology for the Iberian Waters—with a range of potential management scenarios relevant for the specific regional fisheries.

The North Sea demersal mixed fisheries projections consider the single-species advice for cod (cod.27.47d20), haddock (had.27.46a20), whiting (whg.27.47d), saithe (pok.27.3a46), plaice (ple.27.420 and ple.27.7d), sole (sol.27.4), turbot (tur 27.4), and Norway lobster *Nephrops norvegicus* (functional units [FUs] 5–10, 32, 33, 34, and 4 outFU). The most limiting TAC in 2020 will be the TAC for cod for particular fleets (“cod-ns” scenario). The “min” scenario gives a 14% higher catch of cod compared to the “cod-ns” scenario, due to the relaxing of the constraint on a stock where the country is not assumed to be limited for that stock, but the model does not take into account quota reallocation between fleets. Substantial overshoot of TACs can occur under other scenarios (e.g. “max” scenario). This “range” scenario suggests that the potential for mixed fisheries mismatch would be lowered with a 2020 TAC in the lower part of the  $F_{MSY}$  range for North Sea plaice and North Sea saithe, and at the highest possible value for cod in accordance with the MSY approach and the MAP (EU multiannual plan).

The Celtic Sea demersal mixed fisheries projections consider the single-species advice for cod (cod.27.7e–k), haddock (27.7b–k), and whiting (27.7bce–k). The resulting 2020 forecast implies that catches of haddock and whiting would also be zero, as cod single-species advised catch is zero (“min” scenario). The “max” scenario, assumes that all fleets catch their haddock and whiting quotas; this scenario leads to an overshoot for cod and to a lesser extent whiting. In order to provide a scenario with non-zero catch, a reduced cod  $F_{MSY}$  scenario was presented (‘cod\_ $F_{ARMSY}$ ’). Applying the ICES Advice Rule (AR) gives an  $F$  (0.057) for cod and results in undershoots of both haddock and whiting, as fishing is stopped when the cod quota is reached. The range scenario was run using a reduced  $F$  range cod ( $F_{MSY}$  range [0.037–0.089]) and for whiting ( $F_{MSY}$  range [0.45–0.22]), which resulted in haddock and whiting TACs being at the lowest of their respective  $F_{MSY}$  ranges.

The Iberian waters demersal mixed fisheries projections consider the single-species advice for black anglerfish (ank.27.8c9a), hake (hke.27.8c9a), four spot megrim (lbd.27.8c9a), megrim (meg.27.8c9a), and white anglerfish (mon.27.8c9a). The limiting stock for fishing opportunities will be hake, corresponding to an undershoot of the advised catch for the other stocks considered in the mixed fisheries analysis. Conversely, black anglerfish is the least limiting stock, corresponding to an overshoot of the advised catch for the other considered stocks.