1 General

1.1 Terms of Reference

Generic ToRs for Regional and Species Working Groups

2020/2/FRSG01 The following ToRs apply to: AFWG, HAWG, NWWG, NIPAG, WGWIDE, WGBAST, WGBFAS, WGNSSK, WGCSE, WGDEEP, WGBIE, WGEEL, WGEF, WGHANSA and WGNAS.

The working group should focus on:

a) Consider and comment on Ecosystem and Fisheries overviews where available;

b) For the aim of providing input for the Fisheries Overviews, consider and comment on the following for the fisheries relevant to the working group:

i) descriptions of ecosystem impacts on fisheries

ii) descriptions of developments and recent changes to the fisheries

iii) mixed fisheries considerations, and

iv) emerging issues of relevance for management of the fisheries;

c) Conduct an assessment on the stock(s) to be addressed in 2021 using the method (assessment, forecast or trends indicators) as described in the stock annex and produce a **brief** report of the work carried out regarding the stock, providing summaries of the following where relevant:

i) Input data and examination of data quality; in the event of missing or inconsistent survey or catch information refer to the ACOM document for dealing with COVID-19 pandemic disruption and the linked template that formulates how deviations from the stock annex are to be reported.

ii) Where misreporting of catches is significant, provide qualitative and where possible quantitative information and describe the methods used to obtain the information;

iii) For relevant stocks (i.e., all stocks with catches in the NEAFC Regulatory Area), estimate the percentage of the total catch that has been taken in the NEAFC Regulatory Area in 2020.

iv) Estimate MSY reference points or proxies for the category 3 and 4 stocks

v) Evaluate spawning stock biomass, total stock biomass, fishing mortality, catches (projected landings and discards) using the method described in the stock annex;

1) for category 1 and 2 stocks, in addition to the other relevant model diagnostics, the recommendations and decision tree formulated by WKFORBIAS (see Annex 2 of https://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/Fisheries%20Resources%20Steering%20Group/2020/WKFORBIAS_2019.pdf) should be considered as guidance to determine whether an assessment remains sufficiently robust for providing advice.

2) b. If the assessment is deemed no longer suitable as basis for advice, consider whether it is possible and feasible to resolve the issue through an interbenchmark. If this is not possible, consider providing advice using an appropriate Category 2 to 5 approach.;

vi) The state of the stocks against relevant reference points;

Consistent with ACOM's 2020 decision, the basis for Fpa should be Fp.05.

1) 1. Where Fp.05 for the current set of reference points is reported in the relevant benchmark report, replace the value and basis of Fpa with the information relevant for Fp.05

2) 2. Where Fp.05 for the current set of reference points is not reported in the relevant benchmark report, compute the Fp.05 that is consistent with the current set of reference points and use as Fpa. A review/audit of the computations will be organized.

3) 3. Where Fp.05 for the current set of reference points is not reported and cannot be computed, retain the existing basis for Fpa.

vii) Catch scenarios for the year(s) beyond the terminal year of the data for the stocks for which ICES has been requested to provide advice on fishing opportunities;

viii) Historical and analytical performance of the assessment and catch options with a succinct description of associated quality issues. For the analytical performance of category 1 and 2 age-structured assessments, report the mean Mohn's rho (assessment retrospective bias analysis) values for time series of recruitment, spawning stock biomass, and fishing mortality rate. The WG report should include a plot of this retrospective analysis. The values should be calculated in accordance with the "Guidance for completing ToR viii) of the Generic ToRs for Regional and Species Working Groups - Retrospective bias in assessment" and reported using the ICES application for this purpose.

d) Produce a first draft of the advice on the stocks under considerations according to ACOM guidelines.

i. In the section 'Basis for the assessment' under input data match the survey names with the relevant "SurveyCode" listed ICES survey naming convention *(restricted access)* and add the "SurveyCode" to the advice sheet.

e) Review progress on benchmark issues and processes of relevance to the Expert Group.
i) update the benchmark issues lists for the individual stocks;
ii) review progress on benchmark issues and identify potential benchmarks to be initiated in 2022 for conclusion in 2023;
iii) determine the prioritization score for benchmarks proposed for 2022–2023;
iv) as necessary, document generic issues to be addressed by the Benchmark Oversight Group (BOG)

f) Prepare the data calls for the next year's update assessment and for planned data evaluation workshops;

g) Identify research needs of relevance to the work of the Expert Group.

h) Review and update information regarding operational issues and research priorities on the Fisheries Resources Steering Group SharePoint site.

i) If not completed in 2020, complete the audit spread sheet 'Monitor and alert for changes in ecosystem/fisheries productivity' for the new assessments and data used for the stocks. Also note in the benchmark report how productivity, species interactions, habitat and distributional changes, including those related to climate-change, could be considered in the advice.

Information of the stocks to be considered by each Expert Group is available here.

Specific WGNSSK ToRs

WGNSSK – Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak

2020/2/FRSG19 The **Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak** (WGNSSK), chaired by Tanja Miethe, UK, and Raphaël Girardin, France, will meet in ICES HQ, Copenhagen, Denmark, 21–30 April 2021 and by correspondence in September 2021 to:

a) Address generic ToRs for Regional and Species Working Groups.
b) Assess Norway pout assessments by correspondence.
c) Report on reopened advice as appropriate;
d) Add ToR on Benchmark

The assessments will be carried out on the basis of the stock annex. The assessments must be available for audit on the first day of the meeting.

Material and data relevant for the meeting must be available to the group on the dates specified in the 2021 ICES data call.

WGNSSK will report by 14 May 2021, and by 25 September 2021 (Norway pout) for the attention of ACOM.

Only experts appointed by national Delegates or appointed in consultation with the national Delegates of the expert's country can attend this Expert Group

1.2 InterCatch

1.2.1 Métier-based data call for WGNSSK (and other working groups)

The year 2012 represented a major change in the process of data collection for WGNSSK. Following an initiative launched by ICES WGMIXFISH in August 2011, it had been decided to merge the data calls and data collection of both groups WGNSSK and WGMIXFISH, on the basis of:

1. Improving the availability of métier-based data and their consistency with the stock-based data used for single-stock assessment.
2. Allowing WGMIXFISH to meet earlier in order to integrate the mixed-fisheries advice within the single-stocks advice sheets.

In 2014, data-limited stocks were included in the data call for the first time to improve the knowledge base for these stocks. With the landing obligation, these stocks become more important, and under these circumstances, discard information is a prerequisite for giving catch advice and carrying out mixed fisheries scenarios. In 2015, for the first time a joint data call for all relevant assessment working groups was launched.

The principle of the data call is to define the aggregation (métier) level for the data that individual countries should deliver following the requirements of the EU Data Collection Framework (DCF), and to use these as the basis for providing and subsequently raising data for all North Sea demersal stocks. The ICES InterCatch database was chosen as the most appropriate tool to use until the planned Regional Data Base and Estimation System (RDBES) is fully established and operational. Basic strata for the submission of catch and effort data were by country, quarter, area, métier and catch category.

In 2019, the procedure for data submission was similar to previous years, including a requirement for life-history information and length compositions for historic landings and discards for stocks identified as "DLS" (essentially Category 3 stocks) from at least the three most recent consecutive years (only the most recent year for those stock for which length frequency data were already provided in a previous data call). The data call also required reporting to four catch

categories, including BMS landings (landings below minimum size for stocks under the landing obligation).

In 2020, in addition to the above procedure, coe.27.3a47de, hal.27.3a47de , and caa.27.3a47de were included to the data call to collect quarterly landings data for WGMIXFISH. An official data call was issued by ICES, with a deadline for data delivery of 1 April 2020, three weeks prior to the start of the WGNSSK meeting in Bergen. Despite delays in data submissions relative to the deadline and some errors needing to be corrected before the working group, these delays and corrections had no major impact on the work. During the meeting it was noticed that landings for Sweden for subarea 4 have not been uploaded to Intercatch. Amounts were generally low and were added manually for each affected stock to respective landings, and discards were raised using the discard ratio in area 4.

In 2021, the missing catches 2019 from Sweden have been submitted, and catch data was re-raised this year and included in the respective assessment. Due to sampling interruptions due to the Covid pandemic some reduction in samples occurred for quarters 2 to quarter 4 of 2020. Any changes in the approaches for raising catch data in Intercatch are listed in Annex 9.

1.2.2 Data raising and allocation to un-sampled strata

Major changes occurred in recent years with the raising of data within InterCatch. Different initiatives can be mentioned here:

1. Age and length data in parallel in InterCatch

InterCatch can now work with age and length data in parallel, but it demands that length sample data have to be imported last for species with both age and length distribution data. This is due to InterCatch ignoring strata of other sample types. However, InterCatch will always take the latest imported strata without samples. Also, there is no problem with overwriting data in InterCatch as long as length data are imported latest, for stocks with both length and age samples. There is still no age-length-keys in InterCatch. It is important that when importing catches with and without age samples all strata have to be imported, all strata also have to be imported when importing catches with and without length samples.

2. Technical improvements in the InterCatch interface

- Allocation Group Setup: define a group of unsampled catch/strata for which each distribution will be calculated according to the (for the group) allocated sampled catches/strata;
- Automatic allocation ‘same’ strata: automatically find and allocate identically sampled strata from other countries to unsampled catches/strata (with the identical stratum);
- Discard Group setup: Define a group of raised discards for which each discard weight will be calculated according to the (for the group) selected landing-discard ratios;
- CATON and age/length data overviews: it is possible to examine all imported data in detail;
- Allocation overview for pivot table/matrix: all unsampled strata are shown in the first column and all sampled strata are shown as the first row, then all the selected combinations are shown in the matrix;
- Possibility to save allocation schemes.

3. Summary outputs and inspection of data before raising

The new features included in InterCatch allowed improved inspection and visualization of the data submitted by national data providers and a comparison with data from previous years. A generic R script has been developed in 2016 and improved in subsequent years by Y. Vermard (IFREMER) mapping out the raw data, through e.g. quantification of the proportion of catches covered by sampling, identification of major gaps and outliers, plot of the age distribution and discards ratio of the various strata etc.

4. Raising procedures

Based on statistical principles discussed within WKPICS, RCMs, PGCCDBS and DC-MAP etc., the suggestions for the basis on which to proceed regarding raising of age distributions and discards ratio have been revisited. In 2012, the raising and allocating was based on finding similar strata from other countries, but this was judged not fully defendable in terms of statistical integrity. In 2016, the underlying principles applied were thus:

- Main strata are supposed to be sampled. In essence one should expect that the largest share of catches should have age-based and discards information in InterCatch. Even though there may be a great number of unsampled strata, in reality these should represent only a minor part of the catches. Large strata without sampling information would need to be investigated further.
- Therefore, the suggestion was that by default, unsampled strata should be raised by all sampled strata, unless there is a good and informed reason for choosing differently after the data inspection process. Each stock coordinator has developed general principles for the allocation scheme. The main principles are mentioned in the respective report sections.

Ultimately, all these changes have triggered in-depth investigation and understanding of the data submitted, and are hopefully contributing to improved consistency and transparency in the assessment data. However, if more than one year needs to be raised, the InterCatch procedure is still very time consuming. The saving of allocations schemes does not always function, especially when the métiers differ between years, and currently, only the age allocation scheme can be copied (not the discard ratio allocation scheme). It would be beneficial to allow for more flexible automatic matching based on e.g. gear type or area only. Also the possibility of entering allocation schemes via scripts (instead of the need to click through the options and metiers) would allow for fast sensitivity checks and would make InterCatch much more user-friendly. However, there is limited scope for improvements in InterCatch, given the focus on getting RDBES (its successor) operational and fully functional in the near future.

Because of the landing obligation, new catch categories have been reported since 2016. BMS landings, observer discards and logbook recorded discards should sum up to discard data provided prior to 2016 (i.e. double-counting should be avoided), and when performing raising procedures, the raising procedure in InterCatch should be adapted as necessary to provide a robust approach, independent of how countries categorize catches when providing catch data. The general approach adopted by WGNSSK is to raise discards using only the observed discards (catch category “D” from the datacall), and to allocate discard age compositions to BMS landings (category “B” from the datacall), if reported and given a “CATON” value.

InterCatch summary data have been made available on the SharePoint, and will be investigated further during ICES WGMIXFISH.

By the end of the WG in May 2021, the status of InterCatch use was as follows:

Stock	Data Year	Working Group	Extracted	Exported	Status of Data filled in
bll.27.3a47de	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
caa.27.3a47de	2020	WGNSSK	No	No	Notfilled
cod.27.47d20	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
coe.27.3a47de	2020	WGNSSK	No	No	Notfilled
dab.27.3a4	2020	WGNSSK	Extracted	Exported	Notfilled
fle.27.3a4	2020	WGNSSK	Extracted	Exported	Notfilled
gug.27.3a47d	2020	WGNSSK	Extracted	Exported	Notfilled
had.27.46a20	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
hal.27.3a47de	2020	WGNSSK	No	No	Notfilled
lem.27.3a47d	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
mur.27.3a47d	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.27.4outFU	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.10	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.32	2020	WGNSSK	Extracted	Exported	DataNOTusedForAssessment
nep.fu.33	2020	WGNSSK	No	No	Notfilled
nep.fu.34	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.3-4	2020	WGNSSK	Extracted	No	Notfilled
nep.fu.5	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.6	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.7	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.8	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nep.fu.9	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
nop.27.3a4	2020	WGNSSK	No	No	Notfilled
ple.27.420	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
ple.27.7d	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
pok.27.3a46	2020	WGNSSK	Extracted	Exported	DataNOTusedForAssessment
pol.27.3a4	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
sol.27.4	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment

Stock	Data Year	Working Group	Extracted	Exported	Status of Data filled in
sol.27.7d	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
tur.27.3a	2020	WGNSSK	Extracted	Exported	Notfilled
tur.27.4	2020	WGNSSK	Extracted	Exported	Notfilled
whg.27.3a	2020	WGNSSK	Extracted	No	Notfilled
whg.27.47d	2020	WGNSSK	Extracted	Exported	DataUsedForAssessment
wit.27.3a47d	2020	WGNSSK	Extracted	Exported	Notfilled

1.2.3 Treatment of BMS landings in advice sheets

There remain inconsistencies in the reporting of BMS landings between different nations, both in the official statistics (FAO) and in Intercatch. In general, WGNSSK has assumed that BMS landings are part of discards, and BMS landings are not shown separately in tables of ICES estimates given in the advice sheets; the only BMS estimates that appear in advice sheet tables are those from official statistics. The only exceptions to this treatment of BMS landings as discards is for the saithe stock (pok.27.3a46), for which the Norwegian component of BMS landings are included with the ICES estimates of landings, and for the lemon sole stock (lem.27.3a47d), for which BMS landings were allocated discard length distributions in Intercatch but included in ICES estimates of landings.

1.3 General uncertainty considerations

Data or inputs used in this report are based on sampling or on census. Typical census data are landings data from sales slips representing total landing, while sampled data are random samples (design based) used to produce estimates of total, relative indices or to characterize composition (like catch at age). All sources of input may introduce error in estimates/calculations and are a limiting factor in the amount of signal in data and/or interpretation of model results. The scientist at this working group are only responsible for a modest fraction of the input data used and are relying heavily on assumptions regarding their validity and quality. The information based on sampling will contain sampling errors (random errors due to the stochastic nature of such sampling) and estimates of sampling error are generally not used by this working group. Such errors will show up in residuals (residual plots are an important diagnostic in the report), but other sources of error will also show up in the same residuals and are not easily separated from random errors. Non-random errors are either bias or model errors. Systematic bias over time is a particular concern and an example of such can be underreporting of catches, which will compromise the validity of the model results as basis for advice. Model errors may represent the use of the "wrong" equations to describe relations, but will in this report typically be linked to assumptions regarding natural mortality, the relationship between survey indices and stock size (catchability) and exploitation pattern. Some assumptions are needed since, for example, the Baranov catch equations do not have unique solutions (too many parameters to estimate).

Assessment working groups are in many ways end users of data and it would be preferable to have such information presented as point estimates together with estimates of uncertainty or confidence bands and with a description of potential sources of bias and qualitative remarks related to specific observations. InterCatch is still not fully operational in this respect.

The working group appreciates the effort made by so many supporting hands involved in creating all information needed in fish stock assessment and is dependent on the quality of information being upheld over time. An assessment working group is where information from the commercial fishery is handled together with fishery independent information to create estimates of stock status and the impact of fishing.

Demersal trawl surveys are the most used source of fishery independent information in this working group (WGNSSK). A demersal trawl survey uses a standardized procedure of trawling to create samples from a fish population. The "population" in statistical terms is the population of possible trawl stations with trawl station being the primary sampling unit. The estimates of uncertainty from a demersal trawl survey is very much dependent on the number of samples (trawl stations) and it seems that demersal trawl surveys on gadoids produces very similar estimates of uncertainty given the same number of trawl stations (ICES, 1992) regardless of the size of the area. The relationship between sample size and precision can be illustrated using the following example: If a survey of 400 trawl stations produces an estimate (for a parameter of interest) with a corresponding relative standard error of 0.1 a reduction in survey effort to 100 trawl stations is likely to produce estimates with a relative standard error of 0.2 (divide the number of stations by 4 and the relative standard error is doubled). This is also likely to hold (at least as a rule of thumb) if one looks at results from a subarea of the original (400 station) area. When estimates of relative standard error approaches 0.3, trends over time will be very difficult to detect, and with relative standard errors above 0.3, the estimator can only be used to detect sudden events. WGNSSK recommends that, along with survey index point estimates, DATRAS should also provide the uncertainty around these estimates as standard output.

1.4 Survey corrections during 2020 and 2021

No major concerns about corrections to DATRAS data were raised during the working group. New automated ALK filling methodology was introduced for DATRAS indices in early 2020. Indices for Q1 2020 and onwards are only available calculated using the new methodology. These indices are used either together with the historical index time-series historical indices will be updated during an inter-benchmark protocol or a benchmark process) or with an updated index time series using new methodology (if survey update and reference points were checked during WGNSSK).

In 2021, there was a large re-submission of IBTS data from France with many additional hauls and length information for the period 1999-2012. Until a stock undergoes an interbenchmark or benchmark, for the historical period the survey data as in WGNSSK 2020 will be used for the assessments. Only survey data for 2020 and 2021 have been updated.

1.5 Internal auditing

Although a very important quality assurance mechanism, internal audits do place an additional burden on group members, and it has not been possible to complete most audits during the meeting itself for a few years now. WGNSSK operates with seldom more than one scientist per stock (sometimes one scientist is responsible for two or more stocks), and there was in most cases not enough time to have the reports finalized in order to carry out the audit within the WG meeting itself. Audits had to be conducted by correspondence after the WG time, which is neither very efficient nor very motivating, given the heavy workload under which most members usually operate back in home institutes. It is hoped that the move to TAF will both make auditing easier and more transparent, and improve the quality of auditing procedures.

All WGNSSK stocks with advice in 2021 could be covered by the internal audit (Table 1.5.1). The audits are given in Annex 4 of the report.

Table 1.5.1. Fish stocks covered by the internal audit and external reviews.

Fish Stock	Internal Audit Spring	Internal Audit Autumn
bll.27.3a47de	X	
cod.27.47d20	X	
dab.27.3a4	*No new advice in 2021*	
fle.27.3a4	X	
gug.27.3a47d	*No new advice in 2021*	
had.27.46a20	X	
lem.27.3a47d	X	
mur.27.3a47d	X	
nep.27.4outFU	*No new advice in 2021*	
nep.fu.10	*No new advice in 2021*	
nep.fu.32	*No new advice in 2021*	
nep.fu.33	*No new advice in 2021*	
nep.fu.34	*No new advice in 2021*	
nep.fu.3-4	X	
nep.fu.5	No advice in spring	X
nep.fu.6	No advice in spring	X
nep.fu.7	No advice in spring	X
nep.fu.8	No advice in spring	X
nep.fu.9	No advice in spring	X
nop.27.3a4	No advice in spring	X
ple.27.420	X	
ple.27.7d	X	
pok.27.3a46	X	
pol.27.3a4	X	
sol.27.4	X	
sol.27.7d	X	

Fish Stock	Internal Audit Spring	Internal Audit Autumn
tur.27.3a	X	
tur.27.4	X	
whg.27.3a	*No new advice in 2021*	
whg.27.47d	X	
wit.27.3a47d	No advice in spring (need IBP)	X

1.6 Transparent Assessment Framework (TAF)

TAF is a new framework, currently in development, to organize all ICES stock assessments. Using a standard sequence of R scripts, it makes the data, analysis, and results available online, and documents how the data were pre-processed. Among the key benefits of this structured and open approach are improved quality assurance and peer review of ICES stock assessments. Furthermore, a fully scripted TAF assessment is easy to update and rerun later, with a new year of data. As of spring 2018, the first assessments have been scripted in standard TAF scripts. See http://taf.ices.dk for more information. Progress continues to be made, and there are now 14 out of 30 WGNSSK stocks in varying states of completeness in TAF

During the WGNSSK 2019 meeting, a presentation on TAF was made, and stock assessors were encouraged to take part in workshops offered by ICES to get their assessments into TAF.

1.7 Mixed Fisheries

The mixed fisheries analyses for the North Sea are performed by the Working Group for Mixed Fisheries Advice for the North Sea (WGMIXFISH), which aims to evaluate the consistency of the ICES advice for the individual stocks in a mixed fisheries context, using the Fcube model (Ulrich *et al*., 2011).

WGNSSK and WGMIXFISH have developed and issued a common data call since 2012, which has greatly improved the quality and scheduling of data delivery. WGMIXFISH meets directly after WGNSSK in June 2021 (WGMIXFISH-METH), and also in late October 2021 (WGMIXFISH-ADVICE) in order to produce mixed-fisheries advice for the North Sea (integrated into the Fisheries Overview for the North Sea). We therefore refer to the ICES WGMIXFISH 2021 report and Fisheries Overview for any further description of the mixed-fisheries context.

However, the group continues to discuss mixed fisheries issues under the landing obligation. There is a potential problem with choke species in the North Sea, where target as well as bycatch species can become choke species for certain fleet segments. One way to deal with this is to use the recently defined ranges for F_{MSY} instead of point estimates (see e.g. ICES WKMSYREF III 2014 and ICES WKMSYREF IV 2016). Ranges can introduce the flexibility needed to minimize the discrepancies in available quotas for species in a mixed fishery, and have been introduced as part of EU MAPs, which are mixed-fishery multiannual plans for demersal stocks in the North Sea (Regulation (EU) 2018/973) and stocks in Western Waters (Regulation (EU) 2019/472). These plans allow fishing within the F_{MSY} range, but with more stringent conditions (related to the need to meet mixed fisheries objectives) for using the part of the range above F_{MSY}, referred to as the upper range. STECF undertook an evaluation of mixed-fishery multiannual plans for the North

Sea (STECF EWG-15-02), following a European Commission proposal for such plans, and concluded in relation to the use of the upper range that (STECF PLEN-15-01):

→ *There is an increased risk of over-exploitation if fishing opportunities are set in line with the upper limits of the F_{MSY} ranges, particularly if several stocks in a mixed fishery are involved.*

and furthermore that:

→ *The use of the F_{MSY} range approach should only be employed when informed by objective mixed fishery advice which demonstrates that attaining F_{MSY} for the key driver species cannot be achieved simultaneously and the application of F_{MSY} ranges are necessary to better reconcile mixed fisheries issues. In the absence of such information, then fishing opportunities should be set in accordance with single species F_{MSY} advice.*

Blindly setting TACs within the upper range for all stocks should be avoided by managers. In the long-term, there is no gain to fish stocks above F_{MSY} as the yield becomes lower and the risk for the stocks increases. Selectivity in mixed fisheries should be improved instead to avoid choke effects.

The management of bycatch species (e.g. lemon sole, turbot) by TAC further complicates the situation. If the TAC management for these species continues and F_{MSY} proxies implemented, these species can become serious choke species. The inter-institutional task force on multi annual plans between the European parliament, the council and the Commission write in their agreement (EU 8529/14): "With regard to bycatch species, the co-legislators will have to determine, taking account of the available scientific advice, whether these are sufficiently covered through the management measures according to MSY for the key species". Policy has to define what sustainable exploitation means for bycatch species and it has to be evaluated by science whether MSY targets for target stocks are enough to ensure a sustainable exploitation of bycatch species.

1.8 Multispecies considerations

ICES gave advice on multi species considerations for the North Sea in 2013 for the first time to start a dialogue between ICES and its stakeholders on this topic. Simulations were carried out with the stochastic multi species model SMS to analyse F_{MSY} in a multi species context. The multi species considerations can be found under: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2013/2013/mult-NS.pdf

WGNSSK supports this step. However, the group also raised concerns about the data basis for the simulations (stomach data mainly from 1981 and 1991) and the high number of assumptions behind the model results.

Already in 2013 the group discussed the progress achieved under various initiatives such as ICES WGSAM (2011, 2012), ICES WKMTRADE (2012) and the EU project MYFISH. The group noted that a multispecies benchmark, as in the Baltic, may be needed where the North Sea SMS model and key-run settings are reviewed by external experts before a final multi species advice can be given.

There are many direct and indirect interactions between species, making it difficult to reach a single and robust best solution. Optimization scenarios carried out so far show that the result (target F) depends very much on the objectives (objective function) and SSB constraints used. The exact combination of species target F depends also on the weighting factors (e.g. price per kg when optimizing value) actually used for calculating these objectives. During a stakeholder workshop organized by ICES and MYFISH (ICES WKMTRADE 2012) it has been agreed that when offering trade-offs, ICES can provide scenarios below F_{MSY} for the exploitation of some populations. This will allow a policy choice to be made within the limits defined and explained

by ICES. F_{MSY} ranges (see also under mixed fisheries) could also help here to reach consensus based on a pretty good yield concept instead of trying to reach the absolute maximum for each stock, which is impossible given the biological interactions between predator and prey.

1.9 Special requests

There were no special requests for WGNSSK to handle during the meeting.

1.10 Presentations

Two presentations were made to WGNSSK in 2021, as follows:

(1) Annual industry survey targeting turbot and brill

Jurgen Batsleer presented the annual industry survey targeting turbot and brill, which took place for the first time in Q4 of 2018 as a pilot, and subsequently, after survey design modifications, took place again in Q4 of 2019 with the intention of starting an annually updated time series.

Current surveys (BTS-ISIS (B2453) and SNS (B3498)) show poor internal consistency performance for these species, mainly for the older ages. The aim of the industry survey is to deliver a long-term annual survey using commercial fishing vessels fishing at randomly selected predefined locations, providing a data stream allowing the detection of trends and direct application in stock assessments. The programme is a science-industry collaboration between the Dutch demersal fishing industry and Wageningen Marine Research (WMR).

The first iteration of the survey took place in Q4 of 2018. Three Dutch vessels were recruited to take part in the programme. The survey design of this pilot year was discussed at WGNSSK 2019, leading to modifications to improve the survey which were implemented in the survey carried out from 2019 onwards. An overview of the modifications and design of the survey is provided in ICES (2019), Schram *et al.* (2021).

The revised survey design considered the use of data on turbot and brill catches (LPUE) and beam trawl fleet data (VMS) in a step-wise process. First, the survey area was based on LPUE data for turbot in the southern North Sea over a 6-year period (2007–2009 and 2012–2014). By defining the positions were 60% of the LPUE is realized, the survey area covers the main high LPUE areas but also some areas around these. Inaccessible areas such as wind parks, Natura 2000 closures, etc. were removed from the survey area following discussions with the participating fishermen. A 5x5 km grid was overlaid onto the survey area.

Each grid cell in the survey area is a potential survey station. Each year 60 grid cells are to be randomly selected using an R-script. Because the cutting out of unfishable areas resulted in some cells having irregular shapes and smaller surface areas than regular 5x5 km grid cells, the probability of being randomly selected as survey station was made proportional to their surface areas. The selected survey stations are then equally distributed over the three participating vessels (~20 survey stations each) on the basis of their normal fishing grounds. Survey hauls are carried out similar to commercial hauls, taking approximately 100 to 120 minutes. Hauls may start anywhere in a designated grid cell, may then follow any route, and may exit the grid cell during the haul. Data collected include fishing conditions (e.g. haul list, gear description), and for each haul: counts of all turbot and brill; length, weight, and sex of all turbot and brill; a specified number of otoliths per length class (number required per length class currently under review).

A random selection of 60 grid cells was drawn.

The 2020 survey had to be adapted as boarding of the participating fishing vessels by two researchers was not possible under COVID-19 restrictions. Therefore, an alternative protocol was

developed in liaison with ICES turbot and brill stock coordinators to ensure the continuity of the survey. In brief: the survey design remained unchanged but instead of direct on-board processing by researchers of the fish caught at the survey stations, the survey fish were sorted from the catches and then labelled per station and stored by the vessel's crews. At the end of the survey week all collected survey fish was handed over to a team of researchers for processing in the fish auction. The number of of otoliths per cm-class targeted per species, sex and length group during the 2019 and 2020 surveys are described in Schram *et al.* (2021).

The procedure for the random selection of survey stations and their assignment to the vessels remained unchanged from 2019 except for the number of selected stations. Instead of selecting the required 60 stations, a total of 75 stations were selected (Figure 1.10.1). Sixty stations were manually assigned to the vessels (20 each) and the remaining 15 stations were kept as 'spares', undisclosed to the skippers in case some of the stations were deemed unsuitable.

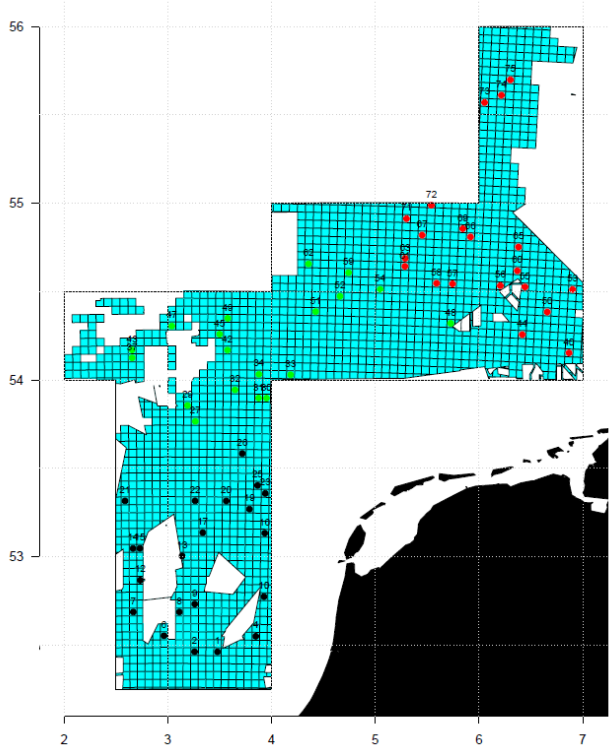

Figure 1.10.1: Randomly drawn survey locations for the 2020 survey.

During 2021 WGNSSK an overview of the 3 year of survey data was presented (Table 1.10.1).

Table 1.10.1: Descriptive statistics for industry survey 2018–2020 (BSAS) compared to the BTS-ISIS and SNS survey.

Species	Survey	Year	Total # caught	Total # hauls	Occurrence (%)	CPUE (#/h)
Turbot	BSAS	2018	1035	45	100.0	42.1
		2019	1709	50	98.0	57.8
		2020	1415	59	98.3	55.7
	BTS	2018	181	82	65.9	5.2
		2019	191	73	84.9	6.3
		2020	162	74	82.4	5.2
	SNS	2018	37	45	51.1	1.0
		2019	30	44	40.9	1.0
		2020	23	46	32.6	0.7
Brill	BSAS	2018	518	45	58.7	14.9
		2019	785	50	100	26.4
		2020	454	59	81.4	17.3
	BTS	2018	67	82	35.4	1.8
		2019	85	73	53.4	2.7
		2020	47	74	33.8	1.7
	SNS	2018	30	45	31.1	0.8
		2019	10	44	14	0.4
		2020	0	46	0	0.0

The 2019 and 2020 survey was presented and discussed at WGNSSK. The expectation from the programme partners is the new survey design will allow for the determination of an indicator to be used for the identification of trends over time. In this context, several points were raised that will be investigated further by the programme partners:

- The question was asked whether maturity is recorded on the survey. This is not currently the case, but the feasibility and the merits of adding this to the survey will be investigated further.
- An issue was raised about the overlap in spatial distribution of the survey area and the main distribution of brill. The stock area for brill is larger compared to turbot and includes divisions 3.a and 7.d–e. These divisions are not covered by the industry survey. An similar survey, e.g. set up by Belgium, could resolve this issue over time.
- Pending full analysis, age-length relations appeared to be as expected for females of both species and for brill males, but for brill females there were unexpectedly large age 1 specimens in the 2019 dataset. Brill, however, is a fast growing species and age-length data from Belgium showed similar large (>40 cm) females at age 1. Still, the issue will need further investigation by WMR.
- It is expected that by combining the age data of the different surveys the accuracy of the age-length relation will increase. However, more analyses are needed to determine whether the BSAS ALK in itself is sufficient for future use in the assessments or a combined ALK is more appropriate.

- A follow-up grant proposal for 3 years of further funding has been successfully submitted. The proposal includes exploring the potential of adding a German and Belgian vessel to the programme. Such addition will improve the coverage of the stock area for both species. Several conversations with German representatives (science and government) have taken place.

(2) Development of a Dutch Nephrops catch monitoring programme

Katinka Bleeker presented the Dutch *Nephrops norvegicus* catch monitoring programme which has commenced in 2019.

The Dutch *Nephrops* fleet target FU5 (Botney Cut), FU33 (Off Horn's Reef), and also fish out-FU, and there, areas are data-poor. Landings are well quantified using standard procedures. Discards are estimated from the Dutch demersal discards self-sampling programme, but the coverage and resolution are not sufficient. ICES WGNSSK has expressed concerns about data limitations, including lack of representative discard data in FU33. The aim of this project was to improve data for *Nephrops* stock assessments, and comprised of three phases: 1. Development of a Fully Catch-Monitored system (FCM), 2. Implementation of the FCM scheme by a reference fleet and 3. Data analysis and reporting including data sharing with ICES WGNSSK. The programme is a science-industry collaboration between the Dutch demersal fishing industry and Wageningen Marine Research (WMR).

The FCM system comprised of so-called load cells, installed to measure the total catch of a haul. The total discards weight of a haul is determined by subtracting the landings from that haul. In addition, the reference fleet participates in a self-sampling scheme in which discard samples 80 kg are taken from two hauls during a fishing trip. The 80 kg sample can be raised to the haul using the total discards weight of a haul. A sample of approximately 5 kg of Norway lobster landings is taken from these same hauls for length measurements of approximately 50 males and 50 females. Landings of commercial species will also be recorded per haul. The self-sampling scheme is validated with observer trips.

The reference fleet (2018–2020) consisted of three vessels. In 2019 two observer trips were executed and one in 2020. Due to COVID-19 restrictions, more observer trips were not possible. A total of 34 self-sampling trips have been carried out (12 in 2019 and 22 in 2020). The collected data provides valuable insight in catch composition, including in the length-frequency distribution, and fishing effort of the reference fleet in regard to the FUs. However, more data is needed to build a reliable time-series for these fisheries. WGNSSK has raised some concerns about how representative participating vessels are for Dutch fishing effort on *Nephrops*, as they are Dutch owned but foreign flagged. While skippers believe that in a 'regular year' (no COVID-19, no temporary Brexit quota) there are no differences, the question whether or not the current reference fleet is a good representation of the Dutch Norway lobster fishing fleet warrants further investigation. The full catch monitoring in the Dutch Norway lobster fishery will be continued in a follow-up programme in which outcomes of the current project will be taken into consideration. This includes expansion of the current reference fleet with three Dutch registered vessels. While the load cell currently used works reliable, it cannot be easily tranferred to other vessels and thereby hinders the ambitions to scale up the monitoring activities to a broader set of vessels. Therefore, the follow-up programme will explore alternative methods such as: using the proportion of discarded to landed *Nephrops*, considering that landings of each haul are already recorded as part of the practice of commercial fishing; using volume rather than weight of the total catch, a) by visual estimation, and b) through the use of 3D-imaging using a smartphone application with image processing on land; and developing a mobile version of the load cell that can be fitted to a vessel for an individual fishing trip. The overall aim of the follow-up programme is to

improve data for *Nephrops* stock assessments, by continuing the current sampling scheme and expanding with three more vessels.

The research collaboration also provides an opportunity for improved exchanges with *Nephrops* fishers on developments in the fishery and how these affect landings. This is of particular importance to current assessments as they rely heavily on landings data. The skippers pointed out that fishing effort on *Nephrops*, and hence catch composition and landings in 2020 was influenced by COVID-19 and by the temporary Brexit quota allocations.

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