Diets of demersal fish from the CCGS *Teleost* ecosystemic surveys in the estuary and northern Gulf of St. Lawrence, August 2015-2017

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DIETS OF DEMERSAL FISH FROM THE CCGS *TELEOST* ECOSYSTEMIC SURVEYS IN THE ESTUARY AND NORTHERN GULF OF ST. LAWRENCE, AUGUST 2015-2017

by

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This document summarizes the stomach sampling effort carried out during the August ecosystemic surveys conducted from 2015 to 2017 by the Quebec Region in the lower estuary and northern gulf of St. Lawrence. Descriptive analyses of summer diets are provided for 10 demersal fishes (11 species): black dogfish (*Centroscyllium fabricii*), thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), Atlantic cod (*Gadus morhua*), longfin hake (*Phycis chesteri*), white hake (*Urophycis tenuis*), redfish (*Sebastes fasciatus* and *S. mentella*), lumpfish (*Cyclopterus lumpus*), Greenland halibut (*Reinhardtius hippoglossoides*) and Atlantic halibut (*Hippoglossus hippoglossus*). For these predators, 6,956 stomachs were analyzed, from which 206 taxa could be associated with 87 prey families.

RÉSUMÉ

Ouellette-Plante, J., Chabot, D., Nozères, C. and Bourdages, H. 2020. Diets of demersal fish from the CCGS *Teleost* ecosystemic surveys in the estuary and northern Gulf of St. Lawrence, August 2015-2017. Can. Tech. Rep. Fish. Aquat. Sci. 3383: v + 121 p.

Le présent document résume l'effort d'échantillonnage en estomacs réalisé au cours des relevés écosystémiques d'août 2015 à 2017 effectués par la Région du Québec dans l'estuaire maritime et le nord du golfe du Saint-Laurent. Des analyses descriptives des régimes alimentaires estivaux sont fournies pour 10 poissons démersaux (11 espèces): l'aiguillat noir (*Centroscyllium fabricii*), la raie épineuse (*Amblyraja radiata*), la raie lisse (*Malacoraja senta*), la morue franche (*Gadus morhua*), la merluche à longues nageoires (*Phycis chesteri*), la merluche blanche (*Urophycis tenuis*), le sébaste (*Sebastes fasciatus* and *S. mentella*), la grosse poule de mer (*Cyclopterus lumpus*), le flétan du Groenland (*Reinhardtius hippoglossoides*) et le flétan atlantique (*Hippoglossus hippoglossus*). Pour ces prédateurs, 6956 estomacs ont été analysés, desquels 206 taxons pouvaient être associés à 87 familles de proies.

1 INTRODUCTION

Several changes have been observed in the structure of fish and invertebrate communities in the Lower Estuary and the Northern Gulf of St. Lawrence (ENGSL) in recent decades. In particular, historically very high stocks, mainly Atlantic cod (*Gadus morhua*) and redfish[1], have greatly decreased due to, among other things, overfishing and cold temperatures in the late 1980s and early 1990s (Dutil et al. 1999; Savenkoff et al. 2007). The northern shrimp (*Pandalus borealis*) is one of the species that benefited from this disturbance in the ENGSL. Indeed, the abundance and biomass of this species only increased between the early 1990s and the mid-2000s (Bourdages et al. 2018). However, since the record year of 2004, the biomass of this species has decreased by more than 50 % to reach the levels observed in the early 1990s (Bourdages et al. 2018). Several factors are likely responsible for this decline, including a warming of more than 1 °C in the deep waters of the ENGSL following the warming of the waters that enter the Laurentian Channel at Cabot Strait (Galbraith et al. 2018) and the strong resurgence of some groundfish species. Of these, redfish alone made up almost three-quarters of the total catch from the August 2017 survey, generating abundance and biomass estimated at historic highs (Bourdages et al. 2018). These changes in the structure of communities are likely to modify diets and intra- and inter-specific dynamics in the coming years. It is therefore important to monitor diets in order to understand the effects of the changes observed at the ecosystem level.

It is in this context that the project *Return of groundfish to the estuary and the northern Gulf of St. Lawrence* supported by the Partnership Fund of the Department of Fisheries and Oceans Canada (DFO) got under way in 2017. One of the objectives of the project was to assess changes in the structure and composition of the fish and invertebrate communities of the ENGSL and their impacts on diets and predator-prey relationships. This report is the first publication by DFO for the Quebec Region with the main objective of providing detailed diet descriptions of fish found in the ENGSL.

The objectives of this report are to :

1. Summarize the stomach sampling effort carried out during the Canadian Coast Guard Ship (CCGS) *Teleost* ecosystemic survey conducted in August from 2015 to 2017.
2. Characterize the summer diet[2] from a subgroup of ten demersal fish during this same period.

[1] The species *Sebastes mentella* and *S. fasciatus* are the two most abundant species, very similar morphologically and combined in this work. Although *S. norvegicus* was present in the study area, no stomachs were collected for this species during the reported period. The term *redfish* is used hereinafter to refer to species *S. mentella* and *S. fasciatus*.

[2] In this study, the diet is inferred directly from the analysis of stomach contents, without correction for the retention time which could differ between prey nor weighting for spatial patterns in sampling and distribution of predators.

2 MATERIALS AND METHODS

2.1 Study site

The ENGSL is a semi-enclosed sea connected to the Atlantic Ocean by two openings: Cabot Strait to the southeast and the Strait of Belle Isle to the northeast. It covers Divisions 4R, 4S and the northernmost part of 4T of the Northwest Atlantic Fisheries Organization (NAFO). This region has a distinct character compared to the Atlantic Ocean on the periphery (see the summary in de Lafontaine et al. (1991)). In particular, the dynamics governing physical, chemical and biological processes in this region are the result of internal factors, rather than oceanic influence. This uniqueness of the ENGSL does not, however, imply homogeneity on the scale of the territory, and many sub-regions have long been proposed to help better understand certain natural phenomena. The work of de Lafontaine et al. (1991) provides a good overview of some of the proposed areas.

For this study, zones were developed from the survey strata, in order to facilitate data processing (Figure 1). Three zones were created, with their limits inspired by the work of de Lafontaine et al. (1991) and Ouellet et al. (2015). The first zone, the northwestern gulf (hereinafter NWG), includes all the strata of the estuary, those of the northwestern Gaspésie and Sept-Îles region. It extends a little further to the east due to the particular geographical location of stratum 841 which surrounds Anticosti Island (Figure 1A). The second zone is that of the Laurentian Channel (hereinafter LC), which begins northeast of the Gaspé peninsula and forms a strip running along Anticosti Island to the north and to the southern limit of the ENGSL before widening to the east to cover deep strata. Finally, the northeastern gulf (hereinafter NEG) covers the rest of the ENGSL. Although the LC and NEG zones form only one zone in the previously mentioned works (de Lafontaine et al. 1991; Ouellet et al. 2015), the waters are generally deeper in the LC zone and it is more prudent to distinguish these two regions.

2.2 At-sea sampling and laboratory analyses

Since 1990, DFO has conducted a bottom trawl survey in the ENGSL every August on board the CCGS *Alfred Needler* or *Teleost*. These ecosystemic surveys mainly target groundfish, shrimp and benthic macro-invertebrates. The choice of sites where trawl hauls are made follows a stratified random sampling design. To do this, the study area is divided into strata sharing certain common characteristics, such as depth, NAFO divisions and the substrate type (Figure 1A). For more details on the stratified random sampling design used, see the report by Bourdages et al. (2018).

From 2015 to 2017, different species were targeted for stomach collection (Appendix A). These species will be called predators throughout the report. The selection of predators was made on the basis of current needs for the assessment of certain stocks or simply with the aim of improving knowledge of the diet of the various species in the region. For a successful fishing operation at a given tow, an individual of a given predator was selected for stomach sampling when the set corresponded to the target sets for this predator and the desired number of stomachs for specimens of its length class had not yet been reached. The length classes and the

number of stomachs targeted for each class differed from one species to another (Appendix A). Specimens with food in their mouths were rejected as they could have regurgitated during the ascent or eaten in the trawl. Similarly, the same decision was taken for specimens from which the stomach was evaginated, that is to say expelled from the abdominal cavity to the mouth, a frequent consequence of barotrauma, especially in redfish. Specimens $\leq$ 15 cm were frozen whole in individual plastic bags containing an identification label, while the stomachs of larger specimens were initially excised from their abdominal cavity at sea to maximize space in the freezers of the ship.

Back in the laboratory, the stomachs were thawed just before their examination. A protocol developed by Denis Chabot (Appendix B) guided the examination of stomachs by scientific personnel. In short, each stomach, followed by all of its stomach contents, were weighed (wet weight up to 0.001 g). Subsequently, the contents of each stomach were sorted by type of prey or ingested material, which were then individually weighed, identified at the most precise taxonomic level possible, and then assigned to a digestion stage. Undigested prey were entered as stage 1, while partially digested prey were entered as stage 2. Very digested or partial prey and all other material found were entered as stage 3. Prey identified as stages 1 and 2 were counted, except for the small species present in large numbers, for which 10 individuals were randomly selected and weighed, so as to estimate the total number of individuals of this stage of digestion for this taxon.

Morphometry (length, mass, etc.) and geographic origin of each predator was available for each individual sampled for stomach content analysis. The following analyses use the taxa recorded at the three stages of digestion, and only predators with at least 75 non-empty stomachs collected over the three-year period were considered.

2.3 Diet characterization

2.3.1 Selection and calculation of indices

The percentage of empty stomachs (PES, see Table 1 for the terminology used in this report), the mass contribution (MC), the partial fullness index (FI), the contribution to the total fullness index (CFI) and the frequency of occurrence (FO) are the five measures that were used to classify the importance of the different taxa in the diet of each of the predators. These metrics are taken from the method presented in Bernier and Chabot (2013).

For a given stomach sample[3], the percentage of empty stomach (PES) is calculated as follows:

$$\mathrm{PES} = \frac{\mathrm{N_e}}{\mathrm{N}} \cdot 100 \tag{1}$$

where $\mathrm{N_e}$ is the number of empty stomachs and N is the total number of stomachs in a sample. The mass contribution (MC) of a taxon i is calculated as follows:

$$\mathrm{M_i} = \sum_{\mathrm{j=1}}^{\mathrm{N}} \mathrm{M_{ij}} \tag{2}$$

[3]For example: all LC Atlantic cod stomachs, all Atlantic cod stomachs < 30 cm, etc.

$$\mathrm{MC_i} = \frac{\mathrm{M_i}}{\mathrm{M_{tot}}} \cdot 100 \tag{3}$$

where $\mathrm{M_{ij}}$ is the mass of taxon i in the stomach j, $\mathrm{M_i}$ is the total mass of this taxon in the N stomachs of the sample and $\mathrm{M_{tot}}$ is the total mass of stomach contents of the same sample, expressed as a percentage. As identified in the study by Bernier and Chabot (2013), the use of MC alone has certain disadvantages:

- For a sample of stomachs from a given predator, the sum of $\mathrm{MC_i}$ of all the taxa found gives 100 %. This therefore implies an interdependence between the $\mathrm{MC_i}$ of the different taxa, where a high value found for a given taxon may reflect a decrease in the abundance of alternative taxa and not an increase in the abundance of this taxon in the predator's diet.
- The taxa found in small specimens have less influence on the description of the diet, because they contribute less to $\mathrm{M_{tot}}$ than the stomachs from large specimens.
- MC ignores empty stomachs.

To avoid these potential shortcomings, Bernier and Chabot (2013) also use the partial fullness index for each prey i ($\mathrm{FI_i}$) to describe fish diet. This index is first calculated for each fish ($\mathrm{FI_{ij}}$), then an average value for the sample is calculated ($\mathrm{FI_i}$). This index adjusts the amount of each taxon found in a stomach, taking into account the effect of the size of the predator:

$$\mathrm{FI_{ij}} = \mathrm{M_{ij}} \cdot \mathrm{L_j^{-b}} \cdot 10^4 \tag{4}$$

$$\mathrm{FI_i} = \frac{1}{\mathrm{N}} \cdot \sum_{\mathrm{j=1}}^{\mathrm{N}} \mathrm{FI_{ij}} \tag{5}$$

where $\mathrm{L_j}$ is the length of the fish associated with the stomach, in cm, and b is the allometric exponent. A constant (10^4) allows us to maintain the majority of the calculated FI values between 0 and 10. The allometric exponent b is specific to each predator and corresponds to the slope of the linear regression log(mass)$\sim$log(length). A b value of 3 has often been used in the literature since fish generally have very similar values (Bowering and Lilly 1992; Orr and Bowering 1997; Hovde et al. 2002). However, it is preferable to use each species' specific value to reduce the influence of the size of the specimens on the calculation of the fullness index. The methodology used is presented in detail in Appendix C.

The partial fullness index of a taxon i in a sample is easier to interpret if it is expressed as a percentage of the total fullness index for the sample (TFI):

$$\mathrm{TFI_j} = \sum_{\mathrm{i=1}}^{\mathrm{I}} \mathrm{FI_{ij}} \tag{6}$$

$$\mathrm{TFI} = \sum_{\mathrm{i=1}}^{\mathrm{I}} \mathrm{FI_i} = \frac{1}{\mathrm{N}} \cdot \sum_{\mathrm{j=1}}^{\mathrm{N}} \mathrm{TFI_j} \tag{7}$$

where I represents the number of taxa found in the sample. FI and TFI can be calculated by including or rejecting empty stomachs. For this study, empty stomachs were included because TFI then becomes an index of stomach fullness and a measure of feeding intensity. The

contribution of prey i to the stomach fullness of the sample, $\mathrm{CFI_i}$, expressed as a percentage, is then calculated as follows:

$$\mathrm{CFI_i} = \frac{\mathrm{FI_i}}{\mathrm{TFI}} \cdot 100 \tag{8}$$

The frequency of occurrence FO of a taxon i in a sample N is calculated as follows:

$$\mathrm{FO} = \frac{\mathrm{N_i}}{\mathrm{N}} \cdot 100 \tag{9}$$

where $\mathrm{N_i}$ is the number of stomachs in the sample containing the taxon i.

2.3.2 Grouping of prey

The occurrence of the different prey families found in the stomachs of the predators selected for the analyses was calculated for each predator.

For several predators, although the number of taxa I observed was subtantially higher than others, it did not necessarily result in more information as to the specifics of their diet since the taxonomic level achieved in the identification of a prey when analyzing stomach contents greatly depends on its degree of digestion. In fact, several prey could only be identified to family or genus. In order to facilitate the interpretation of the diet of the investigated predators, taxonomic groupings k were created, each predator having a maximum of 15. For each predator, this process was carried out using all the stomachs and disregarding the year and zone of collection.

For predators with 15 taxa or less observed in the stomach contents, taxonomic groupings corresponded to the original taxa. For predators with more than 15 taxa in stomach contents, taxonomic groupings were selected in a four-step process:

1. A taxon automatically became a taxononomic grouping if its $\mathrm{CFI_i}$ was in the top ten values and if this taxon corresponded to a commercial species[4]. For this report, commercial species are capelin (*Mallotus villosus*), blue mackerel (*Scomber scombrus*), Atlantic cod, Greenland halibut, American plaice (*Hippoglossoides platessoides*), Atlantic halibut (*Hippoglossus hippoglossus*), redfish, northern shrimp, snow crab (*Chionoecetes opilio*) and Atlantic herring (*Clupea harengus*). Taxonomic groupings corresponding to commercial species are called commercial taxonomic groupings (CTG) thereafter.
2. Taxa that could not be linked to a family (e.g. digested fish, bivalve, etc.) were assigned to one of the seven generic taxonomic groupings (GTG): empty, other fishes, other crabs, other shrimp, other zooplankton, other invertebrates and unidentifiable prey.
3. Taxa that were not assigned to a taxonomic grouping in steps 1 and 2 were grouped by family before calculating values of $\mathrm{CFI_f}$ for each of these families. Depending on the number of taxonomic groupings still to be created, i.e., 15 – (number of CTG + number of GTG), the families with the highest $\mathrm{CFI_f}$ values became taxonomic groupings. In the situation where a family selected to be a taxonomic grouping was only represented by one taxon (ex: only capelin catches for the family Osmeridae), the taxonomic grouping then took the name of the single taxon.

[4]The authors note that the approach used here could benefit prey of commercial value, however this procedure was put forward given the frequent questions regarding these species.

4. Families that had not yet been selected in step 3 to become a fully-fledged taxonomic grouping were assigned to one of the GTGs corresponding to the type of prey.

2.3.3 Descriptive analyses

In a preliminary analysis carried out for each of the predators selected for this study, 5 cm length classes were created to study the effect of the length of predators on the CFI of large prey groups. These prey groups are:

- fishes,
- crabs (infra-order Brachyura),
- shrimp,
- zooplankton (calanoid copepods, hyperiids, mysids and euphausiids),
- other invertebrates (invertebrates other than crabs, shrimp or zooplankton), and
- unidentifiable prey, i.e., material too digested to be associated with a taxon.

If changes related to the size of a given predator were observed, individuals of the predator were divided into two or three larger length classes whose limits were chosen based on obvious changes in CFI and in order to obtain similar and considerable counts of stomachs in all classes. The absence of changes related to the size of the predators did not justify the creation of length classes.

A detailed analysis of the diet was completed for each predator, from all zones, years and length classes combined. The FO, MC, FI and CFI values were calculated for each of the taxa observed. These values were also calculated according to the length classes created and for the large groups of prey mentioned above.

A summary of analysis of the diet of predators for which more than 15 different taxa were observed was also carried out using the same procedure as the detailed analysis, however, in this case the taxa observed was replaced by the taxonomic groupings created according to subsection 2.3.2.

Finally, a spatial analysis of the diet was carried out according to the same procedure as the summary analysis, but broken down by zone (see subsection 2.1 for details). The purpose of assigning predator stomachs to one of these zones was to account for potential spatial differences in the availability of prey. For these analyses, only the FI and CFI metrics were used to describe diets in order to limit the effect of the length of specimens which may vary between the different zones.

3 RESULTS

3.1 Synthesis and comparisons

Twenty-two predators were targeted for stomach samples during the 2015-2017 August ENGSL ecosystemic surveys (Appendix A). Stomachs were analyzed for 17 of these predators (Table 2). For the remaining 5 targeted predators, the absence of stomachs can be explained by a delay in their analysis or by their scarcity in the surveys' catches. For example, there were no catches of spiny dogfish (*Squalus acanthias*), while only three specimens of yellowtail flounder (*Limanda ferruginea*) were caught in 2017, when the predator was targeted for stomach collection.

Stomachs of three additional predators, spinytail skate (*Bathyraja spinicauda*), Greenland cod (*Gadus ogac*) and Atlantic spiny lumpsucker (*Eumicrotremus terraenovae*) were also collected on an opportunistic basis (Table 2). In total, the 20 predators for which stomachs have been analyzed so far provide a count of 6,996 stomachs. Redfish (31 %), Atlantic cod (29 %) and Greenland halibut (21 %) accounted for 80 % of the stomach sampling effort. Half of the predators did not have 75 stomachs. The percentage of empty stomachs varied from 0 to 100 % depending on the predator, with an average of 30 %. The predators for which more in-depth analyses were carried out, i.e., the 10 predators with counts of at least 75 non-empty stomachs, ate prey belonging to 243 different taxa. The full list is provided in Appendix D. Only one stomach is shown in Table 2 for silver hake (*Merluccius bilinearis*). These data forms part of an external analysis in association with an MSc which is still in progress.

For some predators, the reduction in the number of stomachs analyzed still results in a considerable number of taxa. Thirty-five taxa have been observed in the 87 stomachs of smooth skate (*Malacoraja senta*), a diversity of prey much greater than that of the black dogfish (22), for which almost three times more stomachs were available. By considering only the taxa at the family, genus or species levels (206 taxa among the 243 observed in the stomach contents of the 10 predators selected), 87 families are represented, of which 21 and 66 families are fishes and invertebrates respectively (Table 3).

Table 1. Terminology used in this report.

Symbol	Description	Unit
b	Allometric exponent corresponding to the slope of the linear relationship log(mass)$\sim$log(length).	
c	Length class c among the C length classes.	
$\mathrm{CFI_f}$	Contribution of a sample's family f to the total fullness index.	%
$\mathrm{CFI_i}$	Contribution of a sample's taxon i to the total fullness index.	%
CTG	Commercial taxonomic groupings. See text for the list of commercial species retained.	
f	Family f among the F families of a sample.	
FI	Partial fullness index.	
FO	Frequency of occurrence.	%
GTG	Generic taxonomic groupings. These groupings are as follows: empty, other fishes, other crabs, other shrimp, other zooplankton, other invertebrates and unidentifiable prey.	
i	Taxon i among the I taxa of a sample.	
j	Stomach j among the N stomachs of a sample.	
k	Taxonomic grouping k among the K taxonomic groupings. K cannot be > 15.	
L	Fish length.	cm
LC	Laurentian Channel	
$\mathrm{MC_i}$	Mass contribution of taxon i found in a sample.	%
$\mathrm{M_i}$	Sum of masses $\mathrm{M_{ij}}$ of the sample.	g
$\mathrm{M_{ij}}$	Mass of taxon i found in the stomach j.	g
$\mathrm{M_{tot}}$	Total stomach contents of the sample.	g
N	Number of stomachs in a given sample.	
$\mathrm{N_i}$	Number of stomachs in the sample where taxon i is present.	
$\mathrm{N_e}$	Number of empty stomachs in the sample.	
NEG	Northeastern Gulf.	
NWG	Northwestern Gulf.	
p	Predator p of a total P.	
PES	Percentage of empty stomachs.	%
TFI	Total fullness index.	

Table 2. Number of stomachs sampled by predators during the ENGSL *Teleost* surveys for the period 2015-2017. For each predator, the percentage of empty stomachs as well as the number of taxa found in the stomach contents are also provided. Predators in bold are those retained for the in-depth analyses.

			No. of stomachs		
English name	***Latin name***	**French name**	**Total**	**Empty (%)**	**No. of taxa**
Haddock	*Melanogrammus aeglefinus*	Aiglefin	6	0 (0)	26
Black dogfish	***Centroscyllium fabricii***	**Aiguillat noir**	**254**	**83 (32.68)**	**22**
Northern shortfin squid	*Illex illecebrosus*	Encornet rouge nordique	2	2 (100)	0
Atlantic halibut	***Hippoglossus hippoglossus***	**Flétan Atlantique**	**346**	**114 (32.95)**	**63**
Greenland halibut	***Reinhardtius hippoglossoides***	**Flétan du Groenland**	**1455**	**879 (60.41)**	**51**
Pollock	*Pollachius virens*	Goberge	2	0 (0)	6
Lumpfish	***Cyclopterus lumpus***	**Grosse poule de mer**	**124**	**6 (4.84)**	**37**
Silver hake	*Merluccius bilinearis*	Merlu argenté	1	1 (100)	0
Longfin hake	***Phycis chesteri***	**Merluche à longues nageoires**	**119**	**21 (17.65)**	**18**
White hake	***Urophycis tenuis***	**Merluche blanche**	**148**	**30 (20.27)**	**51**
Atlantic cod	***Gadus morhua***	**Morue franche**	**2004**	**178 (8.88)**	**204**
Greenland cod	*Gadus ogac*	Ogac	2	0 (0)	6
Atlantic spiny lumpsucker	*Eumicrotremus spinosus*	Petite poule de mer atlantique	11	0 (0)	6
American plaice	*Hippoglossoides platessoides*	Plie canadienne	5	1 (20)	2
Witch flounder	*Glyptocephalus cynoglossus*	Plie grise	6	3 (50)	5
Spinytail skate	*Bathyraja spinicauda*	Raie à queue épineuse	2	0 (0)	3
Thorny skate	***Amblyraja radiata***	**Raie épineuse**	**273**	**17 (6.23)**	**82**
Smooth skate	***Malacoraja senta***	**Raie lisse**	**87**	**12 (13.79)**	**35**
Redfish	***Sebastes spp.***	**Sébaste**	**2146**	**782 (36.44)**	**72**
Wrymouth	*Cryptacanthodes maculatus*	Terrassier tacheté	3	1 (33.33)	3
		Total	**6996**	**2130 (30.45)**	**249**

Table 3. Percentage of occurrence of the different families of prey found in the stomach contents of the predators selected for the analyses. For each family, the value in parentheses represents the number of different taxa observed in the 6,956 stomachs (206 taxa that can be associated with a family). BD = black dogfish, AH = Atlantic halibut, GH = Greenland halibut, L = lumpfish, LH = longfin hake, WH = white hake, AC = Atlantic cod, TS = thorny skate, SS = smooth skate, R = redfish.

Family	BD	AH	GH	L	LH	WH	AC	TS	SS	R
Fishes										
Agonidae (3)	.	.	.	.	.	.	0.2	.	.	.
Ammodytidae (1)	.	0.29	0.14	.	.	.	2	0.37	.	.
Anarhichadidae (3)	.	0.29	.	.	.	.	0.25	0.37	.	.
Clupeidae (1)	.	.	0.07	.	.	.	0.65	.	.	.
Cottidae (10)	.	0.58	.	.	.	.	1.15	.	.	.
Cyclopteridae (1)	0.39	0.87	.	.	.	.	.	.	.	.
Gadidae (4)	.	3.76	.	.	.	0.68	0.7	.	.	.
Gasterosteidae (1)	0.39	.	0.07	.	.	.	.	.	.	.
Liparidae (1)	.	.	.	.	.	.	0.1	.	.	.
Lotidae (1)	0.79	6.07	0.62	.	.	4.05	0.8	2.2	.	.
Macrouridae (1)	.	0.29	0.07	.	.	0.68	.	0.37	.	.
Myctophidae (2)	.	.	.	.	.	.	.	.	.	0.14
Myxinidae (1)	.	0.87	0.07	.	.	2.03	.	0.73	.	.
Osmeridae (1)	.	0.29	2.06	.	.	.	5.44	.	.	0.14
Paralepididae (1)	0.39	.	0.34	.	.	.	0.15	.	.	0.47
Pleuronectidae (5)	.	3.18	0.07	.	.	1.35	1.15	.	.	.
Rajidae (2)	.	4.05	0.14	.	.	0.68	0.05	0.37	.	.
Scombridae (1)	.	.	.	.	.	.	0.05	.	.	.
Sebastidae (1)	1.18	22.25	7.22	.	.	13.51	6.69	10.99	.	0.79
Stichaeidae (5)	.	3.76	.	.	.	.	1.75	.	.	.
Zoarcidae (6)	0.39	1.16	1.79	.	.	.	0.5	1.83	.	0.61
Invertebrates										
Aegidae (3)	.	0.29	.	.	.	.	0.05	1.1	.	.
Aetideidae (4)	.	.	.	1.61	.	0.68	0.4	13.92	37.93	0.47
Ampeliscidae (5)	.	.	0.07	.	.	1.35	3.54	8.42	3.45	0.05
Aphroditidae (1)	.	.	.	.	.	.	0.05	.	.	0.05
Ascidiidae (1)	.	0.29	.	.	.	.	.	.	.	.
Astartidae (1)	.	.	.	.	.	.	0.35	.	.	.
Axiidae (1)	.	.	.	.	.	.	.	2.2	.	.

Table 3. Continued.

Family	BD	AH	GH	L	LH	WH	AC	TS	SS	R
Balanidae (1)	.	.	.	.	.	.	0.05	.	.	.
Buccinidae (4)	.	.	.	.	.	.	0.6	.	.	.
Calanidae (4)	0.39	.	.	1.61	63.87	2.7	2.79	0.37	.	17.66
Caprellidae (2)	.	.	.	.	.	.	0.65	.	.	.
Cardiidae (1)	.	.	.	.	.	.	0.05	.	.	.
Corophiidae (2)	.	.	.	.	.	.	0.15	.	.	.
Crangonidae (7)	0.39	0.29	0.21	.	.	3.38	3.74	4.76	6.9	.
Epimeriidae (1)	.	0.29	.	.	.	.	0.1	.	.	.
Euchaetidae (1)	.	.	0.14	.	16.81	.	0.55	0.73	2.3	2.42
Eunicidae (2)	.	.	.	.	.	.	0.05	1.1	.	.
Euphausiidae (3)	5.51	2.6	6.39	21.77	0.84	6.76	19.36	22.71	10.34	9.6
Eusiridae (5)	.	.	.	.	.	5.41	4.04	0.73	2.3	.
Flabelligeridae (1)	.	.	.	.	.	.	0.05	0.37	.	.
Hippolytidae (14)	.	2.31	0.07	.	.	0.68	11.98	0.73	2.3	0.09
Hyperiidae (7)	.	0.58	4.81	65.32	1.68	3.38	27.1	6.59	5.75	14.03
Idoteidae (1)	.	.	.	.	.	.	0.05	.	.	.
Leptanthuridae (1)	.	.	.	.	.	.	0.25	1.1	.	.
Limacinidae (1)	.	.	.	.	.	.	.	.	.	0.09
Lithodidae (1)	.	0.87	.	.	.	.	0.25	.	.	.
Lumbrineridae (1)	.	.	.	.	.	.	.	0.37	.	.
Lysianassidae (1)	.	0.29	.	.	0.84	0.68	0.7	3.3	.	0.09
Maeridae (3)	.	.	0.14	.	.	2.03	0.7	6.23	.	0.05
Maldanidae (2)	.	.	.	.	.	.	0.05	1.1	.	.
Melitidae (3)	.	.	.	0.81	.	.	1.35	1.47	1.15	.
Metridinidae (3)	.	.	.	.	5.04	.	0.55	0.37	.	2.84
Munidopsidae (1)	.	.	.	.	.	.	.	0.73	.	.
Muricidae (1)	.	.	.	.	.	.	0.05	.	.	.
Mysidae (11)	2.76	0.29	1.1	2.42	22.69	16.89	6.89	26.74	28.74	7.22
Naticidae (1)	.	.	.	.	.	.	0.05	.	.	.
Nephropidae (1)	.	.	.	0.81	.	.	.	.	.	.
Nephtyidae (1)	.	.	.	.	.	.	0.35	1.47	.	.
Nuculanidae (1)	.	0.29	.	.	.	.	0.05	.	.	.
Nuculidae (1)	.	.	.	.	.	.	0.05	.	.	.
Nymphonidae (1)	.	.	.	.	.	.	0.05	.	.	.

Table 3. Continued.

Family	BD	AH	GH	L	LH	WH	AC	TS	SS	R
Octopodidae (2)	.	1.73	.	.	.	.	0.25	0.37	.	.
Oedicerotidae (2)	.	.	0.07	.	.	0.68	0.5	8.42	2.3	0.05
Ommastrephidae (1)	.	.	.	.	.	0.68	0.55	.	.	.
Ophiactidae (1)	.	.	.	.	.	.	1	.	.	.
Ophiuridae (4)	.	0.29	.	.	.	.	0.75	.	.	.
Oregoniidae (5)	.	10.12	0.14	16.94	.	0.68	14.27	11.36	6.9	.
Paguridae (3)	.	5.49	.	1.61	.	.	0.85	0.73	.	.
Pandalidae (3)	2.36	9.83	5.98	1.61	.	28.38	26.7	9.52	17.24	3.68
Pasiphaeidae (2)	40.16	0.87	2.75	.	5.88	1.35	2.79	11.36	4.6	9.55
Pectinariidae (1)	.	.	.	.	.	.	0.1	.	.	.
Phyllodocidae (2)	.	.	.	.	.	.	2.54	.	.	.
Phyllophoridae (1)	.	.	.	.	.	.	0.05	.	.	.
Polynoidae (1)	.	.	.	.	.	.	0.1	.	.	.
Schizasteridae (1)	0.39	0.29	0.07	.	0.84	.	.	.	.	.
Scinidae (1)	.	.	0.07	.	.	.	.	.	.	0.89
Sepiolidae (1)	.	2.89	.	.	.	0.68	0.2	1.47	.	0.05
Sergestidae (2)	0.79	.	0.07	.	.	.	0.05	2.2	.	.
Stegocephalidae (1)	.	.	0.07	.	.	.	0.3	0.37	.	.
Strongylocentrotidae (1)	.	.	.	.	.	.	0.05	.	.	.
Synopiidae (2)	.	.	.	.	.	.	2.89	2.56	.	.
Terebellidae (1)	.	.	.	.	.	.	0.15	.	.	.
Turbinidae (2)	.	.	.	.	.	.	0.15	.	.	.
Unciolidae (1)	.	.	.	.	.	0.68	4.69	5.86	1.15	0.05
Uristidae (5)	.	.	0.07	.	.	1.35	5.24	4.03	.	0.09
Yoldiidae (1)	.	.	.	.	.	.	0.05	.	.	.
Total (87 families)	**14**	**33**	**29**	**10**	**9**	**26**	**74**	**43**	**15**	**25**

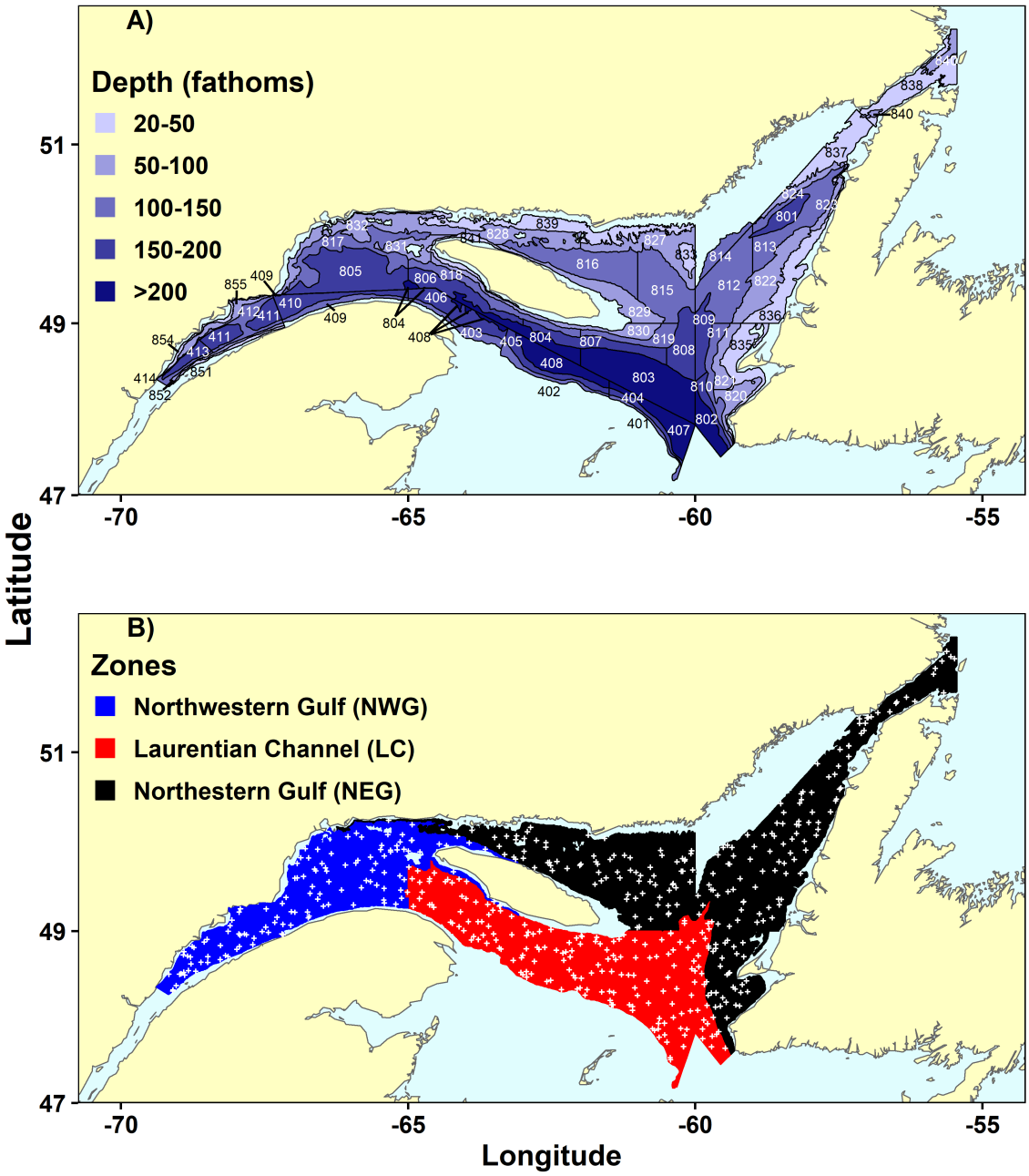

Figure 1. A) stratification used for the August ENGSL ecosystemic survey presented by depth classes and B) zones used to spatially discriminate the diet of collected specimens. The white crosses in B) represent each of the 527 successful sets made during the 2015-2017 period.

3.2 Black dogfish (*Centroscyllium fabricii*)

Black dogfish was targeted for stomach content analysis in 2015 and 2017. In total, 254 stomachs were collected and analyzed in the laboratory, where it was observed that one third of the stomachs were empty (Table 4). These stomachs were from specimens ranging from 13.8 to 67.6 cm in length, with an average length of 39.8 cm (Table 4). Even with a considerable number of stomachs ($\geq$ 75), no clear distinction in the diet evolution as a function of length is discernible, which results in the absence of length classes for this predator (Figure 2). The average mass of stomach contents for black dogfish, all lengths combined, was 4.0 g, excluding empty stomachs (Table 4).

Twenty-two taxa were found in the stomach contents of the black dogfish representing 14 families (Tables 3 and 4). The occurrence of Pasiphaeidae in the stomachs of black dogfish was much higher than for the other investigated predators. Table 5 shows the detailed diet of the dogfish, all zones and years combined. Overall, its diet was 82 % invertebrates, 14 % fishes and 4 % unidentifiable prey according to CFI. Results indicate that pink glass shrimp (*Pasiphaea multidentata*) alone contributed nearly 50 % of the total fullness index, making this species the main food source for black dogfish. Setting aside the general taxa in ranks 2 to 5 of the CFI, completing the top five taxa were, in order, redfish, fourbeard rockling (*Enchelyopus cimbrius*), euphausiids and the shrimp *Eusergestes arcticus* (Table 6). Shrimp were found in 50 % of dogfish stomachs, making this group of prey the most frequently observed.

More than 80 % of black dogfish stomachs came from LC (Table 4, Figure 3). No black dogfish were caught in the NEG, which agrees with the distribution of this predator for the period 2015-2017 (Figure 3). The feeding intensity is significantly lower for the NWG black dogfish compared to those of LC (Table 7). The size of the black dogfish could be a factor, those of the LC being smaller on average (Table 4). When comparing the FI values of the large groups of prey between the NWG and LC zones, we observed that shrimp were the source of this difference in feeding intensity, the pink glass shrimp having a high importance in the diet of LC specimens (Table 7).

Table 4. Summary of sampling effort for black dogfish stomachs, by zone and for the entire ENGSL. A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

Metric	**NWG**	**LC**	**NEG**	**ENGSL**
Mean TFI	0.24	0.59		0.53
No. of stomachs	46	208	0	254
No. of empty stomachs	10	73		83
% empty	21.7	35.1		32.7
Length (cm)				
min	41.4	13.8		13.8
med	56.4	32.6		39.2
mean	55.7	36.3		39.8
max	65.9	67.6		67.6
Total stomach content (g)				
min	0.083	0.029		0.029
med	3.921	1.711		2.159
mean	7.247	3.187		4.042
max	67.011	56.000		67.011
No. of observed taxa				
Fishes	7	4		8
Crabs	0	0		0
Shrimp	4	5		6
Zooplankton	2	4		4
Other invertebrates	1	3		3
Unidentifiable prey	1	1		1
Total	15	17		22

Table 5. Detailed diet of black dogfish from the 2015-2017 ENGSL *Teleost* surveys.

				CFI	
Prey	**FO**	**MC**	**FI**	**Value**	**Rank**
Actinopterygii	0.39	0.29	0.000	0.04	17
Arctozenus risso	0.39	3.30	0.003	0.64	10
Cyclopterus lumpus	0.39	1.58	0.003	0.54	11
Digested fish	4.33	2.65	0.045	8.59	4
Enchelyopus cimbrius	0.79	12.00	0.011	2.08	7
Gasterosteus aculeatus	0.39	0.17	0.000	0.06	15
Melanostigma atlanticum	0.39	0.10	0.000	0.02	21
Sebastes spp.	1.18	11.98	0.012	2.20	6
Fishes, total	**8.27**	**32.08**	**0.075**	**14.17**	
Digested shrimp	12.6	7.35	0.056	10.68	3
Eusergestes arcticus	0.79	0.32	0.005	0.89	9
Pandalus borealis	1.57	2.15	0.002	0.35	12
Pandalus sp.	0.79	0.29	0.000	0.04	16
Pasiphaea multidentata	40.16	42.08	0.253	48.10	1
Pontophilus norvegicus	0.39	0.09	0.000	0.02	20
Shrimp, total	**50.39**	**52.27**	**0.316**	**60.08**	
Boreomysis sp.	2.76	0.26	0.002	0.32	14
Calanus sp.	0.39	0.00	0.000	0.00	22
Euphausiidae	2.36	0.15	0.002	0.34	13
Meganyctiphanes norvegica	3.15	0.46	0.006	1.07	8
Zooplankton, total	**8.66**	**0.87**	**0.009**	**1.73**	
Brisaster fragilis	0.39	0.09	0.000	0.04	18
Crustacea	14.96	7.75	0.107	20.35	2
Digested invertebrates	0.39	0.02	0.000	0.02	19
Other invertebrates, total	**15.75**	**7.85**	**0.107**	**20.41**	
Invertebrates, total	**62.6**	**60.99**	**0.433**	**82.22**	
Unidentified digested material	8.66	6.92	0.019	3.61	5
Unidentifiable prey, total	**8.66**	**6.92**	**0.019**	**3.61**	
Total		**100.00**	**0.526**	**100.00**	

Table 6. Summary of diet of black dogfish from the 2015-2017 ENGSL *Teleost* surveys.

				CFI	
Prey	**FO**	**MC**	**FI**	**Value**	**Rank**
Arctozenus risso	0.39	3.30	0.003	0.64	10
Cyclopterus lumpus	0.39	1.58	0.003	0.54	11
Enchelyopus cimbrius	0.79	12.00	0.011	2.08	7
Gasterosteus aculeatus	0.39	0.17	0.000	0.06	14
Other fishes	5.12	3.05	0.045	8.64	4
Sebastes spp.	1.18	11.98	0.012	2.20	6
Fishes, total	**8.27**	**32.08**	**0.075**	**14.17**	
Eusergestes arcticus	0.79	0.32	0.005	0.89	9
Other shrimp	12.6	7.44	0.056	10.70	3
Pandalidae	2.36	2.43	0.002	0.39	12
Pasiphaea multidentata	40.16	42.08	0.253	48.10	1
Shrimp, total	**50.39**	**52.27**	**0.316**	**60.08**	
Boreomysis sp.	2.76	0.26	0.002	0.32	13
Euphausiidae	5.51	0.61	0.007	1.41	8
Other zooplankton	0.39	0.00	0.000	0.00	15
Zooplankton, total	**8.66**	**0.87**	**0.009**	**1.73**	
Other invertebrates	15.75	7.85	0.107	20.41	2
Other invertebrates, total	**15.75**	**7.85**	**0.107**	**20.41**	
Invertebrates, total	**62.6**	**60.99**	**0.433**	**82.22**	
Unidentifiable prey	8.66	6.92	0.019	3.61	5
Unidentifiable prey, total	**8.66**	**6.92**	**0.019**	**3.61**	
Total		**100.00**	**0.526**	**100.00**	

Table 7. Summary of diet of the ENGSL black dogfish from the 2015-2017 *Teleost* surveys, as a function of zones of origin. For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

Prey	**NWG**	**LC**	**NEG**
Arctozenus risso	0.019 (7.75)		
Cyclopterus lumpus		0.003 (0.59)	
Enchelyopus cimbrius	0.020 (8.40)	0.009 (1.51)	
Gasterosteus aculeatus	0.002 (0.77)		
Other fishes	0.002 (0.83)	0.055 (9.35)	
Sebastes spp.	0.057 (23.68)	0.002 (0.26)	
Fishes, total	**0.100 (41.42)**	**0.069 (11.71)**	
Eusergestes arcticus		0.006 (0.97)	
Other shrimp	0.031 (12.97)	0.062 (10.50)	
Pandalidae	0.011 (4.59)	0.000 (0.01)	
Pasiphaea multidentata	0.062 (25.81)	0.295 (50.11)	
Shrimp, total	**0.104 (43.37)**	**0.363 (61.58)**	
Boreomysis sp.	0.000 (0.03)	0.002 (0.35)	
Euphausiidae	0.001 (0.39)	0.009 (1.50)	
Other zooplankton		0.000 (0.00)	
Zooplankton, total	**0.001 (0.42)**	**0.011 (1.85)**	
Other invertebrates	0.006 (2.43)	0.130 (22.03)	
Other invertebrates, total	**0.006 (2.43)**	**0.130 (22.03)**	
Invertebrates, total	**0.111 (46.22)**	**0.504 (85.47)**	
Unidentifiable prey	0.030 (12.36)	0.017 (2.82)	
Unidentifiable prey, total	**0.030 (12.36)**	**0.017 (2.82)**	
Total	**0.240 (100.00)**	**0.589 (100.00)**	

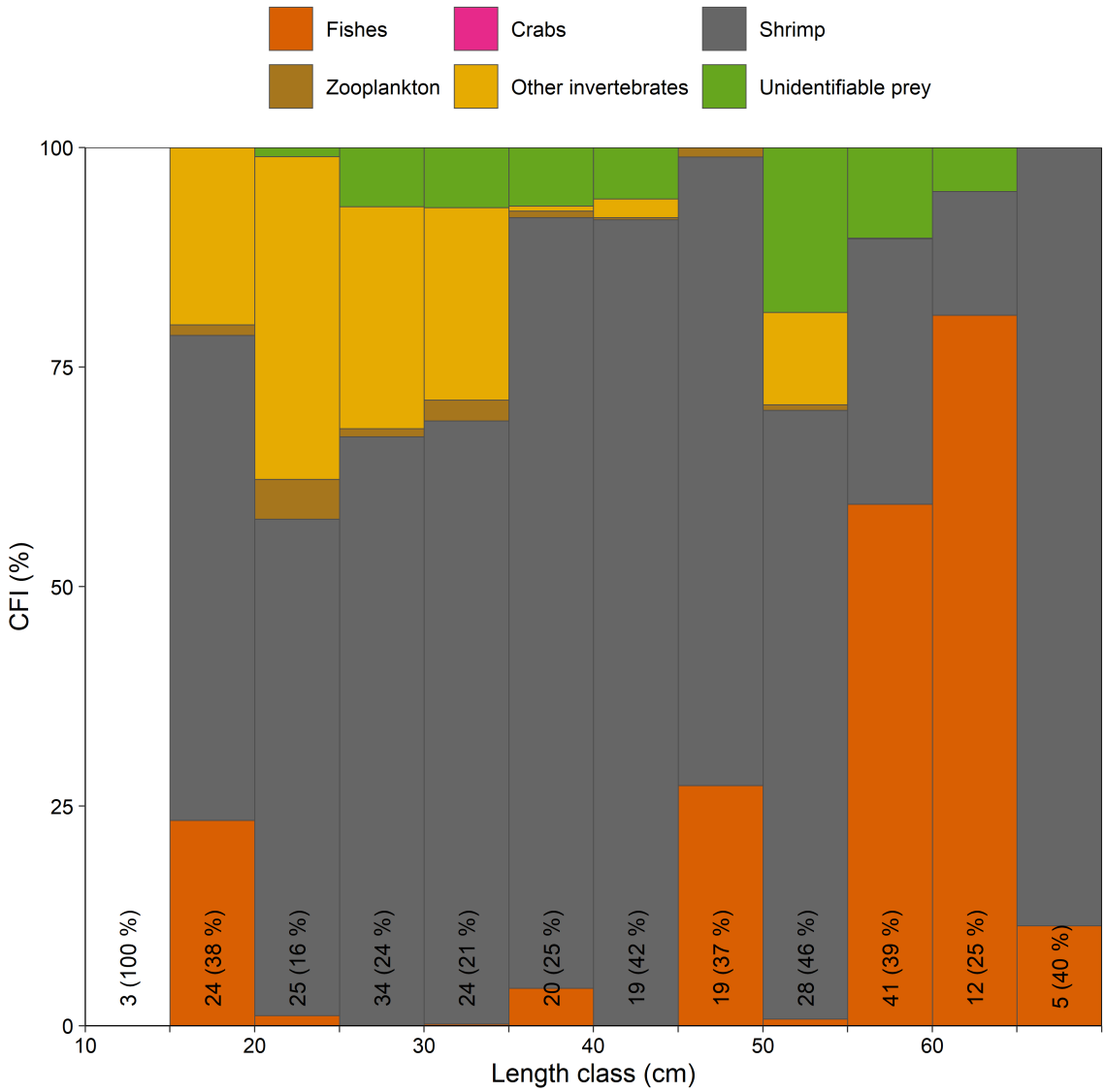

Figure 2. Prey group contributions to the total fullness index (CFI) for black dogfish in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs.

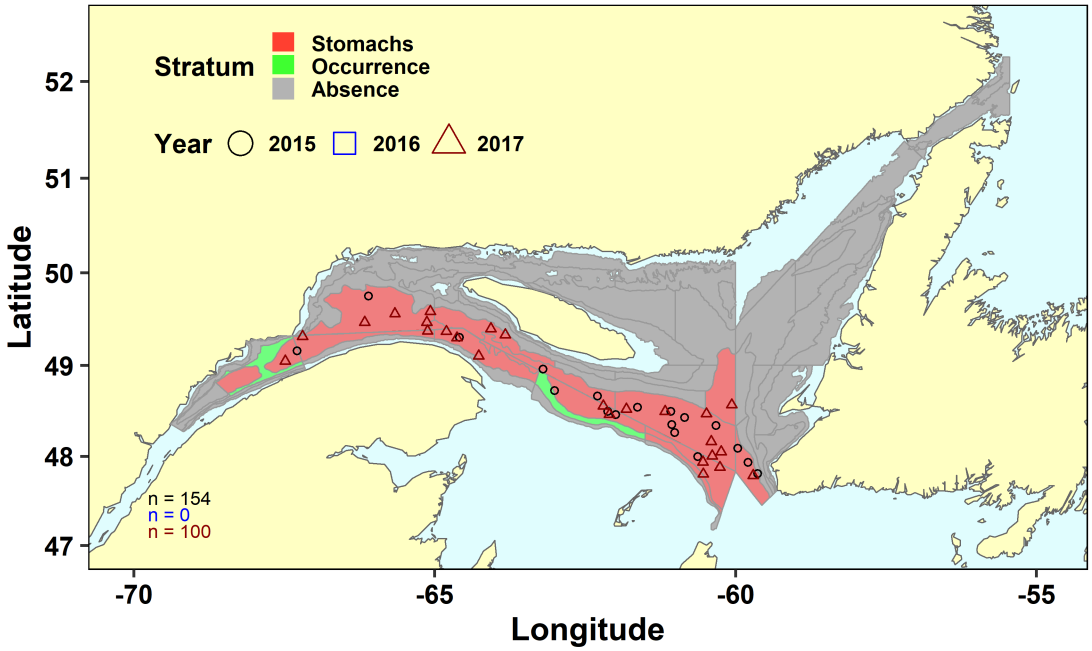

Figure 3. Origin of black dogfish stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.3 Atlantic halibut (*Hippoglossus hippoglossus*)

Atlantic halibut were targeted for stomach content analysis in each year of the 2015-2017 period. Three hundred and forty-six stomachs were collected and analyzed in the laboratory for this predator (Table 8). These stomachs were from specimens ranging from 22.8 to 170.0 cm in length, for an average length of 64.9 cm (Table 8). A third of the stomachs were empty. By assessing the contribution of different groups of prey to the total fullness index by specimen length, two size groups were created with a break at 50 cm in length (Figure 4). The average mass of stomach content for Atlantic halibut, all lengths combined, was 62.7 g, excluding empty stomachs (Table 8).

Sixty-three taxa in 33 families were found in the stomach contents of this predator (Tables 3 and 8). When not considering length classes, fishes accounted for 66 % of the food intake for this predator (Table 9). Redfish was the most frequently observed fish (22 %) in Atlantic halibut stomachs, accounting for 23 % of the total food intake, when all groups of prey were combined. This importance of redfish in Atlantic halibut's diet placed it in the 1st rank by CFI. Among fishes, other important prey were the fourbeard rockling, Atlantic cod, pricklebacks and skates (Table 10). Fishes were found in almost half of all stomachs.

Crabs contributed more than 9 % to Atlantic halibut's food intake. Snow crab was the prey with the highest relative importance in this group. With 15 mainly benthic taxa reported, the group of other invertebrates provided 12 % of the food intake. The remainder (13 %) of Atlantic halibut's diet consisted mainly of shrimp (12 %), in particular those from the Pandalidae family (Table 10).

When taxonomic groupings were broken down according to length classes, feeding intensity varied very little (Table 10). On the other hand, invertebrates (62 %) were the most important prey in the diet of individuals < 50 cm in length (Table 10). In particular, hermit crabs and Pandalidae shrimp were very important prey in these small halibut (Table 10). For individuals $\geq$ 50 cm in length, fishes were the main prey (84 % of the TFI). Redfish became the main prey starting at this length, when considering all types of prey combined. Crabs (especially snow crab) complemented its diet.

The origin of the Atlantic halibut stomachs according to size class shows that there are only very few strata from which Atlantic halibut stomachs were not collected (Figure 5). Atlantic halibut from NEG showed the highest feeding intensity according to the calculated average TFI values (Table 11). This increased feeding intensity is likely the result of the additional intake of Atlantic cod.

Table 8. Sampling effort summary for Atlantic halibut stomachs, by zone and length class (cm, S = < 50, L = 50+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG			LC			NEG			ENGSL		
Metric	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Mean TFI	0.30	0.33	0.31	0.41	0.24	0.31	0.35	0.44	0.41	0.34	0.35	0.34
No. of stomachs	65	71	136	36	57	93	31	86	117	132	214	346
No. of empty stomachs	29	24	53	9	21	30	8	23	31	46	68	114
% empty	44.6	33.8	39.0	25.0	36.8	32.3	25.8	26.7	26.5	34.8	31.8	32.9
Length (cm)												
min	23.0	50.1	23.0	22.8	50.0	22.8	23.0	51.0	23.0	22.8	50.0	22.8
med	42.3	61.0	50.5	37.7	81.0	59.0	39.0	77.8	65.3	39.5	70.7	54.6
mean	41.2	70.7	56.6	37.8	85.3	66.9	38.4	85.6	73.1	39.6	80.6	64.9
max	49.4	170.0	170.0	49.5	158.0	158.0	49.8	160.0	160.0	49.8	170.0	170.0
Total stomach content (g)												
min	0.064	0.246	0.064	0.030	0.118	0.030	0.199	0.012	0.012	0.030	0.012	0.012
med	4.131	22.517	9.566	4.161	24.400	7.507	3.811	48.135	23.479	4.111	32.426	10.448
mean	8.334	87.744	53.301	4.443	73.399	43.846	4.291	115.373	85.665	6.031	96.129	62.731
max	61.784	959.400	959.400	12.597	766.443	766.443	12.132	691.700	691.700	61.784	959.400	959.400
No. of observed taxa												
Fishes	6	15	16	7	11	14	7	17	21	14	22	27
Crabs	2	1	2	2	1	2	2	4	5	4	4	5
Shrimp	6	3	7	2	4	5	6	5	7	8	7	10
Zooplankton	2	3	3	0	2	2	2	1	2	3	4	5
Other invertebrates	3	7	9	6	4	7	7	4	10	9	11	15
Unidentifiable prey	1	1	1	1	1	1	1	1	1	1	1	1
Total	20	30	38	18	23	31	25	32	46	39	49	63

Table 9. Detailed diet of Atlantic halibut from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 50, L = 50+ and T = all lengths combined).

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Amblyraja radiata	1.52	2.34	2.02	4.88	7.74	7.64	0.008	0.014	0.012	2.28	3.98	3.35	10	7	8
Ammodytes sp.	0.76		0.29	0.07		0.00	0		0.000	0.03		0.01	34		51
Anarhichas lupus	0.76		0.29	0.27		0.01	0.001		0.000	0.34		0.13	24		36
Cyclopterus lumpus		1.4	0.87		3.64	3.51		0.004	0.002		1.09	0.68		14	20
Digested fish	4.55	9.81	7.8	1.75	2.21	2.19	0.006	0.009	0.008	1.91	2.54	2.31	11	8	12
Digested roundfish	6.06	3.27	4.34	4.61	1.27	1.39	0.014	0.008	0.010	4.21	2.16	2.93	9	9	9
Enchelyopus cimbrius	6.82	5.61	6.07	26.89	3.23	4.07	0.057	0.038	0.045	16.96	10.84	13.13	2	3	2
Gadiformes	0.76		0.29	0.18		0.01	0		0.000	0.11		0.04	31		46
Gadus morhua		6.07	3.76		23.17	22.34		0.038	0.024		10.98	6.87		2	5
Glyptocephalus cynoglossus		2.8	1.73		3.04	2.93		0.015	0.009		4.22	2.64		6	11
Gymnelus viridis	0.76		0.29	0.28		0.01	0.001		0.000	0.27		0.10	26		39
Hippoglossoides platessoides	0.76	2.34	1.73	1.38	2.5	2.46	0.005	0.004	0.004	1.51	1.06	1.23	14	15	18
Leptoclinus maculatus	0.76		0.29	0.27		0.01	0.001		0.000	0.28		0.10	25		38
Lumpenus lampretaeformis	0.76	4.67	3.18	1.72	1.42	1.43	0.005	0.021	0.015	1.61	6.1	4.42	12	5	7
Lumpenus sp.	0.76	0.47	0.58	0.07	0.06	0.06	0	0	0.000	0.07	0.09	0.09	32	29	41
Lycodes sp.		0.93	0.58		0.55	0.53		0.001	0.001		0.42	0.26		23	31
Lycodes vahlii		0.47	0.29		0.1	0.10		0	0.000		0.05	0.03		35	48
Mallotus villosus		0.47	0.29		0.26	0.25		0.002	0.002		0.71	0.44		18	27
Myoxocephalus scorpius		0.47	0.29		0.32	0.31		0.001	0.001		0.32	0.20		24	34
Myxine glutinosa		1.4	0.87		0.93	0.89		0.003	0.002		0.74	0.47		17	25
Nezumia bairdii		0.47	0.29		0.52	0.50		0.002	0.001		0.61	0.38		21	29
Pisces		0.47	0.29		0.02	0.02		0	0.000		0.11	0.07		28	42
Pleuronectiformes		3.27	2.02		2.21	2.13		0.007	0.004		2.05	1.28		10	17
Rajidae	0.76	2.8	2.02	1.45	4.92	4.80	0.003	0.005	0.004	0.93	1.4	1.23	19	12	19
Reinhardtius hippoglossoides		0.47	0.29		0.52	0.50		0.002	0.001		0.62	0.39		20	28
Sebastes spp.	13.64	27.57	22.25	8.85	23.75	23.22	0.019	0.117	0.079	5.71	33.41	23.05	6	1	1
Triglops murrayi		0.47	0.29		0.05	0.05		0	0.000		0.05	0.03		34	47
Fishes, total	**34.09**	**55.61**	**47.4**	**52.67**	**82.43**	**81.37**	**0.122**	**0.292**	**0.227**	**36.21**	**83.56**	**65.85**			
Brachyura	0.76	0.47	0.58	0.21	0.04	0.04	0.002	0	0.001	0.49	0.09	0.24	23	30	33
Chionoecetes opilio	8.33	8.41	8.38	7.25	12.6	12.41	0.015	0.036	0.028	4.49	10.38	8.18	7	4	3
Hyas araneus	0.76	1.4	1.16	0.05	0.17	0.16	0	0.003	0.002	0.12	0.76	0.52	30	16	23
Hyas coarctatus		0.47	0.29		0.03	0.03		0	0.000		0.08	0.05		31	44
Hyas sp.	0.76		0.29	0.36		0.01	0.002		0.001	0.65		0.24	20		32

Table 9. Continued.

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Crabs, total	**10.61**	**10.75**	**10.69**	**7.87**	**12.83**	**12.65**	**0.019**	**0.039**	**0.032**	**5.75**	**11.31**	**9.23**			
Digested shrimp	4.55	1.87	2.89	2.99	0.01	0.11	0.021	0	0.008	6.11	0.02	2.30	5	38	13
Eualus macilentus	1.52		0.58	0.19		0.01	0.001		0.000	0.25		0.09	27		40
Lebbeus polaris	0.76		0.29	0.16		0.01	0		0.000	0.13		0.05	28		45
Pandalus borealis	1.52	7.01	4.91	0.37	1.23	1.20	0.002	0.006	0.004	0.63	1.7	1.30	21	11	16
Pandalus montagui	9.85	0.47	4.05	10.2	0.08	0.44	0.066	0	0.025	19.39	0.02	7.26	1	39	4
Pandalus sp.	1.52	0.93	1.16	0.12	0.07	0.07	0	0	0.000	0.13	0.11	0.12	29	27	37
Pasiphaea multidentata		1.4	0.87		0.04	0.04		0	0.000		0.03	0.02		37	50
Pontophilus norvegicus		0.47	0.29		0	0.00		0	0.000		0	0.00		47	61
Spirontocaris liljeborgii	2.27		0.87	1.56		0.06	0.004		0.002	1.33		0.50	16		24
Spirontocaris spinus	0.76	0.47	0.58	0.28	0	0.01	0.002	0	0.001	0.51	0.01	0.20	22	41	35
Shrimp, total	**18.94**	**12.15**	**14.74**	**15.86**	**1.42**	**1.93**	**0.096**	**0.007**	**0.041**	**28.47**	**1.89**	**11.83**			
Euphausiidae	0.76	0.47	0.58	0.01	0	0.00	0	0	0.000	0.01	0	0.00	38	46	56
Meganyctiphanes norvegica	1.52	2.34	2.02	0.1	0.04	0.04	0	0	0.000	0.06	0.06	0.06	33	33	43
Meterythrops robusta	0.76		0.29	0.01		0.00	0		0.000	0.02		0.01	36		54
Themisto compressa		0.47	0.29		0	0.00		0	0.000		0	0.00		48	62
Themisto sp.		0.47	0.29		0	0.00		0	0.000		0	0.00		45	60
Zooplankton, total	**3.03**	**3.74**	**3.47**	**0.13**	**0.04**	**0.04**	**0**	**0**	**0.000**	**0.08**	**0.07**	**0.07**			
Ascidia sp.		0.47	0.29		0.02	0.02		0	0.000		0.01	0.00		43	57
Bathypolypus bairdii	3.03	0.47	1.45	1.74	0.01	0.07	0.004	0	0.002	1.32	0.08	0.54	17	32	22
Bathypolypus sp.	0.76		0.29	1.14		0.04	0.004		0.002	1.21		0.45	18		26
Brisaster fragilis		0.47	0.29		0.02	0.02		0	0.000		0.03	0.02		36	49
Cephalopoda	0.76	0.47	0.58	0	0	0.00	0	0	0.000	0	0.01	0.00	39	42	55
Crustacea	3.03	1.4	2.02	0.79	0.02	0.05	0.005	0	0.002	1.48	0.14	0.64	15	26	21
Lithodes maja		1.4	0.87		2.08	2.01		0.002	0.001		0.61	0.38		22	30
Lysianassidae		0.47	0.29		0	0.00		0	0.000		0	0.00		49	63
Nuculana sp.	0.76		0.29	0.01		0.00	0		0.000	0.02		0.01	35		53
Ophiuridae	0.76		0.29	0.01		0.00	0		0.000	0.01		0.00	37		58
Pagurus pubescens	9.09		3.47	11.22		0.40	0.045		0.017	13.38		5.00	3		6
Pagurus sp.	3.79	0.93	2.02	1.77	0.09	0.15	0.014	0.001	0.006	4.22	0.26	1.74	8	25	14
Paramphithoe hystrix		0.47	0.29		0	0.00		0	0.000		0	0.00		44	59
Rossia sp.	6.06	0.93	2.89	5.26	0.12	0.31	0.021	0.002	0.010	6.3	0.7	2.79	4	19	10
Syscenus infelix		0.47	0.29		0.02	0.01		0	0.000		0.02	0.01		40	52
Other invertebrates, total	**26.52**	**7.01**	**14.45**	**21.94**	**2.39**	**3.09**	**0.094**	**0.006**	**0.040**	**27.94**	**1.85**	**11.60**			

Table 9. Continued.

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Invertebrates, total	**42.42**	**26.64**	**32.66**	**45.8**	**16.68**	**17.72**	**0.21**	**0.053**	**0.113**	**62.24**	**15.11**	**32.73**			
Unidentified digested material	6.06	4.67	5.2	1.53	0.89	0.92	0.005	0.005	0.005	1.55	1.34	1.42	13	13	15
Unidentifiable prey, total	**6.06**	**4.67**	**5.2**	**1.53**	**0.89**	**0.92**	**0.005**	**0.005**	**0.005**	**1.55**	**1.34**	**1.42**			
Total				**100**	**100**	**100.00**	**0.338**	**0.349**	**0.345**	**100**	**100**	**100.00**			

Table 10. Summary of diet of Atlantic halibut from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 50, L = 50+ and T = all lengths combined).

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Enchelyopus cimbrius	6.82	5.61	6.07	26.89	3.23	4.07	0.057	0.038	0.045	16.96	10.84	13.13	3	3	2
Gadus morhua		6.07	3.76		23.17	22.34		0.038	0.024		10.98	6.87		2	6
Other fishes	13.64	20.09	17.63	7.16	12.07	11.90	0.023	0.038	0.032	6.86	10.84	9.36	6	4	3
Pleuronectidae	0.76	4.67	3.18	1.38	6.06	5.90	0.005	0.021	0.015	1.51	5.90	4.26	12	7	11
Rajidae	2.27	5.14	4.05	6.32	12.66	12.43	0.011	0.019	0.016	3.21	5.39	4.57	9	8	10
Sebastes spp.	13.64	27.57	22.25	8.85	23.75	23.22	0.019	0.117	0.079	5.71	33.41	23.05	7	1	1
Stichaeidae	2.27	4.67	3.76	2.06	1.48	1.50	0.007	0.022	0.016	1.96	6.19	4.61	10	6	9
Fishes, total	**34.09**	**55.61**	**47.4**	**52.67**	**82.43**	**81.37**	**0.122**	**0.292**	**0.227**	**36.21**	**83.56**	**65.85**			
Chionoecetes opilio	8.33	8.41	8.38	7.25	12.60	12.41	0.015	0.036	0.028	4.49	10.38	8.18	8	5	5
Other crabs	2.27	2.34	2.31	0.63	0.23	0.25	0.004	0.003	0.004	1.26	0.93	1.06	13	12	14
Crabs, total	**10.61**	**10.75**	**10.69**	**7.87**	**12.83**	**12.65**	**0.019**	**0.039**	**0.032**	**5.75**	**11.31**	**9.23**			
Other shrimp	8.33	4.21	5.78	5.18	0.05	0.23	0.028	0.000	0.011	8.32	0.06	3.15	5	15	12
Pandalidae	12.12	8.41	9.83	10.68	1.37	1.70	0.068	0.006	0.030	20.15	1.83	8.68	1	9	4
Shrimp, total	**18.94**	**12.15**	**14.74**	**15.86**	**1.42**	**1.93**	**0.096**	**0.007**	**0.041**	**28.47**	**1.89**	**11.83**			
Other zooplankton	3.03	3.74	3.47	0.13	0.04	0.04	0	0.000	0.000	0.08	0.07	0.07	14	14	15
Zooplankton, total	**3.03**	**3.74**	**3.47**	**0.13**	**0.04**	**0.04**	**0**	**0.000**	**0.000**	**0.08**	**0.07**	**0.07**			
Other invertebrates	13.64	6.54	9.25	8.94	2.30	2.54	0.035	0.006	0.017	10.34	1.59	4.86	4	10	8
Paguridae	12.88	0.93	5.49	13	0.09	0.55	0.059	0.001	0.023	17.6	0.26	6.74	2	13	7
Other invertebrates, total	**26.52**	**7.01**	**14.45**	**21.94**	**2.39**	**3.09**	**0.094**	**0.006**	**0.040**	**27.94**	**1.85**	**11.60**			
Invertebrates, total	**42.42**	**26.64**	**32.66**	**45.8**	**16.68**	**17.72**	**0.21**	**0.053**	**0.113**	**62.24**	**15.11**	**32.73**			
Unidentifiable prey	6.06	4.67	5.2	1.53	0.89	0.92	0.005	0.005	0.005	1.55	1.34	1.42	11	11	13
Unidentifiable prey, total	**6.06**	**4.67**	**5.2**	**1.53**	**0.89**	**0.92**	**0.005**	**0.005**	**0.005**	**1.55**	**1.34**	**1.42**			
Total				**100**	**100.00**	**100.00**	**0.338**	**0.349**	**0.345**	**100**	**100.00**	**100.00**			

Table 11. Summary of diet of the ENGSL Atlantic halibut from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 50, L = 50+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG			LC			NEG		
Taxonomic grouping	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Enchelyopus cimbrius	0.113 (38.08)	0.03 (10.32)	0.07 (22.90)		0.012 (4.86)	0.01 (2.37)	0.01 (2.30)	0.06 (13.38)	0.045 (10.91)
Gadus morhua		0.02 (5.15)	0.01 (2.82)		0.023 (9.36)	0.01 (4.56)		0.07 (15.17)	0.049 (11.79)
Other fishes	0.018 (6.14)	0.04 (12.84)	0.03 (9.80)	0.04 (10.56)	0.013 (5.48)	0.02 (8.08)	0.01 (3.15)	0.05 (11.59)	0.040 (9.71)
Pleuronectidae		0.01 (2.09)	0.00 (1.15)	0.02 (4.62)	0.010 (3.95)	0.01 (4.29)		0.04 (8.96)	0.029 (6.96)
Rajidae	0.016 (5.30)	0.03 (10.40)	0.03 (8.09)	0.01 (2.83)	0.001 (0.60)	0.01 (1.74)		0.02 (4.06)	0.013 (3.16)
Sebastes spp.	0.013 (4.54)	0.09 (28.81)	0.06 (17.81)	0.04 (9.66)	0.130 (53.39)	0.09 (30.99)	0.01 (2.44)	0.13 (28.87)	0.095 (22.98)
Stichaeidae		0.05 (14.91)	0.03 (8.15)	0.02 (5.13)		0.01 (2.63)	0.00 (1.15)	0.01 (3.11)	0.011 (2.67)
Fishes, total	**0.160 (54.06)**	**0.28 (84.53)**	**0.22 (70.72)**	**0.13 (32.80)**	**0.189 (77.64)**	**0.17 (54.66)**	**0.03 (9.05)**	**0.37 (85.14)**	**0.282 (68.17)**
Chionoecetes opilio	0.019 (6.45)	0.04 (11.25)	0.03 (9.08)	0.00 (0.56)	0.027 (11.06)	0.02 (5.68)	0.02 (6.31)	0.04 (9.59)	0.037 (8.86)
Other crabs	0.003 (1.14)		0.00 (0.52)	0.00 (0.37)		0.00 (0.19)	0.01 (2.69)	0.01 (1.85)	0.008 (2.04)
Crabs, total	**0.022 (7.59)**	**0.04 (11.25)**	**0.03 (9.59)**	**0.00 (0.93)**	**0.027 (11.06)**	**0.02 (5.87)**	**0.03 (9.00)**	**0.05 (11.44)**	**0.045 (10.90)**
Other shrimp	0.003 (0.93)	0.00 (0.12)	0.00 (0.49)	0.04 (9.41)	0.000 (0.05)	0.01 (4.84)	0.07 (20.01)	0.00 (0.02)	0.019 (4.48)
Pandalidae	0.006 (2.05)	0.01 (2.20)	0.01 (2.13)	0.18 (43.82)	0.003 (1.21)	0.07 (23.04)	0.07 (20.38)	0.01 (1.82)	0.025 (5.96)
Shrimp, total	**0.009 (2.98)**	**0.01 (2.32)**	**0.01 (2.62)**	**0.22 (53.23)**	**0.003 (1.26)**	**0.09 (27.88)**	**0.14 (40.39)**	**0.01 (1.85)**	**0.043 (10.45)**
Other zooplankton	0.000 (0.11)	0.00 (0.04)	0.00 (0.07)		0.000 (0.20)	0.00 (0.10)	0.00 (0.14)	0.00 (0.03)	0.000 (0.06)
Zooplankton, total	**0.000 (0.11)**	**0.00 (0.04)**	**0.00 (0.07)**		**0.000 (0.20)**	**0.00 (0.10)**	**0.00 (0.14)**	**0.00 (0.03)**	**0.000 (0.06)**
Other invertebrates	0.042 (14.13)	0.00 (0.41)	0.02 (6.63)	0.01 (2.54)	0.014 (5.73)	0.01 (4.10)	0.05 (14.13)	0.00 (0.79)	0.016 (3.77)
Paguridae	0.062 (21.07)	0.00 (0.72)	0.03 (9.94)	0.04 (10.03)	0.000 (0.19)	0.02 (5.23)	0.08 (21.66)		0.020 (4.83)
Other invertebrates, total	**0.104 (35.20)**	**0.00 (1.13)**	**0.05 (16.56)**	**0.05 (12.57)**	**0.014 (5.92)**	**0.03 (9.32)**	**0.12 (35.79)**	**0.00 (0.79)**	**0.036 (8.60)**
Invertebrates, total	**0.136 (45.87)**	**0.05 (14.74)**	**0.09 (28.84)**	**0.27 (66.72)**	**0.045 (18.43)**	**0.13 (43.17)**	**0.30 (85.32)**	**0.06 (14.11)**	**0.124 (30.00)**
Unidentifiable prey	0.000 (0.07)	0.00 (0.74)	0.00 (0.43)	0.00 (0.48)	0.010 (3.93)	0.01 (2.17)	0.02 (5.63)	0.00 (0.75)	0.008 (1.83)
Unidentifiable prey, total	**0.000 (0.07)**	**0.00 (0.74)**	**0.00 (0.43)**	**0.00 (0.48)**	**0.010 (3.93)**	**0.01 (2.17)**	**0.02 (5.63)**	**0.00 (0.75)**	**0.008 (1.83)**
Total	**0.296 (100.00)**	**0.33 (100.00)**	**0.31 (100.00)**	**0.41 (100.00)**	**0.244 (100.00)**	**0.31 (100.00)**	**0.35 (100.00)**	**0.44 (100.00)**	**0.414 (100.00)**

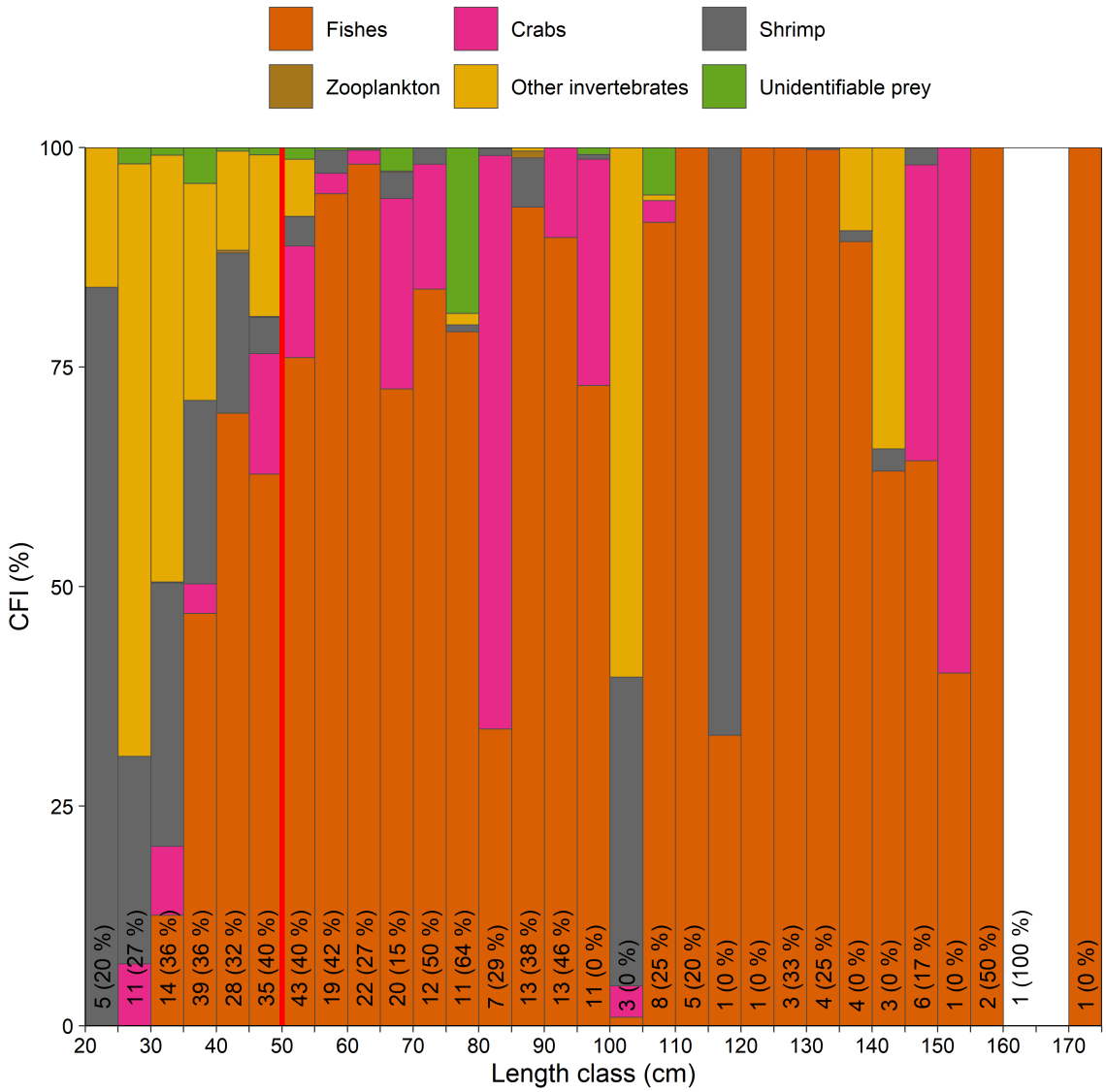

Figure 4. Prey group contributions to the total fullness index (CFI) for Atlantic halibut in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. The vertical red line separates the length classes that were combined for the analyzes.

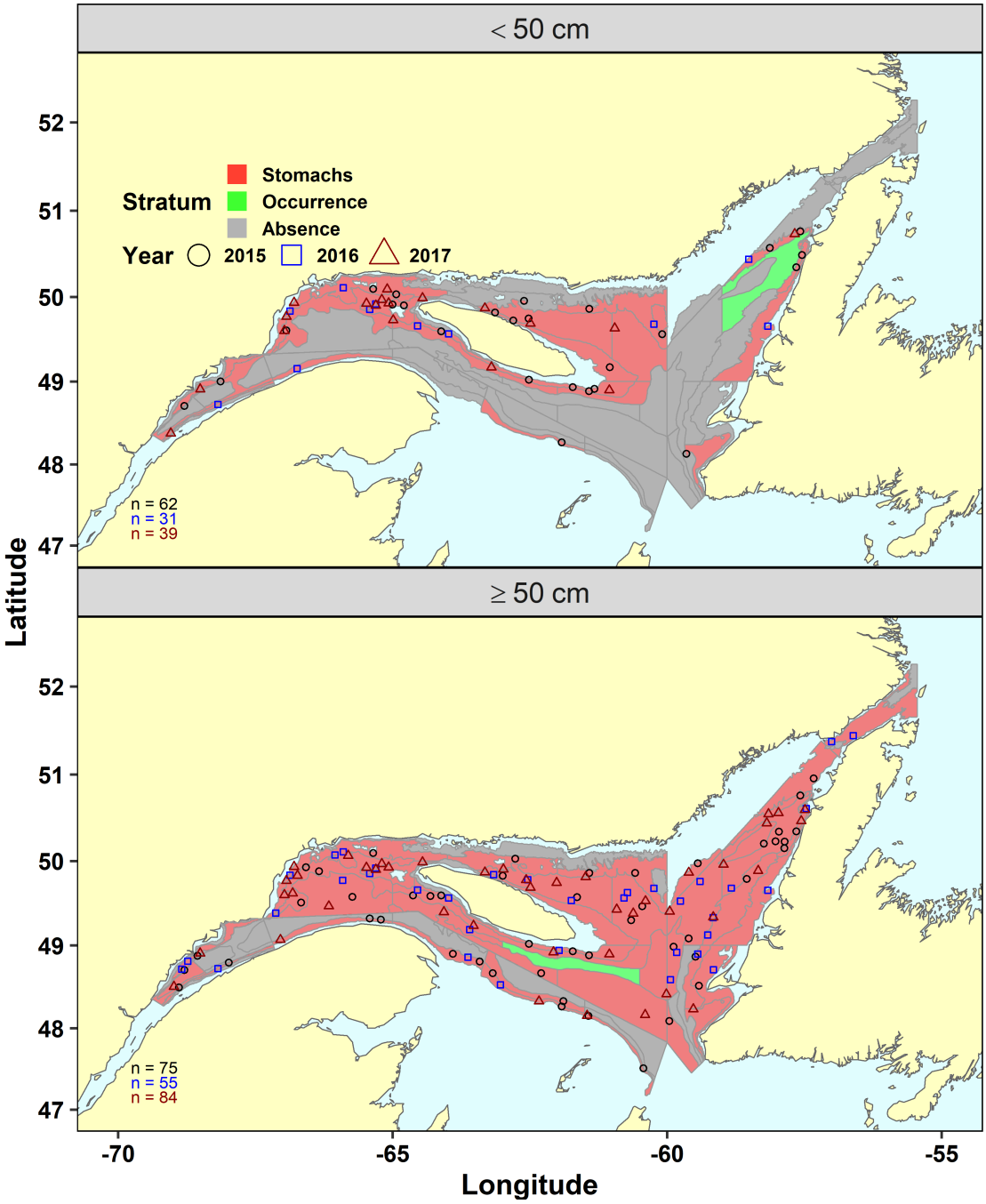

Figure 5. Origin of Atlantic halibut stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.4 Greenland halibut (*Reinhardtius hippoglossoides*)

Greenland halibut were targeted for stomach content analysis in each year of the 2015-2017 period. One thousand four hundred and fifty-five stomachs were collected and analyzed in the laboratory, ranking this predator in 3rd position regarding the number of stomachs collected, just after Atlantic cod and redfish (Table 12). Stomachs came from specimens ranging from 6.4 to 72.5 cm in length, with an average length of 32.8 cm (Table 12). Just over 60 % of the stomachs were empty. By assessing the contribution of different groups of prey to the total fullness index by specimen length, three size groups were created with breaks at lengths of 20 and 40 cm (Figure 6). The average mass of stomach contents for Greenland halibut, all lengths combined, was 6.3 g, excluding empty stomachs (Table 12).

Fifty-one taxa in 29 families were found in the stomach contents of this predator (Tables 3 and 12). Disregarding length classes, the contributions of fishes (49 %) and invertebrates (47 %) to the diet of Greenland halibut were very similar (Table 13). Although found in only 2 % of the stomachs analyzed, capelin was the most important taxon by CFI in this predator's diet. Redfish was ranked 2nd according to CFI and 1st for occurrence among all observed taxa for this predator (7 %). The ease of identification of redfish otoliths has potentially contributed to this high occurrence rate. Overall, fishes were found in less than one in five stomachs.

Following fishes, zooplankton was the prey group contributing the most to the diet of Greenland halibut (CFI of 23 %). Twelve taxa were reported for this prey group. The families Euphausiidae and Hyperiidae alone contributed more than 23 % to the diet of this predator (Table 14). The shrimp contribution in Greenland halibut's diet was significant and dominated by two species, the northern shrimp and the pink glass shrimp. More than 10 % of the stomachs analyzed contained shrimp. The group of other invertebrates contributed little to the diet of Greenland halibut (3 %).

Greenland halibut < 20 cm had a feeding intensity far greater than that of their larger conspecifics (Table 13). This difference was mainly caused by their high consumption of zooplankton. In fact, zooplankton and capelin contributed almost 75 % to the diet of Greenland halibut < 20 cm. The diet of medium-sized Greenland halibut (20 to 40 cm in length) consisted mainly of fish (51 %) and shrimp (37 %). Individuals ≥ 40 cm focused almost exclusively on fish (87 %), especially redfish. It was also noted that the pink glass shrimp had a higher CFI value than that of the northern shrimp in Greenland halibut < 20 cm, and that this relationship was reversed in larger specimens.

Greenland halibut stomachs of different length classes were collected from almost all strata where individuals were caught (Figure 7). The feeding intensity decreased from NEG to NWG and then to LC (Table 15). The higher feeding intensity in the NEG was mainly due to the additional intake of fishes, making this group the main food source for this zone. The NEG zone was where Greenland halibut ate the most redfish in the ENGSL. In contrast, this predator relied more on invertebrates, especially zooplankton, as a food source in NWG (52 %). In particular, the zooplankton family Euphausiidae alone generated a higher FI value than those of zooplankton in the two other zones. As for Greenland halibut in LC, their diet was mainly composed of fishes and shrimp. The pink glass shrimp and northern shrimp were more solicited

in the LC and the NEG, respectively.

Table 12. Sampling effort summary for Greenland halibut stomachs, by zone and size class (cm, S = < 20, M = [20-40[, L = 40+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG				LC				NEG				ENGSL			
Metric	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Mean TFI	0.57	0.20	0.16	0.27	0.49	0.12	0.12	0.16	0.69	0.24	0.32	0.33	0.58	0.18	0.18	0.25
No. of stomachs	120	303	103	526	62	253	220	535	65	224	105	394	247	780	428	1455
No. of empty stomachs	42	214	55	311	24	201	146	371	23	129	45	197	89	544	246	879
% empty	35.0	70.6	53.4	59.1	38.7	79.4	66.4	69.3	35.4	57.6	42.9	50.0	36.0	69.7	57.5	60.4
Length (cm)																
min	6.8	20.0	40.0	6.8	12.8	20.0	40.0	12.8	6.4	20.0	40.0	6.4	6.4	20.0	40.0	6.4
med	16.2	30.1	45.8	29.7	16.5	28.5	47.2	35.5	16.5	29.7	47.3	32.0	16.5	29.5	46.8	31.6
mean	16.2	29.7	46.4	29.9	16.6	29.4	48.3	35.7	15.6	30.2	48.9	32.8	16.1	29.8	48.0	32.8
max	19.9	39.8	61.2	61.2	19.8	39.7	72.1	72.1	19.9	39.8	72.5	72.5	19.9	39.8	72.5	72.5
Total stomach content (g)																
min	0.006	0.001	0.072	0.001	0.018	0.003	0.008	0.003	0.009	0.019	0.089	0.009	0.006	0.001	0.008	0.001
med	0.477	1.782	4.399	0.962	0.442	1.265	6.111	1.624	0.409	2.064	12.568	2.424	0.447	1.471	8.078	1.450
mean	0.853	3.604	8.879	3.783	0.779	2.343	14.480	7.457	1.042	3.881	19.487	8.029	0.885	3.437	14.653	6.281
max	8.716	25.897	36.388	36.388	5.912	17.292	108.694	108.694	7.878	51.897	91.285	91.285	8.716	51.897	108.694	108.694
No. of observed taxa																
Fishes	4	7	7	8	2	6	9	10	4	7	8	11	5	10	12	15
Crabs	0	1	0	1	0	0	0	0	2	0	0	2	2	1	0	2
Shrimp	2	5	4	5	2	5	5	7	2	5	6	7	3	7	6	8
Zooplankton	8	7	2	11	6	3	2	7	7	5	1	7	10	10	4	12
Other invertebrates	2	2	3	5	1	1	2	2	6	2	1	7	7	3	4	12
Unidentifiable prey	1	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2
Total	17	24	18	32	12	16	19	27	22	20	17	35	28	33	28	51

Table 13. Detailed diet of Greenland halibut from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 20, M = [20-40[, L = 40+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Amblyraja radiata			0.23	0.07			0.48	0.35			0.001	0.000			0.53	0.11			12	30
Ammodytes sp.		0.13	0.23	0.14		0.89	0.02	0.22		0.001	0	0.000		0.48	0.02	0.20		18	23	26
Arctozenus risso		0.13	0.93	0.34		1.24	1.68	1.52		0.002	0.004	0.002		1	2.07	0.82		16	6	19
Clupea harengus		0.13		0.07		6.4		1.43		0.004		0.002		2.33		0.92		10		17
Digested fish	3.64	2.18	4.91	3.23	4.25	2.91	1.52	1.93	0.019	0.005	0.003	0.007	3.22	2.58	1.68	2.65	10	9	8	10
Digested roundfish	1.21	3.08	1.87	2.41	1.4	7.44	4.82	5.28	0.011	0.015	0.006	0.012	1.81	8.35	3.65	4.78	11	3	5	7
Enchelyopus cimbrius		0.26	1.64	0.62		1.98	4.87	4.03		0.002	0.01	0.004		1.02	5.9	1.63		15	3	14
Gasterosteus aculeatus		0.13		0.07		0.14		0.03		0.001		0.000		0.29		0.11		20		29
Mallotus villosus	3.24	1.92	1.64	2.06	28.17	17.51	3.43	7.55	0.13	0.048	0.01	0.051	22.35	25.97	5.75	20.35	2	1	4	1
Melanostigma atlanticum	0.4	1.54	3.04	1.79	0.6	1.26	0.91	0.97	0.002	0.002	0.003	0.002	0.35	1.14	1.53	0.91	19	14	10	18
Myxine glutinosa			0.23	0.07			1.27	0.93			0.002	0.001			1.1	0.23			11	25
Nezumia bairdii			0.23	0.07			0.33	0.24			0.001	0.000			0.34	0.07			16	35
Rajidae			0.23	0.07			0.23	0.17			0.001	0.000			0.48	0.10			14	32
Reinhardtius hippoglossoides	0.4			0.07	0.64			0.02	0.004			0.001	0.67			0.27	16			23
Sebastes spp.		2.31	20.33	7.22		12.54	70.22	54.57		0.014	0.112	0.041		7.8	64.05	16.33		5	1	2
Fishes, total	**8.91**	**11.79**	**32.94**	**17.53**	**35.06**	**52.3**	**89.77**	**79.26**	**0.166**	**0.094**	**0.152**	**0.123**	**28.4**	**50.97**	**87.1**	**49.46**				
Brachyura	1.62			0.27	0.6			0.02	0.004			0.001	0.76			0.30	15			22
Chionoecetes opilio	0.4	0.13		0.14	1.69	0.26		0.12	0.008	0		0.001	1.4	0.09		0.59	12	24		21
Crabs, total	**1.62**	**0.13**		**0.34**	**2.29**	**0.26**		**0.15**	**0.013**	**0**		**0.002**	**2.16**	**0.09**		**0.90**				
Digested shrimp	0.81	2.44	2.1	2.06	1.13	2.83	0.37	0.95	0.004	0.003	0.001	0.003	0.77	1.79	0.5	1.12	14	11	13	16
Pandalus borealis	0.4	5.64	6.31	4.95	0.07	27.66	6.19	10.77	0.001	0.042	0.014	0.027	0.17	22.9	8.04	10.79	20	2	2	3
Pandalus montagui		0.13	0.47	0.21		0.19	0.15	0.15		0.001	0	0.000		0.41	0.15	0.19		19	18	27
Pandalus sp.		1.28	0.7	0.89		2.8	0.35	0.88		0.006	0	0.003		3.07	0.23	1.26		8	17	15
Pasiphaea multidentata	3.24	2.95	2.1	2.75	8.39	6.57	1.19	2.67	0.033	0.015	0.003	0.015	5.72	8.23	1.72	5.88	5	4	7	5
Pontophilus norvegicus			0.7	0.21			0.12	0.08			0	0.000			0.15	0.03			19	38
Sergia robusta		0.13		0.07		0.46		0.10		0		0.000		0.27		0.10		21		31
Spirontocaris liljeborgii		0.13		0.07		0.04		0.01		0		0.000		0.06		0.02		26		39
Shrimp, total	**4.05**	**12.18**	**11.21**	**10.52**	**9.59**	**40.54**	**8.35**	**15.62**	**0.039**	**0.067**	**0.019**	**0.048**	**6.65**	**36.72**	**10.8**	**19.40**				
Boreomysis arctica			0.23	0.07			0.01	0.00			0	0.000			0.01	0.00			25	45
Boreomysis sp.	0.4	1.41	0.7	1.03	0.1	0.18	0.02	0.06	0	0	0	0.000	0.06	0.12	0.03	0.08	23	23	22	34
Euphausiidae	21.86	0.9	0.23	4.26	18.4	0.47	0	0.82	0.143	0.002	0	0.025	24.55	0.98	0	10.15	1	17	26	4
Hyperiidae	0.81	0.13		0.21	0.09	0		0.00	0.001	0		0.000	0.16	0		0.06	21	33		36
Meganyctiphanes norvegica	6.88	0.38	0.47	1.51	3.24	0.08	0.03	0.16	0.028	0	0	0.005	4.84	0.09	0.04	1.97	9	25	20	12
Paraeuchaeta norvegica	0.4	0.13		0.14	0	0		0.00	0	0		0.000	0	0		0.00	28	30		47
Scina borealis		0.13		0.07		0		0.00		0		0.000		0		0.00		31		50
Themisto abyssorum	0.81			0.14	0.01			0.00	0			0.000	0.01			0.00	25			44
Themisto compressa	7.29	0.13		1.31	3.13	0.01		0.12	0.028	0		0.005	4.88	0.01		1.95	8	29		13
Themisto libellula	2.02	0.51		0.62	1.41	0.17		0.09	0.008	0		0.002	1.37	0.21		0.63	13	22		20
Themisto sp.	16.6	1.54		3.64	4.64	0.46		0.28	0.034	0.002		0.007	5.86	1.2		2.81	4	13		9
Thysanoessa sp.	5.67	0.51		1.24	11.37	1.45		0.77	0.057	0.008		0.014	9.75	4.26		5.56	3	6		6
Zooplankton, total	**47.37**	**5.13**	**1.64**	**11.27**	**42.38**	**2.83**	**0.05**	**2.31**	**0.3**	**0.013**	**0**	**0.058**	**51.47**	**6.87**	**0.08**	**23.21**				
Brisaster fragilis			0.23	0.07			0.46	0.34			0.001	0.000			0.38	0.08			15	33
Byblis gaimardi	0.4			0.07	0.51			0.02	0.002			0.000	0.42			0.17	18			28
Crustacea	7.69	2.05	0.93	2.68	4.69	1.1	0.03	0.45	0.029	0.002	0	0.006	4.89	1.3	0.04	2.46	7	12	21	11
Cumacea	0.4			0.07	0.01			0.00	0			0.000	0.01			0.00	26			46

Table 13. Continued.

	FO				MC				FI				CFI							
													Value				Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Decapoda			0.23	0.07			0	0.00			0	0.000			0	0.00			28	51
Gammaridea	0.4			0.07	0.36			0.01	0.004			0.001	0.62			0.25	17			24
Maera loveni	0.4			0.07	0.02			0.00	0			0.000	0.02			0.01	24			41
Oedicerotidae	0.4			0.07	0			0.00	0			0.000	0			0.00	27			48
Polychaeta	0.4			0.07	0.14			0.01	0.001			0.000	0.12			0.05	22			37
Stegocephalus inflatus		0.13		0.07		0.01		0.00		0		0.000		0.02		0.01		28		42
Tmetonyx cicada			0.23	0.07			0.01	0.01			0	0.000			0.02	0.00			24	43
Wimvadocus torelli		0.13		0.07		0.05		0.01		0		0.000		0.03		0.01		27		40
Other invertebrates, total	**8.5**	**2.31**	**1.64**	**3.16**	**5.73**	**1.16**	**0.5**	**0.85**	**0.035**	**0.002**	**0.001**	**0.008**	**6.07**	**1.34**	**0.43**	**3.03**				
Invertebrates, total	**55.47**	**18.85**	**14.25**	**23.71**	**59.99**	**44.78**	**8.91**	**18.93**	**0.387**	**0.083**	**0.02**	**0.116**	**66.36**	**45.02**	**11.31**	**46.54**				
Unidentified digested material	6.48	3.85	3.97	4.33	4.95	2.91	1.31	1.81	0.031	0.007	0.003	0.010	5.24	4.01	1.58	3.99	6	7	9	8
Unidentified egg		0.13	0.23	0.14		0	0	0.00		0	0	0.000		0	0	0.00		32	27	49
Unidentifiable prey, total	**6.48**	**3.97**	**4.21**	**4.47**	**4.95**	**2.91**	**1.32**	**1.81**	**0.031**	**0.007**	**0.003**	**0.010**	**5.24**	**4.01**	**1.58**	**3.99**				
Total					**100**	**100**	**100**	**100.00**	**0.583**	**0.184**	**0.175**	**0.249**	**100**	**100**	**100**	**100.00**				

Table 14. Summary of diet of Greenland halibut from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 20, M = [20-40[, L = 40+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Clupea harengus		0.13		0.07		6.40		1.43		0.004		0.002		2.33		0.92		9		13
Enchelyopus cimbrius		0.26	1.64	0.62		1.98	4.87	4.03		0.002	0.01	0.004		1.02	5.9	1.63		13	4	10
Mallotus villosus	3.24	1.92	1.64	2.06	28.17	17.51	3.43	7.55	0.13	0.048	0.01	0.051	22.35	25.97	5.75	20.35	2	1	5	1
Other fishes	5.67	7.18	10.98	8.04	6.89	13.88	11.25	11.67	0.035	0.025	0.02	0.025	6.05	13.85	11.4	10.24	5	3	2	5
Sebastes spp.		2.31	20.33	7.22		12.54	70.22	54.57		0.014	0.112	0.041		7.80	64.05	16.33		5	1	3
Fishes, total	**8.91**	**11.79**	**32.94**	**17.53**	**35.06**	**52.30**	**89.77**	**79.26**	**0.166**	**0.094**	**0.152**	**0.123**	**28.4**	**50.97**	**87.1**	**49.46**				
Other crabs	1.62	0.13		0.34	2.29	0.26		0.15	0.013	0.000		0.002	2.16	0.09		0.90	8	15		14
Crabs, total	**1.62**	**0.13**		**0.34**	**2.29**	**0.26**		**0.15**	**0.013**	**0.000**		**0.002**	**2.16**	**0.09**		**0.90**				
Other Pandalidae		1.41	1.17	1.1		2.98	0.5	1.03		0.006	0.001	0.004		3.48	0.38	1.45		8	10	11
Other shrimp	0.81	2.69	2.8	2.41	1.13	3.33	0.48	1.14	0.004	0.004	0.001	0.003	0.77	2.11	0.65	1.28	9	10	8	12
Pandalus borealis	0.4	5.64	6.31	4.95	0.07	27.66	6.19	10.77	0.001	0.042	0.014	0.027	0.17	22.90	8.04	10.79	10	2	3	4
Pasiphaea multidentata	3.24	2.95	2.1	2.75	8.39	6.57	1.19	2.67	0.033	0.015	0.003	0.015	5.72	8.23	1.72	5.88	6	4	6	6
Shrimp, total	**4.05**	**12.18**	**11.21**	**10.52**	**9.59**	**40.54**	**8.35**	**15.62**	**0.039**	**0.067**	**0.019**	**0.048**	**6.65**	**36.72**	**10.8**	**19.40**				
Euphausiidae	30.77	1.79	0.7	6.39	33	2.00	0.03	1.75	0.228	0.010	0	0.044	39.13	5.32	0.04	17.68	1	6	11	2
Hyperiidae	21.86	2.05		4.81	9.27	0.64		0.50	0.072	0.003		0.014	12.28	1.42		5.45	3	11		7
Other zooplankton	0.81	1.67	0.93	1.31	0.1	0.19	0.02	0.06	0	0.000	0	0.000	0.06	0.13	0.04	0.08	11	14	12	15
Zooplankton, total	**47.37**	**5.13**	**1.64**	**11.27**	**42.38**	**2.83**	**0.05**	**2.31**	**0.3**	**0.013**	**0**	**0.058**	**51.47**	**6.87**	**0.08**	**23.21**				
Other invertebrates	8.5	2.31	1.64	3.16	5.73	1.16	0.5	0.85	0.035	0.002	0.001	0.008	6.07	1.34	0.43	3.03	4	12	9	9
Other invertebrates, total	**8.5**	**2.31**	**1.64**	**3.16**	**5.73**	**1.16**	**0.5**	**0.85**	**0.035**	**0.002**	**0.001**	**0.008**	**6.07**	**1.34**	**0.43**	**3.03**				
Invertebrates, total	**55.47**	**18.85**	**14.25**	**23.71**	**59.99**	**44.78**	**8.91**	**18.93**	**0.387**	**0.083**	**0.02**	**0.116**	**66.36**	**45.02**	**11.31**	**46.54**				
Unidentifiable prey	6.48	3.97	4.21	4.47	4.95	2.91	1.32	1.81	0.031	0.007	0.003	0.010	5.24	4.01	1.58	3.99	7	7	7	8
Unidentifiable prey, total	**6.48**	**3.97**	**4.21**	**4.47**	**4.95**	**2.91**	**1.32**	**1.81**	**0.031**	**0.007**	**0.003**	**0.010**	**5.24**	**4.01**	**1.58**	**3.99**				
Total					**100**	**100.00**	**100**	**100.00**	**0.583**	**0.184**	**0.175**	**0.249**	**100**	**100.00**	**100**	**100.00**				

Table 15. Summary of diet of the ENGSL Greenland halibut from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 20, M = [20-40[, L = 40+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG				LC				NEG			
Taxonomic grouping	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Clupea harengus										0.01 (6.29)		0.01 (2.54)
Enchelyopus cimbrius		0.00 (1.92)	0.00 (0.11)	0.002 (0.80)		0.001 (1.06)	0.00 (2.54)	0.00 (1.13)			0.036 (11.33)	0.01 (2.86)
Mallotus villosus	0.054 (9.52)	0.07 (34.21)	0.02 (12.51)	0.055 (20.04)	0.15 (31.04)	0.048 (39.77)		0.04 (24.94)	0.25 (36.03)	0.02 (8.74)	0.022 (6.91)	0.06 (17.66)
Other fishes	0.038 (6.66)	0.02 (10.20)	0.02 (9.91)	0.023 (8.48)	0.01 (3.04)	0.004 (3.58)	0.01 (12.06)	0.01 (5.90)	0.05 (7.15)	0.06 (23.88)	0.037 (11.61)	0.05 (15.03)
Sebastes spp.		0.03 (13.93)	0.10 (62.43)	0.035 (12.71)		0.005 (4.48)	0.09 (76.43)	0.04 (24.22)		0.01 (2.85)	0.174 (55.26)	0.05 (15.09)
Fishes, total	**0.093 (16.18)**	**0.12 (60.25)**	**0.13 (84.95)**	**0.115 (42.04)**	**0.17 (34.08)**	**0.059 (48.89)**	**0.11 (91.03)**	**0.09 (56.19)**	**0.30 (43.18)**	**0.10 (41.76)**	**0.269 (85.11)**	**0.18 (53.19)**
Other crabs		0.00 (0.22)		0.000 (0.09)					0.05 (6.89)			0.01 (2.37)
Crabs, total		**0.00 (0.22)**		**0.000 (0.09)**					**0.05 (6.89)**			**0.01 (2.37)**
Other Pandalidae		0.01 (4.24)	0.00 (0.11)	0.005 (1.76)		0.004 (3.61)	0.00 (0.18)	0.00 (1.33)		0.01 (2.54)	0.002 (0.66)	0.00 (1.19)
Other shrimp	0.009 (1.59)	0.00 (0.76)	0.00 (0.09)	0.003 (1.08)	0.00 (0.04)	0.004 (3.64)	0.00 (0.13)	0.00 (1.34)		0.01 (2.75)	0.004 (1.32)	0.00 (1.44)
Pandalus borealis		0.02 (12.27)	0.02 (10.78)	0.017 (6.26)		0.019 (15.92)	0.01 (5.77)	0.01 (7.35)	0.00 (0.54)	0.09 (38.86)	0.027 (8.48)	0.06 (18.02)
Pasiphaea multidentata	0.019 (3.34)	0.01 (3.22)	0.00 (0.03)	0.008 (2.92)	0.08 (16.77)	0.029 (24.17)	0.00 (0.02)	0.02 (14.43)	0.01 (1.92)	0.01 (4.64)	0.012 (3.87)	0.01 (3.51)
Shrimp, total	**0.028 (4.93)**	**0.04 (20.49)**	**0.02 (11.01)**	**0.033 (12.03)**	**0.08 (16.80)**	**0.057 (47.34)**	**0.01 (6.10)**	**0.04 (24.45)**	**0.02 (2.46)**	**0.12 (48.78)**	**0.045 (14.33)**	**0.08 (24.17)**
Euphausiidae	0.363 (63.49)	0.02 (12.08)	0.00 (0.13)	0.097 (35.21)	0.07 (15.24)	0.000 (0.05)	0.00 (0.01)	0.01 (5.35)	0.13 (18.12)	0.00 (0.79)	0.000 (0.02)	0.02 (6.55)
Hyperiidae	0.002 (0.42)	0.00 (0.01)		0.001 (0.20)	0.13 (27.44)	0.001 (1.10)		0.02 (9.99)	0.14 (20.15)	0.01 (3.19)		0.03 (8.22)
Other zooplankton	0.001 (0.12)	0.00 (0.09)	0.00 (0.05)	0.000 (0.10)		0.001 (0.42)	0.00 (0.09)	0.00 (0.17)	0.00 (0.01)			0.00 (0.00)
Zooplankton, total	**0.366 (64.03)**	**0.02 (12.18)**	**0.00 (0.18)**	**0.097 (35.51)**	**0.21 (42.68)**	**0.002 (1.57)**	**0.00 (0.10)**	**0.03 (15.52)**	**0.27 (38.28)**	**0.01 (3.99)**	**0.000 (0.02)**	**0.05 (14.77)**
Other invertebrates	0.046 (8.00)	0.00 (1.05)	0.00 (1.90)	0.012 (4.45)	0.01 (2.71)	0.000 (0.29)	0.00 (0.06)	0.00 (1.07)	0.04 (5.41)	0.01 (2.26)	0.000 (0.01)	0.01 (2.78)
Other invertebrates, total	**0.046 (8.00)**	**0.00 (1.05)**	**0.00 (1.90)**	**0.012 (4.45)**	**0.01 (2.71)**	**0.000 (0.29)**	**0.00 (0.06)**	**0.00 (1.07)**	**0.04 (5.41)**	**0.01 (2.26)**	**0.000 (0.01)**	**0.01 (2.78)**
Invertebrates, total	**0.440 (76.96)**	**0.07 (33.94)**	**0.02 (13.09)**	**0.143 (52.08)**	**0.30 (62.20)**	**0.060 (49.21)**	**0.01 (6.26)**	**0.07 (41.03)**	**0.37 (53.04)**	**0.13 (55.03)**	**0.045 (14.37)**	**0.15 (44.09)**
Unidentifiable prey	0.039 (6.86)	0.01 (5.81)	0.00 (1.96)	0.016 (5.88)	0.02 (3.73)	0.002 (1.90)	0.00 (2.71)	0.00 (2.78)	0.03 (3.78)	0.01 (3.20)	0.002 (0.52)	0.01 (2.72)
Unidentifiable prey, total	**0.039 (6.86)**	**0.01 (5.81)**	**0.00 (1.96)**	**0.016 (5.88)**	**0.02 (3.73)**	**0.002 (1.90)**	**0.00 (2.71)**	**0.00 (2.78)**	**0.03 (3.78)**	**0.01 (3.20)**	**0.002 (0.52)**	**0.01 (2.72)**
Total	**0.572 (100.00)**	**0.20 (100.00)**	**0.16 (100.00)**	**0.274 (100.00)**	**0.49 (100.00)**	**0.121 (100.00)**	**0.12 (100.00)**	**0.16 (100.00)**	**0.69 (100.00)**	**0.24 (100.00)**	**0.316 (100.00)**	**0.33 (100.00)**

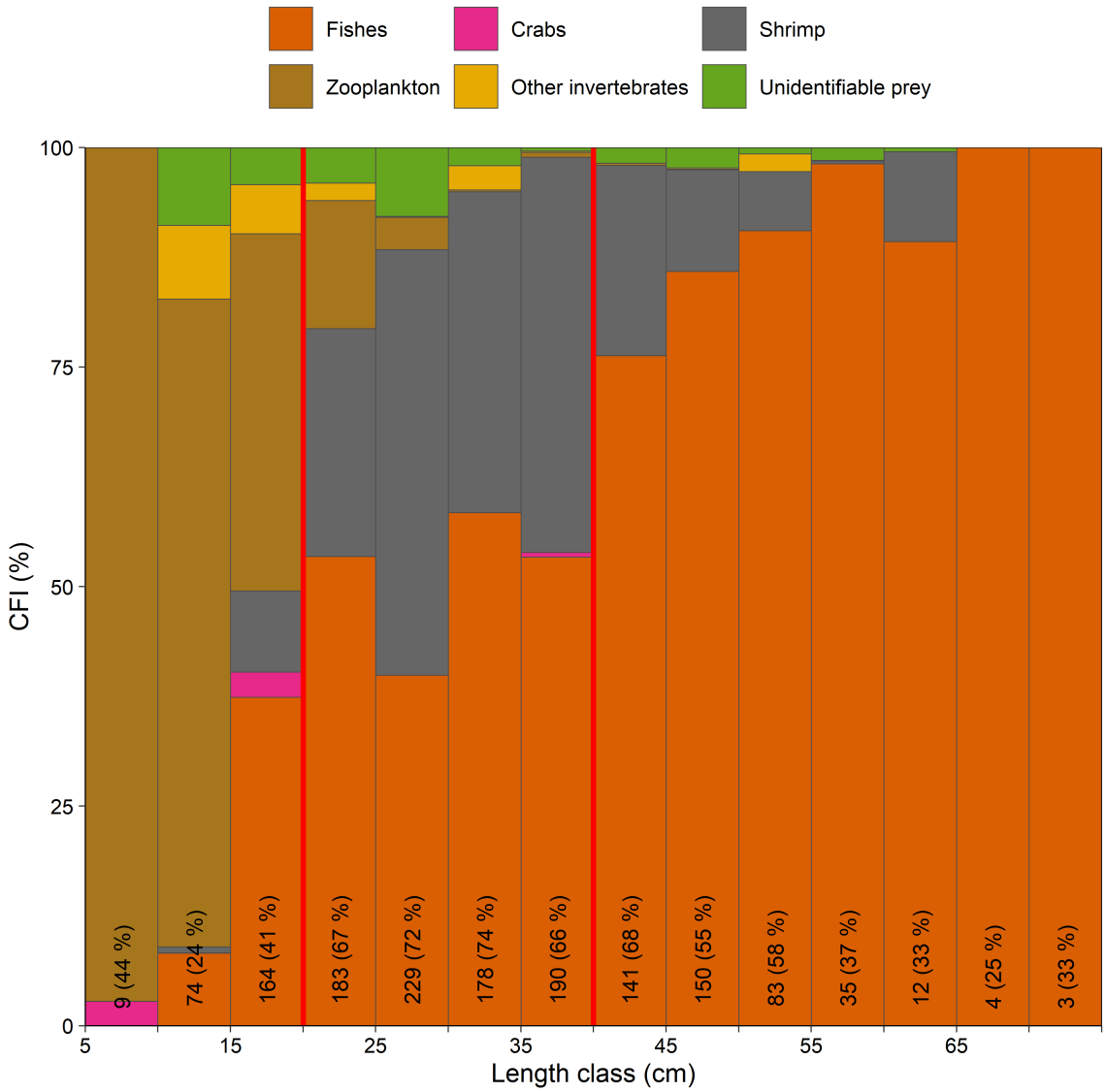

Figure 6. Prey group contributions to the total fullness index (CFI) for Greenland halibut in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. Vertical red lines separate the length classes that were combined for the analyzes.

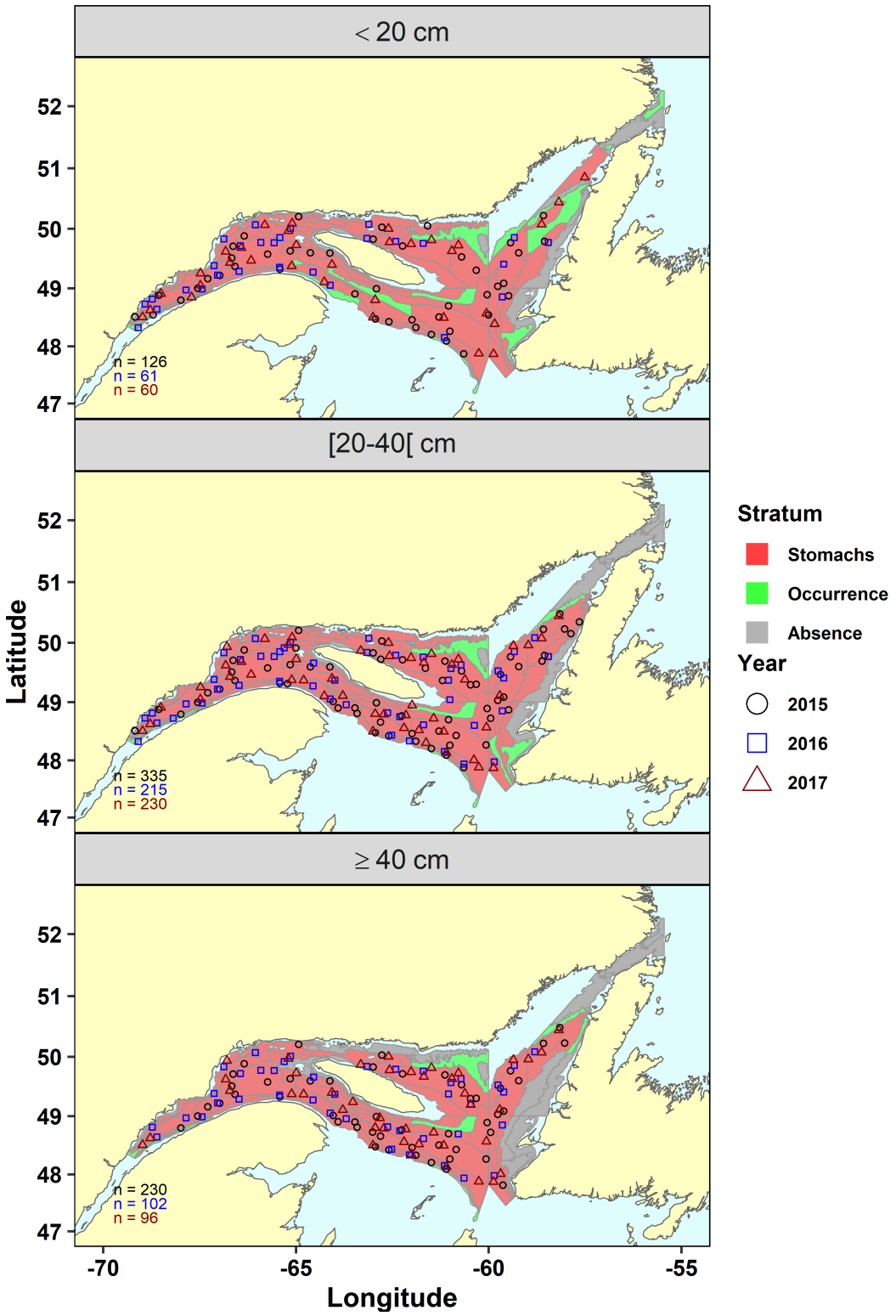

Figure 7. Origin of Greenland halibut stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.5 Lumpfish (*Cyclopterus lumpus*)

Lumpfish stomachs were collected in each year of the 2015-2017 period. In total, 124 stomachs were analyzed in the laboratory, of which only 5 % were empty (Table 16). These stomachs came from specimens ranging from 4.0 to 39.5 cm in length, for an average length of 15.1 cm (Table 16). By assessing the contribution of different groups of prey to the total fullness index by specimen length, two size groups were created with a break at 15 cm in length (Figure 8). The average mass of stomach contents for lumpfish, all lengths combined, was 8.1 g, excluding empty stomachs (Table 16).

Thirty-seven taxa in 10 families were found in the stomach contents of this predator (Tables 3 and 16).

The digestion level was often advanced for lumpfish prey, which made their identification difficult. Disregarding length classes, > 75 % of the mean TFI value was due to prey recorded as digested invertebrates or unidentified digested material (Table 17). Of the 17 taxa identified in the zooplankton group, the euphausiid *Thysanoessa* sp. was the most important, followed closely by the hyperiid *Themisto* sp. For all prey combined, these two taxa respectively ranked 3rd and 4th in importance in lumpfish's diet, when all lengths were combined (Table 17). Of the genus *Themisto*, the species *Themisto compressa* was by far the most observed in stomach contents (32 %). The four most important zooplankton families in the diet of this predator were, in order of importance, Hyperiidae, Euphausiidae, Aetideidae and Mysidae (Table 18).

The contribution of shrimp as prey was negligible in the diet of lumpfish (Table 17). Except for fragments of unidentifiable shrimp, the two shrimp taxa identified to the species level were only found in one stomach each. A small contribution was also observed for fishes.

It was difficult to differentiate the diet of lumpfish according to the created length classes. Indeed, the CFI sum of the taxonomic groupings other invertebrates and unidentifiable prey were high, namely 76 % and 93 % for small and large specimens of lumpfish, respectively (Table 17). However, there was an increased importance of zooplankton in small specimens and a higher feeding intensity in small specimens.

The origin of lumpfish stomachs according to size class shows extensive coverage of the ENGSL given the occurrence of this predator in the catches of the ecosystemic surveys for the period 2015-2017 (Figure 9). In fact, the 124 stomachs collected came from 75 different sets distributed over 35 strata. During the 2015-2017 period, 248 lumpfish were caught in 40 different strata, 50 % of which was used for stomach content analysis.

The feeding intensity was higher for NEG lumpfish (Table 19). Stomachs collected in this zone were the only ones where dietary contribution of fishes, Pandalidae shrimp and Melitidae amphipods were reported. In the LC, the vast majority of prey (63 %) were not identifiable. This zone also had by far the highest percentage of empty stomachs (15 %) compared to what was observed elsewhere (2-3 %). In NWG, lumpfish consumed more euphausiids than elsewhere and it was the only zone where contributions of mysids and hermit crabs (Paguridae) were reported.

Table 16. Sampling effort summary for lumpfish stomachs, by zone and length class (cm, S = < 15, L = 15+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG			LC			NEG			ENGSL		
Metric	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Mean TFI	11.28	7.20	9.75	10.73	7.44	10.24	17.64	10.87	15.59	12.83	8.19	11.41
No. of stomachs	40	24	64	23	4	27	23	10	33	86	38	124
No. of empty stomachs	0	1	1	4	0	4	0	1	1	4	2	6
% empty	0.0	4.2	1.6	17.4	0.0	14.8	0.0	10.0	3.0	4.7	5.3	4.8
Length (cm)												
min	4.0	18.9	4.0	7.0	18.9	7.0	4.0	21.8	4.0	4.0	18.9	4.0
med	11.4	22.4	12.9	10.4	23.6	11.0	9.5	29.0	10.6	10.6	24.0	11.6
mean	10.9	24.3	15.9	10.4	25.7	12.6	9.5	29.3	15.5	10.4	25.8	15.1
max	14.3	36.0	36.0	12.0	36.5	36.5	14.5	39.5	39.5	14.5	39.5	39.5
Total stomach content (g)												
min	0.009	0.021	0.009	0.013	5.663	0.013	0.022	6.449	0.022	0.009	0.021	0.009
med	1.691	11.638	2.031	1.064	13.684	1.234	1.514	36.514	2.394	1.329	14.075	1.830
mean	2.031	13.744	6.307	1.238	16.861	3.955	2.136	46.879	14.720	1.877	22.374	8.130
max	8.937	48.431	48.431	4.765	34.411	34.411	7.590	116.373	116.373	8.937	116.373	116.373
No. of observed taxa												
Fishes	0	0	0	0	0	0	3	0	3	3	0	3
Crabs	2	2	2	2	0	2	2	1	2	2	2	2
Shrimp	1	1	1	0	0	0	1	3	3	1	3	3
Zooplankton	13	10	15	9	0	9	10	4	10	17	10	17
Other invertebrates	7	4	7	3	2	4	4	4	6	10	6	11
Unidentifiable prey	1	1	1	1	0	1	1	1	1	1	1	1
Total	24	18	26	15	2	16	21	13	25	34	22	37

Table 17. Detailed diet of lumpfish from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 15, L = 15+ and T = all lengths combined).

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Digested fish	1.16		0.81	0		0.00	0.002		0.001	0.01		0.01	27		27
Digested roundfish	1.16		0.81	0		0.00	0		0.000	0		0.00	31		34
Pleuronectiformes	1.16		0.81	0.11		0.02	0.011		0.008	0.09		0.07	21		21
Fishes, total	**2.33**		**1.61**	**0.12**		**0.02**	**0.014**		**0.009**	**0.11**		**0.08**			
Brachyura	29.07	18.42	25.81	2.35	0.63	0.91	0.252	0.129	0.214	1.96	1.58	1.88	9	4	8
Chionoecetes opilio	22.09	5.26	16.94	2.54	0.02	0.42	0.277	0.001	0.192	2.16	0.01	1.68	8	13	9
Crabs, total	**46.51**	**23.68**	**39.52**	**4.89**	**0.65**	**1.33**	**0.528**	**0.13**	**0.406**	**4.12**	**1.59**	**3.56**			
Digested shrimp	5.81	5.26	5.65	0.08	0	0.02	0.007	0.001	0.005	0.06	0.01	0.05	23	14	23
Pandalus borealis		2.63	0.81		0.06	0.05		0.002	0.001		0.03	0.01		11	30
Pandalus montagui		2.63	0.81		0	0.00		0	0.000		0	0.00		16	37
Shrimp, total	**5.81**	**10.53**	**7.26**	**0.08**	**0.06**	**0.07**	**0.007**	**0.003**	**0.006**	**0.06**	**0.04**	**0.05**			
Aetideidae	2.33		1.61	0.01		0.00	0.023		0.016	0.18		0.14	18		18
Boreomysis sp.	1.16		0.81	0.06		0.01	0.011		0.008	0.09		0.07	22		22
Calanoida	6.98		4.84	0.04		0.01	0.014		0.010	0.11		0.08	20		20
Calanus hyperboreus	1.16		0.81	0.01		0.00	0.001		0.001	0.01		0.00	30		32
Calanus sp.	1.16		0.81	0		0.00	0		0.000	0		0.00	34		36
Copepoda	5.81	2.63	4.84	0.01	0	0.00	0.001	0	0.001	0.01	0	0.01	29	15	31
Euphausiidae	5.81	2.63	4.84	0.49	0	0.08	0.074	0	0.052	0.58	0	0.45	13	19	13
Hyperia galba	12.79	21.05	15.32	1.45	0.07	0.29	0.221	0.005	0.155	1.72	0.07	1.36	10	9	10
Hyperia sp.	3.49	2.63	3.23	0.1	0	0.02	0.018	0	0.013	0.14	0	0.11	19	21	19
Hyperiidae	5.81	5.26	5.65	0.3	0.01	0.05	0.066	0	0.046	0.52	0	0.40	15	17	15
Meganyctiphanes norvegica	6.98	10.53	8.06	0.79	0.06	0.18	0.132	0.01	0.095	1.03	0.12	0.83	12	7	12
Mysidae	1.16	2.63	1.61	0	0	0.00	0	0	0.000	0	0	0.00	33	18	33
Themisto abyssorum	4.65		3.23	0.04		0.01	0.004		0.003	0.03		0.02	25		25
Themisto compressa	33.72	28.95	32.26	3.9	0.61	1.13	0.401	0.079	0.303	3.13	0.97	2.65	6	5	7
Themisto libellula	3.49	5.26	4.03	0.97	1.91	1.76	0.385	0.306	0.361	3	3.74	3.16	7	3	5
Themisto sp.	45.35	21.05	37.9	3.04	0.04	0.53	0.54	0.005	0.376	4.21	0.07	3.30	4	8	4
Thysanoessa sp.	18.6		12.9	5.09		0.82	0.598		0.415	4.66		3.64	3		3
Zooplankton, total	**79.07**	**52.63**	**70.97**	**16.29**	**2.71**	**4.89**	**2.49**	**0.407**	**1.851**	**19.4**	**4.98**	**16.23**			
Amphipoda	1.16		0.81	0		0.00	0.007		0.005	0.05		0.04	24		24
Crustacea	12.79	10.53	12.1	1.23	0.01	0.21	0.508	0.001	0.353	3.96	0.01	3.09	5	12	6
Ctenophora		2.63	0.81		0.02	0.02		0.003	0.001		0.03	0.01		10	29
Digested invertebrates	31.4	60.53	40.32	41.77	89.81	82.11	3.475	6.941	4.537	27.08	84.78	39.77	2	1	1

Table 17. Continued.

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Gammaridea	4.65		3.23	0.2		0.03	0.071		0.050	0.56		0.43	14		14
Homarus americanus	1.16		0.81	0.02		0.00	0.002		0.001	0.02		0.01	26		26
Melitidae	1.16		0.81	0.03		0.00	0.024		0.017	0.19		0.15	16		16
Mollusca	1.16	2.63	1.61	0.26	0	0.04	0.024	0	0.017	0.19	0	0.14	17	20	17
Ophiuroidea	1.16		0.81	0		0.00	0		0.000	0		0.00	32		35
Paguridae	1.16	2.63	1.61	0.02	0	0.00	0.001	0	0.001	0.01	0	0.01	28	22	28
Polychaeta	2.33	5.26	3.23	0.08	0.18	0.16	0.185	0.019	0.134	1.44	0.23	1.17	11	6	11
Other invertebrates, total	**46.51**	**63.16**	**51.61**	**43.61**	**90.02**	**82.58**	**4.297**	**6.964**	**5.115**	**33.49**	**85.06**	**44.83**			
Invertebrates, total	**89.53**	**89.47**	**89.52**	**64.87**	**93.45**	**88.87**	**7.323**	**7.505**	**7.379**	**57.06**	**91.67**	**64.67**			
Unidentified digested material	48.84	18.42	39.52	35.02	6.55	11.12	5.496	0.682	4.021	42.83	8.33	35.24	1	2	2
Unidentifiable prey, total	**48.84**	**18.42**	**39.52**	**35.02**	**6.55**	**11.12**	**5.496**	**0.682**	**4.021**	**42.83**	**8.33**	**35.24**			
Total				**100**	**100**	**100.00**	**12.833**	**8.187**	**11.409**	**100**	**100**	**100.00**			

Table 18. Summary of diet of lumpfish from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 15, L = 15+ and T = all lengths combined).

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Other fishes	2.33		1.61	0.12		0.02	0.014		0.009	0.11		0.08	10		10
Fishes, total	**2.33**		**1.61**	**0.12**		**0.02**	**0.014**		**0.009**	**0.11**		**0.08**			
Chionoecetes opilio	22.09	5.26	16.94	2.54	0.02	0.42	0.277	0.001	0.192	2.16	0.01	1.68	5	7	6
Other crabs	29.07	18.42	25.81	2.35	0.63	0.91	0.252	0.129	0.214	1.96	1.58	1.88	6	4	5
Crabs, total	**46.51**	**23.68**	**39.52**	**4.89**	**0.65**	**1.33**	**0.528**	**0.13**	**0.406**	**4.12**	**1.59**	**3.56**			
Other shrimp	5.81	5.26	5.65	0.08	0	0.02	0.007	0.001	0.005	0.06	0.01	0.05	12	8	12
Pandalidae		5.26	1.61		0.06	0.05		0.003	0.001		0.03	0.01		6	15
Shrimp, total	**5.81**	**10.53**	**7.26**	**0.08**	**0.06**	**0.07**	**0.007**	**0.003**	**0.006**	**0.06**	**0.04**	**0.05**			
Aetideidae	2.33		1.61	0.01		0.00	0.023		0.016	0.18		0.14	8		8
Euphausiidae	26.74	10.53	21.77	6.37	0.07	1.08	0.805	0.01	0.561	6.27	0.13	4.92	4	5	4
Hyperiidae	70.93	52.63	65.32	9.79	2.64	3.79	1.635	0.396	1.256	12.74	4.84	11.01	3	3	3
Mysidae	2.33	2.63	2.42	0.06	0	0.01	0.011	0	0.008	0.09	0	0.07	11	10	11
Other zooplankton	13.95	2.63	10.48	0.06	0	0.01	0.016	0	0.011	0.12	0	0.10	9	9	9
Zooplankton, total	**79.07**	**52.63**	**70.97**	**16.29**	**2.71**	**4.89**	**2.49**	**0.407**	**1.851**	**19.4**	**4.98**	**16.23**			
Homarus americanus	1.16		0.81	0.02		0.00	0.002		0.001	0.02		0.01	13		13
Melitidae	1.16		0.81	0.03		0.00	0.024		0.017	0.19		0.15	7		7
Other invertebrates	45.35	63.16	50.81	43.54	90.02	82.57	4.27	6.964	5.096	33.27	85.06	44.66	2	1	1
Paguridae	1.16	2.63	1.61	0.02	0	0.00	0.001	0	0.001	0.01	0	0.01	14	11	14
Other invertebrates, total	**46.51**	**63.16**	**51.61**	**43.61**	**90.02**	**82.58**	**4.297**	**6.964**	**5.115**	**33.49**	**85.06**	**44.83**			
Invertebrates, total	**89.53**	**89.47**	**89.52**	**64.87**	**93.45**	**88.87**	**7.323**	**7.505**	**7.379**	**57.06**	**91.67**	**64.67**			
Unidentifiable prey	48.84	18.42	39.52	35.02	6.55	11.12	5.496	0.682	4.021	42.83	8.33	35.24	1	2	2
Unidentifiable prey, total	**48.84**	**18.42**	**39.52**	**35.02**	**6.55**	**11.12**	**5.496**	**0.682**	**4.021**	**42.83**	**8.33**	**35.24**			
Total				**100**	**100**	**100.00**	**12.833**	**8.187**	**11.409**	**100**	**100**	**100.00**			

Table 19. Summary of diet of the ENGSL lumpfish from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 15, L = 15+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG			LC			NEG		
Taxonomic grouping	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Other fishes							0.05 (0.29)		0.036 (0.23)
Fishes, total							**0.05 (0.29)**		**0.036 (0.23)**
Chionoecetes opilio	0.405 (3.59)	0.00 (0.02)	0.25 (2.60)	0.03 (0.32)		0.03 (0.28)	0.30 (1.68)		0.206 (1.32)
Other crabs	0.431 (3.82)	0.20 (2.84)	0.35 (3.55)	0.02 (0.19)		0.02 (0.17)	0.17 (0.97)	0.00 (0.01)	0.120 (0.77)
Crabs, total	**0.836 (7.41)**	**0.21 (2.86)**	**0.60 (6.15)**	**0.05 (0.51)**		**0.05 (0.45)**	**0.47 (2.65)**	**0.00 (0.01)**	**0.326 (2.09)**
Other shrimp	0.004 (0.03)	0.00 (0.01)	0.00 (0.03)				0.02 (0.12)	0.00 (0.00)	0.015 (0.10)
Pandalidae								0.01 (0.09)	0.003 (0.02)
Shrimp, total	**0.004 (0.03)**	**0.00 (0.01)**	**0.00 (0.03)**				**0.02 (0.12)**	**0.01 (0.09)**	**0.018 (0.12)**
Aetideidae	0.000 (0.00)		0.00 (0.00)				0.08 (0.48)		0.059 (0.38)
Euphausiidae	1.569 (13.92)	0.02 (0.23)	0.99 (10.13)	0.01 (0.08)		0.01 (0.07)	0.27 (1.53)		0.189 (1.21)
Hyperiidae	0.782 (6.94)	0.61 (8.51)	0.72 (7.37)	1.64 (15.28)		1.40 (13.64)	3.11 (17.65)	0.04 (0.35)	2.182 (13.99)
Mysidae	0.024 (0.22)	0.00 (0.00)	0.02 (0.16)						
Other zooplankton	0.029 (0.26)	0.00 (0.01)	0.02 (0.19)	0.00 (0.03)		0.00 (0.03)	0.00 (0.02)		0.003 (0.02)
Zooplankton, total	**2.406 (21.34)**	**0.63 (8.75)**	**1.74 (17.85)**	**1.65 (15.39)**		**1.41 (13.74)**	**3.47 (19.68)**	**0.04 (0.35)**	**2.432 (15.60)**
Homarus americanus				0.01 (0.07)		0.01 (0.06)			
Melitidae							0.09 (0.51)		0.063 (0.40)
Other invertebrates	4.954 (43.93)	5.61 (77.98)	5.20 (53.36)	1.44 (13.44)	7.438 (100.00)	2.33 (22.76)	5.91 (33.48)	10.02 (92.22)	7.154 (45.89)
Paguridae	0.003 (0.03)	0.00 (0.00)	0.00 (0.02)						
Other invertebrates, total	**4.957 (43.96)**	**5.61 (77.98)**	**5.20 (53.38)**	**1.45 (13.51)**	**7.438 (100.00)**	**2.34 (22.82)**	**6.00 (33.99)**	**10.02 (92.22)**	**7.217 (46.29)**
Invertebrates, total	**8.203 (72.74)**	**6.45 (89.61)**	**7.54 (77.41)**	**3.16 (29.41)**	**7.438 (100.00)**	**3.79 (37.01)**	**9.96 (56.45)**	**10.07 (92.66)**	**9.992 (64.10)**
Unidentifiable prey	3.074 (27.26)	0.75 (10.39)	2.20 (22.59)	7.57 (70.59)		6.45 (62.99)	7.63 (43.26)	0.80 (7.34)	5.562 (35.68)
Unidentifiable prey, total	**3.074 (27.26)**	**0.75 (10.39)**	**2.20 (22.59)**	**7.57 (70.59)**		**6.45 (62.99)**	**7.63 (43.26)**	**0.80 (7.34)**	**5.562 (35.68)**
Total	**11.277 (100.00)**	**7.20 (100.00)**	**9.75 (100.00)**	**10.73 (100.00)**	**7.438 (100.00)**	**10.24 (100.00)**	**17.64 (100.00)**	**10.87 (100.00)**	**15.590 (100.00)**

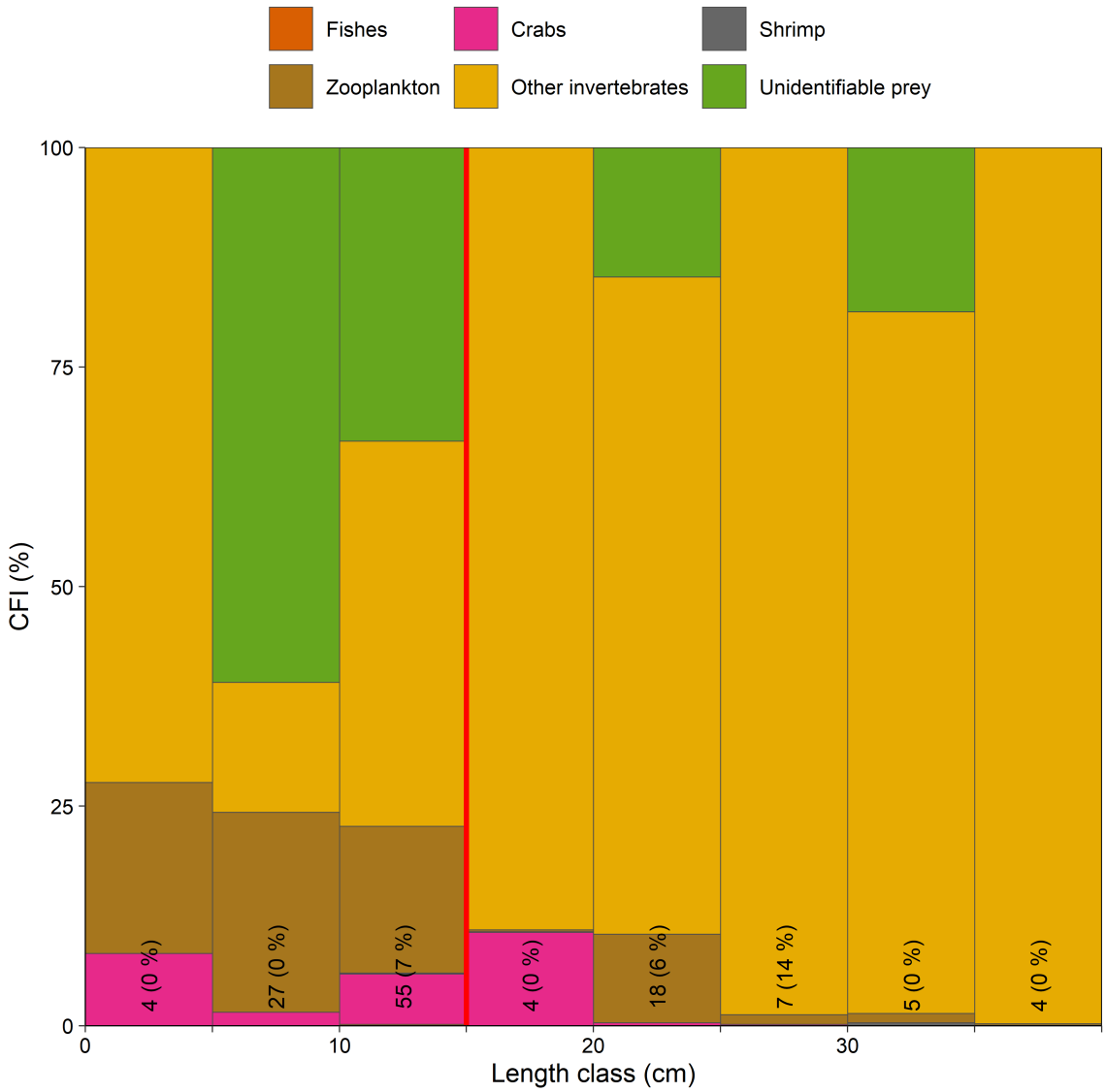

Figure 8. Prey group contributions to the total fullness index (CFI) for lumpfish in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. The vertical red line separates the length classes that were combined for the analyzes.

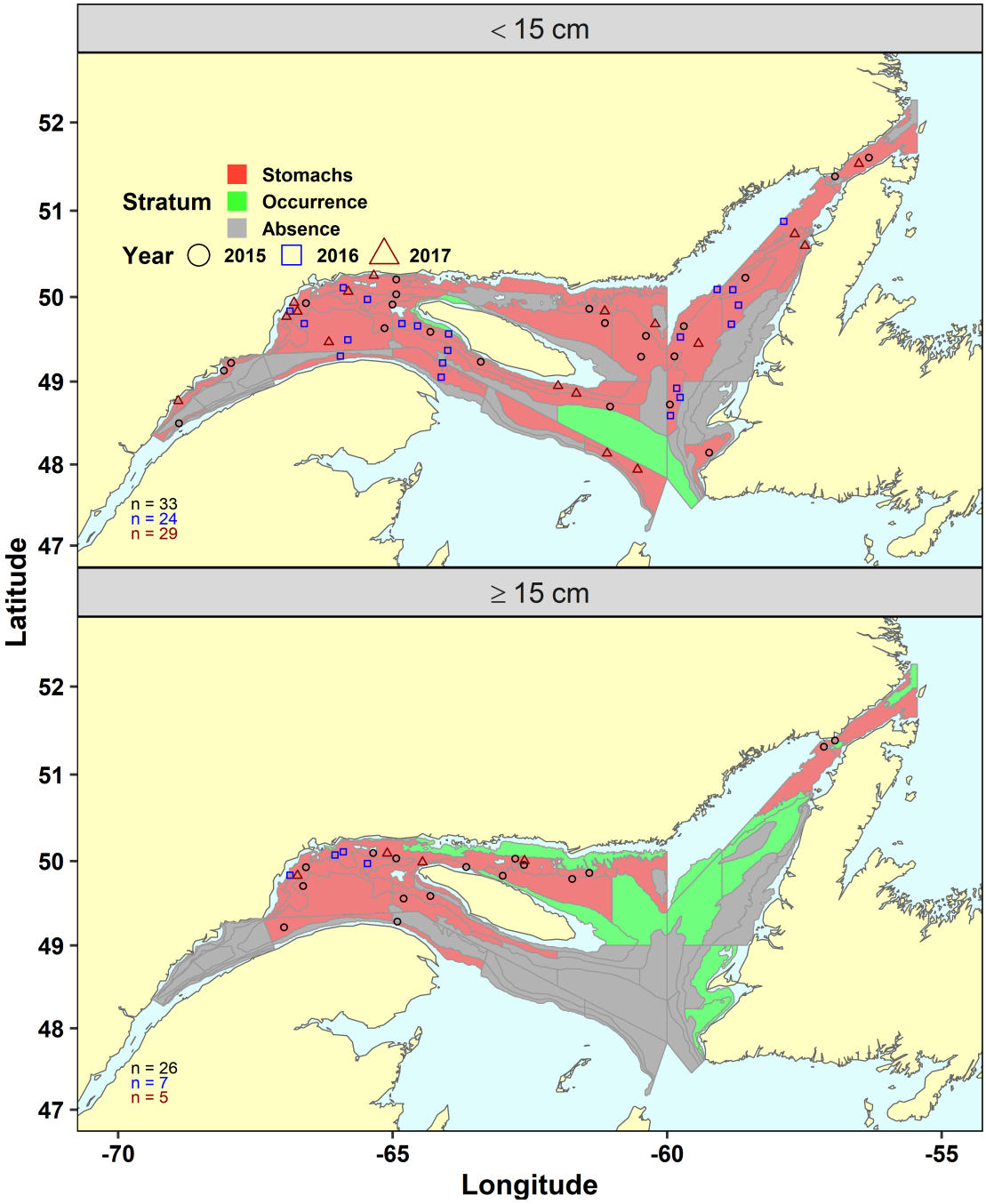

Figure 9. Origin of lumpfish stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.6 Longfin hake (*Phycis chesteri*)

Longfin hake were only targeted for stomach content analysis in 2017. One hundred and nineteen stomachs were collected and analyzed in the laboratory, with 18 % being empty (Table 20). These stomachs came from specimens ranging from 14.5 to 39.5 cm in length, for an average length of 26.4 cm (Table 20). No clear distinction in the evolution of the diet as a function of length was discernible, which resulted in the absence of length classes for this predator (Figure 10). The average mass of stomach contents for this predator, all lengths combined, was 0.3 g, excluding empty stomachs (Table 20).

Eighteen taxa in nine families have been found in the stomach contents of this predator (Tables 3 and 20). The diet of longfin hake was almost 100 % invertebrates (Table 21), with pink glass shrimp in 1st rank by CFI. Copepods of the family Calanidae ranked 2nd for the same metric, and were the prey most often found in stomachs of this predator (64 %, Table 22). This family is far ahead of the other taxonomic groupings created for zooplankton, as much in FO as in MC or CFI (Table 22). Zooplankton contributed the most to the food intake of this predator (53 %), followed by shrimp (31 %), other invertebrates (13 %) and unidentifiable prey (3 %).

More than 90 % of the longfin hake stomachs originated from LC (Table 20, Figure 11). Only three and five stomachs respectively were collected in the NWG (more specifically from the estuary) and NEG zones. Because of this small stomach count in two zones, it was impossible to examine the dietary differences between zones. Results are nonetheless provided in Table 23.

Table 20. Sampling effort summary for longfin hake stomachs, by zone. A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

Metric	NWG	LC	NEG	ENGSL
Mean TFI	0.0014	0.024	0.099	0.027
No. of stomachs	3	111	5	119
No. of empty stomachs	2	19	0	21
% empty	66.7	17.1	0.0	17.6
Length (cm)				
min	26.9	14.5	17.5	14.5
med	27.2	26.5	18.1	26.5
mean	30.0	26.7	18.3	26.4
max	35.9	39.5	19.6	39.5
Total stomach content (g)				
min	0.042	0.002	0.115	0.002
med	0.042	0.141	0.246	0.142
mean	0.042	0.261	0.266	0.259
max	0.042	2.551	0.449	2.551
No. of observed taxa				
Fishes	0	0	0	0
Crabs	0	0	0	0
Shrimp	0	2	0	2
Zooplankton	2	9	6	10
Other invertebrates	0	5	1	5
Unidentifiable prey	0	1	0	1
Total	2	17	7	18

Table 21. Detailed diet of longfin hake from the 2015-2017 ENGSL *Teleost* surveys.

				CFI	
Prey	**FO**	**MC**	**FI**	**Value**	**Rank**
Digested shrimp	1.68	1.50	0.000	0.47	11
Pasiphaea multidentata	5.88	35.82	0.008	30.08	1
Shrimp, total	**7.56**	**37.32**	**0.008**	**30.55**	
Boreomysis sp.	21.01	12.47	0.002	9.25	5
Calanoida	36.13	8.72	0.004	13.70	3
Calanus hyperboreus	32.77	9.87	0.002	7.11	6
Calanus sp.	34.45	12.47	0.004	15.01	2
Meganyctiphanes norvegica	0.84	0.12	0.000	0.13	13
Meterythrops robusta	0.84	0.05	0.000	0.17	12
Metridia sp.	5.04	0.27	0.000	0.77	9
Mysidae	0.84	0.09	0.000	0.03	17
Paraeuchaeta norvegica	16.81	2.78	0.002	6.63	7
Themisto abyssorum	1.68	0.15	0.000	0.50	10
Zooplankton, total	**77.31**	**47.00**	**0.014**	**53.31**	
Amphipoda	1.68	0.07	0.000	0.04	16
Brisaster fragilis	0.84	0.16	0.000	0.08	15
Crustacea	31.93	13.63	0.003	13.00	4
Gammaridea	0.84	0.03	0.000	0.02	18
Lysianassidae	0.84	0.07	0.000	0.10	14
Other invertebrates, total	**34.45**	**13.95**	**0.004**	**13.25**	
Invertebrates, total	**82.35**	**98.26**	**0.026**	**97.11**	
Unidentified digested material	4.2	1.74	0.001	2.89	8
Unidentifiable prey, total	**4.2**	**1.74**	**0.001**	**2.89**	
Total		**100.00**	**0.027**	**100.00**	

Table 22. Summary of diet of longfin hake from the 2015-2017 ENGSL *Teleost* surveys.

				CFI	
Prey	**FO**	**MC**	**FI**	**Value**	**Rank**
Other shrimp	1.68	1.50	0.000	0.47	10
Pasiphaea multidentata	5.88	35.82	0.008	30.08	1
Shrimp, total	**7.56**	**37.32**	**0.008**	**30.55**	
Calanidae	63.87	22.34	0.006	22.12	2
Meganyctiphanes norvegica	0.84	0.12	0.000	0.13	11
Metridia sp.	5.04	0.27	0.000	0.77	8
Mysidae	22.69	12.61	0.003	9.45	5
Other zooplankton	36.13	8.72	0.004	13.70	3
Paraeuchaeta norvegica	16.81	2.78	0.002	6.63	6
Themisto abyssorum	1.68	0.15	0.000	0.50	9
Zooplankton, total	**77.31**	**47.00**	**0.014**	**53.31**	
Brisaster fragilis	0.84	0.16	0.000	0.08	13
Lysianassidae	0.84	0.07	0.000	0.10	12
Other invertebrates	33.61	13.72	0.003	13.06	4
Other invertebrates, total	**34.45**	**13.95**	**0.004**	**13.25**	
Invertebrates, total	**82.35**	**98.26**	**0.026**	**97.11**	
Unidentifiable prey	4.2	1.74	0.001	2.89	7
Unidentifiable prey, total	**4.2**	**1.74**	**0.001**	**2.89**	
Total		**100.00**	**0.027**	**100.00**	

Table 23. Summary of diet of the ENGSL longfin hake from the 2015-2017 *Teleost* surveys, as a function of zones of origin. For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

Prey	**NWG**	**LC**	**NEG**
Other shrimp		0.000 (0.56)	
Pasiphaea multidentata		0.009 (35.68)	
Shrimp, total		**0.009 (36.24)**	
Calanidae	0.000 (19.05)	0.006 (24.50)	0.009 (9.25)
Meganyctiphanes norvegica		0.000 (0.15)	
Metridia sp.		0.000 (0.00)	0.005 (4.91)
Mysidae	0.001 (80.95)	0.003 (11.09)	
Other zooplankton		0.002 (8.62)	0.041 (41.33)
Paraeuchaeta norvegica		0.000 (0.68)	0.039 (38.88)
Themisto abyssorum			0.003 (3.23)
Zooplankton, total	**0.001 (100.00)**	**0.011 (45.05)**	**0.097 (97.60)**
Brisaster fragilis		0.000 (0.10)	
Lysianassidae		0.000 (0.12)	
Other invertebrates		0.004 (15.05)	0.002 (2.40)
Other invertebrates, total		**0.004 (15.27)**	**0.002 (2.40)**
Invertebrates, total	**0.001 (100.00)**	**0.023 (96.57)**	**0.099 (100.00)**
Unidentifiable prey		0.001 (3.43)	
Unidentifiable prey, total		**0.001 (3.43)**	
Total	**0.001 (100.00)**	**0.024 (100.00)**	**0.099 (100.00)**

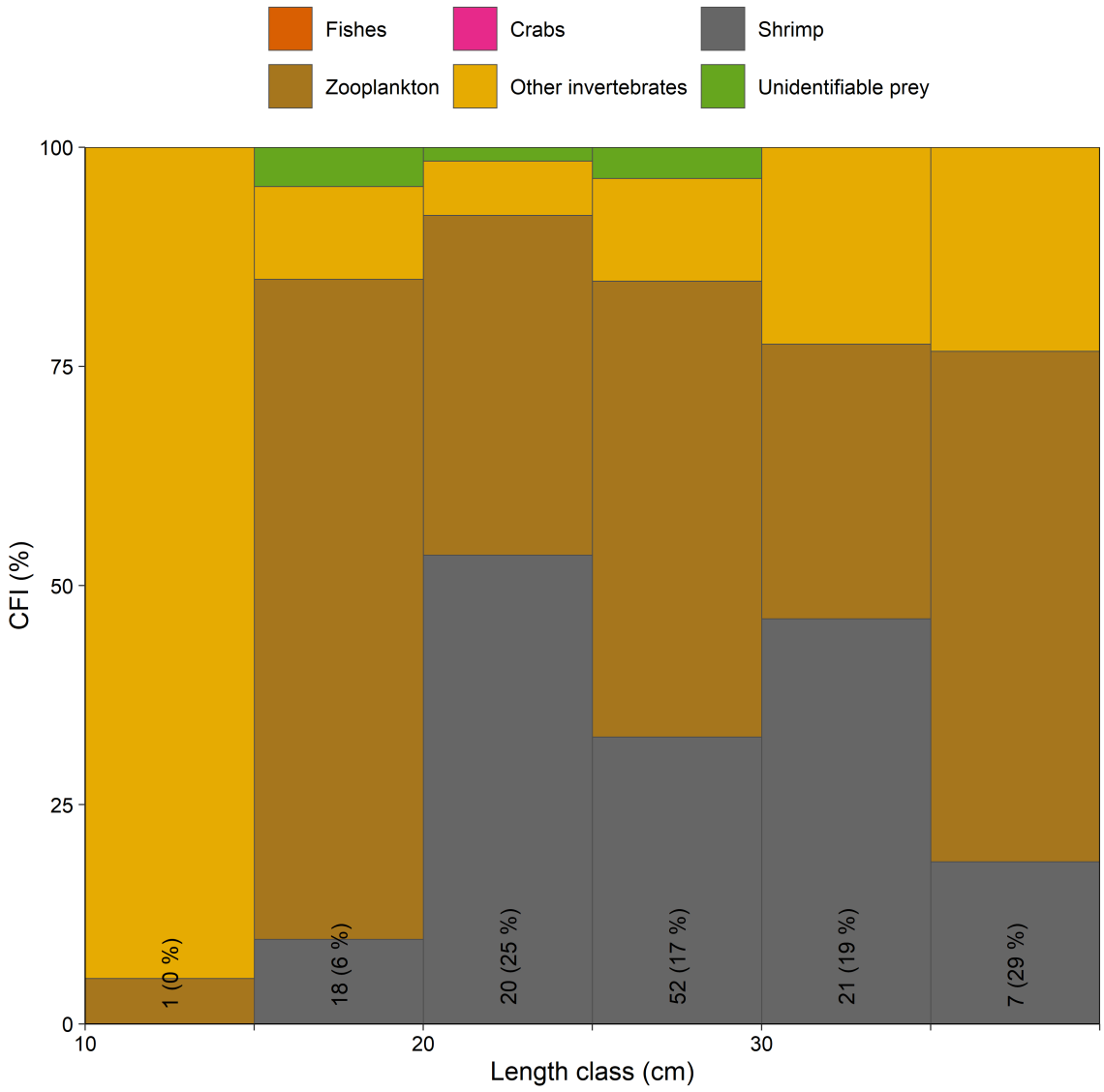

Figure 10. Prey group contributions to the total fullness index (CFI) for longfin hake in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs.

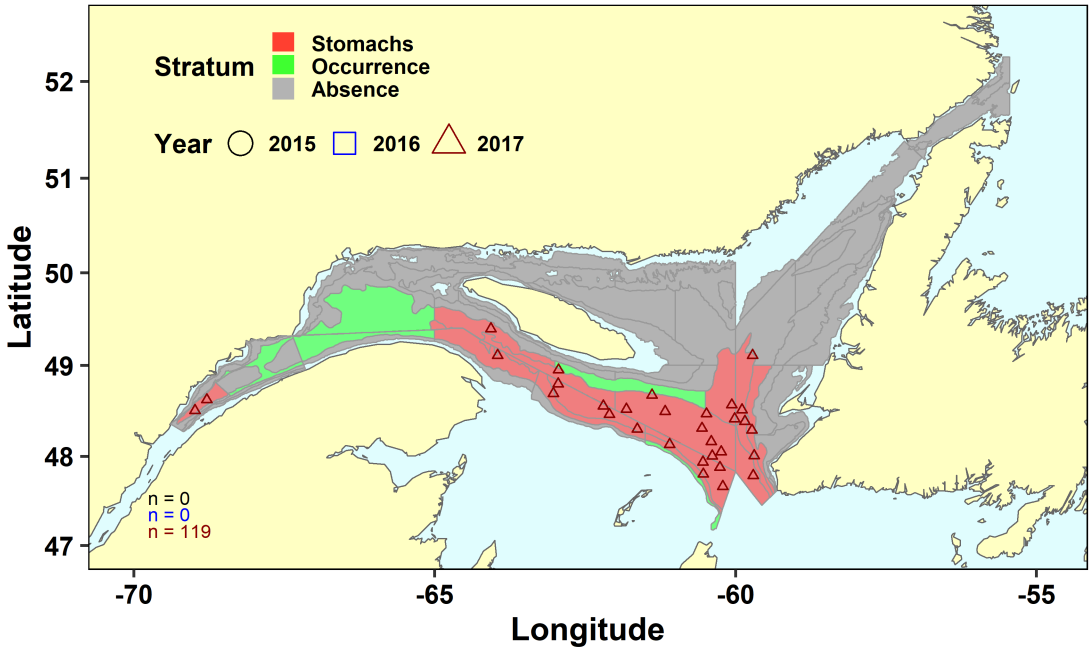

Figure 11. Origin of longfin hake stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.7 White hake (*Urophycis tenuis*)

White hake stomachs were sampled in 2017 only. One hundred and forty-eight stomachs were collected and analyzed in the laboratory, of which about 20 % were empty (Table 24). These stomachs came from indididuals ranging from 21.7 to 65.2 cm in length, for an average length of 38.4 cm (Table 24). By assessing the contribution of different groups of prey to the total fullness index by specimen length, two size groups were created with a break of 35 cm in length (Table 24, Figure 12). The average mass of stomach contents for white hake, all lengths combined, was 13.2 g, excluding empty stomachs (Table 24).

Fifty-one taxa in 26 families were found in the stomach contents of this predator (Tables 3 and 24).

When not considering length classes, fishes contributed the most to TFI in white hake (58 %) and were found in approximately a quarter of all stomachs (Table 25). Redfish and fourbeard rockling together accounted for almost 80 % of white hake diet. They were also the most common, non-generic fish prey, with occurrences of 14 and 4 %, respectively. Redfish was, when all prey types were combined, the most important prey in the diet of white hake.

Ranked 2nd in CFI, the shrimp group (29 %) was mainly represented by the northern shrimp, which was found in slightly more than one in five stomachs. Eight other shrimp taxa were observed and were grouped into the other Pandalidae and other shrimp taxonomic groupings (Table 26).

With 13 taxa observed, zooplankton ranked 3rd in importance in terms of food intake for this predator. These taxa could be summarized in three groups, which in order of importance were northern krill (*Meganyctiphanes norvegica*), the family Mysidae and other zooplankton (Table 26).

White hake $\geq$ 35 cm in length had a feeding intensity 1.8 times greater than their smaller conspecifics. Large white hake consumed more fish (73 % of the TFI) than those < 35 cm (11 %). The presence of redfish, absent from the stomach contents of individuals < 35 cm, was likely responsible for this difference. Shrimp constituted the main prey (55 % according to CFI) of white hake < 35 cm, in particular the northern shrimp. Zooplankton came 2nd, with northern krill alone contributing to the same level as the five taxa of fish found in stomach contents for this length class (Tables 25 and 26).

The origin of white hake stomachs according to size class showed extensive coverage of the ENGSL considering stomachs were only collected during a single survey in 2017 (Figure 13). Based on the catches reported for this period, several strata need to be sampled in future to obtain optimal coverage of the distribution of this predator. In particular, it would be interesting to assess the importance of shrimp in the diet of small white hake located in the Sept-Îles region (NWG).

White hake from NWG did not contain any of the four most important fish taxa seen overall in the ENGSL, and compensated with other taxa, resulting in a FI value similar to that of NEG

(Table 27). The food intake of fish (24 %) for this zone was substantially lower than that of invertebrates (76 %), making NWG specimens primarily dependent on invertebrates, with northern shrimp contributing to > 50 % of TFI. White hake from NEG were also highly dependent on invertebrates, but to a lesser extent (59 %). In contrast, those from the LC depended more on fish (68 %). The average TFI value in the LC was the highest of the three zones, and the contribution of redfish (> 50 % of the TFI) in their diet was likely driving this. Among the taxonomic groups created, the LC was the only zone where remains of northern hagfish (*Myxine glutinosa*), marlin-spike (*Nezumia bairdii*) and northern shortfin squid (*Illex illecebrosus*) were found in white hake stomachs.

Table 24. Sampling effort summary for white hake stomachs, by zone and length class (cm, S = < 35, L = 35+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG			LC			NEG			ENGSL		
Metric	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Mean TFI	0.24	0.22	0.23	0.15	0.41	0.32	0.18	0.18	0.18	0.17	0.32	0.26
No. of stomachs	9	8	17	29	55	84	17	30	47	55	93	148
No. of empty stomachs	2	1	3	4	12	16	3	8	11	9	21	30
% empty	22.2	12.5	17.6	13.8	21.8	19.0	17.6	26.7	23.4	16.4	22.6	20.3
Length (cm)												
min	23.8	35.2	23.8	26.1	35.0	26.1	21.7	35.5	21.7	21.7	35.0	21.7
med	27.0	43.6	34.8	30.4	40.2	36.8	29.6	41.5	36.5	29.6	40.6	36.7
mean	27.9	44.7	35.8	30.3	44.0	39.3	29.3	42.5	37.7	29.6	43.6	38.4
max	34.8	55.2	55.2	34.9	62.5	62.5	34.6	65.2	65.2	34.9	65.2	65.2
Total stomach content (g)												
min	0.035	0.210	0.035	0.003	0.052	0.003	0.338	0.089	0.089	0.003	0.052	0.003
med	1.049	5.485	2.669	0.749	10.211	2.538	1.639	3.627	2.853	0.996	5.201	2.564
mean	2.165	12.734	7.449	1.797	25.241	16.622	2.519	12.908	8.868	2.073	20.257	13.168
max	7.322	61.152	61.152	11.218	93.730	93.730	7.313	97.648	97.648	11.218	97.648	97.648
No. of observed taxa												
Fishes	0	1	1	3	8	10	3	4	5	5	9	12
Crabs	0	0	0	0	1	1	0	0	0	0	1	1
Shrimp	4	3	4	4	4	6	6	4	6	8	6	9
Zooplankton	5	0	5	10	4	11	4	1	5	12	5	13
Other invertebrates	4	0	4	5	3	7	6	1	7	12	4	15
Unidentifiable prey	0	1	1	1	1	1	1	0	1	1	1	1
Total	13	5	15	23	21	36	20	10	24	38	26	51

Table 25. Detailed diet of white hake from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 35, L = 35+ and T = all lengths combined).

										CFI					
	FO			MC			FI			Value			Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Amblyraja radiata		1.08	0.68		0.11	0.10		0.001	0.000		0.25	0.19		15	24
Digested fish	5.45	9.68	8.11	4.74	5.78	5.72	0.007	0.015	0.012	4.1	4.82	4.65	6	5	4
Digested roundfish	1.82		0.68	0		0.00	0		0.000	0		0.00	38		50
Enchelyopus cimbrius	1.82	5.38	4.05	4.76	2.88	2.99	0.005	0.017	0.012	2.8	5.28	4.67	9	3	3
Gadus morhua		1.08	0.68		0	0.00		0	0.000		0	0.00		26	51
Hippoglossoides platessoides	1.82		0.68	0.01		0.00	0		0.000	0.01		0.00	31		42
Myxine glutinosa		3.23	2.03		2.66	2.50		0.016	0.010		5.23	3.94		4	5
Nezumia bairdii		1.08	0.68		0.96	0.90		0.008	0.005		2.4	1.81		8	10
Pisces		1.08	0.68		0	0.00		0	0.000		0	0.00		25	45
Pleuronectiformes	3.64		1.35	5.14		0.32	0.007		0.003	4.31		1.06	5		13
Reinhardtius hippoglossoides		1.08	0.68		1.56	1.46		0.003	0.002		0.79	0.60		11	17
Sebastes spp.		21.51	13.51		66.64	62.55		0.171	0.107		54.1	40.81		1	1
Fishes, total	**9.09**	**38.71**	**27.7**	**14.66**	**80.58**	**76.53**	**0.02**	**0.23**	**0.152**	**11.23**	**72.88**	**57.73**			
Chionoecetes opilio		1.08	0.68		0.04	0.04		0	0.000		0.07	0.05		17	30
Crabs, total		**1.08**	**0.68**		**0.04**	**0.04**		**0**	**0.000**		**0.07**	**0.05**			
Crangonidae	1.82		0.68	0.05		0.00	0		0.000	0.03		0.01	29		39
Digested shrimp	14.55	2.15	6.76	3.88	0.13	0.36	0.007	0.001	0.003	3.79	0.28	1.15	7	14	12
Pandalus borealis	14.55	23.66	20.27	29.87	9.5	10.75	0.068	0.053	0.059	39.1	16.78	22.27	1	2	2
Pandalus montagui	1.82		0.68	0.62		0.04	0.002		0.001	1.1		0.27	16		23
Pandalus sp.	12.73	6.45	8.78	12.08	1.12	1.79	0.015	0.007	0.010	8.46	2.09	3.66	3	9	6
Pasiphaea multidentata	1.82	1.08	1.35	3.19	0	0.20	0.003	0	0.001	1.97	0.01	0.49	13	24	20
Pontophilus norvegicus	1.82	2.15	2.03	1.21	0.31	0.37	0.001	0.002	0.002	0.71	0.6	0.63	17	12	16
Sabinea sarsii		1.08	0.68		0.38	0.36		0.003	0.002		0.87	0.66		10	15
Spirontocaris sp.	1.82		0.68	0.38		0.02	0		0.000	0.28		0.07	21		29
Shrimp, total	**40**	**36.56**	**37.84**	**51.27**	**11.44**	**13.88**	**0.096**	**0.065**	**0.077**	**55.45**	**20.63**	**29.18**			
Boreomysis sp.	16.36	4.3	8.78	1.24	0.09	0.16	0.002	0.001	0.001	1.23	0.23	0.48	15	16	21
Bradyidius similis	1.82		0.68	0		0.00	0		0.000	0		0.00	37		49
Calanoida	5.45		2.03	0.01		0.00	0		0.000	0.01		0.00	33		44
Calanus hyperboreus	7.27		2.7	0.05		0.00	0		0.000	0.04		0.01	28		38
Calanus sp.	1.82		0.68	0		0.00	0		0.000	0.01		0.00	36		48
Erythrops erythrophthalma	10.91		4.05	0.33		0.02	0.001		0.000	0.41		0.10	20		28
Erythrops sp.	3.64		1.35	3		0.18	0.004		0.001	2.24		0.55	12		19
Meganyctiphanes norvegica	14.55	2.15	6.76	13.71	0.28	1.10	0.021	0.002	0.009	11.87	0.52	3.31	2	13	7

Table 25. Continued.

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Mysidae	5.45		2.03	1.71		0.10	0.004		0.001	2.25		0.55	11		18
Pseudomma sp.	7.27		2.7	0.94		0.06	0.003		0.001	1.72		0.42	14		22
Themisto compressa	3.64	1.08	2.03	0.76	0.02	0.06	0.001	0	0.000	0.63	0.04	0.18	19	19	25
Themisto libellula		1.08	0.68		0.01	0.01		0	0.000		0.02	0.02		22	35
Themisto sp.	3.64	2.15	2.7	0.32	0.03	0.05	0	0	0.000	0.26	0.05	0.10	22	18	27
Zooplankton, total	**45.45**	**8.6**	**22.3**	**22.07**	**0.42**	**1.75**	**0.036**	**0.003**	**0.015**	**20.68**	**0.87**	**5.74**			
Amphipoda	1.82		0.68	0.01		0.00	0		0.000	0.01		0.00	32		43
Byblis gaimardi	3.64		1.35	0.07		0.00	0		0.000	0.13		0.03	24		32
Crustacea	29.09	3.23	12.84	5.98	0.01	0.38	0.01	0	0.004	5.58	0.02	1.39	4	21	11
Cumacea	1.82		0.68	0		0.00	0		0.000	0.01		0.00	34		46
Gammaridea	1.82		0.68	0.04		0.00	0		0.000	0.05		0.01	26		36
Illex illecebrosus		1.08	0.68		6.35	5.96		0.01	0.006		3.08	2.32		6	9
Lysianassidae	1.82		0.68	0.03		0.00	0		0.000	0.03		0.01	30		40
Maera loveni	1.82		0.68	0.11		0.01	0		0.000	0.11		0.03	25		34
Neohela monstrosa		1.08	0.68		0.02	0.02		0	0.000		0.04	0.03		20	33
Oedicerotidae	1.82		0.68	0.01		0.00	0		0.000	0.01		0.00	35		47
Rhachotropis aculeata	14.55		5.41	2.51		0.15	0.006		0.002	3.26		0.80	8		14
Rossia sp.	1.82		0.68	0.24		0.01	0		0.000	0.18		0.04	23		31
Tmetonyx cicada		1.08	0.68		0	0.00		0	0.000		0.01	0.01		23	41
Tmetonyx sp.	1.82		0.68	0.05		0.00	0		0.000	0.05		0.01	27		37
Wimvadocus torelli	3.64		1.35	1.02		0.06	0.001		0.000	0.66		0.16	18		26
Other invertebrates, total	**43.64**	**5.38**	**19.59**	**10.08**	**6.39**	**6.62**	**0.018**	**0.01**	**0.013**	**10.08**	**3.15**	**4.85**			
Invertebrates, total	**80**	**48.39**	**60.14**	**83.41**	**18.29**	**22.29**	**0.15**	**0.078**	**0.105**	**86.21**	**24.71**	**39.82**			
Unidentified digested material	10.91	6.45	8.11	1.93	1.13	1.18	0.004	0.008	0.006	2.56	2.41	2.44	10	7	8
Unidentifiable prey, total	**10.91**	**6.45**	**8.11**	**1.93**	**1.13**	**1.18**	**0.004**	**0.008**	**0.006**	**2.56**	**2.41**	**2.44**			
Total				**100**	**100**	**100.00**	**0.174**	**0.316**	**0.263**	**100**	**100**	**100.00**			

Table 26. Summary of diet of white hake from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 35, L = 35+ and T = all lengths combined).

										CFI						
	FO			MC			FI			Value			Rank			
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	
Enchelyopus cimbrius	1.82	5.38	4.05	4.76	2.88	2.99	0.005	0.017	0.012	2.8	5.28	4.67	8	4	4	
Myxine glutinosa		3.23	2.03		2.66	2.50		0.016	0.010		5.23	3.94		5	5	
Nezumia bairdii		1.08	0.68		0.96	0.90		0.008	0.005		2.40	1.81		8	13	
Other fishes	9.09	12.9	11.49	9.9	7.45	7.60	0.015	0.019	0.017	8.43	5.87	6.50	5	3	3	
Sebastes spp.		21.51	13.51		66.64	62.55		0.171	0.107		54.10	40.81		1	1	
Fishes, total	**9.09**	**38.71**	**27.7**	**14.66**	**80.58**	**76.53**	**0.02**	**0.230**	**0.152**	**11.23**	**72.88**	**57.73**				
Other crabs		1.08	0.68		0.04	0.04		0.000	0.000		0.07	0.05		15	15	
Crabs, total		**1.08**	**0.68**		**0.04**	**0.04**		**0.000**	**0.000**		**0.07**	**0.05**				
Other Pandalidae	14.55	6.45	9.46	12.7	1.12	1.83	0.017	0.007	0.010	9.56	2.09	3.93	4	9	6	
Other shrimp	18.18	6.45	10.81	8.7	0.83	1.31	0.012	0.006	0.008	6.78	1.76	2.99	7	10	8	
Pandalus borealis	14.55	23.66	20.27	29.87	9.50	10.75	0.068	0.053	0.059	39.1	16.78	22.27	1	2	2	
Shrimp, total	**40**	**36.56**	**37.84**	**51.27**	**11.44**	**13.88**	**0.096**	**0.065**	**0.077**	**55.45**	**20.63**	**29.18**				
Meganyctiphanes norvegica	14.55	2.15	6.76	13.71	0.28	1.10	0.021	0.002	0.009	11.87	0.52	3.31	2	11	7	
Mysidae	38.18	4.3	16.89	7.22	0.09	0.53	0.014	0.001	0.006	7.86	0.23	2.11	6	12	12	
Other zooplankton	18.18	3.23	8.78	1.14	0.05	0.12	0.002	0.000	0.001	0.95	0.12	0.32	10	13	14	
Zooplankton, total	**45.45**	**8.6**	**22.3**	**22.07**	**0.42**	**1.75**	**0.036**	**0.003**	**0.015**	**20.68**	**0.87**	**5.74**				
Illex illecebrosus		1.08	0.68		6.35	5.96		0.010	0.006		3.08	2.32		6	11	
Other invertebrates	43.64	4.3	18.92	10.08	0.04	0.66	0.018	0.000	0.007	10.08	0.07	2.53	3	14	9	
Other invertebrates, total	**43.64**	**5.38**	**19.59**	**10.08**	**6.39**	**6.62**	**0.018**	**0.010**	**0.013**	**10.08**	**3.15**	**4.85**				
Invertebrates, total	**80**	**48.39**	**60.14**	**83.41**	**18.29**	**22.29**	**0.15**	**0.078**	**0.105**	**86.21**	**24.71**	**39.82**				
Unidentifiable prey	10.91	6.45	8.11	1.93	1.13	1.18	0.004	0.008	0.006	2.56	2.41	2.44	9	7	10	
Unidentifiable prey, total	**10.91**	**6.45**	**8.11**	**1.93**	**1.13**	**1.18**	**0.004**	**0.008**	**0.006**	**2.56**	**2.41**	**2.44**				
Total				**100**	**100.00**	**100.00**	**0.174**	**0.316**	**0.263**	**100**	**100.00**	**100.00**				

Table 27. Summary of diet of the ENGSL white hake from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 35, L = 35+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG			LC			NEG		
Taxonomic grouping	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Enchelyopus cimbrius					0.026 (6.34)	0.02 (5.29)	0.02 (8.80)	0.00 (2.54)	0.009 (4.83)
Myxine glutinosa					0.028 (6.87)	0.02 (5.74)			
Nezumia bairdii					0.013 (3.16)	0.01 (2.64)			
Other fishes		0.12 (52.92)	0.05 (23.86)	0.01 (8.67)	0.015 (3.58)	0.01 (4.42)	0.02 (13.96)	0.00 (0.07)	0.009 (5.14)
Sebastes spp.					0.244 (60.10)	0.16 (50.20)		0.08 (46.58)	0.052 (29.57)
Fishes, total		**0.12 (52.92)**	**0.05 (23.86)**	**0.01 (8.67)**	**0.325 (80.05)**	**0.22 (68.29)**	**0.04 (22.76)**	**0.09 (49.19)**	**0.070 (39.54)**
Other crabs					0.000 (0.09)	0.00 (0.07)			
Crabs, total					**0.000 (0.09)**	**0.00 (0.07)**			
Other Pandalidae	0.024 (10.39)	0.00 (2.11)	0.02 (6.66)	0.00 (0.14)		0.00 (0.02)	0.04 (22.62)	0.02 (10.91)	0.027 (15.19)
Other shrimp	0.003 (1.07)	0.00 (0.42)	0.00 (0.78)	0.02 (10.56)	0.006 (1.36)	0.01 (2.88)	0.01 (5.30)	0.01 (3.87)	0.008 (4.39)
Pandalus borealis	0.146 (62.04)	0.10 (43.82)	0.12 (53.82)	0.06 (40.93)	0.042 (10.23)	0.05 (15.29)	0.04 (20.47)	0.06 (35.54)	0.053 (30.04)
Shrimp, total	**0.173 (73.49)**	**0.10 (46.35)**	**0.14 (61.25)**	**0.08 (51.63)**	**0.047 (11.59)**	**0.06 (18.19)**	**0.09 (48.40)**	**0.09 (50.31)**	**0.088 (49.61)**
Meganyctiphanes norvegica				0.03 (22.68)	0.003 (0.68)	0.01 (4.30)	0.01 (4.50)		0.003 (1.64)
Mysidae	0.042 (17.69)		0.02 (9.71)	0.01 (7.62)	0.001 (0.31)	0.00 (1.51)	0.00 (1.35)		0.001 (0.49)
Other zooplankton	0.000 (0.06)		0.00 (0.03)	0.00 (2.03)	0.000 (0.08)	0.00 (0.40)	0.00 (0.01)	0.00 (0.30)	0.000 (0.19)
Zooplankton, total	**0.042 (17.75)**		**0.02 (9.75)**	**0.05 (32.33)**	**0.004 (1.07)**	**0.02 (6.22)**	**0.01 (5.86)**	**0.00 (0.30)**	**0.004 (2.33)**
Illex illecebrosus					0.016 (4.05)	0.01 (3.38)			
Other invertebrates	0.021 (8.76)		0.01 (4.81)	0.01 (5.02)	0.000 (0.04)	0.00 (0.86)	0.03 (18.34)	0.00 (0.19)	0.012 (6.82)
Other invertebrates, total	**0.021 (8.76)**		**0.01 (4.81)**	**0.01 (5.02)**	**0.017 (4.09)**	**0.01 (4.24)**	**0.03 (18.34)**	**0.00 (0.19)**	**0.012 (6.82)**
Invertebrates, total	**0.235 (100.00)**	**0.10 (46.35)**	**0.17 (75.81)**	**0.14 (88.98)**	**0.068 (16.84)**	**0.09 (28.72)**	**0.13 (72.60)**	**0.09 (50.81)**	**0.104 (58.76)**
Unidentifiable prey		0.00 (0.73)	0.00 (0.33)	0.00 (2.35)	0.013 (3.11)	0.01 (2.98)	0.01 (4.65)		0.003 (1.70)
Unidentifiable prey, total		**0.00 (0.73)**	**0.00 (0.33)**	**0.00 (2.35)**	**0.013 (3.11)**	**0.01 (2.98)**	**0.01 (4.65)**		**0.003 (1.70)**
Total	**0.235 (100.00)**	**0.22 (100.00)**	**0.23 (100.00)**	**0.15 (100.00)**	**0.406 (100.00)**	**0.32 (100.00)**	**0.18 (100.00)**	**0.18 (100.00)**	**0.177 (100.00)**

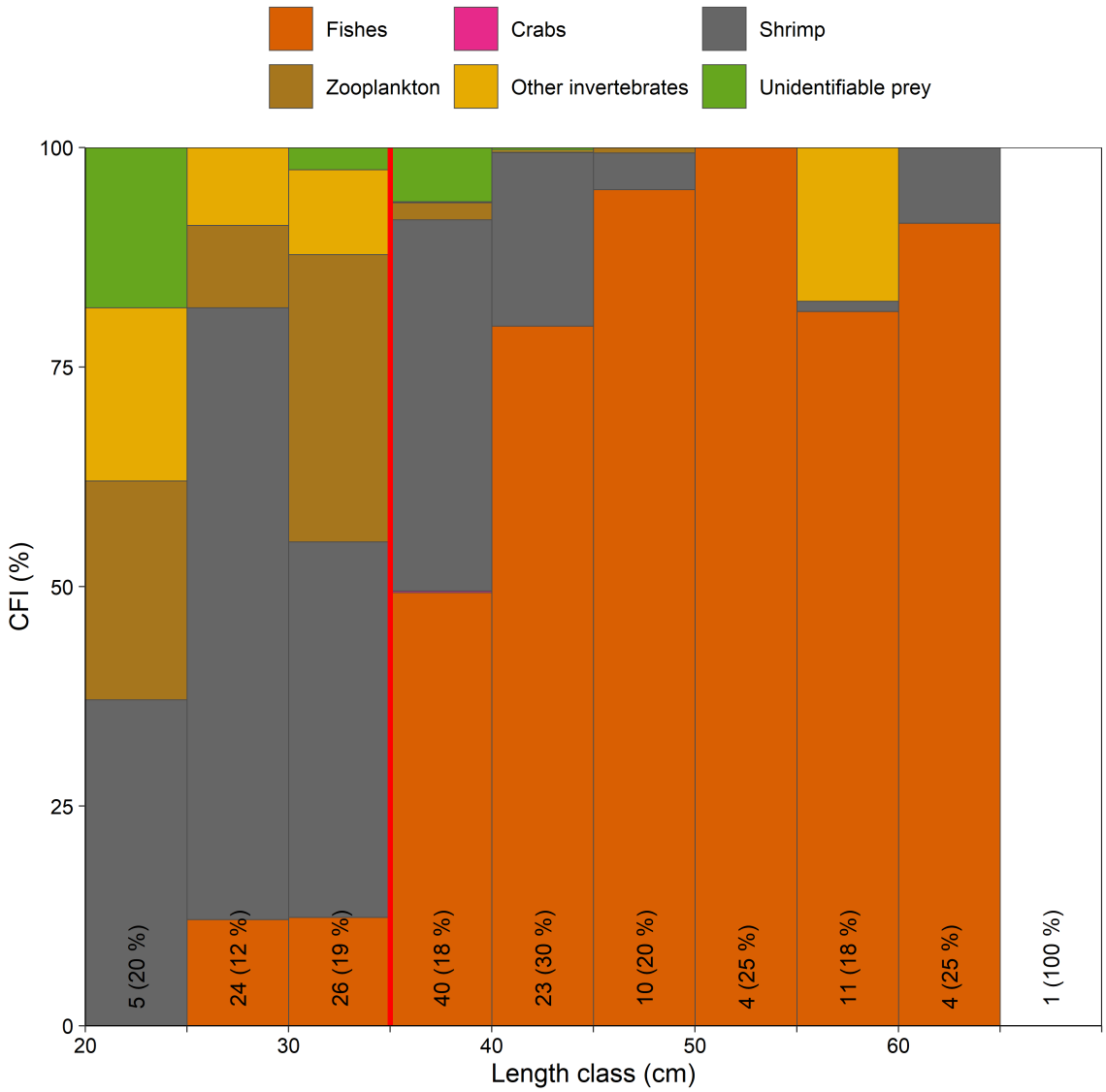

Figure 12. Prey group contributions to the total fullness index (CFI) for white hake in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. The vertical red line separates the length classes that were combined for the analyzes.

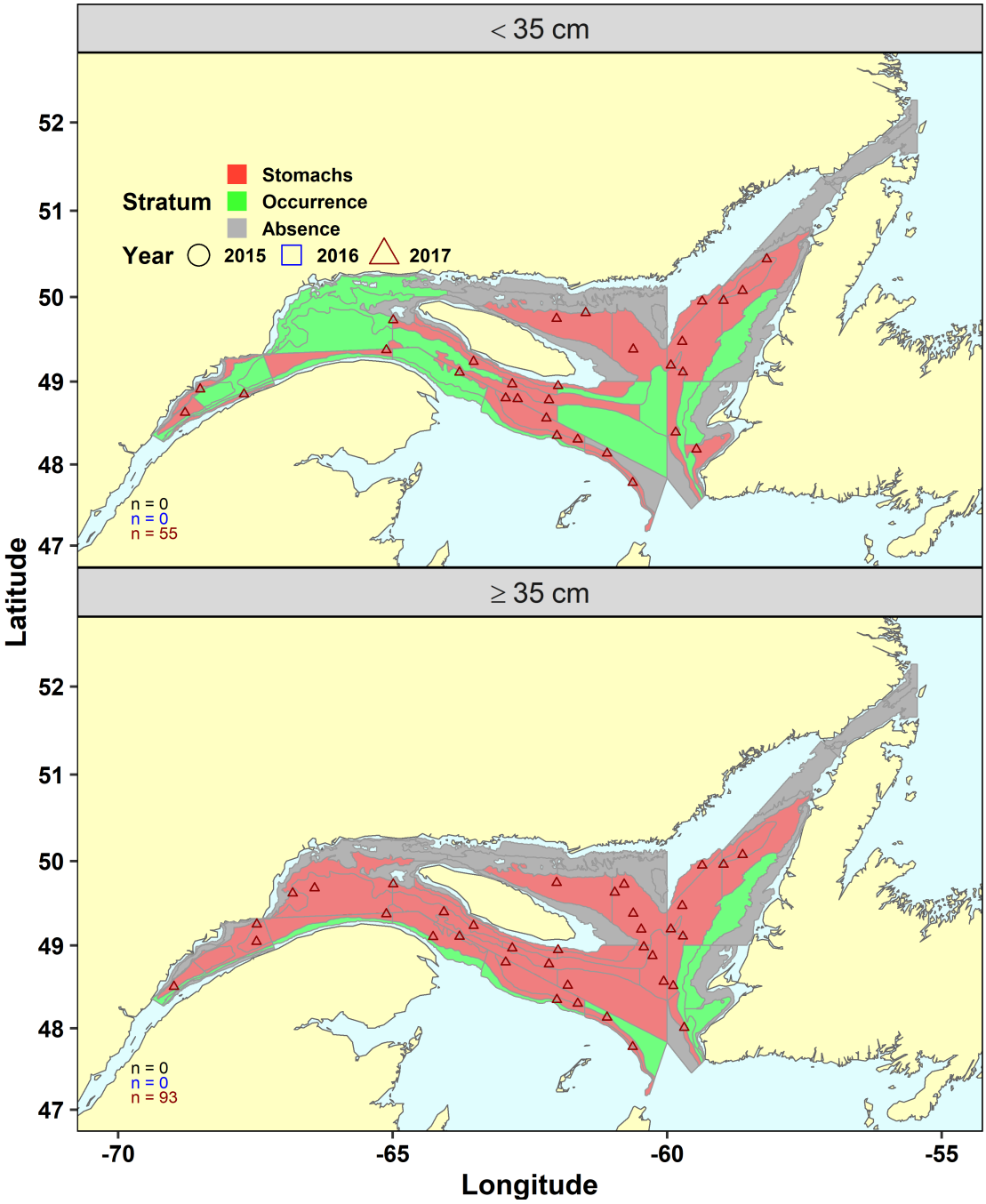

Figure 13. Origin of white hake stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.8 Atlantic cod (*Gadus morhua*)

Atlantic cod was targeted for stomach content analysis in each year of the 2015-2017 period. Two thousand four stomachs were collected and analyzed in the laboratory, 9 % of which were empty (Table 28). These stomachs came from specimens ranging from 4.6 to 95.0 cm in length, for an average length of 40.7 cm (Table 28). By assessing the contribution of different groups of prey to the total fullness index by specimen length, three size groups were created with breaks at 30 and 55 cm in length (Figure 14). The average mass of stomach contents for cod, all lengths combined, was 12.7 g, excluding empty stomachs (Table 28).

Cod alone consumed 204 different taxa, corresponding to 82 % of the total number of taxa observed in the stomachs of all predators (249, Table 2). Seventy-four families of prey were found in the stomachs analyzed (Table 3).

Disregarding length classes, the group of prey contributing the most to TFI in Atlantic cod consisted of fishes, at 40 %, with 48 taxa observed (Table 29). Thirty-six percent of this fish intake was provided by capelin, which was the most important taxon in the diet of this predator according to CFI when combining the different length classes. Redfish (7 %) and capelin (5 %) were the two fish taxa identifiable at least to the genus level, which were most commonly encountered in terms of FO when length classes were not taken into account. Sand lances (*Ammodytes* sp.) were the only other fish to have a FO $\geq$ 1 % among those where the identification was at least to the genus.

After fishes, the prey groups contributing the most to the diet of cod were in order of importance shrimp, zooplankton, other invertebrates, crabs and unidentifiable prey.

Cod < 30 cm fed mainly on zooplankton (33 %, mainly *Themisto* sp. hyperiids), shrimp (24 %, mainly northern shrimp) and fish (22 %, mainly capelin). From 30 to 55 cm, the intake of zooplankton decreased, while that of fishes (especially redfish and capelin) and shrimp increased. From 55 cm, the diet of cod was mainly composed of fishes. Redfish was the most important prey, when all prey groups were combined (Table 29). Feeding intensity was higher for large cod (TFI of 1.31 compared to 0.706 and 0.762, respectively for small and medium-sized cod, Table 29).

Twenty-seven shrimp taxa were reported from nearly half of all stomachs. The northern shrimp contributed the most to this group's FI and, in general, to the diet of this predator (CFI ranking 2nd when combining length classes). Using the taxonomic groupings in Table 30 to facilitate interpretation, we note that other Pandalidae, namely the striped pink shrimp (*Pandalus montagui*) and the taxon *Pandalus* sp., also contributed substantially to the diet of this predator. The importance of *P. borealis* in cod diet could therefore be even higher, considering that *Pandalus sp.* is made up of the two species of *Pandalus* in an advanced state of digestion, and that based on shrimp identified to the species level, *P. borealis* probably contributes much more than *P. montagui*.

Thirty-one zooplankton taxa were observed in the stomach contents of cod (Table 29), with the hyperiid *Themisto* sp. contributing the most to the diet for this group, with a 5th position overall in

terms of CFI. In cod < 30 cm, this taxon was the most important, regardless of the group of prey. The zooplankton consumed by cod came from two main families, Hyperiidae and Euphausiidae, which accounted for 96 % of the FI in zooplankton (Table 30).

Six crab taxa were reported. Their importance increased with cod length. The majority of the 90 taxa observed in the other invertebrates group appeared to be benthic invertebrates (Table 29). Apart from the generic crustacean taxon (Crustacea), the suborder Gammaridea was the most frequently observed taxon (13 %).

The origin of cod stomachs showed extensive coverage of the ENGSL for the size class [30-55[cm (Figure 15). For cod < 30 cm, several strata in the LC zone did not provide stomachs, even though catches were reported. In contrast, cod $\geq$ 55 cm were not found in catches of several strata of the NWG and LC zones during the 2015-2017 period. NEG cod, all sizes combined, had a much higher feeding intensity than cod from the other two zones (Table 31). The increased importance of zooplankton in this zone partly explains this observation. In particular, the intake of prey from the Hyperiidae family was much greater there than elsewhere.

The NWG cod diet was, in order of importance, mainly composed of shrimp, fishes, other invertebrates, crabs, unidentifiable prey and zooplankton. Two prey, northern shrimp and capelin, alone constituted more than half of the cod's diet in this zone.

In contrast, LC cods ate mainly fish (61 %). Redfish was the most consumed prey there. It was also in this zone that its contribution to diet was the most important. No capelin were found among the 264 stomachs from the LC zone.

Table 28. Sampling effort summary for Atlantic cod stomachs, by zone and size class (cm, S = < 30, M = [30-55[, L = 55+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG				LC				NEG				ENGSL			
Metric	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Mean TFI	0.78	0.71	0.57	0.71	0.28	0.44	0.93	0.49	0.74	0.85	1.63	0.92	0.71	0.76	1.31	0.82
No. of stomachs	87	298	48	433	42	178	44	264	291	853	163	1307	420	1329	255	2004
No. of empty stomachs	6	31	6	43	6	49	4	59	17	53	6	76	29	133	16	178
% empty	6.9	10.4	12.5	9.9	14.3	27.5	9.1	22.3	5.8	6.2	3.7	5.8	6.9	10.0	6.3	8.9
Length (cm)																
min	14.4	30.0	55.1	14.4	4.6	30.0	55.0	4.6	6.1	30.0	55.0	6.1	4.6	30.0	55.0	4.6
med	24.7	40.6	58.9	39.6	24.2	41.8	61.1	42.0	24.8	41.6	61.1	39.8	24.6	41.3	60.7	40.0
mean	23.9	41.4	61.6	40.1	22.5	42.1	63.1	42.5	24.1	41.6	63.7	40.5	23.9	41.6	63.2	40.7
max	29.7	54.6	90.4	90.4	29.9	54.7	77.3	77.3	29.8	54.9	95.0	95.0	29.9	54.9	95.0	95.0
Total stomach content (g)																
min	0.004	0.005	0.025	0.004	0.004	0.004	0.004	0.004	0.001	0.006	0.026	0.001	0.001	0.004	0.004	0.001
med	0.594	2.754	11.182	2.167	0.172	1.468	12.148	1.339	0.613	4.402	25.057	3.337	0.580	3.775	18.789	2.878
mean	1.504	6.628	22.922	7.319	0.658	8.133	34.524	11.970	1.445	9.115	64.813	14.511	1.385	8.454	52.382	12.690
max	9.465	114.733	178.458	178.458	5.512	246.915	326.900	326.900	12.135	177.608	836.880	836.880	12.135	246.915	836.880	836.880
No. of observed taxa																
Fishes	5	16	9	18	2	12	9	16	12	33	24	41	14	37	27	48
Crabs	2	5	1	5	3	5	1	5	4	6	5	6	4	6	5	6
Shrimp	10	13	6	14	6	11	6	14	18	26	19	26	19	27	20	27
Zooplankton	20	16	5	21	16	14	7	22	23	26	11	28	28	28	12	31
Other invertebrates	16	31	5	34	13	21	7	29	35	74	31	83	40	81	35	90
Unidentifiable prey	1	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2
Total	54	83	28	94	41	64	31	87	94	167	92	186	107	181	101	204

Table 29. Detailed diet of Atlantic cod from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 30, M = [30-55[, L = 55+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Actinopterygii	0.24			0.05	0.02			0.00	0			0.000	0.01			0.00	88			174
Amblyraja radiata		0.08		0.05		0.08		0.03		0.001		0.000		0.07		0.04		73		90
Ammodytes sp.	0.48	2.48	1.96	2	1.92	1.32	0.12	0.69	0.013	0.011	0.002	0.011	1.89	1.48	0.18	1.29	15	17	36	21
Anarhichas lupus			0.39	0.05			0.97	0.52			0.017	0.002			1.27	0.26			15	41
Anarhichas minor		0.08		0.05		0.08		0.03		0.001		0.001		0.12		0.07		58		73
Anarhichas sp.		0.15	0.39	0.15		0.14	0.04	0.08		0.001	0	0.000		0.08	0.03	0.05		70	63	83
Arctozenus risso		0.23		0.15		0.15		0.07		0.001		0.001		0.15		0.09		53		63
Artediellus sp.	0.24	0.53	0.39	0.45	0.07	0.23	0.05	0.13	0	0.002	0.001	0.001	0.05	0.25	0.05	0.17	64	42	56	52
Aspidophoroides monopterygius		0.08		0.05		0.05		0.02		0.001		0.000		0.07		0.04		74		92
Boreogadus saida		0.08		0.05		0.03		0.01		0		0.000		0.02		0.01		105		133
Clupea harengus		0.23	3.92	0.65		0.57	14.29	7.97		0.003	0.129	0.018		0.36	9.81	2.22		35	3	13
Cottidae	0.24	0.15		0.15	0.08	0.23		0.10	0	0.001		0.001	0.05	0.12		0.08	70	60		67
Digested fish	4.05	8.13	15.29	8.18	2.86	2	3.77	2.97	0.034	0.015	0.055	0.024	4.81	1.98	4.22	2.94	9	15	8	10
Digested roundfish	5.48	10.38	14.51	9.88	6.25	3.89	4.32	4.18	0.038	0.035	0.043	0.036	5.37	4.55	3.32	4.45	8	5	11	6
Enchelyopus cimbrius		0.45	3.92	0.8		0.72	2.98	1.92		0.006	0.04	0.009		0.8	3.05	1.11		23	12	22
Eumesogrammus praecisus		0.23	0.39	0.2		0.16	0.17	0.16		0.001	0.002	0.001		0.11	0.15	0.10		63	38	61
Gadidae			0.39	0.05			0.02	0.01			0	0.000			0.03	0.01			66	150
Gadus morhua		0.3	2.75	0.55		2.49	6.23	4.46		0.01	0.063	0.015		1.3	4.78	1.78		18	7	17
Gadus sp.			0.39	0.05			0.18	0.10			0.004	0.000			0.3	0.06			26	79
Glyptocephalus cynoglossus			0.39	0.05			0.8	0.43			0.005	0.001			0.38	0.08			23	72
Gymnelus sp.			0.39	0.05			0.12	0.06			0.003	0.000			0.2	0.04			33	94
Gymnelus viridis	0.24	0.15		0.15	0.66	0.24		0.12	0.004	0.001		0.002	0.53	0.14		0.18	26	56		50
Gymnocanthus tricuspis		0.15		0.1		2.25		0.98		0.008		0.006		1.09		0.67		20		27
Hippoglossoides platessoides	0.24	0.38	5.1	0.95	0.51	0.59	11.69	6.58	0.003	0.003	0.086	0.014	0.36	0.45	6.52	1.67	33	33	6	18
Hippoglossus hippoglossus		0.08		0.05		0		0.00		0		0.000		0		0.00		166		194
Icelus bicornis		0.08		0.05		0		0.00		0		0.000		0		0.00		151		179
Icelus sp.		0.08		0.05		0.35		0.15		0.001		0.001		0.17		0.10		49		59
Icelus spatula		0.08		0.05		0		0.00		0		0.000		0.01		0.00		128		160
Leptagonus decagonus		0.08	0.39	0.1		0	0.07	0.04		0	0.001	0.000		0	0.08	0.02		163	45	119
Leptoclinus maculatus		1.43		0.95		0.51		0.22		0.003		0.002		0.45		0.28		32		37
Liparis gibbus		0.15		0.1		0.16		0.07		0.001		0.001		0.16		0.10		51		62
Lumpenus lampretaeformis		0.68	0.78	0.55		0.59	0.23	0.38		0.005	0.003	0.004		0.66	0.26	0.46		26	28	30
Lumpenus sp.			0.39	0.05			0.04	0.02			0.001	0.000			0.04	0.01			57	134
Lycodes lavalaei	0.24			0.05	0.23			0.01	0.001			0.000	0.17			0.03	47			102
Lycodes sp.			0.78	0.1			0.09	0.05			0.001	0.000			0.09	0.02			43	117
Mallotus villosus	2.62	5.79	8.24	5.44	9.04	13.92	11.51	12.51	0.056	0.127	0.173	0.118	7.92	16.61	13.21	14.35	2	2	2	1
Melanostigma atlanticum	0.24	0.15		0.15	0.03	0.01		0.00	0	0		0.000	0.02	0.01		0.01	81	120		136
Myoxocephalus aenaeus		0.08		0.05		0.2		0.09		0.003		0.002		0.36		0.22		36		48
Myoxocephalus scorpius		0.08	0.39	0.1		0	0.11	0.06		0	0.002	0.000		0	0.18	0.04		135	35	96
Myoxocephalus sp.	0.24	0.15	0.39	0.2	0.07	0.05	0.19	0.13	0	0	0.003	0.001	0.05	0.05	0.23	0.09	71	81	31	65
Pisces	0.71	0.53	2.35	0.8	0.03	0.22	0.61	0.43	0	0.001	0.01	0.002	0.02	0.17	0.74	0.26	79	50	19	42
Pleuronectidae			0.78	0.1			0.19	0.10			0.003	0.000			0.25	0.05			30	86
Pleuronectiformes		0.3	1.96	0.45		0.08	0.12	0.10		0	0.002	0.001		0.06	0.16	0.07		80	37	78
Scomber scombrus			0.39	0.05			0.85	0.46			0.015	0.002			1.12	0.23			17	46
Sebastes spp.	0.71	5.79	21.18	6.69	1.12	6.25	12.66	9.59	0.007	0.037	0.202	0.051	0.96	4.81	15.41	6.27	23	4	1	3

Table 29. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Stichaeus punctatus		0.15		0.1		0.06		0.02		0		0.000		0.04		0.02		84		109
Triglops murrayi		0.08		0.05		0.06		0.03		0		0.000		0.05		0.03		82		104
Ulcina olrikii		0.08		0.05		0.03		0.01		0		0.000		0.01		0.01		110		141
Fishes, total	**15.48**	**31.83**	**67.06**	**32.88**	**22.9**	**37.73**	**72.41**	**56.12**	**0.157**	**0.28**	**0.865**	**0.329**	**22.21**	**36.76**	**66.03**	**40.09**				
Brachyura	2.14	4.82	6.27	4.44	0.1	0.6	0.43	0.50	0.001	0.004	0.006	0.004	0.09	0.54	0.49	0.45	61	29	22	31
Chionoecetes opilio	3.81	10.68	17.25	10.08	0.84	4.22	6.41	5.33	0.005	0.027	0.094	0.031	0.72	3.51	7.17	3.75	24	7	5	7
Chionoecetes sp.		0.23		0.15		0.14		0.06		0.001		0.001		0.12		0.07		61		77
Hyas araneus	0.71	2.18	2.35	1.9	0.13	0.31	0.21	0.25	0.001	0.002	0.004	0.002	0.1	0.25	0.3	0.23	56	40	25	43
Hyas coarctatus	0.48	3.46	4.31	2.94	0.13	1.59	1.45	1.48	0.001	0.009	0.015	0.008	0.1	1.17	1.12	0.97	57	19	16	23
Hyas sp.		1.5	1.18	1.15		0.66	0.09	0.33		0.003	0.002	0.002		0.4	0.12	0.27		34	40	39
Crabs, total	**6.67**	**18.81**	**24.71**	**17.02**	**1.2**	**7.52**	**8.59**	**7.95**	**0.007**	**0.046**	**0.121**	**0.047**	**1.01**	**6**	**9.2**	**5.75**				
Argis dentata	0.24	1.2	1.18	1	0.16	0.57	0.22	0.37	0.001	0.004	0.004	0.003	0.17	0.53	0.3	0.42	49	30	24	32
Crangonidae	0.48	0.38	0.39	0.4	0.28	0.03	0.05	0.04	0.002	0	0.001	0.001	0.31	0.06	0.07	0.11	34	77	47	57
Digested shrimp	15.24	18.28	17.25	17.51	5.45	3.04	1	1.99	0.041	0.025	0.018	0.027	5.78	3.26	1.4	3.34	4	9	14	8
Eualus fabricii	0.24	1.35	1.57	1.15	0.07	0.07	0.01	0.04	0	0.001	0	0.001	0.05	0.11	0.02	0.08	69	64	69	68
Eualus gaimardii		0.38	0.39	0.3		0.02	0.01	0.01		0	0	0.000		0.02	0.01	0.01		103	74	125
Eualus gaimardii belcheri		0.08	0.39	0.1		0	0	0.00		0	0	0.000		0	0	0.00		144	83	166
Eualus gaimardii gaimardii		0.38	0.39	0.3		0.01	0	0.01		0	0	0.000		0.02	0	0.01		104	81	129
Eualus macilentus	1.19	1.88	2.75	1.85	0.48	0.21	0.05	0.13	0.004	0.002	0.001	0.002	0.5	0.25	0.07	0.26	28	41	49	40
Eualus sp.	0.24	0.53		0.4	0.06	0.02		0.01	0.001	0		0.000	0.08	0.02		0.03	62	101		106
Eusergestes arcticus		0.08		0.05		0		0.00		0		0.000		0		0.00		158		185
Hippolytidae	1.43	1.28	2.35	1.45	0.19	0.07	0.19	0.13	0.001	0.001	0.003	0.001	0.21	0.1	0.26	0.15	42	67	27	54
Lebbeus groenlandicus		0.08		0.05		0.03		0.01		0		0.000		0.01		0.01		109		140
Lebbeus microceros		0.08		0.05		0		0.00		0		0.000		0		0.00		140		169
Lebbeus polaris	1.43	3.24	5.1	3.09	0.32	0.48	0.14	0.29	0.002	0.004	0.002	0.003	0.22	0.52	0.19	0.40	40	31	34	33
Pandalus borealis	3.1	16.78	15.69	13.77	6.31	17.86	7.21	11.84	0.039	0.131	0.121	0.110	5.53	17.15	9.23	13.44	7	1	4	2
Pandalus montagui	4.29	9.86	10.2	8.73	3.81	3.13	0.55	1.75	0.027	0.026	0.009	0.024	3.87	3.47	0.72	2.99	12	8	20	9
Pandalus sp.	5.95	8.65	6.67	7.83	4.79	1.88	0.48	1.19	0.028	0.016	0.009	0.018	3.9	2.14	0.68	2.16	11	12	21	14
Pasiphaea multidentata	0.95	3.54	1.96	2.79	1.54	1.71	0.07	0.82	0.008	0.015	0.001	0.012	1.16	1.94	0.06	1.42	21	16	52	19
Pontophilus norvegicus	0.24	0.6		0.45	0.01	0.08		0.04	0	0.001		0.000	0.01	0.07		0.05	92	72		88
Sabinea sarsii	0.71	0.08		0.2	0.48	0.01		0.01	0.003	0		0.001	0.44	0.01		0.09	30	111		64
Sabinea septemcarinata		0.98	0.78	0.75		0.16	0.05	0.10		0.001	0.001	0.001		0.14	0.06	0.10		54	53	60
Sabinea sp.	0.71	0.75	0.39	0.7	0.13	0.08	0.01	0.04	0.001	0.001	0	0.001	0.1	0.09	0.01	0.07	58	68	73	75
Sclerocrangon boreas		0.45	1.18	0.45		0.18	0.07	0.12		0.001	0.001	0.001		0.15	0.07	0.11		52	48	58
Spirontocaris liljeborgii	1.67	2.86	1.57	2.45	0.39	0.18	0.02	0.10	0.003	0.002	0	0.002	0.36	0.25	0.02	0.23	32	39	67	47
Spirontocaris phippsii	0.24	0.53		0.4	0.18	0.03		0.02	0.002	0		0.001	0.3	0.04		0.08	37	83		69
Spirontocaris sp.	2.38	1.96	1.57	2	0.35	0.1	0.02	0.06	0.003	0.001	0	0.001	0.49	0.14	0.03	0.18	29	55	65	51
Spirontocaris spinus	2.14	1.66	0.78	1.65	0.6	0.15	0	0.08	0.007	0.002	0	0.002	0.98	0.2	0.01	0.30	22	46	79	36
Shrimp, total	**31.67**	**50.04**	**44.31**	**45.46**	**25.62**	**30.09**	**10.14**	**19.21**	**0.173**	**0.234**	**0.173**	**0.213**	**24.47**	**30.72**	**13.22**	**26.03**				
Aetideidae	0.24	0.08		0.1	0	0		0.00	0	0		0.000	0	0		0.00	103	180		195
Aetideopsis armata	0.48			0.1	0.01			0.00	0			0.000	0.01			0.00	87			173
Boreomysis arctica	0.24	0.08		0.1	0	0		0.00	0	0		0.000	0	0		0.00	107	157		183
Boreomysis sp.	0.48	0.53	0.39	0.5	0.01	0.02	0	0.01	0	0	0	0.000	0.02	0.02	0	0.02	85	96	92	122
Bradyidius similis	0.95			0.2	0			0.00	0			0.000	0.01			0.00	97			187
Calanoida	8.1	0.98		2.35	0.07	0		0.00	0.001	0		0.000	0.18	0		0.03	44	156		99
Calanus hyperboreus	3.1	0.98		1.3	0.05	0		0.00	0	0		0.000	0.05	0		0.01	68	147		128
Calanus sp.	4.05	1.28		1.7	0.07	0		0.00	0.001	0		0.000	0.09	0.01		0.02	60	134		114

Table 29. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Copepoda	1.9	0.3		0.6	0.04	0		0.00	0.001	0		0.000	0.16	0		0.03	51	173		103
Erythrops erythrophthalma	4.52	2.71		2.74	0.15	0.01		0.01	0.001	0		0.000	0.17	0.01		0.04	50	112		97
Erythrops sp.	1.67	0.23		0.5	0.02	0		0.00	0	0		0.000	0.04	0		0.01	72	172		143
Euphausiacea	0.95	0.45	1.18	0.65	0.1	0.03	0.01	0.02	0.001	0	0	0.000	0.11	0.06	0.01	0.06	55	79	72	80
Euphausiidae	7.62	7.22	4.31	6.94	1.39	0.54	0.01	0.28	0.012	0.005	0	0.006	1.72	0.66	0.02	0.72	17	27	70	26
Hyperia galba		0.3	0.39	0.25		0	0	0.00		0	0	0.000		0	0	0.00		162	97	189
Hyperia sp.		0.3	0.39	0.25		0	0	0.00		0	0	0.000		0	0	0.00		159	98	186
Hyperiidae	0.24	0.23		0.2	0	0		0.00	0	0		0.000	0	0		0.00	105	164		191
Meganyctiphanes norvegica	9.05	14.52	6.67	12.38	4.03	1.5	0.05	0.78	0.028	0.016	0.001	0.016	3.93	2.07	0.09	2.00	10	14	44	16
Meterythrops robusta	0.24			0.05	0.01			0.00	0			0.000	0.03			0.01	73			149
Metridia sp.	2.38	0.08		0.55	0.09	0		0.00	0.001	0		0.000	0.17	0		0.03	46	181		101
Mysida	1.19	0.45		0.55	0.01	0		0.00	0	0		0.000	0.01	0		0.00	91	139		157
Mysidae	1.19	0.23	0.39	0.45	0.03	0	0	0.00	0	0	0	0.000	0.07	0	0	0.01	63	137	90	124
Mysis sp.	4.52	1.58	0.78	2.1	1.45	0.06	0	0.06	0.01	0.001	0	0.003	1.43	0.08	0	0.31	18	69	85	35
Paraeuchaeta norvegica	1.43	0.38		0.55	0.01	0		0.00	0	0		0.000	0.02	0		0.00	82	174		162
Pseudomma sp.	0.48	0.15		0.2	0	0		0.00	0	0		0.000	0	0		0.00	99	167		184
Stilomysis grandis	0.24	0.45		0.35	0	0		0.00	0	0		0.000	0	0.01		0.00	98	132		158
Stilomysis sp.		0.15		0.1		0.01		0.00		0		0.000		0.01		0.01		115		144
Themisto abyssorum	3.33	3.61	1.57	3.29	1.08	0.46	0	0.22	0.009	0.004	0	0.005	1.22	0.55	0	0.56	20	28	88	29
Themisto compressa	11.43	9.26	5.1	9.18	5.55	1.43	0.05	0.78	0.04	0.016	0.001	0.019	5.68	2.07	0.06	2.31	6	13	54	12
Themisto libellula	3.1	4.51	3.92	4.14	2.64	2.36	1.17	1.73	0.014	0.017	0.019	0.017	2.02	2.21	1.49	2.03	14	11	13	15
Themisto sp.	22.86	15.73	7.84	16.22	11.7	4.07	0.74	2.45	0.089	0.03	0.014	0.041	12.56	4	1.04	4.95	1	6	18	5
Thysanoessa sp.	2.86	1.73		1.75	1.61	0.84		0.40	0.02	0.006		0.008	2.84	0.74		0.97	13	24		24
Zooplankton, total	**55.24**	**42.51**	**29.41**	**43.51**	**30.12**	**11.33**	**2.05**	**6.76**	**0.23**	**0.095**	**0.035**	**0.116**	**32.54**	**12.51**	**2.71**	**14.13**				
Actiniaria		0.15	0.78	0.2		0.07	0.17	0.12		0.001	0.003	0.001		0.11	0.25	0.12		65	29	56
Aega psora		0.08		0.05		0.01		0.00		0		0.000		0.01		0.00		125		156
Aeginina longicornis		0.3		0.2		0.01		0.00		0		0.000		0.02		0.01		98		126
Ampelisca eschrichti	0.24			0.05	0.03			0.00	0			0.000	0.02			0.00	78			159
Ampelisca sp.	0.71	1.5	1.18	1.3	0.02	0.05	0.01	0.03	0	0.001	0	0.000	0.02	0.08	0.02	0.05	77	71	71	84
Ampeliscidae	1.19	0.53		0.6	0.11	0.02		0.01	0.001	0		0.000	0.18	0.03		0.05	45	90		85
Amphipoda	0.48	0.08		0.15	0	0		0.00	0	0		0.000	0	0		0.00	101	177		190
Anonyx lilljeborgi		0.08		0.05		0		0.00		0		0.000		0.01		0.00		130		161
Anonyx sp.	3.1	3.99	4.71	3.89	0.38	0.17	0.07	0.12	0.002	0.002	0.001	0.002	0.31	0.2	0.06	0.19	36	47	51	49
Aphrodita hastata		0.08		0.05		0.05		0.02		0		0.000		0.03		0.02		91		116
Astarte sp.	0.24	0.15	1.57	0.35	0.02	0.01	0.03	0.02	0	0	0.001	0.000	0.02	0.01	0.04	0.01	84	127	59	123
Aulacofusus brevicauda		0.08		0.05		0.04		0.02		0		0.000		0.02		0.01		99		127
Balanidae		0.08		0.05		0		0.00		0		0.000		0		0.00		149		178
Bathypolypus bairdii		0.15	1.18	0.25		0	0.05	0.03		0	0.001	0.000		0	0.08	0.02		169	46	120
Bivalvia		0.6	0.39	0.45		0.09	0	0.04		0.001	0	0.001		0.12	0	0.07		59	99	74
Bryozoa		0.08		0.05		0		0.00		0		0.000		0		0.00		168		196
Buccinidae		0.3	0.78	0.3		0.1	0.03	0.06		0	0	0.000		0.06	0.03	0.04		78	61	93
Buccinum sp.		0.3	0.39	0.25		0.06	0	0.03		0	0	0.000		0.04	0	0.02		87	96	112
Buccinum undatum		0.08		0.05		0.01		0.01		0		0.000		0.01		0.01		113		142
Byblis gaimardi	3.33	1.2	0.39	1.55	0.14	0	0	0.01	0.001	0	0	0.000	0.17	0.01	0	0.04	48	126	94	98
Byblis sp.	0.24	0.15		0.15	0.01	0		0.00	0	0		0.000	0.01	0		0.00	94	155		167
Calathura brachiata		0.38		0.25		0.01		0.00		0		0.000		0.01		0.00		131		163
Caprellidae	0.95	0.38		0.45	0.09	0		0.00	0.001	0		0.000	0.09	0.01		0.02	59	119		111

Table 29. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Cephalopoda		0.53	0.39	0.4		0	0	0.00		0	0	0.000		0	0	0.00		150	95	177
Ciliatocardium ciliatum ciliatum		0.08		0.05		0.01		0.00		0		0.000		0.01		0.00		124		153
Cistenides granulata		0.15		0.1		0		0.00		0		0.000		0		0.00		165		193
Crustacea	28.57	17.38	9.8	18.76	5.58	2.25	0.15	1.19	0.041	0.019	0.003	0.021	5.77	2.45	0.2	2.59	5	10	32	11
Cryptonatica affinis		0.08		0.05		0		0.00		0		0.000		0.01		0.01		118		148
Cumacea	8.33	1.96	0.39	3.09	0.2	0	0	0.01	0.002	0	0	0.000	0.29	0.01	0	0.06	38	122	101	82
Digested invertebrates		0.23	0.78	0.25		0.02	0.1	0.06		0	0.001	0.000		0.01	0.07	0.02		116	50	113
Ennucula sp.		0.08		0.05		0		0.00		0		0.000		0		0.00		179		204
Eunice pennata		0.08		0.05		0.02		0.01		0		0.000		0.01		0.01		108		138
Eusiridae	0.71	0.23		0.3	0.01	0		0.00	0	0		0.000	0.01	0		0.00	95	160		176
Eusirus cuspidatus	0.71	0.38	0.78	0.5	0.06	0.01	0	0.01	0	0	0	0.000	0.05	0.01	0	0.02	66	114	82	118
Flabelligeridae		0.08		0.05		0		0.00		0		0.000		0		0.00		154		181
Gammaridea	23.81	10.31	5.88	12.57	0.93	0.14	0.01	0.09	0.009	0.002	0	0.003	1.27	0.24	0.01	0.38	19	43	77	34
Gastropoda	0.48	0.23	0.39	0.3	0.01	0	0.01	0.00	0	0	0	0.000	0.01	0	0	0.00	90	145	84	155
Holothuroidea		0.08		0.05		0.03		0.01		0		0.000		0.01		0.01		106		135
Idotea sp.	0.24			0.05	0.01			0.00	0			0.000	0.01			0.00	93			182
Illex illecebrosus		0.45	1.96	0.55		1.28	2.2	1.74		0.008	0.046	0.011		1.03	3.55	1.36		21	10	20
Invertebrata	0.71	0.3		0.35	0.1	0.03		0.02	0.001	0		0.000	0.15	0.03		0.05	52	89		89
Lithodes maja		0.3	0.39	0.25		0.17	0.02	0.09		0.001	0	0.001		0.11	0.03	0.07		62	62	76
Lysianassidae		0.9	0.78	0.7		0.02	0	0.01		0	0	0.000		0.02	0	0.01		102	89	131
Maera loveni		0.3		0.2		0.01		0.00		0		0.000		0.01		0.01		107		137
Maera sp.		0.08		0.05		0		0.00		0		0.000		0		0.00		143		171
Maldanidae		0.08		0.05		0.04		0.02		0		0.000		0.06		0.04		76		95
Margarites costalis		0.08	0.39	0.1		0	0.01	0.00		0	0	0.000		0	0	0.00		152	86	172
Margarites sp.		0.08		0.05		0		0.00		0		0.000		0.01		0.01		117		147
Megayoldia thraciaeformis		0.08		0.05		0		0.00		0		0.000		0		0.00		176		201
Melita dentata	0.48	0.15		0.2	0.03	0		0.00	0	0		0.000	0.03	0.01		0.01	75	129		139
Melita sp.	0.95	1.05		0.9	0.06	0.02		0.01	0	0		0.000	0.05	0.03		0.03	65	94		107
Melitidae	0.95	0.23		0.35	0.05	0		0.00	0.001	0		0.000	0.12	0		0.02	54	142		110
Mollusca		0.08		0.05		0		0.00		0		0.000		0		0.00		175		200
Nemertea		0.38	1.18	0.4		0.16	0.08	0.11		0.001	0.001	0.001		0.1	0.09	0.08		66	42	71
Neohela monstrosa	2.14	6.02	1.96	4.69	0.95	0.53	0.02	0.26	0.005	0.005	0	0.005	0.71	0.7	0.03	0.57	25	25	60	28
Nephtys sp.	0.24	0.45		0.35	0.7	0.22		0.11	0.004	0.002		0.002	0.53	0.22		0.23	27	45		44
Nuculana sp.	0.24			0.05	0			0.00	0			0.000	0			0.00	106			202
Nymphon sp.	0.24			0.05	0			0.00	0			0.000	0			0.00	104			199
Oedicerotidae	0.95	0.45		0.5	0.01	0		0.00	0	0		0.000	0.03	0		0.01	76	161		146
Onisimus sp.	0.24	0.15		0.15	0	0		0.00	0	0		0.000	0	0		0.00	100	146		168
Ophiopholis aculeata		1.2	1.57	1		0.35	0.09	0.20		0.003	0.002	0.002		0.33	0.14	0.23		37	39	45
Ophiura robusta		0.08	0.39	0.1		0	0	0.00		0	0	0.000		0	0	0.00		171	91	197
Ophiura sarsii		0.08	0.39	0.1		0.01	0.05	0.03		0	0.001	0.000		0	0.04	0.01		138	58	132
Ophiura sp.		0.75		0.5		0.01		0.00		0		0.000		0.01		0.01		121		151
Ophiuridae		0.08		0.05		0		0.00		0		0.000		0		0.00		178		203
Ophiuroidea		1.13	1.18	0.9		0.1	0	0.05		0.001	0	0.001		0.14	0.01	0.09		57	75	66
Paguridae	0.24			0.05	0.02			0.00	0			0.000	0.01			0.00	89			175
Pagurus sp.	1.43	0.75		0.8	0.1	0.07		0.03	0.002	0.001		0.001	0.21	0.07		0.08	41	75		70
Paramphithoe hystrix		0.15		0.1		0		0.00		0		0.000		0.01		0.00		123		152
Pentamera calcigera			0.39	0.05			0	0.00			0	0.000			0	0.00			80	188

Table 29. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Phyllodoce groenlandica	1.67	2.41	1.57	2.15	0.33	0.13	0.02	0.08	0.002	0.001	0	0.001	0.23	0.2	0.03	0.17	39	48	64	53
Phyllodoce sp.	0.24	0.45	0.39	0.4	0	0.03	0.01	0.02	0	0	0	0.000	0	0.04	0.01	0.03	102	85	78	105
Polychaeta	10.71	10.08	4.31	9.48	2.01	0.74	0.08	0.42	0.013	0.007	0.002	0.007	1.79	0.85	0.11	0.87	16	22	41	25
Polynoidae	0.24	0.08		0.1	0.46	0.01		0.01	0.002	0		0.000	0.31	0		0.06	35	148		81
Protomedeia fasciata	0.48			0.1	0.01			0.00	0			0.000	0.02			0.00	83			165
Protomedeia sp.		0.08		0.05		0		0.00		0		0.000		0		0.00		153		180
Rhachotropis aculeata	1.67	3.54	2.35	2.99	0.19	0.21	0.02	0.11	0.003	0.002	0	0.002	0.4	0.33	0.02	0.28	31	38	68	38
Rhachotropis inflata	0.24			0.05	0			0.00	0			0.000	0.01			0.00	86			170
Rhachotropis sp.		0.53		0.35		0.01		0.01		0		0.000		0.03		0.02		92		121
Rossia sp.		0.3		0.2		0.11		0.05		0.002		0.001		0.23		0.14		44		55
Scabrotrophon fabricii		0.08		0.05		0.01		0.00		0		0.000		0.01		0.00		133		164
Stegocephalus inflatus		0.3	0.78	0.3		0	0.01	0.00		0	0	0.000		0	0.01	0.00		136	76	154
Strongylocentrotus sp.			0.39	0.05			0	0.00			0	0.000			0	0.00			87	192
Syrrhoe crenulata	3.1	3.31		2.84	0.07	0.01		0.01	0	0		0.000	0.05	0.03		0.03	67	93		108
Syrrhoe sp.		0.08		0.05		0		0.00		0		0.000		0		0.00		170		198
Terebellida		0.08		0.05		0.02		0.01		0		0.000		0.02		0.01		100		130
Terebellidae	0.48	0.08		0.15	0.27	0.02		0.02	0.001	0		0.000	0.19	0.03		0.05	43	95		87
Tmetonyx cicada	0.48	0.98	0.39	0.8	0.02	0.02	0	0.01	0	0	0	0.000	0.03	0.02	0	0.02	74	97	93	115
Tmetonyx sp.	0.48	0.6	0.39	0.55	0.02	0	0	0.00	0	0	0	0.000	0.02	0	0	0.01	80	141	100	145
Wimvadocus torelli	0.48	0.53		0.45	0.19	0.03		0.02	0.001	0		0.000	0.13	0.03		0.04	53	88		91
Other invertebrates, total	**56.43**	**44.39**	**34.9**	**45.71**	**13.18**	**7.59**	**3.25**	**5.37**	**0.093**	**0.063**	**0.063**	**0.069**	**13.24**	**8.23**	**4.84**	**8.45**				
Invertebrates, total	**86.19**	**82.77**	**71.76**	**82.09**	**70.13**	**56.53**	**24.03**	**39.29**	**0.503**	**0.438**	**0.393**	**0.446**	**71.26**	**57.47**	**29.98**	**54.36**				
Unidentified digested material	25.95	26.41	22.75	25.85	6.97	5.7	3.54	4.56	0.046	0.044	0.052	0.045	6.52	5.74	3.94	5.51	3	3	9	4
Unidentified egg	0.24	0.23	0.78	0.3	0.01	0.04	0.03	0.03	0	0	0.001	0.000	0.01	0.04	0.05	0.03	96	86	55	100
Unidentifiable prey, total	**26.19**	**26.56**	**23.53**	**26.1**	**6.98**	**5.74**	**3.57**	**4.59**	**0.046**	**0.044**	**0.052**	**0.045**	**6.53**	**5.78**	**3.99**	**5.55**				
Total					**100**	**100**	**100**	**100.00**	**0.706**	**0.762**	**1.31**	**0.820**	**100**	**100**	**100**	**100.00**				

Table 30. Summary of diet of Atlantic cod from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 30, M = [30-55[, L = 55+ and T = all lengths combined).

													CFI							
	FO				MC				FI				Value				RanK			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Clupea harengus		0.23	3.92	0.65		0.57	14.29	7.97		0.003	0.129	0.018		0.36	9.81	2.22		14	4	12
Gadidae		0.38	3.53	0.7		2.52	6.43	4.57		0.010	0.067	0.015		1.32	5.10	1.85		13	7	14
Mallotus villosus	2.62	5.79	8.24	5.44	9.04	13.92	11.51	12.51	0.056	0.127	0.173	0.118	7.92	16.61	13.21	14.35	6	2	3	2
Other fishes	12.38	23.63	41.57	23.55	12.73	14.47	27.52	21.48	0.094	0.104	0.295	0.126	13.33	13.66	22.50	15.40	2	3	1	1
Sebastes spp.	0.71	5.79	21.18	6.69	1.12	6.25	12.66	9.59	0.007	0.037	0.202	0.051	0.96	4.81	15.41	6.27	11	9	2	7
Fishes, total	**15.48**	**31.83**	**67.06**	**32.88**	**22.9**	**37.73**	**72.41**	**56.12**	**0.157**	**0.280**	**0.865**	**0.329**	**22.21**	**36.76**	**66.03**	**40.09**				
Chionoecetes opilio	3.81	10.68	17.25	10.08	0.84	4.22	6.41	5.33	0.005	0.027	0.094	0.031	0.72	3.51	7.17	3.75	12	10	6	10
Other crabs	3.1	10.16	10.98	8.78	0.36	3.30	2.17	2.62	0.002	0.019	0.027	0.016	0.29	2.49	2.03	2.00	13	12	12	13
Crabs, total	**6.67**	**18.81**	**24.71**	**17.02**	**1.2**	**7.52**	**8.59**	**7.95**	**0.007**	**0.046**	**0.121**	**0.047**	**1.01**	**6.00**	**9.20**	**5.75**				
Other Pandalidae	9.76	16.93	15.29	15.22	8.59	5.01	1.03	2.94	0.055	0.043	0.018	0.042	7.78	5.61	1.40	5.15	7	8	13	9
Other shrimp	24.05	30.55	28.24	28.89	10.72	7.22	1.90	4.43	0.079	0.061	0.034	0.061	11.16	7.95	2.60	7.44	4	6	10	6
Pandalus borealis	3.1	16.78	15.69	13.77	6.31	17.86	7.21	11.84	0.039	0.131	0.121	0.110	5.53	17.15	9.23	13.44	9	1	5	3
Shrimp, total	**31.67**	**50.04**	**44.31**	**45.46**	**25.62**	**30.09**	**10.14**	**19.21**	**0.173**	**0.234**	**0.173**	**0.213**	**24.47**	**30.72**	**13.22**	**26.03**				
Euphausiidae	17.62	21.6	10.59	19.36	7.03	2.88	0.07	1.46	0.06	0.026	0.001	0.030	8.5	3.47	0.10	3.69	5	11	14	11
Hyperiidae	33.1	26.94	18.04	27.1	20.97	8.32	1.97	5.18	0.152	0.067	0.034	0.081	21.49	8.83	2.59	9.84	1	4	11	4
Other zooplankton	27.62	9.63	2.75	12.52	2.12	0.14	0.01	0.12	0.018	0.002	0.000	0.005	2.56	0.21	0.02	0.60	10	15	15	15
Zooplankton, total	**55.24**	**42.51**	**29.41**	**43.51**	**30.12**	**11.33**	**2.05**	**6.76**	**0.23**	**0.095**	**0.035**	**0.116**	**32.54**	**12.51**	**2.71**	**14.13**				
Other invertebrates	56.43	44.39	34.9	45.71	13.18	7.59	3.25	5.37	0.093	0.063	0.063	0.069	13.24	8.23	4.84	8.45	3	5	8	5
Other invertebrates, total	**56.43**	**44.39**	**34.9**	**45.71**	**13.18**	**7.59**	**3.25**	**5.37**	**0.093**	**0.063**	**0.063**	**0.069**	**13.24**	**8.23**	**4.84**	**8.45**				
Invertebrates, total	**86.19**	**82.77**	**71.76**	**82.09**	**70.13**	**56.53**	**24.03**	**39.29**	**0.503**	**0.438**	**0.393**	**0.446**	**71.26**	**57.47**	**29.98**	**54.36**				
Unidentifiable prey	26.19	26.56	23.53	26.1	6.98	5.74	3.57	4.59	0.046	0.044	0.052	0.045	6.53	5.78	3.99	5.55	8	7	9	8
Unidentifiable prey, total	**26.19**	**26.56**	**23.53**	**26.1**	**6.98**	**5.74**	**3.57**	**4.59**	**0.046**	**0.044**	**0.052**	**0.045**	**6.53**	**5.78**	**3.99**	**5.55**				
Total					**100**	**100.00**	**100.00**	**100.00**	**0.706**	**0.762**	**1.310**	**0.820**	**100**	**100.00**	**100.00**	**100.00**				

Table 31. Summary of diet of the ENGSL Atlantic cod from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 30, M = [30-55[, L = 55+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG				LC				NEG			
Taxonomic grouping	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Clupea harengus							0.12 (13.33)	0.02 (4.19)		0.00 (0.51)	0.168 (10.28)	0.02 (2.57)
Gadidae		0.00 (0.32)	0.03 (5.14)	0.005 (0.68)		0.065 (14.88)	0.00 (0.21)	0.04 (8.93)		0.00 (0.16)	0.095 (5.85)	0.01 (1.39)
Mallotus villosus	0.144 (18.32)	0.20 (28.61)	0.04 (6.12)	0.173 (24.32)					0.04 (5.07)	0.13 (14.88)	0.261 (15.98)	0.12 (13.36)
Other fishes	0.094 (11.98)	0.05 (6.55)	0.16 (28.74)	0.069 (9.74)	0.01 (3.49)	0.091 (20.95)	0.17 (18.68)	0.09 (18.67)	0.11 (14.29)	0.13 (14.96)	0.366 (22.44)	0.15 (16.49)
Sebastes spp.		0.03 (4.85)	0.13 (21.98)	0.038 (5.31)		0.095 (21.71)	0.49 (52.42)	0.14 (29.41)	0.01 (1.31)	0.03 (2.98)	0.147 (9.04)	0.04 (4.02)
Fishes, total	**0.237 (30.30)**	**0.29 (40.34)**	**0.35 (61.98)**	**0.284 (40.05)**	**0.01 (3.49)**	**0.251 (57.54)**	**0.79 (84.64)**	**0.30 (61.21)**	**0.15 (20.67)**	**0.28 (33.48)**	**1.037 (63.59)**	**0.35 (37.82)**
Chionoecetes opilio	0.012 (1.48)	0.02 (3.32)	0.04 (7.56)	0.023 (3.29)	0.01 (3.22)	0.014 (3.27)	0.01 (1.36)	0.01 (2.66)	0.00 (0.34)	0.03 (3.59)	0.131 (8.02)	0.04 (3.99)
Other crabs	0.001 (0.11)	0.01 (1.35)		0.007 (0.96)	0.00 (0.39)	0.008 (1.78)		0.01 (1.10)	0.00 (0.35)	0.02 (2.90)	0.042 (2.56)	0.02 (2.36)
Crabs, total	**0.012 (1.59)**	**0.03 (4.68)**	**0.04 (7.56)**	**0.030 (4.25)**	**0.01 (3.61)**	**0.022 (5.05)**	**0.01 (1.36)**	**0.02 (3.76)**	**0.01 (0.69)**	**0.06 (6.49)**	**0.173 (10.58)**	**0.06 (6.35)**
Other Pandalidae	0.055 (7.08)	0.05 (7.25)	0.01 (2.00)	0.048 (6.74)	0.03 (10.15)	0.019 (4.40)	0.00 (0.21)	0.02 (3.60)	0.06 (7.87)	0.04 (5.26)	0.025 (1.52)	0.05 (4.91)
Other shrimp	0.146 (18.59)	0.03 (4.14)	0.03 (5.73)	0.053 (7.48)	0.02 (6.11)	0.020 (4.52)	0.00 (0.15)	0.02 (3.29)	0.07 (9.09)	0.08 (9.44)	0.043 (2.65)	0.07 (7.88)
Pandalus borealis	0.142 (18.08)	0.23 (31.70)	0.10 (17.55)	0.195 (27.41)		0.076 (17.49)	0.06 (6.57)	0.06 (12.49)	0.01 (1.88)	0.11 (12.86)	0.143 (8.77)	0.09 (9.99)
Shrimp, total	**0.343 (43.74)**	**0.31 (43.08)**	**0.14 (25.28)**	**0.296 (41.64)**	**0.05 (16.26)**	**0.115 (26.40)**	**0.06 (6.92)**	**0.10 (19.37)**	**0.14 (18.84)**	**0.23 (27.56)**	**0.211 (12.94)**	**0.21 (22.77)**
Euphausiidae	0.026 (3.32)	0.02 (2.63)	0.00 (0.12)	0.018 (2.55)	0.01 (2.69)	0.001 (0.28)	0.00 (0.02)	0.00 (0.42)	0.08 (10.44)	0.03 (4.05)	0.002 (0.11)	0.04 (4.33)
Hyperiidae	0.015 (1.94)	0.00 (0.59)	0.00 (0.40)	0.006 (0.87)	0.05 (19.81)	0.007 (1.61)	0.00 (0.03)	0.01 (2.74)	0.21 (27.73)	0.10 (12.02)	0.052 (3.21)	0.12 (12.90)
Other zooplankton	0.004 (0.57)	0.00 (0.03)		0.001 (0.15)	0.02 (7.81)	0.000 (0.09)	0.00 (0.01)	0.00 (0.76)	0.02 (2.91)	0.00 (0.28)	0.000 (0.02)	0.01 (0.69)
Zooplankton, total	**0.046 (5.83)**	**0.02 (3.25)**	**0.00 (0.52)**	**0.025 (3.58)**	**0.08 (30.30)**	**0.009 (1.98)**	**0.00 (0.06)**	**0.02 (3.92)**	**0.31 (41.08)**	**0.14 (16.35)**	**0.055 (3.34)**	**0.17 (17.92)**
Other invertebrates	0.083 (10.54)	0.04 (5.88)	0.01 (1.52)	0.046 (6.52)	0.10 (34.39)	0.026 (5.87)	0.00 (0.39)	0.03 (6.71)	0.10 (12.95)	0.08 (9.18)	0.096 (5.87)	0.08 (9.13)
Other invertebrates, total	**0.083 (10.54)**	**0.04 (5.88)**	**0.01 (1.52)**	**0.046 (6.52)**	**0.10 (34.39)**	**0.026 (5.87)**	**0.00 (0.39)**	**0.03 (6.71)**	**0.10 (12.95)**	**0.08 (9.18)**	**0.096 (5.87)**	**0.08 (9.13)**
Invertebrates, total	**0.484 (61.70)**	**0.40 (56.89)**	**0.20 (34.88)**	**0.398 (55.99)**	**0.23 (84.55)**	**0.171 (39.31)**	**0.08 (8.73)**	**0.17 (33.75)**	**0.55 (73.56)**	**0.51 (59.58)**	**0.534 (32.73)**	**0.52 (56.17)**
Unidentifiable prey	0.063 (8.00)	0.02 (2.77)	0.02 (3.14)	0.028 (3.96)	0.03 (11.96)	0.014 (3.16)	0.06 (6.63)	0.02 (5.04)	0.04 (5.77)	0.06 (6.94)	0.060 (3.67)	0.06 (6.01)
Unidentifiable prey, total	**0.063 (8.00)**	**0.02 (2.77)**	**0.02 (3.14)**	**0.028 (3.96)**	**0.03 (11.96)**	**0.014 (3.16)**	**0.06 (6.63)**	**0.02 (5.04)**	**0.04 (5.77)**	**0.06 (6.94)**	**0.060 (3.67)**	**0.06 (6.01)**
Total	**0.784 (100.00)**	**0.71 (100.00)**	**0.57 (100.00)**	**0.710 (100.00)**	**0.28 (100.00)**	**0.435 (100.00)**	**0.93 (100.00)**	**0.49 (100.00)**	**0.74 (100.00)**	**0.85 (100.00)**	**1.631 (100.00)**	**0.92 (100.00)**

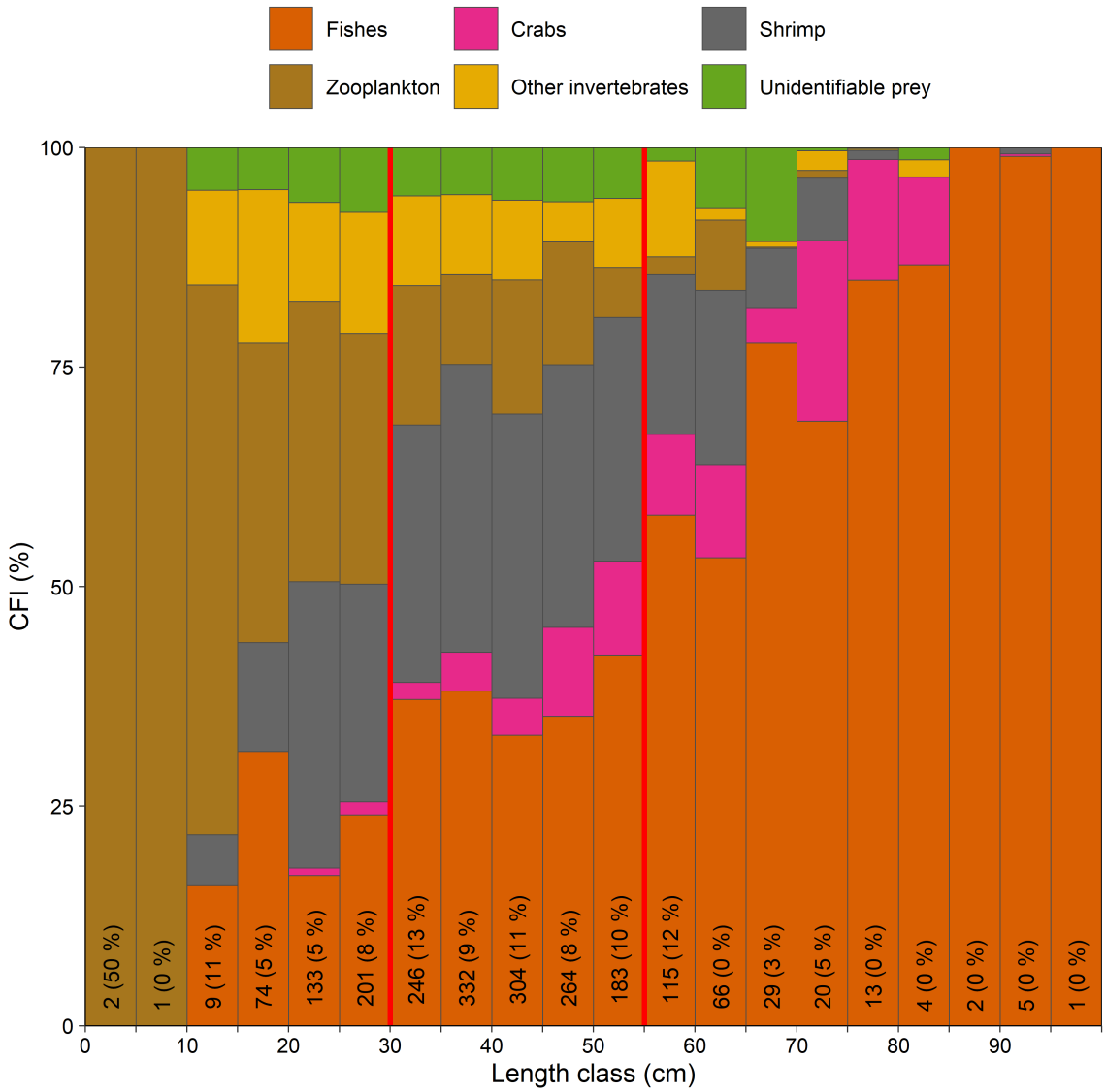

Figure 14. Prey group contributions to the total fullness index (CFI) for Atlantic cod in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. Vertical red lines separate the length classes that were combined for the analyzes.

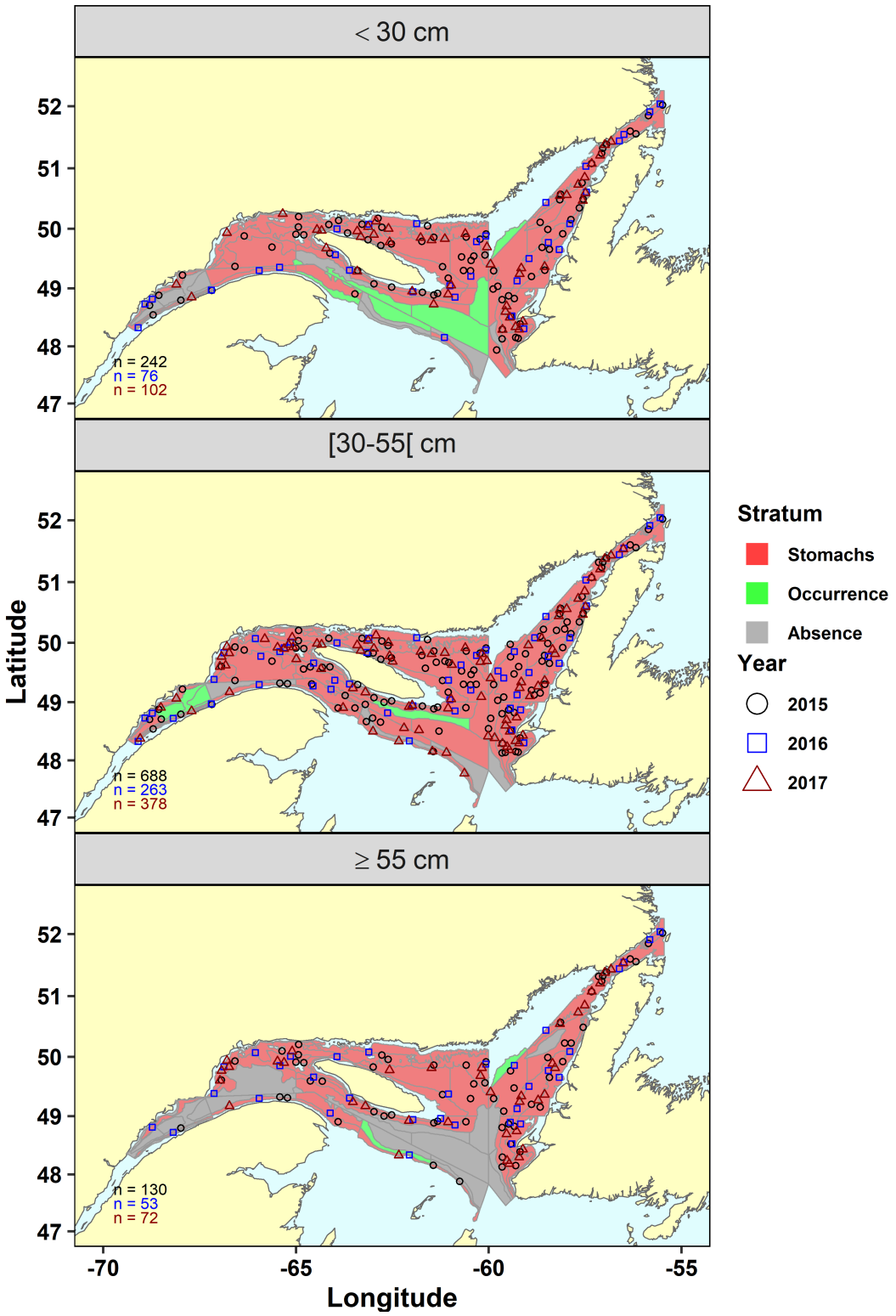

Figure 15. Origin of Atlantic cod stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.9 Thorny skate (*Amblyraja radiata*)

Thorny skate was targeted for stomach content analysis in 2017 only. Two hundred and seventy-three stomachs were collected and analyzed in the laboratory, with 6 % being empty (Table 32). These stomachs came from specimens ranging from 10.0 to 71.0 cm in length, for an average length of 39.1 cm (Table 32). By assessing the contribution of different groups of prey to the total fullness index by specimen length, three size groups were created with breaks at 30 and 45 cm in length (Table 32, Figure 16). The average mass of stomach contents for thorny skate, all lengths combined, was 8.1 g, excluding empty stomachs (Table 32).

Despite a reduced sampling effort, thorny skate ranked second after Atlantic cod in terms of the diversity of prey observed in their stomachs, with 82 different taxa in 43 families (Tables 3 and 32).

Disregarding length classes, the group of prey contributing the most to TFI in thorny skate was the unidentifiable prey group at 44 %, with the contribution of only two taxa (Table 33). The other groups were in order of importance fishes, other invertebrates, shrimp, crabs and zooplankton.

Excluding unidentifiable prey, thorny skates < 30 cm fed mainly on other invertebrates. From 30 cm in length, shrimp and fishes became more important in its diet. Thorny skates $\geq$ 45 cm fed mainly on fishes (49 %) and shrimp (18 %). These two contributions were essentially redfish and northern shrimp. Redfish was the fish most consumed by thorny skate, ranking 1st and 2nd as prey of importance in the $\geq$ 45 cm in length and for all length classes combined respectively. Only one occurrence of cannibalism has been recorded for thorny skate.

Both crabs and shrimp were found in just under one-third of stomachs and contributed 7 and 11 %, respectively, of the CFI in thorny skate. Twelve shrimp taxa were listed, the pink glass shrimp being the most frequently observed (11 %), followed by the northern shrimp (9 %) and the generic taxon for this type of prey (6 %). The northern shrimp was the most important invertebrate in the diet of thorny skate and ranked among the top three prey contributing the most to the feeding of this predator for length classes [30-45[and $\geq$ 45 cm, as well as for all length classes combined.

Seventeen zooplankton taxa were observed in the stomach contents of this predator. All the indices for zooplankton (FO, MC, FI and CFI) were higher in small specimens than in larger ones. Among the taxa observed, two families were kept as taxonomic groupings: Mysidae and Euphausiidae (Table 34).

For the group of other invertebrates, the family Oedicerotidae was the only amphipod taxon among the fifteen found in the stomachs of thorny skate which had not been pooled into the taxonomic grouping of other invertebrates of Table 34. When combined together, gammarid amphipods were found in > 55 % of analyzed thorny skate stomachs and contributed almost 6 % of this predator's diet for all length classes combined.

Thorny skate stomachs were captured from the three zones of the ENGSL (Table 35, Figure 17). This species was caught in several strata where no stomach was taken. This is partly due to

the fact that the codification of the strata covers the period 2015-2017, while stomachs of this predator were only targeted in 2017 (Appendix A). Feeding intensity was highest in the NEG zone. When we compare the NEG and NWG zones in terms of mean TFI, we observe that northern shrimp seems to be the explanatory factor in this increased feeding intensity in NEG. In the LC zone, fishes were more important than invertebrates in the diet of thorny skate. Redfish contributed the majority of fish intake for this zone, alone supplanting the FI in fish from the other two zones.

Table 32. Sampling effort summary for thorny skate stomachs, by zone and size class (cm, S = < 30, M = [30-45[, L = 45+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG				LC				NEG				ENGSL			
Metric	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Mean TFI	0.96	0.47	0.40	0.64	0.69	0.30	0.35	0.44	0.95	0.78	0.56	0.76	0.86	0.50	0.41	0.58
No. of stomachs	30	18	28	76	32	16	72	120	32	14	31	77	94	48	131	273
No. of empty stomachs	0	0	0	0	5	1	7	13	4	0	0	4	9	1	7	17
% empty	0.0	0.0	0.0	0.0	15.6	6.2	9.7	10.8	12.5	0.0	0.0	5.2	9.6	2.1	5.3	6.2
Length (cm)																
min	10.0	30.4	45.6	10.0	12.4	31.9	45.0	12.4	12.0	30.7	45.1	12.0	10.0	30.4	45.0	10.0
med	18.6	34.9	50.2	33.7	14.6	37.5	56.5	47.8	15.7	38.9	55.0	38.7	16.1	36.9	54.6	43.6
mean	19.9	35.7	50.8	35.0	17.9	38.1	56.5	43.8	17.1	38.0	54.5	36.0	18.3	37.2	54.8	39.1
max	29.2	44.6	61.8	61.8	29.5	44.8	71.0	71.0	29.4	44.2	64.5	64.5	29.5	44.8	71.0	71.0
Total stomach content (g)																
min	0.028	0.613	0.129	0.028	0.002	0.463	0.043	0.002	0.001	0.583	0.515	0.001	0.001	0.463	0.043	0.001
med	0.824	3.381	5.223	2.454	0.563	2.476	6.791	3.332	0.821	6.848	14.557	5.244	0.768	3.571	7.543	3.232
mean	1.214	4.063	9.897	5.088	1.036	3.272	14.462	9.506	1.227	7.154	17.667	9.345	1.162	4.731	14.233	8.148
max	3.552	10.957	56.200	56.200	4.875	8.935	109.662	109.662	5.244	17.000	94.524	94.524	5.244	17.000	109.662	109.662
No. of observed taxa																
Fishes	1	2	6	6	1	2	8	8	0	1	5	6	1	3	11	11
Crabs	2	2	3	3	3	2	2	3	3	2	2	3	4	2	3	4
Shrimp	0	2	2	2	2	1	6	7	5	4	8	10	6	4	11	12
Zooplankton	8	5	4	8	10	4	6	12	9	2	4	11	16	8	8	17
Other invertebrates	11	11	6	18	15	10	12	26	18	8	14	24	23	18	21	36
Unidentifiable prey	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	2
Total	23	23	22	38	32	20	36	58	36	18	34	55	51	36	56	82

Table 33. Detailed diet of thorny skate from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 30, M = [30-45[, L = 45+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Amblyraja radiata			0.76	0.37			0.2	0.17			0.001	0.000			0.24	0.08			28	47
Ammodytes sp.			0.76	0.37			0.28	0.23			0.001	0.001			0.36	0.12			23	39
Anarhichas sp.			0.76	0.37			0.15	0.12			0.001	0.000			0.13	0.04			32	57
Digested fish	3.19	2.08	19.08	10.62	0.03	0.57	2.74	2.38	0	0.004	0.009	0.005	0.01	0.74	2.24	0.88	48	13	7	18
Digested roundfish		6.25	3.82	2.93		5.49	1.24	1.64		0.036	0.007	0.010		7.14	1.66	1.65		4	10	11
Enchelyopus cimbrius		2.08	3.82	2.2		1.06	1.33	1.24		0.003	0.005	0.003		0.61	1.32	0.54		15	16	25
Melanostigma atlanticum			3.82	1.83			0.32	0.27			0.002	0.001			0.46	0.16			21	35
Myxine glutinosa			1.53	0.73			2.79	2.36			0.009	0.004			2.23	0.76			8	22
Nezumia bairdii			0.76	0.37			3.74	3.17			0.019	0.009			4.69	1.59			4	13
Pisces			0.76	0.37			0.59	0.50			0.004	0.002			1.06	0.36			18	27
Sebastes spp.			22.9	10.99			38.51	32.58			0.141	0.068			34.23	11.62			1	2
Fishes, total	**3.19**	**10.42**	**50.38**	**27.11**	**0.03**	**7.13**	**51.89**	**44.66**	**0**	**0.043**	**0.201**	**0.104**	**0.01**	**8.48**	**48.62**	**17.80**				
Brachyura	30.85	25	6.87	18.32	4.8	3.02	0.3	0.80	0.044	0.015	0.001	0.019	5.15	2.98	0.31	3.18	2	9	25	5
Chionoecetes opilio	8.51	12.5	10.69	10.26	4.41	2.88	2.09	2.29	0.02	0.01	0.01	0.013	2.28	1.95	2.46	2.29	7	11	6	7
Chionoecetes sp.	1.06			0.37	0.05			0.00	0			0.000	0.02			0.01	43			71
Hyas sp.	1.06		0.76	0.73	5.06		1.68	1.66	0.019		0.007	0.010	2.16		1.58	1.63	8		11	12
Crabs, total	**37.23**	**33.33**	**16.79**	**26.74**	**14.33**	**5.9**	**4.07**	**4.75**	**0.083**	**0.025**	**0.018**	**0.041**	**9.6**	**4.93**	**4.35**	**7.11**				
Argis dentata			2.29	1.1			0.6	0.51			0.003	0.001			0.75	0.26			19	31
Crangonidae	1.06		1.53	1.1	0.02		0.21	0.18	0		0.001	0.000	0.01		0.21	0.08	49		29	52
Digested shrimp	3.19	10.42	6.11	5.86	0.03	0.62	1.61	1.43	0	0.002	0.006	0.003	0.05	0.4	1.49	0.59	36	19	14	24
Eusergestes arcticus			4.58	2.2			0.48	0.41			0.002	0.001			0.44	0.15			22	36
Pandalus borealis		12.5	13.74	8.79		16.36	9.11	9.45		0.082	0.044	0.035		16.26	10.61	6.07		2	3	3
Pandalus sp.	1.06		1.53	1.1	0.95		0.25	0.26	0.021		0.001	0.008	2.46		0.18	1.31	6		31	15
Pasiphaea multidentata		6.25	21.37	11.36		3.56	4.76	4.41		0.022	0.018	0.012		4.41	4.26	2.12		6	5	9
Pontophilus norvegicus		2.08	1.53	1.1		0.44	0.04	0.08		0.003	0	0.001		0.66	0.03	0.11		14	44	41
Sabinea septemcarinata	1.06		2.29	1.47	0.03		0.26	0.22	0		0.001	0.001	0.05		0.26	0.11	35		26	40
Sabinea sp.	1.06		0.76	0.73	0.13		0.03	0.03	0.001		0	0.000	0.07		0.04	0.05	33		37	54
Spirontocaris sp.			0.76	0.37			0.03	0.02			0	0.000			0.03	0.01			43	69
Spirontocaris spinus	1.06			0.37	0.13			0.01	0			0.000	0.05			0.03	34			62
Shrimp, total	**7.45**	**29.17**	**41.98**	**27.84**	**1.29**	**20.99**	**17.38**	**17.01**	**0.023**	**0.11**	**0.076**	**0.064**	**2.68**	**21.73**	**18.3**	**10.88**				
Aetideidae	31.91	2.08		11.36	0.71	0		0.03	0.015	0		0.005	1.69	0		0.86	12	36		19
Aetideopsis armata	7.45			2.56	0.04			0.00	0.001			0.000	0.1			0.05	31			55
Boreomysis sp.	14.89	27.08	26.72	22.71	3.8	3.56	1.61	1.92	0.024	0.019	0.008	0.016	2.83	3.81	2.01	2.70	4	7	9	6
Calanoida	19.15	2.08	0.76	7.33	0.08	0.01	0	0.00	0.001	0	0	0.000	0.15	0.01	0	0.08	28	33	55	51
Calanus sp.	1.06			0.37	0			0.00	0			0.000	0			0.00	50			80
Erythrops erythrophthalma	6.38	2.08		2.56	0.07	0.01		0.00	0.001	0		0.000	0.15	0		0.07	29	35		53
Euphausiacea	1.06			0.37	0.09			0.00	0			0.000	0.03			0.01	40			66
Euphausiidae	9.57	2.08	8.4	7.69	0.41	0.02	0.73	0.64	0.005	0	0.004	0.004	0.6	0.01	1.09	0.68	17	31	17	23
Meganyctiphanes norvegica	8.51	20.83	22.14	17.22	1.8	3.02	1.32	1.52	0.015	0.017	0.006	0.011	1.73	3.35	1.42	1.87	11	8	15	10
Metridia sp.	1.06			0.37	0			0.00	0			0.000	0			0.00	51			81
Mysidae	3.19	2.08	0.76	1.83	0.05	0.17	0	0.02	0.001	0.001	0	0.001	0.15	0.16	0	0.10	27	23	53	43
Paraeuchaeta norvegica	2.13			0.73	0.02			0.00	0			0.000	0.02			0.01	41			67
Pseudomma sp.	1.06			0.37	0.01			0.00	0			0.000	0.01			0.01	45			72
Themisto compressa	1.06		0.76	0.73	0.01		0	0.00	0		0	0.000	0.02		0	0.01	42		52	70
Themisto libellula			1.53	0.73			0.02	0.02			0	0.000			0.01	0.00			47	75

Table 33. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Themisto sp.	6.38	4.17	4.58	5.13	0.18	0.09	0.03	0.04	0.002	0.001	0	0.001	0.29	0.12	0.03	0.18	21	26	40	33
Thysanoessa sp.	1.06			0.37	0.1			0.00	0.001			0.000	0.16			0.08	26			50
Zooplankton, total	**72.34**	**56.25**	**49.62**	**58.61**	**7.36**	**6.87**	**3.71**	**4.22**	**0.068**	**0.038**	**0.019**	**0.039**	**7.93**	**7.46**	**4.57**	**6.72**				
Aegidae			0.76	0.37			0.01	0.01			0	0.000			0.01	0.00			49	76
Ampelisca sp.	2.13	2.08		1.1	0.05	0.05		0.01	0.001	0		0.001	0.16	0.06		0.09	25	28		46
Anonyx sp.	5.32		1.53	2.56	1.79		0.04	0.12	0.008		0	0.003	0.92		0.05	0.49	15		36	26
Bathypolypus bairdii			0.76	0.37			0	0.00			0	0.000			0	0.00			50	78
Byblis gaimardi	18.09	8.33	0.76	8.06	1.2	0.11	0	0.07	0.013	0.001	0	0.005	1.49	0.16	0	0.78	14	24	51	21
Calathura brachiata	1.06	2.08	0.76	1.1	0.15	0.01	0.01	0.01	0	0	0	0.000	0.04	0.01	0.01	0.03	38	30	48	61
Calocaris templemani		2.08	3.82	2.2		0.32	0.18	0.18		0.001	0.001	0.001		0.18	0.2	0.09		22	30	45
Cephalopoda	1.06		1.53	1.1	0.03		0.02	0.02	0		0	0.000	0.04		0.02	0.03	39		45	63
Crustacea	21.28	25	16.79	19.78	2.23	4.52	1.32	1.70	0.014	0.027	0.006	0.013	1.63	5.45	1.49	2.16	13	5	13	8
Cumacea	19.15			6.59	0.15			0.01	0.002			0.001	0.29			0.15	22			37
Echiura			0.76	0.37			0.02	0.01			0	0.000			0.03	0.01			42	68
Eunicidae		4.17	0.76	1.1		0.6	0.06	0.12		0.004	0	0.001		0.84	0.11	0.17		12	33	34
Eusiridae	2.13			0.73	0.03			0.00	0.001			0.000	0.09			0.04	32			56
Flabelligeridae		2.08		0.37		0.01		0.00		0		0.000		0.01		0.00		29		77
Gammaridea	37.23	4.17		13.55	1.7	0.19		0.10	0.019	0.001		0.007	2.15	0.23		1.13	9	21		16
Invertebrata		2.08		0.37		0.01		0.00		0		0.000		0.01		0.00		32		79
Lumbrineridae			0.76	0.37			0.18	0.15			0	0.000			0.11	0.04			35	59
Lysianassidae	8.51	2.08		3.3	0.23	0		0.01	0.003	0		0.001	0.35	0		0.18	20	34		32
Maldanidae		4.17		0.73		0.16		0.02		0.001		0.000		0.24		0.04		20		60
Melita dentata	1.06			0.37	0.16			0.01	0			0.000	0.04			0.02	37			64
Melitidae	3.19			1.1	0.33			0.02	0.005			0.002	0.55			0.28	18			30
Munidopsis curvirostra		2.08	0.76	0.73		0.82	0.03	0.11		0.002	0	0.000		0.46	0.03	0.08		17	41	48
Nemertea		2.08	2.29	1.47		0.05	0.15	0.13		0	0.001	0.001		0.08	0.25	0.10		27	27	44
Neohela monstrosa	5.32	14.58	3.05	5.86	0.54	0.64	0.04	0.13	0.004	0.002	0	0.002	0.45	0.48	0.04	0.32	19	16	38	28
Nephtys sp.	1.06		2.29	1.47	0.19		0.69	0.59	0.001		0.003	0.002	0.13		0.67	0.29	30		20	29
Oedicerotidae	24.47			8.42	1.17			0.06	0.024			0.008	2.78			1.41	5			14
Pagurus sp.	1.06		0.76	0.73	0.02		0.02	0.02	0		0	0.000	0.01		0.02	0.01	44		46	65
Polychaeta	29.79	54.17	25.19	31.87	3.97	8.89	1.34	2.27	0.026	0.044	0.006	0.020	3.06	8.82	1.57	3.43	3	3	12	4
Praxillella sp.	1.06			0.37	1.89			0.09	0.018			0.006	2.14			1.09	10			17
Rossia sp.		2.08	2.29	1.47		0.45	0.04	0.09		0.002	0	0.000		0.45	0.03	0.08		18	39	49
Stegocephalus inflatus	1.06			0.37	0			0.00	0			0.000	0.01			0.01	47			74
Syrrhoe crenulata	6.38			2.2	0.1			0.00	0.002			0.001	0.21			0.11	24			42
Syrrhoe sp.	1.06			0.37	0.01			0.00	0			0.000	0.01			0.01	46			73
Syscenus infelix			1.53	0.73			0.16	0.13			0	0.000			0.11	0.04			34	58
Tmetonyx cicada	2.13	2.08	0.76	1.47	0.27	0.09	0	0.02	0.002	0.001	0	0.001	0.22	0.14	0	0.13	23	25	54	38
Wimvadocus torelli	4.26	12.5	5.34	6.23	2.6	1.72	0.25	0.52	0.007	0.01	0.001	0.005	0.77	2.01	0.35	0.82	16	10	24	20
Other invertebrates, total	**75.53**	**79.17**	**48.85**	**63.37**	**18.82**	**18.64**	**4.56**	**6.73**	**0.151**	**0.099**	**0.021**	**0.080**	**17.53**	**19.63**	**5.11**	**13.64**				
Invertebrates, total	**89.36**	**97.92**	**84.73**	**88.64**	**41.79**	**52.39**	**29.72**	**32.71**	**0.326**	**0.271**	**0.134**	**0.224**	**37.74**	**53.75**	**32.34**	**38.34**				
Unidentified digested material	78.72	81.25	51.15	65.93	58.18	40.48	18.4	22.63	0.537	0.19	0.079	0.256	62.25	37.77	19.04	43.87	1	1	2	1
Unidentified egg			0.76	0.37			0	0.00			0	0.000			0	0.00			56	82
Unidentifiable prey, total	**78.72**	**81.25**	**51.15**	**65.93**	**58.18**	**40.48**	**18.4**	**22.63**	**0.537**	**0.19**	**0.079**	**0.256**	**62.25**	**37.77**	**19.04**	**43.87**				
Total					**100**	**100**	**100**	**100.00**	**0.863**	**0.504**	**0.413**	**0.584**	**100**	**100**	**100**	**100.00**				

Table 34. Summary of diet of thorny skate from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 30, M = [30-45[, L = 45+ and T = all lengths combined).

													CFI						
	FO				MC				FI				Value				RanK			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Nezumia bairdii			0.76	0.37			3.74	3.17			0.019	0.009			4.69	1.59			6	13
Other fishes	3.19	10.42	32.82	18.68	0.03	7.13	9.64	8.91	0	0.043	0.04	0.027	0.01	8.48	9.7	4.58	11	4	4	5
Sebastes spp.			22.9	10.99			38.51	32.58			0.141	0.068			34.23	11.62			1	3
Fishes, total	**3.19**	**10.42**	**50.38**	**27.11**	**0.03**	**7.13**	**51.89**	**44.66**	**0**	**0.043**	**0.201**	**0.104**	**0.01**	**8.48**	**48.62**	**17.80**				
Chionoecetes opilio	8.51	12.5	10.69	10.26	4.41	2.88	2.09	2.29	0.02	0.01	0.01	0.013	2.28	1.95	2.46	2.29	9	9	10	10
Other crabs	30.85	25	6.87	18.32	4.8	3.02	0.3	0.80	0.044	0.015	0.001	0.019	5.15	2.98	0.31	3.18	3	8	13	6
Other Oregoniidae	2.13		0.76	1.1	5.11		1.68	1.66	0.019		0.007	0.010	2.17		1.58	1.64	10		12	12
Crabs, total	**37.23**	**33.33**	**16.79**	**26.74**	**14.33**	**5.9**	**4.07**	**4.75**	**0.083**	**0.025**	**0.018**	**0.041**	**9.6**	**4.93**	**4.35**	**7.11**				
Other shrimp	7.45	12.5	16.79	12.82	1.29	1.06	3.51	3.15	0.023	0.005	0.014	0.016	2.68	1.06	3.43	2.69	6	10	8	8
Pandalus borealis		12.5	13.74	8.79		16.36	9.11	9.45		0.082	0.044	0.035		16.26	10.61	6.07		3	3	4
Pasiphaea multidentata		6.25	21.37	11.36		3.56	4.76	4.41		0.022	0.018	0.012		4.41	4.26	2.12		5	7	11
Shrimp, total	**7.45**	**29.17**	**41.98**	**27.84**	**1.29**	**20.99**	**17.38**	**17.01**	**0.023**	**0.11**	**0.076**	**0.064**	**2.68**	**21.73**	**18.3**	**10.88**				
Euphausiidae	17.02	22.92	26.72	22.71	2.31	3.04	2.04	2.16	0.021	0.017	0.01	0.015	2.49	3.36	2.51	2.63	7	7	9	9
Mysidae	24.47	29.17	27.48	26.74	3.93	3.73	1.61	1.95	0.027	0.02	0.008	0.017	3.14	3.97	2.02	2.88	4	6	11	7
Other zooplankton	58.51	8.33	7.63	25.27	1.12	0.09	0.05	0.11	0.02	0.001	0	0.007	2.3	0.12	0.05	1.20	8	11	14	15
Zooplankton, total	**72.34**	**56.25**	**49.62**	**58.61**	**7.36**	**6.87**	**3.71**	**4.22**	**0.068**	**0.038**	**0.019**	**0.039**	**7.93**	**7.46**	**4.57**	**6.72**				
Oedicerotidae	24.47			8.42	1.17			0.06	0.024			0.008	2.78			1.41	5			14
Other invertebrates	75.53	79.17	48.85	63.37	17.65	18.64	4.56	6.68	0.127	0.099	0.021	0.071	14.75	19.63	5.11	12.22	2	2	5	2
Other invertebrates, total	**75.53**	**79.17**	**48.85**	**63.37**	**18.82**	**18.64**	**4.56**	**6.73**	**0.151**	**0.099**	**0.021**	**0.080**	**17.53**	**19.63**	**5.11**	**13.64**				
Invertebrates, total	**89.36**	**97.92**	**84.73**	**88.64**	**41.79**	**52.39**	**29.72**	**32.71**	**0.326**	**0.271**	**0.134**	**0.224**	**37.74**	**53.75**	**32.34**	**38.34**				
Unidentifiable prey	78.72	81.25	51.15	65.93	58.18	40.48	18.4	22.63	0.537	0.19	0.079	0.256	62.25	37.77	19.04	43.87	1	1	2	1
Unidentifiable prey, total	**78.72**	**81.25**	**51.15**	**65.93**	**58.18**	**40.48**	**18.4**	**22.63**	**0.537**	**0.19**	**0.079**	**0.256**	**62.25**	**37.77**	**19.04**	**43.87**				
Total					**100**	**100**	**100**	**100.00**	**0.863**	**0.504**	**0.413**	**0.584**	**100**	**100**	**100**	**100.00**				

Table 35. Summary of diet of the ENGSL thorny skate from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 30, M = [30-45[, L = 45+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG				LC				NEG			
Taxonomic grouping	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Nezumia bairdii							0.04 (9.94)	0.02 (4.85)				
Other fishes	0.000 (0.02)	0.03 (5.91)	0.05 (11.37)	0.023 (3.65)	0.00 (0.01)	0.011 (3.54)	0.04 (12.62)	0.03 (6.49)		0.10 (12.68)	0.025 (4.38)	0.03 (3.66)
Sebastes spp.			0.14 (36.46)	0.053 (8.36)			0.16 (45.12)	0.10 (22.01)			0.095 (16.90)	0.04 (5.04)
Fishes, total	**0.000 (0.02)**	**0.03 (5.91)**	**0.19 (47.83)**	**0.077 (12.01)**	**0.00 (0.01)**	**0.011 (3.54)**	**0.24 (67.68)**	**0.15 (33.35)**		**0.10 (12.68)**	**0.120 (21.28)**	**0.07 (8.69)**
Chionoecetes opilio	0.035 (3.62)	0.01 (2.68)	0.02 (4.02)	0.023 (3.54)	0.02 (3.17)	0.011 (3.73)	0.00 (0.25)	0.01 (1.80)	0.00 (0.35)	0.00 (0.59)	0.027 (4.71)	0.01 (1.69)
Other crabs	0.041 (4.26)	0.03 (5.43)	0.00 (0.56)	0.023 (3.61)	0.00 (0.52)	0.000 (0.09)	0.00 (0.02)	0.00 (0.24)	0.09 (9.35)	0.02 (2.37)	0.003 (0.56)	0.04 (5.44)
Other Oregoniidae			0.03 (7.67)	0.011 (1.76)	0.00 (0.06)			0.00 (0.02)	0.05 (5.78)			0.02 (2.99)
Crabs, total	**0.076 (7.87)**	**0.04 (8.11)**	**0.05 (12.25)**	**0.057 (8.92)**	**0.03 (3.74)**	**0.012 (3.82)**	**0.00 (0.28)**	**0.01 (2.06)**	**0.15 (15.48)**	**0.02 (2.96)**	**0.030 (5.27)**	**0.08 (10.12)**
Other shrimp		0.00 (0.28)	0.00 (0.98)	0.002 (0.27)	0.00 (0.20)	0.002 (0.52)	0.00 (1.12)	0.00 (0.68)	0.07 (7.05)	0.01 (1.91)	0.047 (8.36)	0.05 (6.48)
Pandalus borealis							0.01 (1.41)	0.00 (0.69)		0.28 (36.16)	0.174 (30.79)	0.12 (15.89)
Pasiphaea multidentata		0.03 (7.26)	0.02 (4.03)	0.014 (2.19)			0.01 (2.71)	0.01 (1.32)		0.03 (4.16)	0.038 (6.68)	0.02 (2.76)
Shrimp, total		**0.04 (7.54)**	**0.02 (5.00)**	**0.016 (2.47)**	**0.00 (0.20)**	**0.002 (0.52)**	**0.02 (5.25)**	**0.01 (2.69)**	**0.07 (7.05)**	**0.33 (42.22)**	**0.258 (45.83)**	**0.19 (25.13)**
Euphausiidae	0.054 (5.60)	0.01 (3.01)	0.01 (1.28)	0.026 (4.16)	0.00 (0.03)	0.022 (7.25)	0.00 (0.94)	0.00 (1.14)	0.01 (1.32)	0.01 (1.90)	0.032 (5.59)	0.02 (2.70)
Mysidae	0.020 (2.03)	0.02 (4.15)	0.01 (2.86)	0.017 (2.59)	0.06 (8.86)	0.038 (12.57)	0.01 (3.03)	0.03 (6.36)	0.00 (0.05)		0.000 (0.01)	0.00 (0.03)
Other zooplankton	0.024 (2.54)	0.00 (0.02)	0.00 (0.00)	0.010 (1.52)	0.01 (1.19)		0.00 (0.08)	0.00 (0.54)	0.03 (2.87)	0.00 (0.26)	0.000 (0.02)	0.01 (1.54)
Zooplankton, total	**0.098 (10.17)**	**0.03 (7.19)**	**0.02 (4.14)**	**0.053 (8.26)**	**0.07 (10.08)**	**0.060 (19.82)**	**0.01 (4.04)**	**0.04 (8.04)**	**0.04 (4.23)**	**0.02 (2.15)**	**0.032 (5.62)**	**0.03 (4.26)**
Oedicerotidae	0.008 (0.88)			0.003 (0.52)	0.01 (1.86)			0.00 (0.78)	0.05 (5.26)			0.02 (2.72)
Other invertebrates	0.156 (16.25)	0.11 (23.83)	0.03 (8.39)	0.101 (15.78)	0.09 (12.86)	0.054 (17.81)	0.02 (4.56)	0.04 (9.27)	0.14 (14.70)	0.13 (17.18)	0.022 (3.84)	0.09 (11.92)
Other invertebrates, total	**0.165 (17.13)**	**0.11 (23.83)**	**0.03 (8.39)**	**0.104 (16.30)**	**0.10 (14.71)**	**0.054 (17.81)**	**0.02 (4.56)**	**0.04 (10.05)**	**0.19 (19.96)**	**0.13 (17.18)**	**0.022 (3.84)**	**0.11 (14.64)**
Invertebrates, total	**0.338 (35.17)**	**0.22 (46.67)**	**0.12 (29.78)**	**0.229 (35.94)**	**0.20 (28.73)**	**0.127 (41.97)**	**0.05 (14.12)**	**0.10 (22.83)**	**0.44 (46.72)**	**0.50 (64.51)**	**0.342 (60.57)**	**0.41 (54.15)**
Unidentifiable prey	0.624 (64.81)	0.22 (47.42)	0.09 (22.39)	0.332 (52.04)	0.49 (71.26)	0.165 (54.49)	0.06 (18.19)	0.19 (43.82)	0.50 (53.28)	0.18 (22.81)	0.102 (18.15)	0.28 (37.15)
Unidentifiable prey, total	**0.624 (64.81)**	**0.22 (47.42)**	**0.09 (22.39)**	**0.332 (52.04)**	**0.49 (71.26)**	**0.165 (54.49)**	**0.06 (18.19)**	**0.19 (43.82)**	**0.50 (53.28)**	**0.18 (22.81)**	**0.102 (18.15)**	**0.28 (37.15)**
Total	**0.962 (100.00)**	**0.47 (100.00)**	**0.40 (100.00)**	**0.637 (100.00)**	**0.69 (100.00)**	**0.303 (100.00)**	**0.35 (100.00)**	**0.44 (100.00)**	**0.95 (100.00)**	**0.78 (100.00)**	**0.564 (100.00)**	**0.76 (100.00)**

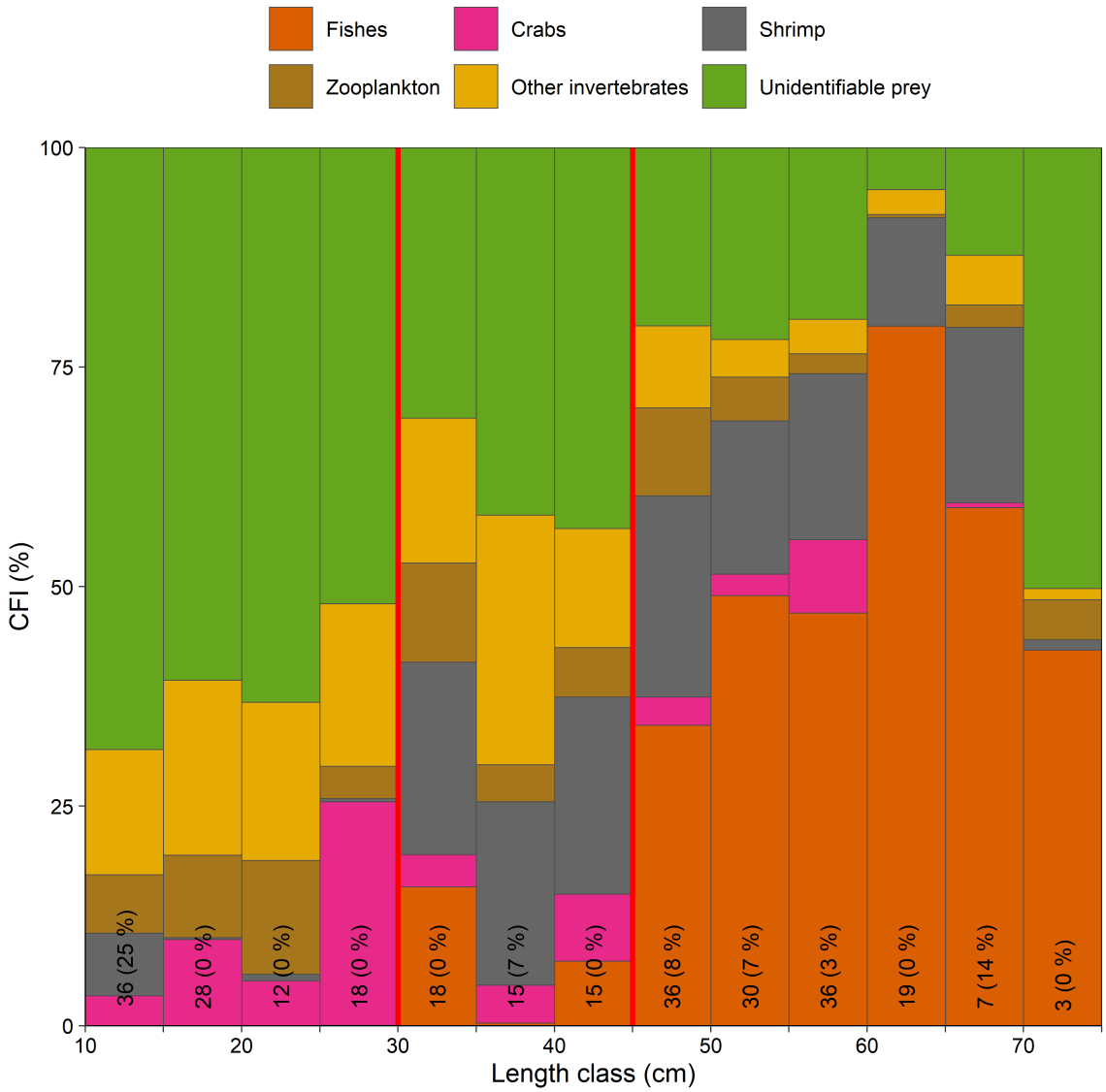

Figure 16. Prey group contributions to the total fullness index (CFI) for thorny skate in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. Vertical red lines separate the length classes that were combined for the analyzes.

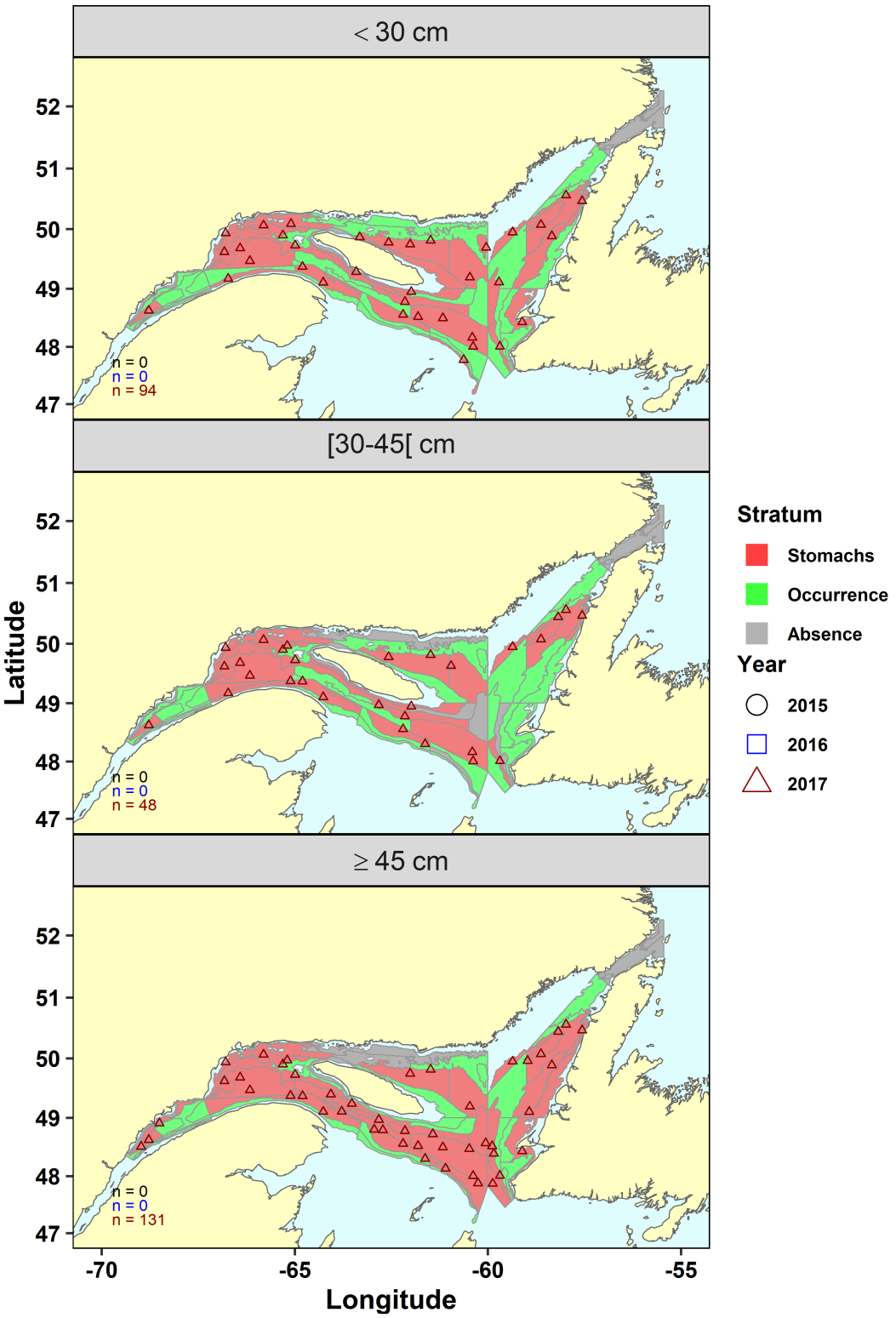

Figure 17. Origin of thorny skate stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017

3.10 Smooth skate (*Malacoraja senta*)

Smooth skate was targeted for stomach content analysis in 2017 only. Eighty-seven stomachs were collected and analyzed in the laboratory, with almost 14 % being empty (Table 36). These stomachs came from individuals ranging from 9.0 to 58.0 cm in length, for a mean length of 27.1 cm (Table 36). By assessing the contribution of different groups of prey to the total fullness index by specimen length, two size groups were created with a break at 40 cm in length (Table 36, Figure 18). The average mass of stomach content for smooth skate, all lengths combined, was 2.4 g, excluding empty stomachs (Table 36).

Thirty-five taxa in 15 families were observed in the stomachs of smooth skate (Tables 3 and 36). Calanoid copepods of the family Aetideidae were found in 38 % of stomachs, which was far greater than what was observed in other predators (Table 3).

No fish taxa were observed as prey for smooth skate during the period 2015-2017 (Table 37). Disregarding length classes, the prey group contributing the most to TFI in smooth skate was the unidentifiable prey (53 %), which does not facilitate the description of its diet. The other groups were, in order of importance, shrimp, zooplankton, other invertebrates and crabs.

Excluding unidentifiable prey, smooth skates < 40 cm, which had the highest feeding intensity, fed mainly on zooplankton, of which northern krill was an important prey. Zooplankton intake decreased in specimens $\geq$ 40 cm to give way to shrimp, whose intake was mainly composed of northern shrimp (CFI of 49 %). Nine shrimp taxa were observed, only two of which were found in specimens less than 40 cm in length.

The 14 zooplankton taxa observed in the stomach contents of smooth skate can be summarized in five taxonomic groupings where the families Euphausiidae, Aetideidae (copepod calanoid) and Mysidae were in order the most important for this type of prey (Table 38).

Regarding the other invertebrates, the family Oedicerotidae constituted the only taxon among the six of the suborder Gammaridea found in the stomachs of smooth skate which was not pooled in the taxonomic grouping other invertebrates of Table 38. When combined together, gammarid amphipods were found in > 40 % of analyzed smooth skate stomachs and contributed to 4 % of this predator's diet for all length classes combined.

Smooth skate stomachs were collected from all three zones of the ENGSL (Table 39, Figure 19). The green-filled strata testify to the potential coverage achievable if sampling for stomachs was continued for this predator in future, according to catches recorded during the 2015-2017 period. The feeding intensity did not differ greatly between the ENGSL zones, but was higher in the LC zone (Table 39). Shrimp contributed the most to the diet of smooth skate in the NEG zone. This zone was also the only one where large specimens had a higher feeding intensity than small ones.

Table 36. Sampling effort summary for smooth skate stomachs, by zone and length class (cm, S = < 40, L = 40+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG			LC			NEG			ENGSL		
Metric	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Mean TFI	0.33	0.28	0.32	0.53	0.21	0.44	0.36	0.40	0.38	0.44	0.28	0.39
No. of stomachs	18	8	26	30	12	42	11	8	19	59	28	87
No. of empty stomachs	2	1	3	2	4	6	3	0	3	7	5	12
% empty	11.1	12.5	11.5	6.7	33.3	14.3	27.3	0.0	15.8	11.9	17.9	13.8
Length (cm)												
min	9.5	49.3	9.5	9.1	42.1	9.1	9.0	46.6	9.0	9.0	42.1	9.0
med	15.6	51.4	17.1	13.4	54.0	18.1	14.6	50.5	18.8	14.6	52.3	18.7
mean	15.7	51.9	26.8	15.4	52.5	26.0	14.5	50.5	29.7	15.3	51.7	27.1
max	31.5	56.1	56.1	38.8	58.0	58.0	24.4	54.5	54.5	38.8	58.0	58.0
Total stomach content (g)												
min	0.024	0.253	0.024	0.003	0.625	0.003	0.057	3.058	0.057	0.003	0.253	0.003
med	0.172	5.891	0.253	0.206	6.403	0.318	0.0965	6.569	2.474	0.182	6.390	0.283
mean	0.247	6.778	2.235	0.399	6.281	1.706	0.364	8.012	4.188	0.347	7.034	2.398
max	1.284	13.233	13.233	2.400	12.812	12.812	1.891	14.723	14.723	2.400	14.723	14.723
No. of observed taxa												
Fishes	0	0	0	0	0	0	0	0	0	0	0	0
Crabs	1	1	1	2	1	2	0	1	1	2	2	2
Shrimp	0	4	4	1	5	5	1	7	8	2	8	9
Zooplankton	6	0	6	12	5	13	6	3	8	13	6	14
Other invertebrates	5	0	5	6	1	6	5	3	6	8	3	9
Unidentifiable prey	1	1	1	1	1	1	1	1	1	1	1	1
Total	13	6	17	22	13	27	13	15	24	26	20	35

Table 37. Detailed diet of smooth skate from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 40, L = 40+ and T = all lengths combined).

										CFI					
	FO			MC			FI			Value			Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Brachyura	10.17	10.71	10.34	7.24	0.73	1.38	0.008	0.002	0.006	1.71	0.72	1.48	7	12	12
Chionoecetes opilio	1.69	17.86	6.9	7.46	9.16	8.99	0.003	0.029	0.011	0.57	10.07	2.79	10	3	7
Crabs, total	**10.17**	**28.57**	**16.09**	**14.69**	**9.89**	**10.37**	**0.01**	**0.031**	**0.017**	**2.29**	**10.79**	**4.28**			
Argis dentata		7.14	2.3		6.67	6.00		0.018	0.006		6.51	1.52		5	11
Digested shrimp		17.86	5.75		6.93	6.23		0.019	0.006		6.66	1.56		4	10
Eualus macilentus		7.14	2.3		0.75	0.68		0.002	0.001		0.84	0.20		11	25
Pandalus borealis		39.29	12.64		47.73	42.94		0.137	0.044		48.55	11.36		1	2
Pandalus sp.	1.69	21.43	8.05	0.17	12.08	10.88	0	0.036	0.012	0.06	12.61	3.00	25	2	6
Pasiphaea multidentata		14.29	4.6		2.86	2.57		0.006	0.002		2.27	0.53		8	15
Pontophilus norvegicus		10.71	3.45		1.64	1.48		0.003	0.001		1.14	0.27		10	19
Sabinea septemcarinata		3.57	1.15		0.01	0.01		0	0.000		0.02	0.00		17	34
Sabinea sp.	1.69		1.15	0.1		0.01	0		0.000	0.07		0.06	24		31
Shrimp, total	**3.39**	**67.86**	**24.14**	**0.27**	**78.67**	**70.81**	**0.001**	**0.222**	**0.072**	**0.14**	**78.6**	**18.49**			
Aetideidae	27.12		18.39	2.16		0.22	0.015		0.010	3.36		2.58	5		8
Aetideopsis armata	28.81		19.54	0.63		0.06	0.004		0.003	0.93		0.72	9		14
Boreomysis sp.	1.69		1.15	0.13		0.01	0.001		0.001	0.34		0.26	14		20
Calanoida	32.2	3.57	22.99	1.34	0.01	0.14	0.012	0	0.008	2.81	0.01	2.16	6	18	9
Copepoda	5.08		3.45	0.06		0.01	0.001		0.001	0.3		0.23	16		22
Erythrops erythrophthalma	28.81	3.57	20.69	1.39	0.01	0.14	0.007	0	0.004	1.48	0.01	1.14	8	19	13
Euphausiidae	1.69		1.15	0.08		0.01	0		0.000	0.06		0.04	26		32
Meganyctiphanes norvegica	6.78	14.29	9.2	9.74	2.99	3.67	0.022	0.008	0.018	5.01	2.92	4.52	3	7	4
Mysidae	8.47		5.75	0.21		0.02	0.001		0.001	0.29		0.22	18		24
Paraeuchaeta norvegica	3.39		2.3	0.07		0.01	0.001		0.000	0.16		0.12	21		28
Pseudomma sp.	6.78		4.6	0.19		0.02	0.001		0.001	0.21		0.16	19		26
Themisto abyssorum		3.57	1.15		0	0.00		0	0.000		0	0.00		20	35
Themisto compressa	1.69	7.14	3.45	0.78	0.07	0.14	0.002	0	0.001	0.36	0.05	0.29	13	15	18
Themisto sp.	5.08	3.57	4.6	1.05	0.03	0.13	0.002	0	0.002	0.52	0.02	0.40	11	16	16
Zooplankton, total	**77.97**	**17.86**	**58.62**	**17.83**	**3.1**	**4.57**	**0.07**	**0.008**	**0.050**	**15.83**	**3**	**12.83**			
Byblis gaimardi	1.69	7.14	3.45	0.42	0.07	0.11	0.001	0	0.000	0.14	0.07	0.12	23	14	29
Crustacea	35.59	7.14	26.44	6.33	1.99	2.42	0.039	0.005	0.028	8.76	1.84	7.14	2	9	3
Cumacea	11.86		8.05	0.37		0.04	0.002		0.001	0.38		0.29	12		17
Eusiridae	3.39		2.3	0.29		0.03	0.001		0.001	0.18		0.14	20		27
Gammaridea	45.76		31.03	4.7		0.47	0.019		0.013	4.39		3.36	4		5

Table 37. Continued.

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Isopoda	5.08		3.45	0.24		0.02	0.001		0.001	0.29		0.22	17		23
Melita dentata	1.69		1.15	0.16		0.02	0.001		0.000	0.15		0.12	22		30
Neohela monstrosa		3.57	1.15		0.2	0.18		0	0.000		0.17	0.04		13	33
Oedicerotidae	3.39		2.3	0.26		0.03	0.001		0.001	0.31		0.24	15		21
Other invertebrates, total	**71.19**	**14.29**	**52.87**	**12.76**	**2.27**	**3.32**	**0.064**	**0.006**	**0.045**	**14.6**	**2.08**	**11.67**			
Invertebrates, total	**88.14**	**82.14**	**86.21**	**45.54**	**93.92**	**89.07**	**0.144**	**0.267**	**0.184**	**32.86**	**94.48**	**47.27**			
Unidentified digested material	66.1	17.86	50.57	54.46	6.08	10.93	0.295	0.016	0.205	67.14	5.52	52.73	1	6	1
Unidentifiable prey, total	**66.1**	**17.86**	**50.57**	**54.46**	**6.08**	**10.93**	**0.295**	**0.016**	**0.205**	**67.14**	**5.52**	**52.73**			
Total				**100**	**100**	**100.00**	**0.44**	**0.283**	**0.389**	**100**	**100**	**100.00**			

Table 38. Summary of diet of smooth skate from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 40, L = 40+ and T = all lengths combined).

	FO			MC			FI			CFI Value			CFI Rank		
Prey	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Chionoecetes opilio	1.69	17.86	6.9	7.46	9.16	8.99	0.003	0.029	0.011	0.57	10.07	2.79	9	4	8
Other crabs	10.17	10.71	10.34	7.24	0.73	1.38	0.008	0.002	0.006	1.71	0.72	1.48	7	9	11
Crabs, total	**10.17**	**28.57**	**16.09**	**14.69**	**9.89**	**10.37**	**0.01**	**0.031**	**0.017**	**2.29**	**10.79**	**4.28**			
Other shrimp	1.69	25	9.2	0.1	16	14.41	0	0.043	0.014	0.07	15.17	3.61	11	2	5
Pandalus borealis		39.29	12.64		47.73	42.94		0.137	0.044		48.55	11.36		1	3
Pandalus sp.	1.69	21.43	8.05	0.17	12.08	10.88	0	0.036	0.012	0.06	12.61	3.00	12	3	7
Pasiphaea multidentata		14.29	4.6		2.86	2.57		0.006	0.002		2.27	0.53		7	13
Shrimp, total	**3.39**	**67.86**	**24.14**	**0.27**	**78.67**	**70.81**	**0.001**	**0.222**	**0.072**	**0.14**	**78.6**	**18.49**			
Aetideidae	55.93		37.93	2.79		0.28	0.019		0.013	4.3		3.29	4		6
Euphausiidae	8.47	14.29	10.34	9.83	2.99	3.67	0.022	0.008	0.018	5.07	2.92	4.56	3	6	4
Hyperiidae	5.08	7.14	5.75	1.83	0.09	0.27	0.004	0	0.003	0.88	0.07	0.69	8	10	12
Mysidae	40.68	3.57	28.74	1.91	0.01	0.20	0.01	0	0.007	2.31	0.01	1.77	6	12	10
Other zooplankton	38.98	3.57	27.59	1.46	0.01	0.15	0.014	0	0.010	3.28	0.01	2.51	5	11	9
Zooplankton, total	**77.97**	**17.86**	**58.62**	**17.83**	**3.1**	**4.57**	**0.07**	**0.008**	**0.050**	**15.83**	**3**	**12.83**			
Oedicerotidae	3.39		2.3	0.26		0.03	0.001		0.001	0.31		0.24	10		14
Other invertebrates	69.49	14.29	51.72	12.5	2.27	3.29	0.063	0.006	0.045	14.29	2.08	11.43	2	8	2
Other invertebrates, total	**71.19**	**14.29**	**52.87**	**12.76**	**2.27**	**3.32**	**0.064**	**0.006**	**0.045**	**14.6**	**2.08**	**11.67**			
Invertebrates, total	**88.14**	**82.14**	**86.21**	**45.54**	**93.92**	**89.07**	**0.144**	**0.267**	**0.184**	**32.86**	**94.48**	**47.27**			
Unidentifiable prey	66.1	17.86	50.57	54.46	6.08	10.93	0.295	0.016	0.205	67.14	5.52	52.73	1	5	1
Unidentifiable prey, total	**66.1**	**17.86**	**50.57**	**54.46**	**6.08**	**10.93**	**0.295**	**0.016**	**0.205**	**67.14**	**5.52**	**52.73**			
Total				**100**	**100**	**100.00**	**0.44**	**0.283**	**0.389**	**100**	**100**	**100.00**			

Table 39. Summary of diet of the ENGSL smooth skate from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 40, L = 40+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG			LC			NEG		
Taxonomic grouping	**S**	**L**	**T**	**S**	**L**	**T**	**S**	**L**	**T**
Chionoecetes opilio				0.00 (0.93)	0.060 (28.82)	0.02 (4.72)		0.01 (2.34)	0.004 (1.04)
Other crabs	0.012 (3.67)	0.01 (2.56)	0.01 (3.37)	0.01 (1.41)		0.01 (1.22)			
Crabs, total	**0.012 (3.67)**	**0.01 (2.56)**	**0.01 (3.37)**	**0.01 (2.34)**	**0.060 (28.82)**	**0.03 (5.93)**		**0.01 (2.34)**	**0.004 (1.04)**
Other shrimp		0.04 (13.21)	0.01 (3.60)		0.016 (7.74)	0.00 (1.05)	0.00 (0.48)	0.09 (22.42)	0.039 (10.20)
Pandalus borealis		0.21 (74.66)	0.06 (20.32)		0.070 (33.64)	0.02 (4.57)		0.17 (41.98)	0.070 (18.61)
Pandalus sp.		0.02 (6.42)	0.01 (1.75)	0.00 (0.10)	0.038 (18.33)	0.01 (2.58)		0.05 (12.44)	0.021 (5.52)
Pasiphaea multidentata					0.005 (2.20)	0.00 (0.30)		0.02 (3.94)	0.007 (1.74)
Shrimp, total		**0.26 (94.29)**	**0.08 (25.67)**	**0.00 (0.10)**	**0.130 (61.90)**	**0.04 (8.50)**	**0.00 (0.48)**	**0.32 (80.78)**	**0.136 (36.08)**
Aetideidae	0.020 (6.08)		0.01 (4.42)	0.01 (1.77)		0.01 (1.53)	0.04 (11.74)		0.025 (6.54)
Euphausiidae				0.04 (8.23)	0.001 (0.28)	0.03 (7.15)		0.03 (7.05)	0.012 (3.12)
Hyperiidae				0.01 (1.42)	0.000 (0.10)	0.01 (1.24)		0.00 (0.10)	0.000 (0.04)
Mysidae	0.008 (2.46)		0.01 (1.79)	0.01 (1.82)		0.01 (1.58)	0.01 (4.04)	0.00 (0.01)	0.009 (2.25)
Other zooplankton	0.016 (4.71)		0.01 (3.43)	0.01 (2.36)	0.000 (0.02)	0.01 (2.04)	0.02 (4.82)		0.010 (2.68)
Zooplankton, total	**0.044 (13.25)**		**0.03 (9.64)**	**0.08 (15.60)**	**0.001 (0.40)**	**0.06 (13.54)**	**0.07 (20.60)**	**0.03 (7.16)**	**0.055 (14.64)**
Oedicerotidae	0.002 (0.70)		0.00 (0.51)	0.00 (0.25)		0.00 (0.21)			
Other invertebrates	0.075 (22.66)		0.05 (16.49)	0.05 (10.03)	0.000 (0.10)	0.04 (8.68)	0.07 (18.84)	0.02 (5.12)	0.048 (12.75)
Other invertebrates, total	**0.078 (23.37)**		**0.05 (17.01)**	**0.05 (10.27)**	**0.000 (0.10)**	**0.04 (8.89)**	**0.07 (18.84)**	**0.02 (5.12)**	**0.048 (12.75)**
Invertebrates, total	**0.134 (40.28)**	**0.27 (96.85)**	**0.18 (55.68)**	**0.15 (28.32)**	**0.191 (91.21)**	**0.16 (36.86)**	**0.14 (39.91)**	**0.38 (95.39)**	**0.243 (64.51)**
Unidentifiable prey	0.198 (59.72)	0.01 (3.15)	0.14 (44.32)	0.38 (71.68)	0.018 (8.79)	0.28 (63.14)	0.22 (60.09)	0.02 (4.61)	0.134 (35.49)
Unidentifiable prey, total	**0.198 (59.72)**	**0.01 (3.15)**	**0.14 (44.32)**	**0.38 (71.68)**	**0.018 (8.79)**	**0.28 (63.14)**	**0.22 (60.09)**	**0.02 (4.61)**	**0.134 (35.49)**
Total	**0.332 (100.00)**	**0.28 (100.00)**	**0.32 (100.00)**	**0.53 (100.00)**	**0.209 (100.00)**	**0.44 (100.00)**	**0.36 (100.00)**	**0.40 (100.00)**	**0.377 (100.00)**

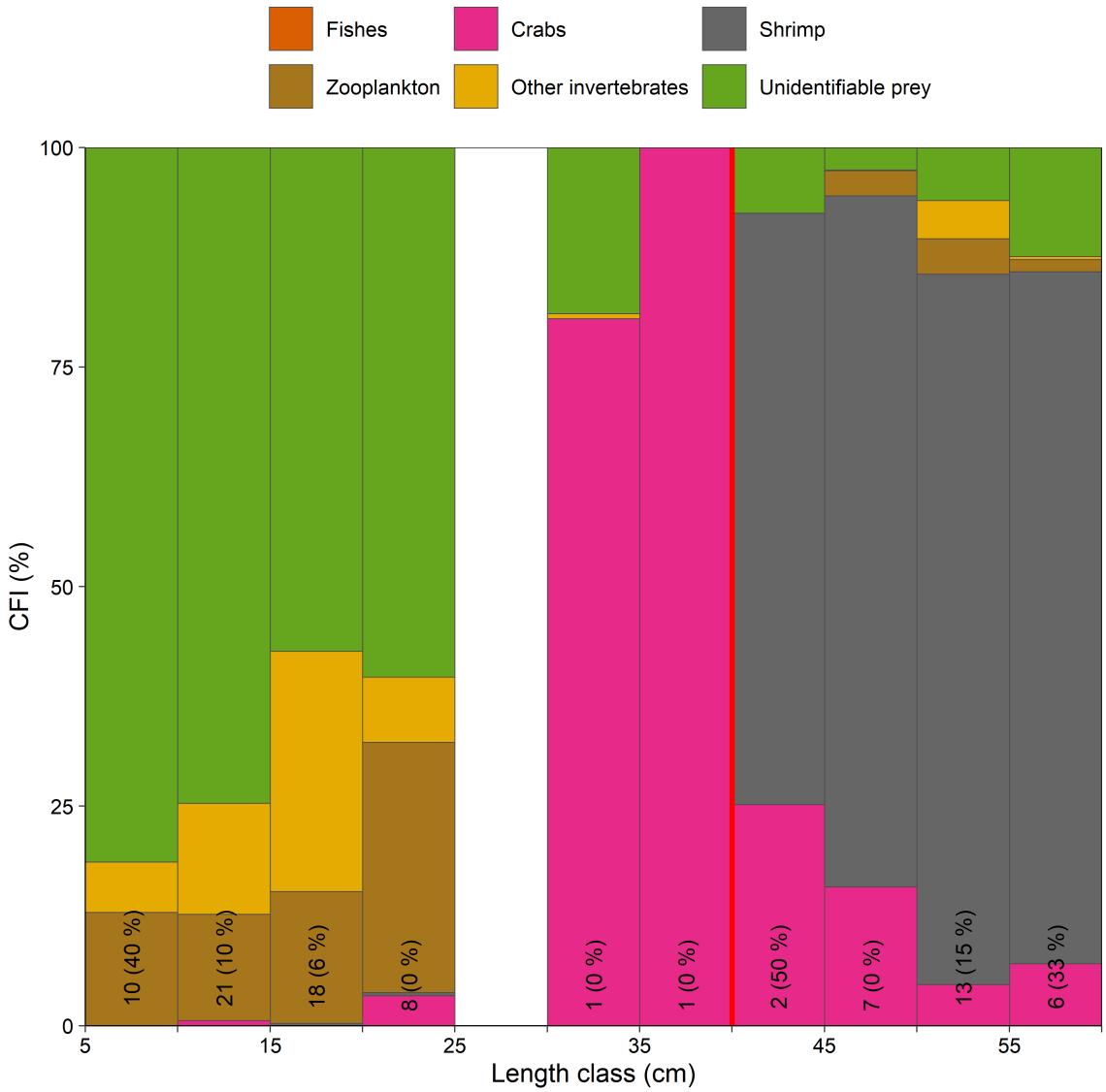

Figure 18. Prey group contributions to the total fullness index (CFI) for smooth skate in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. The vertical red line separates the length classes that were combined for the analyzes.

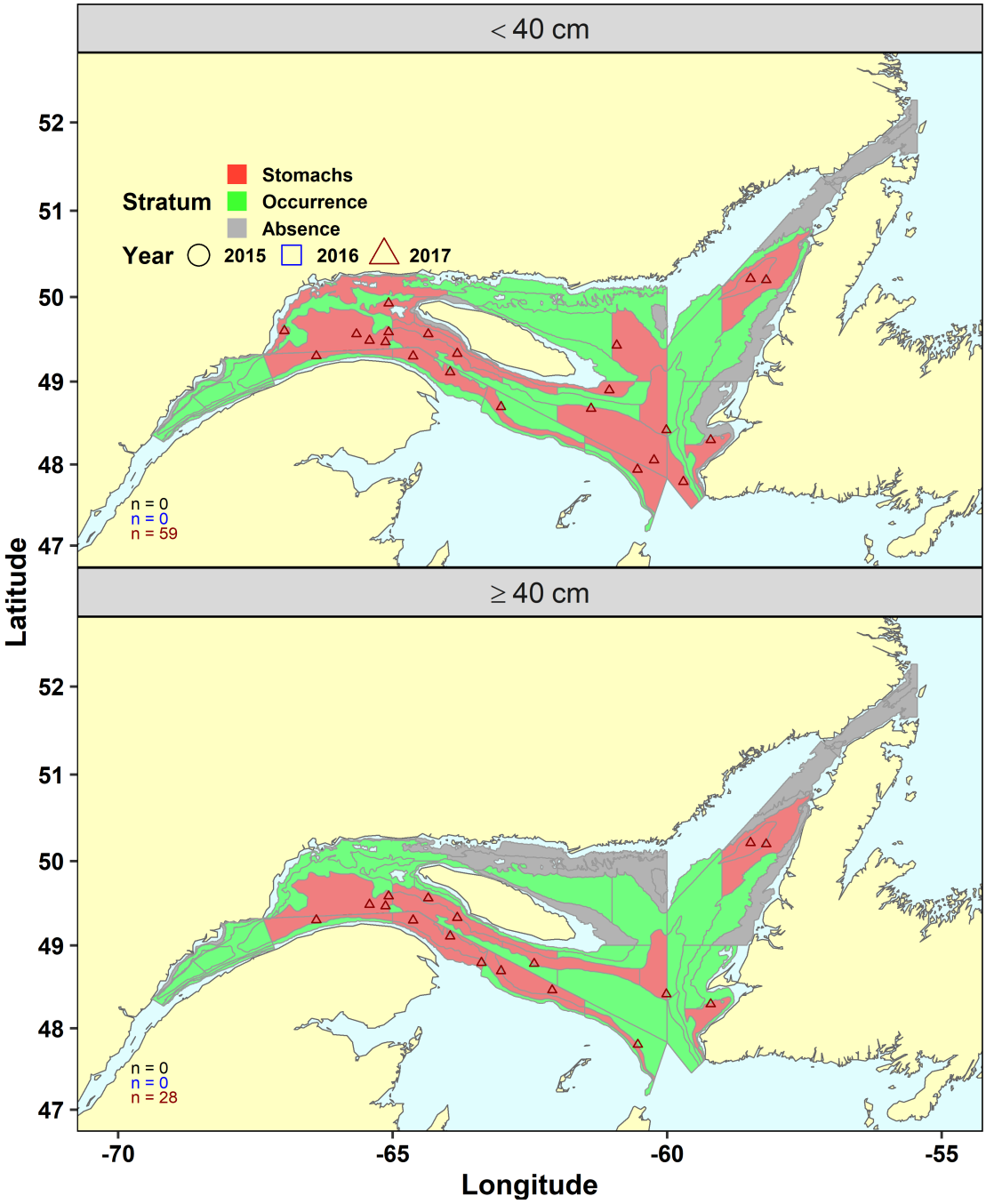

Figure 19. Origin of smooth skate stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

3.11 Redfish (*Sebastes* spp.)

Redfish[5] was targeted for stomach content analysis in each year of the 2015-2017 period. Two thousand one hundred and forty-six stomachs were collected and analyzed in the laboratory, making this predator the most extensively sampled, accounting for a third of all the stomachs collected (Table 2). Stomachs came from specimens ranging from 6.6 to 48.4 cm in length, for an average length of 22.5 cm (Table 40). The redfish is a physoclist fish: its swim bladder does not communicate with the esophagus. This results in preventing the evacuation of gas during the redfish's ascent in the trawl. The swim bladder therefore expands and often the stomach contents is regurgitated in whole or in part, or worse, the stomach is completely evaginated into the fish's mouth. Even if the protocol of collection indicates to reject fish which have evaginated stomachs or which show signs of regurgitation, it is probable that a part of the stomach contents of the individuals judged suitable for stomach sampling has been regurgitated, which invalidates the percentage of empty stomachs and even the fullness index as indices of feeding intensity. However, the stomach contents obtained did allow for the estimation of the relative importance of the different taxa in the diet of redfish. That said, more than a third of the stomachs were empty.

By assessing the contribution of different groups of prey to the total fullness index by specimen length (Figure 20), for those of 20 to 30 cm in length, the contributions of zooplankton and other invertebrates drastically decreased, while those of shrimp and fishes gained importance. For this reason, three size groups were created: < 20, [20-30[and $\geq$ 30 cm (Table 40). The average mass of stomach contents for redfish, all lengths combined, was 1.8 g, excluding empty stomachs (Table 40).

Seventy-two taxa in 25 families were found in the stomach contents of redfish (Tables 3 and 40). Disregarding length classes, the group of prey contributing the most to TFI in redfish was zooplankton, which with 32 taxa observed, reached 46 % in terms of CFI (Table 41). Zooplankton taxa were found in 45 % of the stomachs analyzed. Using the taxonomic groupings to summarize these taxa, four important families stand out, namely, in order of importance, Euphausiidae, Hyperiidae, Calanidae and Mysidae (Table 42). The Euphausiidae and Hyperiidae alone contributed more than 50 % of the zooplankton intake for this predator, and ranked 2nd and 3rd in importance, when all taxonomic groups were combined. (Table 42).

Shrimp represented the 2nd group in importance among the redfish prey; they were found in 15 % of stomachs and represent 33 % of the food ingested. The pink glass shrimp was, when all groups of prey were combined, the most important taxon in the diet of the redfish and contributed to nearly 20 % of the total food intake (Table 41). Northern shrimp, at 3 % FO, was less frequent than the pink glass shrimp (9 % FO), and ranked 2nd in importance among the 72 taxa reported, with a CFI of 8.82.

Less than 5 % of the analyzed redfish stomachs contained fishes. While redfish and the white barracudina (*Arctozenus risso*) were each observed in < 1 % of the stomachs, they were the two most important fish taxa for this predator and ranked respectively 9th and 11th in importance according to taxonomic groupings (Table 42). Capelin was the only fish identifiable to the species

[5] *Sebastes mentella* and *S. fasciatus* are not distinguished in this report.

level to have been consumed by redfish < 20 cm (Table 41).

The 19 taxa in the other invertebrates group contributed less than 10 % of diet in redfish and were mostly generic taxa.

The records indicated that zooplankton was the primary diet in small (< 20 cm) redfish in summer (almost 70 % of the TFI, Table 41). The shrimp and other invertebrates groups made the same contribution for this size of redfish, while fishes and crabs were almost nonexistent. Redfish 20-30 cm long augmented their diet by adding fishes and shrimp, while decreasing the intake of zooplankton and other invertebrates. The increase in fishes and shrimp intake was even higher in redfish $\geq$ 30 cm in length, while that of zooplankton and other invertebrates decreased to < 10 %. According to the average TFI values obtained, large redfish had the highest apparent feeding intensity (given the high probability of regurgitation) among the three size groups, followed by small and medium redfish.

The geographic coverage of stomach samples was extensive in redfish. All sizes combined, stomachs were collected from almost all of the ENGSL strata where catches were reported (Figure 21). The apparent feeding intensity was highest in NWG, followed (in descending order) by NEG and LC (Table 43). For the latter zone, shrimp and zooplankton accounted for the bulk of the intake (67 %). The contribution of fishes to the diet of redfish from the LC zone was the largest observed in the ENGSL. This difference could be caused by the capture of larger specimens, more inclined to eat this type of prey (Tables 40 and 43).

The contributions of the shrimp groups in the three zones were very similar (30-36 %). However, this contribution was mainly generated by northern shrimp in NWG while it was caused by pink glass shrimp elsewhere. For the NEG and NWG zones, redfish were mainly zooplanktivorous (55 %). However, the type of zooplankton was different depending on the zone. Zooplankton was mainly represented by the Euphausiidae family in the NWG redfish, while it was the Hyperiidae family which dominated the zooplankton in the NEG redfish.

Table 40. Sampling effort summary for redfish stomachs, by zone and size class (cm, S = < 20, M = [20-30[, L = 30+ and T = all lengths combined). A description of the length of the specimens from which the stomachs originate, the total stomach contents after removing waste, parasites and empty stomachs, as well as the number of taxa per group of prey are provided. ENGSL = all zones combined.

	NWG				LC				NEG				ENGSL			
Metric	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Mean TFI	0.31	0.27	0.41	0.31	0.21	0.11	0.26	0.22	0.26	0.18	0.32	0.26	0.26	0.17	0.29	0.25
No. of stomachs	335	95	29	459	393	150	392	935	454	149	149	752	1182	394	570	2146
No. of empty stomachs	128	37	8	173	121	68	142	331	141	72	65	278	390	177	215	782
% empty	38.2	38.9	27.6	37.7	30.8	45.3	36.2	35.4	31.1	48.3	43.6	37.0	33.0	44.9	37.7	36.4
Length (cm)																
min	6.6	20.0	30.0	6.6	7.6	20.0	30.0	7.6	6.8	20.0	30.0	6.8	6.6	20.0	30.0	6.6
med	14.1	26.5	31.5	15.7	17.1	24.4	37.0	24.4	15.2	24.3	35.2	18.1	15.5	24.9	36.3	19.0
mean	13.9	25.6	32.9	17.5	16.1	24.4	37.2	26.3	14.8	24.3	35.7	20.8	14.9	24.6	36.6	22.5
max	19.9	29.8	47.5	47.5	19.9	29.9	48.4	48.4	19.9	29.6	45.1	45.1	19.9	29.9	48.4	48.4
Total stomach content (g)																
min	0.001	0.005	0.093	0.001	0.001	0.001	0.004	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.001
med	0.088	0.395	1.706	0.123	0.082	0.160	2.014	0.226	0.103	0.210	2.449	0.158	0.089	0.201	2.029	0.170
mean	0.218	1.801	4.111	0.825	0.201	0.677	5.463	2.444	0.211	1.065	7.505	1.642	0.209	1.115	5.866	1.826
max	2.709	19.771	14.869	19.771	2.971	6.457	71.795	71.795	2.413	17.243	64.896	64.896	2.971	19.771	71.795	71.795
No. of observed taxa																
Fishes	0	2	6	6	0	3	9	9	2	3	4	5	2	5	10	10
Crabs	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1
Shrimp	4	5	5	5	3	4	6	6	6	5	5	8	7	5	6	8
Zooplankton	23	12	8	24	23	12	15	23	22	16	12	24	30	19	17	32
Other invertebrates	6	2	1	6	9	3	4	11	9	4	4	12	15	5	6	19
Unidentifiable prey	1	1	1	1	2	1	1	2	1	0	1	1	2	1	1	2
Total	34	22	21	42	37	23	35	51	41	28	26	51	57	35	40	72

Table 41. Detailed diet of redfish from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 20, M = [20-30[, L = 30+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Arctozenus risso		0.25	1.58	0.47		5.84	7.68	6.99		0.009	0.02	0.007		4.92	6.96	2.73		5	4	13
Digested fish	0.17	1.52	4.04	1.44	0.13	3.82	3.56	3.36	0	0.007	0.009	0.004	0.1	4.06	3.3	1.57	33	7	6	18
Digested roundfish		0.25	2.63	0.75		0.14	3.36	2.83		0	0.01	0.003		0.17	3.66	1.13		26	5	21
Mallotus villosus	0.08		0.35	0.14	0.13		0.28	0.24	0		0.001	0.000	0.07		0.34	0.14	38		19	34
Melanostigma atlanticum		1.02	1.58	0.61		1.39	0.29	0.38		0.002	0.001	0.001		1.3	0.27	0.25		16	22	28
Myctophidae			0.18	0.05			0.97	0.81			0.003	0.001			0.92	0.28			14	26
Notoscopelus kroyeri			0.35	0.09			2.41	2.02			0.005	0.001			1.75	0.53			8	24
Pisces			0.18	0.05			0.3	0.25			0.001	0.000			0.28	0.08			21	37
Pleuronectiformes			0.35	0.09			0.25	0.21			0.001	0.000			0.2	0.06			25	42
Sebastes spp.		0.25	2.81	0.79		1.36	13.45	11.38		0.002	0.038	0.010		0.96	13.33	4.16		19	2	9
Fishes, total	**0.25**	**3.3**	**12.46**	**4.05**	**0.26**	**12.55**	**32.55**	**28.46**	**0**	**0.02**	**0.089**	**0.027**	**0.17**	**11.4**	**31.01**	**10.93**				
Brachyura	0.08			0.05	0			0.00	0			0.000	0.01			0.00	50			63
Crabs, total	**0.08**			**0.05**	**0**			**0.00**	**0**			**0.000**	**0.01**			**0.00**				
Digested shrimp	1.52	2.79	7.72	3.4	1.79	1.14	2.02	1.92	0.003	0.002	0.006	0.004	1.35	1.02	2.14	1.55	15	18	7	19
Eualus gaimardii gaimardii	0.17			0.09	0.49			0.03	0.001			0.001	0.48			0.28	21			27
Hippolytidae	0.08			0.05	0.15			0.01	0			0.000	0.16			0.09	27			36
Pandalus borealis	0.17	3.81	6.67	2.56	2.01	28.99	11.39	12.47	0.009	0.042	0.037	0.022	3.3	23.96	12.85	8.82	13	1	3	2
Pandalus montagui	0.08	0.51	0.35	0.23	0.91	0.95	0.09	0.23	0.002	0.002	0	0.002	0.82	1.14	0.09	0.64	19	17	30	22
Pandalus sp.	0.51	1.52	1.75	1.03	0.63	4.91	0.76	1.15	0.003	0.007	0.003	0.004	1.18	3.97	1.19	1.54	16	8	10	20
Pasiphaea multidentata	1.35	5.84	28.77	9.46	11.9	17.15	46.46	41.31	0.018	0.034	0.127	0.050	6.86	19.73	44.44	19.87	5	2	1	1
Pasiphaea sp.			0.35	0.09			0.03	0.02			0	0.000			0.03	0.01			32	55
Shrimp, total	**3.64**	**13.2**	**39.47**	**14.91**	**17.88**	**53.13**	**60.73**	**57.14**	**0.037**	**0.087**	**0.173**	**0.082**	**14.14**	**49.82**	**60.74**	**32.78**				
Aetideidae	0.08			0.05	0.06			0.00	0.001			0.000	0.35			0.20	23			31
Boreomysis arctica	1.35	0.76	1.23	1.21	0.87	0.85	0.18	0.29	0.011	0.001	0.001	0.007	4.39	0.74	0.22	2.66	10	22	24	14
Boreomysis sp.	3.98	5.33	9.82	5.78	2.3	2.15	0.91	1.12	0.011	0.003	0.003	0.007	4.09	1.76	1.17	2.91	11	13	12	12
Bradyidius similis	0.59			0.33	0.01			0.00	0			0.000	0.03			0.02	42			52
Calanoida	20.3	9.64	3.68	13.93	10.99	0.81	0.11	0.90	0.027	0.003	0	0.015	10.22	1.54	0.16	6.07	2	14	27	4
Calanus finmarchicus	0.17			0.09	0.01			0.00	0			0.000	0.01			0.00	48			61
Calanus finn. + glacialis	0.42			0.23	0.05			0.00	0			0.000	0.14			0.08	30			40
Calanus hyperboreus	9.98	6.09	3.51	7.55	5.62	1.03	0.16	0.61	0.01	0.002	0.001	0.006	3.85	1.35	0.28	2.46	12	15	20	15
Calanus sp.	14.72	11.68	2.46	10.9	14.19	1.66	0.14	1.22	0.024	0.004	0.001	0.014	9.16	2.52	0.19	5.60	3	11	26	5
Chiridius gracilis	0.17			0.09	0			0.00	0			0.000	0			0.00	53			68
Copepoda	1.69	1.78	0.35	1.35	0.58	0.18	0.01	0.06	0.003	0	0	0.001	0.97	0.19	0.01	0.58	18	25	35	23
Erythrops erythrophthalma			0.18	0.05			0	0.00			0	0.000			0	0.00			39	72
Euphausiidae	5.58	4.82	3.86	4.99	5.59	10.13	0.29	1.60	0.017	0.014	0.001	0.012	6.57	8.05	0.38	4.89	7	3	17	7
Hyperia galba	0.08	0.51		0.14	0.07	0.01		0.01	0	0		0.000	0.04	0.01		0.02	41	31		50
Hyperia sp.	0.08			0.05	0.03			0.00	0			0.000	0.09			0.05	34			43
Hyperiidae	0.42	0.25		0.28	0.03	0		0.00	0	0		0.000	0.05	0		0.03	39	35		48
Meganyctiphanes norvegica	3.89	5.84	6.14	4.85	6.11	3.37	0.85	1.44	0.017	0.008	0.003	0.012	6.58	4.41	1.17	4.67	6	6	11	8
Metridia longa	0.42			0.23	0.04			0.00	0			0.000	0.02			0.01	44			54
Metridia lucens	0.08			0.05	0			0.00	0			0.000	0			0.00	52			66
Metridia sp.	4.4	0.76		2.56	0.59	0		0.04	0.002	0		0.001	0.8	0.01		0.46	20	32		25
Mysida	0.08			0.05	0.01			0.00	0			0.000	0			0.00	51			65
Mysidae	0.08		0.35	0.14	0		0.01	0.01	0		0	0.000	0		0.01	0.00	57		36	64
Mysis sp.		0.76		0.14		0.31		0.03		0.001		0.000		0.38		0.05		23		45

Table 41. Continued.

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Paraeuchaeta norvegica	2.79	1.78	2.11	2.42	0.27	0.23	0.07	0.10	0.001	0.001	0	0.000	0.23	0.29	0.1	0.20	26	24	28	30
Pseudomma roseum	0.17			0.09	0.11			0.01	0			0.000	0.14			0.08	28			38
Pseudomma sp.	0.08			0.05	0.01			0.00	0			0.000	0.01			0.00	47			60
Scina borealis	1.44	0.25	0.18	0.89	0.29	0	0	0.02	0.001	0	0	0.000	0.32	0	0	0.18	24	34	40	32
Themisto abyssorum	1.18	2.03	1.4	1.4	0.38	0.12	0.01	0.05	0.001	0	0	0.000	0.24	0.14	0.02	0.16	25	27	33	33
Themisto compressa	4.74	2.03	3.16	3.82	7.46	1.15	0.25	0.82	0.023	0.002	0.001	0.013	8.88	0.87	0.25	5.25	4	20	23	6
Themisto libellula	0.93	1.78	0.7	1.03	1.75	3.56	1.03	1.32	0.003	0.013	0.003	0.005	1.17	7.4	1.12	1.95	17	4	13	16
Themisto sp.	11.25	10.41	6.32	9.79	5.36	1.4	0.24	0.69	0.016	0.003	0.001	0.010	6.3	1.93	0.36	3.95	8	12	18	10
Thysanoessa sp.	1.18	1.78	0.35	1.07	4.29	3.79	0.31	0.91	0.012	0.005	0.001	0.008	4.7	3.16	0.49	3.23	9	10	16	11
Zooplankton, total	**53.81**	**39.59**	**29.65**	**44.78**	**67.07**	**30.75**	**4.55**	**11.26**	**0.18**	**0.06**	**0.017**	**0.115**	**69.36**	**34.76**	**5.92**	**45.76**				
Amphipoda	0.68		0.18	0.42	0.06		0	0.00	0		0	0.000	0.12		0	0.07	32		38	41
Aphrodita hastata	0.08			0.05	0.26			0.02	0.001			0.001	0.35			0.20	22			29
Byblis sp.	0.08			0.05	0.06			0.00	0			0.000	0.08			0.04	36			46
Crustacea	21.24	13.2	9.65	16.68	12.3	2.66	0.68	1.64	0.033	0.006	0.003	0.020	12.82	3.17	0.9	7.98	1	9	15	3
Cumacea	1.35	0.51		0.84	0.06	0		0.00	0	0		0.000	0.14	0.01		0.08	29	33		39
Digested invertebrates	0.42		1.05	0.51	0.13		0.06	0.05	0		0	0.000	0.13		0.06	0.09	31		31	35
Gammaridea	0.34	0.76		0.33	0.02	0.01		0.00	0	0		0.000	0.09	0.02		0.05	35	30		44
Gastropoda	0.08			0.05	0			0.00	0			0.000	0			0.00	55			70
Invertebrata	0.08			0.05	0			0.00	0			0.000	0			0.00	54			69
Limacina sp.	0.17			0.09	0.01			0.00	0			0.000	0.01			0.00	49			62
Lysianassidae		0.51		0.09		0.03		0.00		0		0.000		0.06		0.01		28		56
Maera loveni	0.08			0.05	0.05			0.00	0			0.000	0.04			0.02	40			51
Mollusca	0.08			0.05	0			0.00	0			0.000	0			0.00	56			71
Monoculodes sp.	0.08			0.05	0.01			0.00	0			0.000	0.01			0.01	46			58
Neohela monstrosa	0.08			0.05	0.15			0.01	0			0.000	0.08			0.04	37			47
Ostracoda	0.51			0.28	0.01			0.00	0			0.000	0.03			0.02	43			53
Polychaeta			0.18	0.05			0	0.00			0	0.000			0.01	0.00			37	67
Rossia sp.			0.18	0.05			0.04	0.04			0	0.000			0.09	0.03			29	49
Tmetonyx cicada		0.25	0.18	0.09		0.02	0.01	0.01		0	0	0.000		0.02	0.01	0.01		29	34	59
Other invertebrates, total	**23.6**	**14.21**	**11.05**	**18.55**	**13.12**	**2.72**	**0.78**	**1.79**	**0.036**	**0.006**	**0.003**	**0.022**	**13.89**	**3.28**	**1.06**	**8.66**				
Invertebrates, total	**65.4**	**52.79**	**57.19**	**60.9**	**98.06**	**86.61**	**66.07**	**70.19**	**0.253**	**0.153**	**0.193**	**0.219**	**97.4**	**87.85**	**67.72**	**87.20**				
Unidentified digested material	4.31	1.52	2.98	3.45	1.65	0.84	1.38	1.35	0.006	0.001	0.004	0.005	2.42	0.75	1.27	1.86	14	21	9	17
Unidentified egg	0.08			0.05	0.03			0.00	0			0.000	0.01			0.01	45			57
Unidentifiable prey, total	**4.4**	**1.52**	**2.98**	**3.49**	**1.68**	**0.84**	**1.38**	**1.35**	**0.006**	**0.001**	**0.004**	**0.005**	**2.43**	**0.75**	**1.27**	**1.86**				
Total					**100**	**100**	**100**	**100.00**	**0.259**	**0.174**	**0.286**	**0.251**	**100**	**100**	**100**	**100.00**				

Table 42. Summary of diet of redfish from the 2015-2017 ENGSL *Teleost* surveys, according to length class (cm, S = < 20, M = [20-30[, L = 30+ and T = all lengths combined).

	FO				MC				FI				CFI Value				CFI Rank			
Prey	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Arctozenus risso		0.25	1.58	0.47		5.84	7.68	6.99		0.009	0.02	0.007		4.92	6.96	2.73		7	5	11
Other fishes	0.25	2.79	8.77	2.98	0.26	5.35	11.43	10.09	0	0.01	0.031	0.010	0.17	5.52	10.72	4.04	12	5	4	10
Sebastes spp.		0.25	2.81	0.79		1.36	13.45	11.38		0.002	0.038	0.010		0.96	13.33	4.16		13	2	9
Fishes, total	**0.25**	**3.3**	**12.46**	**4.05**	**0.26**	**12.55**	**32.55**	**28.46**	**0**	**0.02**	**0.089**	**0.027**	**0.17**	**11.4**	**31.01**	**10.93**				
Other crabs	0.08			0.05	0			0.00	0			0.000	0.01			0.00	13			15
Crabs, total	**0.08**			**0.05**	**0**			**0.00**	**0**			**0.000**	**0.01**			**0.00**				
Other Pandalidae	0.59	2.03	2.11	1.26	1.54	5.86	0.84	1.38	0.005	0.009	0.004	0.005	2	5.11	1.27	2.18	10	6	10	12
Other shrimp	1.69	2.79	7.72	3.49	2.43	1.14	2.02	1.96	0.005	0.002	0.006	0.005	1.99	1.02	2.14	1.91	11	12	6	13
Pandalus borealis	0.17	3.81	6.67	2.56	2.01	28.99	11.39	12.47	0.009	0.042	0.037	0.022	3.3	23.96	12.85	8.82	8	1	3	4
Pasiphaeidae	1.35	5.84	29.12	9.55	11.9	17.15	46.48	41.33	0.018	0.034	0.127	0.050	6.86	19.73	44.47	19.88	7	2	1	1
Shrimp, total	**3.64**	**13.2**	**39.47**	**14.91**	**17.88**	**53.13**	**60.73**	**57.14**	**0.037**	**0.087**	**0.173**	**0.082**	**14.14**	**49.82**	**60.74**	**32.78**				
Calanidae	23.6	17.01	5.79	17.66	19.85	2.68	0.3	1.83	0.034	0.007	0.001	0.020	13.16	3.87	0.47	8.14	4	8	13	6
Euphausiidae	9.56	9.9	9.47	9.6	16	17.29	1.44	3.95	0.046	0.027	0.006	0.032	17.85	15.62	2.05	12.79	1	3	7	2
Hyperiidae	15.99	14.72	9.47	14.03	15.08	6.24	1.54	2.89	0.044	0.018	0.005	0.029	16.79	10.36	1.74	11.41	2	4	8	3
Mysidae	5.58	6.85	10.88	7.22	3.29	3.31	1.09	1.45	0.022	0.005	0.004	0.014	8.63	2.87	1.4	5.71	6	10	9	8
Other zooplankton	27.92	13.2	5.44	19.25	12.85	1.23	0.18	1.13	0.034	0.004	0.001	0.019	12.94	2.04	0.27	7.72	5	11	14	7
Zooplankton, total	**53.81**	**39.59**	**29.65**	**44.78**	**67.07**	**30.75**	**4.55**	**11.26**	**0.18**	**0.06**	**0.017**	**0.115**	**69.36**	**34.76**	**5.92**	**45.76**				
Other invertebrates	23.6	14.21	11.05	18.55	13.12	2.72	0.78	1.79	0.036	0.006	0.003	0.022	13.89	3.28	1.06	8.66	3	9	12	5
Other invertebrates, total	**23.6**	**14.21**	**11.05**	**18.55**	**13.12**	**2.72**	**0.78**	**1.79**	**0.036**	**0.006**	**0.003**	**0.022**	**13.89**	**3.28**	**1.06**	**8.66**				
Invertebrates, total	**65.4**	**52.79**	**57.19**	**60.9**	**98.06**	**86.61**	**66.07**	**70.19**	**0.253**	**0.153**	**0.193**	**0.219**	**97.4**	**87.85**	**67.72**	**87.20**				
Unidentifiable prey	4.4	1.52	2.98	3.49	1.68	0.84	1.38	1.35	0.006	0.001	0.004	0.005	2.43	0.75	1.27	1.86	9	14	11	14
Unidentifiable prey, total	**4.4**	**1.52**	**2.98**	**3.49**	**1.68**	**0.84**	**1.38**	**1.35**	**0.006**	**0.001**	**0.004**	**0.005**	**2.43**	**0.75**	**1.27**	**1.86**				
Total					**100**	**100**	**100**	**100.00**	**0.259**	**0.174**	**0.286**	**0.251**	**100**	**100**	**100**	**100.00**				

Table 43. Summary of diet of the ENGSL redfish from the 2015-2017 *Teleost* surveys, as a function of zones of origin and length classes (cm, S = < 20, M = [20-30[, L = 30+ and T = all lengths combined). For each taxonomic grouping, the value presented is FI (CFI). Refer to Figure 1 for zone codes.

	NWG				LC				NEG			
Taxonomic grouping	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**	**S**	**M**	**L**	**T**
Arctozenus risso			0.05 (11.07)	0.003 (0.93)			0.03 (9.70)	0.01 (4.95)		0.02 (12.42)		0.00 (1.73)
Other fishes		0.01 (3.03)	0.07 (17.19)	0.006 (1.99)		0.013 (12.49)	0.04 (14.34)	0.02 (8.30)	0.00 (0.43)	0.01 (3.79)	0.004 (1.23)	0.00 (1.10)
Sebastes spp.			0.02 (4.25)	0.001 (0.36)		0.004 (4.17)	0.05 (19.91)	0.02 (10.49)			0.004 (1.31)	0.00 (0.32)
Fishes, total		**0.01 (3.03)**	**0.13 (32.51)**	**0.010 (3.27)**		**0.018 (16.66)**	**0.12 (43.95)**	**0.05 (23.74)**	**0.00 (0.43)**	**0.03 (16.22)**	**0.008 (2.55)**	**0.01 (3.15)**
Other crabs									0.00 (0.01)			0.00 (0.01)
Crabs, total									**0.00 (0.01)**			**0.00 (0.01)**
Other Pandalidae	0.009 (3.05)	0.00 (1.52)	0.04 (10.96)	0.011 (3.44)	0.00 (0.08)	0.008 (7.66)	0.00 (0.43)	0.00 (0.85)	0.01 (2.42)	0.01 (7.01)	0.002 (0.70)	0.01 (2.64)
Other shrimp	0.005 (1.55)	0.00 (1.27)	0.01 (1.63)	0.005 (1.50)	0.00 (1.49)	0.002 (2.30)	0.01 (2.91)	0.00 (2.28)	0.01 (2.71)	0.00 (0.02)	0.002 (0.60)	0.00 (1.82)
Pandalus borealis	0.030 (9.73)	0.14 (52.60)	0.14 (35.24)	0.060 (19.60)		0.008 (7.80)	0.02 (7.40)	0.01 (4.39)		0.01 (6.42)	0.061 (19.12)	0.01 (5.59)
Pasiphaeidae	0.014 (4.46)	0.02 (8.35)	0.04 (9.16)	0.017 (5.56)	0.03 (16.08)	0.033 (30.86)	0.10 (38.25)	0.06 (28.55)	0.01 (2.50)	0.04 (23.94)	0.213 (66.74)	0.05 (21.26)
Shrimp, total	**0.058 (18.79)**	**0.17 (63.73)**	**0.23 (56.98)**	**0.093 (30.10)**	**0.04 (17.66)**	**0.051 (48.63)**	**0.13 (48.99)**	**0.08 (36.07)**	**0.02 (7.64)**	**0.07 (37.40)**	**0.279 (87.16)**	**0.08 (31.30)**
Calanidae	0.038 (12.13)	0.00 (0.62)		0.028 (9.04)	0.03 (13.84)	0.009 (8.20)	0.00 (0.33)	0.01 (6.50)	0.04 (13.57)	0.01 (4.41)	0.003 (0.90)	0.02 (9.18)
Euphausiidae	0.083 (26.85)	0.07 (25.12)	0.00 (0.75)	0.075 (24.35)	0.02 (7.35)	0.007 (7.06)	0.00 (1.47)	0.01 (4.32)	0.05 (17.35)	0.02 (11.67)	0.012 (3.62)	0.03 (13.19)
Hyperiidae	0.017 (5.49)	0.00 (1.03)	0.02 (4.42)	0.014 (4.59)	0.04 (16.91)	0.004 (3.50)	0.00 (0.33)	0.02 (7.40)	0.07 (26.53)	0.04 (23.15)	0.013 (4.13)	0.05 (20.56)
Mysidae	0.034 (10.92)	0.01 (2.66)	0.02 (4.54)	0.027 (8.90)	0.04 (18.01)	0.007 (6.44)	0.00 (1.68)	0.02 (8.77)	0.00 (0.08)	0.00 (0.99)	0.000 (0.00)	0.00 (0.19)
Other zooplankton	0.035 (11.24)	0.00 (1.14)	0.00 (0.01)	0.026 (8.47)	0.02 (8.29)	0.003 (2.90)	0.00 (0.36)	0.01 (3.82)	0.05 (17.67)	0.00 (2.37)	0.000 (0.15)	0.03 (11.23)
Zooplankton, total	**0.207 (66.63)**	**0.08 (30.57)**	**0.04 (9.72)**	**0.170 (55.35)**	**0.14 (64.40)**	**0.030 (28.12)**	**0.01 (4.16)**	**0.07 (30.82)**	**0.20 (75.20)**	**0.08 (42.59)**	**0.028 (8.80)**	**0.14 (54.36)**
Other invertebrates	0.040 (12.98)	0.00 (0.86)	0.00 (0.10)	0.030 (9.71)	0.03 (15.93)	0.007 (6.28)	0.00 (1.02)	0.02 (7.57)	0.03 (13.26)	0.01 (3.80)	0.004 (1.40)	0.02 (9.03)
Other invertebrates, total	**0.040 (12.98)**	**0.00 (0.86)**	**0.00 (0.10)**	**0.030 (9.71)**	**0.03 (15.93)**	**0.007 (6.28)**	**0.00 (1.02)**	**0.02 (7.57)**	**0.03 (13.26)**	**0.01 (3.80)**	**0.004 (1.40)**	**0.02 (9.03)**
Invertebrates, total	**0.305 (98.40)**	**0.26 (95.17)**	**0.27 (66.80)**	**0.293 (95.17)**	**0.21 (97.99)**	**0.088 (83.03)**	**0.14 (54.18)**	**0.16 (74.46)**	**0.25 (96.12)**	**0.15 (83.78)**	**0.311 (97.35)**	**0.24 (94.70)**
Unidentifiable prey	0.005 (1.60)	0.00 (1.81)	0.00 (0.69)	0.005 (1.56)	0.00 (2.01)	0.000 (0.31)	0.00 (1.87)	0.00 (1.81)	0.01 (3.45)		0.000 (0.10)	0.01 (2.15)
Unidentifiable prey, total	**0.005 (1.60)**	**0.00 (1.81)**	**0.00 (0.69)**	**0.005 (1.56)**	**0.00 (2.01)**	**0.000 (0.31)**	**0.00 (1.87)**	**0.00 (1.81)**	**0.01 (3.45)**		**0.000 (0.10)**	**0.01 (2.15)**
Total	**0.310 (100.00)**	**0.27 (100.00)**	**0.41 (100.00)**	**0.308 (100.00)**	**0.21 (100.00)**	**0.106 (100.00)**	**0.26 (100.00)**	**0.22 (100.00)**	**0.26 (100.00)**	**0.18 (100.00)**	**0.320 (100.00)**	**0.26 (100.00)**

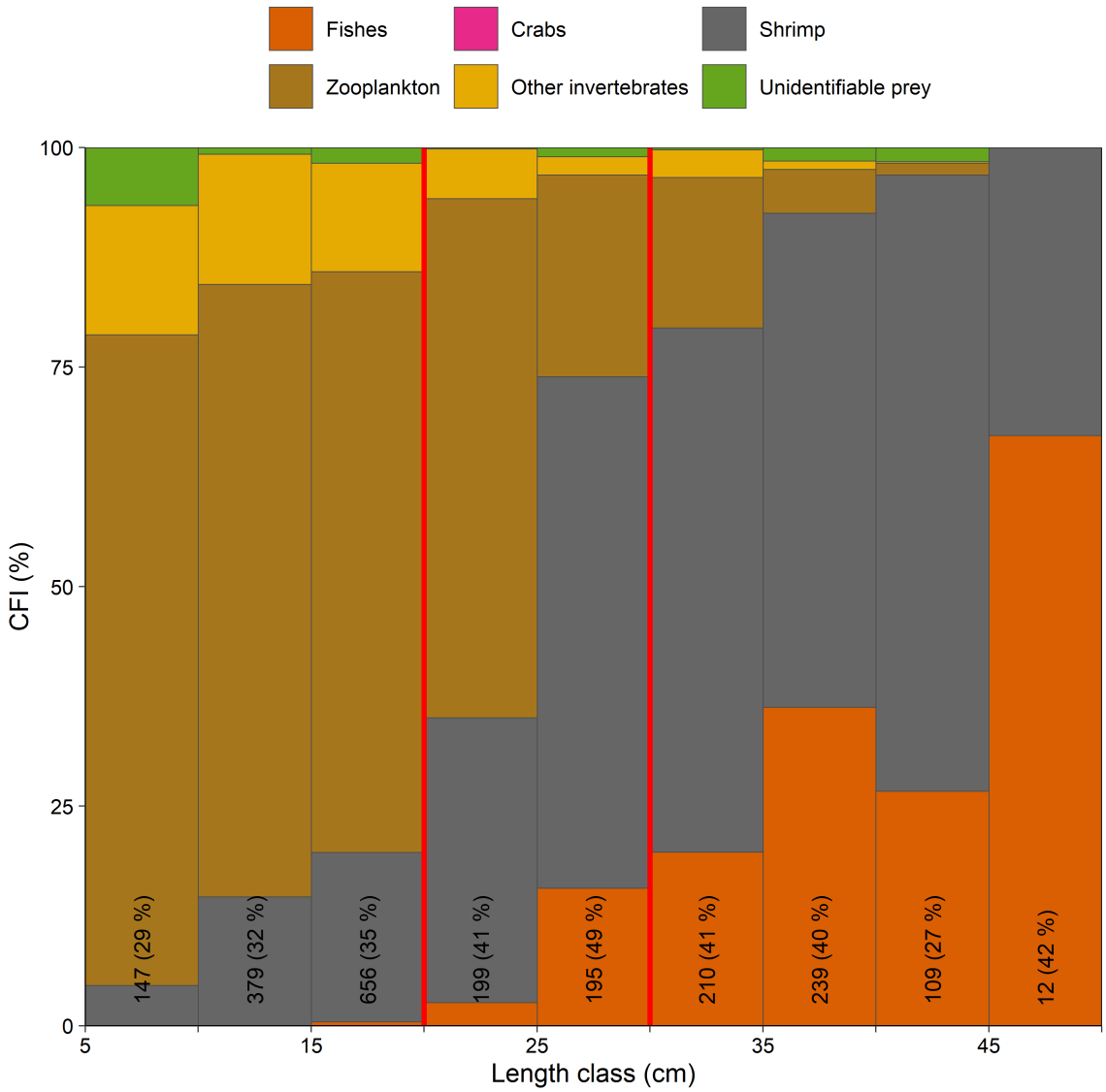

Figure 20. Prey group contributions to the total fullness index (CFI) for redfish in 5 cm length classes, along with the number of stomachs and percentage of empty stomachs. Vertical red lines separate the length classes that were combined for the analyzes.

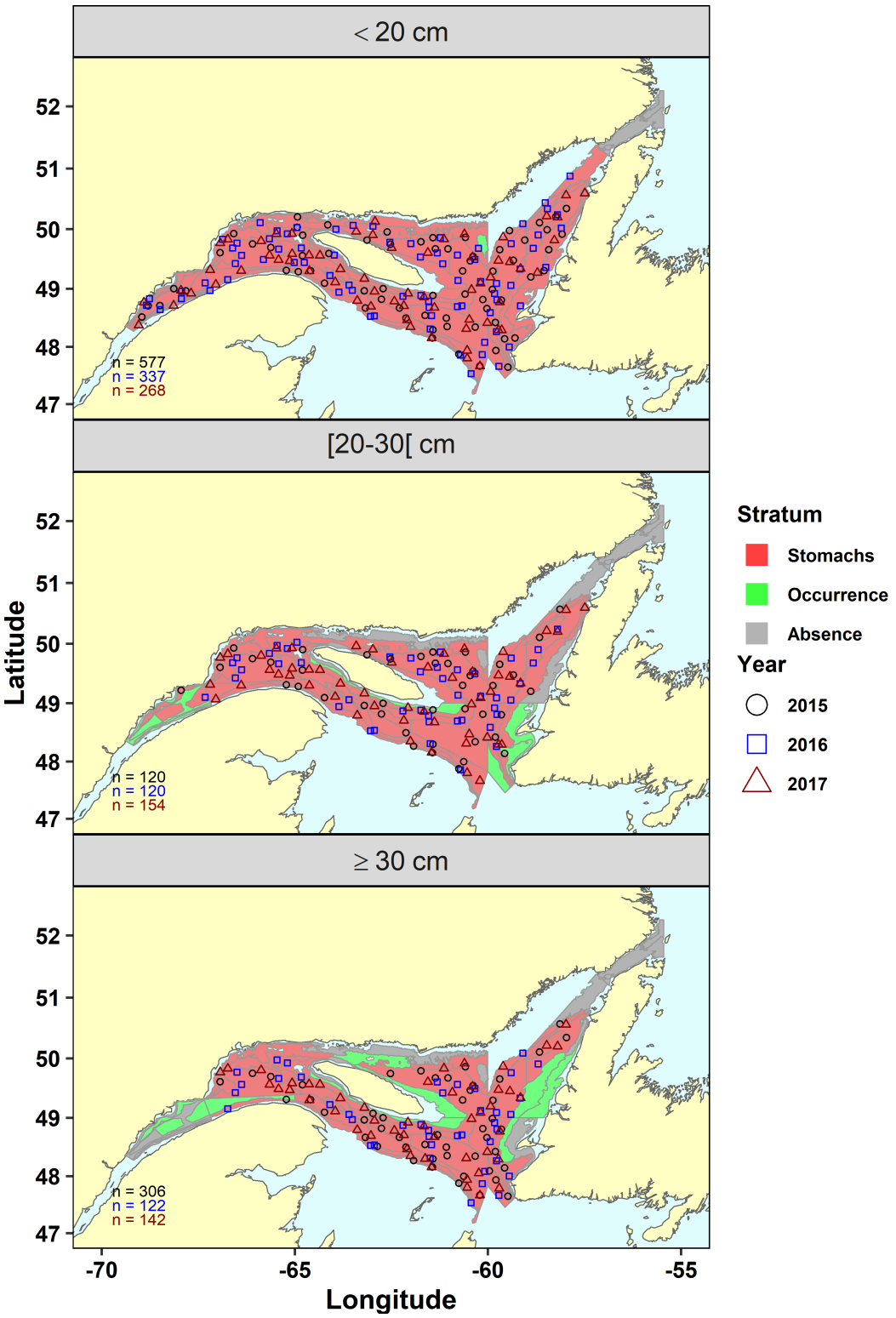

Figure 21. Origin of redfish stomachs used for analysis, based on the year of the scientific survey. The annual stomach count is provided in the lower left corner. Each stratum is coded according to whether stomachs were collected (Stomachs), the predator was caught without collection of stomachs (Occurrence), or the predator was never caught (Absence) during the period 2015-2017.

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APPENDIX A Stratification of the stomach collection

Table A.1. Stratification of the stomach collection by species and year of the ENGSL *Teleost* survey for the 2015-2017 period. $\mathrm{n_{max}}$ is the maximum number of stomachs of a given species that can be taken in one set.

Predator	Year(s)	Sets	$\mathrm{n_{max}}$	Length / sex stratification
Haddock	2017	All	All	All stomachs.
Spiny dogfish	2015	All	All	All stomachs.
Black dogfish	2015	All	36	< 25 cm : 3
				[25-75[cm : 3 per 5 cm
				$\geq$ 75 cm : 3
	2017	All	10	< 30 cm: 5; $\geq$ 30 cm: 5
Capelin	2017	All	3	Representative of the catch
Northern shortfin squid	2015	All	5	Representative of the catch
Atlantic halibut	2015-2017	All	All	All stomachs.
Greenland halibut	2015	Even	36	< 10 cm : 2
				[10-20[cm : 2 per 5 cm per sex
				[20-45[cm : 1 per 5 cm per sex
				[45-65[cm : 2 per 5 cm per sex
				$\geq$ 70 cm : 2 per sex
	2016	Even	10	< 30 cm: 5; > 30 cm: 5
	2017	Even	10	< 30 cm: 5; $\geq$ 30 cm: 5
Pollock	2017	All	All	All stomachs.
Atlantic argentine	2017	All	All	All stomachs.
Lumpfish	2015-2016	All	All	All stomachs.
Yellowtail flounder	2017	All	10	< 30 cm: 5; $\geq$ 30 cm: 5
White barracudina	2016	Even	5	Representative of the catch
Silver hake	2015-2016	All	6	$\geq$ 15 cm : 2; [16-30] cm : 2; $\geq$ 31 : 2
	2017	All	30	$\geq$ 15 cm : 10; [16-30] cm : 10; $\geq$ 31 : 10
Longfin hake	2017	All	10	< 30 cm: 5; $\geq$ 30 cm: 5
White hake	2017	Even	10	< 30 cm: 5; $\geq$ 30 cm: 5
Atlantic cod	2015	All	40	< 10 cm : 2
				[10-100[cm : 2 per 5 cm
				$\geq$ 100 cm : 2
	2016	Even	10	< 40 cm: 5; > 40 cm: 5
	2017	All		< 40 cm: 4; [40-70] cm : 4; > 70 cm: tous
American plaice	2016	Odd	10	< 20 cm: 5; > 20 cm: 5
Witch flounder	2016	Odd	10	< 20 cm: 5; > 20 cm: 5
Thorny skate	2017	Even	10	< 30 cm: 5; $\geq$ 30 cm: 5
Smooth skate	2017	Odd	10	< 30 cm: 5; $\geq$ 30 cm: 5
Redfish	2015	Odd	40	< 10 cm : 5
				[10-40[cm : 5 per 5 cm
				$\geq$ 40 cm : 5
	2016	Odd	10	< 20 cm: 5; > 20 cm: 5
	2017	Odd	10	< 20 cm: 5; $\geq$ 20 cm: 5
Wrymouth	2017	All	All	All stomachs.

APPENDIX B Stomach contents analysis protocol

Preliminary steps:

1. Defrost stomachs.

- When only stomach contents are present, remove it from the bag while it is still frozen to minimize losses in the bag.
- When the bags are put in hot water to speed up the thawing, make sure that the water does not get into the bags (i.e., put a 2nd bag).
- Avoid thawing and refreezing stomachs.

2. Once a week, check the correct functioning of the balance with standard weights and calibrate if necessary.
3. Prepare the input file.

- The information obtained during the stomach examination in the lab is entered directly into an Excel entry file.
- The template entry file has 1 header line.
- Create a copy of the entry file for each day of lab work for each person analyzing stomachs. If you are analyzing stomachs from different predators, or from different surveys, create as many entry files as you need. The file name should be vessel, year, predator, examiner initials, exam date (YYYYMMDD): Teleost_2011_cod_CN_20140219.xls. Use the xlsx format rather than xls if possible. Make a copy of the file on a USB key at the end of the day. At least once a week, send the key to the person responsible for the analysis of stomach contents or to Denis Chabot.
- **Warning**, the entry sheet contains several automatic formulas and tabs used by search formulas. Do not sort the sheet or move rows or cells. Copy lines at the end of the file if necessary, making sure that the formulas are still functional.

Information to enter beforehand for each stomach:

4. Additional data: if the length of the fish is not on the label and this is the annual ecosystemic survey, check in the survey database if the information on this fish is present. If this is another survey, also verify that the fish information is available in a database or another file. Length is essential for data analysis. Do not invest time analyzing the stomach if the length of the fish is not available.
5. *Vessel number*

- if captured by **mobile gear**: see list of DFO vessels and their codes. Enter 90 for mobile gear sentinel fisheries.
- if captured by **fixed gear**: Enter 99.

6. *Vessel details*

- if captured by **mobile gear**: leave blank for those of DFO; register the NBPC for sentinel fisheries.
- if captured by **fixed gear**: use the new ship code (NBPC).

7. *Survey number*

- if captured by **mobile gear**: write what is on the bag or label.
- if captured by **fixed gear**: use the year.

8. *Set number*

- if captured by **mobile gear**: write what is on the bag or label.
- if captured by **fixed gear**: use the hauling number.

9. *Sorting category*: enter it when provided.
10. *Date*: write what is on the bag or label.
11. For catches by fixed gear, if the fisherman's number (*coded by*) is written on the label or the box (ex: SBC03 or STN23), enter it in *Remarks*.
12. If the length or mass of the predator is on the label, enter it in the appropriate column, with any other information in *Notes*. NOTE: the length[6] should be noted in mm, the mass in g.
13. For whole frozen fish, before removing the stomach, measure the length and mass of the fish and enter them in the *preserved* columns. If the fish is not a juvenile, note the **sex** too.
14. *Examined by*: initials of the person examining the stomach.
15. *Date examined*: date of stomach examination, YYYY-MM-DD.
16. Fish identifier

[6]Until spring 2003, the length was in cm, but during the validation of the permanent files we agreed to transform in mm in all the validated files. In the future we will always work in mm. Similarly, the masses of fish were noted in kg in the 1990s, but were all transformed into g in the permanent files and the Oracle database.

- Corresponds to *table number* x 1000 + *fish number*. On board the ship, table = 1, 2 or 3; at IML, table = 4 or 5.
- Please note, this number is replaced by a *unique fish number* in recent surveys and this is the one to enter. The combination *table number* and *fish number* is then obtained by querying the survey database based on *unique number*.
- Other surveys: take the *fish number* directly on the label.

17. *Preservation method.*[7]

- 1: Examined fresh
- 2: Whole frozen stomach
- 3: Stomach preserved in formalin
- 4: Stomach frozen then preserved in formalin
- 5: Stomach preserved in formalin and then frozen
- 6: Whole frozen fish, stomach analyzed from thawed fish
- 8: Stomach preserved in brine and frozen
- 12: Frozen stomach contents
- 13: Whole frozen fish, stomach removed and refrozen
- 14: Whole frozen fish, stomach content collected from thawed fish and refrozen
- 15: Stomach preserved on ice before being frozen
- 16: Stomach frozen, thawed, and refrozen

18. *Preserved whole stomach mass*: in a tared weighing scoop, weigh the whole stomach with its contents (if necessary, remove any organ that may have been excised with the stomach, such as pyloric caecae). This mass can be useful when we find duplicate fish numbers (entry error on the vessel).
19. *Mass of stomach content*: cut the stomach wall to expose all the contents and avoid cutting prey. Remove the wall, leaving the contents in the weighing scoop (including any debris, parasite, but avoid mucus) and remove the wall. Enter the weight.
20. **Empty stomach**: Enter 0 in *mass stomach content*, and enter **9998** in *prey code*. Check that *empty* displays in *prey name*.
21. **Non-empty stomach**

[7] For the 2015-2017 period, the preservation methods used were 2 and 6.

- Before each weighing, place an empty weighing scoop on the scale and tare it.
- Using the binocular magnifier and reference manuals, sort the prey according to their species or taxonomic group and according to the level of digestion in different weighing scoops. Also sort debris, parasites etc. Table B.1 gives a good idea of the interpretation of the three stages of digestion used in this protocol.
- Often, what remains at the end of sorting is liquid, mucus, or material that is very digested and impossible to identify, except perhaps at a very general level (offal of fish, digested crustaceans, etc.).
- Ensure that the correct vessel, survey, set, category (if applicable) and fish numbers are entered on each line for each stomach. For surveys with a unique fish number, enter this instead of the set and fish numbers.

For all items found in the stomach:

22. Identify to the taxonomic level according to the instructions below.
23. Find the corresponding code in the list of prey codes (*Taxa v.19* tab). If you have a prey whose code is not on the list, inform Claude Nozères or Denis Chabot to add it.
24. Detail code: mostly empty. We write a code when we have a stage of prey to code, like a copepodite, an egg, a larva, or when only a hard part of the prey remains, like a squid beak, a whelk shell, or when when all that remains of a fish is the otoliths (See Table B.2 or the *Taxa detail* tab). Check that the prey detail that appears is the one you want with the detail code.
25. Weigh the types of prey separately, in a tared weighing scoop.
26. For an item < 0.001 g, leave the record at 0.000 g.
27. Number of individuals: count individuals

    - For fragmented prey, count either heads or tails.
    - For the excessively numerous (and small) prey, the mass of 10 individuals (see below) is sufficient, but avoid this as much as possible.

28. Fish and large invertebrates (bivalves, gastropods, shrimp, crabs, cephalopods)

    - Identify to the species level, using hard parts (otoliths, shells) if necessary. The stage of digestion depends on our estimate of the losses in length and mass observable on the specimens (see Table B.1).

- Use one line per prey in the input file, there will therefore be at least as many lines for a stomach as there are taxa. Several digestion stages can be entered per line, if necessary (by weighing them separately), or the different digestion stages of the same taxon can be put on a different line. Please note, if part of the prey of a taxon is in advanced digestion (stage 3), it could be necessary to register a less precise taxon (genus, family), which will necessarily be on a different line from the precise taxon less digested.
- For stage 1 prey (sometimes at the beginning of stage 2), measure up to 10 individuals per taxon when digestion has little or no influence on length. This is rarely possible in stage 2 for fish, but quite often possible for crustaceans in stage 2 or rarely 3.
- Cod, redfish, turbot, Atlantic halibut, mackerel, haddock and other species with forked tail: fork length (mm)
- Hake, flatfishes, capelin, herring, sand lance and other species with straight or round tail: total length (mm)
- Shrimp, lobster: length of cephalothorax (0.01 mm)
- Snow crab, rock crab: shell width (0.01 mm)
- *Hyas* crab, spiny crab: shell length from eye socket (0.01 mm)
- *Themisto* spp.: total length (0.01 mm)
- Scallop: shell height (0.01 mm)
- For prey which are partially digested but still identifiable to the species level, weigh and enter the mass under Stage 2.
- If the fish or crustacean is fairly digested (has lost a lot of its initial mass), but is still identifiable to the species level due to the otoliths, telson, etc., weigh it and enter the mass under Stage 3. If less than 8 individuals from Stage 1 were measured, and that individuals in Stage 2 are not too digested, measure up to 10.
- When we can say that a digested fish was not a flat fish, we specify it with the code 9974. This is the equivalent of using the code 882 for digested flat fish. If it is too digested to say if it was flat or not, we continue to use 9994 (fish offal).
- Snow crabs, make a separate line of weight by sex, and indicate it in detail code (7 = male, 8 = female, 9 = berried female); check that the type name that appears is valid.
- Hermit crabs: Take them out of their shells before weighing them. The shells will be weighed with the old shells found in the stomach (code 9988).
- Bivalves and gastropods: identify with large groups (family or genus), if possible. If both flesh and shell are present, separate them and weigh them separately. Use separate lines on the entry sheet. Enter in detail code to indicate whether it is the weight of the flesh (83) or the shell (84) in addition in the prey code. When there are shells that are in perfect condition in the stomach, use this method (e.g. *Chlamys islandica* shell 4167 - 84) rather

than the code for old shells. For small bivalves $\leq$ 0.010 g, weigh them whole (80). Bivalve siphons (often the only part ingested): code 3995 - 83. (See Table B.2). The digestion stage depends on the appearance of the siphon (digestion stage is 1, 2 or 3 depending on whether the siphon is intact, slightly degraded, rather to very degraded, respectively).

- Other hard parts often found alone: cephalopod beaks, code 4545 - 86; gastropod opercula, code 3175 - 84.
- If digestion is too advanced, identify to the highest possible taxonomic level, weigh, and enter under Stage 3 (Table B.1).
- Digested shrimp : code 8020 (Natantia) because the Caridea infra-order, code 8037 excludes certain shrimp, such as *Sergestes*. Even if Natantia is no longer in the modern taxonomic nomenclature, it is a group that is useful to us. So Natantia = shrimp.
- Keep the otoliths of redfish, cod, saidas, turbots and flatfishes (even the otoliths found alone), and the beaks of cephalopods. Let them dry, then place them in envelopes, or vials with a label, and write: predator (e.g. cod), vessel, survey, year, set, fish number and the otoliths' species. Put all the otoliths of a species from the same stomach in the same envelope/vial.

29. **Small invertebrates** (mysids, hyperiids, euphausiids, and other groups relatively easy to identify)

    - **Identify the species, weigh all the individuals and pieces together, and enter under Stage 1 if a rapid examination suggests that $\geq$ 50 % are practically intact, Stage 2 otherwise.**
    - Select 10 individuals with little or no digestion, weigh them and enter the result in the column *mass 10 ind*. Do not weigh poorly digested individuals if the stomach has less than 10.
    - **Remove specimens that are too damaged to be identifiable to the species level and weigh them under Stage 3.**
    - Please note: the taxonomy of excessively digested material should not be assumed. Just because a stomach contains a lot of *Themisto libellula* doesn't mean that the remaining *amphipod porridge* belongs to the same species. In this case, in addition to the line for *T. libellula*, create a new line for *Themisto* or *Hyperiids*, according to the available criteria, and put the weight of the material too digested under Stage 3.

30. Small invertebrates difficult to identify and relatively rare (copepods, annelids, gastropods, echinoderms, gammarid amphipods, parasites)

    - Identification to the species level is not necessary unless it is familiar to you. **Masses are listed under Stage 2 if they are poorly digested**, to distinguish them from cases where it is the level of digestion which prevented a more precise identification.

- **Gammarid amphipod**: for certain species of predator, they can be frequent in the stomach contents. In these cases, it pays to push the identification to the species level. Keep them for future validation.
- **Small gastropods**: weigh them with their shells. If they are large enough so it is practical to separate them from their shells, proceed as described above.
- **Nematodes**: code **2585** or species code, if known (often, **2596** in turbot). Make no effort for taxonomy. **They are not digested so register under Stage 1**.
- **Parasitic copepods**: code 9996, and *copepods* in *Remarks*; Stage 1.
- Try to go to the genus and even the species for any organism that is frequently seen in the stomach contents.
- As the taxonomic level is less precise, it is possible to combine several stages of digestion in the same weighing (for example, poorly digested gammarid amphipods with highly digested gammarid amphipods). Enter under **Stage 2** if $\geq$ 50 % of the material is poorly digested, and under **Stage 3** otherwise.
- **Bait** (i.e., slices of fish) : 9993
- **Rocks**: 9982
- **Sand**: 9981
- **Plants, algae**: 9987
- **Plastic, metal**: 9983
- **Insects**: 9989
- **Old shells**, including shells of **hermit crabs**: 9988

32. Highly digested material

- **If present, this is what remains in the original weighing scoop when the other prey has been sorted**; not identifiable, code **9980**, Stage 3.
- If mucus is present and **easy to separate**, weigh it separately and give it the code **9977**. Otherwise, it will be part of the highly digested material.
- If liquid **can be separated** from the slurry, weigh it separately (**9979**).
- Note: weighing the liquid often results in a total mass (sum of all lines) less than the mass of the stomach contents weighed at the beginning due to manipulation/evaporation. Proceeding by subtraction solves this problem: 9979 = (mass stomach content) - (each line of prey)

- For validation, weigh the liquid and compare with the calculated mass. **A small difference (< 1 g)** indicates that some fluid/mucus was lost during transfers between weighing scoops or by evaporation. We ignore it. **A bigger difference** indicates an error when weighing or transcribing data and the different weighing scoops have to be reweighed to find the error.

Data archiving :

33. Finalize the file

    - Make a preliminary **validation** of your data: duplicate stomach number, number of prey types, etc.
    - Select the used lines, copy and paste special, choosing *values only*
    - Remove tabs that are no longer needed
    - Save the file in .xlsx if your Excel version allows it.

34. Archiving: submit the input files on USB key to Claude Nozères or Denis Chabot. They are archived in the directory *S:/Alimentation/Données brutes*. Do not reuse a data file except the day of its creation.

Table B.1. Description of digestion stages used for the examination of stomach contents carried out since September 2000.

Fishes	Invertebrates
Stage 1	
Fish intact, skin and fins slightly damaged.	**Crab or shrimp intact**, shell and appendages only slightly damaged.
Identify to species level and measure the length and weigh up to 10 individuals, randomly selected if number > 10.	**Identify** to species level and measure the width or length, up to 10 individuals, randomly selected if number > 10.
Conserve otoliths : cod, ogac, saida, turbot, redfish and flatfishes.	**Other practically intact invertebrates**: identify the species and weigh 10 individuals in good condition as a whole. Some invertebrates do not have to be identified to the species level even if they are in stage 1 (see detailed protocol).
Stage 2	
Fish identifiable to the species species level and showing at least a beginning of digestion, i.e., the mass is probably less than at the time of ingestion, fins can be eroded and length would be underestimated.	**Invertebrate still identifiable to the species level** but whose size or mass has begun to be reduced by digestion.
If there are fewer than 10 Stage 1 individuals measured for the stomach, and the length of Stage 2 individuals is still reliable, measure the length for up to 10 individuals.	**Identify** the species, except for the gammarid amphipods, annelids, echinoderms (see detailed protocol).
Conserve otoliths: cod, ogac, saida, turbot, redfish and flatfishes.	**Bivalves**: separate the flesh from the shells.
	Crabs and shrimp: if there are less than 10 Stage 1 individuals measured for the stomach, and the length of Stage 2 individuals is still reliable, measure up to 10 individuals.
	Krill, hyperiids, mysids and other invertebrates that we are trying to identify to the species level : take the mass of 10 intact or poorly digested individuals, if there are enough, unless it has already been done with individuals in Stage 1.
Stage 3	
Fishes whose mass has been considerably reduced by digestion but which can still be identified to the species level using otoliths or other structures.	**Digested invertebrate**, possibly still identifiable to the species level by obvious structures or characteristics.

Table B.1. Continued.

Fishes	Invertebrates
Also for **free otoliths** in the stomach.	**Squid beaks or other hard parts** allowing identification to the species level even if the prey is very digested.
Fishes too digested to allow identification to the species level, no hard identifiable parts. Identification depends on the level of digestion. Distinction between a flatfish (Pleuronectiformes, 882) or a digested non-flat fish (9974), and when it is no longer possible, write *digested fish* (2 synonymous codes, 9994 and 999, the first was used more often historically).	**Invertebrates too digested** to allow identification to the species level. Identification can go as far as possible (bivalve, shrimp, hyperiid, amphipod, isopod, etc.).
Unidentifiable and liquid material: Weigh liquid (9979) and mucus (9977), if present, separately from the solids (9980). **Indigestible material**: rock, sand, plant, shell, parasite, plastic, wire, etc. To be weighed and coded (see list).	

Table B.2. Description of the item details for the stomach content examinations carried out as of February 2011.

Code	French	English	Comments	Code	French	English
1	œufs	eggs		35	N5	N5
2	larves	larvae		36	N6	N6
3	mégalopes	megalopa		37	N3-6	N3-6
4	calyptopis	calyptopis		40	parasitique	parasitic
5	petit/juvénile	small/juvenile		50	zoé	zoea
6	gros/adulte	large/adult		51	zoé 1	zoea 1
7	mâle	male		52	zoé 2	zoea 2
8	femelle	female		53	zoé 3	zoea 3
9	femelle œuvée	berried female		54	zoé 4	zoea 4
10	Ci-v	copepodite		55	zoé 5	zoea 5
11	Ci	Ci		56	zoé 6	zoea 6
12	Cii	Cii		57	zoé 7	zoea 7
13	Ci-ii	Ci-ii		58	zoé 8	zoea 8
14	Ciii	Ciii		80	entier	whole
15	Civ	Civ		81	partiel/fragments	parts
16	Cv	Cv		83	chair	flesh/meat
17	Cvi mâle	Cvi male	synonym 7	84	coquille/opercule	shell/operculum
18	Cvi femelle	Cvi female	synonym 8	85	carapace	carapace
19	Civ-v	Civ-v		86	bec	beak
30	nauplius	nauplius		87	tube	tube
31	N1	N1		88	otolithe	otolith
32	N2	N2		89	œil/cristallin	eye/lens
33	N3	N3		90	arrêtes	fish bones
34	N4	N4		91	agrégats	aggregates

APPENDIX C Coefficients b used

It is known that mass-length relationships for the same species can change from year to year for the same ecosystem, as well as between ecosystems, because this relationship is sensitive to the feeding success for each year and ecosystem. For the present study, only the data from the 2015-2017 surveys were kept to calculate each predator's coefficient b. For each predator, an initial data cleansing of the outliers was carried out according to the method provided in Bourdages and Ouellet (2011). The coefficients b used are presented in Table C.1.

Table C.1. Coefficient b, corresponding to the slope of the regression log(mass)$\sim$log(length), used in the calculation of the fullness indices of the selected predators. The value $\mathrm{n_{initial}}$ corresponds to the number of specimens from which both the length and the total mass were measured for the period 2015-2017. The value $\mathrm{n_{final}}$ corresponds to the number of specimens used for the calculation of the coefficient, after the data cleansing of the considered outliers.

Predator	**b**	$\mathrm{n_{initial}}$	$\mathrm{n_{final}}$
Black dogfish	3.082	1029	940
Atlantic halibut	3.202	381	357
Greenland halibut	3.249	10450	9286
Lumpfish	3.087	225	194
Longfin hake	3.503	1100	955
White hake	3.409	2232	1948
Atlantic cod	3.058	6837	6032
Thorny skate	3.164	3351	3000
Smooth skate	3.12	1912	1686
Redfish	3.219	20843	18176

APPENDIX D List of taxa observed

12	*Myxine glutinosa*	Atlantic hagfish	Myxine du Nord
88	Rajidae	Skate	Raie
90	*Amblyraja radiata*	Thorny skate	Raie épineuse
125	Actinopterygii	Bony fish	Poisson osseux
150	*Clupea harengus*	Atlantic herring	Hareng atlantique
187	*Mallotus villosus*	Capelin	Capelan
272	Myctophidae	Lanternfish	Lanterne
275	*Notoscopelus kroyeri*	Kroyer's lanternfish	Lanterne-voilière nordique
320	*Arctozenus risso*	White barracudina	Lussion blanc
426	*Gasterosteus aculeatus*	Threespine stickleback	Épinoche à trois épines
430	Gadiformes	Codfish	Gadoide
436	Gadidae	Codfish	Gade
437	*Gadus* sp.	Cods	Morue
438	*Gadus morhua*	Atlantic cod	Morue franche
451	*Boreogadus saida*	Arctic cod	Saïda franc
461	*Enchelyopus cimbrius*	Fourbeard rockling	Motelle à quatre barbillons
478	*Nezumia bairdii*	Marlin-spike	Grenadier du Grand Banc
572	*Scomber scombrus*	Atlantic mackerel	Maquereau bleu
696	*Ammodytes* sp.	Sand lance	Lançon
700	*Anarhichas lupus*	Atlantic wolffish	Loup atlantique
701	*Anarhichas minor*	Spotted wolffish	Loup tacheté
702	*Anarhichas* sp.	Wolffish	Loup
710	*Stichaeus punctatus*	Arctic shanny	Stichée arctique
711	*Eumesogrammus praecisus*	Fourline snakeblenny	Quatre-lignes atlantique
714	*Lumpenus* sp.	Shannies	Lompénie
716	*Lumpenus lampretaeformis*	Snakeblenny	Lompénie serpent
717	*Leptoclinus maculatus*	Daubed shanny	Lompénie tachetée
723	*Gymnelus* sp.	Pout	Unernak
726	*Lycodes* sp.	Eelpout	Lycode
728	*Lycodes lavalaei*	Newfoundland eelpout	Lycode du Labrador
730	*Lycodes vahlii*	Checker eelpout	Lycode à carreaux
745	*Melanostigma atlanticum*	Atlantic soft pout	Mollasse atlantique
746	*Gymnelus viridis*	Fish doctor	Unernak caméléon
792	*Sebastes* spp.	Redfish	Sébaste
808	Cottidae	Sculpin	Chaboisseau
810	*Artediellus* sp.	Hookear sculpin	Hameçon
814	*Triglops murrayi*	Moustache sculpin	Faux-trigle armé
817	*Myoxocephalus* sp.	Horned sculpins	Chaboisseau
818	*Myoxocephalus aenaeus*	Grubby	Chaboisseau bronzé
819	*Myoxocephalus scorpius*	Shorthorn sculpin	Chaboisseau à épines courtes
823	*Gymnocanthus tricuspis*	Arctic staghorn sculpin	Tricorne arctique
830	*Icelus* sp.	Sculpin	Icèle
831	*Icelus bicornis*	Twohorn sculpin	Icèle à deux cornes
832	*Icelus spatula*	Spatulate sculpin	Icèle spatulée
836	*Leptagonus decagonus*	Atlantic poacher	Agone atlantique
837	*Ulcina olrikii*	Arctic alligatorfish	Poisson-alligator arctique
838	*Aspidophoroides monopterygius*	Alligatorfish	Poisson-alligator atlantique
849	*Cyclopterus lumpus*	Lumpfish	Grosse poule de mer
862	*Liparis gibbus*	Variegated snailfish	Limace marbrée
882	Pleuronectiformes	Flatfish	Poisson-plat

IML	Latin name	English name	French name
887	Pleuronectidae	Righteye flounder	Plie
889	*Hippoglossoides platessoides*	American plaice	Plie canadienne
890	*Glyptocephalus cynoglossus*	Witch flounder	Plie grise
892	*Reinhardtius hippoglossoides*	Greenland halibut	Flétan du Groenland
893	*Hippoglossus hippoglossus*	Atlantic halibut	Flétan Atlantique
1100	Invertebrata	Invertebrate	Invertébré
2165	Actiniaria	Anemone	Anémone de mer
2250	Ctenophora	Comb-jellies	Cténophore
2670	Bryozoa	Bryozoan	Bryozoaire
3000	Nemertea	Proboscis worm, ribbon worm	Ver à proboscis, némerte
3110	Mollusca	Mollusc	Mollusque
3175	Gastropoda	Gastropod	Gastéropode
3212	*Margarites* sp.	Topsnail	Troque
3219	*Margarites costalis*	Boreal rosy margarite	Margarite rosé du Nord
3422	*Cryptonatica affinis*	Arctic moonsnail	Natice close
3491	*Scabrotrophon fabricii*	Murex	Murex
3515	Buccinidae	Whelk	Buccinidé
3516	*Buccinum* sp.	Whelk	Buccin
3517	*Buccinum undatum*	Waved whelk	Buccin commun
3583	*Aulacofusus brevicauda*	Thick-ribbed whelk	Buccin
3786	*Limacina* sp.	Shelled sea butterfly	Papillon de mer
3995	Bivalvia	Bivalve	Bivalve
4008	*Ennucula* sp.	Nutclam	Bivalve
4019	*Nuculana* sp.	Nutclam	Nucule
4025	*Megayoldia thraciaeformis*	Broad yoldia	Bivalve
4227	*Astarte* sp.	Astarte	Astarte
4351	*Ciliatocardium ciliatum ciliatum*	Hairy cockle	Coque d'Islande
4545	Cephalopoda	Cephalopod	Céphalopode
4557	*Rossia* sp.	Bobtail	Sépiole
4753	*Illex illecebrosus*	Northern shortfin squid	Encornet rouge nordique
4878	*Bathypolypus* sp.	Octopus	Pieuvre
4904	*Bathypolypus bairdii*	Baird's spoonarm octopus	Poulpe de Baird
4950	Polychaeta	Polychaete	Polychète
4953	*Phyllodoce* sp.	Paddle worm	Polychète
4955	*Phyllodoce groenlandica*	Paddle worm	Polychète
5002	*Aphrodita hastata*	Sea mouse	Souris de mer
5007	Polynoidae	Fifteen-scaled worm	Polychète
5113	*Nephtys* sp.	Red-lined worm	Polychète
5277	Maldanidae	Bamboo worm	Polychète
5285	*Praxillella* sp.	Bamboo worm	Polychète
5477	Eunicidae	Seaworm	Polychète
5479	*Eunice pennata*	Seaworm	Polychète
5490	Lumbrineridae	Seaworm	Polychète
5614	Terebellida	Terebellid worm	Polychète
5617	*Cistenides granulata*	Trumpet worm	Ver-trompette
5673	Terebellidae	Terebellid worm	Polychète
5746	Flabelligeridae	Flabelligerid worm	Polychète
5930	Echiura	Echiurid	Échiure
5961	*Nymphon* sp.	Sea spider	Araignée de mer
6000	Crustacea	Crustacean	Crustacé

IML	Latin name	English name	French name
6020	Ostracoda	Ostracod	Ostracode
6080	Copepoda	Copepod	Copépode
6081	Calanoida	Calanoid copepod	Copépode calanoide
6083	*Calanus* sp.	Calanoid copepod	Copépode calanoide
6084	*Calanus finmarchicus*	Calanoid copepod	Copépode calanoide
6085	*Calanus hyperboreus*	Calanoid copepod	Copépode calanoide
6095	*Calanus finn. + glacialis*	Calanoide copepod	Copépode calanoide
6111	*Bradyidius similis*	Calanoid copepod	Copépode calanoide
6152	*Chiridius gracilis*	Calanoid copepod	Copépode calanoide
6154	*Aetideopsis armata*	Calanoid copepod	Copépode calanoide
6158	Aetideidae	Calanoid copepod	Copépode calanoide
6208	*Paraeuchaeta norvegica*	Calanoid copepod	Copépode calanoide
6264	*Metridia* sp.	Calanoid copepod	Copépode calanoide
6265	*Metridia longa*	Calanoid copepod	Copépode calanoide
6266	*Metridia lucens*	Calanoid copepod	Copépode calanoide
6595	Balanidae	Barnacle	Balane
6620	Cumacea	Cumacean	Cumacé
6760	Isopoda	Isopod	Isopode
6769	Aegidae	Isopod	Isopode
6771	*Aega psora*	Isopod	Isopode
6782	*Calathura brachiata*	Isopod	Isopode
6791	*Syscenus infelix*	Isopod	Isopode
6817	*Idotea* sp.	Isopod	Isopode
6930	Amphipoda	Amphipod	Amphipode
6960	Hyperiidae	Hyperiid	Hypéridé
6967	*Themisto* sp.	Hyperiids	Hypéridé
6968	*Themisto abyssorum*	Hyperiid	Hypéridé
6970	*Themisto compressa*	Hyperiid	Hypéridé
6972	*Themisto libellula*	Hyperiid	Hypéridé
6976	*Hyperia* sp.	Hyperiid	Hypéridé
6977	*Hyperia galba*	Hyperiid	Hypéridé
6979	*Scina borealis*	Hyperiid	Hypéridé
6980	Gammaridea	Gammarid	Gammaride
6995	Ampeliscidae	Gammarid	Gammaride
6996	*Ampelisca* sp.	Gammarid	Gammaride
6999	*Ampelisca eschrichti*	Gammarid	Gammaride
7022	*Byblis* sp.	Gammarid	Gammaride
7025	*Byblis gaimardi*	Gammarid	Gammaride
7193	Eusiridae	Gammarid	Gammaride
7195	*Eusirus cuspidatus*	Gammarid	Gammaride
7210	*Rhachotropis* sp.	Gammarid	Gammaride
7211	*Rhachotropis aculeata*	Gammarid	Gammaride
7214	*Rhachotropis inflata*	Gammarid	Gammaride
7262	Melitidae	Gammarid	Gammaride
7267	*Melita* sp.	Gammarid	Gammaride
7268	*Melita dentata*	Gammarid	Gammaride
7277	*Maera* sp.	Gammarid	Gammaride
7279	*Maera loveni*	Gammarid	Gammaride
7357	Lysianassidae	Gammarid	Gammaride
7359	*Tmetonyx* sp.	Gammarid	Gammaride

IML	Latin name	English name	French name
7361	*Tmetonyx cicada*	Gammarid	Gammaride
7389	*Anonyx* sp.	Gammarid	Gammaride
7391	*Anonyx lilljeborgi*	Gammarid	Gammaride
7441	*Onisimus* sp.	Gammarid	Gammaride
7483	*Neohela monstrosa*	Gammarid	Gammaride
7511	Oedicerotidae	Gammarid	Gammaride
7512	*Monoculodes* sp.	Gammarid	Gammaride
7586	*Paramphithoe hystrix*	Gammarid	Hérisson des éponges
7620	*Protomedeia* sp.	Gammarid	Gammaride
7621	*Protomedeia fasciata*	Gammarid	Gammaride
7691	*Wimvadocus torelli*	Gammarid	Gammaride
7750	*Stegocephalus inflatus*	Gammarid	Gammaride
7877	*Syrrhoe* sp.	Gammarid	Gammaride
7878	*Syrrhoe crenulata*	Gammarid	Gammaride
7881	Caprellidae	Caprellid	Caprellide
7890	*Aeginina longicornis*	Caprellid	Caprellide
7925	Mysida	Mysid	Mysidacé
7932	Mysidae	Mysid	Mysidacé
7933	*Boreomysis* sp.	Mysid	Mysidacé
7935	*Boreomysis arctica*	Mysid	Mysidacé
7940	*Erythrops* sp.	Mysid	Mysidacé
7941	*Erythrops erythrophthalma*	Mysid	Mysidacé
7947	*Meterythrops robusta*	Mysid	Mysidacé
7957	*Pseudomma* sp.	Mysid	Mysidacé
7960	*Pseudomma roseum*	Mysid	Mysidacé
7967	*Mysis* sp.	Mysid	Mysidacé
7982	*Stilomysis* sp.	Mysid	Mysidacé
7983	*Stilomysis grandis*	Mysid	Mysidacé
7991	Euphausiacea	Euphausiid	Euphausiacé
7992	Euphausiidae	Euphausiid	Euphausiacé
7994	*Meganyctiphanes norvegica*	Northern krill	Krill nordique
8000	*Thysanoessa* sp.	Euphausiid	Euphausiacé
8019	Decapoda	Crustacean decapod	Crustacé decapode
8020		Digested shrimp	Crevette digérée
8033	*Eusergestes arcticus*	Arctic sergestid	Sergestidé arctique
8035	*Sergia robusta*	Scarlet sergestid	Sergestidé écarlate
8055	*Pasiphaea* sp.	Glass shrimp	Sivade
8057	*Pasiphaea multidentata*	Pink glass shrimp	Sivade rose
8069	Hippolytidae	Shrimp	Bouc
8074	*Eualus* sp.	Eualid	Bouc
8075	*Eualus fabricii*	Arctic eualid	Bouc Arctique
8077	*Eualus macilentus*	Greenland shrimp	Bouc du Groenland
8079	*Eualus gaimardii*	Circumpolar eualid	Bouc circumpolaire
8080	*Eualus gaimardii gaimardii*	Gaimard's eualid	Bouc de Gaimard
8081	*Eualus gaimardii belcheri*	Belcher's eualid	Bouc de Belcher
8084	*Spirontocaris* sp.	Blade shrimps	Bouc
8085	*Spirontocaris spinus*	Parrot shrimp	Bouc perroquet
8086	*Spirontocaris phippsii*	Punctate blade shrimp	Bouc ponctué
8087	*Spirontocaris liljeborgii*	Friendly blade shrimp	Bouc épineux
8092	*Lebbeus groenlandicus*	Spiny lebbeid	Crevette du Groenland

IML	Latin name	English name	French name
8093	*Lebbeus polaris*	Polar lebbeid	Crevette polaire
8095	*Lebbeus microceros*	Zebra lebbeid	Crevette zebrée
8110	*Pandalus* sp.	Boreal red shrimps	Crevette
8111	*Pandalus borealis*	Northern shrimp	Crevette nordique
8112	*Pandalus montagui*	Striped pink shrimp	Crevette ésope
8117	Crangonidae	Crangon shrimp	Crevette crangonidée
8119	*Sclerocrangon boreas*	Sculptured shrimp	Crevette de roche
8127	*Sabinea* sp.	Shrimp	Crevette
8128	*Sabinea septemcarinata*	Sevenline shrimp	Crevette à sept lignes
8129	*Sabinea sarsii*	Sars shrimp	Crevette de Sars
8135	*Pontophilus norvegicus*	Norwegian shrimp	Crevette de Norvège
8138	*Argis dentata*	Arctic argid	Crevette verte
8154	*Homarus americanus*	American lobster	Homard américain
8164	*Munidopsis curvirostra*	Curved squat lobster	Galathée courbée
8173	*Calocaris templemani*	Templeman's lobster shrimp	Crevette fouisseuse de Templeman
8177	Paguridae	Right handed hermit crab	Bernard l'ermite
8178	*Pagurus* sp.	Hermit crab	Bernard l'ermite droitier
8180	*Pagurus pubescens*	Pubescent hermit crab	Bernard l'hermite pubescent
8196	*Lithodes maja*	Northern stone crab	Crabe épineux du nord
8203	Brachyura	Crab	Crabe
8212	*Chionoecetes* sp.	Tanner crab	Crabe des neiges
8213	*Chionoecetes opilio*	Snow crab	Crabe des neiges
8216	*Hyas* sp.	Lyre crab	Crabe lyre
8217	*Hyas araneus*	Toad crab	Crabe araignée
8218	*Hyas coarctatus*	Arctic lyre crab	Crabe lyre arctique
8290	Holothuroidea	Sea cucumber	Holothurie
8319	*Pentamera calcigera*	Pale sea cucumber	Concombre de mer pâle
8363	*Strongylocentrotus* sp.	Sea urchins	Oursin
8378	*Brisaster fragilis*	Mud heart urchin	Oursin coeur de vase
8530	Ophiuroidea	Brittle star	Ophiure
8550	Ophiuridae	Brittle star	Ophiure
8551	*Ophiura* sp.	Brittle star	Ophiure
8552	*Ophiura robusta*	Brittle star	Ophiure
8553	*Ophiura sarsii*	Sar's brittle star	Ophiure de Sars
8583	*Ophiopholis aculeata*	Daisy brittle star	Ophiure pâquerette
8742	*Ascidia* sp.	Tunicate	Ascidie
9974		Digested roundfish	Poisson rond digéré
9980		Unidentified digested material	Matériel digéré non-identifié
9984	Pisces	Fish (spawn) egg	Oeuf de poisson
9986		Unidentified egg	Oeuf non-identifié
9994		Digested fish	Poisson digéré
9995		Digested invertebrates	Invertébré digéré
9998		Empty	Vide

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5 CITED REFERENCES

Bernier, B., and Chabot, D. 2013. Évaluation de l'état du stock de flétan du Groenland (*Reinhardtius hippoglossoides*) du golfe du Saint-Laurent (4RST) en 2010 et description de son régime alimentaire. Secr. can. de consult. sci. du MPO. Doc. de rech. 2012/140: viii + 85 p.

Bourdages, H., Brassard, C., Desgagnés, M., Galbraith, P., Gauthier, J., Nozères, C., Senay, C., Scallon-Chouinard, P.-M., and Smith, A. 2018. Résultats préliminaires du relevé multidisciplinaire de poissons de fond et de crevette d'août 2017 dans l'estuaire et le nord du golfe du Saint-Laurent. Secr. can. de consult. sci. du MPO. Doc. de rech. 2018/036: iv + 90 p.

Bourdages, H., and Ouellet, J.-F. 2011. Répartition géographique et indices d'abondance des poissons marins du nord du golfe du Saint-Laurent (1990–2009). Rapp. tech. can. sci. halieut. aquat. 2963: vi + 171 p.

Bowering, W.R., and Lilly, G.R. 1992. Greenland halibut (*Reinhardtius hippoglossoides*) off Southern Labrador and Northeastern Newfoundland (Northwest Atlantic) feed primarily on capelin (*Mallotus villosus*). Neth. J. Sea Res. 29(1): 211–222.

de Lafontaine, Y., Demers, S., and Runge, J. 1991. Pelagic food web interactions and productivity in the Gulf of St. Lawrence: a perspective. *In* The gulf of st. Lawrence: Small ocean or big estuary? *Edited by* J.-C. Therriault. Can. Spec. Publ. Fish. Aquat. Sci. 113. p. 99–123.

Dutil, J.-D., Castonguay, M., Gilbert, D., and Gascon, D. 1999. Growth, condition, and environmental relationships in Atlantic cod (*Gadus morhua*) in the northern Gulf of St. Lawrence and implications for management strategies in the Northwest Atlantic. Can. J. Fish. Aquat. Sci. 56(10): 1818–1831.

Galbraith, P.S., Chassé, J., Caverhill, C., Nicot, P., Gilbert, D., Lefaivre, D., and Lafleur, C. 2018. Physical oceanographic conditions in the Gulf of St. Lawrence during 2017. Secr. can. de consult. sci. du MPO. Doc. de rech. 2018/050: v + 79 p.

Hovde, S.C., Albert, O.T., and Nilssen, E.M. 2002. Spatial, seasonal and ontogenetic variation in diet of Northeast Arctic Greenland halibut (*Reinhardtius hippoglossoides*). ICES J. Mar. Sci. 59(2): 421–437.

Miller, R., and Chabot, D. 2014. Liste des codes des plantes, invertébrés et vertébrés marins utilisés par la région du Québec du MPO. Rapp. stat. can. sci. halieut. aquat. 1254: iv + 115 p.

Orr, D.C., and Bowering, W.R. 1997. A multivariate analysis of food and feeding trends among Greenland halibut (*Reinhardtius hippoglossoides*) sampled in Davis Strait, during 1986. ICES J. Mar. Sci. 54(5): 819–829.

Ouellet, P., Savenkoff, C., Benoît, H.P., and Galbraith, P.S. 2015. A comparison of recent trends

in demersal fish biomass and their potential drivers for three ecoregions of the Gulf of St Lawrence, Canada. ICES J. Mar. Sci. 73(2): 329–344.

Savenkoff, C., Castonguay, M., Chabot, D., Hammill, M.O., Bourdages, H., and Morissette, L. 2007. Changes in the northern Gulf of St. Lawrence ecosystem estimated by inverse modelling: evidence of a fishery-induced regime shift? Estuar. Coast. Shelf Sci. 73(3): 711–724.