**Appendix A. Calculation methods of sensitive indices**

For calculating TDI, mTDI and pTDI, scores of the five categories of sensitivity traits (Table 4) were summed for each species and this value is considered as the species sensitivity index (SI) to trawling disturbance. Thus, highly vulnerable species could have a maximum score of 15.

For all calculation with trawling data, abundance was replaced by biomass.

For the TDI (Eq. 1), species are distributed into five groups according to SI: group 1, SI ranged from 0 to 4; group 2, SI = 5-7; group 3, SI = 8-10, group 4, SI = 11-13 and group 5, SI = 14-15 [55]. The abundance of each group was calculated as the sum of abundance of all taxa within each group.

(1) $ TDI\_{x}= \frac{Log1×Log\left(G1\_{x}+1\right)+Log(G2\_{x}+1)+Log4×Log\left(G3\_{x}+1\right)+Log8×Log\left(G4\_{x}+1\right)+Log16×Log(G5\_{x}+1)}{Log(N\_{x}+1)}$

where G1x-G5x were the total abundances of each group in the xth observation and Nx the total abundance of the xth observation

Another indice based on the species sensitivity was proposed by (Foveau et al. 2017) the mTDI (Eq.2).

(2) $mTDI\_{x}= \sum\_{1}^{N\_{x}}\frac{Bi\_{x}}{Bn\_{x}} ×SI\_{i}$

with Nx, the number of taxons in the xth observation; Bix, abundance of the ith taxon in the xth observation; Bnx, summed abundances of the xth observation and SIi, the sensitivity index (SI) of the ith taxon

The pTDI [11] is a modification of mTDI to focused only on sensitive species (SI >7) and thus try to better detect the effect of trawling (Eq. 3).

$$\left(3\right) pTDI\_{x}= \sum\_{1}^{N\_{x}}\frac{Bij\_{x}}{Bn\_{x}} ×SI\_{ij}$$

with Bijx, abundance of the ith taxon of the list j of sensitive taxon (SI>7) in the xth observation; and SIij, SI of the ith taxon of the list j of vulnerable taxon, ; Bnx, summed abundance of the xth observation (including all observed taxa)

Values of these three indices are high when the biomass is dominated by sensitive species and decrease as they are replaced by less sensitive species in the assemblage.

For the calculation of the modified vulnerability Index (mT), the scores of all modalities were rescaled between 0.25 (low sensitivity) and 1 (high sensitivity) (Certain et al. 2015). A sixth trait was used for the calculation of mT: the protection status of each species (OSPAR 2008; OCEANA 2016). The six traits were separated between direct and indirect factors. Direct factors are relative measures of elements controlling the probability of being impacted by a given pressure type, trawling in our case. Indirect factors are relative measures of elements describing the conservation status of species and their indirect sensitivity to disturbance (e.g. filter feeders can be disturbed by the resuspension of sediments due to trawling).Then, for both type of factors, a hierarchy was established between primary factors that directly control the sensitivity and aggravation factors that may not be important on their own, but may worsen pre-existing sensitivity. The factor classification used in our study is detailed in Table A.2.

Table A.2: Direct and indirect factors and their hierarchical classification

|  |  |  |  |
| --- | --- | --- | --- |
|  | Short description | Factor type | Factor hierarchy |
| F1 | Position in the sediment | Direct | Primary |
| F2 | Mobility | Direct | Primary |
| F3 | Adult size | Direct | Primary |
| F4 | Fragility | Direct | Aggravation |
| F5 | Feeding mode | Indirect | Primary |
| F6 | Protection status | Indirect | Primary |

The direct component of the index, ti, of each individual taxon i, is obtained by applying equation (4) with ai = Fi1 x Fi2 x Fi3 , gi = Fi4 and γ = 0.5. The indirect component of the index, si, of the ith taxon is obtained by applying equation (5) with ai = (Fi5 + Fi6)/2 and gi = 0.

$$\left(4\right) t\_{i}=a\_{i}^{ 1-g\_{i}/(g\_{i}+γ)}$$

The modified vulnerability Index (mTx) in then calculated as in equation (5).

$$ \left(5\right) mT\_{x}= -\sum\_{i=1}^{N\_{x}}\frac{Bri\_{x}}{t\_{i} × s\_{i}}$$

with Brix, relative abundance of the ith taxon of the station x and Nx the total number of taxon of the station x. This index tends to increase as the assemblage sensitivity increases.

**Appendix B. Surface sampled**

Table B.1: Sampled surface by the two observations methods in the Gulf of Lion and the English Channel.

The three abrasion values represent the minimum value, the mean and the maximum value.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Video** |  | **Trawl** |
|  | Gulf of Lion | English Channel |  | Gulf of Lion | English Channel |
| **Sampled surface** **(in km²)** | 0.004 - 0.012 - 0.018 | 0.005 - 0.012 - 0.020 |  | 0.204 - 0.239 - 0.265 | 0.162 - 0.226 - 0.254 |