Decommissioning of the Dutch cutter sector

Impact analysis of management measures on the fishery

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This study is part of an overarching socio-economic impact analysis of policy decisions on and developments in fisheries. The central research question for this study is: What are the socio-economic effects of the decommissioning scheme on the fisheries sector, the fish chain and fishing regions? Looking at the historical (2018-2021) activity of the vessels that were registered for scrapping, the expected effects of the removal of those vessels will mainly be felt in the beam trawl flatfish fishery. The relative changes in landings of sole and plaice are expected to exceed the change in quota share due to Brexit. For cod this is less clear and there is a risk that the landings decrease due to the exit of decommissioned vessels in a lesser proportion than the quota due to Brexit. The landings of pelagic species are not expected to change due to the scheme given that no pelagic vessels registered for the scheme, while the share of post-Brexit quotas will go down. All Dutch fisheries regions are expected to be impacted by the exit of scrapped vessels, either because a large part of the fleet is expected to be scrapped (as in Urk) or because a large proportion of the Dutch landings is landed in those regions (as in Southwest Netherlands, Kop van Noord-Holland, Wadden Coast and IJmuiden).

Deze studie maakt deel uit van een overkoepelende impactanalyse van de sociaal-economische gevolgen van beleidsbeslissingen en ontwikkelingen voor de visserij. De centrale onderzoeksvraag voor deze studie is: Wat zijn de sociaal-economische effecten van de sanering op de visserijsector, de visketen en de visserijregio's? Kijkend naar de historische (2018-2021) activiteiten van de vaartuigen die zich voor sloop hebben aangemeld, zullen de verwachte effecten van de sanering van die vaartuigen vooral merkbaar zijn in de boomkorvisserij op platvis. De relatieve veranderingen in de aanvoer van tong en schol zullen naar verwachting groter zijn dan de verandering in het quota-aandeel als gevolg van de Brexit. Voor kabeljauw is dit minder duidelijk en bestaat het risico dat de aanvoer als gevolg van de sanering van vaartuigen minder sterk afneemt dan de afname van het quotum als gevolg van de Brexit. De aanvoer van pelagische soorten zal naar verwachting niet veranderen als gevolg van de saneringsregeling, aangezien er geen pelagische vaartuigen voor de regeling zijn aangemeld, terwijl het quota-aandeel na de Brexit is gedaald. Alle Nederlandse visserijregio's zullen naar verwachting gevolgen ondervinden van de sanering van vaartuigen, hetzij omdat een groot deel van de vloot naar verwachting zal worden gesloopt (zoals op Urk), hetzij omdat een groot deel van de Nederlandse aanvoer in die gebieden wordt aangeland (zoals in Zuidwest-Nederland, de Kop van Noord-Holland, de Waddenkust en IJmuiden).

Key words: BREXIT, decommissioning, Dutch cutter, fishery

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Preface

Dutch fisheries have been increasingly restricted in their activities in recent years by developments in (fisheries) policy on their fishing grounds in the North Sea and beyond. While these developments will impact the Dutch fishery and its activities, the extent of the socio-economic impacts is still largely unclear and understudied. Furthermore, it is unknown how these changes in policy and Dutch fisheries will translate into socioeconomic effects on the chain and fishing communities.

Policy decisions, such as the North Sea Agreement, the Wadden Agenda, the Cutter Vision and the Brexit, including area closures and restrictions in the use of space by offshore wind farms, nitrogen legislation and nature reserves, have major consequences for Dutch fisheries. The adopted motions Lodders and Von Martels asked from the Lower House for an impact analysis of these policy decisions for the Dutch fishery, the fish chain (including fish processing industry) and the economy of regions of which the North Sea fishery is an important part.

A part of this impact analysis is to look at the expected socio-economic impacts of the decommissioning scheme of the Dutch cutter fleet. The decommissioning scheme was open at the autumn of 2022 and will be finalised in July 2023. We performed a scenario analysis of its short-term socio-economic effects on the Dutch fishery, chain and local communities. In this report, we look at i) the fishing capacity that was removed by the decommissioning using past data, ii) the short-term effect on the remaining fleet using quantitative and qualitative data and iii) the impact on the fishery cluster and fishing communities.

We wish to thank the participants to the regional workshops for their participation and the insights they shared with us. We would also like to thank the fishers who participated in our phone survey for their time and the experiential knowledge they shared with us. It helped us improve our assumptions.

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Summary

S.1 Key question and framework of the study

What are the socio-economic effects of the decommissioning scheme on the fisheries sector, the fish chain and fishing regions? Registration for the decommissioning scheme opened in September 2022 and closed in November of the same year. Based on the list of vessels still registered for the decommissioning scheme on 1 April 2023, the expected socio-economic impacts were investigated by looking at i) the historical (2018-2021) fishing activity of the registered[1] vessels, ii) the potential response of the remaining fleet and by looking at iii) changes in landings and in active vessels at the regional level to estimate the impact on land.

Given the timeline of the project, to report in a timely manner to the Dutch House of Representatives, and the data availability at the time the study was conducted, the expected effects of the decommissioning scheme are investigated using six what-if scenarios based on the historical activities of 2018-2021. Here, we do not project what would happen with and without the decommissioning scheme in the current economic and regulatory context nor do we investigate the factors leading to the decision to join the decommission scheme or not. And although those questions could also be investigated, the extra time needed would have jeopardised the desired completion date.

S.2 Half of the eligible cutter vessels registered for the decommissioning scheme although uncertainty remains around the number of vessels that will actually decommission

The cutter fleet registered massively for the scheme

Out of the 146 vessels eligible[2] for the scheme, 139 are cutters and 7 pelagic trawlers. The eligible vessels are the cutter fleet targeting demersal fish in the greater North Sea with beam trawls, otter trawls and flyshoot and the pelagic fleet. The smaller vessels operating in the coastal areas, targeting shellfish or shrimp are not eligible for the scheme. Half of the eligible cutter vessels, 71 out of our estimated 139, were registered to be scrapped on 1 April 2023 (hereafter called 'registered vessels'), those vessels represent 24% of the number of vessels in the cutter fleet and 13% of total Dutch fleet. This means that up to a quarter of the Dutch cutter fleet is expected to leave the fishery and the impact of the decommissioning of the registered fleet will be felt at the national and regional level.

No pelagic vessel registered

Despite the fact that the decommissioning scheme was also open for the pelagic fleet, none of the Dutch pelagic trawlers applied for the scheme. The fixed price offered in the scheme per gross ton for vessels of that size was estimated too low to be financially interesting.

[1] Vessels that are registered whose registration is validated by government. The list of vessel used in this report was updated in April 2023 after some vessels withdrew from the scheme. The list is not definitive as vessels can withdraw from the scheme until the end of July 2023 (but no vessels could register after 30 November 2022), it therefore represents a 'worse-case' scenario in terms of highest reduction of the fleet.

[2] We estimated eligibility against two of the criteria of the scheme, i.e. minimum 90 days activity a year for two consecutive years over the 2018-2021 period and 20% of the landings in the list of stocks impacted by the Brexit. Other criteria, including whether a vessel is eligible due to penalty points were left out for privacy reasons. The 146 eligible vessels are 139 cutters and 7 pelagic trawlers.

Uncertainty remains on the actual number of vessels leaving
The actual number of vessels that will leave the fishery is still unknown at the time the study was carried out but already 42 of those vessels (59% of the registered vessels) were known to be scrapped and completely cease their activities and a representative of a producer organisation estimates that up to 90% of the registered vessels are expected to stop.

Unusual profile of vessels registered limits the risk to offset the effort and catch of the scrapped vessels by increasing individual effort

Larger, more active vessels registered for the decommissioning scheme
While it is usually the older, less active vessels that are decommissioned first in case studies found in literature, here, the registered vessels are actually among the most active, most profitable of the cutter fleet. As a result, it is unlikely that the remaining vessels can increase their effort in such a way as to offset the effects of the exit of the registered vessels on the total effort and catch.

The context at the time of the registration played a role in who decommissioned
At the time of registration, the fuel prices were at record high with a few months of high prices having already depleted the financial reserves of some fishers, the last of the pulse licences stopped a year earlier, definitely closing the door to a technology that had allowed fishers to save substantially on fuel consumption, and the Dutch quotas for North Sea sole and plaice were largely underused (less than half of the quotas was caught in 2021 and 2022). This context was particularly unfavourable for the flatfish fishery. Those vessels already had the highest costs in the 2018-2021 period. With low catches and increasing fuel costs not only is the profit of the vessel owners under pressure, but also the remuneration of the crew members decreases, making it difficult to retain or attract crew members.

Flatfish landings in balance with post-Brexit quotas, unlike pelagic species

The expected reduction of effort and landings due to the decommissioning of flatfish beam trawlers exceeds the reduction of quotas due to Brexit
Most of the flatfish beam trawl fleet (registered vessels represented 63% of the flatfish beam-trawl effort in the 2018-2021 period, see Figure S.1) is likely to exit the fishery through the scheme, bringing the expected landings of flatfish in balance with the post-Brexit flatfish quotas. The Dutch share of North Sea sole quotas will decrease by 13.3% in 2026 compared to pre-Brexit share and the reduction in landings of our scenario ranges from a 63% reduction in sole landings if all registered vessels stop and none of the rest of the fleet increase their effort towards sole (see Table S.1) down to 32% if 'only' 80% of the registered vessels actually leave and the remaining vessels increase their activity. The expected reduction in landings is similar for North Sea plaice while the share of quotas will not be reduced by 2026. So except in a case of a drastic decrease of the total allowable catch, those quotas should be sufficient for the remaining fleet.

Cod could become choke species[3]
The risk that cod, for which the Dutch quota share will decrease by 19% in 2026, becomes a choke species is limited but higher than for flatfish. In two of the six scenarios of this study, the landings decrease by a lower percentage than the Dutch quota share decrease (15 and 18% landings decrease compared to 19% for the quotas, see Table S.1), this coupled to the fact that the Dutch quota for cod is almost fully used annually makes North Sea cod a potential choke species.

The expected landings of pelagic species remains unchanged by the decommissioning scheme
The Dutch quota share of the important pelagic species herring, mackerel, horse mackerel and blue whiting will decrease by respectively 10.8%, 24.8%, 4.3% and 1.5%, however not a single pelagic vessel registered for the decommissioning scheme. The unbalance between the post-Brexit quotas and the pelagic capacity is therefore not improved through this scheme and the likelihood of being a choke species is high for the pelagic stocks.

[3] Choke species are those that have a low quota that, when exhausted, can cause a vessel to stop fishing even if it still has quota for other species.

(https://www.denederlandsegrondwet.nl/id/vl4jbe9p1dvm/nieuws/2020_fishing_opportunities_in_the?ctx=vg9pl1iqmsyi&tab=2).

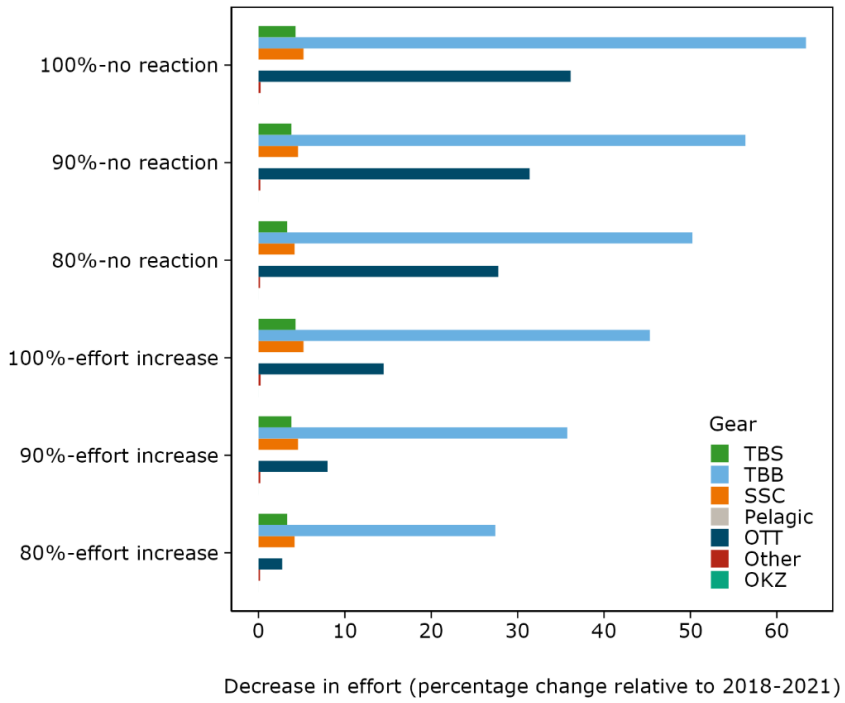


Figure S.1 *Expected change in effort per gear type in percentage for the six scenarios compared to the average historical effort 2018-2021*

Table S.1 *Expected change in landings per species in percentage for the six scenarios compared to the average historical landings 2018-2021. Only the important demersal species are shown here, the pelagic fleet being unaffected by the decommissioning scheme, no change in landings as a result of the decommissioning scheme is expected. *mean value for the scenario.* ***Bold*** *values represent decrease in landings below the change in quotas due to Brexit*

	Historical landings 2018-2021 in t	Quota change due to Brexit	100%-no reaction	90%-no reaction*	80%- no reaction*	100% increasing effort	90% increasing effort*	80% increasing effort*
Sole	7.029	-13	-63	-56	-50	-50	-41	-32
Plaice	20.424	0	-62	-56	-50	-48	-39	-31
Cod	640	-19	-29	-26	-23	-23	**-18**	**-15**

The expected economic performance of the remaining cutter fleet was lower for the registered vessels

Activity of the cutter fleet decreases in larger proportion than the number of vessels in the fleet

The expected total activity (effort and landing figures) of the cutter fleet decreases faster than the number of vessels because the registered vessels were more at sea than the other cutters during the 2018-2021 period, they landed more per unit of effort and the average price of their landings was also higher. Even in the scenarios where the remaining fleet increases their effort, the expected decrease in landings and value of landings was stronger than of the vessels and effort.

Leading to lower profit for the cutter fishery

The registered vessels also had higher costs and much higher profit in the 2018-2021 period. Those were years when the pulse trawl was still used but being phased out of the flatfish fishery and fuel prices were relatively low, resulting in profitable years for the larger flatfish beam trawlers despite a declining trend (Wageningen Economic Research 2022a). Removing the positive economic result of those vessels, the total profit of the cutter fleet decreases by 70% if all the registered vessel leave and the remaining fleet does not react. However, given the development since 2021 (complete ban on pulse, high fuel prices and low catchability of flatfish) it is likely that the profitability of the registered vessels drastically decreased, and that the decommissioning scheme prevented some bankruptcies.

By removing the most profitable vessels, the average profitability of the remaining fleet is lowered

The expected average individual profitability goes down in all scenarios. This is primarily due to the selection of historically less profitable vessels in the remaining fleet. Increasing the effort of individual vessels led to improved individual profitability.

Harbours in all regions will be impacted, either because the number of fishing vessels decreases or the landings decrease

Five out of the six regions will be seriously impacted by the reduction of the cutter fleet
Table 6.1 provides an overview of the socio-economic effects when Dutch cutters are decommissioned. Especially the fisheries regions Urk, Southwest Netherlands, Kop van Noord-Holland, Wadden Coast and IJmuiden are expected to experience the largest social, economic and cultural negative effects due to the disappearance of many flatfish cutters after decommissioning. See also Chapter 4 for a comprehensive analysis per fisheries region what the specialisation and characteristics of fish clusters and fishing communities are per fisheries region. There are also many interactions and spill over effects between the fish clusters of Dutch fisheries regions.

Disappearing skills onboard and on land (processing industry) could be a tipping point for the Netherlands
The relatively large share of registered vessels in the total cutter fleet excluding shrimp in the above four fisheries regions will put pressure on the national chain and infrastructure onshore for North Sea fisheries. It is expected that the fish processing chain and technical and service supply industry will seek alternatives as far as possible such as fish sourced from elsewhere or services in offer in other sectors. However, there is a risk that in the future the Dutch fish clusters will no longer be equipped to process North Sea fish and maintain or build cutters. If more food can be sustainably caught from the North Sea (here: North Sea fish) in the future with a future-proof Dutch fishing fleet, the question is whether there will be enough companies onshore that are willing and able to process North Sea fish. This also applies to the technical and service supply industry that may not have specialist knowledge in-house for the maintenance and construction of cutters for food extraction in the North Sea.

We cannot predict how the socio-cultural importance of fisheries will develop over time for each of the fishing communities, nor what the social impact is of the decline of the Dutch fleet per fishing community. What we do know is that a decline in family businesses will affect the anchoring role these businesses have in fishing communities. Also that a smaller active fleet may result in further impacts on the fishing experience in communities as there will be less capacity to organise and fund fishing-related festivities (e.g. *Vlaggetjesdag*). If this happens in a region already experiencing loss of job opportunities and inhabitants moving out, this may hit harder, both in the fishery (chain) and for tourism. At the same time we have seen in communities where fishing is not active anymore (or really small), that fishing can still remain important for the communities' identity. This would require further research. The added value fishing has for society is linked to the way fishing is organised (Kraan et al. 2023). Three trends are good to mention in this respect: consolidation resulting in more fishing companies instead of owner-operator businesses, foreign crew and continuous fishing. So although we cannot predict what will happen we do know that the configuration of the industry will change. The current reorganisation of the fleet (mainly due to the decommissioning scheme) may lead to further consolidation, which means a further decline of family businesses and skipper-owners, it may lead to further changes in fishing rhythm (more continuous fishing) or in the social organisation of the crew: more foreign workers and/or less fishers fishing via the fisheries agreement culture (which still is the standard). Each of these developments may have 'side effects' on how the fishery is organised and on what the fishery brings to whom. Whether these possible developments are a problem or not is a societal choice. It is recommended to monitor these developments as they have social consequences.

S.3 Methodology

In this study we used combined quantitative and qualitative methods to understand the changes expected with the implementation of the decommissioning scheme.

Analysis of the short-term loss of fishing capacity (in terms of effort and landings) based on the historical fishing activity of the registered vessels
To look at the recent activity of registered vessels, we used the list of registered vessels provided to us by the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland, RVO), logbook data containing information of landings and effort per fishing trip and economic data collected by Wageningen Economic Research. The logbook data was used to estimate the catch and effort of the Dutch fleet and also to identify the eligibility of the vessels in the fleet. We used data of the four years prior to the

decommissioning scheme (2018-2021) and looked at the level of activity of the registered vessels in absolute terms and relatively to the eligible vessels ad to the rest of the fleet in terms of vessel characteristics, effort, landings, value of landings, costs and profit.

We also used relevant insights collected in regional meetings held in June 2022 in the different fishing regions of the Netherlands and in a survey of fishers, fishers' spouses and crew members collected between December 2022 and January 2023 (see Kraan et al. 2023).

Analysis of the response in the fishing patterns of the remaining fleet and the resulting economic performance of the fishery

The deadline for the vessels to withdraw from the scheme is 31 July 2023, because we cannot predict the future of the fishery we assessed the impact of the decommissioning scheme on the Dutch fishery using what-if scenarios. The scenarios tackle two uncertain aspects of the short term future of the fishery: 1) the actual number of vessels that will leave the fishery and 2) the behavioural response of the fleet in terms of effort see table S.2. We used three options as a sensitivity analysis for the actual number of vessels stopping (aspect 1) assuming that either 100% of the registered vessels would get scraped (maximum case), 90% or 80%. This choice was made as it was impossible to estimate a minimum case given that the likelihood of getting scraped fluctuated too much in time with external factors such as current fuel price, fish price and level of catches. For the behavioural response (aspect 2), we assumed two options, either the remaining fleet would not react and the vessels would carry on at the historical level of effort and landings, or the individual vessels would increase their effort of flatfish beam trawl and otter trawl up to the maximum annual effort observed in the past four years for vessels of the same size using the same gears. Both aspects where combined in six scenarios (see Table S.2).

The scenarios were developed based on literature information and validated by the Dutch ministry and the fishing sector (in a phone survey).

The effects of the scenarios on the species landings and the Dutch cutter fleet are then investigated.

Table S.2 *Description of the six scenarios regarding the short term effect of the decommissioning scheme*

#	Scenario name	% of registered vessels actually scrapped	Reaction of remaining fleet
1	Base scenario: 100% - no reaction	100%	No reaction
2	90% - no reaction	90%	No reaction
3	80% - no reaction	80%	No reaction
4	100% - effort increase	100%	Increased effort
5	90% - effort increase	90%	Increased effort
6	80% - effort increase	80%	Increased effort

Estimation of the impacts on land through changes in landings and in number of active vessels

The impacts on land in the fishery cluster is estimated per fisheries region forward in the chain by looking at the change in landings in the region and also backward (on the supply chain) by looking at the number of active vessels registered in the harbours of each fisheries region. Those two dimensions (landings and active vessels) are then interpreted in the light of the recent studies by Hoekstra et al. (2023; Figure 4.3) and Kraan et al. (2023).

Samenvatting

S.1 Kernvraag en kader van het onderzoek

De kernvraag van dit onderzoek is: Wat zijn de sociaal-economische gevolgen van de sanering voor de visserijsector, de visketen en de visserijregio's?
De inschrijving voor de saneringsregeling werd geopend in september 2022 en gesloten in november van hetzelfde jaar. Op basis van de lijst van vaartuigen die op 1 april 2023 voor de saneringsregeling waren ingeschreven, is onderzocht wat de sociaal-economische gevolgen zullen zijn door te kijken naar

i. de historische visserijactiviteit van de geregistreerde[4] vaartuigen,
ii. de potentiële respons van de resterende vloot,
iii. en de veranderingen in de aanvoer en in actieve vaartuigen op regionaal niveau om de nationale gevolgen in te schatten.

Gezien de korte doorlooptijd van het project om tijdig aan de Tweede Kamer te kunnen rapporteren en de beschikbaarheid van gegevens op het moment dat de studie werd uitgevoerd, zijn de verwachte effecten van de sanering onderzocht aan de hand van zes what-if-scenario's op basis van de historische activiteiten van 2018-2021. Hier wordt dus niet voorspeld wat er zou gebeuren in een situatie met en zonder de sanering in de huidige economische en regelgevende context noch wat de redenen zijn die tot de beslissing wel of niet te saneren leiden.

S.2 De helft van de kottervaartuigen die in aanmerking komt, heeft zich ingeschreven voor de saneringsregeling.

Hoeveel kotters daadwerkelijk van de regeling gebruik zullen maken, blijft nog onzeker. Dat is pas eind juli 2023 duidelijk. De 146 voor de regeling in aanmerking[5] komende vaartuigen zijn kotters (139) en pelagische trawlers (7). De kleinere vaartuigen die in de kustgebieden op schelpdieren of garnalen vissen, komen niet voor de regeling in aanmerking.

De kottervloot heeft zich massaal ingeschreven voor de regeling
De kottervloot vist in de Noordzee op demersale vis met boomkorren, bordentrawls en flyshoot. 71 van de 139 in aanmerking komende kotters stond op 1 april 2023 geregistreerd om te worden gesloopt. Deze schepen vertegenwoordigen 24% van het aantal schepen in de kottervloot en 13% van de totale Nederlandse vloot[6]. Dat betekent dat naar verwachting tot een kwart van de Nederlandse kottervloot de visserij zal verlaten, hetgeen zowel nationaal als regionaal impact zal hebben.

Geen geregistreerd pelagisch vaartuig
Geen van de Nederlandse pelagische trawlers heeft zich voor de regeling aangemeld. De vaste prijs per bruto ton in de regeling werd als te laag ingeschat voor schepen van die omvang, om financieel interessant te zijn.

[4] Geregistreerde vaartuigen waarvan de registratie door de overheid is gevalideerd. De in dit verslag gebruikte lijst van vaartuigen is in april 2023 bijgewerkt nadat enkele vaartuigen zich uit de regeling hadden teruggetrokken. De lijst is niet definitief omdat vaartuigen zich tot eind juli 2023 uit de regeling kunnen terugtrekken (maar na 30 november 2022 kunnen geen vaartuigen meer worden geregistreerd).

[5] Wij hebben twee criteria gebruikt om welke voertuigen in aanmerking voor de regeling kwamen te bepalen, namelijk minimaal 90 dagen activiteit per jaar gedurende twee opeenvolgende jaren in de periode 2018-2021 en 20% van de aanvoer in de lijst van door de Brexit getroffen bestanden. Andere criteria, waaronder de vraag of een vaartuig in aanmerking komt vanwege strafpunten, zijn om privacyredenen weggelaten. De 146 in aanmerking komende vaartuigen zijn 139 kotters en 7 pelagische trawlers.

[6] Er zijn ook vaartuigen met een Nederlandse eigenaar maar onder buitenlandse vlag. De gegevens van deze vloot zijn alle in de afslaggegevens meegenomen.

Er blijft onzekerheid bestaan over het werkelijke aantal schepen dat vertrekt
Het werkelijke aantal vaartuigen dat de visserij zal verlaten is ten tijde van de uitvoering van het onderzoek nog onbekend, wel is zeker dat tot nu toe 42 van de 71 geregistreerde kotter vaartuigen (dat is 59%) zullen worden gesloopt en hun activiteiten volledig zullen staken. Een vertegenwoordiger van een producentenorganisatie schat dat naar verwachting tot 90% van de geregistreerde vaartuigen zal stoppen.

Het ongewone profiel van de geregistreerde vaartuigen beperkt het risico dat de inspanning en de vangst van de gesloopte vaartuigen gecompenseerd kan worden door een verhoging van de individuele inspanning

Grotere, actievere vaartuigen geregistreerd voor de saneringsregeling
In de literatuur gaat het meestal om de oudere, minder actieve vaartuigen die het eerst gesaneerd worden. Uit de data over de geregistreerde vaartuigen blijkt dat ze in de periode 2018-2021 tot de meest actieve, toen meest winstgevende vaartuigen van de kottervloot behoorden. Bijgevolg is het onwaarschijnlijk dat de overblijvende vaartuigen hun inspanning zoveel kunnen verhogen dat de effect van sanering van de geregistreerde schepen op inspanning en vangst wordt gecompenseerd.

De context ten tijde van de registratie speelde een rol bij wie zich aanmeldde voor de sanering
Toen de saneringsregeling open stond waren de brandstofprijzen zeer hoog en enkele maanden van hoge prijzen hadden de financiële reserves van sommige vissers al uitgeput. Een jaar eerder waren de laatste pulsvergunningen verlopen door het verbod op de pulsvisserij. Hierdoor was de deur definitief gesloten voor een technologie waarmee de tongvissers aanzienlijk op hun brandstofverbruik en dus energiekosten konden besparen. Ook waren de Nederlandse quota voor tong en schol in de Noordzee grotendeels onderbenut (minder dan de helft van de quota werd in 2021 en 2022 gevangen). Deze context was bijzonder ongunstig voor de platvisvisserij. Deze vaartuigen hadden gemiddeld in de periode 2018-2021 al hogere kosten dan de rest van de kottervloot. Bij lage vangsten en stijgende brandstofkosten staat niet alleen de winst van de reders onder druk, maar daalt ook de beloning van de bemanningsleden, waardoor het moeilijk is bemanningsleden te behouden of aan te trekken.

Aanvoer van platvis in evenwicht met post-Brexit-quota, in tegenstelling tot pelagische soorten

De verwachte vermindering van de inspanning en de aanvoer als gevolg van de sanering[7] van boomkorkotters voor platvis, is groter dan de vermindering van de quota als gevolg van de Brexit
Het grootste deel van de platvis boomkorvloot (de geregistreerde vaartuigen vertegenwoordigden 63% van de platvis boomkorvloot-inspanning in de periode 2018-2021) zal waarschijnlijk via de regeling aan de visserij worden onttrokken, waardoor de verwachte aanvoer van platvis in overeenstemming komt met de quota die resteren na overdracht aan het VK. Het Nederlandse aandeel in de tongquota voor de Noordzee zal in 2026 met 13,3% afnemen ten opzichte van het aandeel van vóór de Brexit in de aannames die zijn gedaan. Een vermindering van de aanvoer van tong varieert 63% (als alle geregistreerde vaartuigen stoppen en geen van de overblijvende vaartuigen de inspanning voor tong verhoogt) tot 32% (als 'slechts' 80% van de geregistreerde vaartuigen daadwerkelijk saneert én de resterende vaartuigen hun activiteit verhogen). De verwachte vermindering van de aanvoer voor Noordzeeschol is vergelijkbaar met Noordzeetong, terwijl het aandeel van de quota tegen 2026 niet zal worden verminderd. Dus behalve in het geval van een drastische verlaging van de totaal toegestane vangst, zouden die quota voldoende moeten zijn voor de resterende vloot.

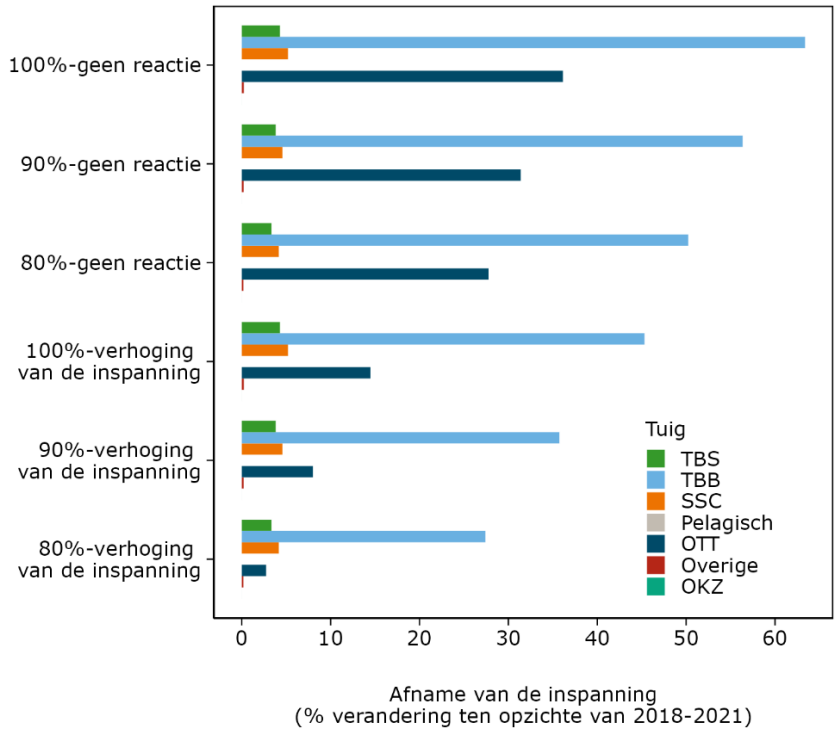
Kabeljauw zou choke-species[8] kunnen worden
Het risico dat kabeljauw, waarvoor het Nederlandse quotum-aandeel in 2026 met 19% zal dalen, een choke-species wordt, is beperkt maar groter dan voor platvis. In twee van de zes scenario's die in deze studie besproken zijn, daalt de aanvoer met een lager percentage dan de daling van het Nederlandse quotum-aandeel (15 en 18% daling van de aanvoer vergeleken met 19% voor het quotum), dit gekoppeld aan het feit dat het Nederlandse quotum voor kabeljauw jaarlijks bijna volledig wordt gebruikt, maakt van Noordzeekabeljauw een potentiële choke-species, dat wil zeggen dat …...

[7] De ongunstige situatie zou mogelijk ook zonder sanering geleid hebben tot stoppende vissers, maar dit valt buiten het kader van dit onderzoek.

[8] Als de quota van deze soorten eerder benut zijn dan de andere quota moet de visserij voortijdig worden gestopt en kunnen de quota voor andere soorten niet volledig worden benut (Buisman et al. 2013).

De verwachte aanvoer van pelagische soorten blijft door de saneringsregeling ongewijzigd

Het Nederlandse quotum-aandeel van de belangrijkste pelagische soorten haring, makreel, horsmakreel en blauwe wijting zal dalen met respectievelijk 10,8%, 24,8%, 4,3% en 1,5%. Het gebrek aan evenwicht tussen het quotum na de Brexit en de pelagische capaciteit wordt door deze regeling dus niet verbeterd en de kans is groot dat deze soorten choke-species en beperkend voor de Nederlandse vloot worden.



Figuur S.1 *Verwachte procentuele verandering van de inspanning per vistuigtype voor de zes scenario's ten opzichte van de gemiddelde historische inspanning 2018-2021*

Tabel S.1 *Verwachte verandering in de aanvoer per soort in procenten voor de zes scenario's ten opzichte van de gemiddelde historische aanvoer 2018-2021. Alleen de belangrijke demersale soorten zijn hier weergegeven; aangezien de pelagische vloot niet wordt beïnvloed door de sanering, wordt geen verandering in de aanvoer als gevolg van de sanering verwacht. *gemiddelde waarde voor het scenario.* ***Vetgedrukte*** *waarden staan voor een daling van de aanvoer onder de verandering in de quota als gevolg van de Brexit*

	Historische aanvoer 2018-2021 in t	Verandering in quotum-aandeel vanwege Brexit	100%-geen reactie	90%-geen reactie *	80%-geen reactie *	100% verhoging van de inspanning	90% verhoging van de inspanning *	80% verhoging van de inspanning *
Tong	7.029	-13	-63	-56	-50	-50	-41	-32
Schol	20.424	0	-62	-56	-50	-48	-39	-31
Kabeljauw	640	-19	-29	-26	-23	-23	**-18**	**-15**

De verwachte economische prestaties van de resterende kottervloot verslechteren

De activiteit van de kottervloot neemt af in grotere mate dan het aantal vaartuigen in de vloot

De verwachte totale activiteit (inspanning en aanvoer) van de kottervloot neemt meer af dan het aantal vaartuigen omdat de geregistreerde vaartuigen meer op zee waren dan de andere kotters in de periode 2018-2021, zij meer aanvoerden per inspanningseenheid en de gemiddelde prijs van hun aanvoer ook hoger was. Zelfs in de scenario's waarin de resterende vloot haar inspanning verhoogt, is de verwachte daling van de aanvoer en van de waarde van de aanvoer sterker dan die van het aantal vaartuigen en de inspanning.

Minder winst voor de kottervisserij

De geregistreerde vaartuigen hadden weliswaar gemiddeld genomen hogere kosten, ze maakten ook veel meer winst in de periode 2018-2021. Dit waren jaren waarin de pulskor nog werd gebruikt maar geleidelijk uit de platvisvisserij werd genomen en de brandstofprijzen relatief laag waren, wat resulteerde in winstgevende jaren voor de grotere platviskotters ondanks een dalende trend (Wageningen Economic Research 2022a). Door het positieve

economische resultaat van die vaartuigen weg te nemen, daalt de totale winst van de kottervloot met 70% als alle geregistreerde vaartuigen vertrekken en de resterende vloot haar visserijpatroon niet verandert. Gezien de ontwikkeling sinds 2021 (volledig verbod op puls, hoge brandstofprijzen en geringe vangbaarheid van platvis) is het echter waarschijnlijk dat de rentabiliteit van de geregistreerde vaartuigen drastisch is gedaald en dat de sanering een aantal faillissementen heeft voorkomen.

Doordat de meest winstgevende schepen mogelijk stoppen, daalt de gemiddelde winstgevendheid van de resterende vloot
De verwachte gemiddelde individuele rentabiliteit gaat in alle scenario's omlaag. Dit is voornamelijk het gevolg van de selectie van historisch minder rendabele vaartuigen in de resterende vloot. Een verhoging van de inspanning van individuele schepen leidt tot een betere individuele rentabiliteit.

De havens in alle regio's zullen gevolgen ondervinden, hetzij omdat het aantal vissersvaartuigen afneemt, hetzij omdat de aanvoer vermindert

Vijf van de zes regio's, Urk, Zuidwest-Nederland, Kop van Noord-Holland, Waddenkust en IJmuiden, ondervinden de meeste sociale, economische en culturele gevolgen van de inkrimping van de kottervloot
Tabel 6.1 geeft een overzicht van de sociaal-economische effecten wanneer Nederlandse kotters uit de vaart worden genomen. Zie ook hoofdstuk 4 voor een beschrijving van de kenmerken van de visclusters en visserijgemeenschappen per visserijregio. Naast deze specifieke kenmerken, zijn er ook veel interacties en overloopeffecten tussen de visclusters van de Nederlandse visserijregio's. Als te veel visclusters en visserijregio's worden geminimaliseerd in termen van actieve bedrijven aan land maar ook ten aanzien van de gespecialiseerde kennis, zal dit op nationaal niveau zijn weerslag hebben op de aanvoer en verwerking van Noordzeevis. Bij een sterke reductie van de vloot per visserijgemeenschap komen ook de sociale en culturele tradities (zoals kennis en vakmanschap) onder druk te staan. Als zulke van generatie op generatie overgedragen kennis verdwijnt, zal het niet makkelijk terug keren, hooguit is het beschreven en getoond als cultureel erfgoed in musea.

Het verdwijnen van vaardigheden aan boord en aan land (verwerkende industrie) zou voor Nederland een kantelpunt kunnen zijn
De verwachting is dat de visverwerkende keten en de technische en dienstverlenende sector zoveel mogelijk alternatieven zullen zoeken, zoals vis die van elders wordt betrokken of diensten die in andere sectoren worden aangeboden. Het risico bestaat echter dat de Nederlandse visclusters in de toekomst niet meer zijn toegerust op het verwerken van Noordzeevis en het onderhouden en bouwen van kotters. Als er in de toekomst meer Noordzeevis kan worden gevangen, is het de vraag of er aan land voldoende bedrijven zijn die Noordzeevis willen en kunnen verwerken. Dit geldt ook voor de technische en dienstverlenende industrie die wellicht geen specialistische kennis in huis heeft voor het onderhoud en de bouw van kotters voor de voedselwinning op de Noordzee.

We kunnen niet voorspellen hoe het sociaal-culturele belang van visserij zich in de loop der tijd voor elk van de visserijgemeenschappen zal ontwikkelen, noch wat de sociale gevolgen precies zijn van de inkrimping van de Nederlandse vloot per visserijgemeenschap. Wat we wel weten is dat een afname van het aantal familiebedrijven gevolgen zal hebben voor de verankerende rol die deze bedrijven in de visserijgemeenschappen spelen. Ook kan een kleinere actieve vloot verdere gevolgen hebben voor de visserijbeleving in de gemeenschappen, aangezien er minder capaciteit zal zijn om visserijgerelateerde festiviteiten (bijvoorbeeld Vlaggetjesdag) te organiseren en te financieren. Als dit gebeurt in een krimpregio kan deze impact relatief groter zijn, zowel in de visserij(keten) als voor het toerisme. Tegelijkertijd hebben we gezien dat in gemeenschappen waar de visserij niet meer actief is (of echt klein), de visserij toch belangrijk kan blijven voor de identiteit van de gemeenschap.

De meerwaarde van de visserij voor de samenleving hangt samen met de wijze waarop de visserij is georganiseerd (Kraan et al. 2023). Drie trends zijn in dit verband te noemen: consolidatie van visserij bedrijven met als gevolg meer rederijen met schippers in loondienst in plaats van schipper-eigenaar familiebedrijven, een toename van buitenlandse opvarenden (in loondienst) en continue visserij. Hoewel we dus niet kunnen voorspellen wat er zal gebeuren, weten we wel dat de configuratie van de sector zal veranderen. De huidige afname van de vloot (voornamelijk als gevolg van de saneringsregeling) kan leiden tot verdere consolidatie, wat een verdere afname van familiebedrijven

en schipper-eigenaren betekent, het kan leiden tot verdere veranderingen in het visritme (meer continu vissen) of in de sociale organisatie van de bemanning: meer buitenlandse werknemers en of minder vissers die vissen via de visserijovereenkomstcultuur (die nog steeds de norm is). Elk van deze ontwikkelingen kan 'neveneffecten' hebben op de wijze waarop de visserij is georganiseerd en op wat de visserij voor wie oplevert. Of deze ontwikkelingen gewenst zijn, is een maatschappelijke keuze. Het verdient aanbeveling deze ontwikkelingen te volgen omdat ze sociale consequenties hebben.

S.3 Methodologie

In deze studie is een combinatie gebruikt van kwantitatieve en kwalitatieve methoden om zicht te krijgen op de verwachte veranderingen als gevolg van de sanering.

Analyse van het verlies aan vangstcapaciteit op korte termijn (in termen van inspanning en aanvoer) op basis van de historische visserijactiviteit van de geregistreerde vaartuigen
We hebben gebruikgemaakt van de lijst van geregistreerde vaartuigen die ons door de Rijksdienst voor Ondernemend Nederland (RVO) is verstrekt, om de recente activiteit van de geregistreerde vaartuigen te bekijken. Het gaat om de logboekgegevens, met informatie over de aanvoer en de inspanning per visreis en om economische gegevens die door Wageningen Economic Research zijn verzameld. De logboekgegevens zijn gebruikt om de vangst en de inspanning van de Nederlandse vloot te schatten. We gebruikten gegevens van de vier jaar voorafgaand aan de sanering (2018-2021). Daarmee brachten we in beeld wat de visserijactiviteit was van de geregistreerde vaartuigen, zowel absoluut als in verhouding tot de in aanmerking komende vaartuigen ten aanzien van de vaartuigkenmerken, inspanning, aanvoer, waarde van de aanvoer, kosten en winst.

Daarnaast hebben we gebruikgemaakt van de regionale bijeenkomsten die in juni-augustus 2022 gehouden zijn in de verschillende visserijregio's van Nederland en van een enquête onder vissers (zowel schipper-eigenaren en bemanning) en vrouwen van vissers die tussen december 2022 en januari 2023 is gehouden (zie Kraan et al. 2023).

Analyse van de reactie in de visserijpatronen van de overblijvende vloot en de daaruit voortvloeiende economische prestaties van de visserij
De uiterste datum waarop de vaartuigen uit de regeling moeten stappen is 31 juli 2023. Omdat wij de toekomst van de visserij niet kunnen voorspellen, hebben wij het effect van de sanering op de Nederlandse visserij beoordeeld aan de hand van what-if-scenario's. 'De scenario's hebben betrekking op twee onzekere aspecten van de toekomst van de visserij op korte termijn: 1) het werkelijke aantal vaartuigen dat de visserij zal verlaten en 2) de gedragsreactie van de vloot in termen van inspanning, zie tabel S.2.

Als gevoeligheidsanalyse voor het werkelijke aantal vaartuigen dat stopt (aspect 1) hebben wij drie opties gebruikt: ofwel 100% van de geregistreerde vaartuigen wordt gesaneerd (maximale situatie), ofwel 90% of 80%. Deze keuze werd gemaakt omdat het onmogelijk was een minimumgeval te schatten, aangezien de kans om gesaneerd te worden van week tot week fluctueert met externe factoren zoals de huidige brandstofprijs, de visprijs en het vangstniveau. Voor de gedragsreactie (aspect 2) gingen wij uit van twee mogelijkheden: ofwel zou de resterende vloot niet reageren en zouden de vaartuigen doorgaan op het historische inspannings- en aanlandingsniveau, ofwel zouden de afzonderlijke vaartuigen hun inspanning voor platvis met de boomkor en de bordentrawl verhogen tot de maximale jaarlijkse inspanning die in de afgelopen vier jaar is waargenomen voor vaartuigen van dezelfde omvang en met hetzelfde vistuig. Beide aspecten werden gecombineerd in zes scenario's (zie tabel S.2).

De scenario's werden ontwikkeld op basis van literatuurinformatie en gevalideerd door het Nederlandse ministerie van LNV en de visserijsector (de laatste door middel van een telefonische enquête).

Vervolgens zijn de effecten van de scenario's op de aanvoer van soorten en op de Nederlandse kottervloot onderzocht.

Tabel S.2 *Beschrijving van de zes scenario's met betrekking tot het kortetermijneffect van de sanering*

#	Naam scenario	% daadwerkelijk gesloopte geregistreerde vaartuigen	Reactie resterende vloot
1	Basisscenario: 100%-geen reactie	100%	Geen reactie
2	90% - geen reactie	90%	Geen reactie
3	80%-geen reactie	80%	Geen reactie
4	100% - verhoging van de inspanning	100%	Verhoging van de inspanning
5	90% - verhoging van de inspanning	90%	Verhoging van de inspanning
6	80% - verhoging van de inspanning	80%	Verhoging van de inspanning

Raming van de gevolgen voor het land door veranderingen in de aanvoer en in het aantal actieve vaartuigen

De effecten op land in de visserijclusters in de visketen worden per visserijregio geschat door te kijken naar de verandering in de aanvoer in de regio en door te kijken naar het aantal actieve vaartuigen dat in de havens van elke visserijregio is geregistreerd. Die twee dimensies (aanvoer en actieve vaartuigen) worden vervolgens geïnterpreteerd in het licht van de recente studies van Hoekstra et al. (2023) en Kraan et al. (2023).

Glossary

- **Fisheries region** = the regions with a clearly present fishing cluster, fishing ports with upstream industry and trade and processing, and associated fishing municipalities and communities. The following six fisheries regions are defined in this study called 'Impact analysis of policy measures on the chain of Dutch fishing regions' (Quirijns et al. 2019):
  - Wadden coast or Waddenkust (provinces of Friesland and Groningen)
  - Kop van Noord Holland (including Den Helder, Texel, Den Oever, Wieringen)
  - IJmuiden
  - Katwijk/Scheveningen
  - Southwest Netherlands (including Stellendam, Ouddorp, Goedereede, Vlissingen, Arnemuiden, Breskens)
  - Urk.
- **Fishery cluster** also **called fishing cluster =** the fishing industry, the supply industry (shipbuilding, energy, etc.), and the processing industry (auctions, transport, processing, trade).
- **Logbook data** data of landings per fishing trip including identifier of vessels, gear used, species caught.
- **VMS data** GPS coordinates of fishing vessels with vessel identifier, speed and direction of the vessel.
- **Registered vessels:** vessels that are registered whose registration is validated by government. The list of vessel used in this report was updated in April 2023 after some vessels withdrew from the scheme. The list is not definitive as vessels can withdraw from the scheme until the end of July 2023 (but no vessels could register after the 30th November 2022), it therefore represent a 'worse-case' scenario in terms of highest reduction of the fleet.
- **Eligible vessels**: vessels that based on their previous activity (minimum 90 days activity a year for two consecutive years over the 2018-2021 period and 20% of the landings in the list of stocks impacted by the Brexit, see Appendix 1) were deemed eligible for the decommissioning scheme. The eligibility criteria does not take into account the administrative and legal status of the vessel (owner) such as date of registration of a vessel in the fleet registry or the existence of penalty points for a vessel owner.
- **Eurocutter:** Smaller (familiar with shrimp cutters) or medium-sized cutters with a length no longer than 28 metres. Main applied fisheries techniques are beam trawling targeting flat fish (often sole) or seasonally brown shrimp and for specific vessels twinrig and quadrig as technique to target nephrops and flat fish species such as plaice. The maximum engine power of these vessels is 221 kW, except for some cutters whose owners decided to focus on techniques such as twinrig and quadrig and therefore decided to increase the engine power. They have thereby given up the possibility of fishing within the 12-mile zone (Quirijns et al. 2019).

1 Decommissioning of the Dutch fishing fleet

1.1 Background and objective

The Dutch fishing industry has been increasingly constrained in recent years by developments in fisheries policy and other policies affecting the fisheries (such as the Brexit or offshore energy development). The economic consequences of these developments for the fishing industry are not clear, nor is it clear how these changes in policy and the fishing industry translate into socio-economic effects on the fish chain and in fishing regions. In response to two motions from the House of Representatives, a project was developped aiming to answer the question: what are the socio-economic effects of policy on the fisheries sector, the fish chain and fishing regions?

The Lodders and Von Martels motions (House of representatives Dossiers number 33450/84 and 33450/93 [in Dutch]) call for an impact analysis of the North Sea Agreement, the Wadden Agenda, the Cutter Vision and the Brexit, including area closures/restrictions due to offshore wind farms and nature reserves, for the fishing industry, the fish chain (including fish processing industry) and the economy of regions where Dutch cutter fishery is an important sector (hereafter referred to as fishing regions). Following these motions, the Ministry of LNV asked Wageningen Economic Research to carry out this socio-economic impact analysis.

Within this impact analysis project, several socio-economic studies are planned to analyse the effects of policy. A total of three studies were planned in the first phase of this research project. The following reports are planned within this two-year impact analysis (2022/2023):

- Baseline measurement of fish cluster structure and dependencies: How large are the regional fish clusters and how do they depend on the fishing sector? (Hoekstra et al. 2023)
- Sociale en culturele waarde van visserij voor de visserijgemeenschap: en gevolgen van beleidswijzigingen (Kraan et al. 2023)
- Impact analysis of the decommissioning schemes on the cutter and shrimp fisheries[9]: What are the socio-economic effects of the two decommissioning schemes on the fishing cluster?

This report presents the results of our study to determine the potential socio-economic effects of the 2023 decommissioning scheme for the Dutch (cutter) fleet. The decommissioning scheme follows the decision of the United Kingdom to leave the EU (Brexit). Fisheries held a symbolic role leading to Brexit (as they British fishers were largely in favour of leaving the EU (Stewart et al. 2022). As such, the UK negotiated resolutely for its fishers,[10] leaving EU fishers largely disappointed and greatly impacted. As a result of the large expected impacts of the Brexit on EU fisheries, The Netherlands and other Member States opened decommissioning schemes to balance the capacity of their fishing fleets with the post Brexit catch opportunities.

1.2 Decommissioning scheme in the Dutch cutter fishery

A decommissioning scheme to bring the fleet capacity in balance with post-Brexit quota

Two main aspects of the agreement negotiated between the EU and the UK following the Brexit vote i.e. the Trade and Cooperation Agreement (TCA) will impact Dutch fishers: access to UK waters could become restricted in the future for all or specific gears, and new quota shares for 105 fish quotas are being phased in between 2021 and 2026 with the UK increasing their share for most of them. In an attempt to limit the impacts caused by the withdrawal of

[9] See Hamon et al. (2023) for the impact of the Wadden Sea shrimp licence decommissioning scheme.

[10] Despite the gain reached by those negotiations, the UK fishers also ended disappointed as the results remained far from the promises of the Brexit 'leave' campaign.

the UK of the EU on fisheries, the Brexit Adjustment Reserve (BAR)[11] was implemented to allow Member States to support economic sectors dependent on fishing activities in the UK waters. This decommissioning scheme falls under one of three tracks developed by the Dutch government under the BAR 'schemes specifically for the affected Dutch fishing industry'. The aim of the scheme is to bring the fleet capacity in line with the quotas remaining after transfers of (Dutch) quotas to the UK (see quota share mutation Table 1.1). For the restructuring of the fleet a total budget of €155m was made available.

Table 1.1 *Mutation to the Dutch quota share of important commercial species as a result of the Brexit (Source: Dutch Ministry of Agriculture, Nature and Food Quality)*

	Fish stock	Change in quota share 2020-2026
Demersal	North Sea sole	-13.3%
Demersal	North Sea cod	-19%
Demersal	North Sea plaice	0%
Pelagic	Herring (ICES 1, 2 and 4a&b)	-10.8%
Pelagic	Mackerel	-24.8%
Pelagic	Horse mackerel	-4.3%
Pelagic	Blue whiting	-1.5%

Who can benefit from the decommissioning scheme?
A vessel owner who decides to permanently cease fishing activities with a fishing vessel by scrapping it can take part in the scheme. However, there are some conditions to being able to benefit from the scheme (see Staatscourant 2022 no. 19616 25 July 2022 for the full list of eligibility criteria), including the following:

- The vessel has been active 90 days a year in two consecutive years in the 2018-2021 period
- At least 20% of the landings of the vessel comes from a list of specific stocks (see Table A1.1 in Appendix 1 for the list of the species and areas).

Other conditions on date of registration of the vessel on the fleet registry and general eligibility for subsidies also apply for this scheme. This would mean that fewer vessels are actually eligible than our estimates if some of the vessels that we deemed eligible have received some penalty points or if vessels changed owner after the specified date. Because those are harder for us to estimate than the activity criteria due to the sensitive nature of the data, in the rest of this report, an *eligible vessel* is defined only on the basis of the two eligibility criteria mentioned above (90 seadays a year and 20% of landings from the species list).

The scheme used fixed compensation prices on the basis of gross tonnage
The amount received per vessel is only dependent on the gross tonnage of the vessel, but it is based on the total value of the average fishing unit (including the value of the accompanying licences and individual transferable quotas). In the scheme text, three categories of vessels are separated, the small cutters, the large cutters and the pelagic freezer trawlers (see Table A1.2 in Appendix 1 for the value per gross ton) with decreasing value per gross ton as the vessels get larger. While the individual quotas[12] held on the decommissioned vessels by 21 June 2022 have to be returned to the government together with the vessels, the compensation is not adjusted for the size of the individual transferable quotas of the individual applicant.

The decision to register for the scheme in an economically difficult and uncertain context
The registration for the decommissioning scheme was opened on 1 September 2022 and closed on 30 November 2022. The scheme opened at a time when a lot of other factors made the future of fisheries uncertain due to declining space, European and societal pressure to reduce bottom trawling, lack of succession and, above all, high fuel prices due to the war in Ukraine. Registered vessels are from owners who, in those uncertain times, decided to keep the option of exiting the fishery through the scheme. Yet, not all vessels initially registered were still on the list in April 2023 when Wageningen Economic Research received the list from the Netherlands Enterprise Agency (RVO). While some turned out not to be eligible for the scheme, others decided to find alternative paths for their vessels. The list used in this report was set on 1 April 2023, but likely contains more vessels than will eventually get scrapped

[11] The Brexit Adjustment Reserve is a European fund meant to compensate the effect of Brexit for affected businesses.

[12] This includes quotas for North Sea sole, North Sea plaice, North Sea cod, Whiting, herring and horse mackerel.

through the decommissioning scheme. The final list will only be known by 31 July 2023 which is the ultimate date of scrapping for decommissioned vessels.

1.3 key research question

The key question of this study is:
What are the socio-economic effects of the decommissioning scheme on the fisheries sector, the fish chain and fishing regions?

The decommissioning of 2023 will impact the fishing industry itself and also the processing industry and fishing communities. Based on the information on the registered vessels, the potential regional impact of the decommissioning is estimated. To identify these impacts, the following analyses have been carried out:

1. An analysis of the short-term loss of fishing capacity (in terms of effort and landings) based on the historical fishing activity of the registered vessels.
2. An analysis of the response in the fishing patterns of the remaining fleet and the resulting economic performance of the fishery. This analysis is based on a quantitative analysis of catch and effort patterns from logbook data, economic data collected by Wageningen Economic Research (Bedrijveninformatienet), and a scenario analysis. The scenarios looked at two dimensions: the amount of vessels actually decommissioning, and the possible reaction of the remaining fleet. The relevance of the scenarios were checked both with the Dutch Ministry of Agriculture, Nature and Food Quality and with fishers. The latter was done with a short phone survey (see Appendix 2).
3. Based on the results of this analysis and the dependencies found in the other sectors and on fishing communities (see the reports 'Baseline measurement of fish cluster structure and dependencies' [in Dutch], Hoekstra et al. 2023; and 'Social and cultural value of fisheries for communities' [in Dutch] Kraan et al. 2023), the effects on the other parts of the regional fish clusters and regions are qualitatively estimated.

1.4 Approach

The analysis of the socio-economic impacts of the decommissioning of the Dutch vessels as part of the BAR was done using a combination of mixed qualitative and quantitative methods described below. Given the sensitivity of the topic and the information used in the report, we only requested feedback and inputs on our assumptions as opposed to a more holistic collaborative approach as done in the analysis of the decommissioning scheme of the shrimp fishery (Hamon et al. 2023). We used input from the Dutch Ministry of Agriculture, Nature and Food Quality (in the writing of the proposal, the framing of the study and the scenario definition), from literature (mainly Squires 2010; and Curtis and Jones 2016), from previous studies in this project (see Hoekstra et al. 2023; and Kraan et al. 2023) and from regional meetings with the fishers and an online questionnaire (see Appendix 2). Based on those insights and the analysis of logbook data, a first version of the scenarios was developed. In those scenarios, different number of vessels decommissioning have been tested from 100% of the registered vessels, down to 90 and 80%. Two reactions of the fleet were envisaged, no reaction and an increase in effort. The scenarios were then checked with active fishers in a phone survey (see Appendix 2) and then used to assess the potential effect of the decommissioning scheme on the fishery.

The analysis of the withdrawn fishing capacity (sub-question 1) was done using insights from the fishery collected in regional meetings between June and August 2022 (see Appendix 2) and a quantitative analysis of the previous activity of the vessels of the Dutch cutter fleet based on their decommissioning status. In a first step, the past activity is analysed for four years prior to the implementation of the decommissioning scheme (2018 to 2021).

The analysis of the response of the remaining fleet (sub-question 2) was done using a number of scenarios. The scenarios were developed based on literature information and validated by the Dutch ministry and the fishing sector.

The effects of the decommissioning scheme on the other parts of the regional fish clusters and regions is discussed (sub-question 3) based on estimations of changes in the fishery following the scheme and insights gained in earlier part of the study (Hoekstra et al. 2023; and Kraan et al. 2023).

The results of the three analyses are shown in the next three sections, the detailed methodology is described in Appendices 2,3 and 4.

2 Description of the vessels registered to be decommissioned

2.1 Almost half of the cutter vessels were eligible for the decommissioning scheme

Out of the annual average of 291 active cutter vessels in the Dutch fleet over the 2018-2021 period, 139 were eligible for the scheme according to our calculation (with seadays and landings composition criteria). This represents 48% of the cutter fleet of those years (Table 2.1).

In addition to the cutter fleet, the pelagic trawlers were also eligible for the decommissioning scheme, but the financial compensation offered to those vessels (€71 per gross ton, see Table A1.2 in Appendix 1) proved not to be attractive for these pelagic companies. For the remainder of the analysis we will hence focus mainly on the cutter fishery as the one mainly impacted by the decommissioning scheme.

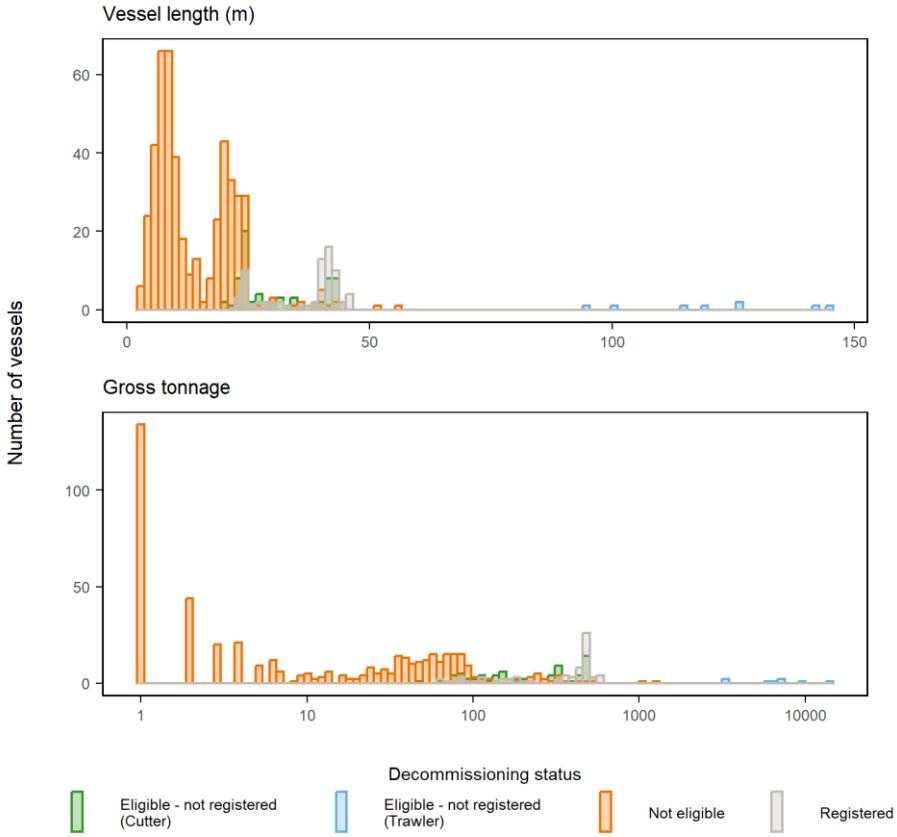


Figure 2.1 *Average 2018-2021 vessel length and tonnage distribution of the total Dutch fleet depending on their decommissioning status. Note, for a better readability, the y-axis is in log-scale*

2.2 Half of the eligible vessels registered for the scheme

Of the 139 eligible vessels, 71 remained on the Netherlands Enterprise Agency (RVO) list of 1 April. This means that more than half of the vessels eligible for the decommissioning scheme were still considered for scrapping by 1 April 2023. Those vessels represent 24% of the number of vessels in the cutter fleet and 13% of total Dutch fleet (see Table 2.1), 32% of days at sea of the cutter fleet (28% of the total Dutch fleet), 38% of landings of the cutter fleet (8% of total Dutch fleet), 43% of value of landings of the cutter fleet (29% of total Dutch fleet).

The total requested amount for all those vessels is €143,035,742. This amount is lower than the total BAR budget allocated to this decommissioning scheme and theoretically, all those vessels could benefit from it.

2.3 The beam-trawl flatfish fishery registered massively

During the 2018-2021 period, most of the registered vessels have operated with flatfish beam trawls (TBB/SUM/PUL) (about 60 of the 71 vessels representing about 81% of the total effort of the registered vessels, Figure 2.2), about 10 to 15 vessels operated annually with demersal otter trawls (OTT/OTB, 12% of effort of registered vessels), 11 with shrimp beam trawls (TBS, 6% of effort) and one vessel with Scottish seines or flyshoots (SSC, 1% of total effort of registered vessels). In comparison, the eligible vessels that did not register have operated with a much more balanced mix of gears, with only 47% of the effort with flatfish beam trawls, 21% with demersal otter trawls (OTT/OTB), 16% with Scottish seines (SSC) and 15% with shrimp beam trawls (TBS) (see Figure 2.2).

This is also confirmed by the composition of landings (see Figure 2.3). Sole and plaice represent about 75% of the landings in value (70% in weight) of registered vessels while for other eligible cutters they only represent 55% of value, 45% of weight.

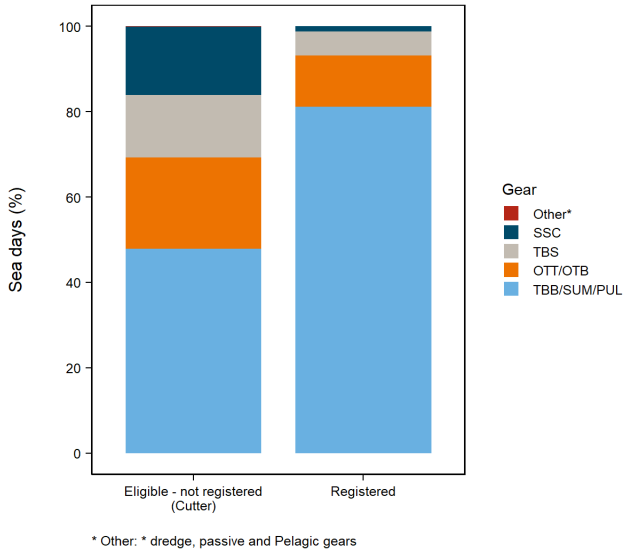


Figure 2.2 *Average composition of effort per gear of the registered vessels and other eligible cutters in seadays for the period 2018-2021. OTT/OTB: otter trawls, SSC: Scottish seines, TBB/SUM/PUL: flatfish beam trawl and alternative sumwing or pulse trawl, TBS: shrimp beam trawl*

2.4 Larger, more active vessels registered for the decommissioning scheme

There is a wide variety in vessel sizes in the Dutch fishing fleet that can be split in three subfleets: 1) the coastal fleet with a lot of less active smaller vessels catching species not impacted by the Brexit (see first peak of non-eligible vessels in vessel length between 2 and 18m on **Figure 2.1**), 2) the cutter fleet with the shrimp cutters (second peak of non-eligible vessels, less than 24m in length) targeting mainly brown shrimp and the rest of the cutter fleet above 20m catching a mix of demersal species and eligible for the decommissioning scheme and 3) the pelagic fleet few very large vessels, pelagic freezer-trawlers (between 90 and 150m in length). The registered vessels are amongst the longer and larger vessels of the cutter fleet (Figure 2.1), their length is on average 39m and gross tonnage 416grt, while

the other eligible cutters have an average length of 32m and gross tonnage of 296grt.

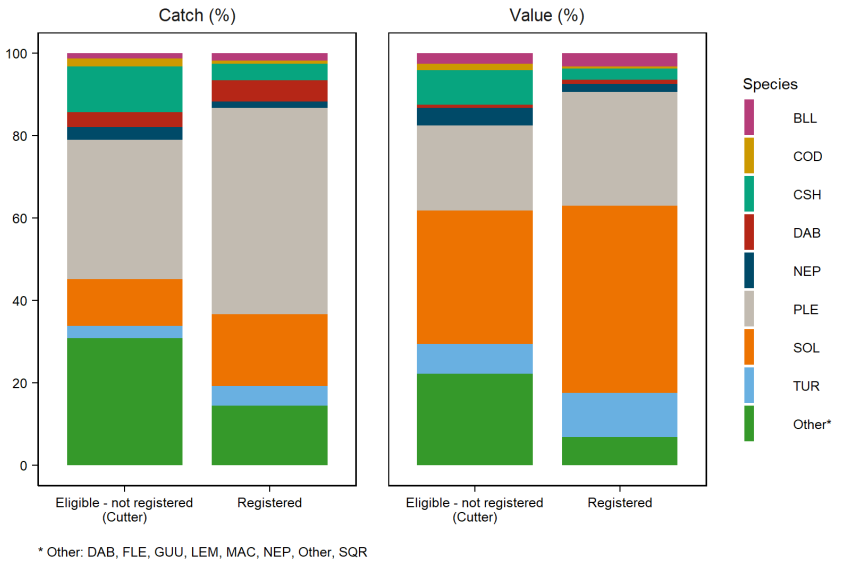


Figure 2.3 *Average catch composition of the registered vessels and other eligible cutters in weight and value for the period 2018-2021*

2.5 Average profitability, higher costs

In the 2018-2021 period, the registered vessels have shown on average a slightly higher revenue per vessel compared to the other eligible vessels (Figure 2.4 and Table 2.1). They also show a higher fuel consumption, costs and profit (Figure 2.4). The higher fuel consumption is probably the reason why those vessels particularly registered for the scheme. While they were still profitable in 2021, the flatfish beam trawlers are fuel intensive and would have been particularly impacted by the increasing fuel prices in 2022. In addition, part of those vessels had to give up using the pulse trawl (the last licences were withdrawn in July 2021), leading to even more fuel consumption.

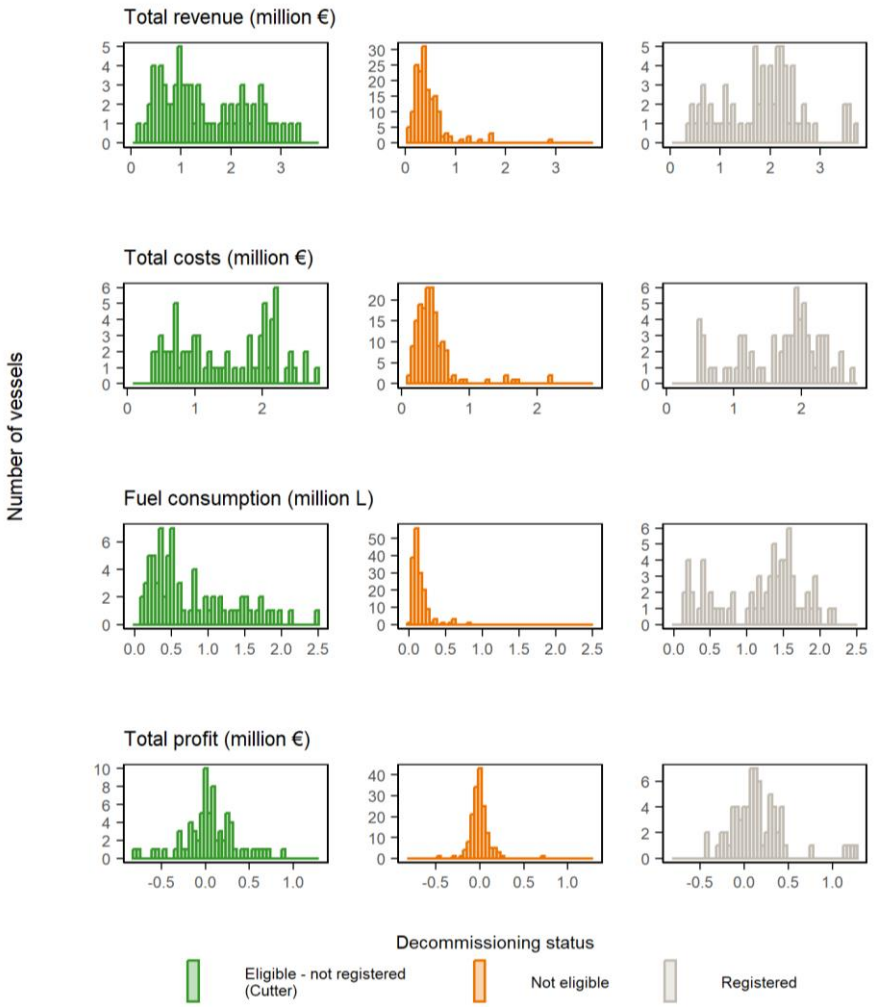


Figure 2.4 *Average distribution of revenue, costs, fuel consumption and profit for the Dutch cutter fleet for the period 2018-2021 per decommissioning status*

Table 2.1 *Summary table of the fleet activity before the decommissioning scheme (2018-2021) in terms of number of active vessels, effort, landings and value of landings. For the registered vessels, the eligible vessels (cutters and pelagic trawlers separately) and the total Dutch fishery*

	Registered	Eligible		Total Dutch fisheries				
	Cutters	Cutters	Pelagic trawlers	Cutters	Pelagic trawlers	Gillnetters	Others small scale	Total
Average per year								
Number of active vessels	71	139	7	291	7	10	222	532
Effort (days at sea)	13,933	26,787	1,667	43,525	1,716	339	2,923	48,506
Landings (tonnes)	25,485	47,542	249,016	66,525	250,844	66	13,426	330,863
Value of landings ('000 euro)	104,775	187,468	103,042	242,648	103,885	436	19,485	366,455
Average per active vessel per year								
Effort (days at sea)	198	193	247	150	237	33	13	91
Landings (tonnes)	361	342	36,891	229	34,599	6	60	622
Value of landings ('000 euro)	1,486	1,349	15,266	834	14,329	43	88	689

2.6 Fishers perception of the consequences of the scheme

Fishers and their spouses do not think lightly about quitting fishing. In 2022 we held an online survey with skipper-owners, crew and their spouses to better understand how they perceived the policy changes of the last couple of years for themselves, their families and the communities they lived in. We also asked them about how they saw the future of their business and whether they considered decommissioning (see Appendix 2).

Thirteen per cent of the respondents with a fishing company had signed up for the decommissioning scheme. This may seem relative low, but the population for the survey was larger than the fleet eligible. A larger group, namely a quarter of the population indicated they considered to stop fishing in 2023. Most of them (92%) said they would find it difficult to quit (Kraan et al. 2023). This is not because they are concerned about finding another job, but because fishing is part of their livelihood, of their way of life and identity (see Kraan et al. 2023 for a description of the social cultural value of fishing). Not only because fishers often have inherited the job and company of their family, sometimes going generations back in time. Also because they enjoy the fact that they are their own boss, appreciate being out at sea, and enjoy the thrill of finding fish and coming home with a hull full of fish. They take pride in what they do. These feelings are also experienced by the crew, whom have a boss (the skipper) but with rotating responsibilities on board and the fact that crew fish in a partnership agreement and thereby also share the profit when the catch is good, there is quite an egalitarian culture on board. Leaving that job, which is part of who you are and the sense of freedom behind is therefore difficult. It is also difficult for the skipper-owners and their spouses because the decision does not only affect themselves, but their family and their crew and their families, whom in many cases are related (50%) or come from the same fishing community (70%) (Kraan et al. 2023).

Regardless of the difficulty to make this decision, still 71 (data 2020) vessels signed up for the decommissioning scheme. Apparently for them the scheme is attractive or the least unattractive scenario for their companies' future. The decommissioning scheme had been announced at the end of 2021 as compensation for Brexit. It took some time to open the scheme, due to the fact that it is complicated piece of legislation that also needs to be checked by Brussels to prevent it from being unauthorised state aid.

In the time period the measure was developed (end of 2021 – 1 September 2022), Russia invaded Ukraine (February 2022). The war soon resulted in a high oil price. It quickly became clear that many cutter companies struggled to keep their business afloat. This was especially true for the large beam trawl vessels, many of which already had to adjust from fishing with the

pulse to revert back to beam trawl, which meant a doubling of fuel use. That this policy change (pulse ban) has had a large impact shows in the amount of former pulse vessels registered; 45 of the 71 vessels were vessels with a pulse license (63% of the registered vessels). In combination with the grim outlook for fisheries due to a whole set of policy changes over the last couple of years and the decreasing space for fisheries at sea, the interest in the scheme therefor was high.

When the scheme and the conditions of decommissioning were announced (22 July 2022) there was a lot of discussion about the conditions. What was new, compared to earlier decommissioning schemes (such as those in 2008 and 1995), was that also the quotas (linked to the vessel) needed to be handed in[13] and fishers could not start fishing again, but had to wait 5 years[14]. Both aspects made it more difficult to take part in the scheme for fishers, especially for (family) businesses with a lot of quotas. The quotas in the Netherlands, although they have been divided for free in the 1980s when the TACs were introduced, have developed a market value because of the Dutch ITQ system (Hoefnagel and de Vos 2017). Many fishers therefore started to see the quotas as part of their business capital and (later on) pension. The Netherlands has quite a number of slipper-skippers, fishers who do not fish anymore but lease their quotas and thereby earn an income (van Ginkel 2009). The other side of the coin was that vessels without a lot of quotas, profited relatively from this scheme given that quotas had to be return with the vessel without additional compensation. The rule that one cannot develop a new fishing activity, thus use the money to buy another (smaller) vessel, was difficult for fishers.

Fishers with more than 1 vessel in the company who would decommission one of the vessels, could off course continue fishing with the remaining vessel(s). But some were confronted with difficult choices as to *which* vessel to decommission. In some cases one of the vessel was the oldest or largest and therefore best to let go of, but if most of their companies' quotas were connected to that vessel, it was a less logical and unattractive choice. So many companies (and families) were going through difficult discussions (Kraan et al. 2023). This time of contemplation meant that one could not talk about it, as if word came out that one was considering to decommission, crew would start looking around for another vessel to fish for (Kraan et al. 2023).

The Dutch fishing community[15] expressed concern over the state the fishing sector is in as a result of the mix of policy measures and the high oil price, and the declining fleet as a result of that. And the majority (94%) indicated that the general mood was depressed (survey 2022). In the course of 2022 and beginning of 2023 the decline of the fleet became noticeable. Vessels were scrapped, or sold, and the auction in Den Helder closed its doors. Pictures and short videos were shared on social media but also news articles and tv shows reported how fishers deconstructed their vessels (taking all personal belongings out) to then see them off to Kampen whilst being tugged out of the harbour by a tug boat. Kampen is a village in Overijssel where many scrapped vessels were brought to.[16] The sight of these majestic vessels (some 40 metres long) being tugged away as empty cascos yet still carrying the colours and name of the vessel was a very emotional sight to those involved as well as bystanders. Some fishers could not bring their vessel away themselves, 'too emotional' they said, and rather waved them goodbye from the quayside.

The Dutch fishing community will, due to the decommissioning of vessels become smaller. The last decommissioning scheme was in 2008, and fishers already refer to the fact that fisheries have declined. More and more they experience that they are becoming a rarity when meeting other people. Also on birthday parties in their community they notice that there are less fishermen, and this increases over time. Where in 2008 (Salz et al. 2008) less than half of the fishers experienced this, in 2022 it was more than 70% (Kraan et al. 2023). Consequences of this already started to show in 2022, for instance the insurance company for fishers with a partnership agreement, raised the cost of the insurance as the number of fishers declined.

[13] https://www.vissersbond.nl/verbazing-en-teleurstelling-over-de-saneringsvoorwaarden/

[14] This condition was unnegotiable with the commission, which the Dutch ministry had tried to change (https://www.rijksoverheid.nl/documenten/kamerstukken/2022/07/22/openstelling-saneringsregeling-visserij).

[15] Fishing community here as defined as a community of practice, encompassing all men and women (in)directly involved in or related to fishing (see Kraan et al. 2023). They have been consulted via regional meetings, interviews and a national survey (Kraan et al. 2023, see also Appendix 2).

[16] https://www.destentor.nl/kampen/dit-bedrijf-in-kampen-sloopt-tientallen-kotters-van-vissers-die-geen-toekomst-zien~a9fb37a6/ and https://www.schuttevaer.nl/nieuws/actueel/2023/02/24/prachtige-viskotters-worden-in-kampen-opgeruimd/

Already in 2022 a lot of vessels lay still due to the high oil price, resulting in a number of fishers (crew) seeking other jobs, which often also paid much more than fishing (at that time with high costs) and with less crazy work hours and risks (Kraan et al. 2023). The fishing community expressed concern over this, as it meant a direct loss of experience and knowledge. 84% of the respondents indicated to be concerned over maintaining a good crew (Kraan et al. 2023). Fishers learn a lot in practice and have to do a lot of follow up training.[17] So when such experienced fishers leave and others more opportunistic men without experience start joining as deckhand, this bears risks. Another option is that the fleet will turn more and more to foreign workers whom are hired via an employment agency and have a fixed salary.

The effects of the decommissioning will differ per fishing community and region (see Chapter 4).

[17] Some qualifications need to be renewed every 5 years.

3 Scenario analysis

3.1 What-if scenarios with varying number of decommissioning vessels and reaction of the remaining fleet

We assess the impact of the decommissioning scheme on the Dutch fishery using scenarios. Because we cannot predict the future we use different types of scenarios to capture uncertainty in the system in a number of 'what-if' cases (see Table 3.1***)***.

Uncertainty in actual decommissioning vessels tackled with sensitivity analysis
As mentioned earlier, the registration for decommissioning scheme opened in a specific context with high uncertainty. Because of this, some fishers saw the decommissioning scheme as an emergency exit door that they didn't want to close too rapidly (personal communication fisher representative[18]). Given that the vessels have until the end of July 2023 (i.e. three months after the writing of this report) to withdraw from the scheme, we run a sensitivity analysis on how many vessels will actually make use of the scheme and exit the fleet assuming that either i) 100% of the registered vessels leave, ii) 90% or iii) 80%.[19] Given that we ignore which 90 or 80% of the vessels would actually be scrapped in those scenarios, we select the vessels randomly a hundred times in order to calculated an average scenario.

Change in behaviour of remaining fleet could lead to higher individual effort
Another unpredictable factor is the reaction of the remaining fleet after the decommissioning. Based on literature it is expected that the remaining vessels may increase investment or fish longer due to the room created by the departure of the decommissioning vessels (Squires 2010). The Dutch flatfish fishery is managed with individual transferable quotas (ITQ) for its two main species, sole and plaice, so to increase their landings, fishers would have to acquire extra quotas. In the transition period (until 2025), the quotas will be redistributed to producer organisations (PO) who can allow their members to increase their effort and flatfish landings, at least in the short term. After that, the Dutch government will make a new plan to reallocate the quotas to existing and potentially new fishers. In addition, the Dutch quotas of both of those stocks have been underutilised for the past years by the Dutch fleet. Since 2016, the Dutch landings of flatfish have been decreasing (Wageningen Economic Research 2022c). In 2021 the quota uptake was lower than 50%.[20] In that context, it is unclear what barriers would be lifted by the decommissioning that would lead to the remaining fleet to increase their effort.

To cover multiple cases, we use two fleet reaction scenarios: i) *no reaction*: we maintain the individual effort at the historical (2018-2021) level, ii) *increased effort*: the vessels targeting sole and plaice will increase their effort for those species. The *increased effort* scenario is capped by the max seadays observed on the segment and also limited by other activities (for example shrimp fishing, see Appendix 3 for the detailed calculation of the increased *effort* scenario).

[18] The fisher representative mentioned in the phone survey (see Appendix 2) that fishers had registered out of precaution. Putting the vessel on the list, kept the door open for decommissioning. In the meantime owners looked for other solutions.

[19] Those percentages were chosen as it is simple to infer a linear relationship, in case an extra 10% vessels decide to remain.

[20] https://vissersbond.nl/benuttingsoverzicht-visquota-15-december-2022/

Table 3.1 *Description of the six scenarios regarding the short term effect of the decommissioning scheme*

#	Scenario name	% of registered vessels actually scrapped	Reaction of remaining fleet	
1	Base scenario: 100%-no reaction	100%	No reaction	1 run
2	90%-no reaction	90%	No reaction	100 runs
3	80%-no reaction	80%	No reaction	100 runs
4	100%-effort increase	100%	Increased effort	1 run
5	90%-effort increase	90%	Increased effort	100 runs
6	80%-effort increase	80%	Increased effort	100 runs

3.2 The expected reduction of effort and landings due to the decommissioning of flatfish beam trawlers exceeds the reduction of quotas due to Brexit

The total fishing effort of the cutter fleet decreases in all scenario due to the decommissioning scheme (from -13% in the 80% - increased effort up to 32% in the 100% - no reaction scenario Table 3.3)
Meaning that the simulated effort increase at the individual level could not offset the reduction in the number of vessels, even if 'only' 80% of the registered vessels actually stop.

The effort reduction is particularly marked for the flatfish beam trawls (from -27% days at sea of the total Dutch fleet in the *80% - increased effort* up to -63% in the *100% - no reaction scenario, see* Figure 3.1) and the otter trawls (from -3% days at sea of the total Dutch fleet in the *80% - increased effort* up to -36% in the *100% - no reaction scenario, see* Figure 3.1), Scottisch seine and shrimp beam trawls also decrease by about 5% of the total effort with those gears in the 2018-2021 period.

As a result of the overall decrease in beam-trawl effort, the landings of demersal species also decrease. In total weight, the landings of the cutter fleet would decrease by 19 (*80% - increased effort* scenario) to 38% (*100% - no reaction* scenario) of the historical value if all the registered vessels were to actually leave the fishery. For sole, the expected decrease in landings ranges from -63% if all the registered vessels stop fishing and the remaining fleet maintain the same level of effort (scenario 100%- no reaction, see Table 3.2) up to -32% if only 80% of the registered vessels actually stop and the remaining vessels increase their effort. Compared to the decrease in quota share of 13% due to Brexit, the expected landings of sole are expected to decrease faster due to the decommissioning scheme in all scenarios. The decreases of plaice landings are expected to be similar to those of sole for all scenario (Table 3.2). Given that the Dutch share of the plaice quota will not change as a result of Brexit, the quota is expected to also remain underutilised except if the total allowable catch drastically decreases.

3.3 Cod could become choke species

Cod shows another story. The quota share is expected to decrease by 19% and while the landings are expected to decrease faster in the scenarios with no increase of effort (between -29 and -23% depending on the percentage of the registered vessels actually being scrapped, Table 3.2), if the remaining fleet were to increase its effort, the average decrease in landings in the 80% and 90% scenarios would 'only' be 15 or 18% and would therefore not compensate the decrease in quota share. This coupled with the fact that cod quotas have actually been fully utilised in the past couple of years (Vissersbond 2022) could lead to cod becoming a choke species for the Dutch demersal fleet.

3.4 The expected landings of pelagic species remains unchanged by the decommissioning scheme

The pelagic species in Table 1.1 are also expected to be limiting the Dutch fleet in the future. While the Dutch quota share has decreased due to Brexit, the fleet catching those species has not registered for the decommissioning scheme and the landings are therefore expected to remain constant.

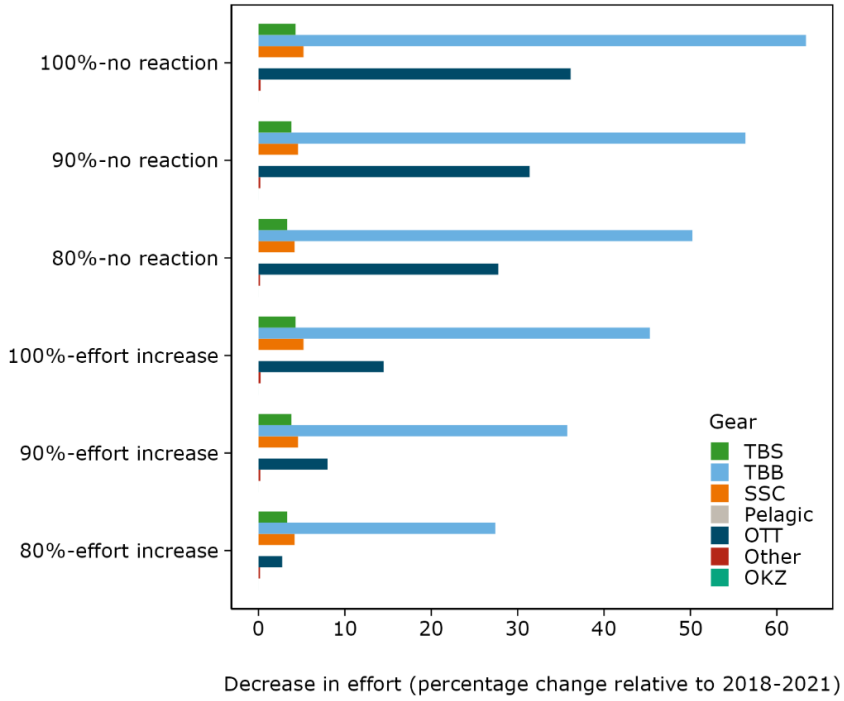


Figure 3.1 *Expected change in effort per gear type in percentage for the six scenarios compared to the average historical effort 2018-2021*

Table 3.2 *Expected change in landings per species in percentage for the six scenarios compared to the average historical landings 2018-2021. Only the important demersal species are shown here, the pelagic fleet being unaffected by the decommissioning scheme, no change in landings as a result of the decommissioning scheme is expected. *mean value for the scenario.* ***Bold*** *values represent decrease in landings below the change in quotas due to Brexit*

	Historical landings 2018-2021 in t	Quota change due to Brexit	100%-no reaction	90%-no reaction*	80%- no reaction*	100% increased effort	90% increased effort*	80% increased effort*
Sole	7.029	-13	-63	-56	-50	-50	-41	-32
Plaice	20.424	0	-62	-56	-50	-48	-39	-31
Cod	640	-19	-29	-26	-23	-23	**-18**	**-15**

3.5 The expected economic performance of the remaining cutter fleet worsens

The expected total activity (effort and landing figures) of the cutter fleet decreases faster than the number of vessels due to the higher historical level of activity of those vessels (Table 3.3)

In the *100% - no reaction* scenario, while the number of vessels decreases by 24%, the total effort is reduced by a third, landings by 38% and value of landings by 43%. So the registered vessels were more at sea than the other cutters in the 2018-2021 period, they landed more per unit of effort and the average price of their landings was also higher. They had also higher costs and much higher profit (the total profit of the cutter fleet decreases by 70% if all the registered vessel leave). Those were years when the pulse trawl was still used but being phased out of the flatfish fishery and fuel prices were relatively low, resulting in profitable years for the larger flatfish beam trawlers despite a declining trend (Wageningen Economic Research 2022a). However, given the development since 2021 (complete ban on pulse, high fuel prices and low catchability of flatfish) it is likely that the profitability of the registered vessels drastically decreased, and that the decommissioning scheme prevented some bankruptcies.

When looking at the average data per vessel it remain clear that the vessels exiting the fishery were the ones driving its profitability. The expected average individual effort goes down by 7 to 10% depending on the scenario if the remaining fleet does not react (Table 3.3), it even increases by 3 to 7% if the fleet does react. This is hardly enough to bring the individual landings to the historical level (only in the 80%-increased effort is the change in individual landings not negative, average is null). And insufficient to compensate the revenue or the profit.

3.6 Less decommissioned vessels means on average less impact but high variability in impacts depending on the vessels selected to decommission

By decreasing the number of vessels actually leaving the fishery by 10 (90% scenarios) or 20% (80% scenarios) of the registered vessels, we see that the effect of the decommissioning scheme is also attenuated and the average effect on the effort, landings and value is linearly correlated with the number of vessels leaving. Of course in this study, we randomly select which of the registered vessels actually leave. However, there are differences in the expected decommissioning scheme impact depending on the selection of the vessels. In the 80% scenarios, the ranges of impacts are the largest. While the effort is on average reduced by 25% if 80% of the registered vessels leave with no reaction from the remainders (scenario 80% - no reaction), this reduction is more or less the same regardless the selection of vessels demonstrating the similar effort profile of the registered vessels, with effort higher than the average cutter (Table 3.3). Differences are more pronounced for landings - depending how much the vessels landed historically the expected decrease in landings in the *80% - no reaction* scenario ranges from -32 to -29%; value of landings (from -36% to -33% decrease expected), cost (from -36% to -31% decrease expected) or profit (from -66% to -44% decrease expected)[21]. For the value of landings and profit, those differences between the lowest and highest bounds of the 90% confidence interval are actually close to the difference between averages of the *90% and 80%* scenarios highlighting the importance of understanding why a vessel owner would scrap their vessel.

3.7 Increasing effort is limited but would still lead to a reduced impact

In the 100% scenarios, increasing the effort of the remaining vessels would lead to a decrease in the overall effort of 22% instead of 32% (Table 3.3), a reduction of the landings and landings value respectively by 30% instead of 38% and 34% instead of 43%. The change in costs and profit also decrease to a lesser extent. Despite leading to a higher average activity per vessel of the cutter fleet, increasing effort would still lead to lower landings and a reduced profitability of the vessels.

Table 3.3 *Activity of the cutter fleet before the decommissioning scheme and changes due to the scheme for the six scenarios compared to the before situation. *median value [bounds of 90% confidence interval]*

	Average 2018-2021	100%-no reaction	90%-no reaction*	80%- no reaction*	100% increased effort	90% increased effort*	80% increased effort*
Total cutter fleet							
Active vessels	291	-24%	-21%	-19%	-24%	-21%	-19%
Effort	43525	-32%	-28% [-29%; -28%]	-25% [-26%; -25%]	-22%	-17% [-18%; -17%]	-13% [-14%; -13%]
Landings 1.000 t	67	-38%	-34% [-35%; -33%]	-30% [-32%; -29%]	-30%	-24% [-26%; -22%]	-19% [-21%; -17%]
Value of landings million euro	243	-43%	-38% [-40%; -37%]	-34% [-36%; -33%]	-34%	-28% [-29%; -26%]	-22% [-24%; -20%]
Costs million euro	234	-41%	-37% [-38%; -36%]	-33% [-34%; -31%]	-32%	-26% [-28%; -25%]	-21% [-23%; -20%]
Profit million euro	15	-70%	-63% [-71%; -54%]	-56% [-66%; -46%]	-61%	-48% [-59%; -34%]	-36% [-50%; -21%]
Average per vessel cutter fleet							
Effort	150	-10%	-9% [-9%; -8%]	-8% [-8%; -7%]	3%	5% [4%; 6%]	7% [7%; 8%]
Landings	2	-19%	-16% [-18%; -14%]	-14% [-16%; -12%]	-7%	-3% [-6%; -1%]	0% [-3%; 3%]
Value of landings	8	-25%	-22% [-23%; -20%]	-19% [-21%; -17%]	-13%	-8% [-10%; -5%]	-3% [-6%; -1%]
Costs	8	-22%	-19% [-21%; -18%]	-17% [-18%; -15%]	-11%	-6% [-8%; -5%]	-3% [-5%; -1%]
Profit	1	-61%	-53% [-63%; -41%]	-46% [-58%; -33%]	-48%	-34% [-48%; -16%]	-21% [-38%; -2%]

[21] Note, the difference between the lowest and highest bounds of the ranges are not necessarily due to the same vessel groups for the different variables.

4 Regional impact of the decommissioning scheme on the fish cluster and fishing communities

4.1 Links with on-land fishery cluster through the fish value chain and the supply chain for the fishery

Policy decisions and developments for the North Sea fishery,[22] affect the entire fish chain and technical and services supply industry as a kind of domino effect. The fish chain and technical and services supply industry refers to the total of companies in the fish processing chain (such as auction, transport, processing, fish wholesale) and technical and services supply industry (shipbuilding, port services, technical services such as electricians, ship carpenters, etc.) (Figure 4.1). The fish processing chain and technical and services supply industry are referred to in this report as *fish cluster*. Several fish clusters are regionally distributed in the Netherlands.

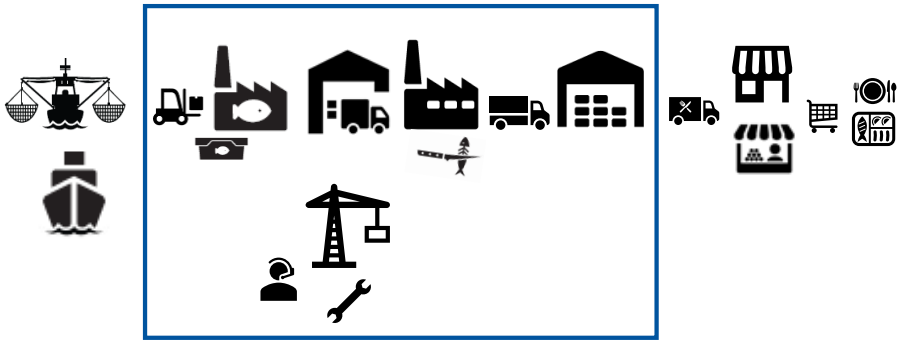


Figure 4.1 *The fish processing chain and technical and services supply industry of North Sea fish simplified as visualisation. The delimitation of the included links are demonstrated within the blue square of the figure*

[22] 'North Sea fish' (as opposed to pelagic fish and inland fish) refer to the fish landed by the 'North Sea fishery' i.e. the Dutch fishery from the North Sea and adjacent areas such as the English Channel, the Kattegat and Skagerrak.

Not only policy decisions like Brexit, landing obligations, pulse ban and decommissioning of fishing vessels could affect fish clusters and fishing communities. Also developments could cause negative socio-economic and socio-cultural effects. Developments such as the war in Ukraine with inflation and largely higher fuel and (sea)food prices as a consequence.

In addition to landings by fresh fish cutters also brown shrimp taken into account to distinguish specialisations per fisheries region

The focus of this report is on the effects of the decommissioning of the Dutch cutter fleet. However, to map the effects of the cutter fleet decommissioning on the fish processing chain and supplying industry per fisheries region, it is important to make a distinction in specialisations per region. Namely, all six fisheries regions and the category 'other' are mapped but it is important to distinguish which region is more dependent on cutter fisheries and which region is more dependent on brown shrimps fisheries. In some regions the specialisations are intertwined because there are auctions with of landings of Brown shrimps and those of fresh North Sea fish. There are also Eurocutters[23] that fish mainly for flatfish but catch brown shrimp seasonally. For the fish processing chain and technical and service supply industry, companies can supply or purchase from both fresh (flat) fish cutters and shrimp cutters. To avoid making it unnecessarily complex in this report, a description is first given of the fisheries regions and the distinction between auctions for fresh North Sea fish and brown shrimp. In the end, the central question is of course what the consequences of the cutter decommissioning are for the fish processing chain and technical and service supply industry per fisheries region.

[23] See Glossary for a definition of Eurocutters.

Knock-on effects for onshore fish clusters by decreasing landing volumes and decommissioning cutter fleet

From Hoekstra et al. (2023) it is demonstrated that as a result of increased costs and/or restricted catch opportunities the fleet reduces both in size as in landings. This has an effect on the auxiliary and processing industry, in terms of financial turnover and employment. The more a company is dependent on fish landed by Dutch flagged vessels related activities the more it will be affected, yet there are companies that diversify (remain active in fish processing chain but source elsewhere) or move to other sectors. Only a limited number of onshore companies (and in that respect also regions) are fully dependent on the North Sea fisheries sector and hence affected to a large extent with reduced fleet and fishing opportunities. On average 40-50% of financial turnover was dependent on North Sea fisheries among fish clusters in the Netherlands in 2021, varying per individual company from 5% to 100% dependence. Most of the companies active in the fish processing chain did urgently need to fall back on alternatives from North Sea fish. For example, when fish processors divert to alternatives, consider fish species that are imported, such as farmed salmon from Norway or flatfish from North America. Technical and service suppliers such as ship builders, installers, port companies and ship carpenters may in certain cases divert to (maritime) industries other than Dutch fisheries such as large shipping, yachting, offshore activities or completely different sectors such as housing and business premises (Hoekstra et al. 2023).

Based on the research study of Quirijns et al. (2019) the six fisheries regions are (Figure 4.2):

- Waddenkust (Provinces Friesland and Groningen)
- Kop van Noord-Holland (among others Den Helder, Texel, Den Oever, Wieringen)
- IJmuiden
- Katwijk-Scheveningen
- Zuidwest-Nederland (among others Stellendam, Ouddorp, Goedereede, Vlissingen, Arnemuiden, Breskens)
- Urk.

In addition to these six regions there are enterprises which belong to fish clusters, although these are not within the regional borders of those six fisheries regions. For these enterprises another categories is created named 'others'.

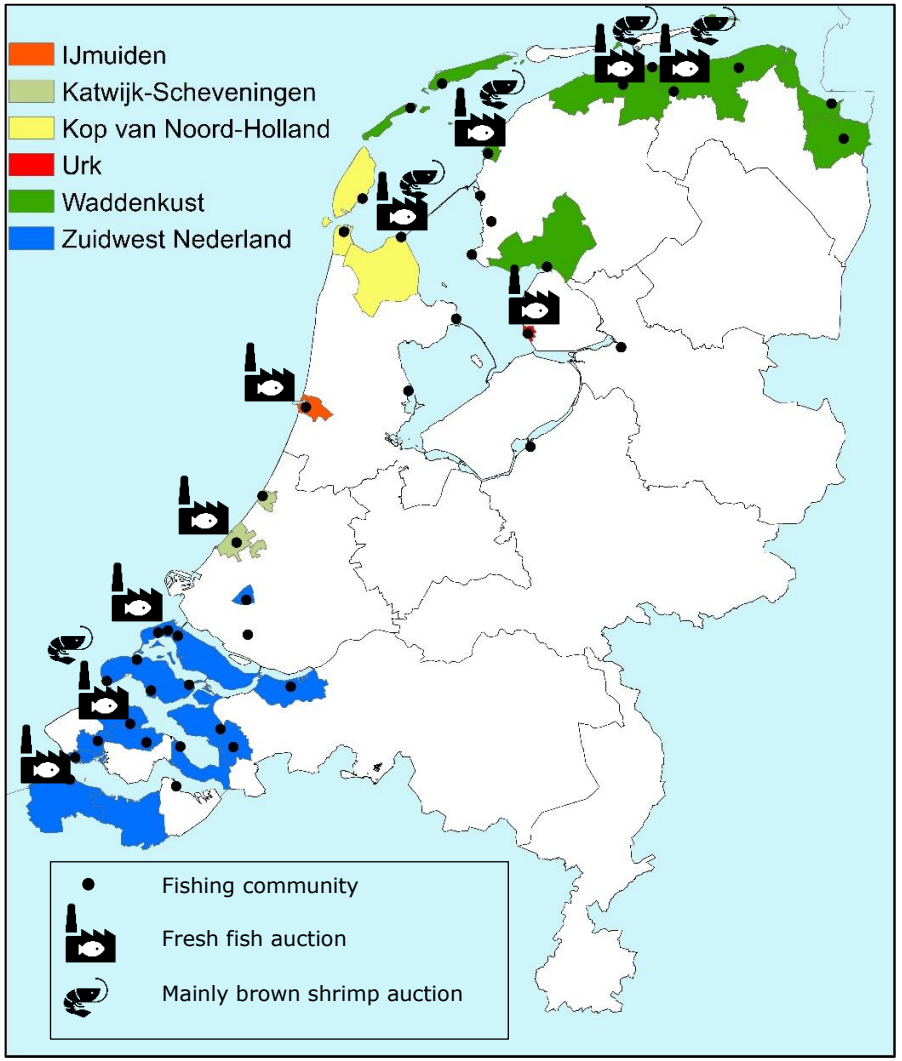


Figure 4.2 *Map with 6 defined fisheries regions and fresh North Sea fish and shrimp auctions in the Netherlands*
Source: Register of Dutch Fishery vessels, edited by Wageningen Economic Research.

Multiple interactions often exist between different fisheries regions (Hoekstra et al. 2023). For example, Katwijk and Urk do not have their own ports where North Sea fish are landed fresh. Cutters with Katwijk as their home port (starting with the abbreviation KW as the fish number) often land in the port of IJmuiden or Stellendam and sell their fresh fish there through the fish auction. For Urker cutters, the ports of Harlingen, IJmuiden and Eemshaven are important as well as foreign ports in Denmark and France. However, most of the fresh North Sea fish landed there is sold through the fish auction in Urk. Cutters from other fisheries regions may have similar interactions with other regions. Thus, the home port where a cutter is registered is not automatically the port where this fishing vessel then lands the fish or the local fish auction where most of the caught fish is sold.

The characteristics per fisheries region of the processing chain and technical and services supply industry of North Sea fish is described in Appendix 4. Within this table the main commercial North Sea fish species landed in volume and the condition or preservation state (fresh, frozen etc.) is mentioned per fisheries region.

Socio-economic size of fish clusters per fisheries region

From Hoekstra et al. (2023) it is demonstrated that the fish clusters in the Netherlands consisted of 346 onshore companies in total in 2021. This baseline measurement shows that there were 12 auctions, 19 fish transporters, 109 technical and service suppliers and 206 fish processors and trade companies in the Netherlands (Table 4.1). Together these 346 companies had a financial turnover of €6.6bn and 13,550 employees (8,350 FTE) in 2021.

Table 4.1 *Socio-economic size of Dutch fish clusters by each link in the fish processing chain and technical and service supply industry in 2021 (Hoekstra et al. 2023)*

Link in fish processing chain and technical and service supply industry	Number of companies	Turnover (million euros)	Employees	FTE 2021
Fish and brown shrimp auctions	12	270	450	250
Fish transporters	19	140	1,000	800
Technical and service suppliers	109	1,030	2,500	2.100
Fish processing/fish wholesale	206	5,170	9,600	5.200
Total	**346**	**6,610**	**13,550**	**8.350**

Out of these 346 companies there were 314 which had a smaller or larger dependency on North Sea fisheries for their financial turnover in 2021. Therefore 32 companies had no revenues from North Sea fisheries. Out of the 314 companies there were large differences between the financial turnover directly related to North Sea fisheries, varying from 5 to 100% on the total turnover in 2021. On average 40-50% of the turnover was directly related to North Sea fisheries. This means an estimated €2.9bn turnover in 2021. Urk was the largest fish cluster in socio-economic terms followed by 'other' and Zuidwest-Nederland (Table 4.2).

Table 4.2 *Socio-economic size of Dutch fish clusters of onshore companies in the fish processing chain and technical and service supply industry by each fisheries region, ranked from largest to smallest in number of employees in 2021 (Hoekstra et al. 2023)*

Fisheries region	Number of companies in 2021	Turnover in 2021 (million euros)	Employees in 2021	fte 2021
1.Urk	96	2,200	4,150	2,450
2.Zuidwest-Nederland	56	550	2,100	1,350
3.Waddenkust	27	800	1,900	1,250
4.Katwijk/Scheveningen	32	700	850	550
5.IJmuiden	26	500	550	350
6.Kop van Noord-Holland	17	100	250	150
7.Other	92	1,760	3,750	2,250
Total	**346**	**6,610**	**13,550**	**8,350**

Fish and shrimp auctions and landed volumes 2011-2022 in the Netherlands

There are historical reasons wherefore fish clusters focusing on demersal (flat fish and shrimps) and small pelagic frozen fish are located close to harbours and auctions (Appendix 4). In this report there is less attention on fish processing chains of pelagic frozen fish as the decomissioning does hardly affect these pelagic fish companies.

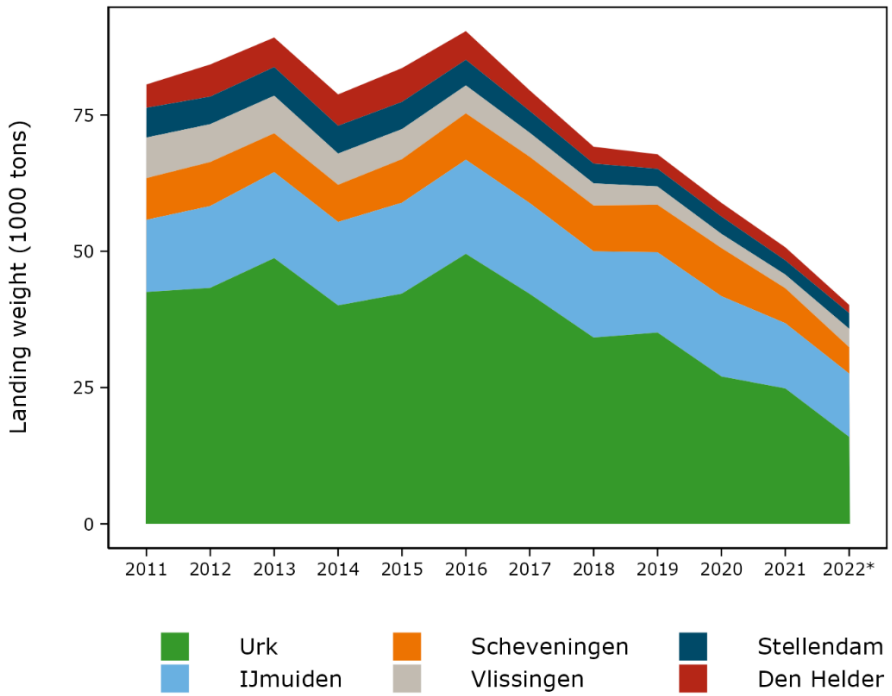


Figure 4.3 *Six auctions with mainly or solely fresh North Sea fish landed and sold in the Netherlands in 2022. Landings of fresh North Sea fish species (including brown shrimp for Stellendam) at Dutch auctions from 2011-2022. Landing weight is expressed in tonnes*

Ten licensed North Sea fish auctions are still operational in the Netherlands by 2023 (Figure 4.2). At the beginning of 2022, there were still twelve. In that year, the doors of the Den Helder fish auction and, earlier, the Breskens shrimp auction were permanently closed. For both auctions, a sharp decline in supply volumes and associated economic losses was the main reason to stop their activities. Operations at the Breskens auction were taken over by the Vlissingen auction, with which they already had a close working relationship. Cutters that previously landed and sold their North Sea fish through the Den Helder fish auction often diverted to Den Oever or IJmuiden. The Den Oever auction falls under the same coop as the until recently operational Den Helder auction. In Den Helder also a fisheries coop has been closed due to decommissioning flat fish cutters from this fisheries region of Kop van Noord-Holland. For this fisheries region and community with its companies and individual employees it has a large social, economic and cultural impact. On a national level fishing vessels and fish clusters are expected to be minimum affected by closing this single fish auction and fisheries coop.

The operational North Sea fish auctions recognised by the NVWA can be divided into typical shrimp auctions and fish auctions. In 2022, there were seven auctions where shrimp was landed if Stellendam is included (Figure 4.4) and six auctions specialised in the landing and sale of North Sea fish (Figure 4.3). These landing volumes at Dutch fish and shrimp auctions (Figures 4.3 and 4.4) includes both landing weight by Dutch and foreign flagged fisheries vessels. In addition to the North Sea fish auctions recognised by the NVWA, there is a separate mussel auction in Yerseke where samples of mussel harvests are taken to determine, in particular, the quality size of the mussels, and an IJsselmeer auction in (popularly called 'on' because of the former island) Urk for the sale of freshwater fish caught mainly on the IJsselmeer. The port of Eemshaven is for transhipment of fresh fish only, no auction.

Landing volume at Dutch fish auctions more than halve in 2016-2022

Of the Dutch auctions where mainly fish is landed, Urk and IJmuiden were the largest both in terms of turnover and landing volume in 2021 and 2022 (Hoekstra et al. 2023; Figure 4.3). High prices of landed fresh North Sea fish caused an increase in financial turnover in 2022 compared to a year earlier for several fish auctions despite decreasing landed weight. Together, Urk and IJmuiden accounted for 73% (2021) and 69% (2022) of total volume landings of fresh North Sea fish. For the flatfish species plaice, Urk is the largest auction. For the other commercially very important flatfish species North Sea sole, IJmuiden and Scheveningen are the most important auctions in the Netherlands. Expressed in landing weight, the decrease in the landing volume of North Sea fish at the Dutch auctions is visible from the peak year 2016 (Figure 4.3). In peak year 2016, the total landing volume was rounded 90,400 tonnes. By 2022, this had more than halved (-56%) to a total of 40,200 tonnes. Over those six years, the landing volume declined by an average of 8,400 tonnes annually (10-20% per year on the total volume landed).

Supply volumes of shrimp fluctuate widely from year to year
Landing volumes by weight (expressed in tonnes) show the strong fluctuations of shrimp landings from year to year (Figure 4.4). This characterises the North Sea shrimp fishery with years of large catches and years of much smaller catches due to a lower recruitment of the shrimp population. The Harlingen auction, with some 3,700 tonnes in landing volume, was also the largest among the six shrimp auctions in the Netherlands in 2021 (Figure 4.4).

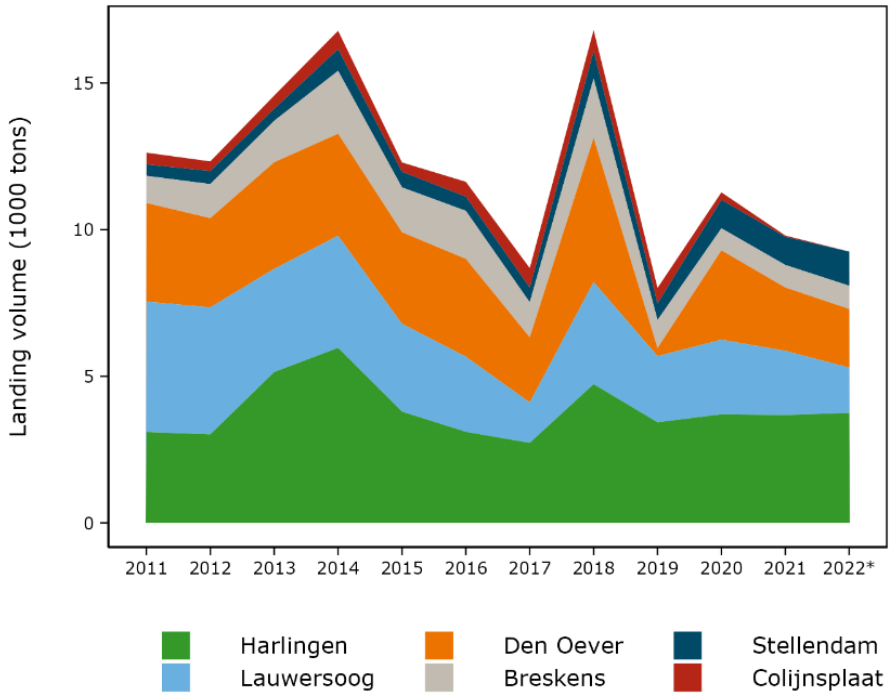


Figure 4.4 *Six auctions with mainly or solely brown shrimp landed and sold in the Netherlands in 2022. Landings of North Sea shrimp at Dutch auctions from 2011-2022. Landing weight is expressed in tonnes. * provisional figures; ** Zoutkamp is missing because no figures have been made available Source: NOVA auctions, edited by Wageningen Economic Research.*

A total of about 9,000 tonnes of North Sea shrimp was sold through the Dutch auctions in 2021. Peak years in terms of supply volume were 2014 (15,000 tonnes) and 2018 (17,000 tonnes). For all volumes mentioned, it is about dead weight, or shrimp cooked on board and excluding sievage. Dead weight is calculated by dividing live weight by conversion factor 1.18 (Wageningen Economic Research 2022a). In such years of large catches and high landing volumes, landing prices often drop sharply due to the market economics of supply and demand. The average landing price was €2-3 per kilogram in those years of many landing volumes of North Sea shrimp. At that time, there was a stock surplus in the cold and frozen warehouses of shrimp processing plants. In years of scarcer supplies or stock shortages in the warehouses of shrimp processors and wholesalers, the average price per kilogram of North Sea shrimp can be much higher, up to above €7 per kilogram.

The year 2020 was exceptional due to market distortion during the corona pandemic. A decrease in supply in terms of weight of shrimp products to the consumer market at that time, was mainly determined by the limited capacity in the peeling workshops in Morocco. Most of the North Sea shrimp from Northern Europe is peeled manually in Morocco because of lower labour costs and by specialised peeling ateliers where hygienic circumstances are significantly better than home manual peeling in Dutch households in the last century. During the corona pandemic, peel workers had to keep at least one and a half to two metres away to prevent the spread of the virus. The peeling capacity was therefore only one-third of the usual processing capacity, which meant that market demand was temporarily limited by supply from processing.

On the total turnover of the shrimp auctions, the sales value of Den Oever seems to be greater than that of Harlingen and Zoutkamp in some years (Hoekstra et al. 2023). However, at the Den Oever and Lauwersoog auctions, in addition to shrimp, other North Sea fish species are landed such as Norway lobster (especially Den Oever) and other flatfish and roundfish. For both outlets, the majority of the total turnover consisted of North Sea shrimp sales. Namely, 66% and 70% respectively in 2021.If only the turnover of sold North Sea shrimp is included, the outlets Harlingen and Zoutkamp are the largest, followed by Den Oever and Lauwersoog. 2021 was chosen here as the most current reference year because the supply volumes sold through Dutch auctions in the year 2022 were disturbed by the idling (not sailing) of many

North Sea cutters. In particular, the larger North Sea cutters fishing for flatfish and roundfish and, to a lesser extent, the shrimp cutters sometimes stayed in port for several weeks because of the sharp increase in fuel prices caused mainly by the war in Ukraine (Deetman et al. 2022).

Lauwersoog was the last auction in 2021 where North Sea shrimp were still sold publicly visible through the public auction clock (RTV Noord 2021). Nowadays, shrimp are only processed at the auction through pre-closed purchase contracts where no publicly transparent price formation between buyers and suppliers (fishermen) takes place through the auction clock system.

The landings of the vessels registered for the decommissioning represent about 8% of the total Dutch landings (Table 2.1) and around 33-36% of the landings of the cutter fleet from 2018-2021 (Table 2.1).

Table 4.3 *Share of landing weight by registered vessels for decommissioning scheme and total Dutch cutter fleet (in tonnes). Source: VIRIS/Bedrijveninformatienet, n.d.*

Year	2018	2019	2020	2021
Landings by total Dutch cutter fleet	80.600	65.300	64.300	58.000
Landings by registered vessels*	26.500	23.600	22.700	20.700
Share by registered vessels on total Dutch cutter fleet	**33%**	**36%**	**35%**	**36%**

*Those 71 Dutch cutter vessels registered for decommissioning in Q1 2023.

This 33-36% as proportion of the landed weight by registered vessels is already a large share of the total annually landed fresh North Sea fish by the Dutch cutter fleet. However, for specific fisheries regions the proportions could differ from this general share on national level. Therefore it is needed to zoom in to the effects per fisheries region. By the landing weight per Dutch fish and shrimp auction the socio-economic size and importance of cutter fisheries vessels could be partly determined. In addition, to determine effects of decommissioning Dutch vessels for fish clusters within each of the six fisheries regions it is needed to zoom in on the landing ports of the registered vessels and their home port as technical and services supply are often executed by local onshore companies from vessels' home port in the fisheries region of living for the skipper/owner.

4.2 Expected changes in landing distribution to harbours

Registered vessels by gear type

Most of the registered vessels were active as bottom trawler targeting flat fish, with 55 of total 71 vessels in 2021. In particular these owners of bottom trawlers experience economically difficult times since the Brexit, high fuel prices and challenges to maintain or recruit crew or even successors within family by decreasing revenues as main reasons for decommissioning. In addition to those 54 beam trawlers there were 8 cutters mainly targeting brown shrimps (data 2021), 1 flyshoot, 6 twin rig, 1 pulse targeting sole and 1 quad rig targeting plaice and nephrops registered for decommissioning based on landing value in 2021. From July 2021 there is a full ban for all pulse trawlers in EU waters. From 2019 to 2021 most of Dutch pulse trawlers had already returned to the conventional beam trawling technique. In 2021 there was one vessel which used their pulse exemption license until July 2021.

In particular less landings of flat fish species expected after decommissioning

Many main commercial North Sea fish species are landed by the registered cutters from 2018-2021 (Table 4.4). Those landed commercial species marked by colour red represent more than 50% of total landed weight by registered cutters, orange marking means a share of 25-50%, yellow means 1-25% and green means no landed weight by registered vessels but only by non-registered Dutch cutter vessels. Looking at the last row, it turns out that the majority of landed flat fish species such as brill, dab, lemon sole, plaice, sole and turbot are caught by registered vessels between 2018 and 2021. It is expected that especially these species will be landed less after decommissioning. The decreasing landed weight by species is expected to be 61% (brill), 58% (dab), 61% (lemon sole), 62% (plaice), 63% (sole) and 65% (turbot) after decommissioning respectively.

Of course, expected landings are relying on several factors such as fishing effort, catch per unit effort, restriction for fisheries by EU and national policy

(e.g. closing areas for fisheries in favour of marine protected areas or offshore wind farms), fish landings prices, Total Allowable Catch per year, behavioural changes between national and other EU flagged fisheries fleets, climate change etc. However, from a simplistic perspective based on historical landing data (2018-2021) it could be expected that for these six North Sea species landed weight could be halved or even more than this 50% drop by Dutch cutters after quitting fishing as registered vessels for decommissioning. For other main commercial species like cod, flounder, red gurnard and nephrops a minority of the landed weight was caught by registered cutters in 2018-2021, namely, 29% (cod), 42% (flounder), 33% (red gurnard) and 36% (nephrops). These landing volumes are not expected to fished after decommissioning if all the registered vessels leave and the remaining fleet does not adapt their reaction. Brown shrimp and squid are least caught by registered cutters with 5% and 13% on total landed weight by Dutch cutter fleet in 2018-2021. For both species a minimal effect is expected after decommissioning of cutters in 2023.

In terms of landed value (in euro) the largest economic effects are expected with a decrease of landings for sole, plaice, turbot and brill. In 2021 the landed value by registered cutters represented €40m, €25m, €11m and €3m. Total landed value of the 12 main commercial landed species by registered cutters was around €89m in 2021.

Table 4.4 *Share of landed weight by registered Dutch cutter vessels as percentage of all Dutch cutter vessels, for the main commercial target species per harbour of landing in 2018-2021. Source: VIRIS/Bedrijveninformatienet, n.d.*

	Brill	Cod	Brown shrimp	Dab	Flounder	Red gurnard	Lemon sole	Nephrops	Plaice	Sole	Squid	Turbot	Total per landed harbour	Number of vessels (cutters) with main landing port
Denmark Hanstholm	67%	18%		70%	31%	67%	44%	100%	69%	57%	81%	69%	**67%**	**5**
Denmark Thyboron	76%	24%		73%	56%	47%	60%	71%	76%	85%	42%	79%	**73%**	**5**
France Boulogne	6%	3%		5%	11%	5%	5%	0%	7%	13%	6%	6%	**6%**	**1**
Netherlands Den Helder	65%	50%	2%	58%	73%	53%	58%	32%	67%	64%	50%	70%	**50%**	**11**
Netherlands Eemshaven	62%	67%	3%	58%	44%	29%	85%	21%	59%	72%	41%	64%	**53%**	**6**
Netherlands Harlingen	71%	21%	3%	65%	72%	56%	54%	24%	61%	84%	32%	71%	**44%**	**12**
Netherlands IJmuiden	70%	42%	6%	67%	71%	42%	62%	16%	62%	71%	25%	71%	**58%**	**10**
Netherland Lauwersoog	43%	31%	1%	37%	3%	41%	51%	40%	42%	27%	69%	42%	**7%**	**4**
Netherlands Scheveningen	20%	47%	4%	32%	33%	11%	56%	13%	37%	23%	10%	27%	**26%**	**1**
Netherlands Stellendam	54%	58%	17%	40%	35%	45%	59%	1%	51%	49%	30%	56%	**41%**	**5**
Netherlands Vlissingen	54%	83%	15%	59%	30%	79%	94%	0%	67%	67%	71%	61%	**52%**	**5**
Netherlands Wieringen/Den Oever	48%	45%	2%	49%	1%	55%	37%	40%	47%	41%	65%	49%	**9%**	**4**
Netherlands Zoutkamp			0%											**0**
Other	45%	5%	13%	30%	15%	13%	22%	50%	42%	58%	8%	36%	**19%**	**2**
Total per main commercial species	**61%**	**29%**	**5%**	**58%**	**42%**	**33%**	**61%**	**36%**	**62%**	**63%**	**13%**	**65%**		**71**

Share of landing weight by registered vessels for decommissioning scheme

Out of the 13 main landing harbours in and outside the Netherlands there were 5 which are expected to be largely affected after decommissioning

There were 13 harbours identified as main landings port for Dutch cutters between 2018-2021 (Table 4.4). In addition to these 13 harbours there was a category 'other' to summarise the landed weight in other ports. Out of the 13 main landings harbours there were 5 harbour where the majority of landed weight came from registered vessels in 2018-2021. In particular the harbours Hanstholm and Thyboron in Denmark are expected to be affected after decommissioning by 67% (5 vessels) and 73% (4 vessels) respectively of total landed weight by Dutch cutters between 2018-2021. In 2021 in both harbours there was 2,200 tonnes (Hanstholm) and 1,900 tonnes (Thyboron) landed by registered Dutch cutters. Other to be expected affected harbours are the Dutch harbours of IJmuiden (58%) (10 vessels), Eemshaven (53%) (6 vessels)and Vlissingen (52%) (5 vessels) with 3,400 tonnes, 2,100 tonnes and 1,600 tonnes by registered cutters respectively in 2021. In absolute terms the landing harbour of Den Helder is intensively affected with 2,900 tonnes (50% of total landed weight here by 11 Dutch cutters) at stake based on 2021. With respect to landed value it is expected that Den Helder (€16.5m), IJmuiden (€16.4m), Harlingen (€15.4m), Vlissingen (€8.9m) and Eemshaven (€8.4m) will have most economic effects as these landings of registered cutters are at stake. Thus in terms of affected regions (looking at landing ports) it is mainly the North of the Netherlands (Kop van Noord Holland and Waddenkust) and the South (Zuidwest Nederland) that are affected.

Possible consequences of decrease in landings in harbours for multiple fisheries regions

Decreasing landings of North Sea fish in harbours (Table 4.4) has potentially large effects for several fish clusters in the six fisheries regions (Figure 4.2). In particular fish auctions and fisheries coops are least resilient of all stakeholders in the fish processing chain and technical and service supply industry, due to limited alternatives or fallback opportunities other than fresh North Sea fisheries (Hoekstra et al. 2023). In particular flatfish auctions will likely experience the economic effects of largely decreasing landed weight after decommissioning of cutters. Fisheries regions Urk, IJmuiden, Zuidwest-Nederland and Kop van Noord-Holland are affected by the expected reduction in landed weight after decommissioning.

Urk with largest Dutch North Sea fish auction largely economically affected by less plaice and flatfish landings in other harbours

Urk has no own landing harbour for North Sea fish but does have their own North Sea fish auction (in addition to the auction for fresh water captured fish species by inland fisheries). This North Sea fish auction is highly dependent of landings via ports elsewhere. Landing harbours important for the Urker fleet are Harlingen, Hanstholm, Thyboron. With 22 registered vessels with Harlingen as main landing port (Table 4.4) this is expected to have a large effect on the onshore companies providing harbour facilities in Harlingen. Considering that fisheries region Waddenkust is a contraction region[24] from a socio-economic perspective, this might have relative more impact. There is a close relation between the port of Harlingen and the fisheries region Urk. Harlingen is the main landing port for most vessels from Urk and most fish landed in Harlingen is directly transported to the fish auction of Urk and processed in this fisheries region. If 22 cutters with Harlingen as main landing port will decommission this will also affect the fish cluster Urk by decreasing landed weight to be processed and less vessels that need technical and service supply. Fishing vessels with Urk as home port make also more and more use of other Dutch auctions like IJmuiden, Vlissingen and even the French port of Boulogne because of the fish species such as squid, mullet and red gurnard caught by flyshoot (also called snurrevaad) fisheries in French coastal waters and in the British Channel. Urk is the largest processor of plaice of all fish clusters in the Netherlands. As plaice is to be expected to decrease with 62% after decommissioning based on landing (in weight) in 2021, the North Sea fish auction in Urk will likely be largely impacted economically. This expected reduction of landings is solely for the Dutch fleet. Urk is also home to 44 foreign flagged vessels that continue to make use of the Urker auction.

[24] https://www.rijksoverheid.nl/onderwerpen/bevolkingsdaling/krimpgebieden-en-anticipeergebieden

IJmuiden as important landing port for fresh North Sea fish species and trade expected to have fewer landings of sole, turbot and brill

IJmuiden has, next to Urk, the most important and largest fish auction in terms of economic turnover and landed weight of North Sea fish in the Netherlands. The IJmuiden fish cluster is known for the fresh trade of luxury North Sea fish species such as sole, turbot and brill. These species are especially attractive to the domestic and European food service such as catering. It is precisely these more luxurious species that are expected to be landed less after the decommissioning of cutters based on landed weight in 2021: sole (-71%), turbot (-71%) and brill (-70%). This decrease in landed weight will negatively affect the local fish processing chain economically. Fresh North Sea fish is a specialty of the fish traders in this fish cluster. They may be able to partly divert to imported aquaculture species or fresh fish from other countries but these are often of lower quality or less unique to the fresh trade aimed at foodservice. Landed species from the flyshoot fishery are of increasing importance to this fish cluster. These landed species such as squid, mullet, mackerel and red gurnard are of high quality and are less affected by the decommissioning of cutters. The total landings of North Sea fish for Dutch fish auctions will decrease after decommissioning. It is expected that the two largest fish auctions Urk and IJmuiden will try hard to bind cutters to their auction and related services.

For the Zuidwest-Nederland fisheries region, Vlissingen fish auction and, to a lesser extent, Stellendam are particularly affected in terms of landed weight

The Zuidwest-Nederland fisheries region is best known for its extensive geographical area with several fish clusters spread across the islands of provinces Zuid-Holland and Zeeland. This fisheries region is pre-eminently specialised in the technical services surrounding shipbuilding and maintenance. Due to the expected decrease in landed weight for the port of Vlissingen (-52%) based on 2021, after decommissioning, it is likely that the fish auction here will come under economic pressure. The Vlissingen fish auction lands several flag cutters owned by Dutch families, particularly British-flagged cutters because the relationship between British and French fishermen is often strained in the port of Boulogne. In addition to the landings of these British and foreign-flagged cutters, several Dutch cutters with home ports in the fisheries region Zuidwest-Nederland are expected to decommission. This explains the expected decrease in flatfish species such as lemon sole (-94%), plaice (-67%), sole (-67%), turbot (-61%), dab (-59%) and brill (-54%). It is noteworthy that precisely the species that are caught a lot by the flyshoot fisheries will also decrease based on the registered cutters. Those registered vessels with Vlissingen as main landing port do not apply flyshoot fishing but rather beam trawling. Thus it is likely that the landed fish species as squid, mullet, mackerel and red gurnard are bycatch species as these beam trawlers often fish in similar waters as the flyshoot fishery.

Den Helder's entire infrastructure may disappear after decommissioning

For the fish cluster Den Helder belonging to the fisheries region Kop van Noord-Holland, the future will be uncertain, because the landed weight may drop sharply (-50%) and because almost all flatfish cutters from this fisheries region are registered for decommissioning. The fish auction in Den Helder was already closed in 2022 due to the expected decline in landings of North Sea fish.

Economic future sustainability for flatfish landing ports and the Netherlands as European leader in flatfish uncertain due to decrease in landings weight after decommissioning

The Netherlands has the largest share of European fishing rights (European catch quotas) for many flatfish species such as plaice and sole. The Dutch cutter fisheries is mainly dependent from commercial perspective on targeting sole, plaice and brown shrimp. In 2021 these three most important commercial species represented together 78% of the total revenues (landed value) of the 12 main commercial species (Table 4.4). Total landed value of these 12 species together was €200m with €66m of sole, €52m of brown shrimp and €38m of plaice in 2021 (VIRIS/Bedrijveninformatienet, n.d.). The total value of landings for the 12 species of North Sea fish (Table 4.4) by registered vessels was €89 million in 2021. This was about 40% of the total revenue (€224 million) in landings of North Sea fish by the Dutch cutter fishery in 2021. The Netherlands fish clusters are specialised in processing and trading flatfish species. The registered cutters represented 62% and 63% of the total landed weight in 2021 for plaice and sole alone. This puts the European leading position and specialisation for the Netherlands under pressure if this decrease in landed weight actually follows after decommissioning. The landing ports and fish clusters dependent on brown shrimp are less adversely affected economically by the decommissioning of cutters. However, these fish clusters dependent on

brown shrimp such as the Waddenkust and parts of the Kop van Noord-Holland (Wieringen/Den Oever) and Zuidwest-Nederland (Stellendam) face other challenges from policy decisions and market developments. For example, the restrictive nitrogen legislation for granting fishing licenses in Natura-2000 areas such as the Wadden Sea, closures of areas for fishing and market price fluctuations due to strong fluctuations in supply from the catchability of shrimp.

4.3 12 home ports have vessels registered for the decommissioning scheme

The Netherlands has 44 fishing communities (Kraan et al. 2023), 12 of these have fishing vessels registered for decommissioning (Table 4.5). We see that in absolute numbers the home port of Urk will most likely loose most cutters with 33 vessels being registered. Based on the year 2020 there is even one more vessel registered with Urk as home port (thus 34 in total). The rest of the fishing communities loose between 1 and 6 cutters (Table 4.5).

However, as share of the total active Dutch cutters, the home ports of Arnemuiden and Katwijk (both 71%) will lose the largest proportion of their active cutter fleet in 2021. Den Helder, Tholen and Vlissingen see their fleet being halved (50%).

Table 4.5 *Number of registered vessels for decommissioning as share of active cutters per home port in 2021*

Home port	Fisheries region	# registered vessels	# active Dutch cutters in home port	% reg. of total active cutter fleet in home port
Urk	Urk	33	74	45%
Den Helder	Kop van Noord-Holland	6	12	50%
Goedereede	Zuidwest-Nederland	5	12	42%
Texel	Kop van Noord-Holland	5	16	31%
Arnemuiden	Zuidwest-Nederland	5	7	71%
Katwijk	Katwijk-Scheveningen	5	7	71%
Wieringen/Den Oever	Kop van Noord-Holland	4	45	9%
Zoutkamp	Waddenkust	2	21	10%
Tholen	Zuidwest-Nederland	2	4	50%
Stellendam	Zuidwest-Nederland	1	7	14%
Vlissingen	Zuidwest-Nederland	1	2	50%
Yerseke	Zuidwest-Nederland	1	8	13%
Totals		**70**	**215**	**33%**

Source: VIRIS/Bedrijveninformatienet, n.d.

Whereas fish auctions and the fish processing chain depend on landed weight, the technical and service supply industry benefits mainly from the number of cutters operating in ports. Namely, shipbuilders, ship carpenters, painters, net makers, port services, installers etcetera mainly perform services on board or around vessels. As most fishers tend to maintain their vessels in their home ports, the fish clusters in the fisheries regions of Zuidwest-Nederland and Urk will experience the most negative consequences of decommissioning cutters due to the large number and share of cutters that will disappear here. In Den Helder within the fisheries region of Kop van Noord-Holland, as mentioned earlier, the entire infrastructure of the fish cluster will be under pressure after the decommissioning of cutters.

4.4 Social impact per mainly affected region summarised

The effect of the exit of the registered vessels through the decommissioning scheme thus is multifaceted, depending on if one looks to the homeport or (main) landing port, at the absolute or relative numbers; resulting in mixed effects and in *all* regions as well as outside the Netherlands (Denmark mainly).

Urk
Urk is expected to be severely impacted by the decommissioning scheme. 33 (data 2021) to 34 (data 2020) vessels are registered to be decommissioned. That means that the Dutch flagged cutter fleet will reduce with 45%. As there are still 44 fishing vessels under foreign flag, the fishing community does remain larger than these data suggest. Still it is a significant amount of people affected.

The impact of these companies exiting fishing will have knock on effects in the fish chain (see above) especially since Urkers bring their fish to the Urker auction, have a fish processing industry in the community which likely will also be affected by the reduction of the Urker fleet as well as of the wider Dutch fleet. Urk is specialised in processing plaice, so with a reduction of 62% in weight of landed plaice this might result in additional job losses affecting more families in Urk. It could be however that these effects are less impactful as the fish chain might find ways to adapt and thereby maintain jobs. However specified processing lines for North Sea fish might lose capacity, and if in the future capacity might grow, it is uncertain if these increases can be handled (Hoekstra et al. 2023). The VCU, the fisher cooperative, will probably also have to find a way to deal with many fishers leaving the industry and wanting to pull out of the cooperative,[25] in addition to fewer customers in the community.

At the regional meetings held in Urk we heard that Urkers have experienced more crises to the (fishing) economy and every time Urk was able to bounce back. There is a strong perception of resilience in the community, and fish and fisheries still are a strong part of the Urker identity (Kraan et al. 2023). As Urkers make use of other landing harbours than Urk as a result of damming of lake IJssel in 1932, the effect of the Urker fleet decommissioning is felt elsewhere. Harbours such as Harlingen, IJmuiden, Eemshaven and harbours outside the Netherlands (in Denmark and France) will also be affected by a decreasing number of fishing vessels making use of the harbour facilities and of the auction (IJmuiden).

Kop van Noord-Holland
In total 15 vessels are registered to be decommissioned, hailing from Den Helder, Wieringen and Texel. Especially Den Helder (-50%) and Texel (-31%) are hit hard by the decommissioning scheme. In addition to the direct decommissioning, a number of vessels from Texel have recently be sold to other fishing companies in other regions, hence no longer hail from Texel.

Most of these vessels were large beam trawlers that landed their fish in Den Helder. As the impact of this was already foreseen, the auction closed its doors in 2022. This has resulted in the jobs of the 22 fish sorters being lost. From participants of the regional meeting held in Den Helder we heard that the auction in Den Helder provided the option for restaurants in the region to buy their fish (in the small quantities they need) directly from the auction. Tourism is important for the sunny coast of Den Helder and Texel. This short value chain was said to be unique, not only providing fresh fish for restaurants but also contributing to the 'story' of fish and fisheries in the region. Participants expressed their concern that the role fisheries in the sense of place of the region would be severely affected.

Zuidwest-Nederland
In this region the mussel and shellfish fishery is important, this is not part of this study but important to mention when discussing impacts on fishing communities. For instance Yerseke is mainly known for its mussels and Oysters fleet and culture. In addition to this, the region has cutter fisheries and small-scale fisheries. It is a region spread over multiple islands in Zuid Holland and Zeeland. Especially sole fisheries are important for the South, fished on by cutters from Arnemuiden, Vlissingen, Goederede and Stellendam. With 15 vessels being registered for decommissioning and the spread of the region

[25] Fishers are owners of the cooperative and thus have invested in the company. If they want to be bought out of the company, the cooperative needs to be able to do so. If many fishers want this at the same time this is difficult.

it makes sense to zoom in to some of the different communities. In Arnemuiden 5 of 7 cutters are registered. From Fieldwork undertaken in Arnemuiden we know that fisheries is very important for the communities' identity with a lot of fisheries material cultural heritage visible in town. Everywhere references are made to fishing (Kraan et al. 2023). Whether this will affect the importance of fishing for the identity of the community remains to be seen. From literature we know that community members might continue to identify themselves with fishing even if it is mainly an historical activity. Tourism is a very important industry in Zeeland and fish and fisheries is an important part of the sense of place in Zeeland (Kraan et al. 2023). Some of the communities in Zuid West Nederland are already experiencing loss of job opportunities and inhabitants moving out (in so-called contraction regions) thus in such cases these developments add up to the list of decreased opportunities.

Stellendam is a harbour which is the main landing port for a couple of vessels likely to decommission. The fleet and the auction are part of a fisheries hub, to which also two shipyards and an innovation centre belong. The auction works closely together with the auction in Scheveningen. The fleet has experienced difficulty in persuading the local government to keep the waterway 'het Slijkgat' open, it might become more difficult to keep fishing on the agenda. Also fishing festivities might be more difficult to organise. Already in 2022 Vlaggetjesdag (Literally translated Flagsday)[26] in Stellendam was not organised.

[26] Vlaggetjesdag is how a number of fishing festivals in the Netherlands are called. This is an inherited tradition from the Herring fleet, which started its fishing season in June by cleaning and maintaining the vessels (after a winter of lying idle) and decorated with flags. The first mention of celebrating flags day was in 1858 (Kraan et al. 2023).

5 Discussion

5.1 Framework of the study

Given the timeline of the project, to report in a timely manner to the Dutch House of Representatives, and the data availability at the time the study was conducted, the expected effects of the decommissioning scheme are investigated using six what-if-scenarios based on the historical activities of 2018-2021. Here, we do not project what would happen with and without the decommissioning scheme in the current economic and regulatory context nor do we investigate the factors leading to the decision to join the decommission scheme or not. And although those questions could also be investigated, the extra time needed would have jeopardised the desired completion date.

5.2 The Dutch decommissioning scheme: Fixed price per gross ton, no added compensation for quotas

Unusual profile of vessel registered to decommissioned as they are rather larger, more actively used and profitable
Unlike, what is usually seen in this kind of scheme, the Dutch decommissioning scheme will see relatively large, actively used and profitable (outside the fuel price crisis) vessels leave the fishery, and not only *'lemons'* (i.e. vessels that would have to be scrapped regardless of the scheme, often valued lower than the financial compensation offered through the scheme see Squires 2010 for a review of the decommissioning schemes in fisheries worldwide). According to Squires (2010), vessel owners would participate in a decommissioning scheme only if the price set is attractive enough. If the price is set too low, the vessel owner may try to sell their vessel at a higher market value. The fact that many of the registered vessels were still profitable a few years ago speaks for the lack of confidence in the future currently held by Dutch (flatfish beam trawl) fishers.

Scheme was less attractive for large quota holders
The scheme offered a fixed price per gross ton (plus an extra value for the larger cutters) to scrap a vessel. This value was based on the total economic value of the average fishing unit of the vessels concerned, including the average economic value of licences and individual transferable quota (van Oostenbrugge et al. 2022a). The fact that the vessel owners also have to return their individual transferable quotas attached to the vessel and that the compensation is not adjusted for the size of the individual transferable quotas, came as surprises to the fishers when the scheme was announced and led to anger and disappointment.[27] For fishers who heavily invested in quota and still have loans that will not be fully compensated by the compensation, this may have been one of the considerations not to enter the scheme, as the reimbursement of their current debts can be a strong determinant in choosing to participate in a decommissioning scheme (Curtis and Jones 2016).

Wider economic context unfavourable to beam-trawls
Record high fuel prices have been observed since the end of 2021 and particularly since February/March 2022 throughout 2022, and have been putting pressure on the Dutch cutter fleet when the decommissioning scheme opened (Deetman et al. 2022). The high fuel prices have had a double negative effect on the fishery, as it reduced the profit for the vessel owners, and it decreased the remuneration of the crew, usually paid on a share system of the value of landings of which a number of costs (including fuel costs) have been removed. The lower remuneration, coupled with a very tight labour market at the moment in the Netherlands meant that crew members could easily chose a better-paying job on land.

[27] https://vissersbond.nl/verbazing-en-teleurstelling-over-de-saneringsvoorwaarden/#:~:text=De%20Nederlandse%20Vissersbond%20en%20PO,22%20juli%202022%20heeft%20aangekondigd%20.

5.3 Use of scenarios to address some unknowns

Uncertainty about the final decommissioned vessels but the expected number of vessel decommissioning is high

At the end of July 2023, the final number of vessels decommissioned through this scheme will be known. To be able to anticipate the potential effects of the scheme on the fishing clusters, the Dutch Ministry of Agriculture, Nature and Food Quality asked Wageningen Economic Research to run this analysis despite the added uncertainty on the vessels decommissioning. In this study, we used sensitivity analysis to assess what would happen if instead of the 71 registered vessels 'only' 80% or 90% of those vessels on the list exited the fishery. At the time of writing, three months before the deadline, 42 vessels are already scrapped or in the process of being so. These vessels represent 59% of the registered vessels, PO representatives estimate that probably 65 vessels will be removed through the scheme, or 90% of the registered vessels (Duk 2023).

Knowing which fisher stops is also important

Even if the number of vessels leaving through the scheme is known, knowing which vessel and therefore fisher is leaving is also important as fishers have different levels of activity, use different gears to target different species, and land in different harbours. All those factors determine the likely level of impact and also where it will be felt. Here we assumed that the fishers linked to the registered vessels will stop, while the other will stay and even potentially increase their activity. However, it also seems that this time has been important for the whole fleet to evaluate their future opportunities and some vessels are changing hands, and regions. So it should be noted that the impacts described here are only the expected impact directly due to the decommissioning scheme.

The likelihood for remaining vessels to increase their fishing effort is slim

On average, the days at sea of the remaining vessels could increase by 15% if we assume that the fisher fish as hard as the most active vessels of their fishing segment. However, the mechanisms by which this would happen are unclear. The decommissioning scheme will free up quota (in the first few years through the producer organisations), but the Dutch quota of the main target species sole and plaice have not been constraining for a few years as fishers have dealt with low catch rates. If people had wanted to fish harder they already could have rented more quotas (assuming the quotas were available on the market and it was financially interesting to do so). While space (or rather the lack thereof) is expected to become an issue with the development of offshore wind farms and the implementation of gear restrictions in marine protected areas, most plans are not active yet and crowding effects)[28] between fishers has not been identified as an issue yet. The availability of qualified crew members could have been seen as a restriction. In the phone survey, active fishers mentioned that they may actually end up changing gears (from beam trawl to twin trawl) and switch target species as they have trouble finding sole but no major change in the level of days at sea was expected.

[28] Crowding effect is when fishing becomes less attractive in an area due to too many fishers active in the area.

5.4 Potential longer-term effects what will happen to the quota

On the short term, the quota for sole and plaice returned by the vessel owners that are decommissioned will be given to the POs for them to redistribute. On the long term, the Dutch government will have to decide to whom and under what conditions the quota can be reallocated. However, it seems unlikely that the quota will be used by a fleet similar to the one currently leaving the fishery. So the question is who could use that quota?

- Small-scale 12-mile zone for sole? they could already have increased their fishing as the Dutch sole quotas haven't been used in the past years. However it would require much more effort than the current effort to compensate for the sole landings of the decommissioned vessels. Fishers experience that sole is difficult to catch in the coastal waters, they suspect impact of wind farms, dredging and climate change in addition to less food in coastal waters due to less eutrophication. Increasing the utilisation of the Dutch small-scale fleet could lead to more fishing days in this relatively low utilised fleet (on average 13 to 33 sea days per year, see Table 2.1).
- Smaller cutter? A Dutch Eurocutter is attractive as the NL have historical fishing rights in coastal waters of DK, Bel and GER. A smaller cutter also uses less fuel and can be flexible (if one has the rights and the technical possibilities to fish both with beam trawl and otter trawl).

- Flagged vessels coming back under Dutch flag ➔ what will be the conditions for quota access when the government take possession of them. According to Art17 of CFP, it should take sustainability factors and social factors into account. Although there seem to be 'enough' quotas, there is not much space left in terms of KW and GT to expand the Dutch fleet. Mainly UK flagged vessels seem to be interested, due to the difficulties they encounter entering UK ports whilst fishing in the channel. German and Belgian flagged vessels seem to be happy where they are (phone survey).

5.5 Impact to be felt in all fisheries regions

Looking at the main landing port or home port, the regional impact is considerable in the sense that all fishing regions in the Netherlands will likely be impacted by the reduction of the fleet due to the decommissioning scheme; either as one or more main landing ports are affected by less catches, or by absolute or relative high numbers of fishing vessels decommissioning resulting in loss of jobs in fisheries, processing and auxiliary services.

As fishing is not only a job, but also has socio-cultural value, the impact is more than economic. A decline of a fleet in a home port might impact, besides the social wellbeing of the fishers and their families involved, the identity of the fishing community where the active fleet is an important carrier of the immaterial cultural heritage (such as fishing festivals). The way fisheries are socially organised as historical family businesses with relatives and community members on board means that fishing in the communities contributes to the social cohesion and social wellbeing of the place (Kraan et al. 2023).

We cannot predict how the socio-cultural importance of fisheries will develop over time for each of the fishing communities, nor what the social impact is of the decline of the Dutch fleet per fishing community. What we do know is that a decline in family businesses will affect the anchoring role these businesses have in fishing communities. Also that a smaller active fleet may result in further impacts on the fishing experience in communities as there will be less capacity to organise and fund fishing-related festivities (e.g. *Vlaggetjesdag*). If this happens in a region already experiencing loss of job opportunities and inhabitants moving out, this may hit harder, both in the fishery (chain) and for tourism. At the same time we have seen in communities where fishing is not active anymore (or really small), that fishing can still remain important for the communities identity. This would require further research.

The added value fishing has for society is linked to the way fishing is organised (Kraan et al. 2023). Three trends are good to mention in this respect: consolidation resulting in more fishing companies instead of owner-operator businesses, foreign crew and continuous fishing. Traditionally demersal fishing in the Netherlands is done by family businesses with relatives and community members on board fishing in a partnership agreement and from Monday to Friday. The latter is because of a large part of the fishers being religious which entails being home on Sunday to go to church (Schadeberg et al. 2021; Kraan et al. 2023). In the last decades we have seen all three aspects slowly changing.

Over time more and more owner-operator businesses have been quitting, with fishing companies becoming larger by acquiring more vessels, joining with other families and sometimes by vertically integrating including processing and trading (Schadeberg et al. 2021). Besides the decommissioning scheme in 2022 a number of vessels have been sold from owner operators to fishing companies. In some of these fishing companies crew do not work in a partnership agreement but as employee, changing the social structure of fishing.

Another change that has started to occur is that more fishing companies, as well as owner-operators hail their crew from outside the Netherlands. In 2022 one fifth of the companies had foreign crew on board (Kraan et al. 2023). Also in other EU countries non-nationals fish in the EU fleets (such as Ireland) (European Commission. Joint Research Centre. and European Commission. Scientific, Technical and Economic Committee for Fisheries. 2022) also a factor changing the social structure of the fleet.

Lastly, more and more fishers have started fishing continuously. Although this is common in Denmark and Germany, in the Netherlands this was not done due to social and religious norms. Kraan et al. (2023) found that 9% of the crew said to fish continuously, but the increased acceptance of a continuous rhythm is also evident from logbook data as Schadeberg et al. (2021) have shown. This change means an increase in effort, a change of the social structure and norm (at least for a part of the fleet). It is good to mention that

some fishers also explain how this rhythm allows them more time with their family and seeing more of their kids as they now also are home during the weeks they do not fish. This is linked to another social norm that is changing, that men should spend more time with their kids which is appreciated by both fishers and their spouses (Kraan et al. 2023).

So although we cannot predict what will happen we do know that the configuration of the industry will change. The current reorganisation of the fleet (mainly due to the decommissioning scheme) may lead to further consolidation, which means a further decline in family businesses and skipper-owners, it may lead to further changes in fishing rhythm (more continuous fishing) or in the social organisation of the crew: more foreign workers and or less fishers fishing via the fisheries agreement culture (which still is the standard). Each of these developments may have 'side effects' on how the fishery is organised and on what the fishery brings to whom. It is recommended to monitor these developments.

It is complex to predict the extent to which onshore companies like fish processors and technical and service suppliers are able to fall back on alternatives. This provides uncertainty about the socio-economic effects of decommissioning for the fish clusters per fisheries region.

There are also many interactions and spill over effects between the fish clusters of Dutch fisheries regions. As far as possible these are taken into account. However, the cumulative effect of the spill overs for national level could even provide a stronger knock-on situation rather than the described effects expected per fisheries region.

In the socio-economic effects foreseen for fish clusters there is only a 100% scenario taken into account. This means all 71 registered vessels are perceived as decommissioning while the actual number of registered vessels that will decommission is less than 71. Therefore the expected decrease in number of vessels and landing weight per fisheries region could be less than is described within Chapter 4.

6 Conclusions

Half of the eligible vessels registered for the decommissioning scheme although uncertainty remains around the number of vessels that will actually decommission

The cutter fleet registered massively for the scheme
Out of the 146 vessels eligible[29] for the scheme, 139 are cutters and 7 pelagic trawlers. The eligible vessels are the cutter fleet targeting demersal fish in the greater North Sea with beam trawls, otter trawls and flyshoot and the pelagic fleet. The smaller vessels operating in the coastal areas or targeting shellfish or the shrimp cutters are not eligible for the scheme. Half of the eligible cutter vessels, 71 out of our estimated 139, were registered to be scrapped on 1 April 2023, those vessels represent 24% of the number of vessels in the cutter fleet and 13% of total Dutch fleet. This means that up to a quarter of the Dutch cutter fleet is expected to leave the fishery and the impact of the decommissioning of the registered fleet will be felt dearly at the national and regional level.

No pelagic vessel registered
Despite the fact that the decommissioning scheme was also open for the pelagic fleet, and that none of the Dutch pelagic trawlers applied for the scheme. The fixed price per gross ton for vessels of that size was estimated too low to be financially interesting.

Uncertainty remains on the actual number of vessels leaving
The actual number of vessels that will leave the fishery is still unknown but already 42 of those vessels (59% of the registered vessels) were known to be scrapped and completely cease their activities and a representative of a producer organisation estimates that up to 90% of the registered vessels are expected to stop.

Unusual profile of vessels registered limits the risk to offset the effort and catch of the scrapped vessels by increasing individual effort

Larger, more active vessels registered for the decommissioning scheme
While it is usually the older, less active vessels that are decommissioned first in case studies found in literature, here, the registered vessels are actually among the most active, most profitable of the cutter fleet. As a result, it is unlikely that the remaining vessels can increase their effort in such a way as to offset the effects of the exit of the vessels on the total fleet activity (in terms of effort and catch).

The context at the time of the registration played a role in who decommissioned
At the time of registration, the fuel prices were at record high with a few months of high prices having already depleted the financial reserves of some fishers, the last of the pulse licences stopped a year earlier, definitely closing the door to a technology that had allowed fishers to save substantially on fuel consumption, and the Dutch quotas for North Sea sole and plaice were largely underused (less than half of the quotas was caught in 2021 and 2022). This context was particularly unfavourable for the flatfish fishery. With low catches and increasing fuel costs not only is the profit of the vessel owners under pressure, but also the remuneration of the crew members decreases, making it difficult to retain or attract crew members.

[29] We estimated eligibility against two of the criteria of the scheme, i.e. minimum 90 days activity a year for two consecutive years over the 2018-2021 period and 20% of the landings in the list of stocks impacted by the Brexit. Other criteria, including whether a vessel is eligible due to penalty points were left out for privacy reasons.

Flatfish landings in balance with post-Brexit quotas, unlike pelagic species

The expected reduction of effort and landings due to the decommissioning of flatfish beam trawlers exceeds the reduction of quotas due to Brexit
Most of the flatfish beam trawl fleet (registered vessels represented 63% of the flatfish beam-trawl effort in the 2018-2021 period) is likely to exit the fishery through the scheme, bringing the expected landings of flatfish in balance with the post-Brexit flatfish quotas. The Dutch share of North Sea sole quotas will decrease by 13.3% in 2026 compared to pre-Brexit share and the reduction in landings of our scenario ranges from a 63% reduction in sole landings if all registered vessels stop and none of the rest of the fleet increase their effort towards sole) down to 32% if 'only' 80% of the registered vessels actually leave and the remaining vessels increase their activity. The expected reduction in landings is similar for North Sea plaice while the share of quotas will not be reduced by 2026.

Cod could become choke species
The risk that cod, for which Dutch quota share will decrease by 19% in 2026, becomes a choke species is limited but higher than for flatfish. In two of the six scenarios of this study, the landings decrease by a lower percentage than the Dutch quota share decrease (15 and 18% landings decrease compared to 19% for the quotas), this coupled to the fact that the Dutch quotas for cod are almost fully used annually makes North Sea cod a potential choke species.

The expected landings of pelagic species remains unchanged by the decommissioning scheme
The Dutch quota share of the important pelagic species herring, mackerel, horse mackerel and blue whiting will decrease by respectively 10.8%, 24.8%, 4.3% and 1.5%, however not a single pelagic vessel registered for the decommissioning scheme. The unbalance between the post-Brexit quotas and the pelagic capacity is therefore not improved through this scheme and the likelihood of being a choke species is high for the pelagic stocks.

The expected economic performance of the remaining cutter fleet worsens

Activity of the cutter fleet decreases in larger proportion than the number of vessels in the fleet
The expected total activity (effort and landing figures) of the cutter fleet decreases faster than the number of vessels because the registered vessels were more at sea than the other cutters during the 2018-2021 period, they landed more per unit of effort and the average price of their landings was also higher. Even in the scenarios where the remaining fleet increases their effort, the expected decrease in landings and value of landings was stronger than of the vessels and effort.

Leading to lower profit for the cutter fishery
The registered vessels also had higher costs and much higher profit, in the 2018-2021 period. Those were years when the pulse trawl was still used but being phased out of the flatfish fishery and fuel prices were relatively low, resulting in profitable years for the larger flatfish beam trawlers despite a declining trend (Wageningen Economic Research 2022a). Removing the positive economic result of those vessels, the total profit of the cutter fleet decreases by 70% if all the registered vessels leave and the remaining fleet does not react. However, given the development since 2021 (complete ban on pulse, high fuel prices and low catchability of flatfish) it is likely that the profitability of the registered vessels drastically decreased, and that the decommissioning scheme prevented some bankruptcies.

By removing the most profitable vessels, the average profitability of the remaining fleet is lowered
The expected average individual profitability goes down in all scenarios. This is primarily due to the selection of less historically profitable vessels in the remaining fleet. Increasing the effort of individual vessels led to improved individual profitability.

Harbours in all regions will be impacted, either because the number of fishing vessels decreases or the landings decrease

Five out of the six regions will be seriously impacted by the reduction of the cutter fleet

Table 6.1 provides an overview of the socio-economic effects when Dutch cutters are decommissioned. Especially the fisheries regions Urk, Southwest Netherlands, Kop van Noord-Holland, Wadden Coast and IJmuiden are expected to experience the largest social, economic and cultural negative effects due to the disappearance of many flatfish cutters after decommissioning. See also Chapter 4 for a comprehensive analysis per fisheries region what the specialisation and characteristics of fish clusters and fishing communities are per fisheries region. There are also many interactions and spill over effects between the fish clusters of Dutch fisheries regions.

Disappearing skills onboard and onland (processing industry) could be a tipping point for the Netherlands

The relatively large share of registered vessels in the total cutter fleet excluding shrimp in the above four fisheries regions will put pressure on the national chain and infrastructure onshore for North Sea fisheries. It is expected that the fish processing chain and technical and service supply industry will seek alternatives as far as possible such as fish sourced from elsewhere or services in offer in other sectors. However, there is a risk that in the future the Dutch fish clusters will no longer be equipped to process North Sea fish and maintain or build cutters. If more food can be sustainably caught from the North Sea (here: North Sea fish) in the future with a future-proof Dutch fishing fleet, the question is whether there will be enough companies onshore that are willing and able to process North Sea fish. This also applies to the technical and service supply industry that may not have specialist knowledge in-house for the maintenance and construction of cutters for food extraction in the North Sea.

We cannot predict how the socio-cultural importance of fisheries will develop over time for each of the fishing communities, nor what the social impact is of the decline of the Dutch fleet per fishing community. What we do know is that a decline in family businesses will affect the anchoring role these businesses have in fishing communities. Also that a smaller active fleet may result in further impacts on the fishing experience in communities as there will be less capacity to organise and fund fishing-related festivities (e.g. *Vlaggetjesdag*). If this happens in a region already experiencing loss of job opportunities and inhabitants moving out, this may hit harder, both in the fishery (chain) and for tourism. At the same time we have seen in communities where fishing is not active anymore (or really small), that fishing can still remain important for the communities identity. This would require further research. The added value fishing has for society is linked to the way fishing is organised (Kraan et al. 2023). Three trends are good to mention in this respect: consolidation resulting in more fishing companies instead of owner-operator businesses, foreign crew and continuous fishing. So although we cannot predict what will happen we do know that the configuration of the industry will change. The current reorganisation of the fleet (mainly due to the decommissioning scheme) may lead to further consolidation, which means a further decline of family businesses and skipper-owners, it may lead to further changes in fishing rhythm (more continuous fishing) or in the social organisation of the crew: more foreign workers and or less fishers fishing via the fisheries agreement culture (which still is the standard). Each of these developments may have 'side effects' on how the fishery is organised and on what the fishery brings to whom. Whether these possible developments are a problem or not is a societal choice. It is recommended to monitor these developments as they have social consequences.

Table 6.1 *Regional impact of the decommissioning scheme. The impacts are computed in percentage change relative to the 2018-2021 situation, taking only the decommissioning of vessels as for the 100% no reaction scenario. For reference, the average total annual historical value for the 2018-2021 period is given in parenthesis. *variables for which the regional impact is estimated based on the landing region and not the home region of the vessels. ** change in profit is given for the cutter fleet only, change in profit is not expected for other fleets as a result of the decommissioning scheme.⁺ the historical profit of the Wadden Sea cutter fleet was negative, so the decrease means a decrease in losses*

	Fishery scenario relative to 2018-2021						Chain onshore companies 2021		Community	
Region	Registered vessels	Active Vessels	Seadays	Cutter profit**	Landings*	Value of landings*	Number of companies	employment		Fishing communities
1.Urk	34	-40% (83 vessels)	-50% (13.156 seadays)	-844% (€0.3m)	-76% (0.06 kilotonnes)	-77% (€0.2m)	96	4,150	Fisheries play an important role in the Urker identity, thus with the fleet of Urk likely to reduce with 45%, impact is significant. This also affects the fish chain as the Urker fleet brings it fish, landed elsewhere, back home to be traded and processed. The cooperative will also notice this shrinkage. However there is a strong perception of resilience in the community.	Urk
2.Zuidwest-Nederland	15	-9% (175 vessels)	-29% (10.443 seadays)	-57% (€9.5m)	-10% (47 kilotonnes)	-36% (€63m)	56	2,100	All communities with cutter fishers are affected, in terms of relative numbers Arnemuiden mostly, then Tholen and Vlissingen, Goedereede, Stellendam and Yerseke. Zeeland is mainly known for its shellfish fishery. Yerseke is a good example, it has a large shellfish fishery and industry. Stellendam and Vlissingen are both also landing ports, with an auction. These southern ports are important for the fishery in the southern North Sea and Channel. With less cutters frequenting Stellendam, it might be more difficult for the remaining fleet to convince local government to keep the waterway towards the port open. Impact of a decline of fisheries in this region might have relative more impact as some regions are contracting regions.	Arnemuiden, Oostbrug-Breskens, Bruinisse, Bergen op Zoom, Goedereede, Goes, Hontenisse, Kortgene, Klundert, Middenschouwen, Ouddorp, Stellendam, Tholen, Vlaardingen, Vlissingen, Westerschouwen, Yerseke, Zierikzee

	Fishery scenario relative to 2018-2021						Chain onshore companies 2021		Community	
3.Wadden coast	2	-2% (77 vessels)	-3% (6.556 seadays)	-19%+ (€1.7m)	-27% (26 kilotonnes)	-36% (€74m)	27	1,900	Waddencoast is mainly important as home harbour to shrimp fishers. Yet Harlingen is an important harbour for Urker cutters, and Eemshaven as well yet to a lesser degree,. So the waddenkust is affected because of Urker fishers being registered for decommissioning. Impact of a decline of fisheries in this region might have relative more impact as some regions are contracting regions.	Wonseradeel, Finsterwolde, Harlingen, Lemsterland-Lemmer, Ulrum-Lauwersoog, Oostdongeradeel, Termunten, Terschelling, Usquert, Vlieland, Westdongeradeel, Zoutkamp
4.Katwijk/ Scheveningen	5	-12% (39 vessels)	-21% (4.763 seadays)	-39% (€1.1m)	-1% (36 kilotonnes)	-8% (€25m)			This region is mainly known as homeport for the pelagic fleet. In addition most of the Katwijker cutters are registered to be decommissioned.	Katwijk, Scheveningen
5.IJmuiden	0	0% (32)	0% (579 seadays)	-	-3% (154 kilotonnes)	-21% (€91m)	32	850	Although no vessels with IJmuiden as homeport are registered, it is still severely impacted by the decommissioning scheme. This region is mainly known for its fresh flatfish value chain. It is with the latter aspect that this region is affected. IJmuiden is next to Urk the largest North sea fish auction. It is also known as landing port for the pelagic fleet, which is not affected by the scheme.	IJmuiden
6.Kop van Noord-Holland	15	-13% (113 vessels)	-27% (11.597 seadays)	-39% (€4.9m)	-32% (13 kilotonnes)	-42% (€49m)	26	550	This region, mainly Den Helder and Texel, is severely affected by the decommissioning scheme. In addition a number of cutters from this fleet have been sold. The auction therefore already closed. The fleet consisted of large beam trawlers (most registered to be decommissioned) and a substantive shrimp fleet (Wieringen). Respondents to the impact study expressed concern that the role fisheries play in the sense of place of the region will diminish.	Den Helder, Texel, Wieringen

	Fishery scenario relative to 2018-2021						Chain onshore companies 2021		Community	
7.Other	0	0% (14 vessels)	0% (1.408 seadays)	-	-9% (54 kilotonnes)	-20% (€64m)	17	250	Here it is mainly ports outside of the Netherlands that are affected as a landing port to part of the Urker fleet registered for decommissioning.	**Ports outside the Netherlands**: Boulogne (France) and Hanstholm and Thyboron (Denmark) **Fishing communities in the Netherlands, outside of the fishery regions**[30] Enkhuizen, Genemuiden, Harderwijk, Nieuw-Beijerland, Staveren, Edam-Volendam, Workum

[30] These are often harbours with inland fisheries (binnenvisserij).

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Appendix 1 Rules of the decommissioning

The BAR decommissioning scheme was officially published in July 2022.

Annex I accompanies Article 2.2(2)(a) of the Scheme. It lists the fishery resources which are also included in Annexes 35 and 36 to the Trade and Cooperation Treaty between the European Union and the United Kingdom.

Species (English)	Soort (Nederlands)	Area
	Alfonsino's	EU waters and international waters of ICES areas 3-10, 12 and 14
	Zeeduivel	ICES area 7
	Zeeduivel	EU waters of ICES area 2a and 4
	Zeeduivel	ICES area 6, EU and international waters of ICES area 5b, international waters of ICES area 12 and 14
	Grote zilversmelt	EU and international waters of ICES areas 1 and 2
	Grote zilversmelt	EU waters of ICES area 3a and 4
	Grote zilversmelt	EU and international waters of ICES areas 5, 6 and 7
	Blauwe leng	International waters of ICES area 12
	Blauwe leng	EU and international waters of ICES areas 2 and 4
	Blauwe leng	EU and international waters of ICES areas 5b, 6 and 7
	Evervis	EU and international waters of ICES areas 6, 7 and 8
	Zwarte haarstaart	EU and international waters of ICES area 5, 6,7 and 12
Cod	Kabeljauw	ICES area 7a
Cod	Kabeljauw	ICES area 7d
Cod	Kabeljauw	ICES area 4; EU waters of ICES area 2a; the part of 3a that doesn't belong to Kattegat or Skagerrak
Cod	Kabeljauw	ICES area 6a; EU and international waters of ICES area 5b east of 12°00'W
Cod	Kabeljauw	ICES area 6b; EU and international waters of ICES area 5b west of 12°00'W; ICES areas 12 and 14
Cod	Kabeljauw	ICES areas 7b, 7c, 7e-7k; 8, 9 and 10 and EU waters of CECAF area 34.1.1
	Doornhaai	ICES areas 6,7 and 8; EU and international waters of ICES area 5; international waters of ICES areas 1, 12 and 14
	Diepzeehaaien	EU and international waters of ICES areas 5-9
	Schelvis	ICES area 4; EU waters of area 2a
	Schelvis	EU and international waters of ICES areas 5b and 6a
	Schelvis	ICES area 7a
	Schelvis	EU and international waters of ICES area 6b; international waters of ICES areas 12 and 14
	Schelvis	ICES area 6a; EU and international waters of ICES area 5b
Herring	Haring	ICES area 7a north of 52°30'N
Herring	Haring	ICES areas 4 and 7d and EU waters of ICES area 2a
Herring	Haring	EU and Norwegian waters of ICES area 4 north of 53° 30' N
Herring	Haring	ICES areas 4c and 7d
Herring	Haring	EU and international waters of ICES areas 5b, 6b and 6a North
Herring	Haring	ICES areas 7e and 7f

Species (English)	Soort (Nederlands)	Area
Herring	Haring	ICES areas 7g, 7h, 7j and 7k
Hake	Heek	EU waters of ICES areas 2a and 4
Hake	Heek	ICES areas 6 and 7; EU and international waters of ICES area 5b; international waters of ICES areas 12 and 14
Horse Mackerel	Horsmakrelen	Wateren van de Unie van de ICES-sectoren 2a en 4a; ICES-deelgebied 6, ICES-sectoren 7a-c, 7e-k, 8a, 8b, 8d en 8e; wateren van de Unie en internationale wateren van ICES-sector 5b; internationale wateren van de ICES-deelgebieden 12 en 14
Horse Mackerel	Horsmakrelen	Wateren van de Unie van de ICES-sectoren 4b, 4c en 7d
	Tongschar en witje	Wateren van de Unie van ICES-sector 2a en ICES-deelgebied 4
	Scharretongen	ICES-deelgebied 7
	Scharretongen	Wateren van de Unie van ICES-sector 2a en ICES-deelgebied 4
	Scharretongen	ICES-deelgebied 6; wateren van de Unie en internationale wateren van ICES-sector 5b; internationale wateren van de ICES-deelgebieden 12 en 14
	Leng	Wateren van de Unie van ICES-sector 3a
	Leng	Wateren van de Unie van ICES-deelgebied 4
	Leng	ICES-deelgebieden 6–10; internationale wateren van ICES-deelgebieden 12 en 14
Mackerel	Makreel	ICES-sector 3a en ICES-deelgebied 4; wateren van de Unie van ICES-sectoren 2a, 3b, 3c en de ICES-deelsectoren 22–32
Mackerel	Makreel	ICES-deelgebieden 6 en 7, ICES-sectoren 8a, 8b, 8d en 8e; wateren van de Unie en internationale wateren van ICES-sector 5b; internationale wateren van ICES-sector 2a en de ICES-deelgebieden 12 en 14
Nephrops	Langoustine	ICES-deelgebied 7
Nephrops	Langoustine	Wateren van de Unie van ICES-sector 2a en ICES-deelgebied 4

Annex II accompanies Article 2.3(2) of the scheme. It lists the amounts from which the subsidy amount is composed. These amounts include any alternative sources of income and are corrected to the net present value for a period of eight years. This period of eight years was chosen because it is expected that without support for the termination of their fishing activities, fishermen would continue their fishing activities for at least another eight years. The figures are constructed in such a way that the highest achievable amount per segment is equal to the average yield of that segment corrected to the net present value. This prevents overcompensation. An additional amount is included for the large cutters segment, so that large cutters always receive a higher amount of subsidy than vessels from the small cutters segment.

Table A1.2 *Compensation per gross ton for the decommissioning of a vessel per gross tonnage category*

Category in gross tonnage	Amount per gross ton
Small cutters 0-178	€6,780
Large cutters* 179-573	€4,835
Pelagic trawlers 3,000-9,500	€71

* All vessels in this segment receive a base amount of €262,578 plus an amount per gross ton.

Appendix 2 Qualitative Methods

Regional meetings

Between June and August 2022 twelve regional meetings were held in Den Helder, Lauwersoog, Urk, Ijmuiden, Scheveningen and Stellendam to present the approach taken of the Impact Analysis Project and to collect information about the current situation of the Dutch fishing sector, looking at the impact of policy measures on the fishery, the fish chain and the fishing communities. Both economic impacts as well as social and cultural impacts were discussed. Separate meetings were organised for stakeholders related to fishing and for those related to the fish chain (trade, auction, processing but also supply industries). Of the fisheries meetings, one meeting focused on the pelagic subsector and one meeting on the small scale coastal fleet. The rest of the fisher meetings were a mix but with a strong focus on the cutter fleet. It was made sure that a wide variety of stakeholders were present, but the groups were kept relatively small to allow for discussion. The world cafe method was used to make sure that everyone would have the opportunity to respond to all the questions. With the world cafe method groups are made even smaller (between 2-5 people in this case) to avoid that discussions are dominated by a small nr of people.

During the meetings the project was explained and the data that Wageningen Economic Research had available was shared and discussed. During and after the presentation, there was ample time for questions and discussion. This time was always used and gave a clear insight in the mix of feelings felt by many: concern, anger, distrust and disappointment were most prevalent. Concern about the situation they were in, the lack of perspective and disappointment about the role of the government in the crisis. The meetings were often the first physical meeting in years, in which a lot had happened. Due to covid many meetings had been cancelled or postponed. Also the meetings were held in a time that the Dutch fleet was suffering from the high oil price, due to the war in Ukraine and was awaiting a long promised announcement of the decommissioning scheme for cutters (which make up the majority of the fleet). This first part of the meeting was followed by discussing different sets of questions in the world cafe format. All the feedback that was received was documented and analysed after coding the data in Atlas.ti, a qualitative coding software. In this programme, texts can be analysed by attaching codes or memos on the text. Codes can be seen as labels existing of one or multiple words. By attaching codes to a specific part of the text, it becomes visible when a certain topic is discussed.

Online survey

As part of the wider impact study we conducted a survey to understand how fishers and their spouses themselves experienced the change in fisheries policy. The survey allowed people to indicate the impact of all the changes in fisheries policy in recent years on the fleet, the fish chain and the fishing communities. In the survey we also asked questions about decommissioning and their perceptions on the fleet becoming smaller. The survey was opened to skipper-owners, fisherwomen and crew members of the North Sea fleet on 20 December 2022 and ended the end of January 2023. The survey was modelled on a survey distributed to the fleet in 2008 (Salz et al. 2008). At that time, too, the cutter fishery was struggling and there was a restructuring (23 cutters were decommissioned) (Quirijns et al. 2019). This allowed the current responses to be compared with responses from the previously conducted survey to see possible developments over time. The survey was tested prior to opening it up, based on the feedback some changes were made. The duration to fill it out was between 10-15 minutes. Once it was available a lot of care was taken to reach the target audience, by making use of diverse platforms of (social) media (Kraan et al. 2023). Fishers also were given the opportunity to fill it in on paper, but only 3 people made use of this option the rest did it online. In total 241 people participated: 61 spouses, 108 skipper-owners and 72 crew members. The majority of respondents (193) were active

in or involved in cutter fishing (80%). Most of them in beam trawling for flatfish and or shrimp (78%). Of the 241 respondents, four fishermen were engaged in pelagic fishing, 29 respondents associated with small-scale fishing and 193 with cutter fishing. Three crew members reported that their companies conducted both pelagic and cutter fisheries. The average age of respondents was 44 years, on average skipper-owners were older (50 years) than crew members (38 years) and spouses were in between (46 years). This age difference between owners and crew members also shows in how long people work in fishing: among crew members, the majority (60%) have worked in fishing for less than 20 years, while among owners 76% have worked for more than 20 years. Respondents come from 31 different fishing communities, most of which are part of the 44 identified fishing communities in the Netherlands (see Kraan et al. 2023). The distribution of respondents across fishing regions is good, only from the IJmuiden region there is no participation of crew and spouses. The number of participants also varies by region, with few respondents coming from Scheveningen-Katwijk (10) and IJmuiden (3). Three respondents are from a place outside the fishing regions.

As for this study the cutter fleet is most important we will describe this group of respondents that took part in the survey a bit further (193 people). Two thirds of these conducted one type of fishery (e.g. shrimp fishing or flyshoot fishing), a third conducted multiple fisheries in their business. Of the participants from the cutter fleet, 134 were owners or spouses of an owner and we also asked them how many vessels they had. Twenty-nine per cent had two or more vessels (four respondents had three vessels, two respondents had four vessels and two respondents had more than four vessels). Of the group of fishermen conducting multiple demersal fisheries in their business, 30 per cent did so with one vessel. Classifying fisheries is thus not straightforward; mixed fisheries are common in several variations (Schadeberg et al. 2021). After all, fishermen are traditionally used to target different target species in different seasons with different nets and techniques.

In order to still provide an overview of the information, we asked owners which fishery is most important to them. Here, we left it to the respondent to weigh up how they define 'most important'. Most cutter fishery respondents mainly carry out shrimp fishing (42%), followed by beam trawling for flatfish (37%). Ten fishers mainly fish with boards (quadrig or twinrig) (5%) and nine fishers carry out flyshoot fishing (slightly less than 5%). Of 22 respondents (11%), we do not know which fishery is most important.

For more detailed information on the respondent population see Kraan et al. 2023.

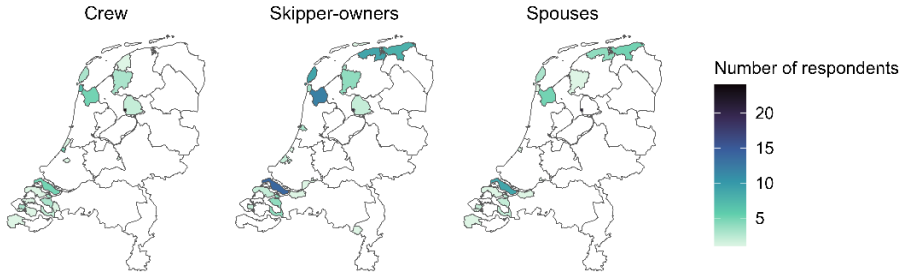


Figure A2.1 *Origin of respondents by fishing municipality. From the municipality of Urk (difficult to see on these maps), for all categories of respondents, more than 20 people participated in the survey*

Phone survey

In order to check our scenarios we interviewed 5 fishers and 1 fisher representative by phone. These were short 15-20 minutes phone calls. To make sure this round of interviews would include a range of perspectives and contexts, we spoke to fishers from the different regions and performing different fisheries.

Region	Type of fisher	No. of vessels
Wadden coast	Shrimp fisher	1
Kop van Noord-Holland	Diversified (small vessel) flatfish and nephrops fisher	1
Urk	Beam trawl/twinrig	2
IJmuiden		
Katwijk-Scheveningen	Beam trawl	1
Zuidwest-Nederland	Beam trawl/Twinrig	1
All	Fisher representative	Na

We asked all fishers:

1. Will you fish less on flatfish after the decommissioning scheme has taken effect?
2. Do you think that other fishers will fish less on flatfish after the decommissioning scheme has taken effect?

The fisher representative was only asked the 2nd question. From here we will only speak of fishers, including the representative.

We wanted to check whether they expected a decline of fishing activity (by the remaining fleet) on flatfish due to the decommissioning scheme in one way or another. We did not expect that, therefore we only work with the scenarios *no reaction* and *increased effort*. But perhaps we missed something that the fleet did see.
None of the fishers expected a decline in fishing activity (by the remaining fleet) due to the decommissioning scheme.

This understanding was arrived at after some probing as many fishers expected a decline of fishing activity due to *other* causes such as a (remaining) low catchability of flatfish species (i.e. plaice), less space for fishing due to wind mills being built,[31] or a high fuel price. Most of them emphasised that one would expect to notice the effect if such a large part (mentioning between 50-80 vessels) of the fleet would be decommissioned, two did say that 'however in former rounds of decommissioning we also did not notice it'.

Summarising the response on the presented option that fishing activity would *increase*, it was said that perhaps some would start continuous fishing, where those suggesting it said they would not either because of religious considerations or because their vessel was too small to work with rotating crews, making their fishery weather dependent which does not allow for alternating crew.

The option to make use of the quotas from the decommissioned vessels was generally met with some skepticism. One could now hardly fish up the quotas, also it was felt very insecure what would actually happen with the quotas as the government had announced to change the system in 2025. Most fishers reckoned that fishers would rather change their activity. It was expected by most of them (5 of 6) that fishers would be interested to use TR rather than BK. Specifically two mentioned fishing on other species as well, such as squid. Another expectation was that more smaller vessels (Eurocutters or smaller) would enter the fleet working in a diversified way.

Another option for an increase that was probed was that vessels now under foreign flag would reflag to the Dutch state. Some had no idea (2), some (3) said that this was a possibility due to the opportunity that now arose with low quota value in combination with the difficulties fishers under UK flag experienced, but one of the emphasised that with the decommissioning scheme the available space had declined as well (in terms of KW and GT). One did not expect it as the foreign flag was too beneficial (referring to the Belgian and German flag).

[31] In the week of the phone calls the government announced the North Sea would be the main supplier of green energy for the Netherlands and many parts in the EU (https://twitter.com/MinisterKenE/status/1650446529461723137), following a new deal with the UK on shared infrastructure between the UK and the EU for wind energy (https://nos.nl/artikel/2472634-nederlands-windpark-wordt-gekoppeld-aan-stroomkabel-met-vk).

Appendix 3 Quantitative Methods

Logbook data

The logbook data records landings and effort at the ICES rectangle level. However, to be able to identify the amount of fishing allocated to the Wadden Sea, a finer scale of analysis is needed. We use the Vessel Monitoring System (VMS) data coupled to the logbook data as described in Hintzen et al. (2013). The landings of a trip are assigned to the different pings proportionally to the duration of a ping (time between two VMS points). The pings are then overlapped with the polygon of the Dutch Wadden Sea to identify fishing pings inside/outside the Dutch part of the Wadden Sea.

One problem arises when using the methods described in Hintzen et al. (2013) in order to estimate when a vessel is fishing or not. Vessels are assumed to be fishing while maintaining a speed between two threshold values. However, it could be that a vessel is estimated to be fishing when in fact it is not. This could cause monthly shrimp effort in the Wadden Sea for a fisher to be above zero during a given month, when in reality the fisher has not fished for shrimp in the Wadden Sea that month. If these errors are small and unbiased, this would not be major problem for reporting, as these errors could be both positive as well as negative. However, for our logistic regression model (see below), it could yield some problems, as the outcome variable changes from a zero (fisher is not fishing for shrimp in the Wadden Sea) to a one (fisher is fishing for shrimp in the Wadden Sea). In order to solve this problem, a minimum monthly effort threshold has been set. In order for a vessel-month observation to count as actually fishing, the number of fish days should be at least one whole fish day in a given month. This approach should not influence our model results, unless errors arising from estimating the fish days are differently distributed across the period before and after the decommissioning scheme, which we assume not to be the case.

Economic data

The economic data of the Dutch cutter fleet is for each vessel estimated based on panel data and individual activity (see van Oostenbrugge et al. 2022b for details about the processing and estimation of the data) for details about the processing and estimation of the data). Prices are kept at historical values and no price flexibility (i.e the price would change with the amount of landings) is assumed.

In addition to the landing weight by registered and all active Dutch cutters, the landed value from 2018-2021 was used from Logbook data (VIRIS/Bedrijveninformatienet, n.d.) to determine the economic impact for the fish clusters. Another parameter is the number of registered vessels per home port to determine the economic impact of less employment and turnover for technical and service supply industry in fisheries regions such as shipbuilders, ship carpenters, painters, net makers, port services, installers etcetera mainly perform services on board or around vessels.

NOVA fish auction data (Nationaal Overlegorgaan voor de Visafslagen) has been received for landing volume and fish species (Figures 4.3 and 4.4 in Chapter 4). Data on landing volumes and number of active cutters per port were obtained from Agrimation WUR (Wageningen Economic Research 2022b).

Reaction remaining vessels – increased effort scenario and impact on other variables

To estimate realistic increase of effort for the remaining vessels, we assume that they could increase their effort up to the maximum[32] number of seadays observed in their segment during the 2018-2021 period or their own maximum effort if it is higher than the computed maximum effort. In addition, given the effort and catch profile of the registered vessels we assumed that the room created by the scrapping of the registered vessels could only be filled by increasing the effort of flatfish directed fisheries, i.e. beam trawls or otter trawls. SO only the effort of those two gears were increased, activities using other gears were maintained at the 2018-2021 level. And lastly we assume that if a vessel also operated in the shrimp fishery which is regulated with a cap on seadays per week. The effort in shrimp weeks could not be increased as fishers are unlikely to change gears in the middle of a week to target other fish.

The expected change in landings is taken per gear assuming constant landings per unit of effort. So the landings per gear increase proportionally to the effort of that gear. The price of fish are also kept constant and the revenue and value of landings evolve proportionally to the landings of the different species. The costs are split in two categories, the variable costs and the fixed costs. The variable costs (variable and crew costs) also change proportionally to the effort and revenue while the fixed costs are kept at the historical level. The profit (revenue minus variable and fixed costs) is therefore adjusted accordingly.

[32] Max seadays per segment is calculated annually based as the average seadays of the 10 most active vessels of a segment, (European Commission, Joint Research Centre, and European Commission, Scientific, Technical and Economic Committee for Fisheries, 2022).

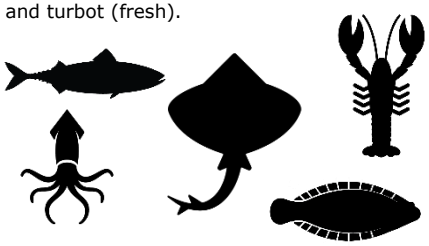
Appendix 4 Characteristics per fisheries region

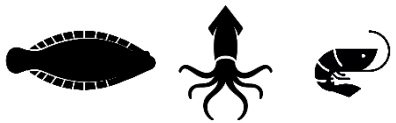
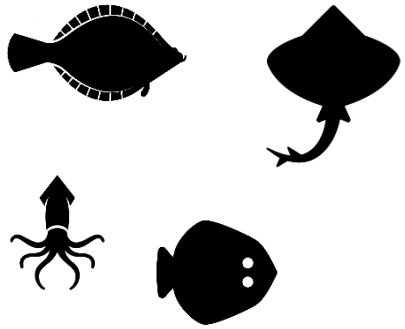
Characteristics of the fish processing chain and technical and services supply industry of North Sea fish by fisheries region

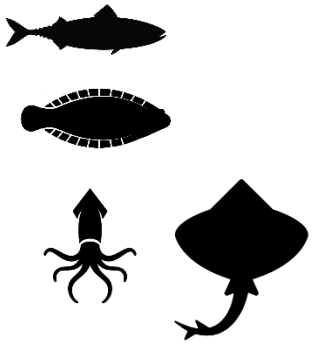
From Hoekstra et al. (2023) each fisheries region is described by the main landed North Sea fish species (in terms of value and weight). Furthermore, the historical context of established fish clusters is given for certain fisheries region.

Historical reasons established fish processing clusters close to harbours

Fish clusters within fisheries regions have often developed around ports of landing and auctions of fresh North Sea fish. The ports and auctions are thus a physical location where supply (landings from the fishery) and demand (from buyers such as fish processors and fish retailers) come together. For pelagic fish, which is brought on board as frozen fish by freezer trawlers, the main offices and frozen warehouses of these fishing companies are historically located in the ports of IJmuiden and Scheveningen. Vlissingen and Amsterdam are exceptions to this because storage capacity in warehouses was found here for the frozen pelagic fish such as herring and mackerel. Ports and auctions are also hubs in the entire infrastructure of the fish processing chain and technical and services supply industry. This includes the entire logistics and transport but also suppliers such as the unloading of fish by specialised fish unloading service companies, (gas) oil bunkering for ships, port facilities such as shore power and ice supply to store the caught fish cooled on board, supply of ship equipment and maintenance by maritime engineering companies (Hoekstra et al. 2023).

Fisheries region	Main North Sea fish species in landed volume (preservation/condition)	Characteristics of the fish cluster
1.Kop van Noord-Holland	Brown shrimp (fresh, cooked), Norway lobster (fresh, preserved), Flatfish (fresh). 	Wieringen and Den Oever are highly specialised in the supply and processing chain of brown shrimp and nephrops (Norway lobster). The shrimp cutters moored in the home port are partly responsible for attracting day tourists, according to interviewees. Den Helder and Texel are more geared to supplying flatfish. There are hardly any fish-processing companies located in this fishing region. Via transport, processing is outsourced mostly to other fish clusters especially in IJmuiden and Urk. During this study, it became clear that the Den Helder fish auction had to close (by 2023) due to declining supplies and thus economic revenues, partly caused by the Brexit, the pulse ban, high fuel prices and consequently that a relatively large number of (flatfish) cutters from this fishing region have applied for decommissioning scheme or sale of the vessel. The Den Helder auction will be leased and put to use by the maritime offshore wind industry and initiatives such as hydrogen generation in the North Sea. Texel is known for its innovative nature in flatfish fishing. An innovative fishing technique such as the pulse trawl has been more or less early tested and further developed here by fishing entrepreneurs and involved technical and services supply industry.
2.IJmuiden	Pelagic fish species such as herring (processed and frozen), miscellaneous species such as skate, lobster and squid (fresh), flatfish such as sole and turbot (fresh). 	In IJmuiden, both frozen pelagic fish and fresh North Sea fish are landed. Unlike Urk, there is less fish processing here such as filleting but a lot of fresh packaging of the North Sea fish as a whole fish, destined for export or domestic catering. IJmuiden has good port and logistics facilities, making it an important national fish cluster for both the pelagic and demersal fish supply chain. There is also much refrigerated and frozen capacity located here, particularly for pelagic fish. The supply of fresh North Sea fish from the English Channel goes mainly through the Scheveningen and IJmuiden auctions. Think of freshly landed fish species such as squid, red gurnard, mullet and mackerel. This fish caught using the flyshoot fishing technique is known for its high quality because, relative to beam trawling, due to the fact that the fish spend much less time in the fishing net before coming on board.

Fisheries region	Main North Sea fish species in landed volume (preservation/condition)	Characteristics of the fish cluster
3.Zuidwest-Nederland	Flatfish such as sole and turbot (fresh), flatfish and round fish such as mullet, red gurnard and squid (fresh), brown shrimp (fresh, cooked). 	This Fisheries Region is characterised by the large geographical distribution of fish clusters, traditionally across several of Zeeland's islands. Vlissingen has become an important port for English-flagged cutters with Dutch owners since the Brexit at the expense of Boulogne, for the supply of fresh North Sea fish from the Channel. Stellendam is an important logistic centre with its auction and shipyards and associated companies specialising in the design and construction of cutters, maintenance and repair. Maritime technical knowledge is also highly developed due to the shellfish fishery present with Yerseke as an important processing hub. In addition, Yerseke has increasingly become an important logistics hub where many transport movements to and from with fish and shellfish products by truck are carried out daily. There is a lot of interaction with Scheveningen due to the fact that the auctions fall under the same company (United Fish Auctions, UFA) and due to the presence of the fishing fleet that originally has Scheveningen as its home port. To a lesser extent there is interaction in transport of fish products to and from Urk.
4.Urk	Flatfish species such as plaice and sole (fresh), various other North Sea fish species such as mullet, red gurnard and squid (fresh). 	Largest fisheries region in the Netherlands in number of fishing vessels and fish processing companies of North Sea fish. Especially most of the landed plaice is sold through the Urk auction to local fish processing companies. As Urk has no own landing port most of the North Sea fish sold at the local fish auction is landed in Harlingen or at other ports in the Netherlands, France and Denmark. This fish cluster is characterised by large growth of business succession due to the strong fisheries identity and many young people that this fisheries region has. The strongly growing international fish processing and maritime cluster of inland shipping and technical companies owe their origins to the traditionally present North Sea fisheries. This fisheries region has a high concentration of fishing-related businesses within its municipal boundaries. The advantage is that companies that stop are often bought up by other local companies, so that the supply chain infrastructure is preserved and does not disappear from the fisheries region. Unique to Urk is that it is inland and has no direct connection to the North Sea or Wadden Sea through the afsluitdijk. In this regard, Urk relies heavily on road transport and logistics. There is much interaction with almost all fisheries regions especially for the purchase of fish for (further) processing. Due to the growing fish processing companies, Urk's importance as a logistics hub is increasing for the Netherlands and even Europe-wide for fish processing. There are many companies that import and export fish and fish products. There has been large-scale deployment of frozen and refrigerated capacity by the processing industry which has started to import more and more frozen fish products.

Fisheries region	Main North Sea fish species in landed volume (preservation/condition)	Characteristics of the fish cluster
5.Katwijk/Scheveningen	Pelagic fish species such as herring (processed and frozen), flatfish such as sole (fresh), round fish such as mullet, red gurnard and squid (fresh) 	Katwijk does not have its own port or auction. Katwijk has a strong pelagic fish cluster because one of the large pelagic shipping companies has its headquarters here. For that reason, pelagic processors such as herring processors and pelagic suppliers such as net makers are also concentrated here. Scheveningen has a renowned harbour around which much processing and trade in fresh North Sea fish has developed with a particular focus on out-of-home consumption in the hospitality industry, partly due to the presence of many expats and tourists. The densely populated periphery of The Hague makes expansion of the fish processing chain and technical and services supplying companies challenging. Pelagic processing and supply chain companies therefore turn their eyes more toward IJmuiden or abroad for expansion opportunities. Because the Scheveningen fish auction is close to the Randstad, it offers many opportunities for local sales of fresh North Sea fish. Compared to other fish auctions, Scheveningen therefore has many more smaller companies that buy fish through the auction, mainly destined for local catering establishments. The supply of fresh North Sea fish from the English Channel goes mainly through the Scheveningen and IJmuiden auctions. Think of freshly landed North Sea fish species such as squid, red gurnard, mullet and mackerel. These fish species caught using the flyshoot fishing technique are known for their high quality because, relative to beam trawling, as the fish spend much less time in the fishing net before coming on board. The supply of fresh demersal fish from the English Channel allows the Scheveningen auction and local fish chain to respond to the demand from exports and the local catering industry including many beach bars. The port and auction determine the streetscape and attract tourists to Scheveningen. There are many interactions with Stellendam and Katwijk because the latter does not have its own harbour and auction. Companies and municipality indicated that pelagic fishing in particular also plays an important social role for the port in Scheveningen and local residents or nearby companies. According to interviewees, during the corona period you could notice that fewer pelagic trawlers were unloading in Scheveningen harbour. It led to unemployment among fish unloading personnel who could hardly find other work quickly. According to the companies, it led to an increase in crime around the port.
6. Waddenkust	Brown shrimp (fresh, cooked), to a much lesser extent, some North Sea fish (fresh) 	Waddenkust is particularly characterised by shrimp fishery at the Wadden Sea and along the northern coast of the North Sea. Similar as in the Kop van Noord-Holland, there are hardly any fish-processing companies in the Waddenkust except for the specialised companies and suppliers in the shrimp chain. Interactions exist between the ports with brown shrimp landings. There is a direct interaction with Urk from the Harlingen shrimp auction because it is owned by the Urk auction. Harlingen is also the home port of many cutters registered at Urk as home port.

Fisheries region	Main North Sea fish species in landed volume (preservation/condition)	Characteristics of the fish cluster
7. Other	To a lesser extent is here supply of North Sea fish species because these places do not have their own fish or shrimp auctions.	This category is a collection of companies in the fish processing chain and technical and services supply industry that fall outside the six fisheries regions. Important fish clusters within this category include Bunschoten-Spakenburg where there are many fish smokehouses (eel, salmon) and itinerant fish trade (fish trucks and stores) that source North Sea fish from other fisheries regions such as Urk, Scheveningen, IJmuiden and Zuidwest-Nederland. In addition, several importers are located close to the logistics mainports of the Port of Rotterdam and Schiphol Airport. These are mainly non-North Sea fish imported and traded, especially within Europe as a destination market. There are also several transporters and maritime suppliers inland that are close to hubs of European highways for efficient connection to the hinterland such as Germany and Belgium as major markets for fish products and their ports for maritime services.

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