Modelling available data for turbot (*Psetta maxima*) in the Irish and Celtic Seas: a first step towards sustainable management?

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Turbot (*Psetta maxima* L.) is an economically very important by-catch species in the European flatfish fisheries. Despite its economic importance, no analytical assessments leading to fisheries advice have been carried out so far. The reason for this is twofold: (1) the available information is inadequate for a detailed evaluation of stock trends; (2) the relatively low numbers of turbot in commercial catches, as well as the high commercial value of this species, make it very difficult to collect data on biological variables in sufficient numbers for a meaningful analysis. Consequently, historic turbot management in the North East Atlantic was based only on an evaluation of trends in landings and effort. Assessing the stock status of turbot remains an important and ever more pressing task, as the 2011-Memorandum of Understanding (MoU) between ICES and the EU requires advice on North Sea turbot from 2011 onwards, and it is anticipated that the request for advice on turbot inhabiting the more westerly fishing grounds will soon follow. As survey time series represents another source of abundance information that was not analyzed for western waters turbot before, this study models the available survey data from 1993-2008 for turbot in ICES-divisions VIIa (Irish Sea) and VIIf and VIIg (Celtic Sea) by means of Generalized Additive Models (GAMs). The results point to a slight increase in population numbers of turbot over the study period. However, these results should be interpreted with much care as scarcity of the data as well as intrinsic uncertainties of the model have to be acknowledged. The model predicts a high concentration of turbot individuals in the Bristol Channel, situated south of Wales, which is a well-known nursery ground for sole (*Solea solea* L.). Previously recognized ecological patterns, such as the relationship between length and depth, are confirmed by our results. At present, performing stock assessments for turbot by means of traditional analytical techniques (such as VPA) is being hampered by the lack of extended time series of catch-at-age data. However, it is feasible to generate relevant insights in population dynamics using more flexible statistical approaches such as GAMs. Improvements in stock assessments can certainly be achieved by implementing enhanced statistical analysis and models, but more attention should be given to improving the quality of the data by re-evaluating current survey designs and addressing fundamental ecological questions for which answers are still lacking.