



COMMISSION
OSPAR

Longueur maximale moyenne des poissons

Évaluation pilote



OSPAR

QUALITY STATUS REPORT 2023

2022

Evaluation pilote : longueur maximale moyenne des poissons

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Convention OSPAR

La Convention pour la protection du milieu marin de l’Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d’Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. Les Parties contractantes sont l’Allemagne, la Belgique, le Danemark, l’Espagne, la Finlande, la France, l’Irlande, l’Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume- Uni de Grande Bretagne et d’Irlande du Nord, la Suède, la Suisse et l’Union européenne

Contributeurs

Christopher Lynam, Gerjan Piet

Citation

Lynam, C. Piet, G. 2022. *Evaluation pilote : longueur maximale moyenne des poissons*. OSPAR, 2023: Bilan de santé. Commission OSPAR, Londres. Disponible via le lien suivant : <https://oap.ospar.org/fr/ospar-assessments/quality-status-reports/qsr-2023/evaluations-des-indicateurs/longueur-maximale-moyenne-des-poissons-pilote/>

Contents

Message clé	3
Contexte	3
Contexte (version étendue)	3
Méthode d'évaluation	4
Data Used and Quality Assurance	5
Data Treatment	7
Overall assessment basis	8
Time series assessment	9
Résultats	9
Résultats (version étendue)	11
Conclusion	12
Lacunes dans les connaissances	12
Références	12
Métadonnées d'évaluation	13

Message clé

La modification de la composition des espèces au sein des communautés halieutiques est évaluée en fonction de l'évolution de l'indicateur de la longueur maximale moyenne. Aucune tendance cohérente ne se dégage parmi les Régions évaluées, mais on constate que la longueur maximale moyenne diminue à long terme dans la mer du Nord, jusqu'à atteindre les valeurs minimales. Dans toutes les autres Régions, on observe des tendances mixtes d'augmentation et de diminution.

Contexte

La pêche s'effectue de façon sélective en fonction de la taille, privilégiant les plus gros poissons. Cela signifie que les espèces de grande taille (c'est-à-dire celles qui peuvent atteindre des tailles plus importantes et donc arriver à maturité à une taille relativement grande) sont plus vulnérables à la pêche sélective en fonction de la taille. Il est probable que la proportion de ces espèces de grande taille diminuera au fil du temps, ce qui aura des répercussions sur la composition des espèces au sein des communautés halieutiques. Comme les espèces de grande taille se trouvent généralement dans les niveaux trophiques supérieurs (au-delà d'une certaine taille spécifique, elles sont principalement piscivores), cela risque également d'affecter le fonctionnement du réseau trophique (par exemple, Bell et al., 2018; Shackell et al., 2009; Thompson et al., 2020). Pour le Bilan de Santé 2023, plusieurs évaluations relatives aux communautés halieutiques ont été menées afin d'évaluer les impacts de la pêche sur le réseau trophique, compte tenu de différents paramètres qui mettent en évidence diverses réactions dans l'écosystème.

Contexte (version étendue)

La longueur maximale (**Figure a**) est l'une des caractéristiques du cycle de vie qui détermine la vulnérabilité des espèces à un facteur de mortalité supplémentaire. On choisit cette caractéristique du cycle de vie, car on part du principe que les espèces de grande taille connues pour atteindre une longueur maximale importante se reproduisent à un stade tardif et sont donc exposées aux pressions qui affectent les communautés halieutiques plus longtemps que d'autres espèces (surtout si les pressions dépendent de la taille, comme la pêche). On s'attend à ce que ces espèces soient les premières à enregistrer un déclin en cas de pressions élevées puisqu'elles y sont exposées plus longtemps. Ce paramètre du cycle de vie a été sélectionné pour représenter la vulnérabilité spécifique d'une espèce, car il se fonde sur des données largement disponibles.

Un déclin de la longueur maximale moyenne indique que les espèces de poissons de grande taille et d'élastomobranches les plus vulnérables sont de moins en moins nombreuses, et que le fonctionnement du réseau trophique est compromis par la perte d'espèces principalement piscivores. Selon l'ampleur et la durée de la pression, cela peut entraîner l'extinction locale ou régionale d'espèces de grande taille, et donc une perte de la biodiversité.

L'indicateur est calculé à partir des données sur les captures provenant d'études scientifiques. Il s'agit de programmes de surveillance normalisés menés chaque année à la même période, dans le cadre desquels sont prélevés des échantillons représentatifs selon des lignes directrices spécifiques. On établit une distinction entre les divers composants des communautés halieutiques en fonction de leur comportement alimentaire, en se fondant pour cela sur des groupes trophiques établis sur la base des habitats ; on se concentre ici sur les espèces de poissons démersales (espèces vivant à proximité des fonds marins).

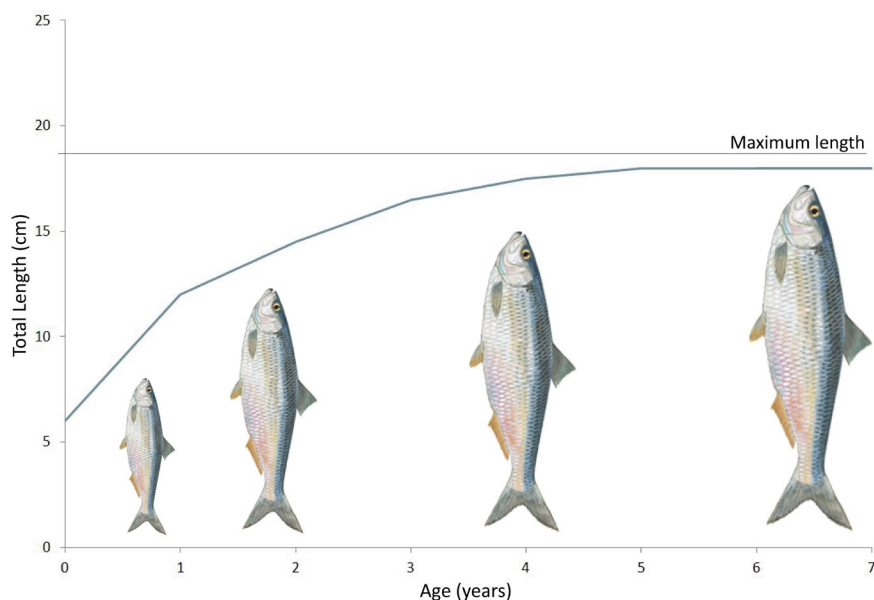


Figure a : Longueur maximale basée sur la courbe de croissance de Von Bertalanffy

Méthode d'évaluation

Mean maximum length (shown as MML in the equation below) can be calculated for the entire assemblage caught by a particular gear or a subset based on morphology, behaviour, or habitat preferences (e.g., bottom-dwelling species only). Mean maximum length is calculated (ICES, 2012) as:

$$MML = \frac{\sum_j (L_{max,j} B_j)}{B}$$

where $L_{max,j}$ is the maximum length obtained by species j , B_j is the biomass of all individuals of species j and B is the total biomass of all individuals. Note, other analyses standardise the indicator in relation to abundance (e.g., Mindel et al., 2008) rather than biomass, which results in an indicator that is more sensitive to recruitment events and large interannual fluctuations.

Data for this indicator come from scientific fisheries surveys, which ideally sample the entire fish community but in practice do not. Every survey can be expected to sample a survey-specific subset of the community often referred to as an assemblage. The indicator requires that each survey is conducted at regular intervals (e.g., annually) in the same area with a standard gear. Sufficiency of sample sizes can be judged using re-sampling techniques (Shephard et al., 2012). The number of individuals per species is not always recorded directly by surveys, but may be based on samples with certain detection error (including false negatives specifically for rare species). The detection error is further complicated by differing catchabilities over length classes and species, such that the observed relative abundance between species (and size-classes) is survey-specific. Where available, catchability estimates can be used to correct for this component of the systematic measurement error (e.g., Fraser et al., 2007; Walker et al., 2017). However, such estimates are sparse in the scientific literature and are prone to great uncertainty. Alternatively, model-based estimates of absolute species abundance can be used to rescale observed abundances, but here model uncertainty is also great (ICES, 2014). For simplicity the mean maximum length indicator is therefore calculated as a survey-specific indicator without any correction for detection error (i.e., catchability). This implies that every survey-specific indicator may provide a slightly different perspective to the reality they are supposed to represent. This indicator is calculated by survey and, where possible, also for subdivisional strata that are assumed to represent different habitats and communities. Whereas each survey may provide a slightly different

perspective to the reality, the surveys themselves are standardised so that they can be assumed to provide a consistent representation of that perspective over time.

The data are collected under national programmes and the data collection framework. Currently, the most important data source for mean maximum length are those groundfish surveys that are coordinated by the International Council for the Exploration of the Sea (ICES). The International Bottom Trawl Survey (IBTS) programme in the Greater North Sea, the Celtic Seas, Bay of Biscay and Iberian Coast, and Wider Atlantic is particularly important since the trawl is a general-purpose design aimed at catching demersal and pelagic species. However, beam trawl surveys are more efficient at catching benthivorous species (e.g., flatfish species such as sole, or plaice). The two gears can therefore be assumed to provide complementary perspectives of the fish community.

Data Used and Quality Assurance

This assessment draws on raw data from the ICES database of trawl surveys (DATRAS, www.ices.dk/marine-data/data-portals/Pages/DATRAS.aspx). These data have been quality controlled within OSPAR to generate a data product for assessment purposes. Time series of mean maximum length for fish and elasmobranchs are derived from each available groundfish and beam trawl survey.

Time series of mean maximum length by guild were determined for many groundfish surveys carried out across four separate Regions: the Greater North Sea, Celtic Seas, Bay of Biscay and Iberian Coast, and the Wider Atlantic (**Table a**). Ecological subdivisions were determined for the Greater North Sea using a simplification of those strata proposed by the European Union financed project Towards a Joint Monitoring Programme for the North Sea and Celtic Sea (JMP NS/CS) that took place in 2013, and building upon work in the European Union VECTORS project (Vectors of Change in European Marine Ecosystems and their Environmental and Socio-Economic Impacts) that examined the significant changes taking place in European seas, their causes, and the impacts they will have on society. In other OSPAR Regions, the strata from the survey design were considered appropriate to represent the ecological subdivisions (**Figure b**).

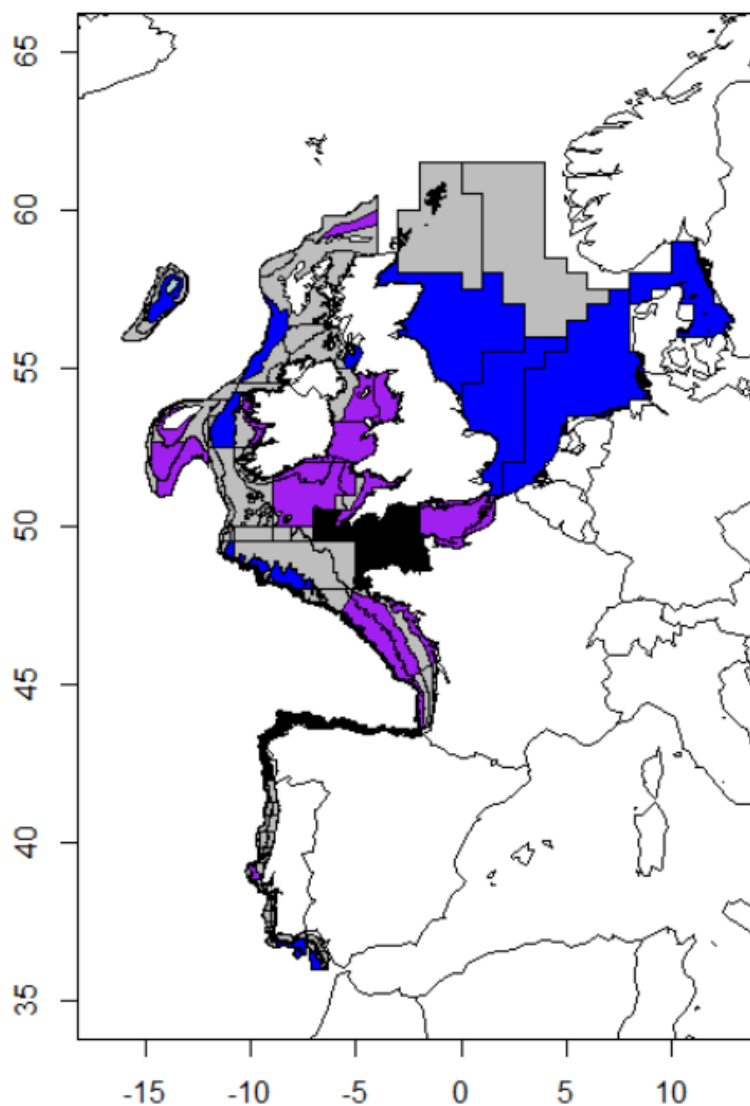


Figure b: Spatial pattern in outcome of mean maximum length indicator by subdivision for preferred surveys by Region. Purple colouring means long-term increase evident; dark blue shows decrease to minimum level; light blue shows decrease to low but not minimum level. Grey areas show areas with no long-term change evident and black areas show surveys that are too short to detect long-term change.

Table a: Groundfish and beam trawl surveys, the Region in which they operate, and the period over which they have been undertaken		
Subregion	Survey Acronym ¹	Survey Period
Bay of Biscay and Iberian Coast	BBIC(n)SpaOT4	2011 – 2018
	BBIC(s)SpaOT1	2000 – 2020
	BBIC(s)SpaOT4	2002 – 2020
	BBICPorOT4	2002 – 2018
	BBICFraBT4	2011 – 2020
	BBICFraOT4 ²	1997 – 2020
Celtic Seas	CSFraOT4 ²	1997 – 2020
	CSEngBT3	1993 – 2019
	CSEngBT3 Bristol Channel	1993 – 2020
	CSlreOT4	2003 – 2020

	CSNirOT1	2008 – 2020
	CSNirOT4	2009 – 2020
	CSScoOT1	1985 – 2020
	CSScoOT4	1997 – 2020
Greater North Sea	GNSEngBT3	1990 – 2020
	GNSFraOT4	1988 – 2020
	GNSGerBT3	1997– 2020
	GNSBelBT4	2004 – 2020
	GNSIntOT1	1983 – 2020
	GNSIntOT1 Eastern Eng. Channel	2007 – 2020
	GNSIntOT3	1998 – 2020
	GNSNetBT3	1999 – 2020
Wider Atlantic	WAScoOT3	1999 – 2020
	WASpaOT3	2006 – 2018

¹ *Survey acronym convention: First 2 to 4 capitalised letters indicate the OSPAR Region (BBIC: Bay of Biscay and Iberian Coast; CS: Celtic Seas; GNS: Greater North Sea; WA – Wider Atlantic). Next capitalised and lowercase letters signify the country involved (Spa: Spain; Bel: Belgium; Por: Portugal; Fra: France; Eng: England; Ire: Republic of Ireland; Nir: Northern Ireland; Sco: Scotland; Ger: Germany; Int: International; Net: The Netherlands. International refers to the two international bottom trawl surveys carried out in the Greater North Sea under the International Council for the Exploration of the Sea (ICES). In the Bay of Biscay and Iberian Coast Region, Spanish surveys are further delimited by (n) for surveys operating in the northern Iberian Coast area and (s) for surveys operating in the southern Iberian Coast area. Next two capitalised letters indicate the type of survey (OT: otter trawl; BT: beam trawl). Final number indicates the season in which the survey is primarily undertaken (1: January to March; 3: July to September; 4: October to December).*

² *This is a single survey that operates across both the Celtic Seas and the Bay of Biscay and Iberian Coast Regions, from the southern coast of the Republic of Ireland and down the western Atlantic coast of France. For indicator assessment purposes, this single survey was split into its two regional components.*

Standard data collected on these surveys comprise numbers of each species of fish sampled in each trawl haul, measured to defined length categories (i.e., 1 cm below, so a fish with a recorded length of 14 cm would be between 14,00 and 14,99 cm in length). By dividing species- and size-specific catch numbers-at-length by the area swept by the trawl on each sampling occasion, the catch data are converted to standardised estimates of fish density-at-length (referred to below as catch-per-unit-area, CPUA), by species, at each sampling location (i.e., trawl haul). Size-specific catch numbers-at-length is thereafter converted into size-specific catch kilograms-at-length by using the length-weight relationship of fish. $W = a L^b$.

Summing these species density-at-length estimates per trawl haul across all trawl hauls collected within each sampling stratum in each year (i.e., survey-specific strata following the survey design, which is the ICES ‘statistical rectangles’ in the Greater North Sea and generally depth-based strata elsewhere) provides a survey-specific regional assessment.

Data Treatment

Surveys with Rectangular Sampling Grids (GNSIntOT1, GNSIntOT3, GNSNetBT3, GNSGerBT3, GNSBelBT3, GNSEngBT3, GNSFraOT4)

Catch-per-unit-area (CPUA) data (kg/km²) from multiple hauls are averaged by species for each rectangular grid cell. In the Greater North Sea these are ICES statistical rectangles, in the eastern Channel a mini-grid 0,25° × 0,25° is used by GNSFraOT4.

The resulting rectangle-based CPUA estimates are multiplied by area (km²) of their rectangles (using a Lambert equal area projection) to give biomass-at-length (now measured in kg per rectangle). Subdivisional level (not GNSFraOT4) estimates of biomass-at-length are given by the sum of the rectangle-based biomass-at-length estimates and corrected by a scaling factor = 1/(proportion of the area of subdivision monitored in the survey year) (units are now tonnes per subdivision). The scaling factor correction ensures that the weighting of the strata relative to each other in each year is not altered by the sampling levels. Subdivisional estimates of mean maximum length are calculated at this point for investigating the local responses of each community.

Regional estimates of biomass-at-length are estimated from the sum of subdivisions. The regional assessment of mean maximum length is thus based on these summed subdivisional estimates.

Surveys with Irregular Depth Banded Strata (i.e., all surveys other than those with Rectangular Sampling Grids)

Catch-per-unit-area (CPUA) data (kg/km²) from multiple hauls are averaged by species for each survey strata. Subdivisional estimates of biomass-at-length are subsequently given by CPUA multiplied by area of the survey strata (km², using a Lambert equal area projection). Subdivisional estimates of mean maximum length represent the local status of the fish community.

Regional estimates of biomass-at-length are estimated from the sum of subdivisions. The regional assessment of mean maximum length is thus based on these summed subdivisional estimates.

Overall assessment basis

Where multiple surveys were available for assessment, key surveys were prioritised (preferred) for assessment given the length of time series available and spatial coverage. If these measures were equal between surveys, then whichever surveyed the greatest biomass by guild was selected for indicator assessment. The following surveys were considered key:

Greater North Sea

GNSIntOT1 was the preferred survey for the Greater North Sea, given it is the longest survey with the best spatial coverage. For the eastern Channel, GNSEngBT3 was preferred given more consistent sampling here than GNSIntOT1 and GNSFraOT4.

Celtic Seas

CSScoOT1 was preferred over CSScoOT4 and CSIreOT4 due to length of time series. CSIreOT4 was preferred for subdivisions to the west of Ireland and in the northern Celtic Sea, but not in the north where there was overlap with CSScoOT1. CSFraOT4 was preferred in subdivision of the Celtic Sea, except where overlap with CSIreOT4.

CSEngBT3 for the demersal guild was preferred for the Irish Sea over CSNIrOT1 and CSNIrOT4 given its greater length of the survey.

Bay of Biscay and Iberian Coast

BBIC(s)SpaOT1 was preferred over BBIC(s)SpaOT4 given length of survey. BBICPorOT4 and BBIC(n)SpaOT4 did not overlap with any other surveys. BBICFraOT4 was preferred over BBICFraBT4 due to length of survey.

Time series assessment

The long-term trend in each time series (subdivision and survey level) was modelled through the application of a LOESS smoother (i.e., locally weighted scatterplot smoothing) with a simple 'fixed span' of one decade. Breakpoint analyses use data to define stable underlying periods (Probst and Stelzenmuller, 2015). The method makes it possible to say whether there is a significant change in the indicator over time, that is, whether a specific period is significantly different from the historically observed period. The method avoids the arbitrary choice of reference periods for assessment (i.e., how many years to choose to calculate an average), which can lead to subjective assessments. The shorter the period chosen the more likely it is to be comparing noise in the data or natural fluctuations in the system against each other. However, a too long period and the actual changes in the indicator might be averaged out. The minimum detectable period is defined in this analysis as six years and is assumed to be appropriate to capture the response of the fish community as opposed to noise (note that in the IA2017 assessment the minimum period was set as three years). The analysis uses two statistical approaches: (1) applying the 'supremum F test' to identify if a non-stationary time series or if a constant period for the entire time series is more suitable; (2) if considered non-stationary, then breakpoint analysis finds periods of at least six years duration.

Résultats

Mer du Nord au sens large

Des augmentations à long terme dans la Manche orientale ont été mises en évidence dans l'étude GNSEngBT3 (depuis 1990) et l'étude GNSFraOT4 (depuis 1998) (**Figure 1**). L'étude GNSIntOT1, plus récente, indique une tendance variable depuis 2007.

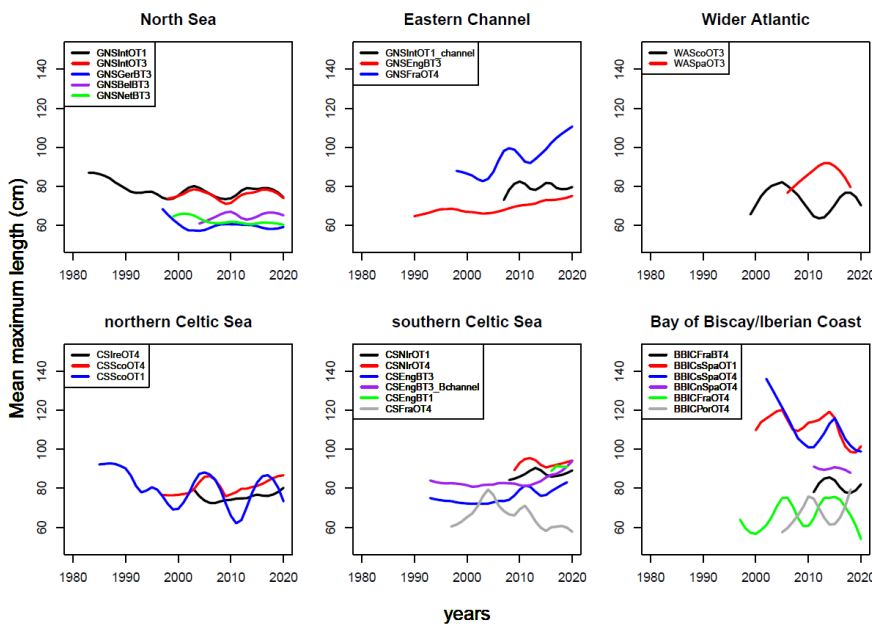


Figure 1: Time series of mean maximum length by survey, showing LOESS smoothed patterns, where overlapping surveys within Regions are grouped.

Pour la mer du Nord (y compris le Kattegat), l'étude la plus ancienne, à savoir GNSIntOT1, montre une diminution à long terme jusqu'au début de l'étude GNSIntOT3, en 1998, et des études effectuées par chalut à perche, en 1997. À partir de cette période, l'étude GNSIntOT1 et la série temporelle plus courte dérivée de l'étude GNSIntOT3 (à partir de 1998) sont variables, sans tendance claire pour la mer du Nord au sens large. Cela révèle deux tendances générales de l'indicateur : une diminution due aux changements antérieurs à 1990 dans les subdivisions centrale et méridionale de la mer du Nord (sud-est SE, sud-ouest SW, centre-ouest

CW et Kattegat-Skagerrak KS) et une évolution variable sans tendance claire dans les subdivisions septentrionales (**Figure b** et **Figure 2**).

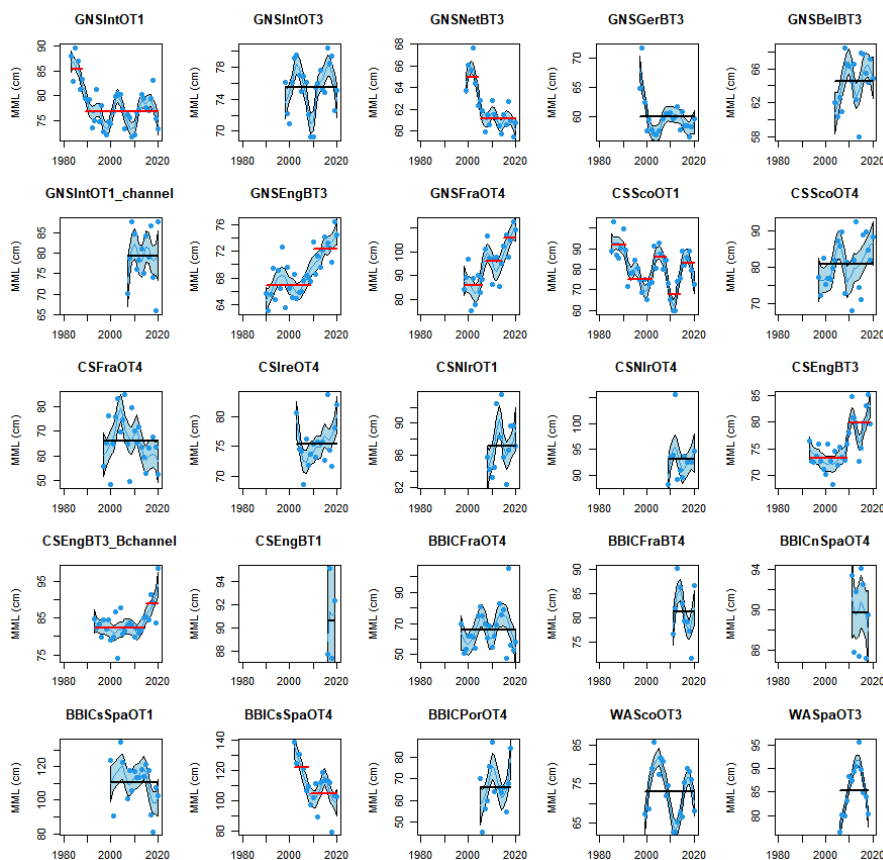


Figure 2: Time series of mean maximum length by survey showing data points, LOESS smoothed patterns and stable periods (black if constant over period assessed and red if a breakpoint is detected).

S’agissant des données plus récentes obtenues par chalut à perche pour les parties centrale et méridionale de la mer du Nord, une diminution générale a été mise en évidence pour l’année 2005 par l’étude GNSNetBT3. À la suite de cette diminution et conformément aux séries temporelles récentes des études GNSGerBT3 et GNSBelBT3, l’indicateur s’est stabilisé à des valeurs faibles.

Mers celtiques

Pour cette Région, les résultats étaient mitigés (augmentations, diminutions, aucun changement) (**Figure b** et **Figure 2**). Des augmentations générales ont été constatées en mer d’Irlande (CSEngBT3) et dans le canal de Bristol (CSEngBT3_Bchannel) (**Figure 1**). Cependant, on a observé une diminution globale sur le long terme, suivie d’une amélioration partielle ces dernières années, dans les eaux profondes à l’ouest de l’Écosse et de l’Irlande (CSScoOT1 et CSIreOT4).

Au sud de l’Irlande, des augmentations ont également été constatées dans une grande partie de la mer Celtique, à l’exception des eaux profondes situées en bordure du plateau (CSIreOT4) (**Figure b** et **Figure 2**).

Golfe de Gascogne et côte ibérique

En ce qui concerne le golfe de Gascogne et la côte Ibérique, sept études n’ont globalement montré aucun changement (**Figure 2**). Cependant, il existe des preuves d’une diminution dans les zones méridionales de la côte ibérique et d’une augmentation dans le golfe de Gascogne, à l’exception des eaux plus profondes ayant fait l’objet d’échantillonnages dans le cadre de l’étude BBICFraOT4 (**Figure b**).

Atlantique au large

Aucun changement global n'a été observé.

Résultats (version étendue)

Greater North Sea

A further decrease was detected in the early 2000s in the south-eastern North Sea in the four surveys that sample this area GNSIntOT1, GNSIntOT3, GNSNetBT3 and GNSGerBT3 (**Figure c**).

One of three surveys that sample the central-western North Sea (GNSNetBT3 but not GNSIntOT1 or GNSIntOT3) found a secondary decline in the subdivision.

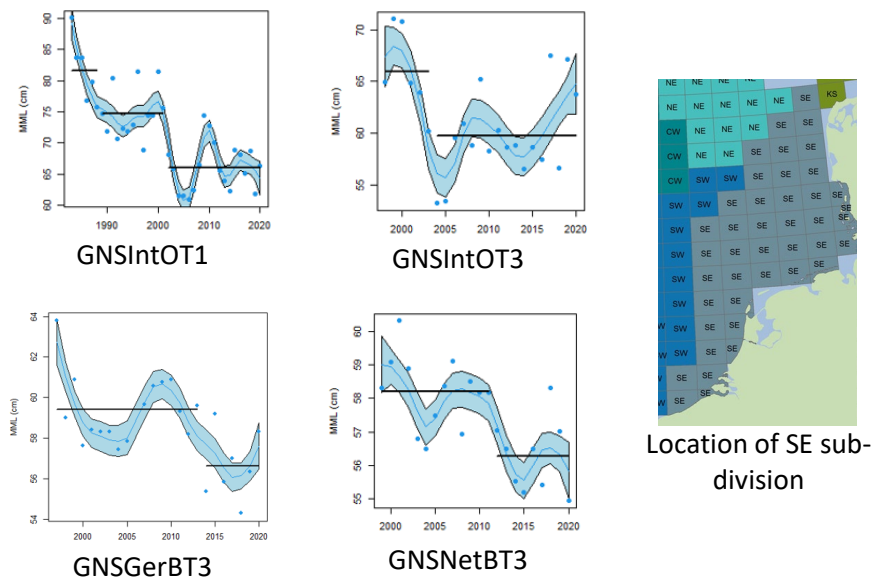


Figure c: Decline in the south-eastern North Sea in the four surveys that sample this subdivision

Celtic Seas

To the west of Ireland, an increase in coastal waters again is opposed by a decrease at the shelf edge. This decrease at the shelf edge continues to the west of Scotland (CSScoOT1). To the north of Scotland an increase was evident in a small subdivision, but an opposing decrease was found in the Clyde subdivision to the south.

Bay of Biscay and Iberian Coast

Overall, a decrease was found in BBICsSpaOT4 only (recent data since 2002), but both BBICsSpaOT1 and BBICsSpaOT4 found decreases in the deepest stratum sampled to the south of Spain (BBICsSpaOT4 also detected a decrease in the second-most deep stratum). These decreases in the south were further supported by decreases in the southerly subdivisions of the Portuguese survey (BBICPorOT4). An area of increasing indicator values was found in the central subdivisions of the Portuguese survey.

Wider Atlantic

Although decreases were found in the shallower central areas of the Rockall Bank (WAScoOT3), the data exhibit oscillations over time that are greater than the detected decline. Similarly, increases were found in more southerly subdivisions of the Porcupine Bank (WASpaOT3) but the last two data points suggest a potential reduction toward the mean level.

Conclusion

Des augmentations ont été constatées en mer d'Irlande, dans le canal de Bristol, dans une partie du banc de Porcupine, dans une petite subdivision au nord de l'Écosse, dans le nord du golfe de Gascogne et dans la Manche orientale.

Des diminutions ont été constatées dans les parties centrale et méridionale de la mer du Nord, le long d'une grande partie de la bordure occidentale du plateau continental, dans les zones peu profondes du banc de Rockall, dans la région de la Clyde et au sud de la côte ibérique.

Lacunes dans les connaissances

On ne connaît pas encore les causes principales des tendances spatiales et temporelles mises en évidence par l'indicateur de la longueur maximale moyenne.

On ne dispose pas encore de niveaux de référence représentant un état intact ou un état d'exploitation durable qui permettraient d'effectuer une évaluation formelle.

Références

Bell, R. J., Collie, J. S., Branch, T. A., Fogarty, M. J., Minto, C., and Ricard, D. 2018. Changes in the size structure of marine fish communities. *ICES Journal of Marine Science*, 75: 102–112

Fraser, H. M., Greenstreet, S. P. R., and Piet, G. J. 2007. Taking account of catchability in groundfish survey trawls: implications for estimating demersal fish biomass. *ICES Journal of Marine Science*, 64: 1800–1819

Greenstreet, S.P.R. and Hall, S.J. 1996 Fishing and ground-fish assemblage structure in the north-western North Sea: an analysis of long-term and spatial trends. *Journal of Animal Ecology*, 68, 577–598.

ICES. 2012. Report of the Working Group on The Ecosystem Effects of Fishing Activities (WGECO), 11–18 April 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:26. 192 pp.

ICES. 2014. Interim Report of the Working Group on Multispecies Assessment Methods (WGSAM), 20–24 October 2014, London, UK. ICES CM 2014/SSGSUE:11

ICES. 2016. Report of the Working Group on the Ecosystem Effects of Fishing Activities (WGECO), 6–13 April 2016, Copenhagen, Denmark. ICES CM 2016/ACOM:25. 110pp.

Probst, W. N. and V. Stelzenmuller (2015). "A benchmarking and assessment framework to operationalise ecological indicators based on time series analysis." *Ecological Indicators* 55: 94-106.

Shackell N.L., Frank K.T., Fisher J.A.D., Petrie B., Leggett W.C. 2010. Decline in top predator body size and changing climate alter trophic structure in an oceanic ecosystem Proc. R. Soc. B.2771353–1360. <https://doi.org/10.1098/rspb.2009.1020>

Shephard, S., Fung, T., Houle, J.E., Farnsworth, K.D., Reid, D.G., Rossberg, A.G. (2012) Size-selective fishing drives species composition in the Celtic Sea. ICES Journal of Marine Science, 69, 223– 234.

Thompson, M. S. A., Pontalier, H., Spence, M. A., Pinnegar, J. K., Greenstreet, S., Moriarty, M., Hélaouët, P., & Lynam, C. (2020). A feeding guild indicator to assess environmental change impacts on marine ecosystem structure and functioning. Journal of Applied Ecology, 57(9), 1769-1781. <https://doi.org/10.1111/1365-2664.13662>

Walker, N. D., Maxwell, D. L., Le Quesne, W. J. F., and Jennings, S. (2017) Estimating efficiency of survey and commercial trawl gears from comparisons of catch-ratios. ICES Journal of Marine Science, doi:10.1093/icesjms/fsw250

Métadonnées d'évaluation

Field	
Type d'évaluation	Evaluation pilote
Indicateur ODD	14.2 D'ici à 2020, gérer et protéger durablement les écosystèmes marins et côtiers, notamment en renforçant leur résilience, afin d'éviter les graves conséquences de leur dégradation et prendre des mesures en faveur de leur restauration pour rétablir la santé la productivité des océans
Activité thématique	Diversité biologique et écosystèmes
Date de publication	2022-06-30
Conditions applying to access and use	https://oap.ospar.org/fr/data-policy/



COMMISSION
OSPAR

OSPAR Secretariat
The Aspect
12 Finsbury Square
London
EC2A 1AS
United Kingdom

t: +44 (0)20 7430 5200
e: secretariat@ospar.org
www.ospar.org

Notre vision est celle d'un océan Atlantique Nord-Est propre, sain et biologiquement diversifié, qui soit productif, utilisé de manière durable et résilient au changement climatique et à l'acidification des océans.

Publication: 995/2022

© OSPAR Commission, 2022. Permission may be granted by the publishers for the report to be wholly or partly reproduced in publications provided that the source of the extract is clearly indicated.

© Commission OSPAR, 2022. La reproduction de tout ou partie de ce rapport dans une publication peut être autorisée par l'Editeur, sous réserve que l'origine de l'extrait soit clairement mentionnée.