Implementing the landing obligation – what costs are involved for the shrimp fisheries sector?

A brief overview

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Summary

Because the current period of the de minimis exemption under the European landing obligation expires, this exemption must be reapplied for in the submission of the Joint Recommendation (JR) in May 2023. For this purpose, it was agreed that the costs involved in the introduction of the landing obligation for the shrimp fishery will be investigated and substantiated. The Ministry of LNV has therefore commissioned Wageningen Marine Research (WMR) and Wageningen Economic Research (WEcR) to investigate and report on the additional costs associated with the implementation of the landing obligation in the shrimp fishery sector. This study is a semi-quantitative study that provides an overview of the difficulties and constraints in implementing the landing obligation in the shrimp fishery and, where possible, an indication of the costs of implementation. An expert session and interviews with fishers and trained observers identified the critical factors that determine the cost of implementing the landing obligation. In addition, from two observer trips estimations of the extra costs and duration of the sorting process were made.

The results show that, taking into account all aspects concerning duration of the process, extra costs of material, time and personnel, safety aspects and practical implementation, implementing the landing obligation for Dutch shrimp fisheries seems for most vessels very difficult or even not possible. Many issues were identified and the results show that even for the part of the fleet where sorting is possible (due to the presence of a sorting belt), it will either lead to considerable extra costs due to significant changes to vessels and crew or will on the other hand lead to loss of income. For all other vessels without a sorting belt implementing the landing obligation is not possible.

Extra costs and time are also directly related to the amount and composition of bycatch, which is different over the seasons and locations. Significant amounts of different fractions of bycatches are obtained during all quarters, and total bycatch amounts were in general proportionally larger in quarters where the fishing effort and shrimp landings were higher. An exception is benthos which was proportionally highest in quarter 3. Large amounts of other bycatch than TAC species, such as high proportions of benthos, influences time and effort to sort out TAC species.

For shrimp vessels in the fleet section >260 hp vessels with combined fisheries (MFL1) costs for sorting the TAC fish were calculated. If these vessels are obliged to sort undersized catches of TAC species, the total labour time onboard will be more than doubled. For three options based on the options that are available for fishermen to react to this obligation the effects were calculated.

1. If the total share of the revenue for the crew stays the same, the share per crew member halves. Due to the extra sorting time needed for the TAC fish, the crew has to be more than doubled.
2. If the ship owner pays the same share per crew member and hires the extra crew needed, all the extra costs due to the sorting of the undersized TAC fish lead to a negative profit.
3. If the number of crew members and the fishing effort stay the same, the number of hauls per fishing trip will need to be reduced due to the extra sorting time for the undersized TAC fish. The total revenue will be reduced proportionally with the reduction in hauls. This leads to a negative profit and halving the share of per crew member.

For the three calculated scenarios, the revenue per crew member either at least halves, the net profit becomes negative, or both. As a result, implementation of the landing obligation in the Dutch shrimp fishery is not economically feasible. Alternatively, there should be room for innovating gears and vessels leading to less bycatch of undersized fish in the future. However, adjustment of the fleet requires time, research and investments.

1 Introduction

An important element in the revision of the Common Fisheries Policy (CFP) is the obligation to land all catches of species subject to quotas, here named TAC species. Under this landing obligation, all discards of commercial species regulated by quotas must also be landed (EU 1380/2013). The landing obligation has been phased in and has been in full force since January 1, 2019. Exemptions to this landing obligation are possible, such as a "de minimis" exemption. This applies to quoted species caught by certain fisheries where selective fishing (fishing with as little unwanted bycatch as possible) is no longer possible, when the cost of keeping them on board is disproportionate.

The brown shrimp (*Crangon crangon*) fishery has been subject to a de minimis exemption since October 18, 2018 (EU 2018/2035). This exemption was granted on the condition that member states with an interest in shrimp fisheries (Germany, Denmark and the Netherlands) set up and implement a self-sampling program in order to gain a better understanding of the amount of bycatch in shrimp fisheries and also investigate the disproportionate costs involved in implementing the landing obligation. The bycatch limit was 7% in 2019 and 2020 (as a percentage of total catch weight) and was further reduced to 6% in 2021 and 2022 and is now at 5% in 2023 (EU 2018, EU 2019, EU 2020: Commission Delegated Regulation).

There have been several data collection programs concerning bycatch in shrimp fisheries in the past. The Data Collection Regulation (DCF) ran between 2009 and 2018 where Wageningen Marine Research (WMR) coordinated a sampling program within the shrimp fishery in the context of the Data Collection Regulation (DCF) of the European Commission (EC) (EU 2016/1701, EU 2016 /1251 and EU 2017/1004). Eight trips per year were sampled by WMR in this sampling programme (Steenbergen et al. 2015). This was discontinued after 2018 because it was no longer a legal obligation and the data collection was judged to be insufficient to evaluate the condition of an exemption from the landing obligation (Steenbergen et al. 2015).

Then IRC Shrimp started in 2019 where WMR, in collaboration with Coöperatie Kottervisserij Nederland (VisNed) and the Dutch Fishermen's Association, started the "International Research Cooperation Shrimp" (IRC shrimp) project with the aim of developing knowledge for an ecologically responsible management of shrimp fisheries by setting up structural, coordinated international and intersectoral cooperation. IRC shrimp is funded by the European Union from the European Maritime and Fisheries Fund. The sampling program within IRC shrimp consists of observer trips where scientists go on board and sample the hauls during a fishing trip (i.e. take a sample of the bycatch, sort it and measure and weigh it). Chapter 3.3.2 and 3.3.3 further describes how the knowledge from the IRC program was used in this study.

In 2021 another shrimp bycatch sampling program started, called self-sampling shrimp fisheries, where experiences from both the previous DCF program and the IRC shrimp project were used. The aim was setting up and implementing a systematic and internationally coordinated self-sampling program in the Dutch shrimp fishery in which bycatch data are collected that are representative for the Dutch shrimp fishery to scientifically substantiate the "de minimis" conditions. Chapter 3.3.2 provides more detail about this program and describes how and which the data was used in this study.

2 Project definition

2.1 Research questions and objectives

Because the current period of the de minimis exemption expires, this exemption must be reapplied for in the Joint Recommendation (JR) in May 2023. For this purpose, it was agreed that the costs involved in the introduction of the landing obligation for shrimp fishery will be investigated and substantiated. The Ministry of LNV has therefore commissioned Wageningen Marine Research (WMR) and Wageningen Economic Research (WEcR) to investigate and report on the additional costs associated with the implementation of the landing obligation in the shrimp fishery sector. This would include the costs involved in processing, retaining on board and landing bycatch species subject to the landing obligation.

The research questions were formulated as follows:

1. What problems can be identified in the implementation of the landing obligation in shrimp fisheries?
2. What is the composition of the Dutch shrimp fleet, considering facilities needed for the implementation of the landing obligation such as, for example: vessel type, freezing/cooling capacity and sorting belt and what are possible bottlenecks per vessel type?
3. What is the bycatch composition in shrimp fisheries and how does it differ between seasons and areas?
4. What are the costs of implementation of the landing obligation for those vessels in the shrimp fishery at which it is practically feasible to sort the catch?

This study is a semi-quantitative study that provides an overview of the difficulties and constraints in implementing the landing obligation in the shrimp fishery and, where possible, an indication of the costs of implementation. An expert session with WMR researchers and the shrimp sector and interviews with fishers and trained observers identified the critical factors that determine the cost of implementing the landing obligation. In addition, from two observer trips estimations of the extra costs and duration of the sorting process were made. Materials and methods are further described in Chapter 3.

Chapter 3 continues with materials and methods used, while Chapter 4 describes the outcome and results per research question. Chapter 5 describes the discussion of this study and finally, Chapter 6 describes the conclusions.

3 Materials and methods

The methods used for each research question are described per research question.

3.1 Problems identified

The Nederlandse Vissersbond (Dutch Fishermen's Association) has provided insight into which vessel types make up the Dutch shrimp fleet (see also Chapter 3.2 for more details about the process involved). It was examined whether the vessel is a combination vessel for mixed fisheries for Norway lobster/flatfish and shrimp, only shrimp, with or without sorting or reading belt.

To identify the problems that will arise when the landing obligation is implemented, interviews were conducted with three researchers from WMR that have been involved in the IRC shrimp project as described in chapter 1. Furthermore, ten shrimp fishers divided among the six vessel types (Chapter 4.2) were also interviewed. Finally, two observer trips were done to go through the process of mimicking the landing obligation to get a better understanding of what problems are going to arise in practice.

3.2 Fleet composition & problems involved

For this research question, the distinction between vessel types (combination vessel for mixed fishing for Norway lobster/flatfish and shrimp, single shrimp, elevator belt or not) as described in the paragraph above were used. For this composition of the ship types of the Dutch shrimp fleet, the study depended on contributions and information from the sector. Therefore the Nederlandse Vissersbond was asked to check with their members which vessels and vessel types are present in the Dutch shrimp fleet. Of the most important, most common type, two vessels were selected and used for the observer trips at sea (see Appendix 1 – Observer protocol
for the protocol (Dutch only)). Furthermore, skippers from other vessel types were interviewed (Appendix 2 – Interview questions fisher) shows the questions asked (Dutch only)). This created a clear picture of the bottlenecks for the most important ship types.

3.3 Catch composition and variability

"What is the bycatch composition in shrimp fisheries and how do they differ between seasons and areas?" This research question involved an analytical study in which the bycatch in shrimp fisheries per season (quarter) were assessed using the data collection program self-sampling shrimp fishery.

3.3.1 Expected bycatches and seasonal variability

It is well known that North Sea and the Wadden Sea ecosystems show a substantial temporal and spatial variability and have also been subject to significant regime shifts (Mariska et al. 2005). Among other fish species, juvenile flatfish species, young whiting and cod as well as pelagic fish species are caught as unwanted bycatch in shrimp fisheries (Tulp et al. 2012; Glorius et al., 2015; Steenbergen et al. 2015; Quirijns et al. 2021). An example of expected seasonal variability in bycatches was obtained from the previous DCF monitoring, where young plaice were mostly caught in quarters 2 and 3, while roundfish were relatively more common as bycatch in quarter 4, and benthos in quarters 3 and 4 (Steenbergen et al. 2015).

3.3.2 Sampling programme

In 2019, the Ministry of Agriculture, Nature and Food Quality issued an assignment to design a shrimp bycatch sampling program, with the aim of setting up and implementing a systematic and internationally coordinated self-sampling program aligned with other member states but implemented in the Dutch shrimp fishery in which bycatch data are collected that are representative for the Dutch shrimp fishery to scientifically quantify the "de minimis" conditions. This program started in 2021 and uses a reference fleet of 20 vessels that self-sample part of the total catch. From specific hauls samples are collected and transferred to the lab, after which it is sorted at species level by the researchers of WMR. Self-sampling data used for this study are based on 85 trips (June 2021 – December 2022). The collected data was used to produce the figures and tables in Chapter 4.3 concerning catch composition over the different quarters and the amounts of non-quota and TAC fish species.

The Dutch brown shrimp fishing fleet have in total about 200 licences and in collaboration with the Dutch Fishers PO's, it was the decided that 10% of the entire fleet should contribute to the selfsampling programme. Therefore a total reference fleet of ~20 ships was maintained throughout the project. Based on the knowledge of the vessels fishing patterns (shift to other fisheries, movements among subareas during periods of the year) and previous projects ("IRC Shrimp") areas were defined. A sampling scheme per month per vessel from which each vessel should collect two samples in the allocated month was designed. If the vessel for some reason did not fish, the samples should be collected on the first coming brown shrimp trip. This should give in total 100 trips (200 samples) per year in the period 2021-2023. However, for this report Dutch data from the second half of 2021 and the whole year 2022 were used (105 trips and 208 samples), as the program is still running until late 2023.

3.3.3 On-board sampling procedure

Before sampling started, WMR provided the vessels with the necessary equipment (buckets, rulers, bags, labels and trawllists). Also, WMR measured hopper volumes in order to calculate, from the total centimetre height measured in the hopper using the ruler, the total volume of the catch in litres. During a sampling trip, two catch samples of 10 litres were taken from the unsorted catch from the hopper by the crew. The catch samples were taken from two different hauls according to the WMR sampling protocol, spread out during the trip, and preferably one haul sampled during day and the other during night. A trawl list with information about all hauls during each co-sampling trip was also completed by the crew and shared with the researchers. The samples were landed and handed over to WMR together with the associated trawl list. WMR ensured transport of the samples to the lab for further processing.

3.3.4 Sample analyses at WMR

In the lab samples were mostly sorted, weighed and measured fresh. If that was not possible, samples were stored in the freezer and thawed before sorting. Length frequencies of all species present in the sample were registered. When having too many small fish of the same species in the sample, researchers sub-sampled according to common procedure. Benthic species and other fractions in the sample were weighed and afterwards all data were registered into the WMR database 'Billie', together with all data registered on the trawllist provided by the skipper. According to data quality and security routines data were controlled before import to the Frisbe database at WMR where data were maintained, and from there extracted for compilation and analyses.

3.3.5 Raising to total bycatches of the whole shrimp fleet per quarter

Although sampling effort has been stratified in five different subareas where the Dutch shrimp fleet operates, these subareas were not used to raise sampled trips to total effort within these areas, as some areas were not sampled during all quarters. It was therefore judged to be more transparent to raise all sampled trips to total fleet effort per quarter using all samples irrespective of subarea.

Catches recorded in collected samples were first raised to catch fractions per sampled haul, by relating to the total catch volume of the haul. Catch fractions in sampled hauls were then raised to bycatch components on trip level by using the total catch volume of the sampled hauls raised to the total catch volume of all hauls during each trip. Bycatch components then raised to quarters of the year first by the total active fishing time during the sampled trips during that quarter, and then to the total fishing hours

as reported from official VMS and logbook data for the same quarter. The TAC-species to be reported for shrimp fisheries for de minimis requirement in the bycatches are shown in Table 3.3.1.

Table 3.3.1 – *TAC fish species reported in shrimp fisheries grouped for reporting in fractions.*

Group	English name	Scientific name	Dutch name
Flatfish	Plaice	*Pleuronectes platessa*	schol
	Sole	*Solea solea*	tong
	Turbot	*Scophthalmus maximus*	tarbot
	Brill	*Scophthalmus rhombus*	griet
	lemon sole	*Microstomus kitt*	tongschar
Roundfish	Whiting	*Merlangius merlangus*	wijting
	Cod	*Gadus morhua*	kabeljauw
Roundfish (pelagic)*	Herring	*Clupea harengus*	haring
	Sprat	*Sprattus sprattus*	sprot
	horse mackerel	*Trachurus trachurus*	horsmakreel
	mackerel**	*Scomber scombrus*	makreel
Sandeels	Sandeels	*Ammodytes sp.*	zandspieringen indet.
	Raitt's sand-eel	*Ammodytes marinus*	Noorse zandspiering
	lesser sand-eel	*Ammodytes tobianus*	kleine zandspiering
	greater sand-eel	*Hyperoplus lanceolatus*	smelt

* Pelagic species as a subgroup of "roundfish" (used in the Results section 4.3).
** Non-quota species in connection to shrimp fisheries, but reported here.

3.4 Costs involved

Costs involved were estimated using information on sorting time obtained during two observer trips on board two shrimp vessels with a sorting belt, and data on the cost structure of shrimp vessels obtained from the official logbook registrations and FADN (Farm Accountancy Data Network) data collected by Wageningen Economic Research.

During the two observer trips, WMR researchers on board went through the entire process of sorting, storage and landing the undersized TAC fish. The extra time for sorting TAC species was measured during two hauls at both vessels and the amount of bycatch and the bycatch of undersized TAC fish was recorded. Because the sorting time will depend both on the total bycatch and on the bycatch of undersized TAC fish, the resulting extra sorting time was related both per kg TAC fish and per kg total bycatch from which the TAC fish were collected.

To estimate the extra costs resulting from implementing the landing obligation, the following steps were taken:

1. Economic data of the Dutch shrimp fleet is prepared for the years 2016-2021, based on FADN data. The data is converted to data per average vessel per fleet section.
2. Calculation of the ratio shrimp and bycatch TAC species/all bycatch is made per quarter based on the self-sampling data.
3. Calculation of the sorting for TAC species based on the amount of TAC species/all bycatch based on two observer trips.
4. Because it is only feasible to sort the TAC species from the bycatches on vessels which combine shrimp fisheries with other fisheries and have a sorting belt, the costs involved in landing the bycatch of TAC species for these vessels (fleet section >260 hp vessels with combined fisheries) is made for three options. These are based on the options that are available for fishermen to react to this obligation:

a) Larger crew, same fishing pattern and effort: the total crew (including the ship owner) receives the same share of the revenue (crew pays for the extra costs).
b) Larger crew, same fishing pattern and effort: each crew member receives the same share of the revenue (owner pays for the extra costs).
c) Same crew and effort (sea days), the number of hauls is adjusted to the extra time needed to sort the catch: each crew member receives a share of the new revenue.

4 Results

This chapter describes the results found per research question.

4.1 Problems identified

An expert session, two observer trips and interviews with WMR observers and skippers from the shrimp fleet revealed several issues in implementing the landing obligation for shrimp fisheries. These issues are described below. Chapter 4.4 provides more detail for some of these issues were also estimations of extra costs are made.

The following issues were identified:

- Working in cold weather requires wearing gloves. However, the gloves make it very hard to get grip on small fish like flatfish and small herring or sprat, extending the duration of the sorting process. Working with gloves also provides less feeling, so shrimp are also grabbed with the fish leading to a loss of marketable catch.

- Since the sorting process takes a long time, the previous haul can barely be finished before the next haul comes in. Crew therefore has no time to rest which may increase the need for extra crew or cause over exhaustion and in addition may increase chances of accidents on board.

- As the sorting process for TAC species takes much longer, other species that normally would have survived will die, including ETP species. In addition, because the sorting process takes a long time, quality of shrimp decreases especially in warmer months leading to possible food safety issues.

- The room on board is limited. All non-marketable (non-quota) species need to be taken out of the catch and collected in baskets. These baskets can only be stored in the same space as the marketable catch (gutted fish and cooked shrimp), limiting the space for cooked product and probably causing food safety issues while being stored too close to the cooked product that is often kept in open storage boxes.

- The crew may encounter problems with the sorting process in heavy winds and waves, like personal safety issues and a longer duration of the entire process.

- As the crew of most vessels consist of 2 people, the sorting process requires both persons being on the sorting belt. It may not be safe for the skipper to leave the wheelhouse for a long time and the cooking process of the marketable shrimps also requires at least 1 crew member on stand-by for packaging. In order to meet the requirements for the landing obligation, vessels might need to take an extra crew member on board (but on most vessels there won't be enough room to sleep for that many crew members).

- All non-marketable TAC species that need to be kept on board need to be stored in the same room as the cooked shrimps. There will be less room for marketable shrimp which will, especially in seasons with a lot of unwanted bycatch, lead to the vessel leaving to port sooner.

- When catches are large, it requires more crew to help sorting and taking out all TAC species at the sorting belt. However, space is limited making it difficult to work with more than 2 crew members on the sorting process (Figure 4.1.1).

Figure 4.1.1 – *Space on board and especially at the sorting belt is limited.*

- Misidentification of species may lead to the wrong species being kept on board and the other being released. As Figure 4.1.2 shows, some species look alike increasing the risk of landing the wrong species and discarding the other. For example, Endangered, Threatened and Protected (ETP) species may not be kept on board and need to be released as soon as possible, but are difficult to identify for untrained fishers. In interviews with WMR observers it became clear that identifying fish to species level needs training and regular practise. Observers on board thoroughly sort the catch and are trained in species identification. In addition, they are tested for their knowledge every year while taking an exam. For fishers this seems impossible and sorting takes a long time if it needs to be done thoroughly.

Figure 4.1.2 - *Risk of misidentification for fish species that look alike. On the left picture from top to bottom: whiting (TAC species), smelt (non-quota species), twaite shad (ETP species), sprat (TAC species), herring (TAC species), sardine (non-quota species), anchovy (non-quota species). On the right picture top row plaice (TAC species) and dab (non-quota species) and on the bottom row flounder (non-quota species).*

- Having a sorting belt on board is a must in order to (try to) fulfil the requirements of the landing obligation. Some vessels do not have a sorting belt yet: this involves extra costs to install such a belt. Also, some vessels might not have the space on deck to install a sorting belt.

- Not having a sorting belt would mean that crew members have to lean forward in the hoppers, making it almost impossible to sort all the non-marketable TAC species from the catch (Figure 4.1.3). This also involves heavy work which may lead to personal injuries.

Figure 4.1.3 – *Sorting catch directly from the hoppers involves leaning forward and sorting each fish by hand.*

- The cooling options and space on a shrimp vessel are limited. If unwanted bycaught fish has to be taken along, it will deteriorate if it cannot be cooled sufficiently. This causes food safety problems.

- From the surveys it also became clear that most fishermen do not see more opportunities for gear innovation since they are already participating in research and have rules and regulations implemented. However, when asking the same question to observers, they do see the importance of continuing innovations in the shrimp sector and are also convinced more can be done to work towards a more sustainable fishery with less bycatch.

4.2 Fleet composition & problems involved

From the overview provided by the Nederlandse Vissersbond a difference in types of vessels emerged distinguishing six variants (Table 4.2.1). The percentages are the best estimation that is currently present and was provided by the Nederlandse Vissersbond. These percentages were used since a classification had to be made in advance based on whether or not a sorting belt was used on board and the type of fishery was done by a certain vessel in 2022. The table shows that most of the Dutch shrimp fleet has no sorting belt on board. In mixed fisheries, the majority of vessels do have a sorting belt.

Table 4.2.1 *– Overview of different types of vessels present in the Dutch shrimp fleet.*

	Sorting belt		
	Yes	No	**Total**
Shrimp	3%	79%	**82%**
Shrimp/Norway lobster	5%	2%	**7%**
Shrimp/flatfish	8%	3%	**11%**
Total	**16%**	**84%**	**100%**

4.3 Catch composition and variability

4.3.1 Temporal variability

Catch fractions (total per quarter) raised to the total shrimp fleet, based on self-sampling data 2021-2022, shows considerable variability over the year (Figures 4.3.1 – 4.3.4). The total shrimp landings and bycatches are also depending on the total fishing effort which also varies over the year, and differs between subareas (Figure 4.3.5). As an example of variability, bycatches of all fractions differ when comparing estimates from quarter 4 in 2021 and 2022, although this can partly be explained by that they were not equally sampled (regarding spatial distribution and total number of samples).

4.3.2 TAC species in the bycatch

Results show that total bycatches of both TAC fish species as well as other fish were highest in quarter 4 and lowest in quarter 1 (Figure 4.3.1). This correlates with the total effort and shrimp total landings in these quarters (Figure 4.3.5). The landed shrimp biomass was higher than the estimated biomass of bycaught TAC fish species in all quarters. However, the fractions 'TAC fish species' as well as 'other fish' were in the same order of magnitude as the landed (boiled) shrimp (Figure 4.3.1). The total bycatch of benthos was highest in quarter 3. The most common TAC fish species in the bycatches were plaice, whiting, sprat and herring (Figure 4.3.2). Out of those were plaice mostly caught in quarter 2, 3 and 4, whiting in quarter 4, sprat in quarter 4 and herring in quarter 1 and 4 (Figure 4.3.2). Out of the TAC flatfish species, sole was the second most common species in the bycatches after plaice. Sole was mostly caught in quarter 3. Other TAC flatfish species in the bycatches were lemon sole and turbot. Bycatches of brill were negligible (Figure 4.3.3). Out of the so called "roundfish" species (as opposed to "flatfish"), whiting was the most common in the bycatch while catches of cod were close to negligible. Among the roundfish species were the pelagic species sprat and herring, which were mainly caught in the winter (quarters 1 and 4). The pelagic species mackerel and horse mackerel were close to negligible in the bycatches (Figure 4.3.4).

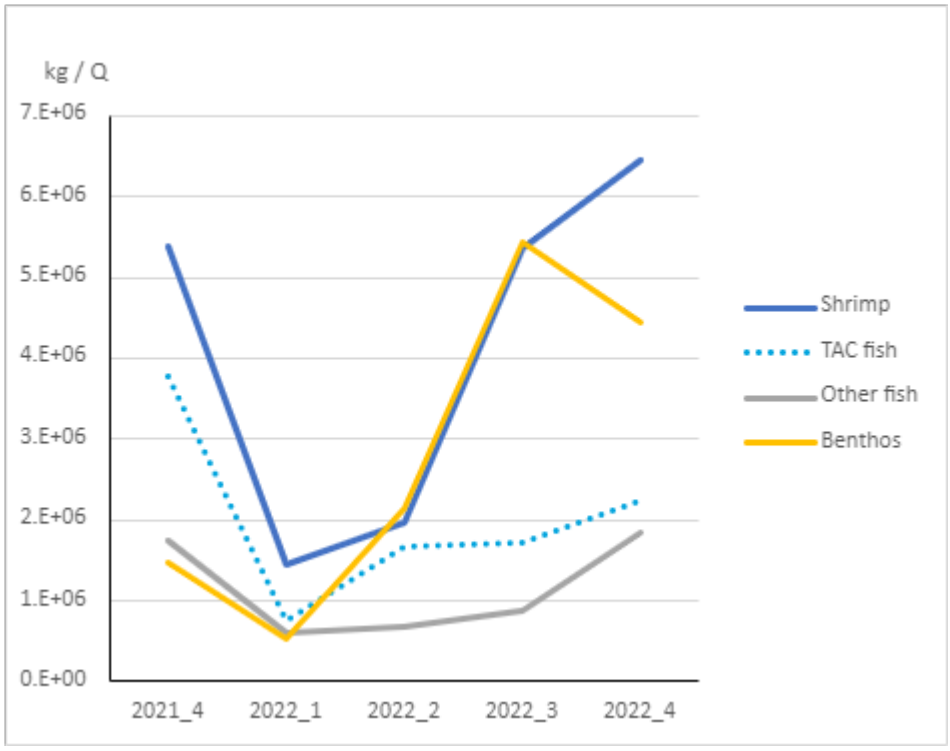

Figure 4.3.1 – *Total shrimp landings (boiled), and estimated bycatches of TAC fish species, other fish species and benthos raised to the total shrimp fleet per quarter (Q4 2021 to Q4 2022). Data from the self-sampling programme 2021-2022.*

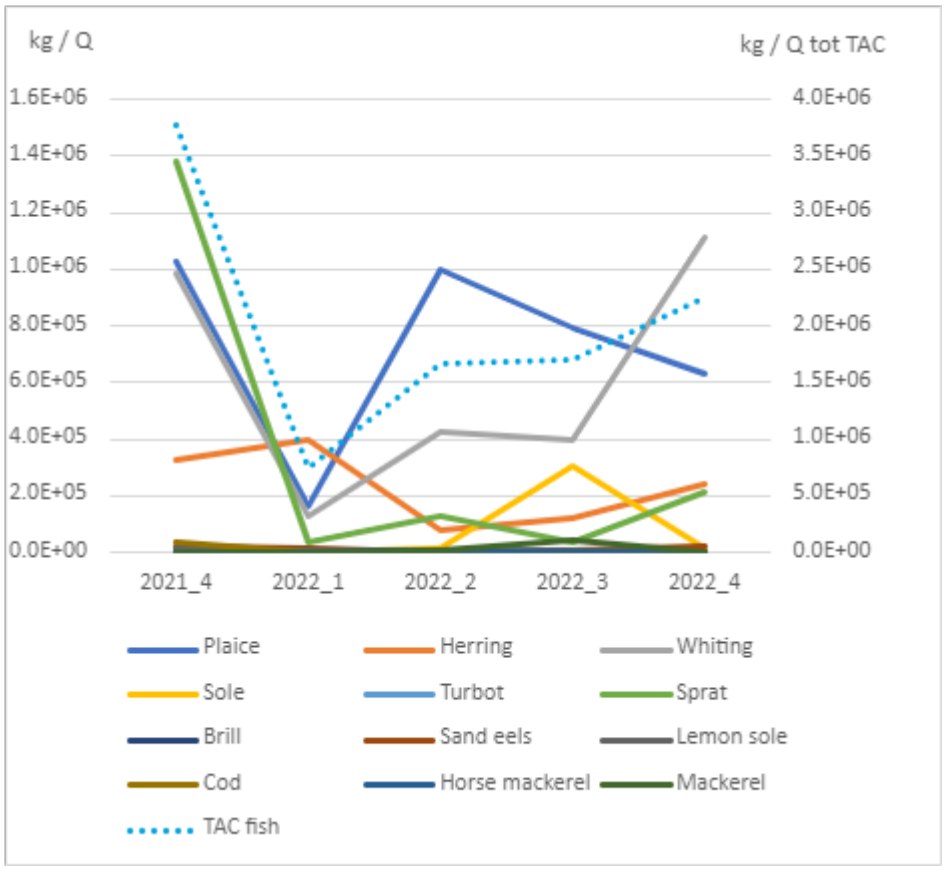

Figure 4.3.2 – *Bycatches per quarter of each TAC fish species as well as total bycatches of these.*

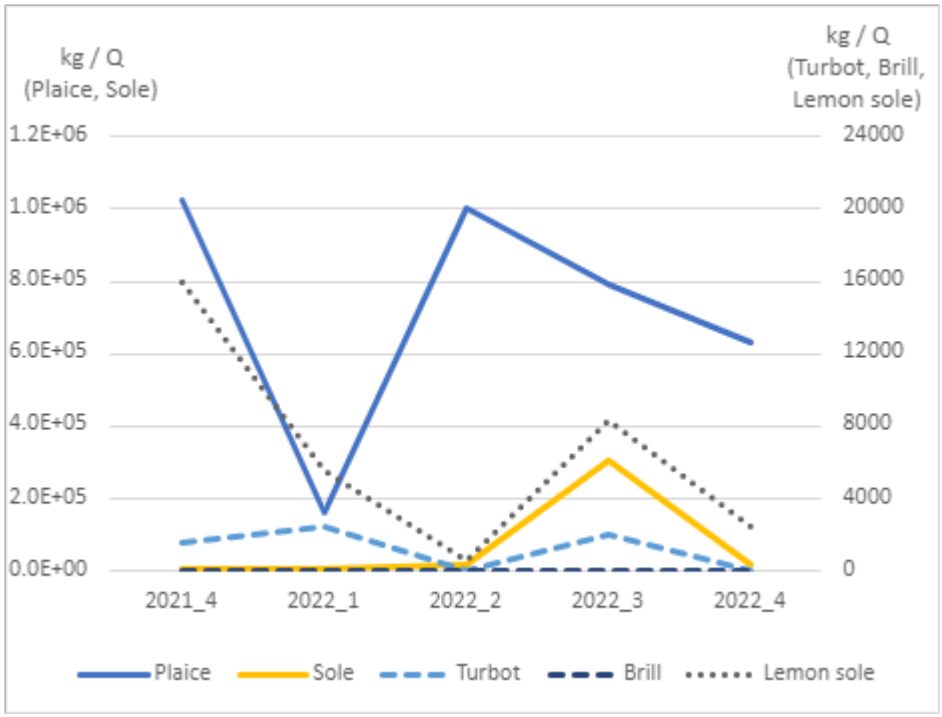

Figure 4.3.3 – *Bycatches per quarter of flatfish species (TAC).*

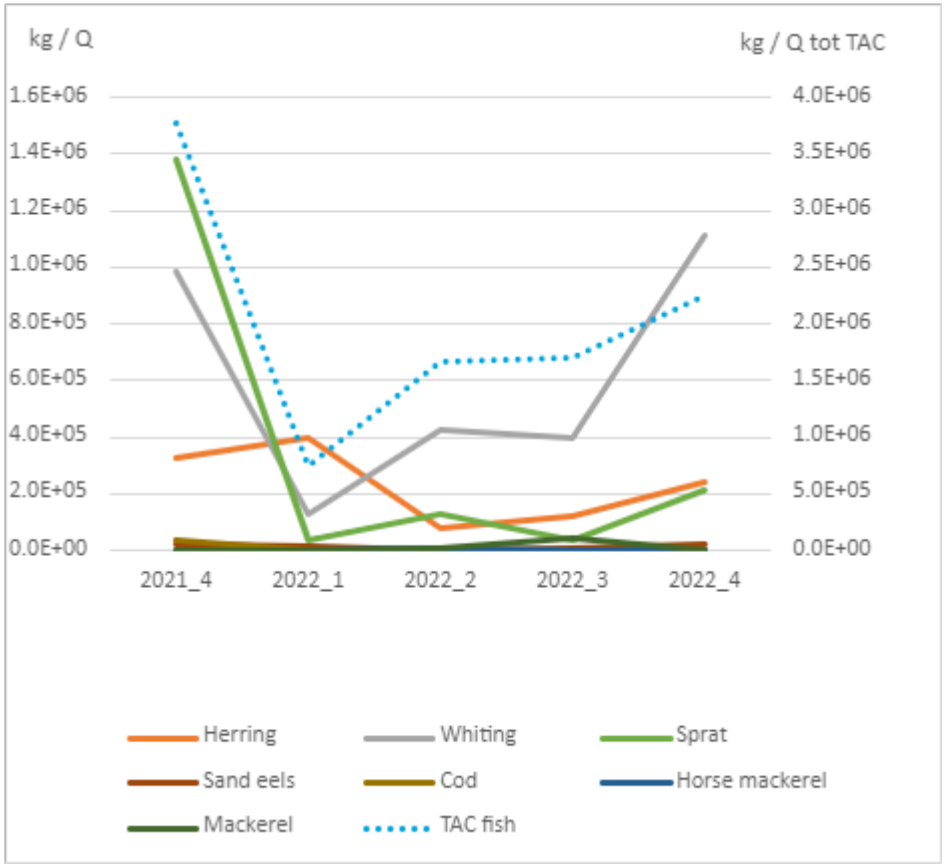

Figure 4.3.4 – *Bycatches per quarter of "roundfish" species (TAC), of which herring, sprat, horse mackerel and mackerel are pelagic species.*

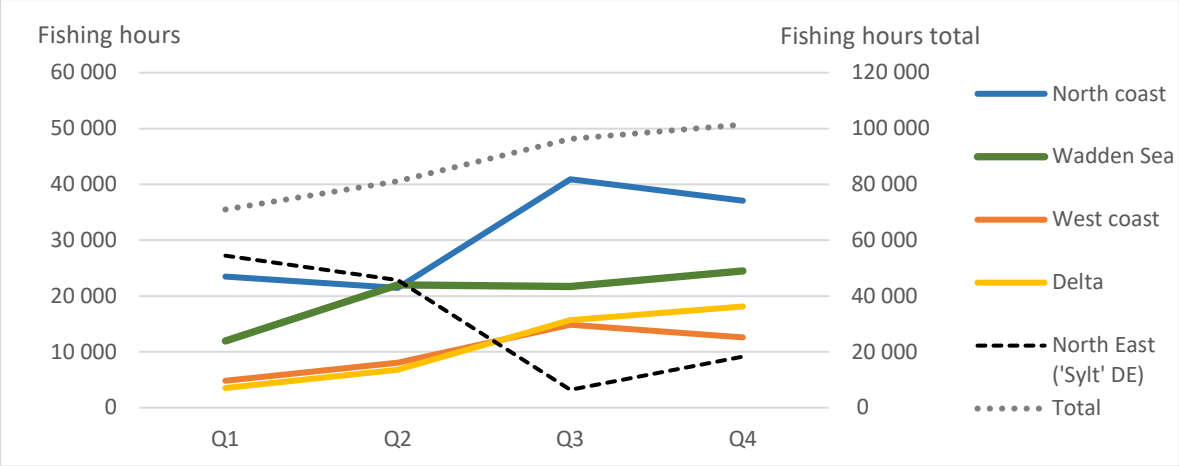

Figure 4.3.5 – *Total fishing hours as averages per quarter (VMS and logbook data 2016-2022) in Dutch shrimp fisheries, divided into five subareas.*

4.3.3 Other bycatch

Both in quarter 2 and 3, the estimated total catch of benthos was similar to the total landings of shrimp, indicating significant amounts of benthos biomass in the catches. It can be expected that large amounts of benthos, consisting of mostly species of crabs, sea stars and brittle stars, would influence the time and effort needed to sort out the TAC fish species.

The bycatch of Hydrozoa (often named "bloemetjes" or "apenhaar"), and sea lettuce (*Ulva* sp.) as well as other algae were not sorted separately in the self-samples. However, it is well known that unwanted bycatch in shrimp fisheries can also include hydrozoa as well as algae, mostly sea lettuce, which can clog the nets and be a nuisance for the fishery. Especially in the summer and early autumn, bycatches of hydrozoa, algae in addition to benthos may be very large. It can be judged that the work to sort out TAC fish from such catches would then mainly depend on the amounts of these fractions (and in some cases it is not possible for the fishers to separate the shrimp and the whole catch is discarded).

4.4 Costs involved

4.4.1 Economic data of the Dutch shrimp fleet

In the Netherlands the main fleet (MFL) is segmented in two parts: MFL1 vessels are vessels that target species with individual catch quota, i.e. 'TAC species', and MFL2 vessels are the vessels that target species with no individual catch quota (e.g. North Sea shrimps)[1].

For this study we classify the shrimp vessels as follows:

1. Vessels with an engine power of less than or equal to 260 hp (<= 260 hp).
2. Vessels with an engine power of 261-300 hp in the MFL2 segment which fish entirely for shrimp (>260 hp).
3. Vessels with an engine power of 261-300 hp in the MFL1 segment. These vessels can, in addition to fishing with the shrimp trawl, switch to other fishing gear targeting other species e.g. flatfish or Norway lobster. These vessels can target these other species, provided that the vessels have the compulsory fishing authorisations (> 260 hp combined).

This classification provides the most accurate structure for shrimp vessels, because all the economic data can be presented according to this.
Vessels with combined fisheries and a sorting belt belong to section 3. But also vessels that have the option of targeting other species than shrimps, but haven't done this the past years, belong to this section. Both vessels selected and used for the observer trips at sea belong to section 3.

[1] https://oceans-and-fisheries.ec.europa.eu/system/files/2019-07/2016_nld_msar_en.pdf

In Table 4.4.1 data is provided for the total Dutch shrimp fleet per section. The fleet section 261-300 hp combined is the largest section in the Dutch shrimp fleet with 55% of the vessels, 60% of the fishing effort, 63% of the catches of shrimps and 65% of the total revenue. The fishing effort presented is only the effort of the shrimp fishing trips, just as the total revenue. The effort and revenue of the fishing trips with other gear targeting other species is thus excluded.
The total catches of shrimps are 17.9 million kg per year for the whole Dutch shrimp fleet (average 2016-2021) and have a value of around 70 million euros per year (revenue shrimp (in €)). The total revenue is the shrimp revenue supplemented with e.g. fees for participating in research and revenues for bycatches of fish during the shrimp fishing trips.

Table 4.4.1 *- Data of the Dutch shrimp fleet per section. Fishing effort, catches and revenue are per year based on the average of 2016-2021.*

	<= 260 hp	> 260 hp	> 260 hp combined	Total
Number of ships	45	45	110	200
Fishing effort (days at sea)	3,183	4,677	11,333	19,192
Shrimp catches (in kg)	2,372,069	4,199,261	11,322,512	17,893,842
Revenue shrimp (in €)	€ 9,495,183	€ 16,004,246	€ 44,850,902	€ 70,350,332
Total revenue (in €)	€ 9,554,066	€ 16,343,675	€ 45,567,671	€ 71,465,412

Source: Official logbook registrations and FADN-data, processed by Wageningen Economic Research.[2]

In Table 4.4.2 per fleet section the data per average vessel is provided. Overall, the vessels with less than 260 hp have approximately two third of the days at sea compared with the vessels with more than 260 hp. The total shrimp revenue of these vessels is about half of the revenue of the combined vessels with more than 260 hp.

Table 4.4.2 *- Overview of the basic data of the Dutch shrimp fleet. Fishing effort, catches and revenue are per year per vessel based on the average of 2016-2021.*

	<= 260 hp	> 260 hp	> 260 hp combined
Fishing effort (days at sea)	72	104	103
Shrimp catches (in kg)	53,305	93,317	102,621
Revenue shrimp (in €)	€ 213,375	€ 355,650	€ 406,504
Total revenue (in €)	€ 214,698	€ 363,193	€ 413,000

Source: Official logbook registrations and FADN-data, processed by Wageningen Economic Research.

4.4.2 Catches of shrimp, TAC species and all bycatch

The quantities of bycatches (both total and TAC species) used in this study are collected in the self-sampling program that was set up by member states with a significant shrimp fishery (Germany, Denmark and the Netherlands). Self-sampling data were collected from Q4 2021 until Q4 2022.

In the self-sampling program data is collected per fishing area and per month. Due to the limited number of sampling trips, for this study averages per quarter were used (Beier et al. 2023). No distinction between the different subareas is used in the calculations. As data was collected for five quarters, the data from Q4(2021) and Q4(2022) are averaged to obtain an estimate for Q4. For the self-sampling program, the shrimp quantity was presented in boiled weight. The shrimp catches of the fleet are in live weight. Therefore, the shrimp catch weight in the self-sampling program was multiplied by the conversion factor of 1.18 to obtain the catches in live weight (ICES 2019). All quantities are converted to the level of the Dutch shrimp fleet.

[2] https://www.agrimatie.nl/SectorResultaat.aspx?subpubID=2232&sectorID=2860

Table 4.4.3 shows that the catches of shrimp vary during the year, with 10% of the catches in Q1 and 40% of the catches in Q4. This is analogue to the total effort which is generally increasing by quarter (Figure 4.3.5). The bycatch of TAC species is also largest in Q4. In ratio to the shrimp catches the largest TAC species bycatch ratio and the total bycatch ratio is highest in Q2. The overall bycatch of benthos is the largest in Q3. As the catches of shrimp are high in this quarter, the ratio is lower than in Q2.

Table 4.4.3 *- The quantity of marketable shrimp, TAC species, other fish in kg per quarter (total Dutch shrimp fleet).*

Quarter	Shrimp (fresh weight)	TAC species	Other fish	Benthos	Total (excl. shrimp)	Ratio shrimp: TAC species	Ratio shrimp: total bycatch
1	1,691,094	747,484	597,323	528,988	1,873,795	0.44	1.11
2	2,307,253	1,667,981	668,389	2,129,223	4,465,593	0.72	1.94
3	6,324,659	1,708,060	868,440	5,443,116	8,019,617	0.27	1.27
4	6,972,698	3,009,603	1,789,223	2,950,589	7,749,415	0.43	1.11

Source: Data Q4 2021-Q4 2022 from the self-sampling project.

4.4.3 Sorting time TAC species and all bycatch

To estimate the time needed to process undersized TAC species onboard a shrimp vessel, the duration of the process was measured and registered during two observer trips onboard two vessels with sorting and sorting belt (see also Chapter 4.2). On both vessels two hauls TAC species were sorted from the catch (haul 1 and 3 onboard vessel 1 and haul 2 and 4 onboard vessel 2). Both vessels belong to the fleet section 261-300 hp vessels (MFL1) and have a sorting belt.

The sorting time of the TAC species from the total catch is calculated in relation to the kg total bycatch (including TAC species, other fish and benthos) and the kg TAC species. This is done to take account of the fact that the occurrence of (large amounts of) other bycatches will also increase the time needed to sort the TAC species from the total catch. The sorting time of TAC species varies between 0.9 and 5.0 minutes per kg total bycatch and the average is 2.5 minutes. The sorting time per kg TAC species varies between 4.2 and 11.3 with an average of 7.2 minutes (table 4.4.4).

Table 4.4.4 *- The data from the observer trips and calculated sorting time per kg bycatch and kg TAC species.*

	Vessel 1		Vessel 2		
	Haul 1	Haul 3	Haul 2	Haul 4	Average
Number of crew involved in sorting	3	3	2	2	
Duration of sorting process only (min)	30	30	55	55	
Number of crew * Sorting time (min)	**90**	**90**	**110**	**110**	
Other fish and Benthos (kg)	74	83	9	12	
TAC species (kg)	8	18	13	26	
Total bycatch (kg)	82	101	22	38	
Sorting time per kg bycatch (min)	1.1	0.9	5.0	2.9	2.5
Sorting time per kg TAC species (min)	11.3	5.0	8.5	4.2	7.2

For the fleet section 261-300 hp vessels with combined fisheries, the total catches of shrimp per quarter (average 2016-2021) were combined with the shrimp:TAC species ratio and the shrimp:total bycatch ratio calculated above (Table 4.4.5) to estimate the total amount of TAC species and total bycatch and in this group. These amounts were combined with the average sorting time per kg TAC species and per kg bycatch to estimate total extra processing time for this section.

In Q3, when the total bycatch is the highest and the bycatch of TAC species is relatively low (ratio of 0.27), the total sorting time based on the amount of bycatch is much higher than the total sorting time based on the amount of TAC species. In this quarter the total bycatch (e.g. of benthos) obstructs the sorting of TAC species the most.
In Q1, Q2 and Q4 the total sorting time based on the amount of TAC species is higher than the sorting time based on the amount of bycatch (Table 4.4.5).

Table 4.4.5 *- The average catch of shrimps of the fleet section 261-300 hp vessels with combined fisheries (2016-2021) and the calculated amount of TAC species and total bycatch and the time needed to sort the TAC species (related to the kg bycatch and kg TAC species).*

Quarter	shrimp (kg)	Ratio shrimp: TAC species	Ratio shrimp: total bycatch	TAC species (kg)	total bycatch (kg)	sorting time TAC species (hr)	sorting time bycatch (hr)
1	1,447,972	0.44	1.11	640,021	1,604,407	77,182	66,071
2	1,328,355	0.72	1.94	960,306	2,570,976	115,806	105,875
3	4,186,122	0.27	1.27	1.130,519	5,307,969	136,333	218,586
4	4,360,064	0.43	1.11	1.881,920	4,845,749	226,946	199,552
	11,322,512			**4,612,767**	**14,329,100**	**556,267**	**590,084**

Source: official logbook registrations, processed by Wageningen Economic Research

To estimate the current total working time of the crew onboard a shrimp vessel the fishing effort of the fleet section >260 hp vessels with combined fisheries per month (average 2016 -2021) is multiplied by the average number of crew members (3) and the average working hours per day (16 hours) (Table 4.4.6).

Table 4.4.6 *– The (calculated) total working time at sea for the fleet section 261-300 hp vessels with combined fisheries (2016-2021).*

quarter	effort (days at sea)	Current total working time (hr)
1	2,449	117,547
2	2,514	120,683
3	3,183	152,793
4	3,186	152,944
	11,333	**543,966**

Source: Official logbook registrations, processed by Wageningen Economic Research.

In total, the crew onboard of the Dutch fleet section 261-300 hp vessels with combined fisheries works 544,000 hours per year. When the vessels in this section must sort undersized TAC species, the extra working time is around 556,000 hours based on the amount of TAC species and 590,000 hours based on the amount of bycatch. This means that, if these vessels are obliged to sort undersized catches of regulated species, the total labour time onboard will be more than doubled (Table 4.4.7).

Table 4.4.7 *- The total working time onboard including sorting TAC species for the fleet section >260 hp vessels with combined fisheries (2016-2021).*

	based on TAC species	based on total bycatch
extra time needed for sorting TAC species (hr)	556,267	590,084
current total working time (hr)	543,966	543,966
total working time (hr)	1,100,233	1,134,050

Percentage extra time needed for sorting TAC species	102%	108%

4.4.4 Costs involved in landing TAC species

Estimation of the costs and revenues of the shrimp fleet is based on data from the Dutch sampling programme for economic data from the fisheries. Within this programme Wageningen Economic Research collects economic data from a panel of approx. one third of the Dutch active fishing vessel fleet (90 vessels) through the 'Bedrijveninformatienetwerk' (Farm Accountancy Data Network, FADN). These data give detailed insight into the costs and earnings of the various vessel types and fisheries (see also www.visserijincijfers.nl).

The costs involving the handling of the undersized TAC species were assumed to be related to the extra sorting time. These extra costs are estimated for these three options which are based on the possibilities of the vessels within the current management system:

a. Larger crew, same fishing pattern and effort: the total crew (including the ship owner) receives the same share of the revenue.
b. Larger crew, same fishing pattern and effort: each crew member receives the same share of the revenue.
c. Same crew and effort, different fishing pattern (less hauls per fishing trip): each crew member receives a share of the new revenue.

The first two options assume that the vessel will take onboard a double crew in order to enable the crew to spend the time sorting the catch and get their rest.
In case there would be no effort restrictions, fishermen could choose to fish longer, but within the current management system, the effort of shrimp fisheries is limited, and these vessels already use the maximum days at sea (4.5 days per week), when they fish for shrimp.

4.4.4.1 Total crew receives same share of the revenue

If the total share of the revenue for the crew stays the same, each crew member will receive less due to the extra processing time needed to sort the undersized TAC fish (Table 4.4.8). The effort, catches and revenue stay the same, but due to the extra sorting time needed, the crew has to be more than doubled. This results in a share per crew member of less than half and the crew members pay for the extra crew costs.

Table 4.4.8 *- Option a.: Share per crew member based on constant total share for the fleet section >260 hp vessels with combined fisheries (2016-2021).*

	Current	based on TAC species	based on total bycatch
Fishing effort (days at sea)	103	103	103
Total catch of shrimp (kg)	102,621	102,621	102,621
Revenue shrimp	€ 406,504	€ 406,504	€ 406,504
Total revenue	€ 413,000	€ 413,000	€ 413,000
Net profit	€ 66,892	€ 66,892	€ 66,892
Total share for the crew	€ 160,501	€ 160,501	€ 160,501
Number of crew members	3.00	6.07	6.25
Share per crew member	€ 53,500	€ 26,451	€ 25,662

Source: Official logbook registrations and FADN-data, processed by Wageningen Economic Research.

4.4.4.2 Each crew member receives the same share of the revenue

If the ship owner pays the same share per crew member all the extra costs due to the sorting of the undersized TAC fish are at the expense of the ship owner and lower the profit. As the crew costs more than double, the profit becomes negative. The crew gets paid as before but the company suffers serious loss (Table 4.4.9).

Table 4.4.9 *- Option b.: Profit based on constant share per crew member for the fleet section >260 hp vessels with combined fisheries (2016-2021).*

	Current	based on TAC species	based on total bycatch
Fishing effort (days at sea)	103	103	103
Total catch of shrimp (kg)	102,621	102,621	102,621
Revenue shrimp	€ 406,504	€ 406,504	€ 406,504
Total revenue	€ 413,000	€ 413,000	€ 413,000
Net profit	€ 66,892	-€ 97,239	-€ 107,217
Total share for the crew	€ 160,501	€ 324,632	€ 334,610
Number of crew members	3.00	6.07	6.25
Share per crew member	€ 53,500	€ 53,500	€ 53,500

Source: Official logbook registrations and FADN-data, processed by Wageningen Economic Research.

4.4.4.3 Same crew and fishing effort, less hauls per fishing trip

If the number of crew members and the fishing effort stay the same, the number of hauls per fishing trip will need to be reduced due to the extra sorting time for the undersized TAC fish. The total revenue will be reduced proportionally with the reduction in hauls: based on TAC species and total bycatch with 51 and 52% respectively to € 204,191 and € 198,102. The crew members only receive about 40% of the payment in the current situation. The profit in the situation that the TAC species have to be sorted is negative (Table 4.4.10).

Table 4.4.10 *- Option c.: Profit and share per crew member based on same crew and fishing effort for the fleet section >260 hp vessels with combined fisheries (2016-2021).*

	Current	based on TAC species	based on total bycatch
Fishing effort (days at sea)	103	103	103
Total catch of shrimp (kg)	102,621		
Revenue shrimp	€ 406,504		
Total revenue	€ 413,000	€ 204,191	€ 198,102
Net profit	€ 66,892	-€ 49,835	-€ 53,239
Total share for the crew	€ 160,501	€ 68,419	€ 65,734
Number of crew members	3.00	3.00	3.00
Share per crew member	€ 53,500	€ 22,806	€ 21,911

Source: Official logbook registrations and FADN-data, processed by Wageningen Economic Research.

5 Discussion

Given the short timeframe of the project, two trips at sea were only carried out during one season, on the same day, on two vessels, on the same location. In order to estimate the sorting time for TAC fish over different seasons, vessels and locations more observer trips will lead to more insight of the duration of the sorting process and extra time and costs involved while implementing the landing obligation.

The different bycatch fractions were estimated using data from the self-sampling project, which was set up in 2021 and covers five quarters. As the North Sea coastal ecosystem is dynamic (e.g., Tulp et al., 2017), bycatches in shrimp fisheries shows a high spatial and temporal variability (Schellekens et al., 2014; Glorius et al., 2015; Steenbergen et al., 2015, Quirijns et al., 2021). Although the sampling was set up to reflect the Dutch shrimp fishery, where fishing effort differs over the year and between subareas (Figure 4.3.5), data from some subareas was missing for some quarters. Therefore, the raising of bycatches to the total fleet was made without taking the fishing effort in different subareas into account. An even more extensive sampling with full coverage of areas and quarters could give a more precise estimate of total bycatches in relation to shrimp landings.

Only the fish of TAC fish species subject to landing obligation were collected, kept on board and landed in order to be able to make an estimate of the costs related to these activities. In addition, TAC fish species were not sorted by species during this process as sorting on board by species is undoable because of limited space, limited amount of crew, extra time needed etcetera. If it will be obliged that TAC fish need to be sorted by species due to the landing obligation, this will lead to even more extra costs. Benthic species, non-quota fish species, seaweed, among other things, were discarded as obliged.

The sorting time for TAC fish was estimated on both the catches of TAC fish and the total by catch. The resulting estimates of the sorting time was not very different, based on these two observations, confirming the conclusion that the extra sorting time is substantial. Seasonal differences in sorting time may however occur, as the proportion of both TAC fish and other bycatches varies considerably in time and place. More information on sorting time in situations with different bycatch compositions would enhance the quality of the estimates.

This study does not yet distinguish between fish above minimum size and undersized unwanted bycatch. It has not yet been decided whether the exemption holds for all TAC fish or only undersized TAC fish. Bycatch of fish above minimum size is negligible compared to the amounts of landed shrimp and in case of catching these fish above minimum size in mixed fisheries they are being landed.

Also, it is still uncertain which issues arise when looking at food safety. TAC species are landed whole, not gutted. Due to limited storage facilities on board shrimp vessels the cooked shrimp need to be stored in the same space as the TAC species, probably leading to food safety issues especially when trip duration is longer and in summer months when temperatures rises. In this study time at sea was limited and therefore which exact issues will arise when implementing the landing obligation when looking at food safety remains unsure.

This study only focused on the Dutch shrimp fleet. No information has been collected about ship types and unwanted bycatch from other member states.

Due to the obligation of sorting the TAC fish extra crew members are needed. Extra costs for payment of these crew members are calculated in this study. Extra costs due to more staff e.g. adjusting the vessel (extra beds, kitchen space etc.), extra food and work clothes weren't included.

6 Conclusions

The results show that, taking into account all aspects concerning duration of the process, extra costs of material, time and personnel, safety aspects and practical implementation, implementing the landing obligation for Dutch shrimp fisheries seems for most vessels very difficult or even not possible. Many issues were identified, and the results show that even for the part of the fleet where sorting is possible (due to the presence of a sorting belt), it will either lead to considerable extra costs due to significant changes to vessels and crew or will on the other hand lead to loss of income. For all other vessels without a sorting belt implementing the landing obligation is not possible.

Extra costs and time are also directly related to the amount and composition of bycatch, which is different over the seasons and locations. Significant amounts of different fractions of bycatches are obtained during all quarters, and total bycatch amounts were in general proportionally larger in quarters where the fishing effort and shrimp landings were higher. An exception is benthos which was proportionally highest in quarter 3. Large amounts of other bycatch than TAC species, such as high proportions of benthos, influences time and effort to sort out TAC species.

For shrimp vessels in the fleet section >260 hp vessels with combined fisheries (MFL1) costs for sorting the TAC fish were calculated. If these vessels are obliged to sort undersized catches of TAC species, the total labour time onboard will be more than doubled. For three options based on the options that are available for fishermen to react to this obligation the effects were calculated.

4. If the total share of the revenue for the crew stays the same, the share per crew member halves. Due to the extra sorting time needed for the TAC fish, the crew has to be more than doubled.
5. If the ship owner pays the same share per crew member and hires the extra crew needed, all the extra costs due to the sorting of the undersized TAC fish lead to a negative profit.
6. If the number of crew members and the fishing effort stay the same, the number of hauls per fishing trip will need to be reduced due to the extra sorting time for the undersized TAC fish. The total revenue will be reduced proportionally with the reduction in hauls. This leads to a negative profit and halving the share of per crew member.

As a result, implementation of the landing obligation in the Dutch shrimp fishery is not economically feasible. Alternatively, there should be room for innovating gears and vessels leading to less bycatch of undersized fish in the future. However, adjustment of the fleet requires time, research and investments.

7 Quality Assurance

Wageningen Marine Research utilises an ISO 9001:2015 certified quality management system. The organisation has been certified since 27 February 2001. The certification was issued by DNV.

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Justification

Report C020/23
Project Number: 4311400045

The scientific quality of this report has been peer reviewed by a colleague scientist and a member of the Management Team of Wageningen Marine Research

Approved: Ir. A.T.M. van Helmond
Colleague scientist

Signature: 

Date: 26th of April, 2023

Approved: Dr. Ir. T.P. Bult
Director

Signature: 

Date: 26th of April, 2023

Appendix 1 – Observer protocol

Protocol – Kosten implementatie aanlandplicht in beeld

Versie 1.0
28 maart 2023
Auteurs: Bryan de Reus, Hans van Oostenbrugge, Bea Deetman, Sophie Neitzel

1 Projectdefinitie

1.1 Achtergrond

Een belangrijk element in de herziening van het Gemeenschappelijk visserijbeleid (GVB) is de verplichting om alle vangsten van soorten waarvoor quota gelden ('TAC soorten') aan land te brengen. Onder deze aanlandplicht moeten ook alle discards van commerciële soorten die gereguleerd worden door quota aangeland worden (EU 1380/2013). De aanlandplicht is stapsgewijs ingevoerd en is sinds 1 januari 2019 geheel van kracht. Op deze aanlandplicht zijn uitzonderingen mogelijk, zoals een "*de minimis*" uitzondering. Deze is van toepassing op gequoteerde soorten gevangen door bepaalde visserijen waarbij selectief vissen (vissen met zo min mogelijk ongewenste bijvangst) niet verder mogelijk is, wanneer de kosten voor het aan boord houden disproportioneel zijn.
Voor de visserij op garnalen (*Crangon crangon*) geldt sinds 1 januari 2019 een *de minimis* uitzondering (EU 2018/2035). Deze uitzondering is toegekend op voorwaarde dat lidstaten met een belang in de garnalenvisserij (Duitsland, Denemarken en Nederland) een zelfbemonsteringsprogramma opzetten en uitvoeren, om een beter inzicht te krijgen in de hoeveelheid bijvangsten in de garnalenvisserij en tevens onderzoek doet naar de disproportionele kosten die gemoeid zijn met het invoeren van de aanlandplicht. De bijvangstgrens is nu 6% (in percentage van totaal vangstgewicht) en zal in de komende 4 jaar worden verlaagd tot 5%.

1.2 Kennisvraag en doelstelling

Omdat de huidige periode van de *de minimis* uitzondering afloopt, moet deze uitzondering opnieuw worden aangevraagd in de Joint Recommendation (JR) in mei 2023. Hiervoor is afgesproken dat de kosten die gemoeid zijn met het invoeren van de aanlandplicht voor de garnalenvisserij worden onderzocht en onderbouwd. Het Ministerie van LNV heeft daarom opdracht gegeven aan Wageningen Marine Research (WMR) en Wageningen Economic Research (WEcR) om te onderzoeken en te rapporteren wat de extra kosten zijn die gepaard gaan met implementatie van de aanlandplicht in de garnalenvisserij. Het gaat daarbij om de kosten die gemoeid zijn met het verwerken, aan boord houden en aanlanden van aanlandplichtige bijvangstsoorten.
De onderzoeksvragen zijn als volgt geformuleerd:

1. Welke problemen kunnen worden geïdentificeerd bij de implementatie van de aanlandplicht in de garnalenvisserij?
2. Hoe ziet de samenstelling van de Nederlandse garnalenvloot eruit als we kijken naar faciliteiten die nodig zijn voor de uitvoering van de aanlandplicht zoals bijvoorbeeld: scheepstype, vries/koelcapaciteit en leesband en wat zijn per scheepstype mogelijke bottlenecks?
3. Hoe zien de vangstsamenstellingen van de bijvangsten in de garnalenvisserij eruit en hoe verschillen deze tussen seizoenen en gebieden?
4. Kan een inschatting worden gemaakt van de kosten die zijn gemoeid met de implementatie van de aanlandplicht in de garnalenvisserij?

Dit onderzoek betreft een semi kwantitatief onderzoek waarin een overzicht wordt gegeven van de moeilijkheden/beperkingen bij de implementatie van de aanlandplicht in de garnalenvisserij en waar mogelijk een indicatie wordt gegeven van de kosten die implementatie met zich meebrengt. Het antwoord op vraag 4 is dus mogelijk niet voor alle schepen/aspecten van de visserij te geven. In een expertsessie wordt in kaart gebracht wat de kritische factoren zijn die de kosten van implementatie van de aanlandplicht bepalen.

Het project zal opgeleverd worden in de vorm van een rapportage waarin een bundeling van kennis van zowel het visserij technische deel (WMR) en het economische deel (WEcR) zal worden beschreven.

1.3 Afbakening

De resultaten van dit project geven een best mogelijke indicatie van de technische problemen en kosten die komen kijken bij het invoeren van de aanlandplicht, op basis van expert judgements, enquêtes, enkele waarnemersreizen aan boord en reeds beschikbare data.
Enkele aandachtspunten hierbij zijn:

- De waarnemersreizen zijn slechts tijdens een seizoen uitgevoerd. Omdat er drie reizen zullen worden uitgevoerd zal slechts op 2 schepen, in een gebied en op 1 moment data worden verzameld over de sorteertijd van de discards. Gegevens over de hoeveelheid discards worden uit het reguliere (selfsampling)bemonsteringsprogramma gebruikt.
- Het oordeel over disproportionaliteit wordt niet gegeven omdat die beleidskeuze niet bij de rol van WR als onafhankelijk wetenschappelijk instituut past.
- Er is ervan uitgegaan dat enkel de gequoteerde en dus aanlandplichtige vissoorten moeten worden verwerkt, aan boord gehouden en aangeland om een schatting te kunnen maken. Onder andere niet gequoteerde vissoorten (o.a. schar, bot), 'verboden soorten' (ETP soorten als houting, zeeprik, zeeforel), benthos, wier en 'bloemetjes' gaan nog steeds over boord, maar kunnen het sorteerproces wel bemoeilijken.
- Dit onderzoek maakt tevens onderscheid tussen maatse of ondermaatse, ongewenste bijvangst.
- Het rapport gaat alleen over de Nederlandse vloot. Er is geen informatie verzameld over scheepstypes en hoeveelheden ongewenste bijvangst van vloten van andere landen.

2 Opzet

2.1 Onderzoeksopzet

De sector heeft inzichtelijk gemaakt uit welke kotters de Nederlandse garnalenvloot bestaat. Dit houdt in dat er gekeken wordt of de kotter een combi kotter is voor gemixte visserij op langoustines/platvis en garnaal, enkel garnaal, met of zonder sorteer- of leesband. Uit dit overzicht ontstaat een verschil in type kotters. Op de drie meest voorkomende typen worden waarnemersreizen uitgevoerd. Tevens zullen voor ieder van de typen schepen garnalenvissers en waarnemers van WMR enquêtes invullen en worden geïnterviewd over technische/praktische zaken waar tegenaan wordt gelopen tijdens het verwerken van de vangst. Het kan hier gaan om het onderscheiden van bepaalde (vis)soorten wat invloed heeft op de discards of aanlandingen, de ruimte aan boord, veiligheidsaspecten maar ook de koelmogelijkheden en sorteermogelijkheden aan boord van een kotter. Met behulp van de vangstsamenstelling en de handelingen wordt een globale inschatting gemaakt of en zo ja in welk deel van de vloot het technisch mogelijk is om de aanlandplicht in te voeren en wat dit aan kosten of problemen met zich meebrengt. Deze inschatting wordt gemaakt voor de situatie waarin alle gequoteerde vissoorten (maats en ondermaats) moeten worden aangeland.

2.2 Achtergrond traject werving

Aan het begin van dit additionele onderzoek zijn schepen benaderd door WMR die willen helpen om onderzoekers van WMR één dag aan boord te nemen om het hele proces in kaart te brengen. Spreiding in gebieden is in deze niet relevant omdat het een momentopname betreft; seizoens- en gebiedsverschillen komen duidelijk naar voren in de selfsampling data en uit de enquêtes.
Voor de enquêtes en interviews zijn 10 vissers benaderd: hiervan doen de 3 schepen van de waarnemersreizen mee. De spreiding over de typen kotters en gebieden van vissers op het Wad, in zuidkust (S-C) en Noordzee kustzone (NZKZ) is hierin wel belangrijk en wordt meegenomen in het benaderen van schepen. Ook de Vissersbond en andere PO’s hebben hierin een rol, omdat de onderzoekers mogelijk niet alle contactgegevens van schepen uit alle verschillende typen ter beschikking hebben.

3 Waarnemersreis

3.1 Voorbereiding

De projectleider van dit onderzoek houdt contact met de schippers over de weersomstandigheden, plek en tijd van opstappen. Het moet duidelijk zijn hoe het totale proces van het verwerken van de garnalen gaat om praktische zaken aan het licht te brengen. Dit moet ook duidelijk naar de schipper gecommuniceerd worden. Zij ontvangen op voorhand dit protocol en worden geïnstrueerd via de telefoon of voor aanvang van de eerste trek. Het proces van vissen op garnalen moet zo natuurlijk mogelijk worden nagebootst om zo een compleet mogelijk beeld te krijgen.
Tijdens de geplande waarnemersreizen voor dit additionele onderzoek moeten de kosten die gemoeid zijn met de implementatie van de aanlandplicht naar voren komen. De onderzoeker(s) die met een waarnemersreis mee gaan aan boord moeten het gehele proces van sorteren, opslag en aanlanden doorlopen en extra handelingen moeten in kaart gebracht worden en duidelijk worden geregistreerd. Ook hier wordt gewerkt met enquêtes en consultaties met de betrokken garnalenvissers waarbij we inzichtelijk willen krijgen tegen welke praktische zaken zij aan lopen en hoe lang een dergelijk sorteerproces zou duren in verschillende situaties.
De drie gekozen schepen worden ingehuurd om een dag op zee te gaan en het gehele proces door te lopen en verschillende scenario's in te beelden waarbij het proces bemoeilijkt of makkelijker gemaakt wordt. De onderzoeker houdt alles bij gedurende dit proces. Hoe het proces aan boord eruit gaat zien wordt beschreven in hoofdstuk 3.2.

3.2 Aan boord

De onderzoeker(s) stapt bij het betreffende schip aan boord en bespreekt met de schipper hoe de reis eruit gaat zien en biedt de schipper en bemanning de mogelijkheid tot het stellen van vragen over dit protocol en het onderzoek in het algemeen. De dag duurt ongeveer 10-12 uur, waarbij het stomen is meegerekend. Idealiter vinden een of enkele trekken 's nachts plaats, maar mocht dit praktisch niet haalbaar zijn kan daarnaar worden gevraagd in de enquête wat het zou inhouden om dit proces in het donker te doorlopen. Om de handelingen op de verschillende scheepstypen met elkaar te kunnen vergelijken worden trekken van 120 minuten gedaan. Op deze manier is de inspanning op elk schip hetzelfde en kan daarna in kaart gebracht worden hoe lang het verwerkingsproces duurt met én zonder de aanlandplicht. Elk scheepstype heeft hierbij zijn eigen mogelijk- en moeilijkheden.
Aan boord is het daarom belangrijk om de normale situatie en de aangepaste situatie in kaart te brengen. De kotter vist zoals het normaal ook zou vissen, behalve dat we de tijdsduur van de trekken standaardiseren naar 120 minuten per trek, en voor twee van de vier trekken doen alsof de aanlandplicht is ingevoerd. De onderzoeker schrijft mee met het proces en houdt bij hoelang het proces duurt en welke zaken van belang zijn. In totaal worden er dus 4 trekken gedaan: twee 'normale' trekken met normale vangstverwerking waarbij de onderzoekers alleen waarnemen en het proces timen, en twee 'aanlandplichtige trekken' waarbij wordt gedaan alsof de aanlandplicht reeds is geïmplementeerd. Zie hoofdstuk 3.2.1 en 3.2.2 voor verdere uitwerking van de trekken.
Foto's en video's (proces, sorteerband, visruim, kisten etc.) moeten tijdens de processen gemaakt worden om alles te verduidelijken (**Let op! Laat bemanning en namen van het schip onzichtbaar**).
Meeneemlijst voor de onderzoeker:

- Savety at Sea, medische keuring, visserijcursus en paspoort
- Reddingsvest en overlevingspak
- Unster en emmer om te wegen
- Lineaal om vangst in de lastbak te bepalen
- Uitgeprint protocol
- Voldoende papier, potloden, pennen en turflijsten om te noteren
- Laptop voor afnemen van de enquête en uitwerking aan boord (tijdens de trek)
- Oliegoed en veiligheidslaarzen

- Eten en drinken

3.2.1 Twee 'normale' trekken (2x 120min)

De onderzoekers brengen voor de 'normale trekken' de volgende zaken in beeld:

- Hoeveelheid gekookte garnalen (kg)
- Totale vangst in de lastbak (cm)
- Tijdsduur van het totale verwerkingsproces (min)
- Proces aan boord:
    - Hoe veel bemanningsleden?
    - Taakverdeling?
    - Proces van lastbak tot gekookte garnaal (bandjes, opvangen etc.)?

3.2.2 Twee 'aanlandplichtige' trekken (2x 120min)

Van deze twee trekken moet worden nagebootst dat de situatie van de aanlandplicht van kracht is. Hierbij moeten dus alle ondermaatse, gequoteerde bijvangstsoorten uit de vangst worden gehaald, apart worden opgeslagen in het visruim, en de rest van de vangst worden verwerkt zoals 'normaal'. Zodra de trek gestort wordt in de lastbak wordt de vangst verwerkt met in het achterhoofd houdende dat de gequoteerde, ondermaatse soorten uit de vangst gehaald moeten worden. We streven ernaar de gehele vangst uit te zoeken, maar mocht dat praktisch of tijd technisch niet haalbaar zijn kiezen we ervoor een deel van de vangst (sample van 10 liter) te nemen. Noteer dit duidelijk op de turflijst, evenals het aantal cm vangst uit de lastbak. Afhankelijk van het type kotter moet het sorteren gebeuren uit de lastbak, aan de sorteerband of door het opvangen van de bijvangsten na een sorteerproces. De onderzoekers brengen voor de 'aanlandplichtige trekken' de volgende zaken in beeld:

- Hoeveelheid gequoteerde, ondermaatse soorten (kg)
- Hoeveelheid gekookte garnalen (kg)
- Hoeveelheid overige discards (niet gequoteerde soorten, benthos, wieren, varia) (kg)
- Totale vangst in de lastbak (cm)
- Tijdsduur van het totale verwerkingsproces (min)
- Tijdsduur van het uitzoeken van gequoteerde soorten (min)
- Problemen die zich voordoen tijdens het sorteerproces van gequoteerde soorten:
    - Misidentificatie van soorten? Kan de bemanning soorten onderscheiden?
    - Veiligheid? Werken in de nacht? Arbo – voorover gebukt sorteren uit de last?
    - Opslag? 1 visruim, staan ze ver genoeg van het gekookte product?
    - Duur van het sorteren, genoeg mankracht?
    - Praktische zaken aan boord? Sorteerband nodig of kotter te klein?

3.3 Verwerking en data analyse (na waarnemersreis)

De nagebootste processen worden uitgewerkt in een samenvatting en verslag na elke waarnemersreis. De foto's moeten hier als verduidelijking zorgen. Eventuele samples (10 liter) die genomen zijn moeten worden teruggerekend naar totale vangst, en schatting van de tijdsduur voor de gehele vangst per trek moet tevens worden gemaakt.

Appendix 2 – Interview questions fisher

Enquête implementatie aanlandplicht garnalenvisserij (vissers)

Voor een additioneel onderzoek aan de huidige garnaalonderzoeken (IRC en Selfsampling) omtrent de *de minimis* uitzondering heeft het Ministerie van LNV opdracht gegeven aan WMR en WEcR om te onderzoeken en te rapporteren wat de extra kosten zijn die gepaard gaan met implementatie van de aanlandplicht in de garnalensector. Het gaat daarbij om de kosten die gemoeid zijn met het verwerken, aan boord houden en aanlanden van aanlandplichtige (gequoteerde of TAC) bijvangstsoorten. Aanlandplichtige vissoorten waarvan bijvangsten zijn te verwachten in de garnalenvisserij zijn (momenteel): schol, haring, sprot, wijting, tong, tarbot, griet, tongschar, kabeljauw, zandspiering, smelt en horsmakreel. Praktisch gezien voor de vissers komt het er dus op neer dat deze soorten, maats of ondermaats, handmatig uit de vangst in de lastbakken moeten worden gehaald en aan boord moeten worden opgeslagen om aangeland te worden. Dit onderzoek betreft een semi-kwantitatief onderzoek waarin een overzicht wordt gegeven van de moeilijkheden/beperkingen bij de implementatie van de aanlandplicht in de garnalenvisserij en waar mogelijk een schatting van de extra kosten (inclusief voor werktijd) die implementatie met zich zou meebrengen. Deze enquête is opgesteld om vanuit het oog van garnalenvissers te kijken naar de samenstellingen van de vangst en eventuele problemen die kunnen gaan ontstaan.

1. Hoelang bent u al garnalenvisser?
2. Kunt u iets vertellen over uw garnalenvisserij, zoals de kotter, met hoeveel bemanning bent u aan boord, hoeveel garnaal heeft u in 2022 aangeland?
3. Hoe veel dagen vist u gemiddeld per trip en hoe veel trekken doet u gemiddeld per trip?
4. Welke perioden van het jaar vist u op garnalen en zijn er perioden waarin u niet op garnaal vist? Zo ja, waarom niet?
5. In welke gebieden vist u het meest op garnaal en verschillen die gebieden per maand?
6. Heeft u bijvangsten van aanlandplichtige soorten en zo ja:
7. Welke soorten?
8. In welke hoeveelheden (schatting in kg)?
9. Verschilt dat ook nog per maand? Zo ja, hoe?
10. Wat vangt u nog meer bij naast aanlandplichtige vissoorten?
11. Wat zijn volgens u verschillen in de samenstelling van de bijvangst tussen verschillende gebieden waar u vist?
12. Wat doet u bij veel bijvangst van aanlandplichtige vis? Wordt er bijvoorbeeld al vis voor de spoelmachine opgevangen en teruggegooid?
13. En wat doet u bij veel van overige bijvangst zoals bloemetjes, zeesla of wieren?
14. Sommige bijgevangen aanlandplichtige soorten moeten aan boord gesorteerd worden, zodat apart in het logboek vermeld kan worden hoeveel van de betreffende soort wordt aangeland:
15. Kunt u de verschillende soorten die u bijvangt goed onderscheiden?
16. Welke soorten zijn voor u en uw bemanning lastig te onderscheiden?
17. Hoeveel tijd bent u en uw bemanning gemiddeld per trek kwijt met het verwerken van de vangst?
18. Als u een schatting of bandbreedte kunt geven van de verwerkingstijd per kg garnalen, wat zou deze dan zijn in aantal minuten?
19. Hoe gaat de bijvangst, nadat het door de trommel is gegaan, over boord (graag foto maken van het gootje)?
20. Stel dat de aanlandplicht in de garnalenvisserij voor aanlandplichtige vis doorgevoerd wordt, hoe gaat dit het werk veranderen op uw kotter?
21. En op de inrichting van uw kotter? (graag foto's maken van dek, opslagruimte, opvoerband, evt. leesband en trommel)
22. Als de bijgevangen aanlandplichtige soorten meegenomen moeten worden is er dan genoeg ruimte en koelmogelijkheid op uw vaartuig om bijvangst aan boord op te slaan?

23. Zijn er nog andere zaken die het sorteren en bewaren van de aanlandplichtige soorten aan boord kan bemoeilijken, zoals verlichting aan boord, te weinig mankracht, veiligheidsaspecten?
24. Welke knelpunten en oplossingen zijn er volgens u?
25. Wat zijn volgens u problemen of mogelijkheden die ontstaan bij het invoeren van de aanlandplicht voor de garnalensector?

Foto's: zorg dat er geen mensen op staan en dat niet herkenbaar is welk vaartuig het betreft.

Appendix 3 – Interview questions observer

Enquête implementatie aanlandplicht garnalenvisserij (onderzoekers)

Voor een additioneel onderzoek aan de huidige garnaalonderzoeken (IRC en Selfsampling) omtrent de de minimis uitzondering heeft het Ministerie van LNV opdracht gegeven aan WMR en WEcR om te onderzoeken en te rapporteren wat de extra kosten zijn die gepaard gaan met implementatie van de aanlandplicht in de garnalensector. Het gaat daarbij om de kosten die gemoeid zijn met het verwerken, aan boord houden en aanlanden van aanlandplichtige (gequoteerde of TAC) bijvangstsoorten. Aanlandplichtige vissoorten waarvan bijvangsten zijn te verwachten in de garnalenvisserij zijn (momenteel): schol, haring, sprot, wijting, tong, tarbot, griet, tongschar, kabeljauw en horsmakreel. Praktisch gezien voor de vissers komt het er dus op neer dat deze soorten, maats of ondermaats, handmatig uit de vangst in de lastbakken moeten worden gehaald en aan boord moeten worden opgeslagen om aangeland te worden. Dit onderzoek betreft een semi-kwantitatief onderzoek waarin een overzicht wordt gegeven van de moeilijkheden/beperkingen bij de implementatie van de aanlandplicht in de garnalenvisserij en waar mogelijk een schatting van de extra kosten (inclusief voor werktijd) die implementatie met zich zou meebrengen. Deze enquête is opgesteld om vanuit het oog van getrainde onderzoekers van WMR met ervaring in de garnalenvisserij te kijken naar de samenstellingen van de vangst en eventuele problemen die kunnen gaan ontstaan.

1. Hoelang ben je al werkzaam voor WMR?
2. Bij welke garnalenonderzoeken ben je betrokken (geweest)?
3. Wat zijn (of waren) je werkzaamheden binnen deze garnalenonderzoeken?
4. In welke periodes van het jaar en in welke gebieden vonden deze werkzaamheden eventueel plaats?
5. Is er in dit veldwerk onderzoek gedaan naar de overlevingskans van de bijgevangen vis (en dan voornamelijk met focus op TAC soorten) in de garnalenvisserij?
6. Zo ja, hoe is vanuit jouw ervaring deze overlevingskans (~%)?
7. Indien deze overlevingskans verschilt per soort, kun je dan aangeven hoe je deze overlevingskans inschat of hoe deze verschilt per soort?
8. Waar bestaan de door jou uitgezochte garnalenmonsters uit? Nb: voor de aanlandplicht hoeven de ondermaatse garnalen niet uitgezocht te worden, het gaat enkel op gequoteerde vissoorten (TAC soorten).
9. Wat zijn de volumes (in kg) van de monsters?
10. Welke vissoorten kom je vooral tegen in de monsters?
11. Zijn er vissoorten die moeilijk van elkaar te scheiden?
12. Welke zijn dit?
13. Waar komt dit door?
14. Wat is de kans dat een vissoort verkeerd wordt gedetermineerd?
15. Hoe verschilt de vangstsamenstelling:
16. Tussen maanden/seizoenen?
17. Tussen gebieden?
18. Hoeveel tijd gaat er in het uitzoeken van deze monsters zitten?
19. Hoe veel tijd kost het om alleen bijgevangen maatse vis uit de lastbak uit te zoeken?
20. Hoe veel tijd zou het volgens jou kosten om alle gequoteerde, en dus aanlandplichtige vis (zowel maats als ondermaats) handmatig uit de lastbak te halen?
21. Wat heeft invloed/kan invloed hebben op de snelheid van het uitzoeken?
22. Hoe verschilt het sorteerproces tussen de maanden of seizoenen; waar zitten de knelpunten en hoe schat je de uitzoektijd per monster (aangeven hoe veel kg monsters) in?
23. Wat is jouw mening over praktische mogelijkheden of moeilijkheden met betrekking tot het uitzoeken van de aanlandplichtige soorten uit de vangst in de lastbak(ken) aan boord?
24. Is er een verschil in maats of ondermaats tijdens dit sorteerproces en zo ja, waar verschilt dit?

25. In hoeverre speelt zeewier of mosdiertjes een rol?
26. Is het volgens jou mogelijk om de aanlandplichtige soorten mee te nemen op een garnalenkotter? (Denk aan ruimte, praktische zaken, voedselveiligheid, voldoende kisten en ijs)
27. Zijn er volgens jou aanpassingen aan boord nodig om aan de aanlandplicht te voldoen?
28. En zo ja, welke?
29. Waar liggen volgens jou mogelijkheden om de aanlandplicht wel in te voeren?

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