Different bottom trawl fisheries have a differential impact on the status of the North Sea seafloor habitats

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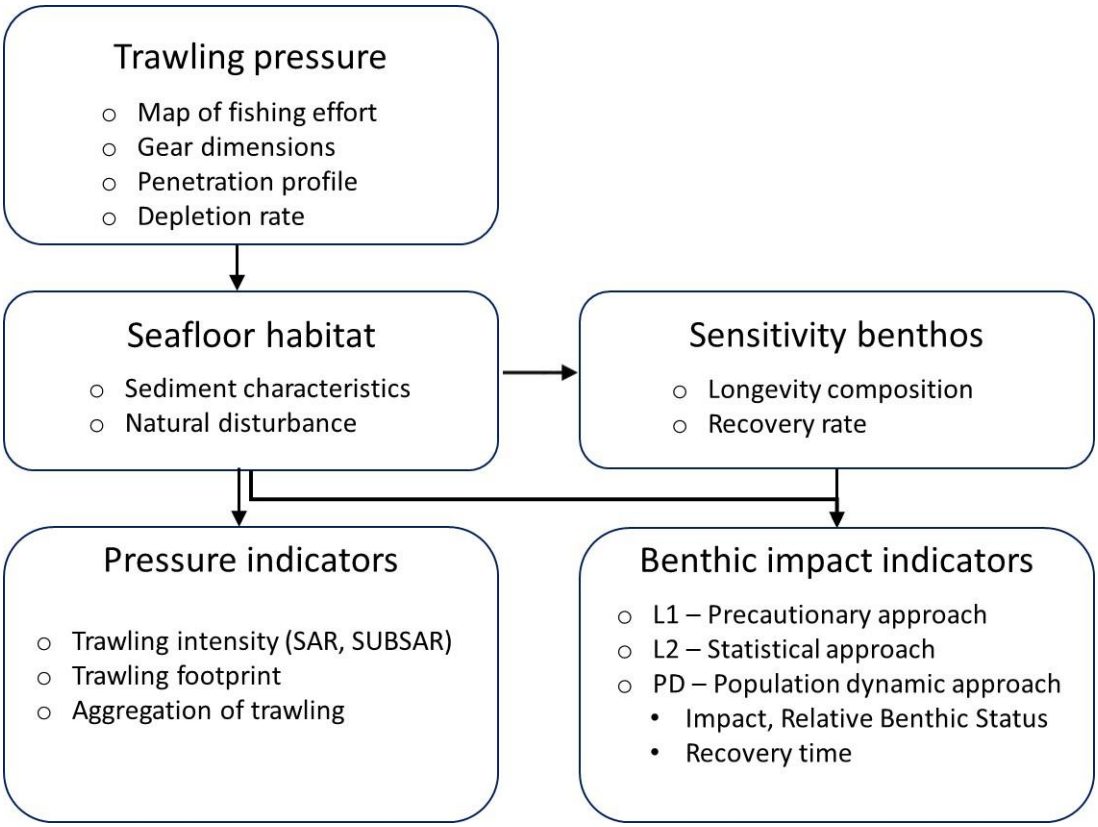

Figure 1. Impact assessment framework showing how the information on the trawling pressure is combined with information on the habitat characteristics of the seafloor and information on the sensitivity of the benthic community to derive indicators of fishing pressure and benthic impact.

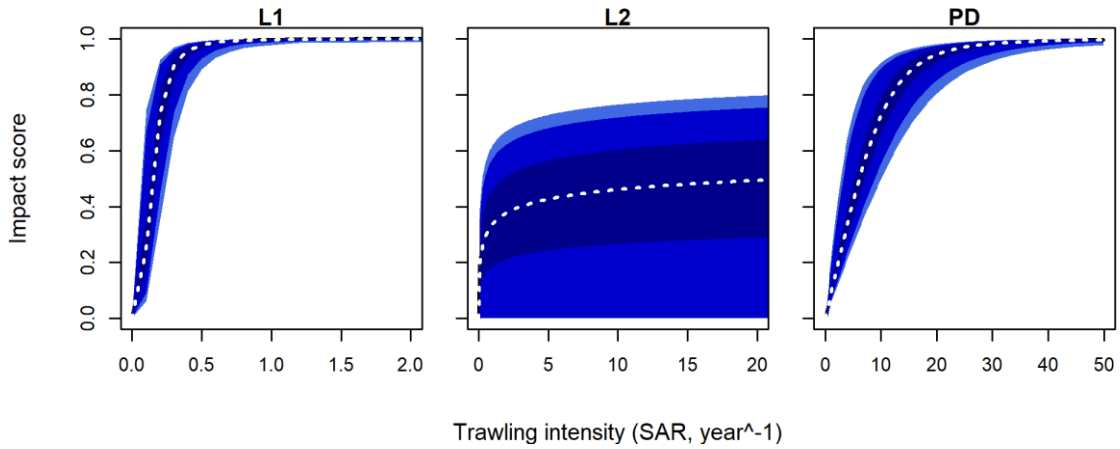

Figure 2. Pressure – response curves for the trawling impact assessment methods L1, L2, PD for a representative sample of habitat conditions in the North Sea. Hatched line shows the median impact scores. Coloured areas show the 1%-99% (light blue), 5%-95% (medium blue) and 25%-75% (dark blue) range of impact scores. Please note different scales on the x-axes.

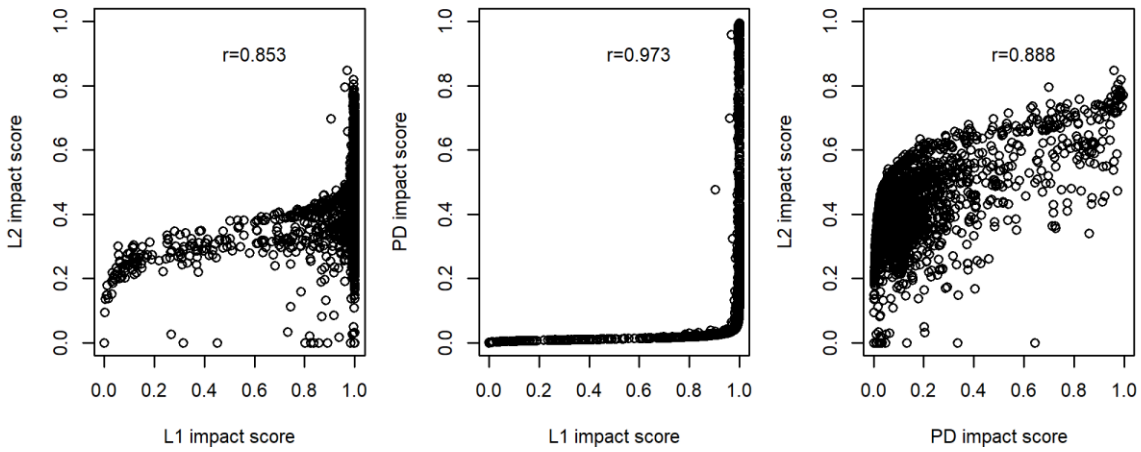

Figure 3. Scatter plots of impact scores of grid cells estimated by methods L1, L2, PD and the spearman rank correlation coefficient. Only every 100th observation is plotted

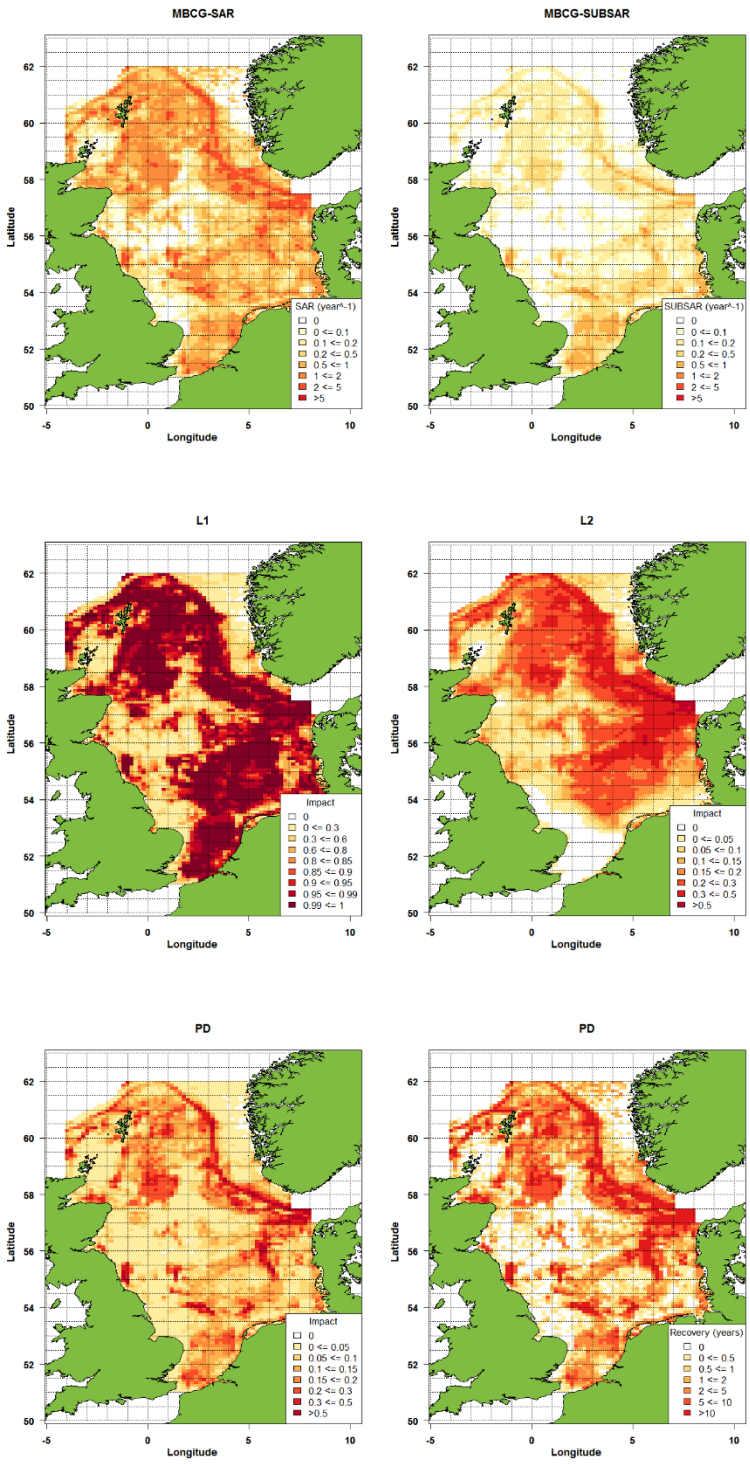

Figure 4. Mean annual trawling intensity (swept area ratio) at the surface (SAR) and subsurface (SUBSAR) and its impact according to the methods L1, L2 and PD. For the PD approach the decrease in biomass relative to the untrawled state and the time (years) required to recover the biomass in absence of trawling to 0.9K (Recovery) is shown.

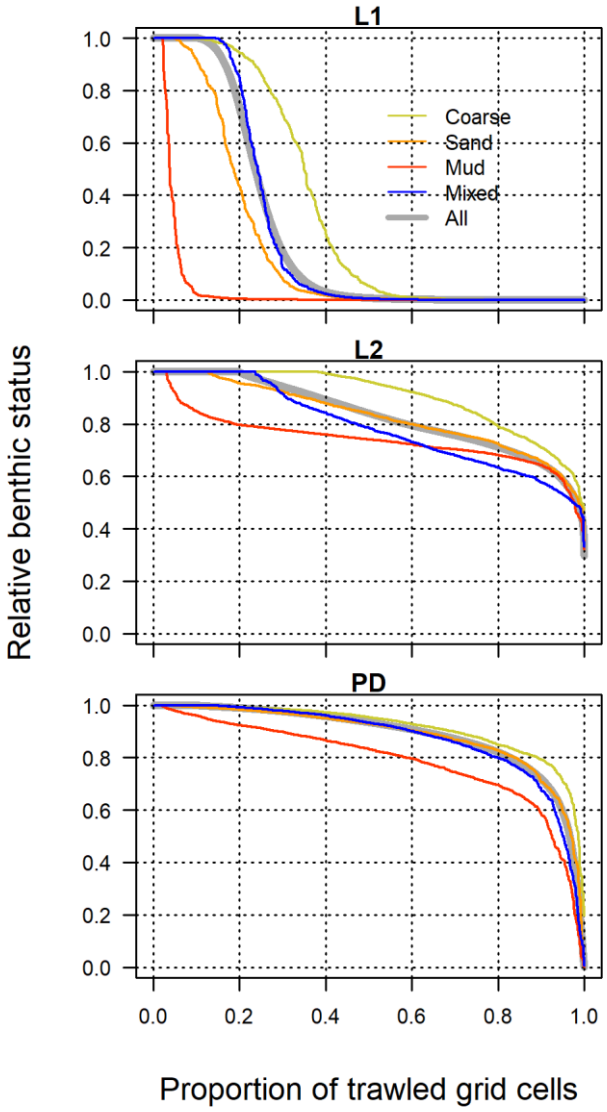

Figure 5. Relative benthic status as a function of the cumulative proportion of the grid cells trawled by mobile bottom contacting gears (MBCG), showing the proportion of the sea bed above or below any given status as determined by the methods L1, L2 and PD. Grid cells are sorted from low to high trawling effort. Results are shown for the main habitat types (coarse, sand, mud, mixed) and for all habitats together (all).

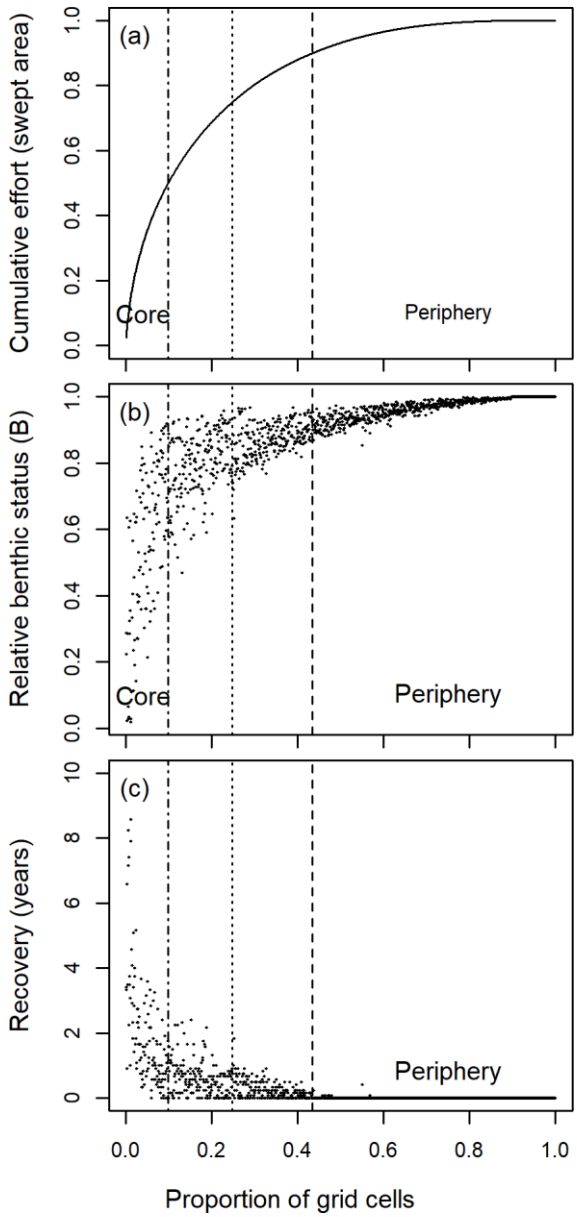

Figure 6. (a) Cumulative trawling effort (swept area); (b) grid cell status according method PD; (c) recovery time of status to 0.9K, in relation to the proportion of grid cells sorted from high to low fishing effort. Vertical lines separate the core parts of the trawled grid cells at 50% (-.-.-.), 75% (....) and 90% (----) of the fishing effort from the peripheral part of the trawled grid cells.

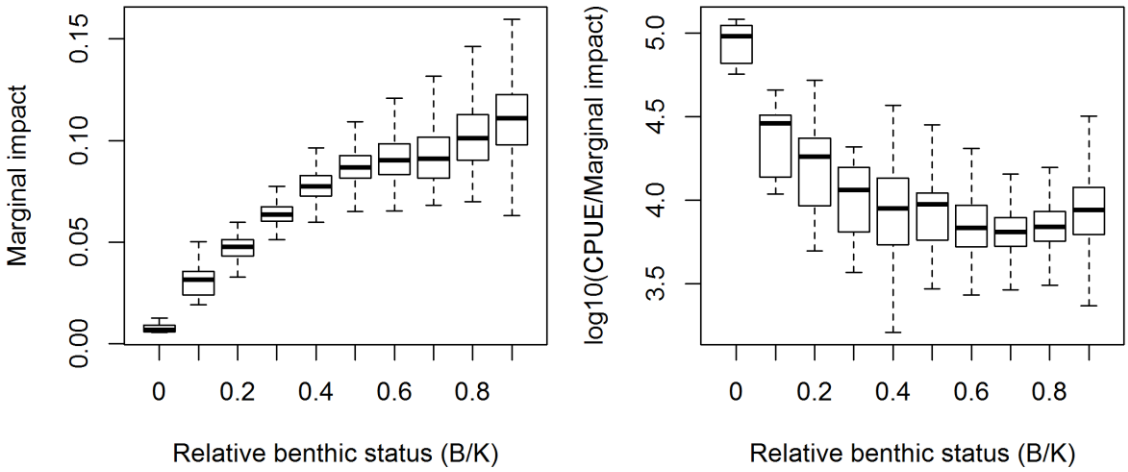

Figure 7. The marginal impact (left) and $\log_{10}$(cpue/marginal impact) ratio by grid cells (right) in relation to the biomass status for metier OT_MIX_1. The marginal impact was estimated with the PD method as the increase in trawling impact due to an increase in trawling intensity of 1 $year^{-1}$.

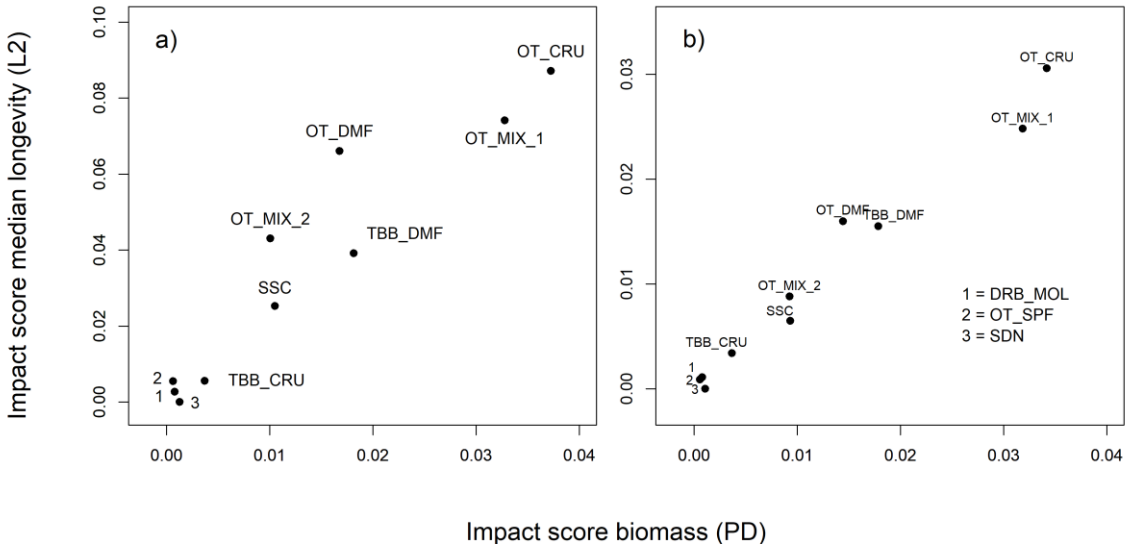

Figure 8. Scatter plot of L2 and PD impact scores by metier against the untrawled reference (a) and trawled reference (b). Impact scores are estimated for all grid cells trawled by mobile bottom contacting gears (MBCG) in the North Sea (0-1000 m).

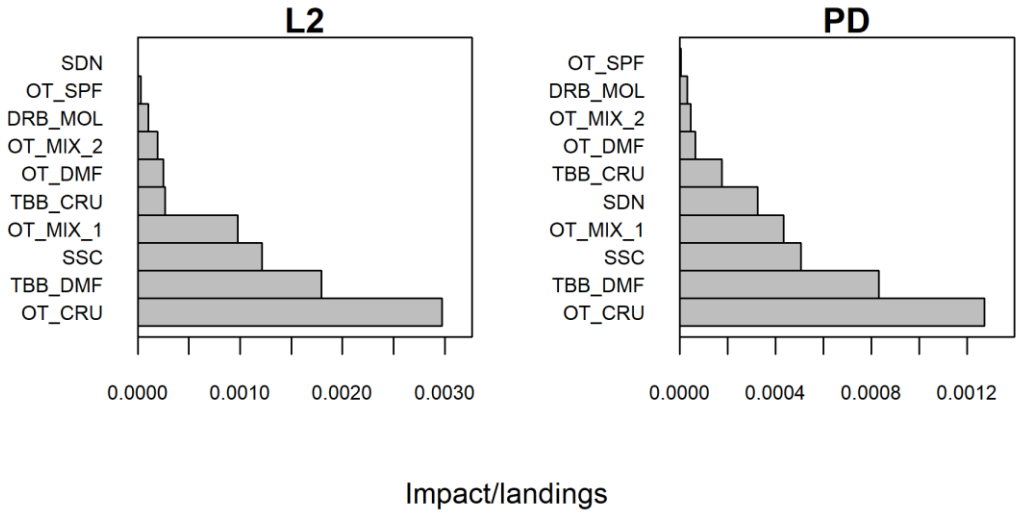

Figure 9. Impact per unit of landings of the ten metiers according the L2 and PD method. Impact scores refer to the untrawled reference.