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Preliminary results from the ecosystemic survey in August 2022 in the Estuary and northern Gulf of St. Lawrence

Hugo Bourdages, Jean-Martin Chamberland, Mathieu Desgagnés, Peter Galbraith, Laurie Isabel, Jordan Ouellette-Plante, Marie-Julie Roux and Caroline Senay

Fisheries and Oceans Canada
Maurice Lamontagne Institute
850 Route de la Mer
Mont-Joli, Quebec G5H 3Z4

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Canada

Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

Fisheries and Oceans Canada conducts an annual multidisciplinary survey in the Estuary and northern Gulf of St. Lawrence. The objectives of this survey are varied; assess the biodiversity of species found near the bottom; estimate the abundance of groundfish and invertebrates; assess physical and biological (phytoplankton and zooplankton) oceanographic conditions; monitor the pelagic ecosystem; and collect samples for various research projects. In 2022, the survey was conducted between August 7 and September 15 on board the CCGS *Teleost* and the CCGS *John Cabot*. During this mission, 181 and 176 trawl tows were completed, respectively on the *Teleost* and the *John Cabot*. In addition, 92 vertical profiles of the water column were carried out in order to characterize the oceanographic conditions and 63 zooplankton samples were also collected.

This report presents the results of catches of 194 tows. In total, 78 fish taxa and 208 invertebrate taxa were identified during the mission. Historical perspectives (catch rates, spatial distribution and length frequency) are presented for 25 taxa. These commercial fishery-independent data will be used in several stock assessments including cod (*Gadus morhua*), redfish (*Sebastes spp.*), Greenland halibut (*Reinhardtius hippoglossoides*), Atlantic halibut (*Hippoglossus hippoglossus*), witch flounder (*Glyptocephalus cynoglossus*), and northern shrimp (*Pandalus borealis*).

A preliminary analysis of water temperature data collected in 2022 shows that conditions have warmed at depths greater than 150 m, establishing new records since 1915 at 150 m, 200 m and 300 m. The August cold intermediate layer minimum temperature was only slightly cooler in 2022 than in 2021 when it attained the highest recorded values observed in contemporary CTD era. Surface water temperatures were above normal in July-August.

INTRODUCTION

Fisheries and Oceans Canada (DFO) conducts an annual bottom trawl survey in the Estuary and the northern Gulf of St. Lawrence. This is a multi-species, fishery-independent survey. Its purpose is to assess the ecosystem with consistent and standardized protocols. This survey examines, among other things, spatial and temporal changes in the distribution and relative abundance of fish and their assemblages. It also aims to gather information on the biological parameters of commercial species.

The main objectives are to:

1. assess groundfish and Northern Shrimp population abundances and conditions;
2. assess environmental conditions;
3. conduct a biodiversity inventory of benthic and demersal megafauna;
4. assess phytoplankton and mesozooplankton abundances;
5. monitor the pelagic ecosystem;
6. collect samples for various research projects.

Since 2005, the survey has been conducted from the vessel CCGS *Teleost*, equipped with a *Campelen* 1800 shrimp trawl. However, it was decided to replace the fishing platform and slightly modify the fishing gear to continue the annual survey beyond 2022 from the vessel CCGS *John Cabot*, equipped with a modified *Campelen* 1800 shrimp trawl. It was agreed that a comparative fishing mission was necessary in order to be able to estimate the difference in catchability between the two vessel-trawl tandems.

In 2022, the survey was conducted between August 7 and September 15 onboard the CCGS *Teleost* and the CCGS *John Cabot* (mission IML-2022-039) in the context of a comparative fishing experiment. Moreover, this mission took place in the context of the Covid-19 pandemic. Sanitary measures were in place and the science crew had to be reduced from 15 to 11 scientists on the CCGS *Teleost* and from 11 to 9 on the CCGS *John Cabot*. The absence of observers for marine mammals and seabirds during the survey meant that the inventory objectives for these species could not be achieved.

SURVEY DESCRIPTION

The survey covers the waters of the Laurentian Channel and the area north of it, from the Lower Estuary in the west to the Strait of Belle Isle and the Cabot Strait in the east, namely, the Northwest Atlantic Fisheries Organization (NAFO) divisions 4R, 4S, and the northern part of 4T (Figure 1). Since 2008, the coverage of division 4T has been increased in the upstream part of the Lower Estuary in order to sample the depths between 37 and 183 m. The study area is 118 587 km^2.

A stratified random sampling strategy was used for this survey. This technique consisted in subdividing the study area into more homogeneous strata. The area was divided into 56 strata based on depth, NAFO division, and substrate type (Figure 2). A total of 200 trawl stations were initially allocated in the study area, proportional to the stratum surface areas, with a minimum of two stations per stratum. The tow positions were chosen randomly within each stratum. Since 2014, a new rule was added to respect a minimum distance of 10 km between stations in the same stratum.

The fishing gear used on the CCGS *Teleost* is a four-sided Campelen 1800 shrimp trawl equipped with Rockhopper footgear (“bicycle”) (McCallum and Walsh 2002). The trawl

lengthening and codend are equipped with a 12.7-mm knotless nylon lining. A new slightly modified version of this trawl was used on the CCGS *John Cabot* , to make it less susceptible to damage and to improve its repairability[1].

Standard trawling tows lasted 15 minutes, starting from the time the trawl touched the sea floor as determined by the *Scanmar*TM hydroacoustic system. Towing speed was 3 knots. Information on trawl geometry (horizontal spread of the doors and wings, vertical opening of the trawl, depth) was recorded for each tow using *Scanmar*TM hydroacoustic sensors mounted on the fishing gear.

For each fishing tow on board the CCGS *Teleost*, the catch was sorted and weighed by taxa and sub-samples of biological data were then collected. For fish, crabs and squids, size and weight were individually measured. For some species, sex, maturity, and the weight of certain organs (stomach, liver, gonads) were also evaluated. Counts of soft anal fin rays for redfish were conducted to distinguish between the two species. Otoliths were saved for cod, Atlantic halibut, Greenland halibut, witch flounder, and redfish to conduct ageing analyses. A sample of approximately 2 kg of shrimps was sorted and weighed by species as well as by stage of maturity for northern shrimp. Shrimps were measured individually. Other invertebrates were counted (no individual measurements) and photographed. The photos were archived in a photo catalogue with associated keywords (taxonomic identification, station description, date, etc.).

The protocol on the CCGS *John Cabot* was simplified during this survey. As on the *Teleost*, the catch was sorted and weighed by taxon. The same individual biological data were also collected on a sub-sample of the catch, however, otoliths were not collected. Some of the shrimp samples were not measured during the mission, but were frozen and brought back to the laboratory and analyzed in the fall of 2022. Requests for additional samples for various scientific projects, such as stomach, species or genetic samples, were only collected from the CCGS *Teleost*.

Since 2001, an increased effort in the identification of species has been aided through the use of digital photos. These additional efforts have targeted fish since 2004 (Dutil et al. 2009) and invertebrates since 2005 (Nozères et al. 2014). An identification guide for marine fishes in the estuary and northern Gulf of St. Lawrence (Nozères et al. 2010), a shrimp atlas (Savard and Nozères 2012), and a guide for invertebrates (Nozères and Archambault 2014) were used during the mission to identify most taxa. The taxon codes and their names followed Miller and Chabot (2014) and updated annually according to the World Register of Marine Species (WoRMS).

Additional samples were taken for various scientific projects:

1. Water samples for genetic analyses of environmental DNA;
2. Greenland halibut tissue samples for population genetic analyses;
3. Beluga and marine mammal preys (several fish species and northern shrimp) in order to follow the evolution of isotopic signatures of key species in the St. Lawrence ecosystem;
4. Stomachs of several fish species in order to describe their diet;
5. Samples of small demersal fish;

[1] Benoît, H.P., and Yin, Y. 2023. Results of comparative fishing between the CCGS Teleost and CCGS John Cabot in the Estuary and Northern Gulf of St. Lawrence in 2021 and 2022. DFO Can. Sci. Advis. Sec. Res. Doc. In preparation.

6. Squid samples to study their trophic role in the ecosystem;
7. Sponges (Porifera) for identification;
8. Collection of tunicate species to identify the presence of potentially invasive species;
9. Samples of herring, capelin and mackerel for maturity determination;
10. Small redfish (< 11 cm) for genetic identification of the species (*Sebastes fasciatus* and *S. mentella*) and the population of new cohorts observed in the Gulf;
11. Monitoring redfish growth from the 2011 cohort.

Oceanographic conditions such as temperature, conductivity (salinity), turbidity, dissolved oxygen, luminosity, and fluorescence were sampled during this survey. A total of 79 vertical profiles of the water column were done at the fishing stations as well as 13 extra stations that fall under the Atlantic Zone Monitoring Program (AZMP). The various equipment, *CTD SeaBird 911Plus*™, dissolved oxygen sensor (*SBE 43*), photometer (*Biospherical*) and fluorometer (*Eco-FLNTU Wetlabs*) were coupled to the rosette of Niskin bottles. For each profile obtained using the rosette, water samples were also taken at several depths to determine their salinity, pH, dissolved oxygen concentration (Winkler titration), nutritive salt content (nitrite, nitrate, phosphate, silicate), and chlorophyll content. In addition, a *CTD SBE 19Plus*™ device (temperature and salinity), coupled to a dissolved oxygen sensor (*SBE 63*), was also installed on the back of the trawl, thereby allowing oceanographic data to be collected for the 181 fishing tows on the CCGS *Teleost* and for 176 fishing tows on the CCGS *John Cabot*.

In order to study the distribution and biomass of zooplankton for the entire territory covered by the survey, part of the sampling program consisted of collecting organisms at 63 stations using a zooplankton net (202 µm) drawn vertically, from the bottom to the surface.

Water column hydroacoustic data at four frequencies (38, 70, 120 and 200 kHz) were recorded using a *SIMRAD™ EK60* echosounder during the entirety of the mission. These data will be used to develop a three-dimensional database to map the pelagic ecosystem.

DATA ANALYSIS

Abundance and biomass data collected on species caught in 2022 were integrated into the series of annual summer survey series initiated in 1990. During this period, three vessel-gear tandems were used (1990-2005: CCGS *Alfred Needler – URI 81'/114'* trawl; 2004-2022: CCGS *Teleost – Campelen 1800* trawl; 2022: CCGS *John Cabot* – modified *Campelen 1800* trawl). The integrity of the time series has been preserved thanks to comparative fishing studies to quantify the difference in catchability between vessel-gear tandems. The first study took place in 2004-2005 between the *Needler* and the *Teleost* (Bourdages et al. 2007) and the second study in 2021-2022 between the *Teleost* and the *John Cabot*[1]. Conversion factors for taxa were therefore applied to catches and length frequencies for taxa where the difference in catchability was significant. The results presented in this document are all expressed as the equivalent of the most recent vessel used, the CCGS John Cabot with a modified *Campelen* 1800 trawl.

In 2021 and 2022, several stations were successfully fished at the same time by the two vessels as part of the comparative fishing experiments, i.e. 21 and 161 stations respectively. For the analyses, in order to avoid pseudo-replicas, i.e. information from two trawl tows at the same station at the same time, only the *Teleost* stations were kept for the comparative stations. So in 2021, the 21 *John Cabot* stations were not retained for the analyses. In 2022, 13 stations from the *John Cabot*, those towed successfully by only this vessel, were retained for the analyzes while the 161 comparative fishing stations from the *John Cabot* were not retained.

The annual catch rate indices, in terms of the mean number and weight (kg) per standardized tow (15 minutes tow, i.e. a swept area of 0.75 nautical miles with an average wingspread of 16.71 m (wingspread average for the *Campelen* trawl on the *John Cabot*)), and their confidence intervals were estimated using the estimators for stratified random sampling (Appendix 1). Given that over the years, some strata were not sampled with a minimum of two successful tows (Table 1), a multiplicative model of the form:

log(catch rate + 0.01) ~ stratum + year,

was used to estimate the catch rate indices of these missing strata. This model provided a predicted value for strata with less than two tows using the data of the current year and the previous three years, or from the current year and the three adjacent years for missing strata in the first three years of the series. Thus, indicators presented for the series are representative of a standard total area of 116 115 km^2, the sum of the area of all strata. In addition, reference points were also added to the catch rate figures. The solid line represents the 1990-2021 period average (long-term average) and the two dotted lines associated to the mean ±0.5 standard deviation corresponding respectively to the upper and lower reference limits.

Note that the distinction between the two redfish species, *S. fasciatus and S. mentella*, is based on the analysis of the soft anal fin rays counts and the depth of capture of individuals (Senay et al. 2021).

Length frequency distributions are presented in two different forms. The first figure shows the distribution for the last two years of the series plus the average distribution for the 1990-2021 period (long-term average distribution). Frequency values are expressed as the average number of individuals caught per tow in increment of 1 cm, except for the northern shrimp (0.5 mm) and Atlantic halibut (3 cm). The second figure represents the length distributions in length mean per class length for each year of the historical surveys series (1990 to 2022).

The geographical distribution of catches by weight per tow (kg/15 minute tow, except for sea pens number/15 minute tow) was made for periods of five or six years. The interpolation of CPUE (catch per unit of effort) was performed on a grid covering the study area using a inverse proportional distance weighting (R version 2.13.0, Rgeos library; R Development Core Team 2011). The isoline contours were then plotted for four CPUE levels which approximate the 20^{th}, 40^{th}, 60^{th} and 80^{th} percentiles of the non-zero values. The catch rate distributions for the 2022 survey are also presented in a bubble map.

The preliminary results for the abundance and biomass indices, the catch rate distribution maps, and the size frequency distributions for about 25 taxa are presented in figures 4 to 62. These results are preliminary and must be considered as such until validations and laboratory analyses have been completed.

Two ecological indices were calculated: one based on grouping taxa into trophic guilds and the other on their thermal preferences. These indices aimed to detect directional changes in the structure of the marine community sampled by the survey. The trophic guild index was used to track structural changes that affect energy flows in the ecosystem while the thermal group index was used to track changes in community structure due to environmental conditions.

To calculate the trophic guild index, seven guilds were defined: benthivorous fishes, filter-feeding invertebrates, piscivorous fishes and invertebrates, mesopelagic micronekton, demersal micronekton, benthivorous invertebrates as well as limivorous and detritivorous fishes and invertebrates. Each taxon was assigned to a single trophic guild according to its main diet. The list of species used for this indicator is shown in Appendix 2. The taxonomic resolution of the species sampled in the survey has increased since 1990 and stabilized in 2006. For this reason, only data from 2006 to present are used in the calculation of the trophic guild index. Redfish

were also excluded from the analyses. Since they account for 82% of the captures' biomass, their guild dominates the figures and makes interpreting the trends of other guilds difficult. The variation in the biomasses of each trophic guild are presented as CPUEs and as anomalies (i.e. Z-score) in Figure 63.

For the ecological index based on thermal groups, the species selected for each group were determined by a team of experts from DFO. The warm group was made up of silver hake (Merluccius bilinearis), northern shortfin squid (Illex illecebrosus), and Atlantic argentine (Argentina silus). The cold group was made up of Arctic cod (Boreogadus saida), Newfoundland spiny lumpsucker (Eumicrotremus terraenovae), northern shrimp (Pandalus borealis), and Greenland halibut (Reinhardtius hippoglossoides). The variation in thermal group biomasses are presented in terms of anomalies in Figure 64.

The average weight per tow for 57 taxa of fish and 99 taxa of invertebrates are given in figures 65 and 66. In these figures, a color code was used to represent the differences between the CPUE in a given year and the average CPUE in the time series divided by the standard deviation of CPUE series.

The catches per tow for fish taxa are available on the St. Lawrence Global Observatory (SLGO).

Finally, Table 2 provides a list of all taxa, vertebrates and invertebrates, caught among the 194 successful tows achieved during the 2022 survey. The occurrence (the number of tows where the taxa was identified), as well as the total catch, by weight and numbers, are also presented. The number of specimens measured per taxon and some descriptive statistics for the length parameter are also presented in Table 3.

RESULTS

Warning: the bottom trawl survey is designed to sample demersal species. However, catches may also include pelagic species and species associated with coastal or rocky habitats which are more difficult to trawl. Although these taxa are found in catches, they have low catchability by bottom trawl net. Some caution is required when interpreting the results obtained for these taxa.

In 2022, 194 fishing stations were successfully completed, i.e. 57 in 4R, 91 in 4S and 46 in 4T, on a planning of 200 stations. All strata were sampled with a minimum of two stations (Figure 3 , Table 1).

BIODIVERSITY

In total, 78 fish taxa and 208 invertebrate taxa were identified in 2022 (Table 2).

For the first time for this survey, two tows were carried out in the Mécatina Trough. Biodiversity observed at each stations was high. A total of 63 and 64 taxa were captured at one of those stations (Appendix 3). Several rare cold-water species in the northern Gulf of St. Lawrence were observed there: bigeye sculpin (n=2), spatulate sculpin (n=2) and Arctic cod (n=415). In addition, gelatinous seasnails (n=5) were captured. This is the first capture of this species in the NGSL survey since 2003. Snow crab and Greenland shrimp were there in large numbers

In 2022, the biomass of the two redfish species combined accounted for 82% of the biomass of all captured organisms in the survey (e.g., invertebrates, pelagic fish, demersal fish and groundfish), while it averaged 15% between 1995 and 2012 (Figure 4). The Atlantic redfish (*Sebastes mentella*) constituted, alone 75% of the catches made during the survey, indicating that they actually dominate the ecosystem of the bottom of the GSL.

Demersal micronekton have been decreasing since 2016 (Figure 63). This guild includes several species of shrimps, the amphipod *Epimeria loricata* and the cephalopods *Rossia* sp. Mesopelagic micronekton, composed of the pink glass shrimp (*Pasiphaea multidentata*) and the hydrozoan *Ptychogena lactea*, have been decreasing between the 2006-2014 and 2015-2022 periods (Figure 63 B). Benthivorous fishes have been increasing throughout the series (Figure 63 A). This result is explained by the observed increases among several species of flatfish such as American plaice, witch flounder, and Atlantic halibut. No clear trend was observed for piscivorous fishes and invertebrates, filter-feeding invertebrates, and for limivorous and detritivorous fishes and invertebrates.

Warm-water species (silver hake, northern shortfin squid, and Atlantic Argentine) are increasing between 2017 and 2020 and decreasing again in 2021 and 2022 (Figure 64 A). Analyses by species show that silver hake and Atlantic argentine have been increasing for the past two (2) years (Figure 65). The decreases observed are caused by squid. The presence of squid in the catches began to increase in 2015 to reach a peak in abundance in 2020 then decreased again in 2021 and 2022 (Figure 56). Still, the biomass of this species remains higher than before 2015 when the species was only harvested in small quantities at only a few stations. Cold-water species (Atlantic cod, Newfoundland spiny lumpsucker, northern shrimp and Greenland halibut) have been declining since 2004 (Figure 64 B). These results suggest that the warming of the northern Gulf of St. Lawrence has already begun to affect the composition of marine communities.

Fish

The abundance and the biomass of the **black dogfish** (*Centroscyllium fabricii*) have been above average for the past ten years (Figures 5 to 7).

Capelin (*Mallotus villosus*) was mainly distributed in the Estuary, along the North Shore and north of the west coast of Newfoundland (Figure 8).

For the past nine years, abundance and biomass of **Atlantic halibut** (*Hippoglossus hippoglossus*) has remained above the series average (Figures 9 to 11). The 2022 values were among the three highest observed, both for biomass and abundance.

The abundance of **Greenland halibut** (*Reinhardtius hippoglossoides*) in 2022 is lower than the 2021 estimate and was slightly below the series average. Biomass decreased in 2022 with regards to 2021 and was close to the series average. Size frequency distributions indicate that the 2021 cohort (mode of 16 cm) and the 22 cm-32 cm fish abundance were lower than the average, while the 32-45 cm fish abundance was above average (Figures 12 to 14).

Lumpfish (*Cyclopterus lumpus*) is a rare but regular catch in this survey. Abundance and biomass were below the series average in 2022 (Figures 15 to 17).

Atlantic herring (*Clupea harengus*) is a frequent catch in this survey and was distributed throughout the northern Gulf of St. Lawrence with the exception of the depths of the Laurentian Channel. The highest catches were observed along the west coast of Newfoundland (Figure 18).

Atlantic wolffish (*Anarhichas lupus*) and **spotted wolffish** (*Anarhichas minor*) were caught on 30 and 6 occasions, respectively, in 2022. These catches were mainly distributed in the northern eastern part of the Gulf of St. Lawrence (Figures 19 and 20).

Since 2007, **silver hake** (*Merluccius bilinearis*) has been more common in the northern Gulf, before it was only occasionally observed (Figures 21 to 23).

The abundance and biomass of the **longfin hake** (*Phycis chesteri*) were below the series average in 2022 (Figures 24 to 26).

The abundance and biomass of **white hake** (*Urophycis tenuis*) have been at or above the average for ten years (Figures 27 to 29).

In 2022, the abundance and biomass indices of **Atlantic cod** (*Gadus morhua*) have continued to increase and were above the average of their respective series. Two length frequency modes were observed from 10 to 20 cm (juvenile cod) and from 30 to 42 cm (2018 cohort). These two length ranges had abundances well above the series average. The geographical distribution of catches in 2022 was comparable to 2021 (Figures 30 to 32).

American plaice (*Hippoglossoides platessoides*) was frequently caught and its abundance and biomass were stable and above average (Figures 33 to 35).

Witch flounder (*Glyptocephalus cynoglossus*) was frequently caught. The strong cohorts from 2007 and 2009 have contributed to the increase in biomass; these fish are now larger than 30 cm (Figures 36 to 38).

Thorny skate (*Amblyraja radiata*) and **smooth skate** (*Malacoraja senta*) are both caught frequently. The abundance of thorny skate was stable and near the series average. The abundance decreased below the average for smooth skate (Figures 39 to 44).

Arctic cod (*Boreogadus saida*) is a small cold water demersal fish. Catches in recent years have been made in the Estuary, along the North Shore and on the west coast of Newfoundland (Figures 45 to 46).

Acadian redfish abundance and biomass (*Sebastes fasciatus*) were close to the averages of the series (Figures 47 to 49).

Three strong cohorts (2011, 2012, and 2013) of **Atlantic redfish** (*Sebastes mentella*) have contributed to the increases in abundance and biomass observed since 2013. The 2011 cohort, which was the most abundant, now has a modal size of 24 cm. These redfish were distributed throughout the channels of the northern Gulf of St. Lawrence (Figures 50 to 52).

Invertebrates

The three most abundant **shrimp** species in the deep waters of the northern Gulf of St. Lawrence were northern shrimp (*Pandalus borealis*), striped pink shrimp (*Pandalus montagui*) and pink glass shrimp (*Pasiphaea multidentata*). All three have been declining for several years (Figure 66).

The abundance and biomass of **northern shrimp** (*Pandalus borealis*) has declined substantially since 2003 to reach the lowest values in the series since 2017 (Figures 53 to 55).

Northern shortfin squid (*Illex illecebrosus*), a seasonal pelagic species from the south, was present in more than 50% of the tows from 2017 to 2021 in all areas except the estuary and Strait of Belle Isle. The species was, however, much less present in 2022 (Figures 59 to 61).

Five species of **sea pens**, a type of soft coral, are found in the northern Gulf of St. Lawrence. The large sea pens (*Anthoptilum grandiflorum, Halipteris finmarchica*, and *Ptilella grandis*) are distributed in the depths of the Laurentian Channel while the thorny sea pen (*Pennatula aculeata*) is more widely distributed (Figures 59 to 62). Another species of small sea pen (*Kophobelemnon stelliferum*) was first identified in 2020 and then seen again in 2021 and 2022. This species is found exclusively in the depths of the Laurentian Channel in the Cabot Strait. A retrospective review of sea pen identifications using the invertebrates photo-catalog allowed us

to identify a specimen of this species collected in 2018. It had previously been classified as an old thorny sea pen.

PHYSICAL OCEANOGRAPHIC CONDITIONS

A preliminary analysis of water temperature data collected in 2022 (Figures 67 and 68) shows that conditions have warmed at 150 m and deeper, reaching new records since 1915 at 150, 200, 250 (not shown) and 300 m (note that these annual records may change with the addition of data sampled during the fall). Compared to conditions observed in August 2021, waters have warmed by about 0.4 °C at 150 m and by 0.2 °C at 200, 250 and 300 m. The August 2022 cold intermediate layer (CIL) minimum temperature was only a bit cooler in than in 2021 when it reached the highest values of the modern CTD era. Surface water temperatures were above normal in July-August (+1.4 standard deviation [SD]; +1.1 °C).

Air temperatures over the Gulf were above normal in April, June, July and August 2022 and near normal in May. This led to above normal average surface water temperatures for the periods of May–August (+1.2 SD relative to the 1991–2020 climatology and +0.8 °C) and July–August (+1.4 SD; +1.1 °C).

At the end of winter 2022, the volume of water in the surface mixed layer with temperatures lower than 0°C was lower than normal, forecasting a slightly warmer than normal summer Cold Intermediate Layer (CIL) of 0.10 °C. However, the CIL seasonal average minimum temperature (the Gilbert and Pettigrew index) was estimated for 2022 using only data from the August survey until a full season analysis is made, and it would potentially be only slightly cooler than the modern era record of 2021, going from 0.63 °C to 0.59 °C.

Beneath the cold intermediate water layer, the estuarine flow that carries deep water to the channel heads has carried the increasingly warm waters that had been transitioning through Cabot Strait, central Gulf and Esquiman Channel for the past several years further upstream. Consequently, deep temperatures in August have increased since 2021 below 150 m in all regions except the Northeast Gulf (Figure 67). Taking into consideration all the data recorded in different months of the year up to but excluding the fall, the four regions along the deep Laurentian Channel, meaning the Estuary, northwestern Gulf, Central Gulf and Cabot Strait, are all experiencing record temperatures at 300 m (6.3 °C, 6.8 °C, 7.1 °C and 7.3 °C). The annual mean in the estuary, which had exceeded 6 °C in 2021 for the first time, increased rapidly to 6.3 °C. The Gulf-wide average temperature at 300 m has reached a record level since 1915 of 7.09 °C, exceeding 7 °C for the first time (Figure 68).

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TABLES

Table 1. Number of successful stations per stratum for the DFO survey.

Stratum	NAFO	Surface (km^2)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
401	4T	545	3	4	4	4	3	3	3	3	3	3	3	3	3	3	3	6	3	3	3	3	0	3	3	2	2	3	2	2	2	2	1	2	2
402	4T	909	3	5	5	3	3	1	3	2	3	5	3	3	3	2	0	3	3	3	3	3	3	3	3	3	2	3	2	2	2	2	2	2	3
403	4T	1190	3	3	3	3	3	3	10	10	3	5	3	3	3	3	6	4	3	3	3	3	3	3	3	2	2	3	2	2	1	2	2	1	2
404	4T	792	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	6	3	3	3	3	0	3	3	3	2	3	2	2	2	2	2	2	2
405	4T	1478	3	3	3	3	3	3	3	2	4	4	4	3	3	3	2	9	3	3	3	3	3	3	3	3	2	3	2	2	2	2	2	2	3
406	4T	2579	5	3	3	3	3	3	5	5	3	5	3	4	5	3	5	6	4	4	4	3	3	3	4	3	3	4	4	4	3	3	4	4	4
407	4T	2336	5	3	3	3	3	3	3	3	2	3	3	3	3	5	3	5	3	3	3	3	0	3	3	2	4	4	2	3	4	3	3	3	4
408	4T	2734	4	5	5	3	2	3	3	2	5	5	4	3	3	3	2	11	4	4	4	4	3	3	4	3	4	4	2	4	3	2	2	2	5
409	4T	909	3	3	3	3	0	3	4	3	3	4	4	4	3	3	3	4	3	3	3	3	3	3	2	3	2	2	2	2	2	2	2	2	2
410	4T	1818	2	3	3	3	4	6	10	6	5	4	4	4	5	3	3	6	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	2	2
411	4T	1859	3	3	3	3	4	7	9	7	6	9	5	9	4	3	5	8	3	3	3	3	3	3	3	3	3	2	3	3	3	2	3	3	3
412	4T	1283	3	3	3	3	4	5	3	3	3	4	4	4	3	3	2	5	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
413	4T	731	3	4	3	3	0	3	3	4	3	4	4	4	3	3	1	5	3	3	3	3	3	3	3	2	2	2	2	2	2	1	2	2	2
414	4T	388	3	2	3	3	1	3	3	3	3	4	4	4	3	3	3	6	3	3	2	1	3	3	2	3	2	2	2	0	2	1	0	2	2
801	4R	1214	3	3	3	4	3	3	3	3	4	5	5	5	2	3	3	4	3	3	3	3	2	3	3	3	3	3	2	3	3	3	2	2	4
802	4R	1369	3	3	3	3	3	3	3	3	3	3	3	3	2	8	3	8	2	3	3	3	0	3	3	3	3	3	2	3	3	3	2	2	2
803	4S	6976	14	3	2	4	3	3	3	3	4	5	3	4	6	2	1	14	6	8	8	7	3	6	7	3	10	8	5	8	8	4	4	5	8
804	4S	2490	5	4	3	3	4	3	3	3	3	3	3	6	3	2	3	10	3	3	3	3	3	3	3	3	4	4	4	4	3	3	3	3	4
805	4S	5762	14	7	4	4	6	4	11	8	4	5	5	5	12	8	4	10	8	7	7	6	4	5	7	5	7	7	9	7	5	6	6	8	7
806	4S	2127	4	4	3	3	3	3	3	3	3	3	3	3	3	3	5	4	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2
807	4S	2370	3	12	11	10	5	5	4	4	3	3	4	3	2	1	0	7	3	3	3	3	3	2	3	3	4	4	4	4	3	2	3	2	5
808	4S	2428	4	7	6	4	5	4	3	3	2	4	3	3	3	3	0	3	3	3	3	3	2	3	3	2	4	4	4	4	4	0	2	3	4
809	4R	1547	3	9	7	6	4	3	3	3	3	3	3	3	3	3	1	5	3	3	3	3	3	3	2	3	3	3	4	3	3	0	3	2	3
810	4R	765	3	4	5	4	3	3	3	3	4	4	4	4	6	5	3	8	3	3	4	3	0	3	3	2	3	2	2	2	2	1	1	2	2
811	4R	1506	3	4	4	4	5	3	8	6	3	3	3	3	3	3	3	7	3	3	3	2	2	2	3	2	2	2	2	2	2	0	2	2	2
812	4R	4648	7	9	8	11	4	3	3	3	3	3	3	3	3	3	4	5	5	4	5	4	5	3	5	3	8	7	6	6	5	6	5	5	9
813	4R	3958	6	6	5	9	3	4	6	5	7	4	6	8	2	5	3	9	5	3	5	3	4	4	6	3	6	6	4	3	5	5	6	4	5
814	4S	1029	3	4	4	4	3	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
815	4S	4407	9	15	11	8	5	4	3	3	8	9	9	2	6	3	3	14	5	5	6	5	5	3	6	4	6	7	6	6	5	6	4	7	7
816	4S	5032	9	11	9	9	6	6	17	17	20	21	21	1	6	4	4	11	7	7	7	6	4	4	3	6	6	8	7	7	5	6	4	6	7
817	4S	3646	7	18	11	7	9	10	9	5	11	17	13	14	8	5	2	7	5	5	4	5	3	3	4	4	5	4	6	6	5	5	6	5	6
818	4S	2774	4	7	5	4	3	3	3	4	4	4	4	5	7	5	1	6	4	4	2	4	3	4	3	3	4	5	4	5	4	4	5	1	5
819	4S	1441	3	7	9	5	4	5	3	2	3	3	4	1	1	3	0	8	2	3	3	2	3	3	3	3	2	2	2	2	2	1	2	0	3
820	4R	1358	3	3	3	3	3	3	7	5	6	5	5	3	2	3	3	14	3	3	3	3	0	2	3	3	3	3	2	3	3	0	2	3	2
821	4R	1272	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	7	3	3	3	3	2	4	3	3	3	2	2	3	3	0	2	1	3
822	4R	3245	6	4	3	2	3	3	6	4	10	8	10	9	3	3	3	8	4	4	4	3	4	2	4	2	5	3	4	2	3	4	5	4	5
823	4R	556	3	3	3	3	2	3	2	3	1	3	2	3	2	5	2	10	3	3	3	3	2	3	3	3	3	3	2	2	3	3	2	2	3
824	4R	837	3	1	3	1	3	3	3	3	3	3	2	3	2	2	3	6	3	3	3	3	2	3	3	2	2	2	1	2	2	2	2	2	2
827	4S	3231	0	1	1	1	3	3	0	2	3	1	3	0	2	2	3	6	4	4	3	3	3	2	3	2	2	3	3	3	4	0	2	3	5
828	4S	2435	4	1	2	2	3	3	3	3	3	1	0	1	0	3	3	1	3	3	3	3	3	2	2	2	2	2	2	4	4	3	2	3	5
829	4S	2692	3	2	3	3	3	3	3	0	3	3	2	0	2	1	0	8	4	4	3	2	3	2	2	3	2	4	3	2	3	1	2	3	3
830	4S	1917	3	3	4	3	3	3	2	2	3	3	3	2	1	1	0	6	3	3	3	3	3	3	2	3	2	4	4	3	3	3	2	2	3
831	4S	1204	3	0	2	3	3	3	3	2	3	4	3	3	1	3	3	4	3	3	3	3	3	3	3	2	2	2	2	2	2	1	2	2	2
832	4S	3962	4	12	11	7	7	9	8	5	3	3	3	3	2	3	4	8	4	5	5	3	4	3	6	4	4	4	3	5	5	4	5	4	5
833	4S	559	3	1	3	3	3	3	3	3	3	3	3	0	3	3	2	6	3	3	3	3	3	3	3	1	2	2	2	2	2	2	1	2	2
835	4R	2641	0	6	7	6	3	3	3	3	6	5	6	5	6	3	3	8	5	5	5	4	0	4	5	2	4	3	3	4	4	0	3	1	2
836	4R	3149	0	7	8	6	3	3	3	3	3	3	3	3	3	2	4	10	5	3	5	4	3	4	4	3	5	5	2	3	4	3	5	3	4
837	4R	2668	0	5	6	3	2	3	4	4	3	3	3	3	5	5	2	4	4	3	5	3	3	2	5	1	4	4	3	3	2	3	3	3	3
838	4R	3378	0	9	8	7	5	5	0	0	0	2	0	4	4	0	3	10	6	3	6	0	0	3	5	0	6	4	5	3	5	3	5	3	4
839	4S	4390	0	2	5	5	3	2	2	1	2	3	3	0	0	3	2	3	6	5	4	3	3	2	2	3	2	3	2	2	2	1	1	3	4
840	4R	765	0	3	3	1	1	0	0	0	0	0	0	2	0	0	0	5	3	0	3	0	0	1	3	0	2	3	2	0	1	0	2	0	2
841	4S	816	0	0	1	3	3	3	3	0	2	1	2	3	2	3	3	3	3	3	2	3	3	3	2	3	2	2	2	2	1	2	1	2	2
Total		116115	191	250	239	214	175	182	217	185	204	224	209	183	171	163	133	354	192	183	189	164	132	156	178	141	177	182	159	163	160	124	143	142	186
851	4T	456	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	3	3	3	2	2	2	2	2	1	1	2	2
852	4T	427	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	3	2	3	2	2	2	1	2	2	1	2	2
854	4T	465	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	2	2	2	2	2	2	2	2	0	1	1	2
855	4T	928	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	3	2	3	3	2	2	2	2	2	1	1	2	2

Table 2. Occurrences and total catches, in weight and number, by taxon during the 2022 survey (194 successful tows). Taxonomic codes (STRAP) follow Miller and Chabot (2014), with scientific name updates by the World Marine Species Registry (WoRMS 2022).

Vertebrates

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
90	*Amblyraja radiata*	Raie épineuse	Thorny Skate	156	1085.4	1699
696	*Ammodytes* sp.	Lançons	Sand Lances	20	0.3	88
700	*Anarhichas lupus*	Loup atlantique	Atlantic Wolffish	30	132.2	272
701	*Anarhichas minor*	Loup tacheté	Spotted Wolffish	6	12.8	5
718	*Anisarchus medius*	Lompénie naine	Stout Eelblenny	1	<0.1	1
320	*Arctozenus risso*	Lussion blanc	White Barracudina	112	13.7	1000
193	*Argentina silus*	Grande argentine	Atlantic Argentine	29	42.8	771
811	*Artediellus atlanticus*	Hameçon atlantique	Atlantic Hookear Sculpin	25	1.6	425
810	*Artediellus* sp.	Hameçons	Hookear Sculpins	9	0.1	37
812	*Artediellus uncinatus*	Hameçon neigeux	Arctic Hookear Sculpin	13	0.9	159
838	*Aspidophoroides monopterygius*	Poisson-alligator atlantique	Alligatorfish	31	0.5	110
837	*Aspidophoroides olrikii*	Poisson-alligator arctique	Arctic Alligatorfish	2	<0.1	2
102	*Bathyraja spinicauda*	Raie à queue épineuse	Spinytail Skate	2	24.7	2
290	*Benthosema glaciale*	Lanterne glacière	Glacier Lanternfish	33	0.6	176
451	*Boreogadus saida*	Saïda franc	Arctic Cod	6	0.2	9
865	*Careproctus reinhardti*	Petite limace de mer	Sea Tadpole	12	0.5	29
27	*Centroscyllium fabricii*	Aiguillat noir	Black Dogfish	28	763.3	1222
150	*Clupea harengus*	Hareng atlantique	Atlantic Herring	100	560.5	5462
721	*Cryptacanthodes maculatus*	Terrassier tacheté	Wrymouth	8	2.2	9
849	*Cyclopterus lumpus*	Grosse poule de mer	Lumpfish	24	10.4	30
208	*Cyclothone microdon*	Cyclothone à petites dents	Veiled Anglemouth	2	<0.1	3
461	*Enchelyopus cimbrius*	Motelle à quatre barbillons	Fourbeard Rockling	129	37.1	1312
618	*Epigonus pandionis*	Cardinal	Big Eye	2	0.1	4
711	*Eumesogrammus praecisus*	Quatre-lignes atlantique	Fourline Snakeblenny	28	6.1	238
847	*Eumicrotremus terraenovae*	Petite poule Terre-Neuve	Newfoundland Spiny Lumpsucker	26	4.5	302
438	*Gadus morhua*	Morue franche	Atlantic Cod	96	5356.4	14142
439	*Gadus ogac*	Ogac, morue ogac	Greenland Cod	4	2.4	7
426	*Gasterosteus aculeatus*	Épinoche à trois épines	Threespine Stickleback	4	<0.1	18
890	*Glyptocephalus cynoglossus*	Plie grise	Witch Flounder	152	1505.6	6782
205	*Gonostomatidae*	Cyclothones	Bristlemouths	1	<0.1	-
746	*Gymnelus viridis*	Unernak caméléon	Fish Doctor	7	0.1	13
823	*Gymnocanthus tricuspis*	Tricorne arctique	Arctic Staghorn Sculpin	34	38.3	660
797	*Helicolenus dactylopterus*	Chèvre impériale	Blackbelly Rosefish	3	0.3	4

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
889	*Hippoglossoides platessoides*	Plie canadienne	American Plaice	171	1372.8	14504
893	*Hippoglossus hippoglossus*	Flétan atlantique	Atlantic Halibut	73	1450.6	188
527	*Hoplostethus mediterraneus*	Poisson-montre	Rosy Soldierfish	1	<0.1	1
832	*Icelus spatula*	Icèle spatulée	Spatulate Sculpin	5	<0.1	10
285	*Lampadena speculigera*	Lanterne-miroir	Mirror Lanternfish	3	0.3	23
836	*Leptagonus decagonus*	Agone atlantique	Atlantic Poacher	13	4.3	178
717	*Leptoclinus maculatus*	Lompénie tachetée	Daubed Shanny	25	0.7	93
891	*Limanda ferruginea*	Limande à queue jaune	Yellowtail Flounder	4	1.4	14
868	*Liparis bathyarcticus*	Limace nébuleuse	Nebulous Snailfish	12	1.9	145
966	*Lophius americanus*	Baudroie d'Amérique	Monkfish, Goosefish	23	154.3	24
716	*Lumpenus lampretaeformis*	Lompénie-serpent	Snakeblenny	30	5.5	192
752	*Lycenchelys verrillii*	Lycode à tête longue	Wolf Eelpout	9	<0.1	9
727	*Lycodes esmarkii*	Lycode d'Esmark	Esmark's Eelpout	5	1.8	6
728	*Lycodes lavalaei*	Lycode du Labrador	Newfoundland Eelpout	24	38	211
734	*Lycodes terraenovae*	Lycode atlantique	Atlantic Eelpout	4	1	5
730	*Lycodes vahlii*	Lycode à carreaux	Vahl's Eelpout	37	40.4	1063
91	*Malacoraja senta*	Raie lisse	Smooth Skate	105	97.3	308
187	*Mallotus villosus*	Capelan	Capelin	77	569.2	80622
441	*Melanogrammus aeglefinus*	Aiglefin	Haddock	6	2.8	7
745	*Melanostigma atlanticum*	Molasse atlantique	Atlantic Soft Pout	43	4.2	957
449	*Merluccius bilinearis*	Merlu argenté	Silver Hake	98	131.6	1376
272	Myctophidae	Poissons-lanterne	Lanternfishes	5	0.1	26
281	*Myctophum punctatum*	Lanterne ponctuée	Spotted Lanternfish	1	<0.1	3
819	*Myoxocephalus scorpius*	Chaboisseau à épines courtes	Shorthorn Sculpin	27	62.2	193
13	*Myxine limosa*	myxine de vase	mud hagfish	100	103.4	1714
278	*Neoscopelus macrolepidotus*	Lanterne à grandes écailles	Glowingfish	4	0.2	5
478	*Nezumia bairdii*	Grenadier du grand Banc	Common Grenadier	108	112.1	2887
275	*Notoscopelus kroyeri*	Lanterne-voilière nordique	Kroyer's Lanternfish	16	0.7	44
874	*Paraliparis calidus*	Limace ardente	Lowfin Snailfish	6	<0.1	6
856	*Paraliparis copei*	Limace à museau noir	Blacksnout Seasnail	3	<0.1	8
444	*Phycis chesteri*	Merluche à longues nageoires	Longfin Hake	43	43.8	314
882	Pleuronectiformes	Poisson-plat	Flatfish	1	<0.1	1
443	*Pollachius virens*	Goberge	Pollock	2	10	3
222	*Polyipnus clarus*	Hache	Slope Hachetfish	2	<0.1	2
892	*Reinhardtius hippoglossoides*	Flétan du Groenland, turbot	Greeenland Halibut, Turbot	142	3519.4	8962
572	*Scomber scombrus*	Maquereau bleu	Atlantic Mackerel	54	6.1	169
796	*Sebastes fasciatus*	Sébaste acadien	Acadian Redfish	109	8542.9	47565
794	*Sebastes mentella*	Sébaste atlantique	Deepwater Redfish	145	89544.8	469067

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
369	*Serrivomer beanii*	Serrivomer trapu	Stout Sawpalate	1	<0.1	1
220	Sternoptychidae	Haches	Hatchetfishes	1	<0.1	5
710	*Stichaeus punctatus*	Stichée arctique	Arctic Shanny	2	<0.1	3
230	*Stomias boa boa*	Dragon-boa	Boa Dragonfish	2	<0.1	2
373	*Synaphobranchus kaupii*	Anguille égorgée bécuée	Northern Cutthroat Eel	3	0.7	8
814	*Triglops murrayi*	Faux-trigle armé	Moustache Sculpin	39	13.4	1287
447	*Urophycis tenuis*	Merluche blanche	White Hake	98	416.1	736
	Total	**Vertébrés**	**Vertebrates**		115 858	667 940

Invertebrates

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
2182	*Actinauge cristata*	Anémone de mer	Anemone	54	22.5	2590
2165	Actiniaria	Actinies et Anémones	Sea Anemones	14	0.3	20
2162	*Actinostola callosa*	Anémones de mer	Anemone	63	182.2	2548
6771	*Aega psora*	Isopode	Isopod	9	<0.1	11
3891	*Aldisa zetlandica*	Nudibranche	Nudibranch	2	<0.1	2
6930	Amphipoda	Amphipodes	Amphipods	4	<0.1	4
8593	*Amphiura* sp.	Ophiures	Brittle star	2	<0.1	7
7389	*Anonyx* sp.	Gammarides	Gammarids	10	<0.1	23
2218	*Anthoptilum grandiflorum*	Plume de mer	Sea pen	33	12.5	1358
5002	*Aphrodita hastata*	Souris de mer	Sea Mouse	12	0.5	21
6594	*Arcoscalpellum michelottianum*	Balane	Barnacle	3	0.1	3
8138	*Argis dentata*	Crevette verte	Arctic Argid	35	5.9	1689
3418	*Arrhoges occidentalis*	Pied-de-pélican	American Pelicanfoot	27	1.3	145
8742	*Ascidia* sp.	Ascidie	Sea squirts	85	7.1	1636
8680	Ascidiacea	Ascidies, tuniqués sessiles	Ascidians, Sessile Tunicates	8	0.1	21
1120	*Asconema foliatum*	Éponge	Sponge	4	17.6	-
4231	*Astarte borealis*	Astarte	Boreal Astarte	3	<0.1	3
4227	*Astarte* sp.	Astartes	Astartes	23	0.1	50
8396	*Asterias rubens*	Astérie boréale commune	Purple Seastar	5	0.1	8
8390	Asteroidea	Étoiles de mer	Sea Stars	1	<0.1	1
8113	*Atlantopandalus propinqvus*	Crevette	Shrimp	38	1.5	389
2097	*Atolla wyvillei*	Méduse	Jellyfish	5	0.3	6
3583	*Aulacofusus brevicauda*	Buccin	Whelk	1	<0.1	1
2085	*Aurelia aurita*	Méduse de lune	Moon Jelly	3	2.7	7

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
6595	Balanidae	Balanes	Barnacles	5	1.6	376
4904	*Bathypolypus bairdii*	Poulpe	North Atlantic Octopus	61	3.8	108
3995	Bivalvia	Bivalves	Bivalves	2	<0.1	2
2158	*Bolocera tuediae*	Anémone de mer	Anemone	64	14.4	303
8793	*Boltenia echinata*	Cactus de mer	Cactus Sea Squirt	1	<0.1	12
8792	*Boltenia ovifera*	Patate de mer	Sea Potato	20	17.2	202
3488	*Boreotrophon* sp.	Murex	Murex	3	<0.1	4
8798	*Botrylloides* sp.	Ascidie	Tunicate	3	<0.1	18
5755	*Brada inhabilis*	Polychète	Flabelligerid worm	11	<0.1	21
8378	*Brisaster fragilis*	Oursin coeur	Heart Urchin	80	181.1	30604
2670	Bryozoa	Bryozoaires	Bryozoans	14	<0.1	17
3520	*Buccinum cyaneum*	Buccin bleu	Bluish Whelk	6	0.1	12
3523	*Buccinum scalariforme*	Buccin	Ladder Whelk	4	0.1	6
3516	*Buccinum* sp.	Buccins	Whelk	23	0.5	67
3517	*Buccinum undatum*	Buccin commun	Waved Whelk	9	0.2	13
8173	*Calocaris templemani*	Crevette fouisseuse	Lobster Shrimp	7	<0.1	8
8206	*Cancer irroratus*	Crabe commun	Common Rock Crab	1	0.1	5
8037	Caridea	Crevettes	Caridean Shrimps	1	<0.1	-
8429	*Ceramaster granularis*	Étoile de mer	Sea Star	29	1.2	71
8213	*Chionoecetes opilio*	Crabe des neiges	Snow Crab	90	290.4	2585
6593	*Chirona hameri*	Balane turbané	Turban Barnacle	6	3.8	137
4167	*Chlamys islandica*	Pétoncle d' Islande	Iceland Scallop	15	4.6	122
4351	*Ciliatocardium ciliatum*	Coque d'Islande	Iceland Cockle	6	0.6	28
5617	*Cistenides granulata*	Ver-trompette	Trumpet Worm	3	<0.1	3
3908	*Colga villosa*	Nudibranche	Nudibranch	6	<0.1	8
3577	*Colus pubescens*	Buccin	Hairy Whelk	8	0.3	25
1130	*Craniella polyura*	Éponge	Sponge	1	<0.1	13
2151	*Cribrinopsis similis*	Anémone de mer	Sea Anemone	1	<0.1	1
8447	*Crossaster papposus*	Soleil de mer épineux	Spiny Sun Star	27	2.7	88
3422	*Cryptonatica affinis*	Lunaties	Arctic moonsnail	4	<0.1	7
8407	*Ctenodiscus crispatus*	Étoile de mer	Mud Star	105	111	32324
8312	*Cucumaria frondosa*	Concombre de mer	Orange Footed Sea Cucumber	11	13.1	25
4526	*Cuspidaria glacialis*	Bivalve	Gacial Dipperclam	19	0.1	52
2080	*Cyanea capillata*	Crinière de lion	Lion's Mane	171	320.1	762
4268	*Cyclocardia borealis*	Vénéricarde boréale	Northern Cyclocardia	3	<0.1	4
8108	*Dichelopandalus leptocerus*	Crevette	Bristled Longbeak Shrimp	1	0.1	42
8408	*Diplopteraster multipes*	Étoile de mer	Sea Star	2	1.1	2
2191	*Drifa glomerata*	Corail mou	Soft coral	19	0.3	50

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
2183	*Duva florida*	Corail mou	Sea Cauliflower	8	0.3	39
8373	*Echinarachnius parma*	Dollar de sable	Common Sand Dollar	3	1.3	98
7383	*Epimeria loricata*	Gammaride	Gammarid	16	<0.1	75
2156	*Epizoanthus erdmanni*	Zoanthide	Zoanthid	21	<0.1	197
8081	*Eualus belcheri*	Bouc	Circumpolar Eualid	1	<0.1	1
8075	*Eualus fabricii*	Bouc Arctique	Arctic Eualid	21	0.1	82
8080	*Eualus gaimardii gaimardii*	Bouc	Circumpolar Eualid	13	0.1	79
8077	*Eualus macilentus*	Bouc du Groenland	Greenland Shrimp	20	4.7	3497
8074	*Eualus* sp.	Bouc	Eualid	6	<0.1	22
8778	*Eudistoma vitreum*	Ascidie	Tunicate	19	0.3	116
5461	*Euphrosine borealis*	Polychète	Seaworm	2	<0.1	3
8033	*Eusergestes arcticus*	Crevette	Shrimp	17	0.1	103
7195	*Eusirus cuspidatus*	Gammaride	Gammarid	8	<0.1	22
3437	*Euspira pallida*	Lunatie du Groenland	Pale Moonsnail	5	<0.1	9
2224	*Flabellum alabastrum*	Madrépore	Cup coral	12	0.6	76
8027	*Gennadas elegans*	Crevette	Shrimp	2	<0.1	-
2184	*Gersemia rubiformis*	framboise de mer	Sea Strawberry	33	0.4	171
5902	*Golfingia margaritacea*	Sipunculide	Sipunculid	7	0.1	16
8540	*Gorgonocephalus* sp.	Gorgonocéphales	Basket Stars	26	105.6	510
2217	*Halipteris finmarchica*	Plume de mer	Sea pen	17	3.3	133
8797	*Halocynthia pyriformis*	Pêche de mer	Sea Peach	2	0.6	17
8263	*Heliometra glacialis*	Lis de mer	Feather star	4	0.1	59
1131	*Hemigellius arcofer*	Éponge	Sponge	1	4.2	-
3090	*Hemithiris psittacea*	Brachiopode	Lamp Shell	7	<0.1	27
8483	*Henricia* sp.	Étoiles de mer	Sea Stars	50	0.4	109
4437	*Hiatella arctica*	Saxicave arctique	Arctic Saxicave	2	<0.1	2
8431	*Hippasteria phrygiana*	Étoile de mer	Sea Star	47	16.5	74
8290	Holothuroidea	Cocombres de mer	Sea Cucumbers	1	<0.1	1
8154	*Homarus americanus*	Homard américain	American Lobster	1	0.8	1
2150	*Hormathia digitata*	Anémone	Anemone	29	1.3	224
2167	*Hormathia nodosa*	Anémone noduleuse	Rugose Anemone	7	0.5	12
8219	*Hyas alutaceus*	Crabe lyre	Arctic Lyre Crab	32	5.3	360
8217	*Hyas araneus*	Crabe lyre	Atlantic Lyre Crab	21	5	142
1341	Hydrozoa	Hydrozoaires	Hydrozoans	23	0.2	-
6977	*Hyperia galba*	Hypéride	Hyperiid	3	<0.1	3
4753	*Illex illecebrosus*	Encornet rouge nordique	Northern Shortfin Squid	69	32.3	245
5003	*Laetmonice filicornis*	Polychète	Seaworm	42	0.2	174
8092	*Lebbeus groenlandicus*	Bouc	Spiny Lebbeid	12	2.4	227

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
8095	*Lebbeus microceros*	Bouc	Shrimp	2	0	11
8093	*Lebbeus polaris*	Bouc	Polar Lebbeid	49	0.6	584
8091	*Lebbeus* sp.	Boucs	Lebbeids	1	<0.1	-
8511	*Leptasterias polaris*	Étoile de mer polaire	Polar Sea Star	12	8.7	49
8513	*Leptasterias groenlandica*	Étoile de mer du Groenland	Greenland Sea Star	17	0.1	32
8521	*Leptychaster arcticus*	Stelléridé	Sea Star	3	<0.1	6
3459	*Limneria undata*	Veloutée rayée	Wavy Lamellaria	1	<0.1	1
2207	*Liponema multicorne*	Anémone	Sea anemone	6	0.3	14
8196	*Lithodes maja*	Crabe épineux du Nord	Norway King Crab	68	66.2	196
4395	*Macoma calcarea*	Bivalve	Chalky Macoma	2	<0.1	7
7279	*Maera loveni*	Gammaride	Gammarid	1	<0.1	1
3219	*Margarites costalis*	Margarite rosé du Nord	Boreal Rosy Margarite	10	<0.1	39
3216	*Margarites groenlandicus*	Troque	Greenland marguerite	3	<0.1	4
7268	*Megamoera dentata*	Gammaride	Gammarid	1	<0.1	1
4025	*Megayoldia thraciaeformis*	Bivalve	Broad Yoldia	28	1.2	313
2171	*Metridium senile*	Anémone de mer	Clonal Plumose Anemone	1	<0.1	1
8164	*Munidopsis curvirostra*	Munidopsis curvirostra	Squat Lobster	19	0.1	68
4126	*Musculus* sp.	Moules	Mussels	2	<0.1	2
1117	*Mycale lingua*	Éponge	Sponge	1	<0.1	-
1143	*Mycale* sp.	Mycale non-identifié	Mycale unidentified	1	<0.1	1
4121	*Mytilus* sp.	Moules	Mussels	12	0.2	36
3000	*Nemertea*	Némerte	Ribbon Worm	1	<0.1	1
7483	*Neohela monstrosa*	Gammaride	Gammarid	1	<0.1	1
2219	Nephtheidae	Coraux mous	Soft corals	12	0.3	50
3567	*Neptunea despecta*	Neptunée commune du nord	Lader Whelk	5	0.1	5
5232	Nereis	Polychète	Clam worm	2	<0.1	10
5236	*Nereis pelagica*	Polychète	Clam worm	1	<0.1	1
8448	*Novodinia americana*	Étoile de mer	Sea star	2	1.2	2
5961	*Nymphon* sp.	Araignées de mer	Sea Spiders	43	0.1	225
8575	*Ophiacantha bidentata*	Ophiure épineuse	Brittle Star	35	0.1	287
8583	*Ophiopholis aculeata*	Ophiure paquerette	Daisy Brittle Star	49	4	2767
8585	*Ophioscolex glacialis*	Ophiure	Brittle star	30	<0.1	60
8553	*Ophiura sarsii*	Ophiure	Brittle Star	74	46.5	48902
8178	*Pagurus* sp.	Bernard hermite droitier	Hermit Crab	26	0.2	54
8111	*Pandalus borealis*	Crevette nordique	Northern Shrimp	148	2547.9	352657
8112	*Pandalus montagui*	Crevette ésope	Striped Pink Shrimp	84	193.6	51867
8110	*Pandalus* sp.	Crevette	Boreal Red Shrimp	1	<0.1	-
7586	*Paramphithoe hystrix*	Gammaride	Gammarid	4	<0.1	5

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
8057	*Pasiphaea multidentata*	Sivade rose, Crevette blanche	Pink Glass Shrimp	89	43.7	12901
8056	*Pasiphaea tarda*	Sivade	Crimson Pasiphaeid	3	0.1	7
2203	*Pennatula aculeata*	Plume de mer	Sea Pen	112	4.2	2230
2096	*Periphylla periphylla*	Méduse à coronne	Crown jellyfish	40	53.7	60
5907	*Phascolion strombus strombus*	Sipunculide	Hermit Sipunculid	2	<0.1	6
4955	*Phyllodoce groenlandica*	Polychète	Paddle Worm	1	<0.1	1
2255	*Pleurobrachia pileus*	Groseille de mer ronde	Sea Gooseberry	14	<0.1	25
3578	*Plicifusus kroyeri*	Colus	Arctic Whelk	1	<0.1	5
8783	*Polycarpa fibrosa*	Ascidie	Tunicate	8	0.2	174
4950	Polychaeta	Polychètes	Polychaetes	60	0.2	117
1107	*Polymastia hemisphaerica*	Éponge	Sponge	7	0.5	127
1109	*Polymastia* sp.	Éponge	Sponge	8	0.1	22
5007	Polynoidae	Polychète errante	Fifteen-Scaled Worm	35	0.1	72
5264	*Polyphysia crassa*	Polychète	Sea worm	2	<0.1	2
8135	*Pontophilus norvegicus*	Crevette	Norwegian Shrimp	115	5.3	3515
8435	*Poraniomorpha* sp.	Étoile de mer	Sea star	4	<0.1	5
1101	Porifera	Éponges	Sponges	110	61.7	-
8433	*Pseudarchaster parelii*	Étoile de mer	Sea Star	17	0.4	31
8520	*Psilaster andromeda*	Étoile de mer	Sea Star	28	2.3	438
8295	*Psolus fabricii*	Psolus écarlate	Scarlet Psolus	1	0.1	1
8294	*Psolus phantapus*	Holothurie	Sea Cucumber	6	<0.1	8
8410	*Pteraster militaris*	Étoile de mer	Sea Star	11	0.2	31
8412	*Pteraster obscurus*	Étoile de mer	Sea Star	3	0.1	6
8411	*Pteraster pulvillus*	Étoile de mer	Sea Star	10	<0.1	14
2210	*Ptilella grandis*	Plume de mer	Sea Pen	24	34.3	998
2153	*Ptychodactis patula*	Anémone beige évasée	Anemone	2	<0.1	2
1353	*Ptychogena lactea*	Méduse	Jellyfish	29	1.3	315
1107	*Radiella hemisphaerica*	Éponge	Sponge	7	0.5	127
7211	*Rhachotropis aculeata*	Gammaride	Gammarid	17	<0.1	81
1380	Rhodaliidae	Siphonophore		24	0.3	83
4557	*Rossia* sp.	Sépioles	Bobtails	25	0.3	38
8129	*Sabinea sarsii*	Crevette	Sars Shrimp	7	0.1	91
8128	*Sabinea septemcarinata*	Crevette	Sevenline Shrimp	20	0.9	764
8127	*Sabinea* sp.	Crevette	Shrimp	1	<0.1	-
3491	*Scabrotrophon fabricii*	Murex	Murex	5	<0.1	5
5267	*Scalibregma inflatum*	Polychète	Seaworm	2	<0.1	2
3715	*Scaphander punctostriatus*	Céphalaspide	Giant Canoe Bubble	22	0.1	100
8119	*Sclerocrangon boreas*	Crevette de roche	Scultured Shrimp	13	21.9	1786

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
2040	Scyphozoa	Scyphozoaires	Scyphozoans	11	0.3	15
2679	*Securiflustra securifrons*	Bryozoaires marins	Marine bryozoans	6	<0.1	17
4352	*Serripes groenlandicus*	Coque du Groenland	Greenland Smoothcockle	1	<0.1	1
4191	*Similipecten greenlandicus*	Pétoncle	Greenland Glass-Scallop	3	<0.1	4
5900	Sipuncula	Sipunculides	Sipunculids	3	<0.1	5
8445	*Solaster endeca*	Soleil de mer pourpre	Purple Sunstar	8	3.3	18
8087	*Spirontocaris liljeborgii*	Bouc épineux	Friendly Blade Shrimp	47	0.2	139
8086	*Spirontocaris phippsii*	Bouc	Punctate Blade Shrimp	1	<0.1	1
8084	*Spirontocaris* sp.	Bouc	Blade Shrimp	8	<0.1	-
8085	*Spirontocaris spinus*	Bouc perroquet	Parrot Shrimp	17	0.3	282
1352	*Staurostoma mertensii*	Méduse à croix blanche	Whitecross Jellyfish	1	0.1	2
7750	*Stegocephalus inflatus*	Gammaride	Gammarid	10	<0.1	13
3146	*Stenosemus exaratus*	Chiton	Chiton	1	<0.1	1
8515	*Stephanasterias albula*	Étoile de mer	Sea star	2	<0.1	18
2159	*Stephanauge nexilis*	Anémone de mer	Sea anemone	15	0.6	80
4587	*Stoloteuthis leucoptera*	Sépiole	Butterfly Squid	15	0.1	27
2173	*Stomphia coccinea*	Anémone marbrée	Anemone	29	1.3	90
8363	*Strongylocentrotus* sp.	Oursins	Sea Urchins	54	37.5	2803
1112	*Stylocordyla borealis*	Éponge	Sponge	10	<0.1	40
1115	*Suberites ficus*	Éponge	Fig sponge	1	0.1	1
6791	*Syscenus infelix*	Isopode	Isopod	80	0.7	431
3310	*Tachyrhynchus erosus*	Gastropode	Eroded Turritsnail	2	<0.1	2
1108	*Tentorium semisuberites*	Éponge	Sponge	12	<0.1	56
3101	*Terebratulina septentrionalis*	Térébratule du Nord	Northern Lamp Shell	8	<0.1	16
6972	*Themisto libellula*	Hypéride	Hyperiid	4	<0.1	185
1357	*Thuiaria thuja*	Hydrozoaire	Bottlebrush Hydroid	11	<0.1	27
4301	Thyasira	Bivalve	Cleftclam	1	<0.1	1
2152	*Urticina crassicornis*	Anémone de mer	Sea Anemone	6	0.5	11
3452	Velutinidae	Gastéropode	Snail	1	<0.1	1
7691	*Wimvadocus torelli*	Gammaride	Gammarid	1	<0.1	1
4451	*Xylophaga atlantica*	Bivalve	Atlantic Woodeater	4	<0.1	-
4074	*Yoldia* sp.	Bivalves	Bivalves	1	<0.1	1
	Total	**Invertebrés**	**Invertebrates**		4 559	572 335

Others

Code STRAP	Scientific Name	French Name	English Name	Occurrence	Weight (kg)	Number
9966		Capsule de raie épineuse	Egg case Thorny skate	6	0.1	9
9970		Capsule de raies	Skates Eggs	15	0.2	29
2296		Capsule d'oeuf de Fecampiidae	Fecampiidae Egg Capsule	3	<0.1	3

Table 3. Number of measured and weighed specimens and descriptive length statistics in 2022. Taxonomic codes (STRAP) follow Miller and Chabot (2014), with scientific name updates by the World Marine Species Registry (WoRMS 2022).

Vertebrates

Code STRAP	Scientific name	Sampled number		Length (cm)				
		Length	Weight	Min	P1*	Median	P99*	Max
90	*Amblyraja radiata*	1481	1380	6.4	11.1	36.4	64.5	77.0
696	*Ammodytes* sp.	81	35	5.0	5.0	8.0	21.0	21.0
700	*Anarhichas lupus*	265	113	6.6	7.0	32.6	67.7	70.0
701	*Anarhichas minor*	5	5	38.2	38.2	65.5	79.5	79.5
718	*Anisarchus medius*	1	1	13.8	13.8	13.8	13.8	13.8
320	*Arctozenus risso*	934	431	17.1	18.6	22.4	26.1	27.1
193	*Argentina silus*	340	114	7.7	8.9	13.4	37.0	37.8
811	*Artediellus atlanticus*	170	88	3.7	3.8	6.5	10.2	12.0
810	*Artediellus* sp.	37	27	3.8	3.8	5.0	7.6	7.6
812	*Artediellus uncinatus*	71	38	3.6	3.6	7.6	10.6	10.6
838	*Aspidophoroides monopterygius*	110	70	5.4	5.9	13.1	16.2	16.7
837	*Aspidophoroides olrikii*	2	2	6.9	6.9	7.9	8.8	8.8
102	*Bathyraja spinicauda*	2	2	127.0	127.0	132.4	137.8	137.8
290	*Benthosema glaciale*	4	4	7.0	7.0	9.5	14.2	14.2
451	*Boreogadus saida*	7	7	10.0	10.0	12.4	27.0	27.0
865	*Careproctus reinhardti*	29	28	4.4	4.4	9.6	13.8	13.8
27	*Centroscyllium fabricii*	590	195	14.0	14.6	36.8	68.1	71.1
150	*Clupea harengus*	2355	1076	10.6	14.5	28.5	36.6	38.7
721	*Cryptacanthodes maculatus*	8	9	23.1	23.1	36.9	84.5	84.5
849	*Cyclopterus lumpus*	31	30	4.9	4.9	13.6	30.0	30.0
461	*Enchelyopus cimbrius*	1092	450	2.3	5.8	18.0	28.2	32.2
618	*Epigonus pandionis*	1	1	17.5	17.5	17.5	17.5	17.5
711	*Eumesogrammus praecisus*	211	96	7.5	8.7	14.8	21.8	23.0
847	*Eumicrotremus terraenovae*	205	100	2.6	2.7	5.0	12.3	13.0
438	*Gadus morhua*	6093	2389	4.4	10.5	35.0	62.0	97.0
439	*Gadus ogac*	7	7	23.0	23.0	31.0	36.0	36.0
426	*Gasterosteus aculeatus*	18	9	4.4	4.4	6.5	6.7	6.7
890	*Glyptocephalus cynoglossus*	4173	2367	3.1	10.1	29.7	43.6	49.6
746	*Gymnelus viridis*	13	13	8.6	8.6	13.7	17.8	17.8
823	*Gymnocanthus tricuspis*	361	143	8.2	9.2	16.4	22.2	25.2
797	*Helicolenus dactylopterus*	4	4	14.1	14.1	17.4	19.5	19.5
889	*Hippoglossoides platessoides*	6907	2957	3.0	7.7	20.6	42.5	57.0
893	*Hippoglossus hippoglossus*	186	182	13.2	27.8	61.2	160.0	163.0
527	*Hoplostethus mediterraneus*	1	1	10.4	10.4	10.4	10.4	10.4
832	*Icelus spatula*	10	9	3.9	3.9	5.8	7.0	7.0
836	*Leptagonus decagonus*	127	40	4.5	4.6	19.4	21.9	22.0
717	*Leptoclinus maculatus*	92	60	8.9	8.9	12.5	20.5	20.5
891	*Limanda ferruginea*	14	14	14.3	14.3	20.2	30.6	30.6
868	*Liparis bathyarcticus*	77	33	3.1	3.1	7.8	19.9	19.9
966	*Lophius americanus*	22	22	23.5	23.5	71.0	100.2	100.2
716	*Lumpenus lampretaeformis*	135	78	12.2	15.5	29.5	38.9	39.0
752	*Lycenchelys verrillii*	9	9	7.0	7.0	9.1	13.1	13.1
727	*Lycodes esmarkii*	6	6	6.4	6.4	39.0	45.0	45.0
728	*Lycodes lavalaei*	216	83	10.2	10.9	26.5	57.0	63.0
734	*Lycodes terraenovae*	5	5	25.3	25.3	34.6	45.2	45.2
730	*Lycodes vahlii*	359	132	7.2	8.5	21.0	36.5	39.7
91	*Malacoraja senta*	316	301	8.5	8.8	32.2	58.7	60.9
187	*Mallotus villosus*	1075	309	8.1	9.2	13.1	15.4	16.9
441	*Melanogrammus aeglefinus*	7	7	17.9	17.9	23.6	53.1	53.1
745	*Melanostigma atlanticum*	384	155	5.2	7.0	11.5	14.4	15.0
449	*Merluccius bilinearis*	1259	867	8.4	12.0	19.8	37.2	48.4
272	Myctophidae	15	5	6.2	6.2	7.2	14.6	14.6
819	*Myoxocephalus scorpius*	193	123	8.1	8.1	26.4	41.0	42.4

Code STRAP	Scientific name	Sampled number		Length (cm)				
		Length	Weight	Min	P1*	Median	P99*	Max
13	*Myxine limosa*	1471	431	19.2	21.5	35.8	48.5	55.8
278	*Neoscopelus macrolepidotus*	2	2	15.5	15.5	16.3	17.1	17.1
478	*Nezumia bairdii*	2243	528	6.5	10.4	23.4	31.8	37.4
275	*Notoscopelus kroyeri*	5	5	11.4	11.4	11.5	15.5	15.5
874	*Paraliparis calidus*	6	6	5.4	5.4	9.7	10.5	10.5
856	*Paraliparis copei*	8	8	5.1	5.1	8.4	12.2	12.2
444	*Phycis chesteri*	314	301	13.5	16.1	26.0	38.7	40.2
882	*Pleuronectiformes*	1	0	7.1	7.1	7.1	7.1	7.1
443	*Pollachius virens*	3	3	61.6	61.6	62.5	76.0	76.0
222	*Polyipnus clarus*	1	1	7.2	7.2	7.2	7.2	7.2
892	*Reinhardtius hippoglossoides*	4499	2654	3.6	11.9	35.6	52.2	72.8
572	*Scomber scombrus*	170	166	5.3	5.5	14.8	30.3	30.8
792	*Sebastes* sp.	16426	5846	3.0	10.0	23.8	31.8	46.5
369	*Serrivomer beanii*	1	1	46.6	46.6	46.6	46.6	46.6
710	*Stichaeus punctatus*	3	3	9.6	9.6	12.3	14.0	14.0
230	*Stomias boa boa*	1	1	5.2	5.2	5.2	5.2	5.2
373	*Synaphobranchus kaupii*	8	8	26.9	26.9	40.7	59.2	59.2
814	*Triglops murrayi*	584	145	4.4	7.3	10.5	15.9	17.6
447	*Urophycis tenuis*	718	593	21.4	23.2	38.2	67.0	78.8

Invertebrates

Code STRAP	Scientific name	Sampled number		Length (cm)				
		Length	Weight	Min	P1*	Median	P99*	Max
8138	*Argis dentata*	762	0	0.7	0.8	1.5	2.3	3.1
8113	*Atlantopandalus propinqvus*	214	0	0.7	0.9	1.7	2.4	2.4
8206	*Cancer irroratus*	5	0	1.3	1.3	1.4	6.6	6.6
8213	*Chionoecetes opilio*	959	40	0.5	1.0	7.1	12.9	13.6
8108	*Dichelopandalus leptocerus*	36	0	1.0	1.0	1.2	1.6	1.6
8081	*Eualus belcheri*	1	0	0.7	0.7	0.7	0.7	0.7
8075	*Eualus fabricii*	58	1	0.6	0.6	0.9	1.3	1.3
8080	*Eualus gaimardii gaimardii*	48	0	0.5	0.5	0.9	1.3	1.3
8077	*Eualus macilentus*	169	0	0.4	0.5	1.0	1.3	1.3
8074	*Eualus* sp.	7	0	0.6	0.6	0.8	0.9	0.9
8033	*Eusergestes arcticus*	47	0	1.1	1.1	1.6	2.1	2.1
8154	*Homarus americanus*	1	1	10.5	10.5	10.5	10.5	10.5
8219	*Hyas alutaceus*	301	5	0.6	0.7	2.5	5.4	6.2
8217	*Hyas araneus*	142	3	0.5	0.7	3.1	8.8	9.2
4753	*Illex illecebrosus*	244	177	5.1	7.2	18.0	22.2	22.5
8092	*Lebbeus groenlandicus*	90	0	0.6	0.6	1.4	2.2	2.2
8095	*Lebbeus microceros*	2	0	1.0	1.0	1.1	1.1	1.1
8093	*Lebbeus polaris*	319	0	0.6	0.6	0.9	1.3	1.3
8196	*Lithodes maja*	198	10	1.4	1.9	7.9	11.8	12.3
8111	*Pandalus borealis*	19568	672	0.2	1.0	2.1	2.7	3.0
8112	*Pandalus montagui*	2413	0	0.4	0.7	1.3	2.1	2.3
8057	*Pasiphaea multidentata*	2891	0	1.0	1.6	2.5	3.1	3.4
8056	*Pasiphaea tarda*	6	0	2.7	2.7	3.4	4.0	4.0
8135	*Pontophilus norvegicus*	1843	0	0.0	0.7	1.2	1.6	1.6
8129	*Sabinea sarsii*	69	0	0.5	0.5	1.0	1.4	1.4
8128	*Sabinea septemcarinata*	294	0	0.6	0.6	1.0	1.7	1.8
8119	*Sclerocrangon boreas*	458	0	0.8	1.0	1.9	3.0	3.2
8087	*Spirontocaris liljeborgii*	113	0	0.6	0.6	1.1	1.5	1.6
8086	*Spirontocaris phippsii*	1	0	1.2	1.2	1.2	1.2	1.2
8084	*Spirontocaris* sp.	4	0	0.9	0.9	0.9	1.1	1.1
8085	*Spirontocaris spinus*	102	0	0.4	0.5	1.0	1.6	1.7

* *P1 : 1er centile P99 : 99^{e} centile*

FIGURES

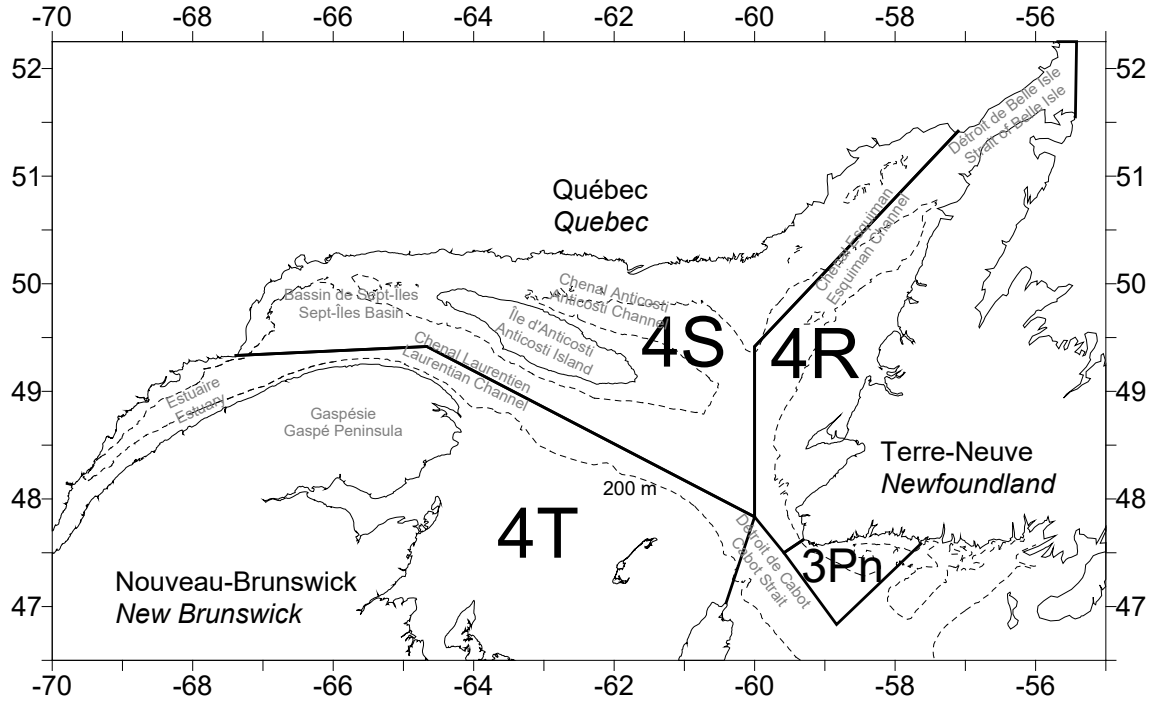

Figure 1. NAFO Divisions of the Estuary and Gulf of St. Lawrence and names of locations mentioned in the text.

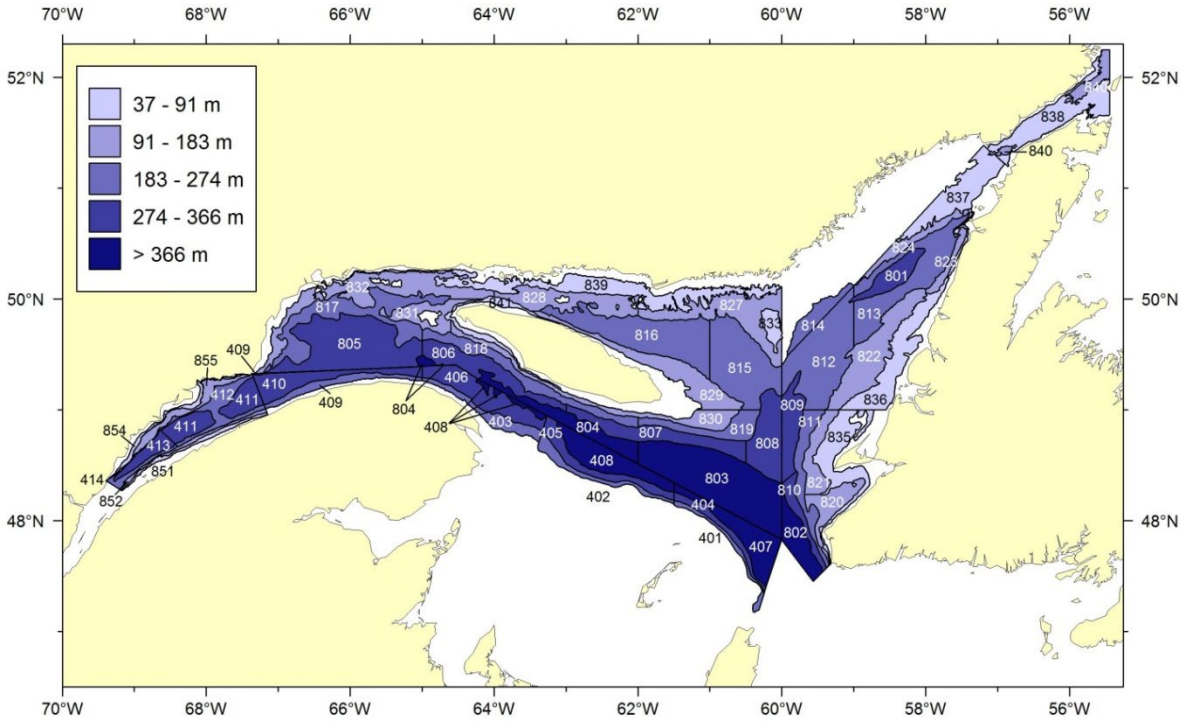

Figure 2. Stratification scheme used for the groundfish and shrimp research survey in the Estuary and northern Gulf of St. Lawrence.

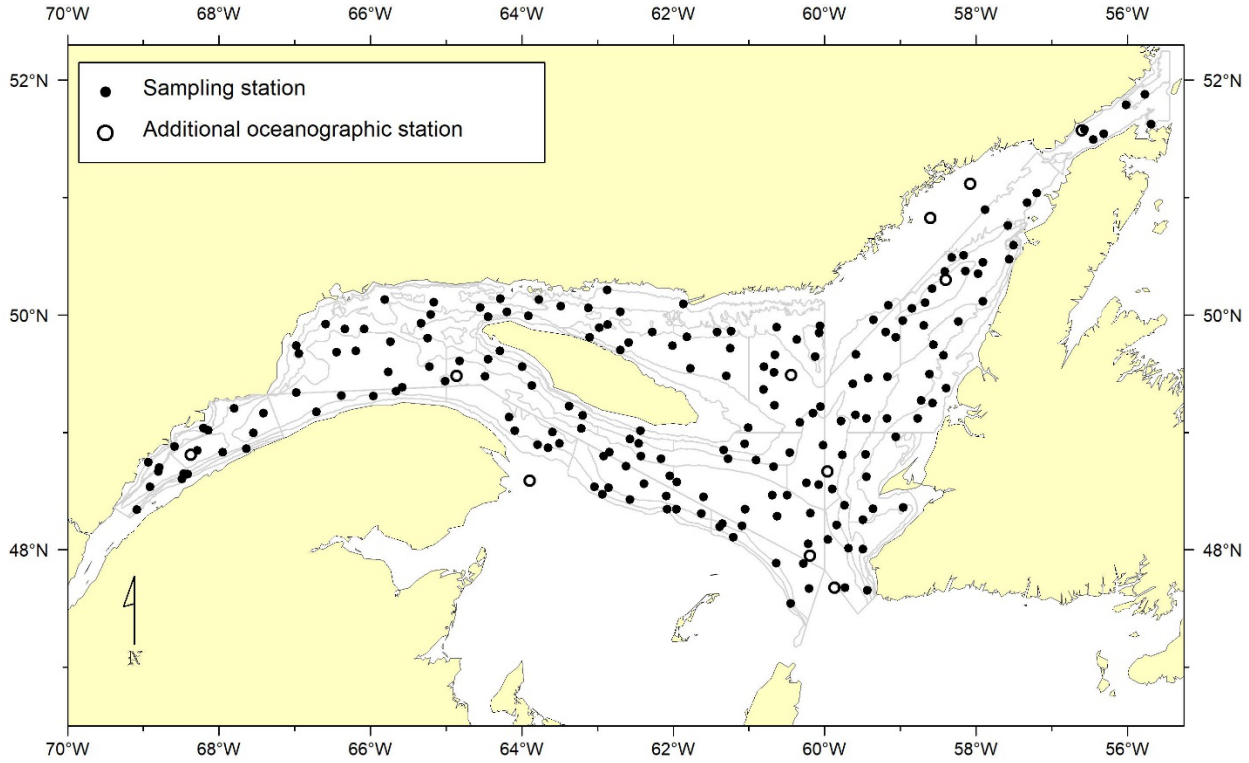

Figure 3. Locations of successful sampling stations (trawl and oceanography) and additional oceanographic stations for the 2022 survey.

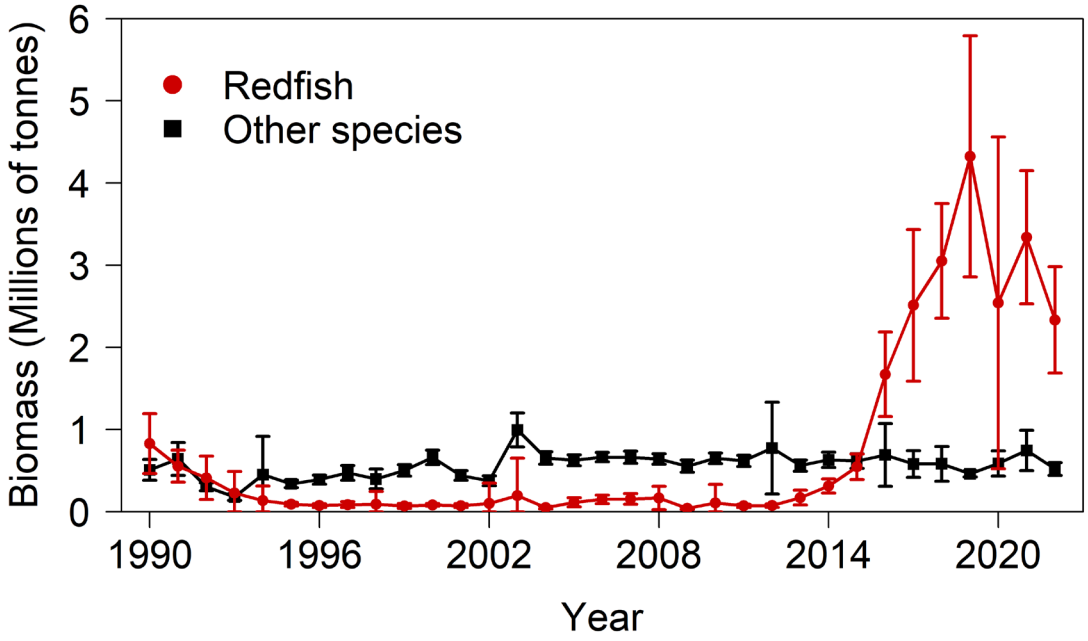

Figure 4. Biomass estimates (million of tons) of redfish spp. and all other species sampled in the study area. Error bars represent 95% confidence intervals.

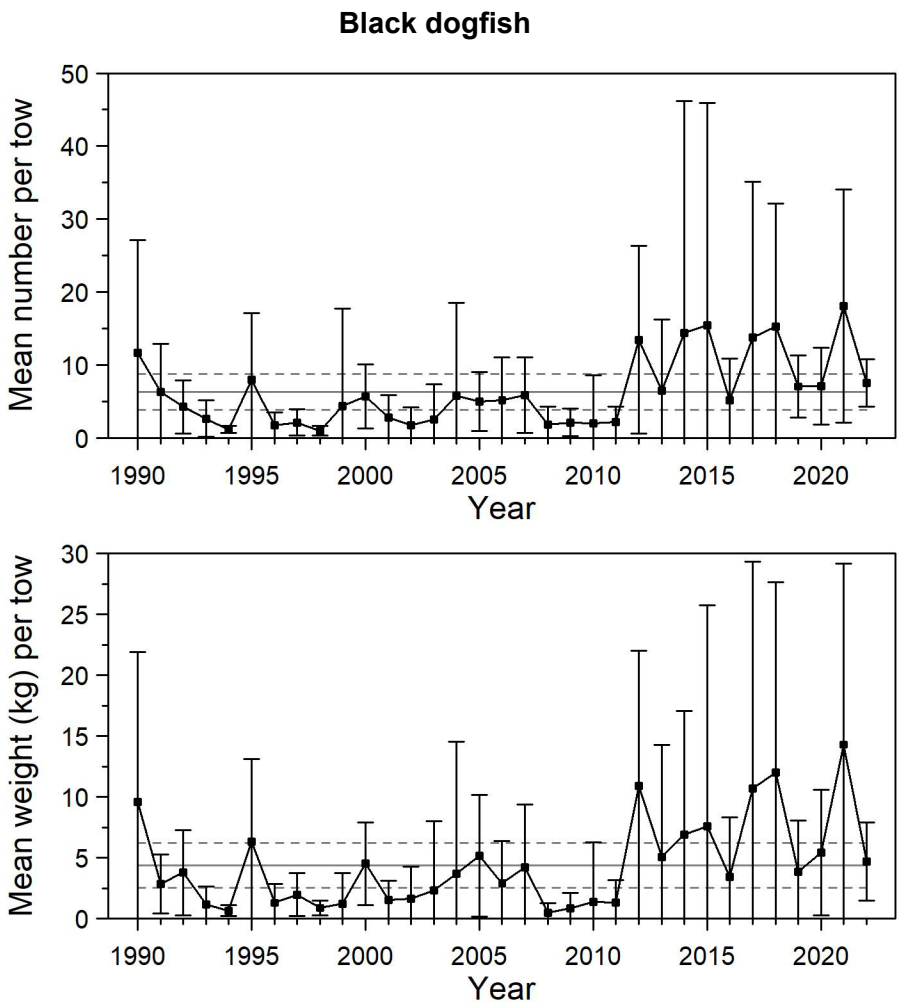

Figure 5. Mean numbers and mean weights per 15 minute tow observed during the survey for black dogfish in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

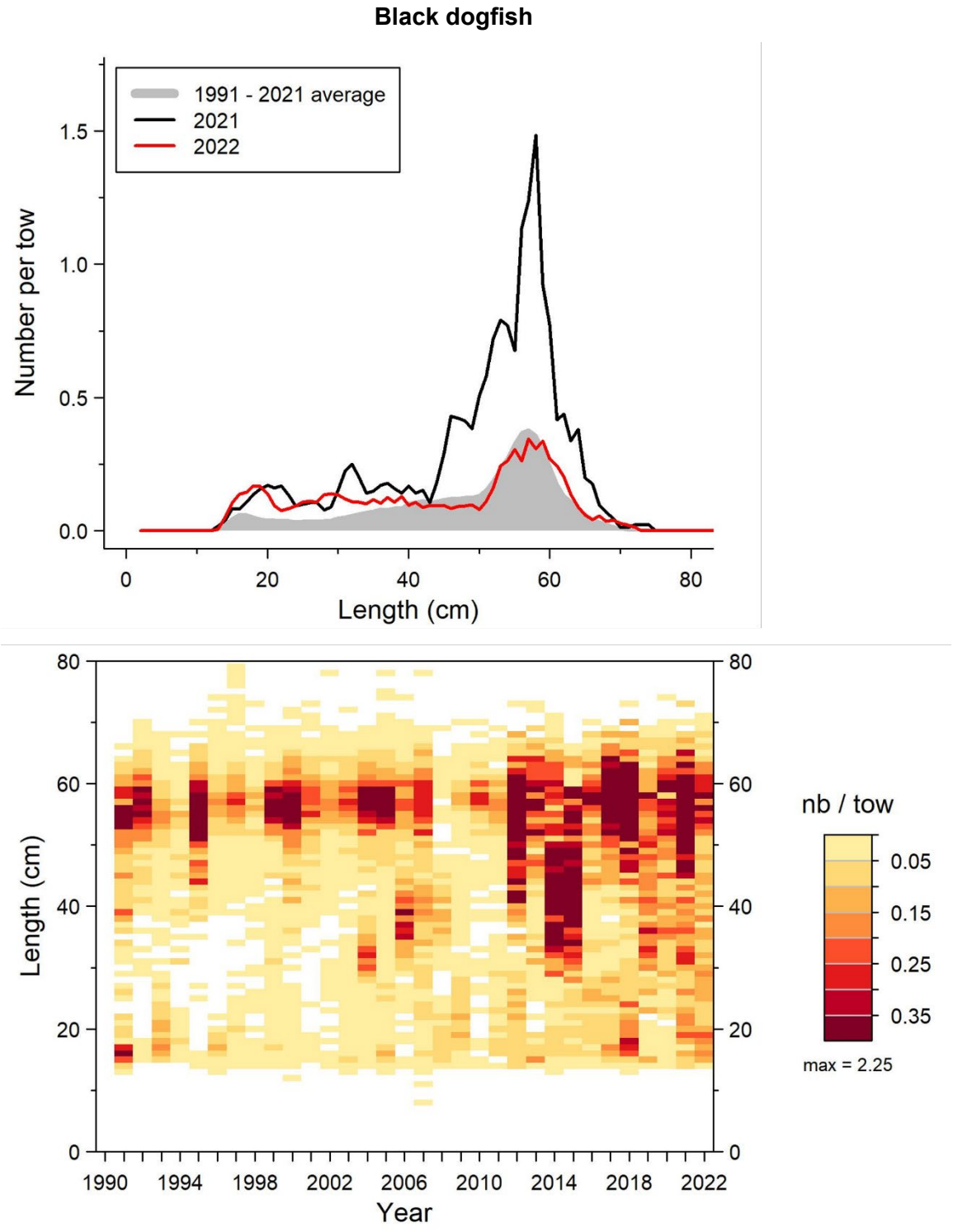

Figure 6. Length frequency distributions (mean number per 15 minute tow) observed during the survey for black dogfish in 4RST.

Black dogfish

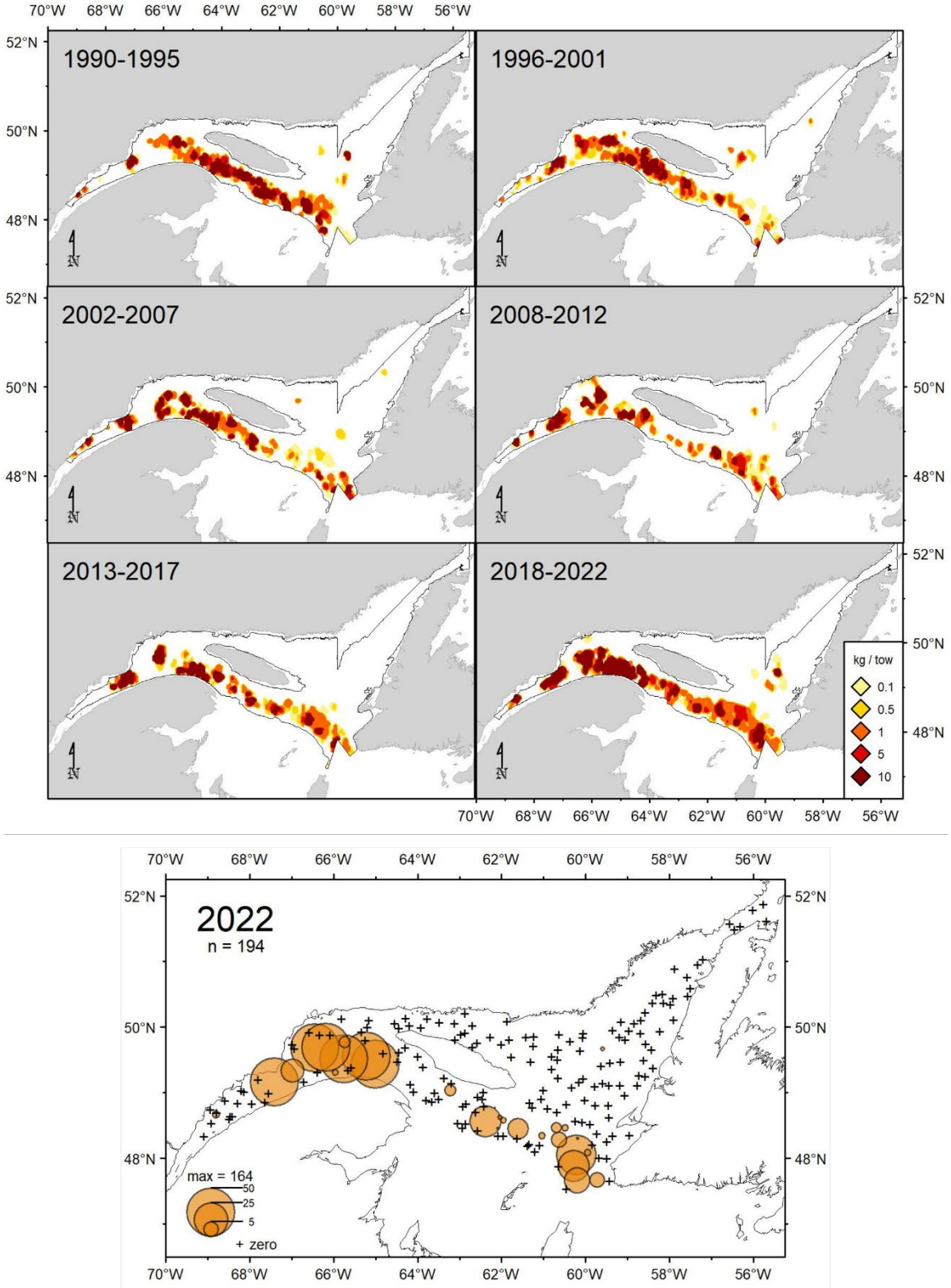

Figure 7. Black dogfish catch rate (kg/15 minute tow) distributions.

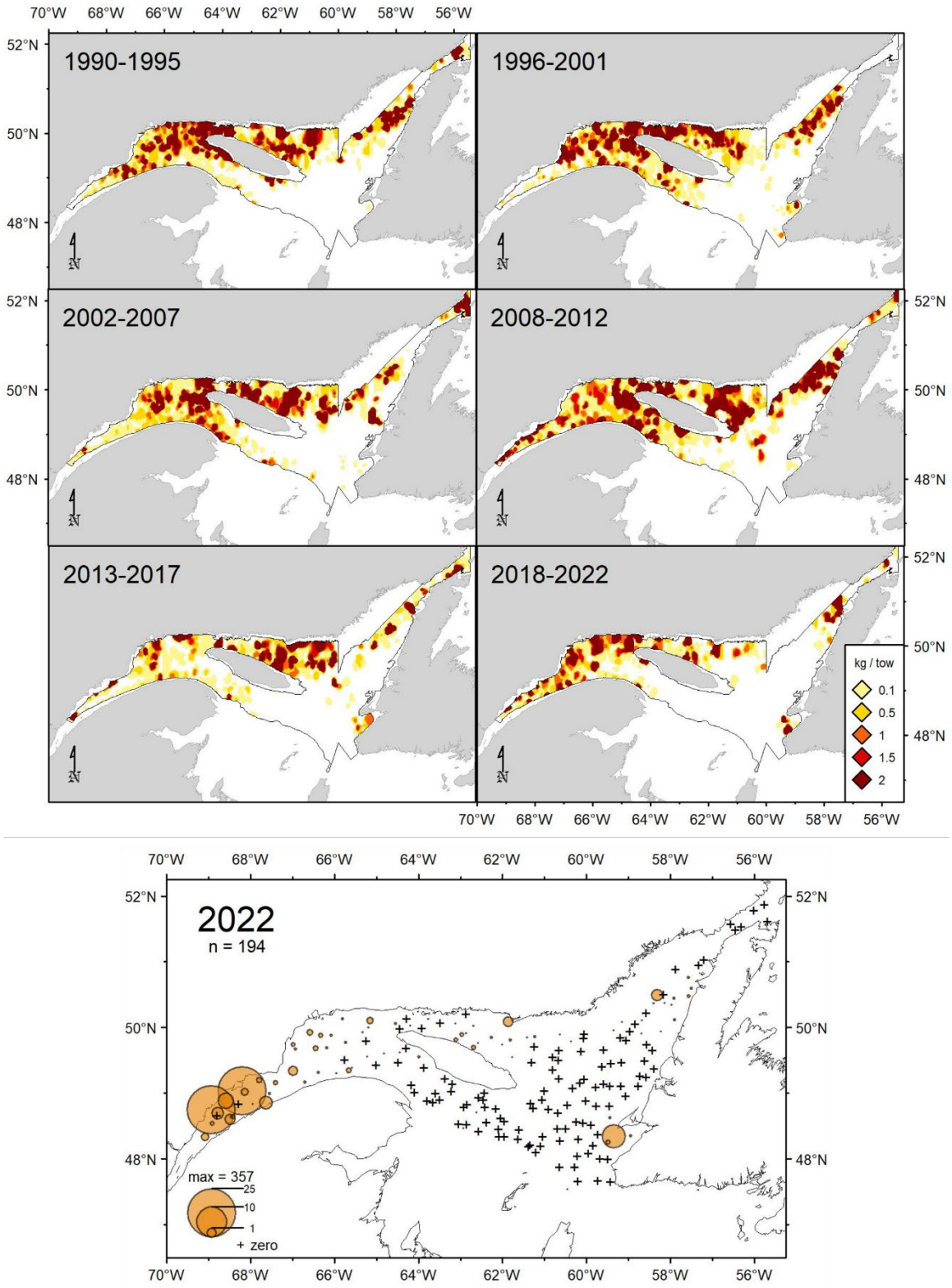

Figure 8. Capelin catch rate (kg/15 minute tow) distributions.

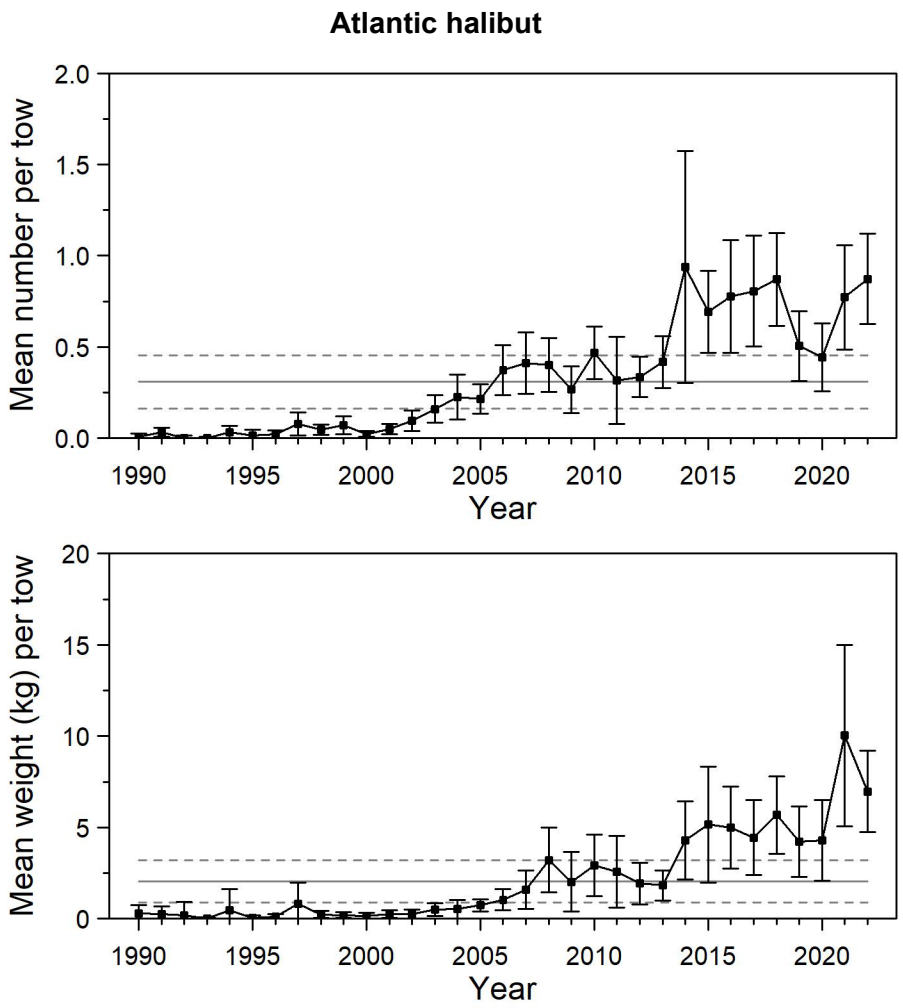

Figure 9. Mean numbers and mean weights per 15 minute tow observed during the survey for Atlantic halibut in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

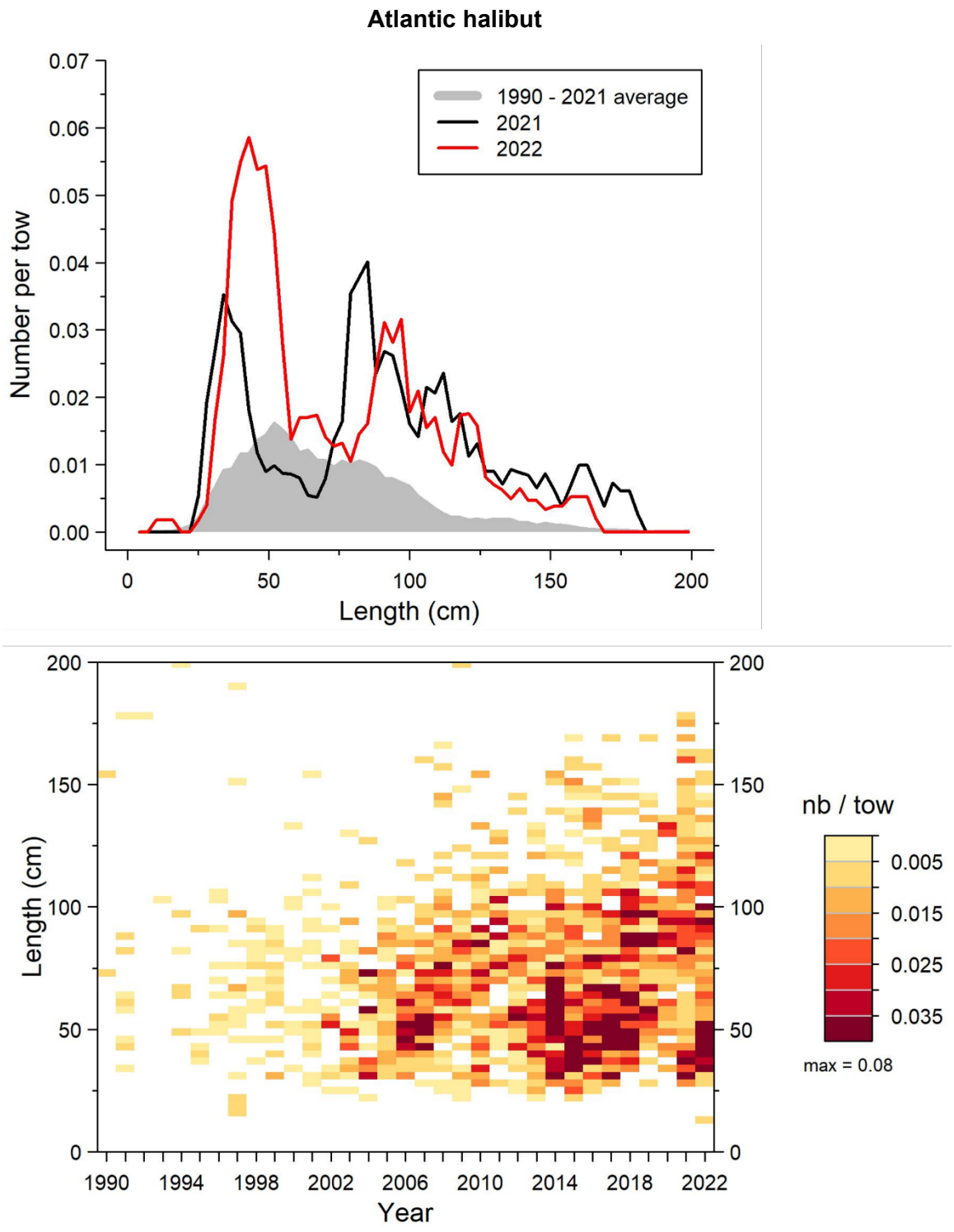

Figure 10. Length frequency distributions (mean number per 15 minute tow) observed during the survey for Atlantic halibut in 4RST.

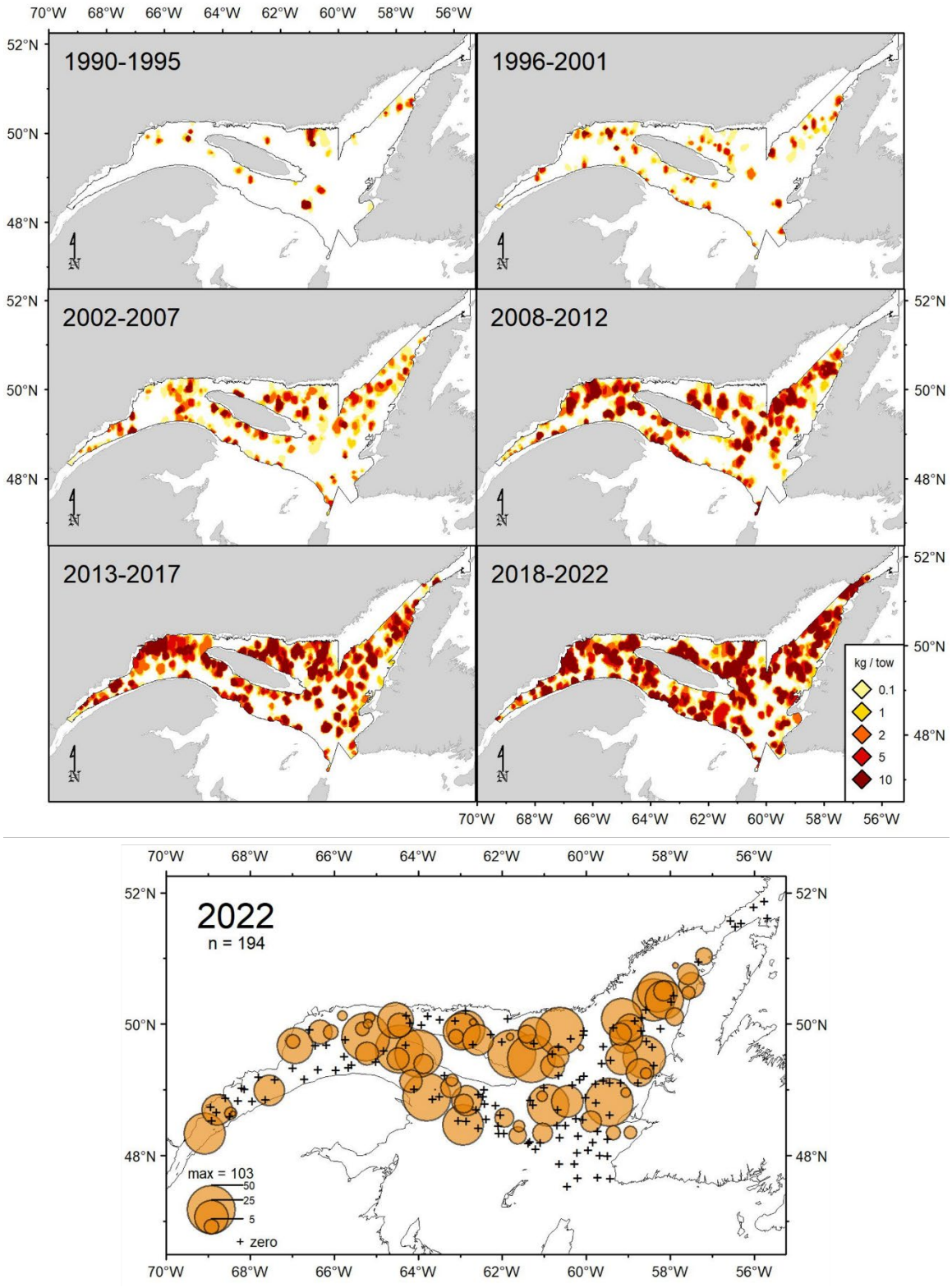

Figure 11. Atlantic halibut catch rate (kg/15 minute tow) distributions.

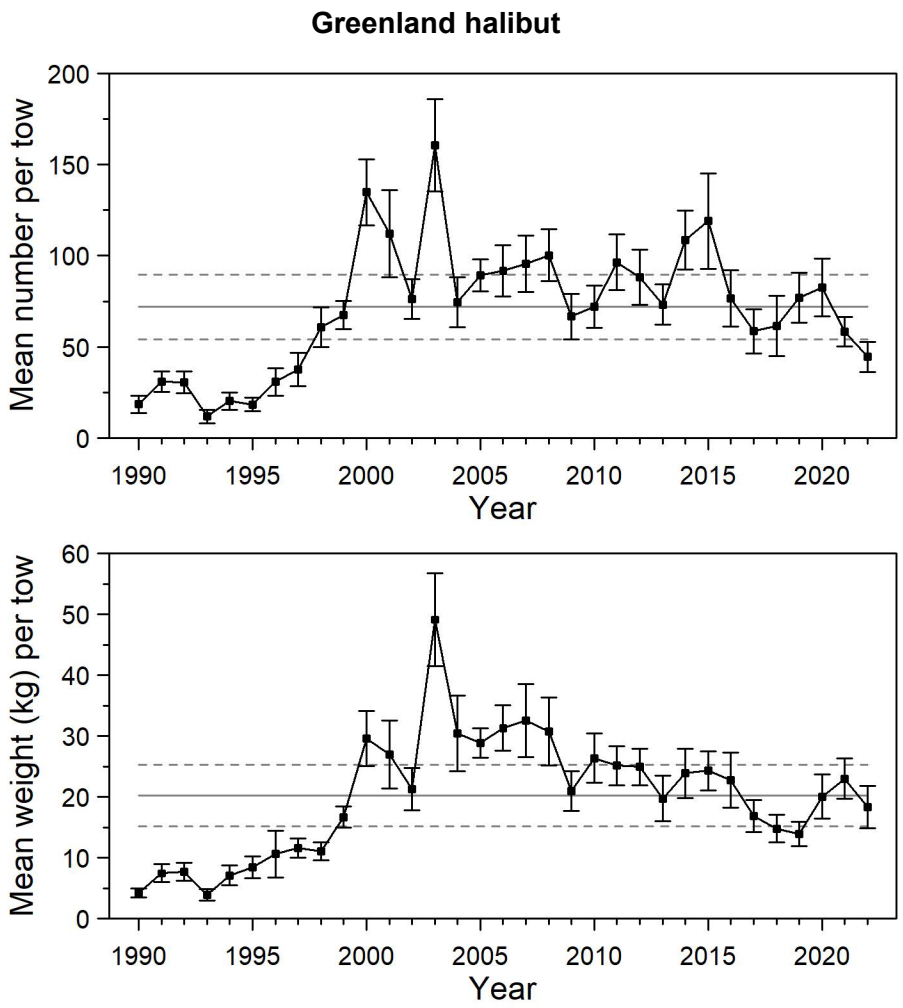

Figure 12. Mean numbers and mean weights per 15 minute tow observed during the survey for Greenland halibut in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

Greenland halibut

Figure 1

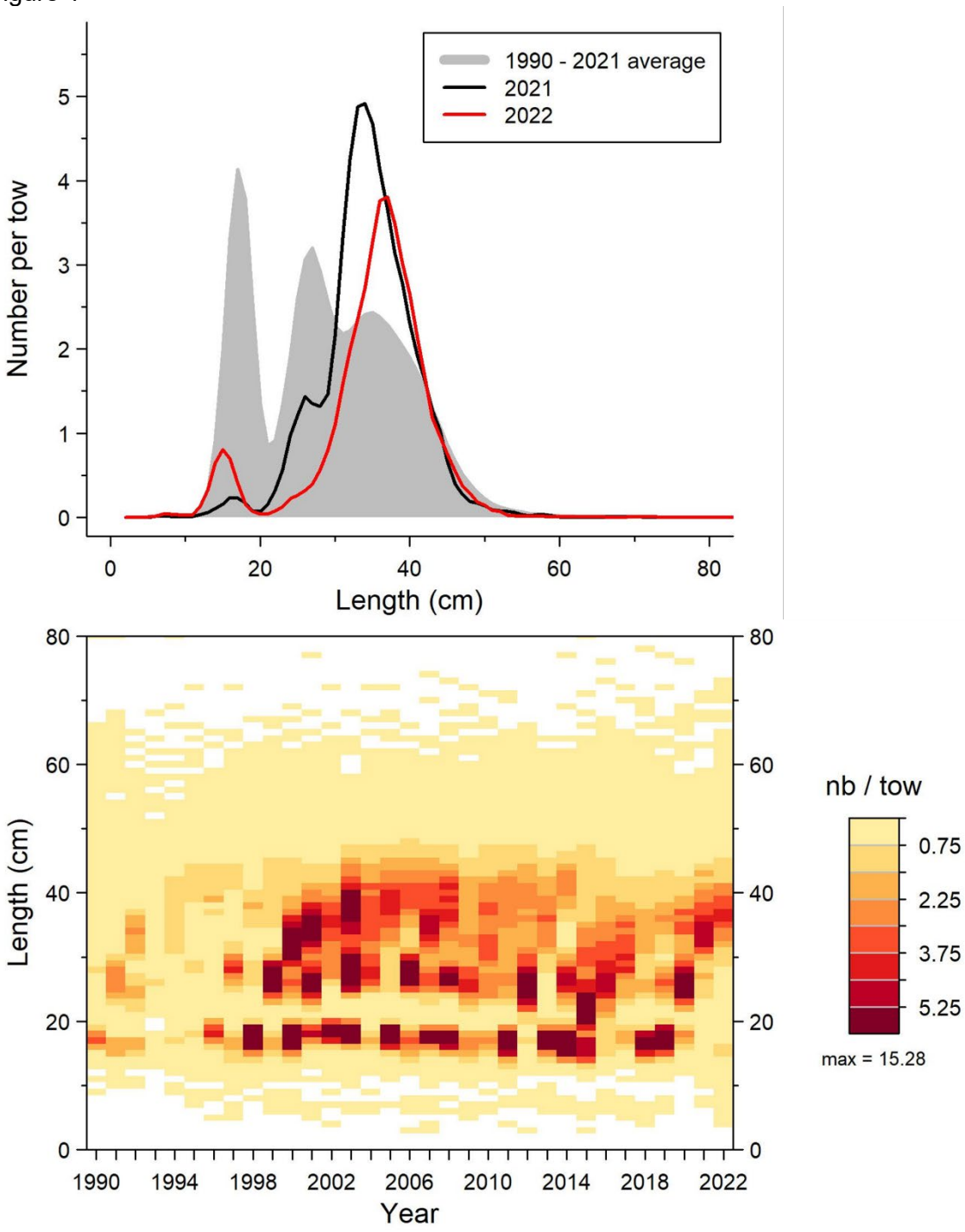

Figure 13. Length frequency distributions (mean number per 15 minute tow) observed during the survey for Greenland halibut in 4RST.

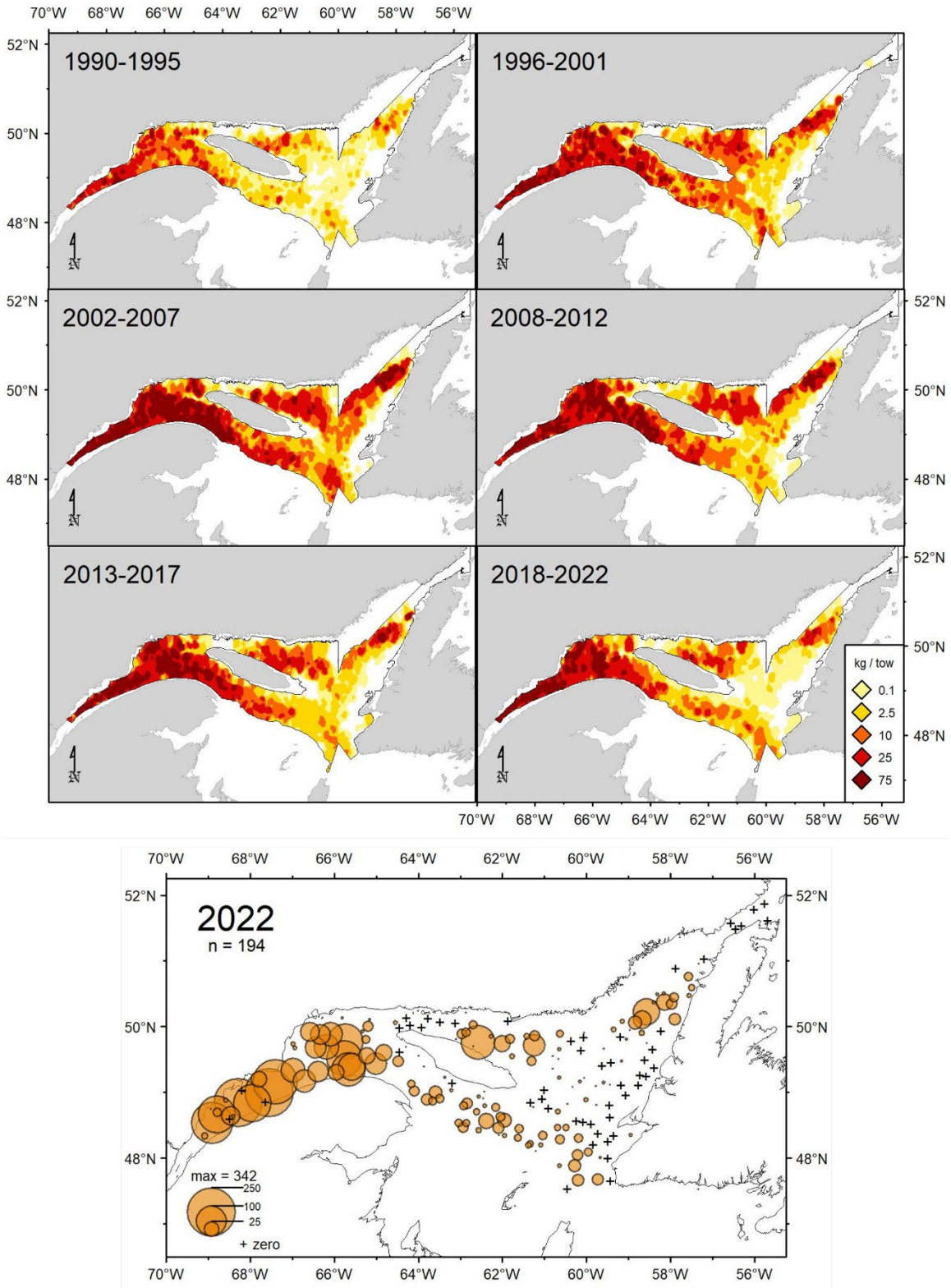

Figure 14. Greenland halibut catch rate (kg/15 minute tow) distributions.

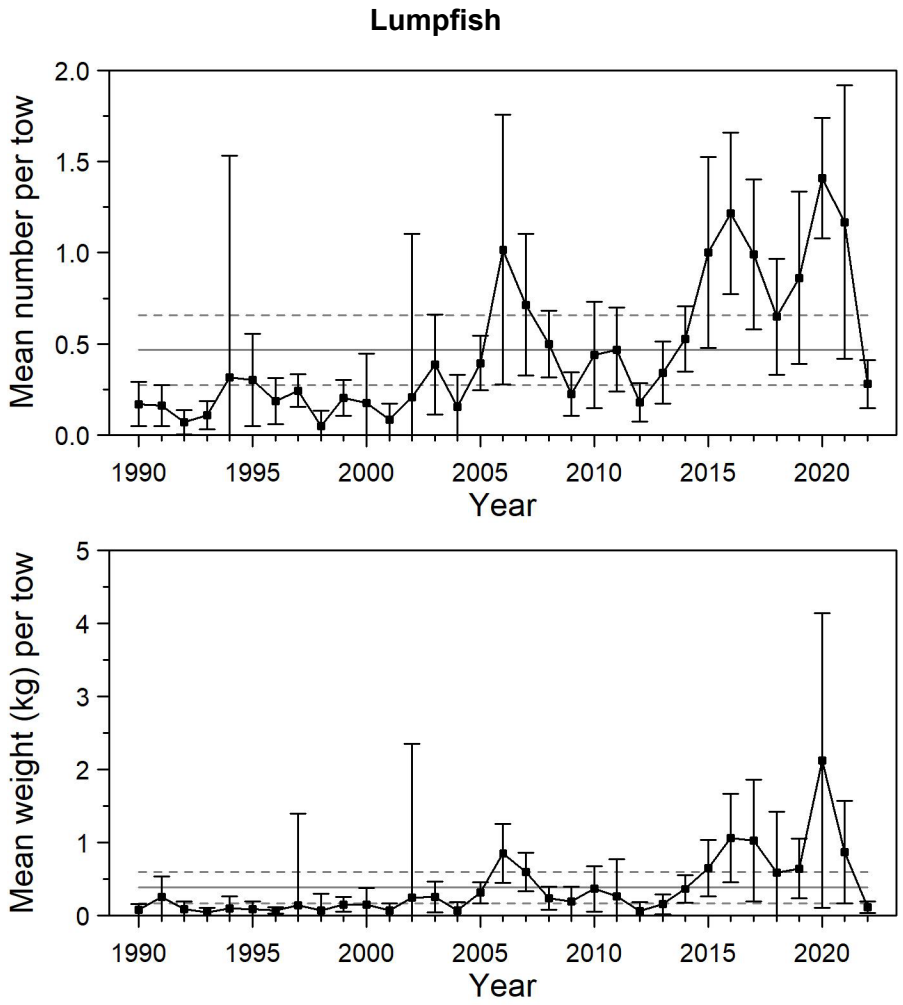

Figure 15. Mean numbers and mean weights per 15 minute tow observed during the survey for lumpfish in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

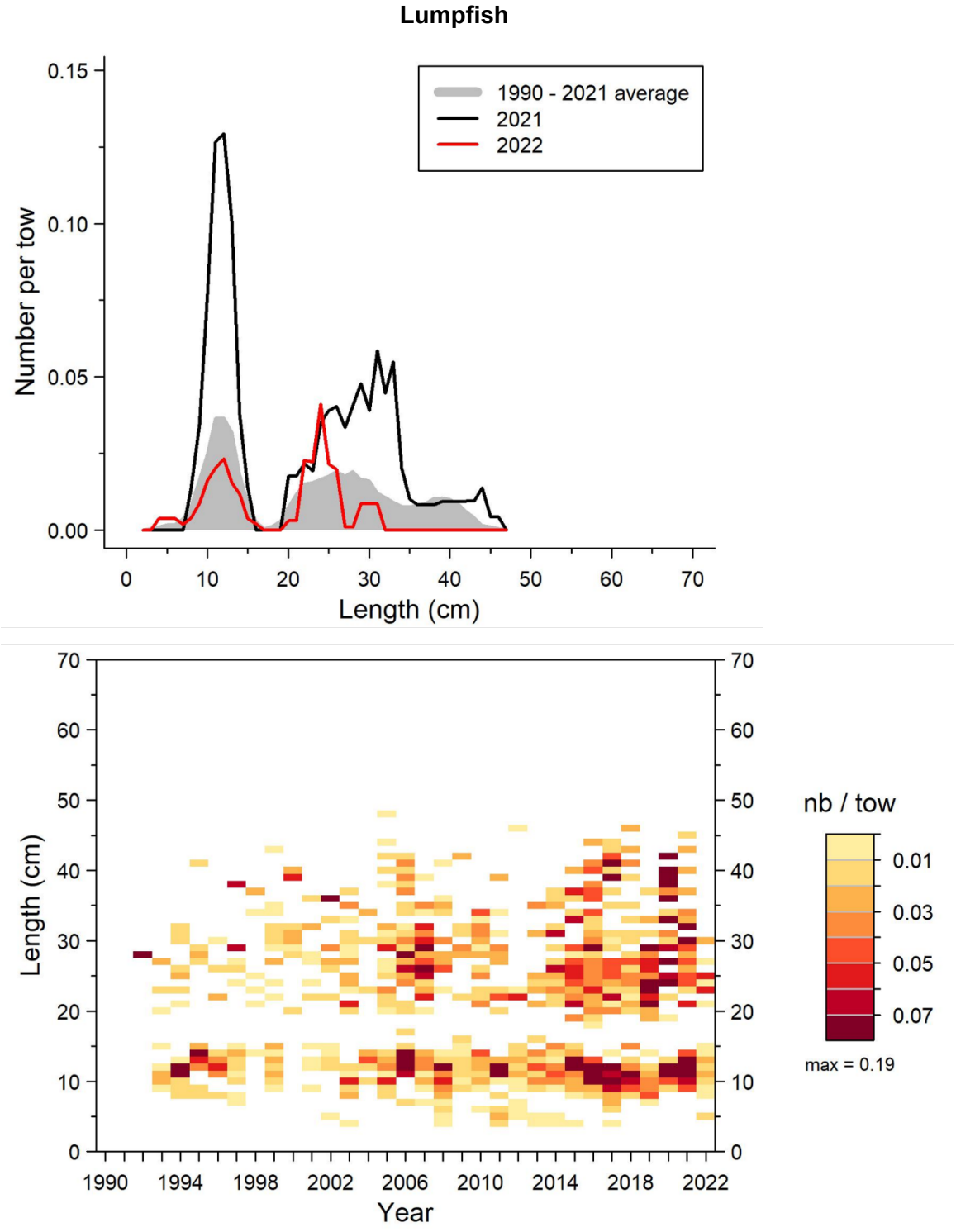

Figure 16. Length frequency distributions (mean number per 15 minute tow) observed during the survey for lumpfish in 4RST.

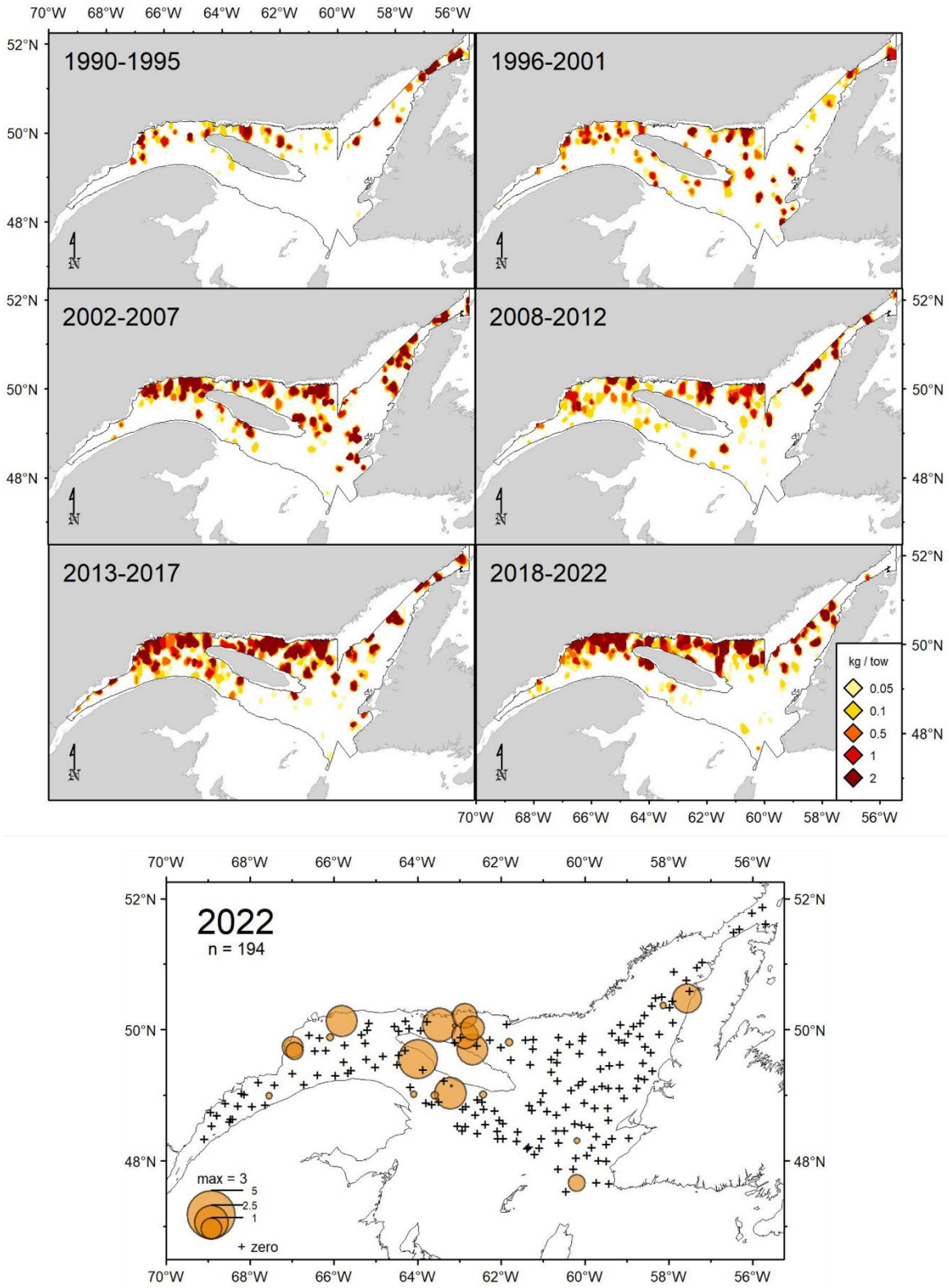

Figure 17. Lumpfish catch rate (kg/15 minute tow) distributions.

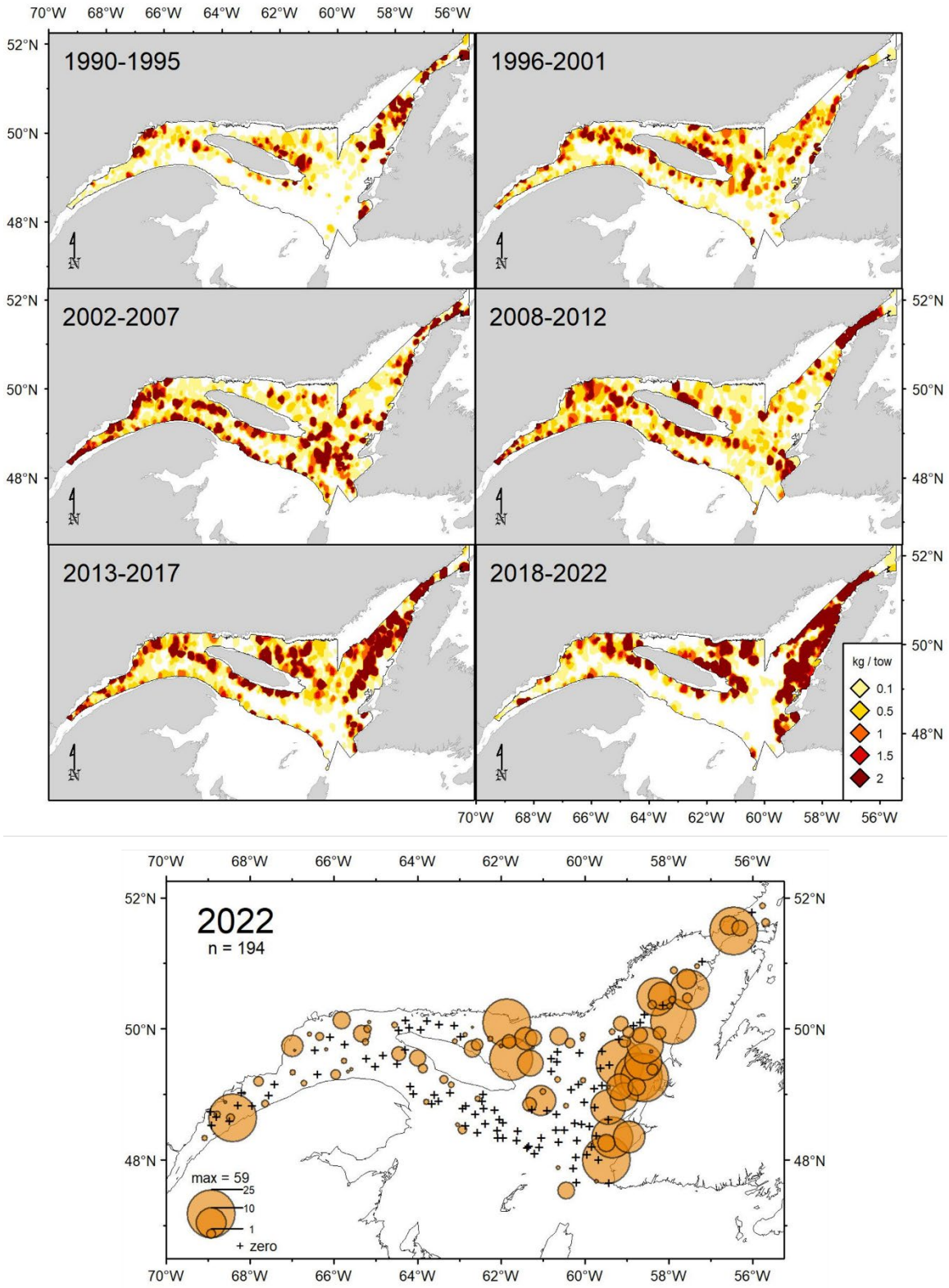

Figure 18. Herring catch rate (kg/15 minute tow) distributions.

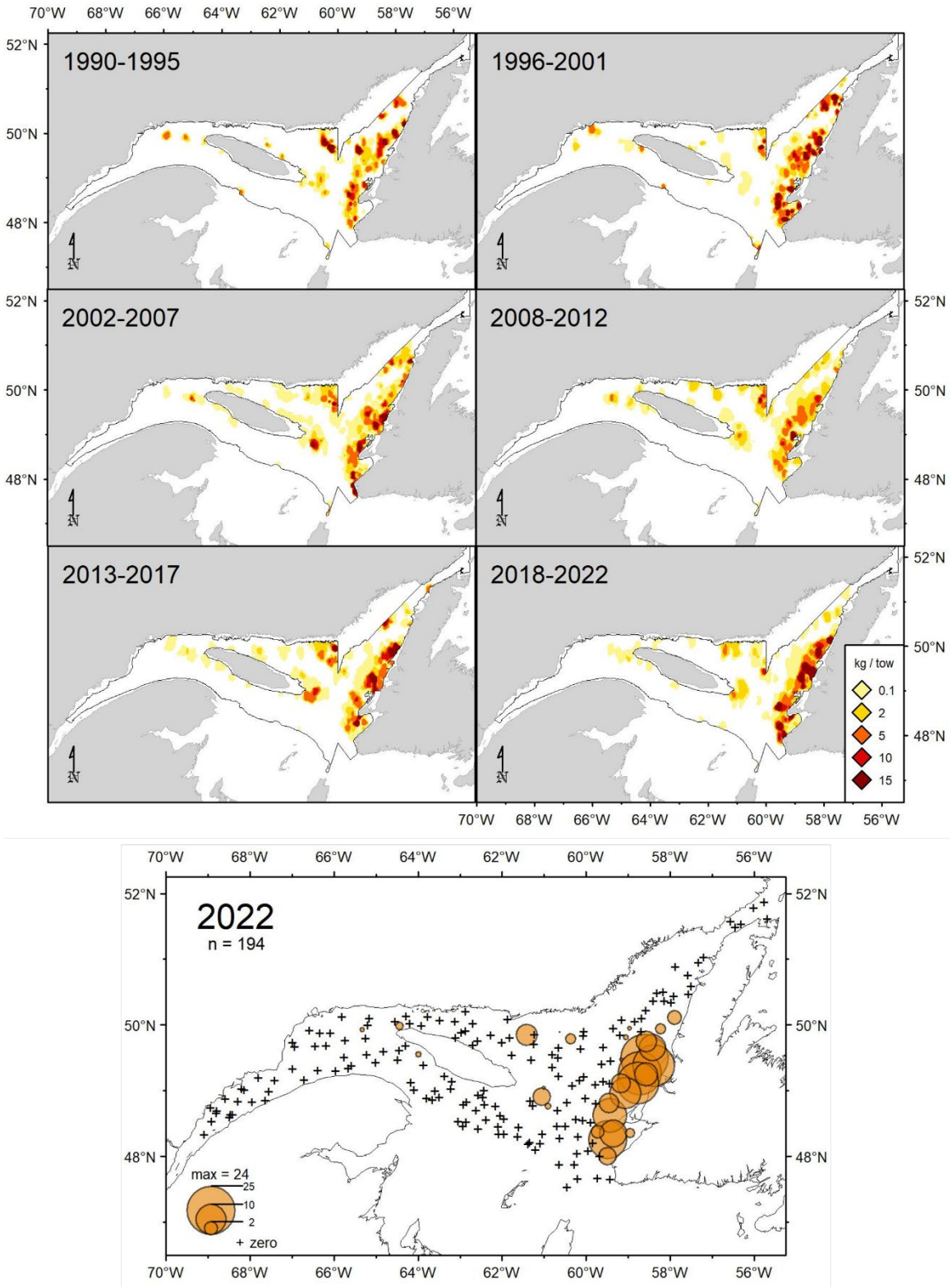

Figure 19. Atlantic wolffish catch rate (kg/15 minute tow) distributions.

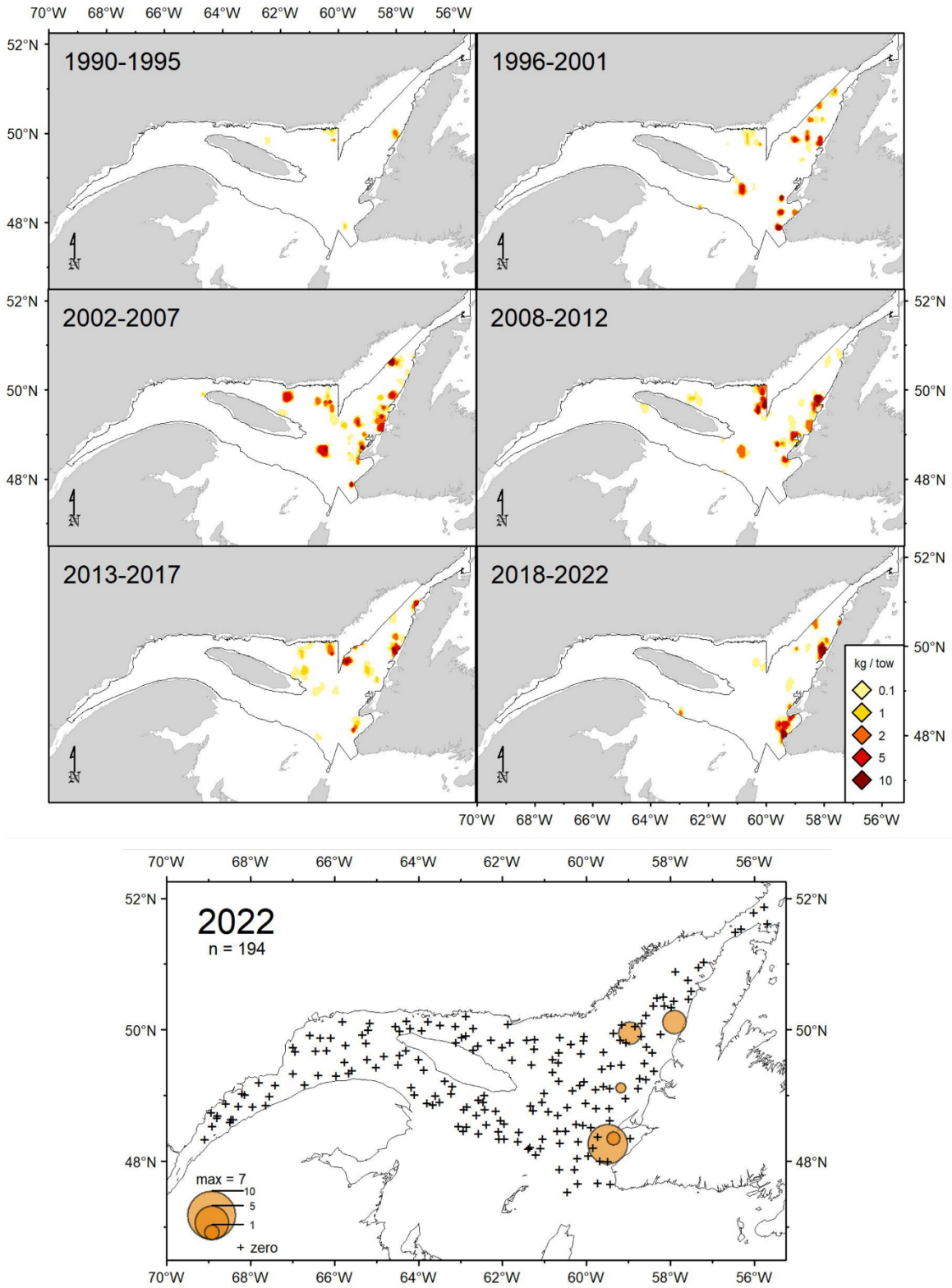

Figure 20. Spotted wolffish catch rate (kg/15 minute tow) distributions.

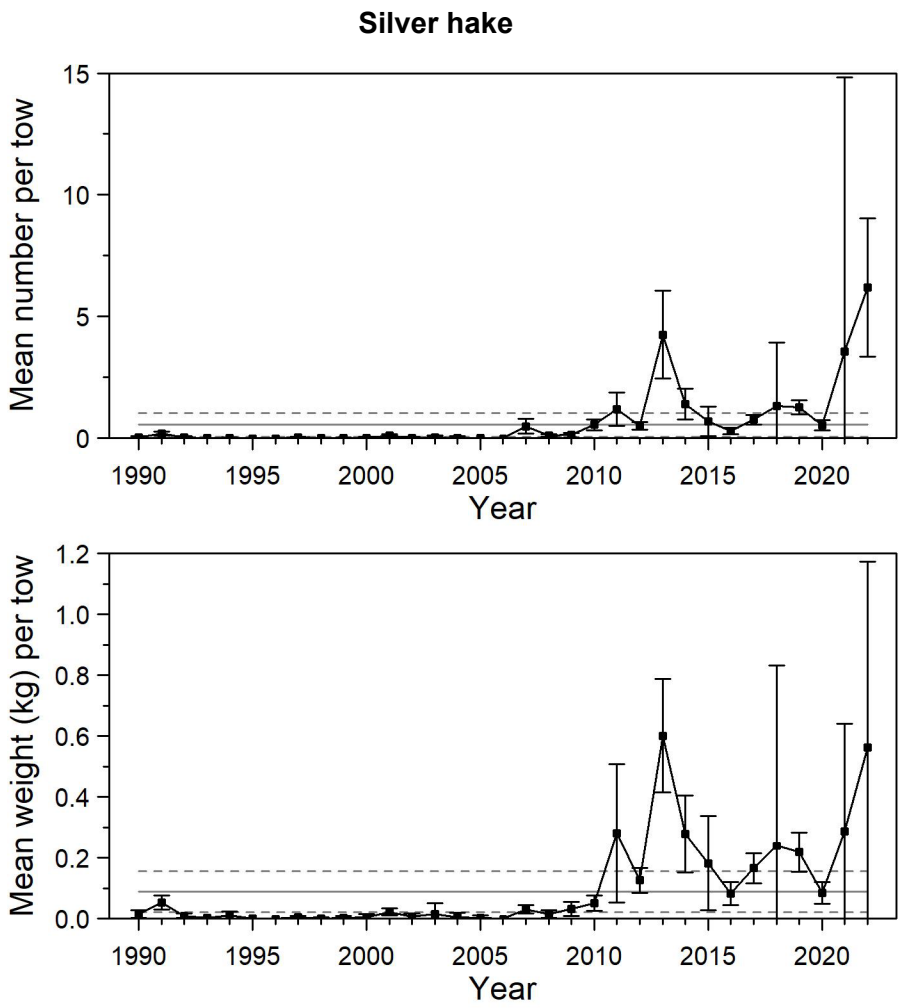

Figure 21. Mean numbers and mean weights per 15 minute tow observed during the survey for silver hake in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

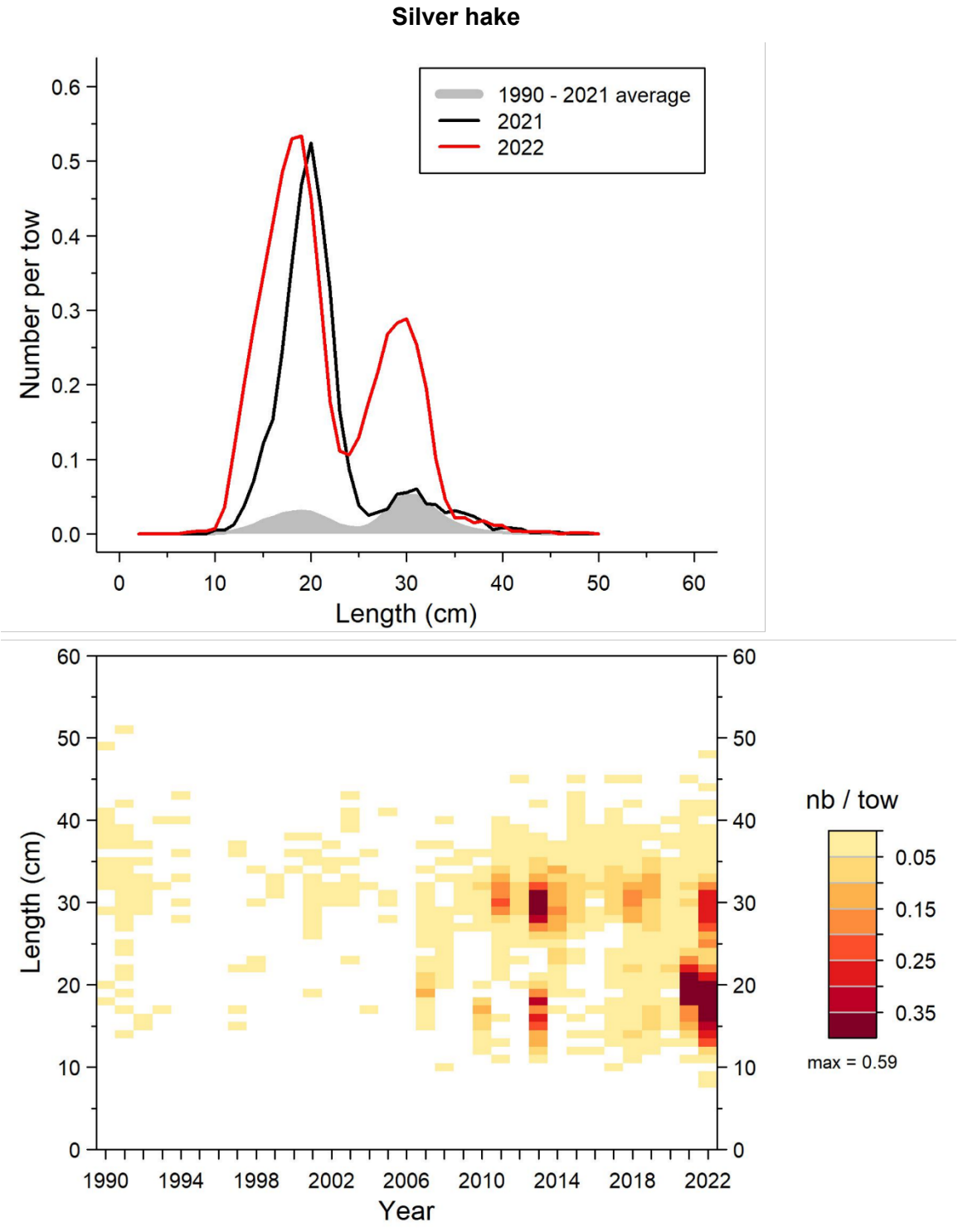

Figure 22. Length frequency distributions (mean number per 15 minute tow) observed during the survey for silver hake in 4RST.

Silver hake

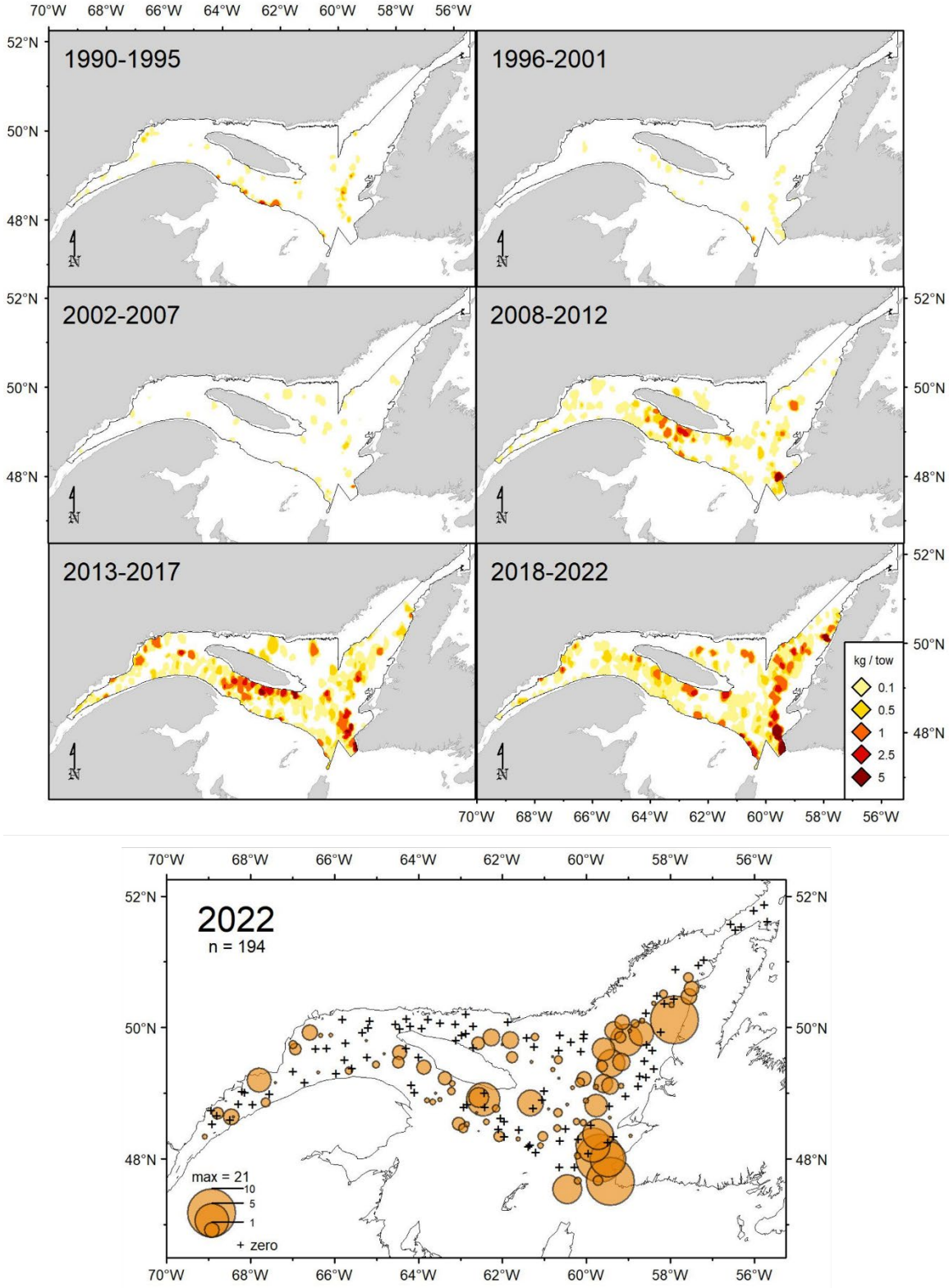

Figure 23. Silver hake catch rate (kg/15 minute tow) distributions.

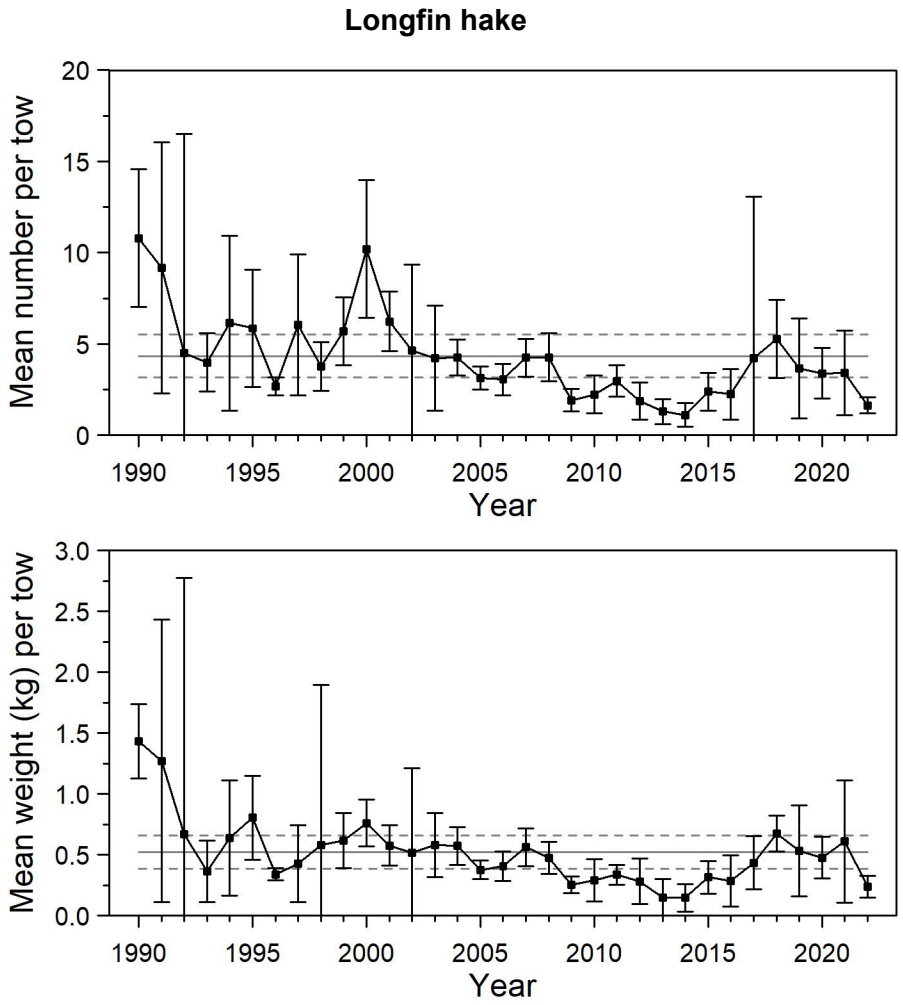

Figure 24. Mean numbers and mean weights per 15 minute tow observed during the survey for longfin hake in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

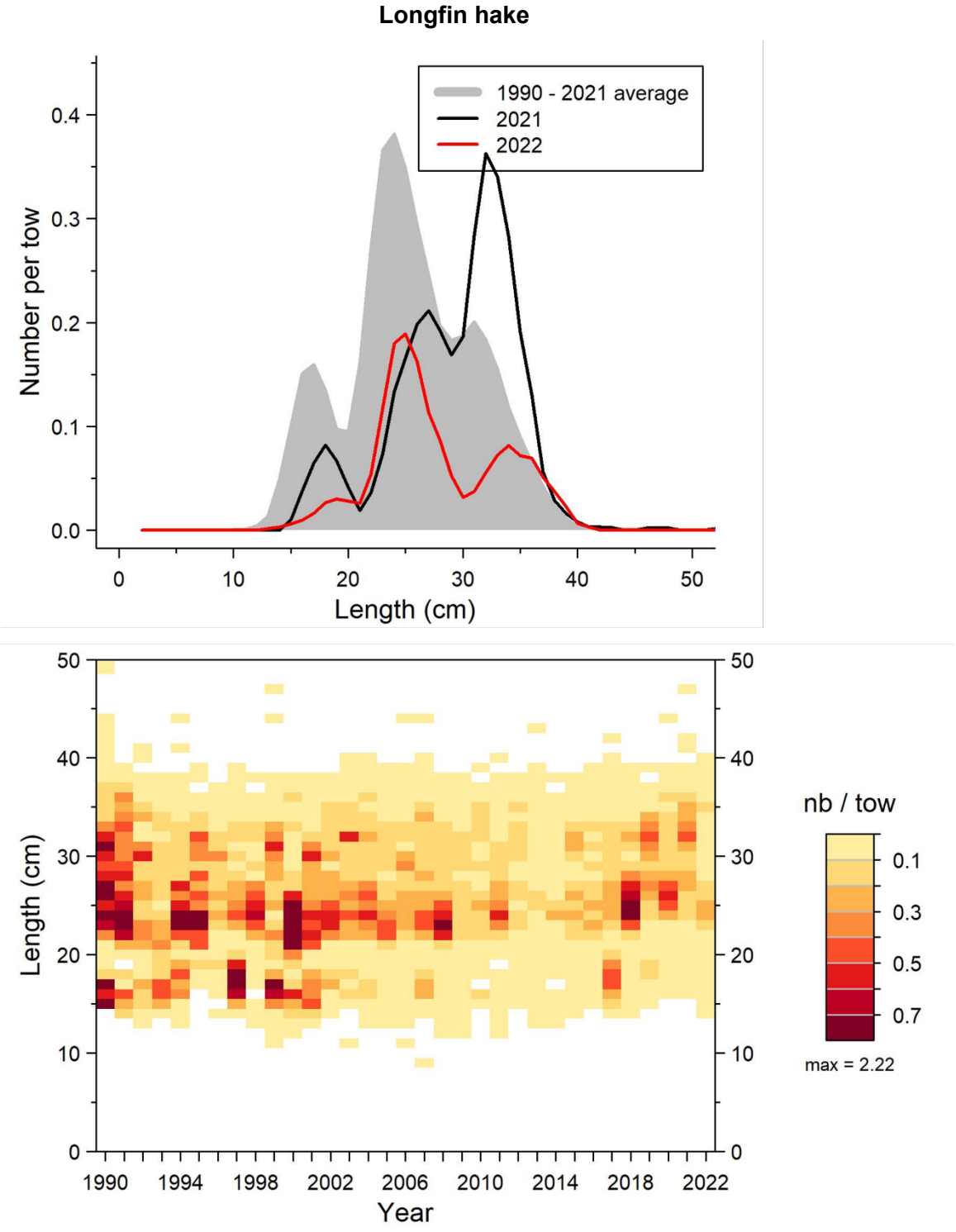

Figure 25. Length frequency distributions (mean number per 15 minute tow) observed during the survey for longfin hake in 4RST.

Longfin hake

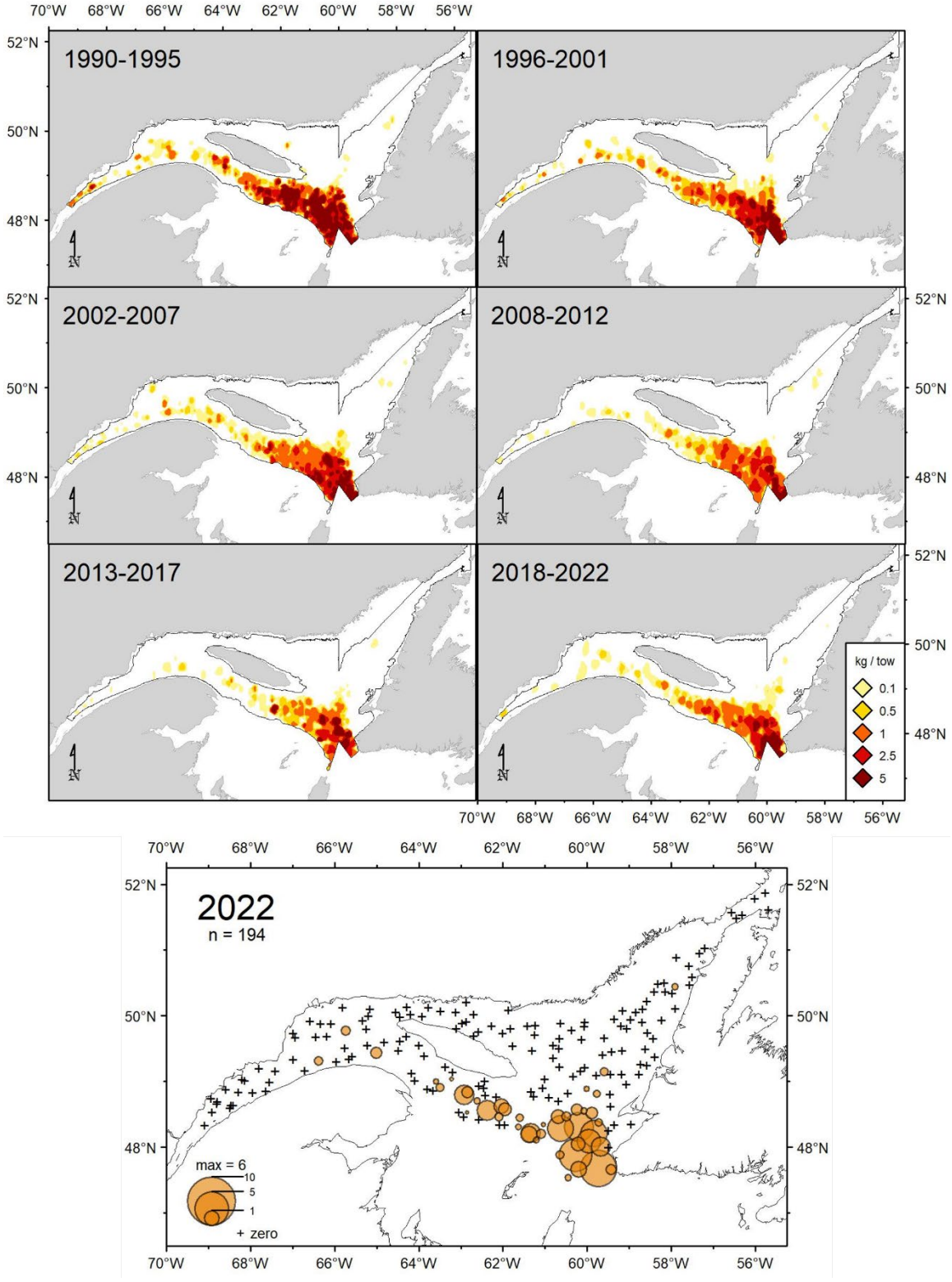

Figure 26. Longfin hake catch rate (kg/15 minute tow) distributions.

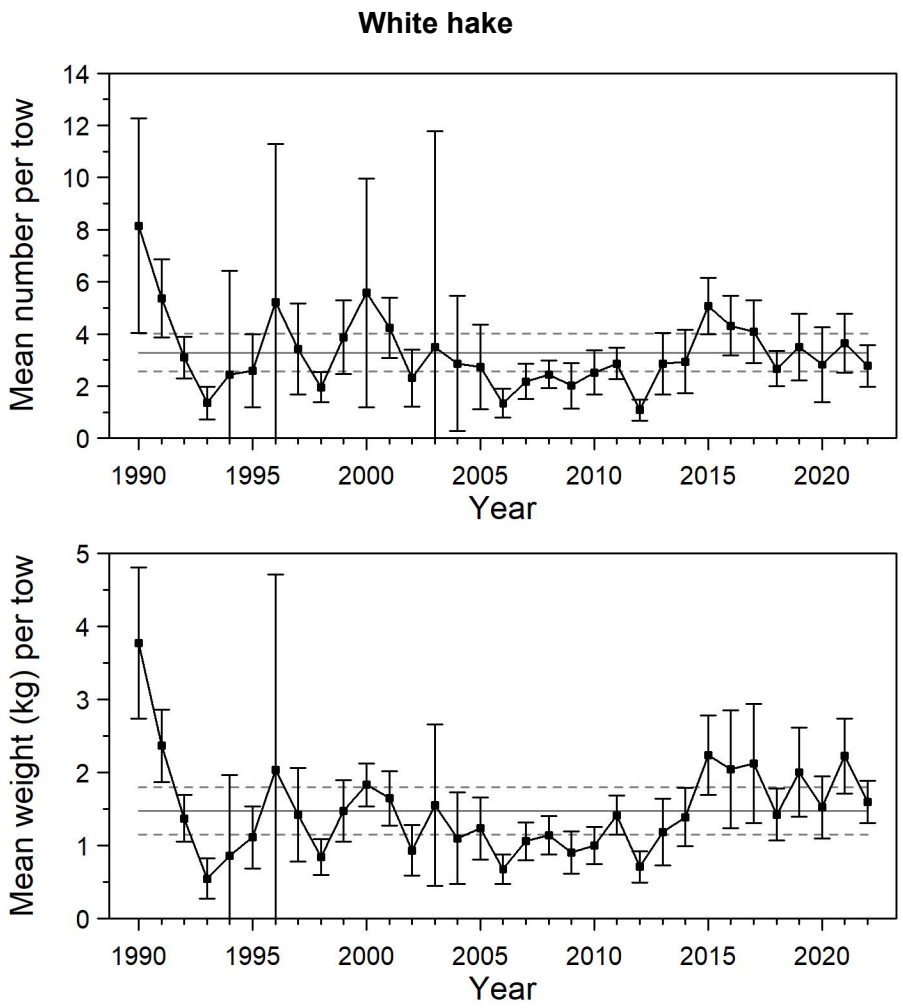

Figure 27. Mean numbers and mean weights per 15 minute tow observed during the survey for white hake in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

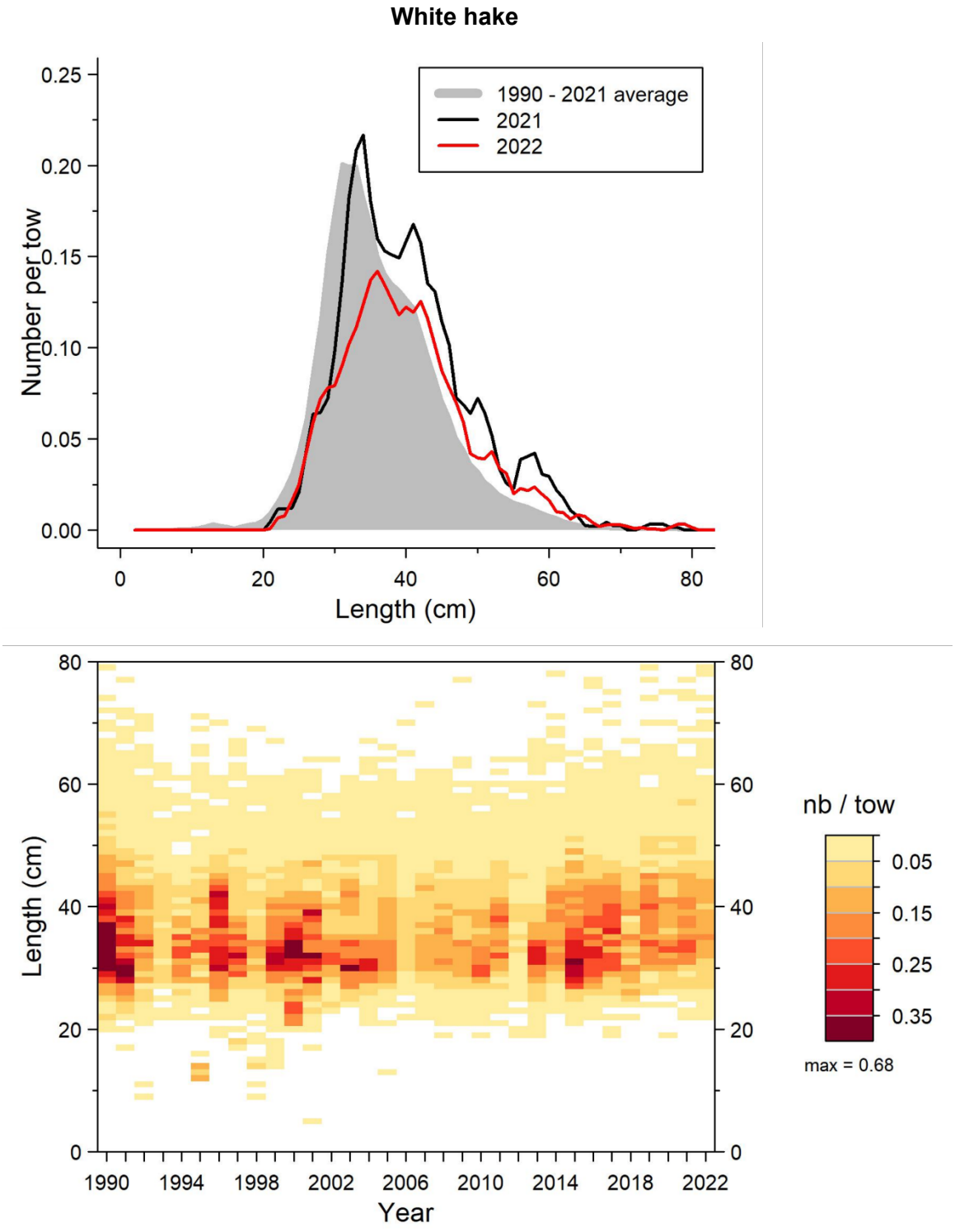

Figure 28. Length frequency distributions (mean number per 15 minute tow) observed during the survey for white hake in 4RST.

White hake

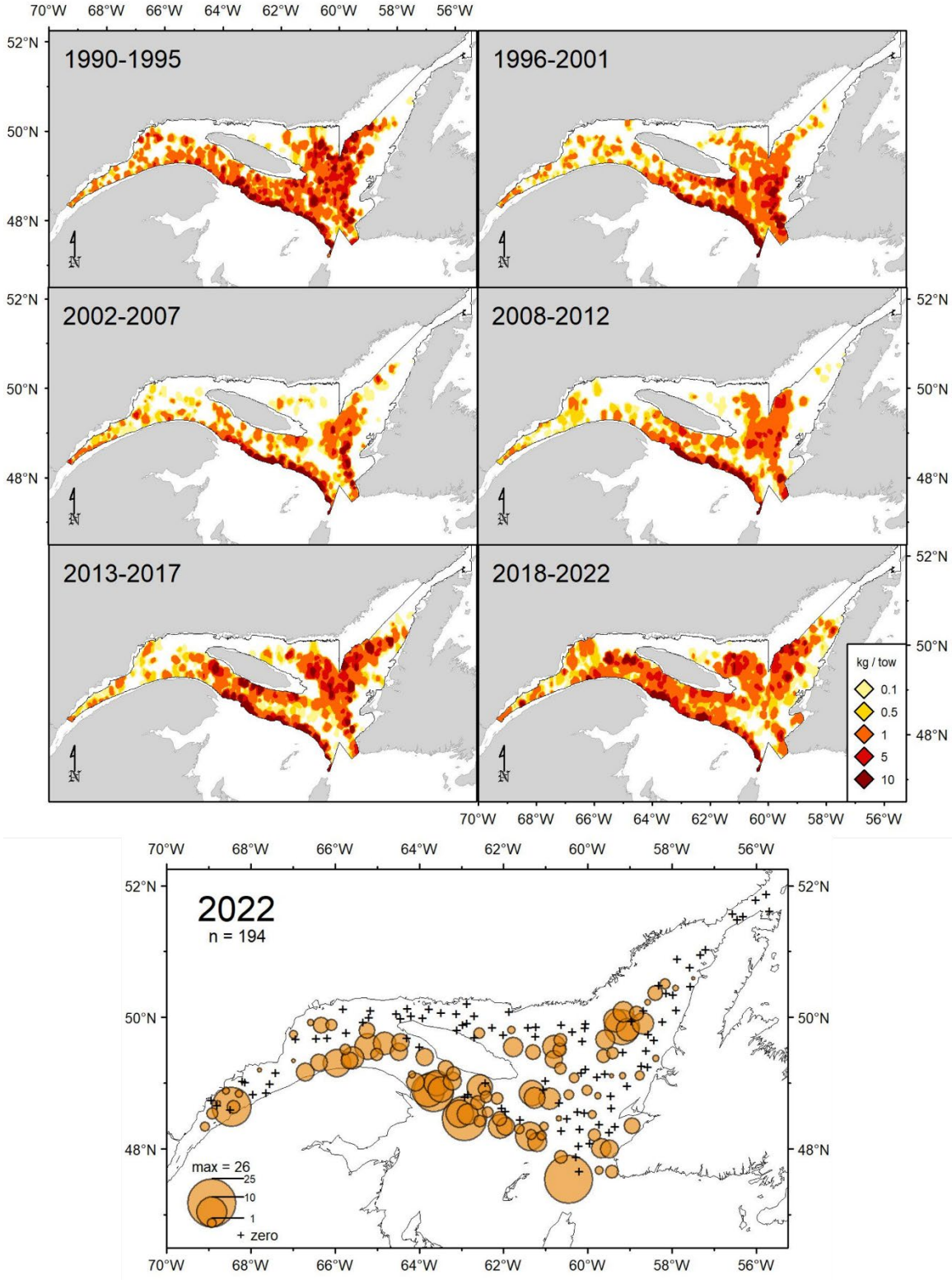

Figure 29. White hake catch rate (kg/15 minute tow) distributions.

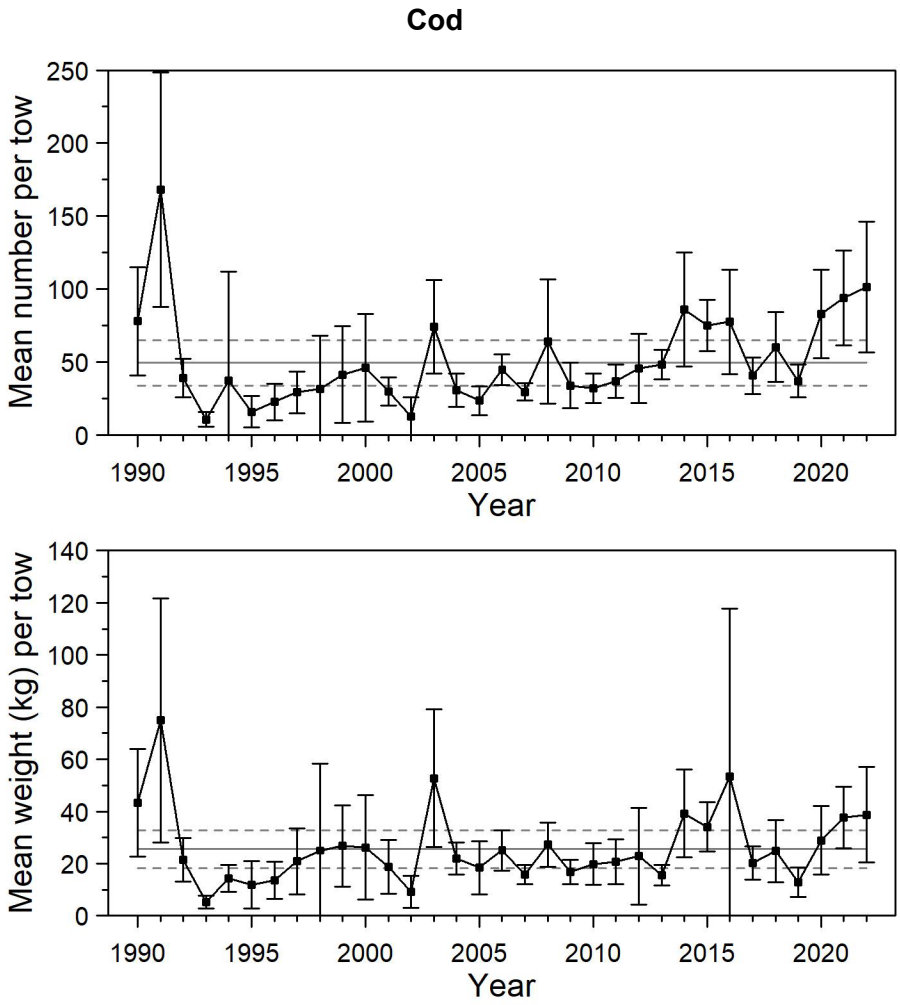

Figure 30. Mean numbers and mean weights per 15 minute tow observed during the survey for cod in 4RS. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

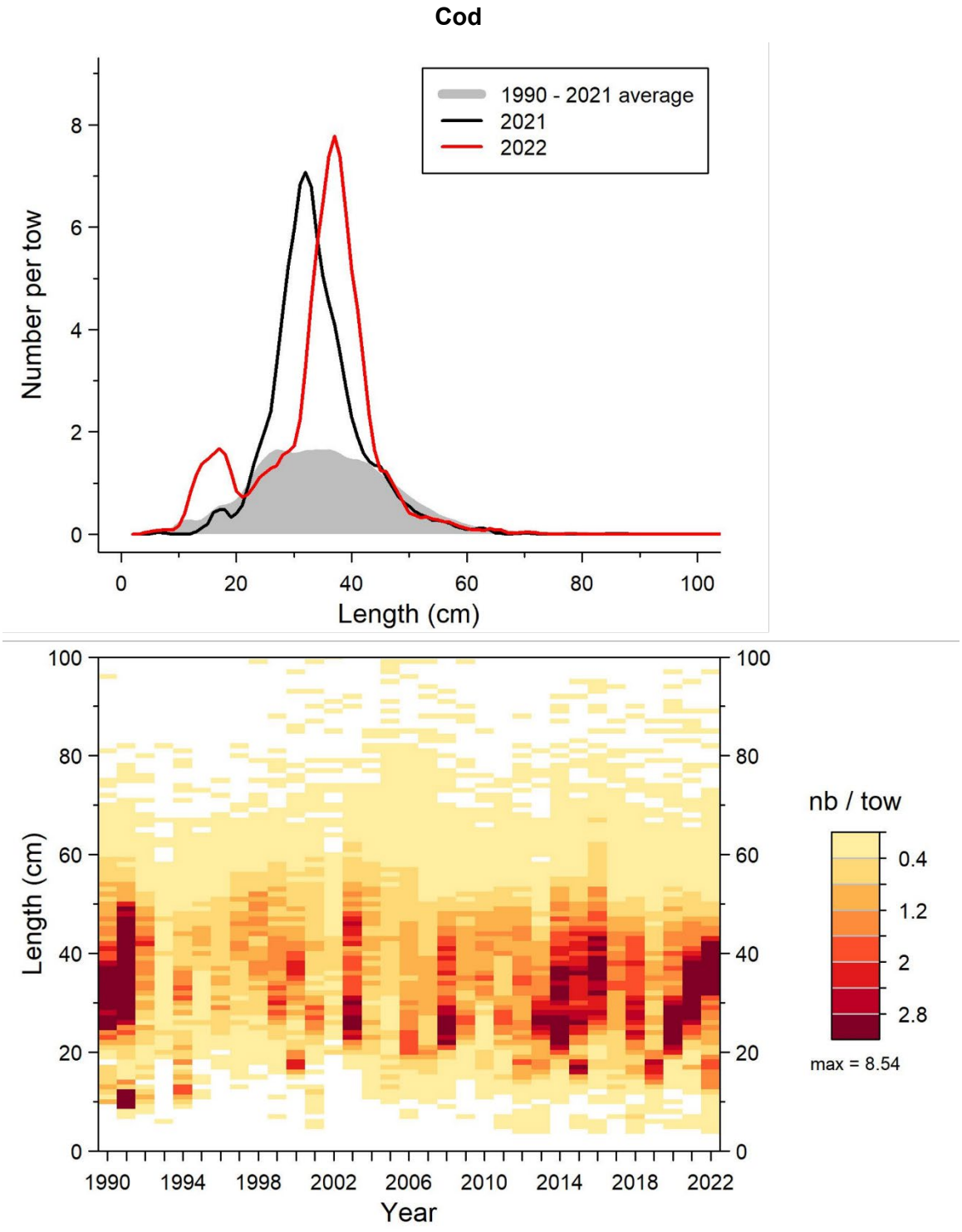

Figure 31. Length frequency distributions (mean number per 15 minute tow) observed during the survey for cod in 4RS.

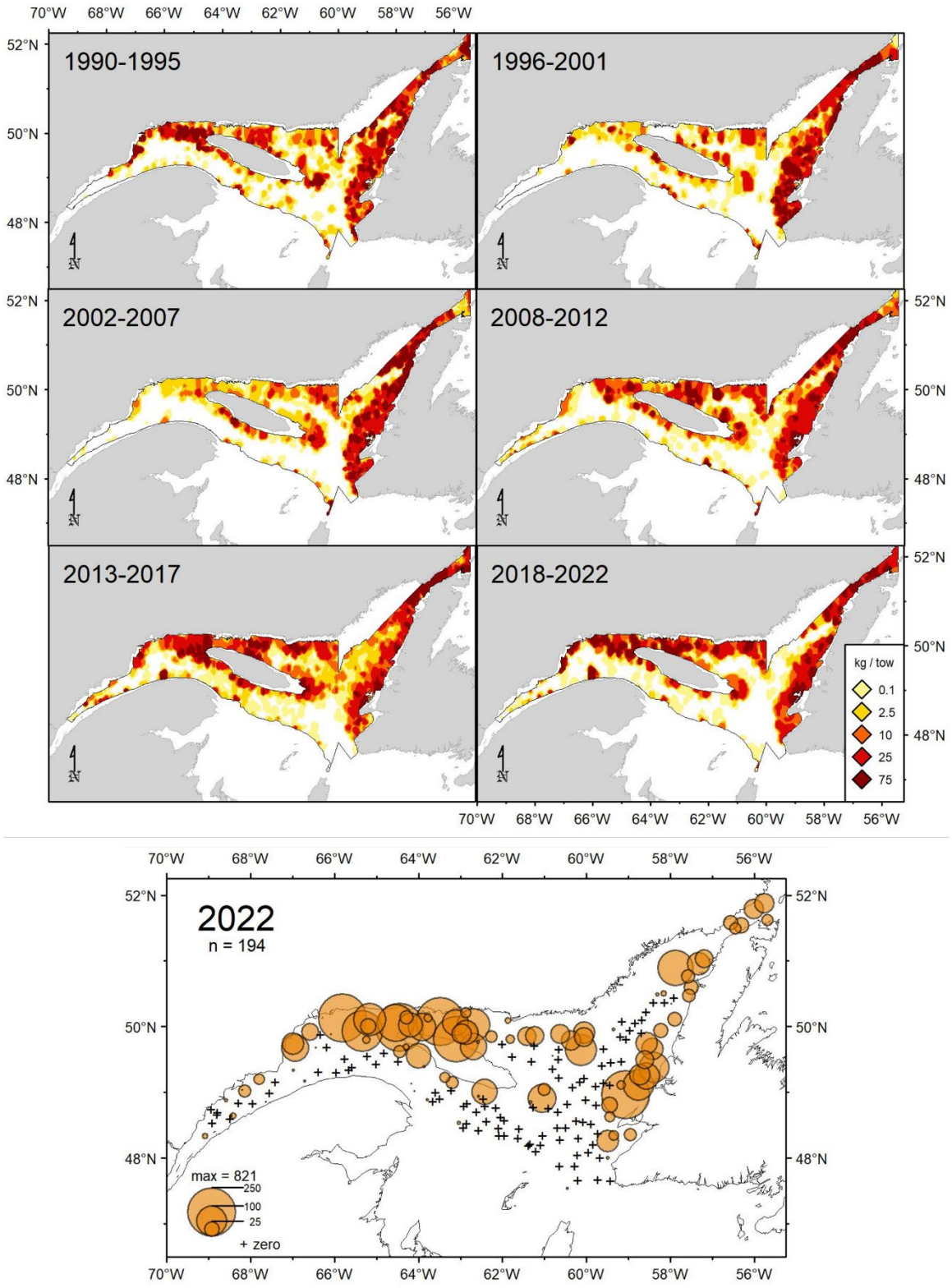

Figure 32. Cod catch rate (kg/15 minute tow) distributions.

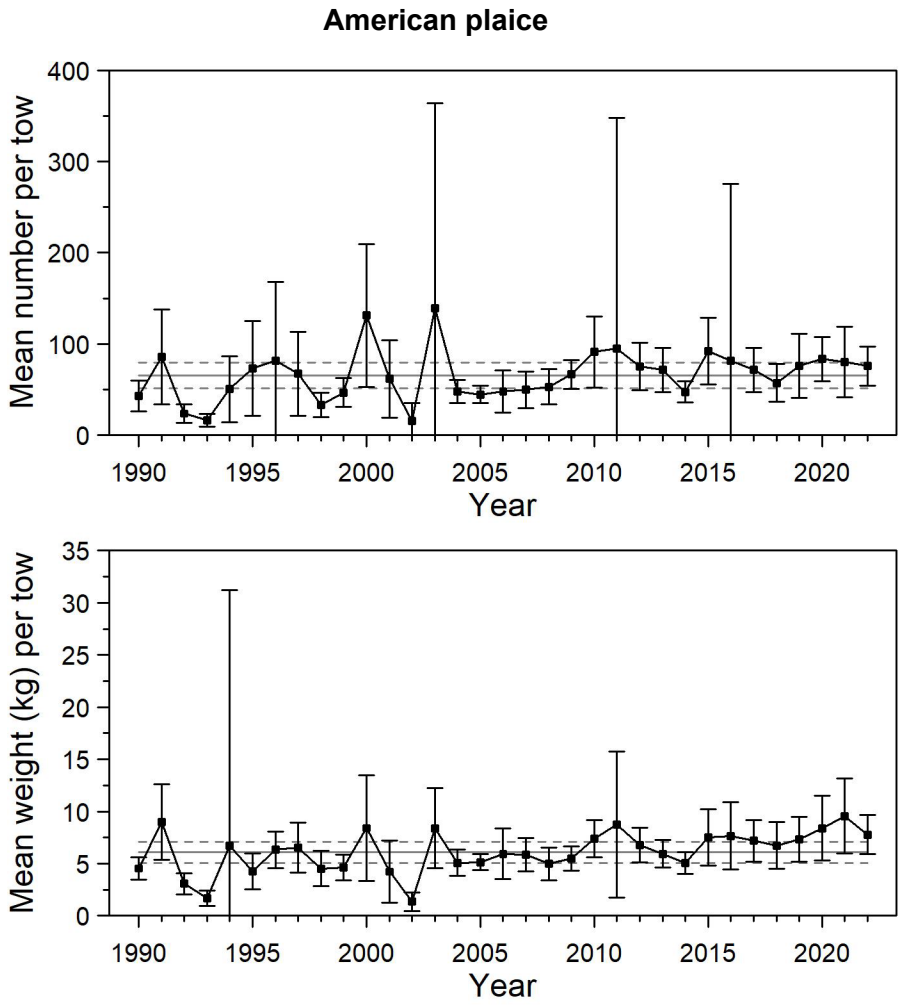

Figure 33. Mean numbers and mean weights per 15 minute tow observed during the survey for American plaice in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

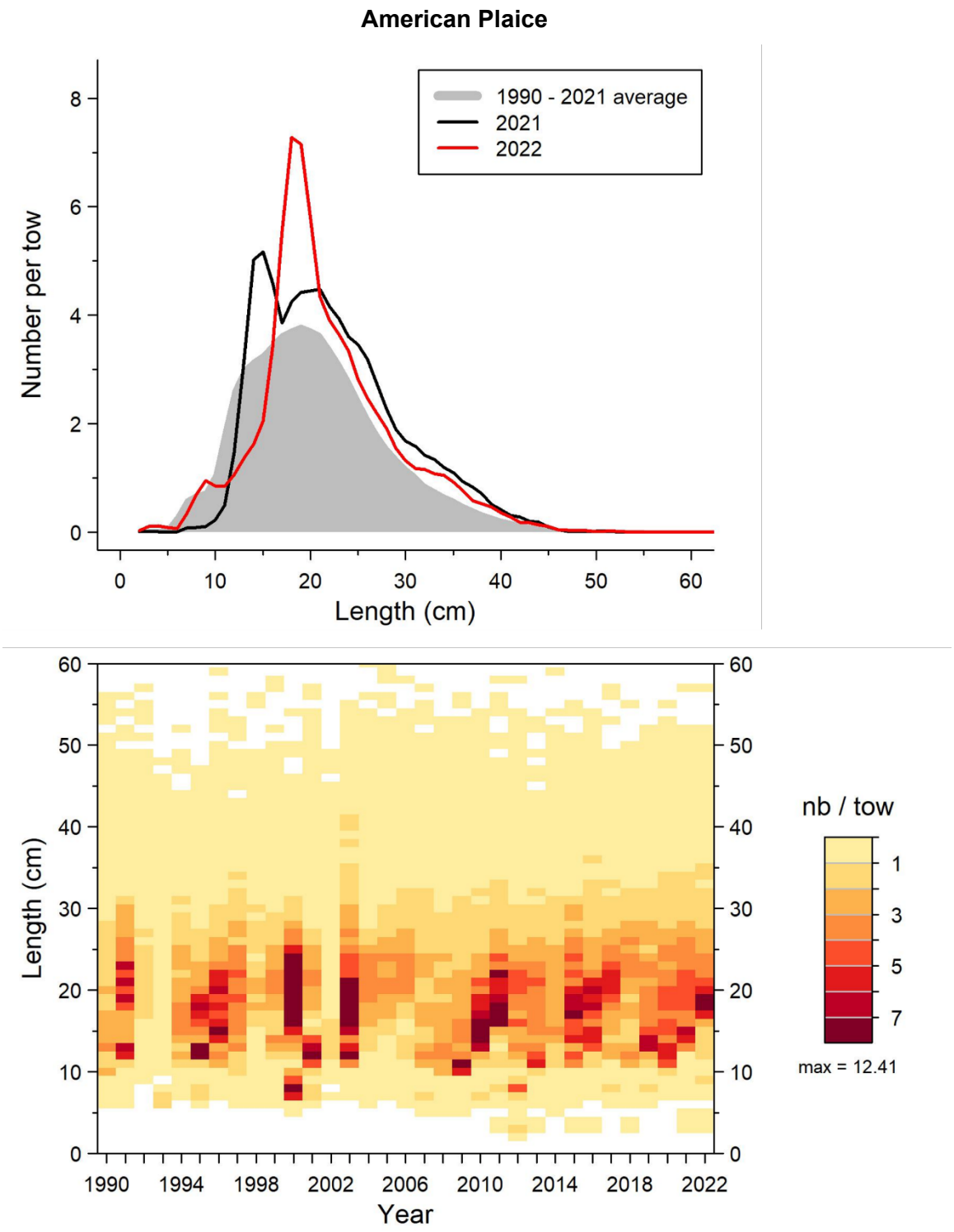

Figure 34. Length frequency distributions (mean number per 15 minute tow) observed during the survey for American plaice in 4RST.

American plaice

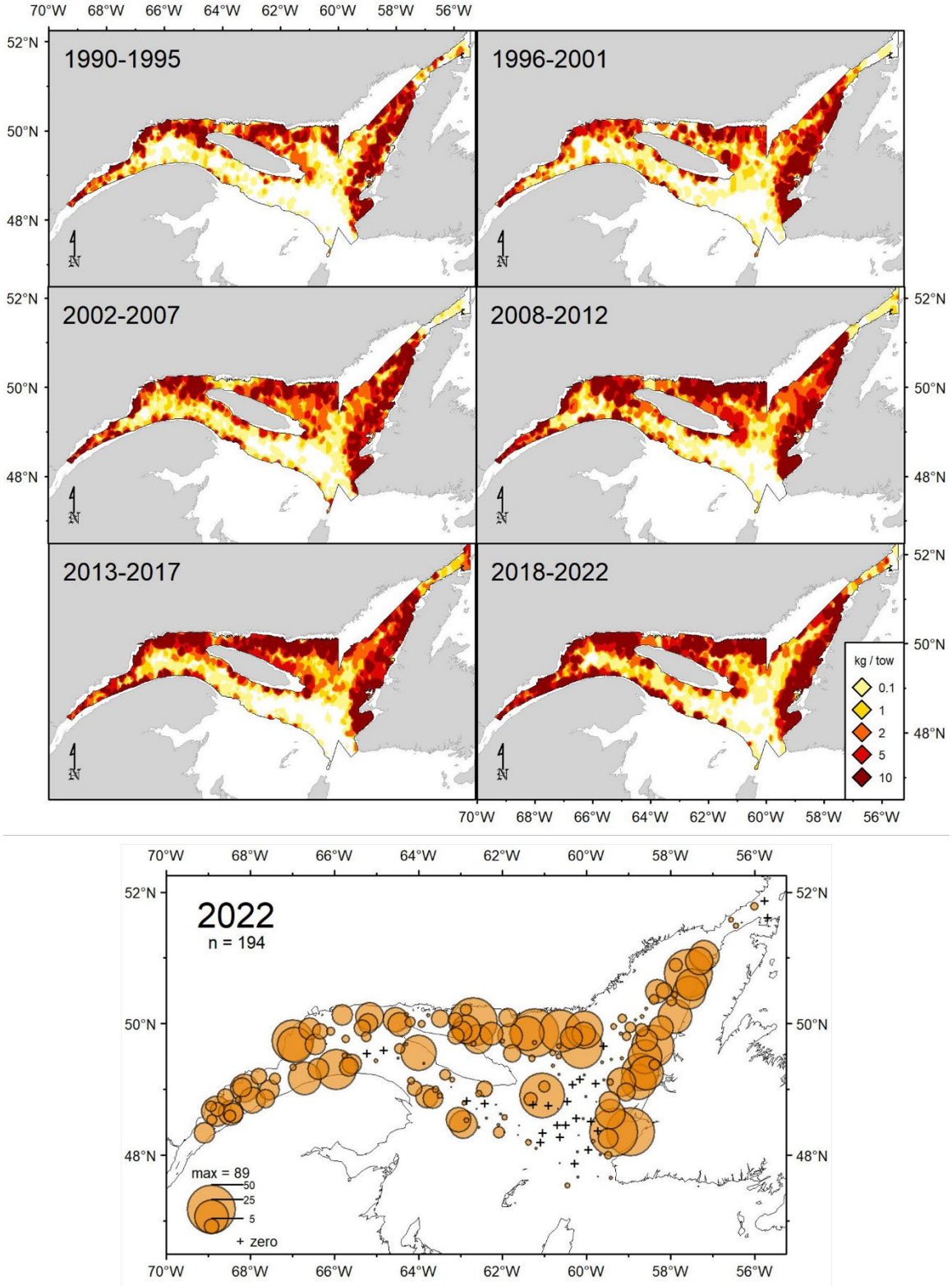

Figure 35. American plaice catch rate (kg/15 minute tow) distributions.

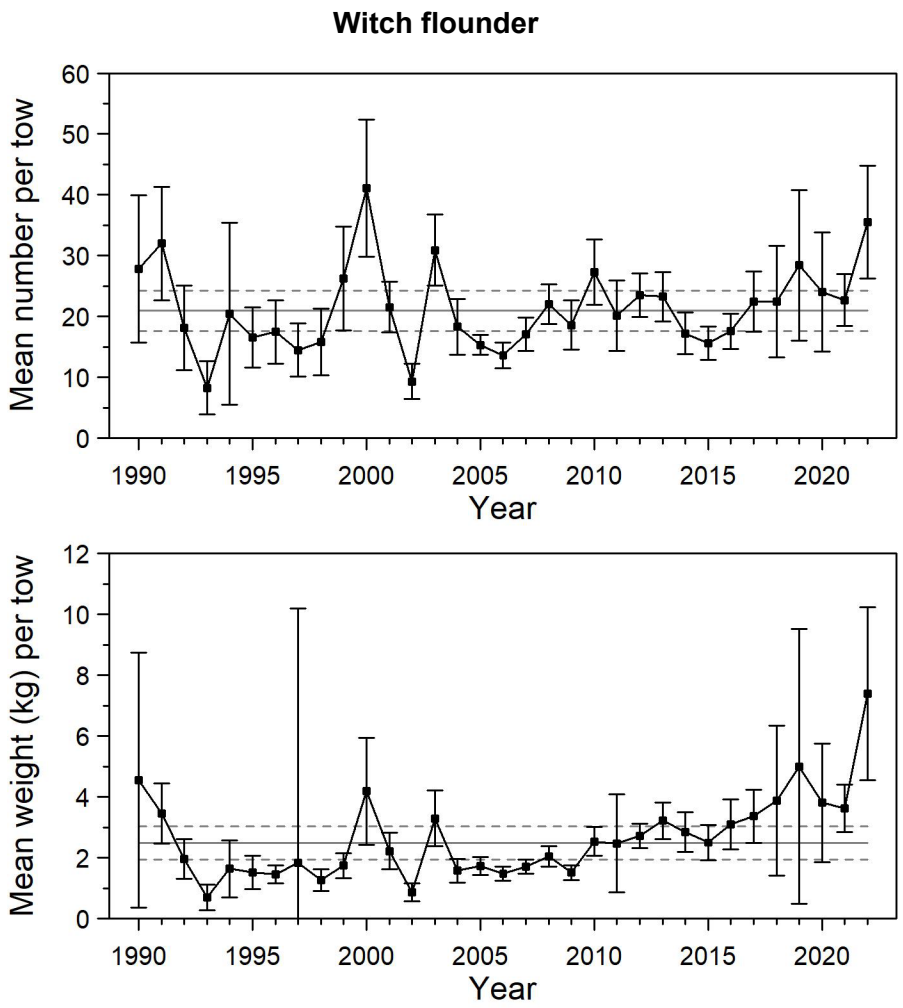

Figure 36. Mean numbers and mean weights per 15 minute tow observed during the survey for witch flounder in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

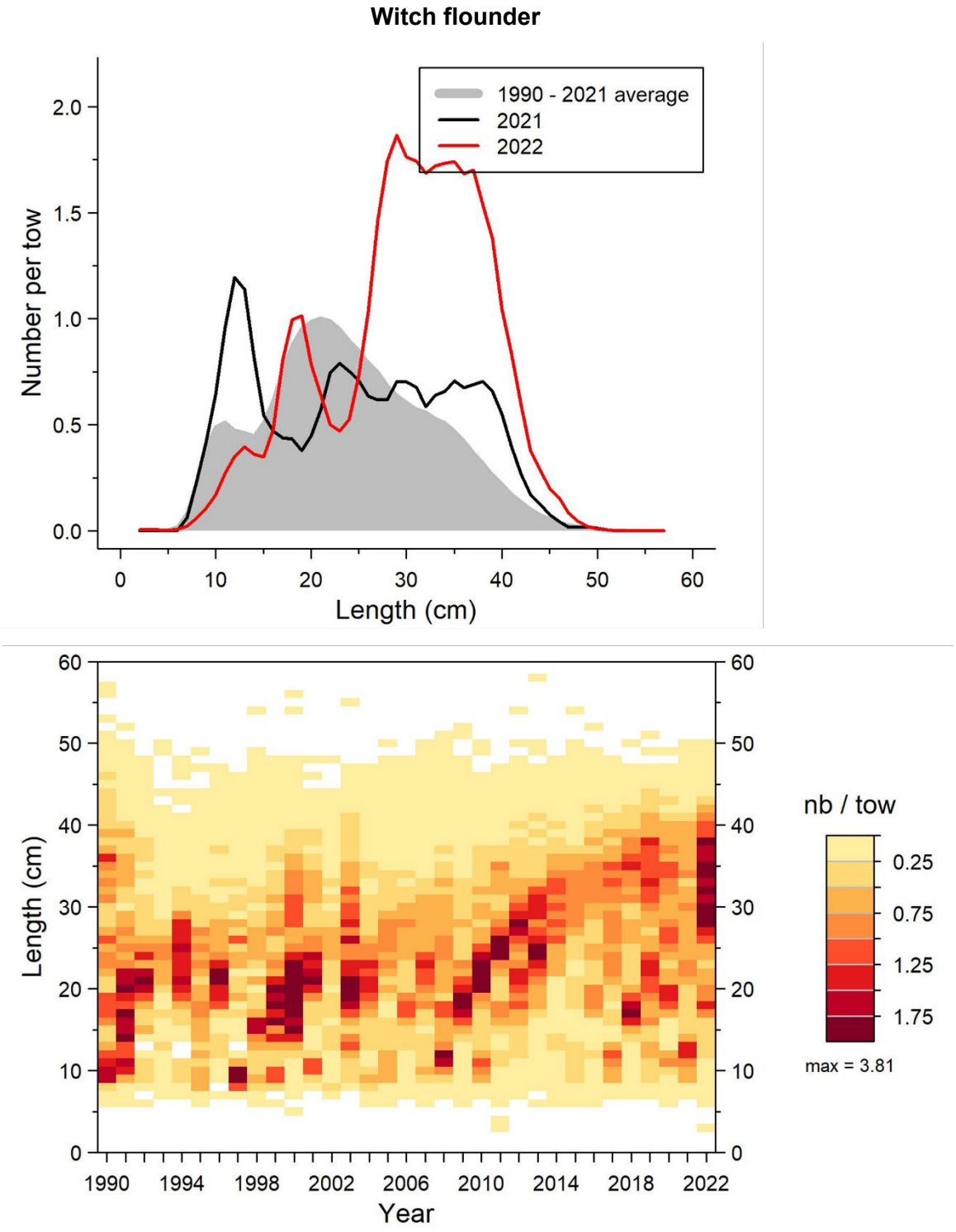

Figure 37. Length frequency distributions (mean number per 15 minute tow) observed during the survey for witch flounder in 4RST.

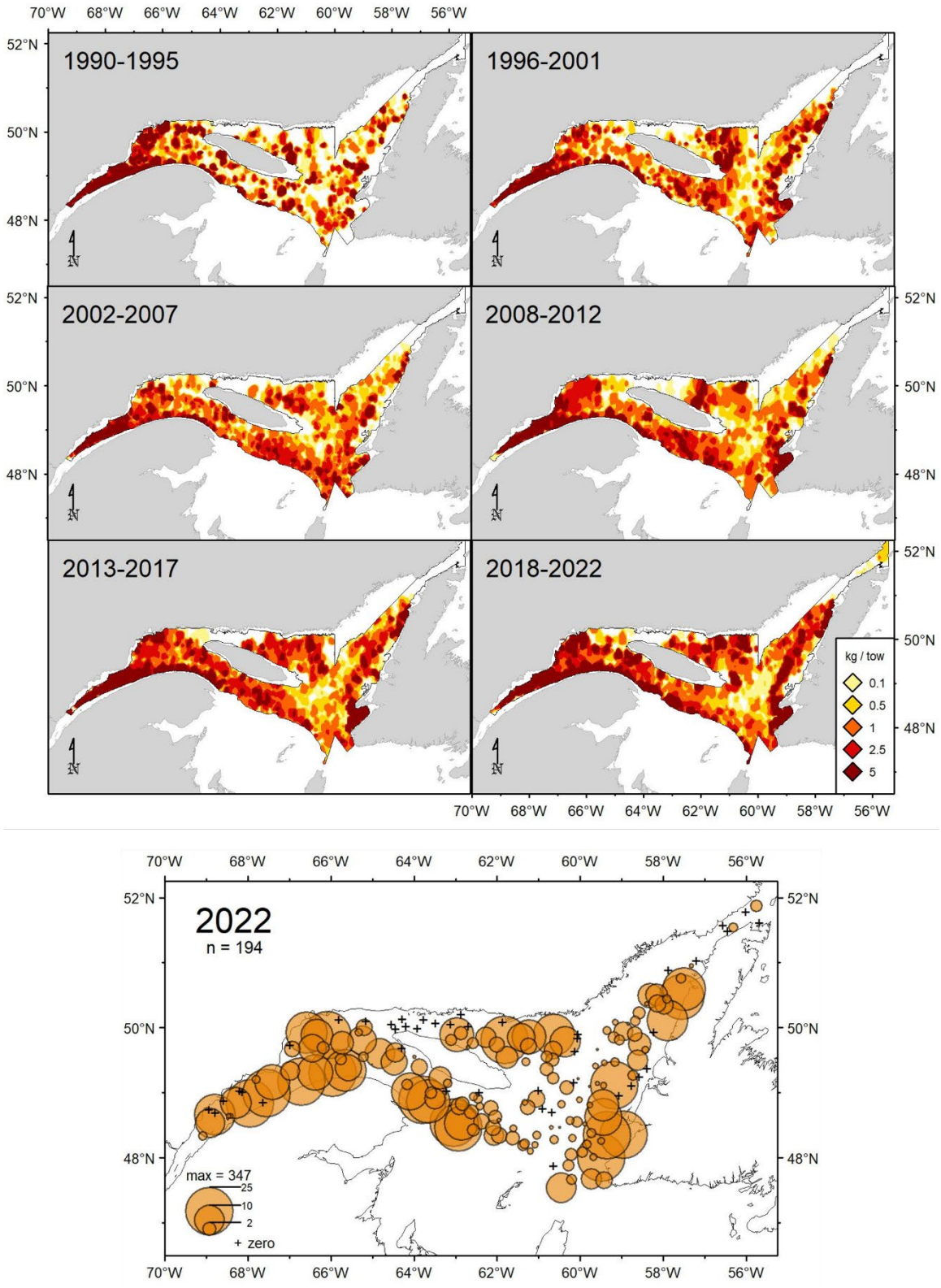

Figure 38. Witch flounder catch rate (kg/15 minute tow) distributions.

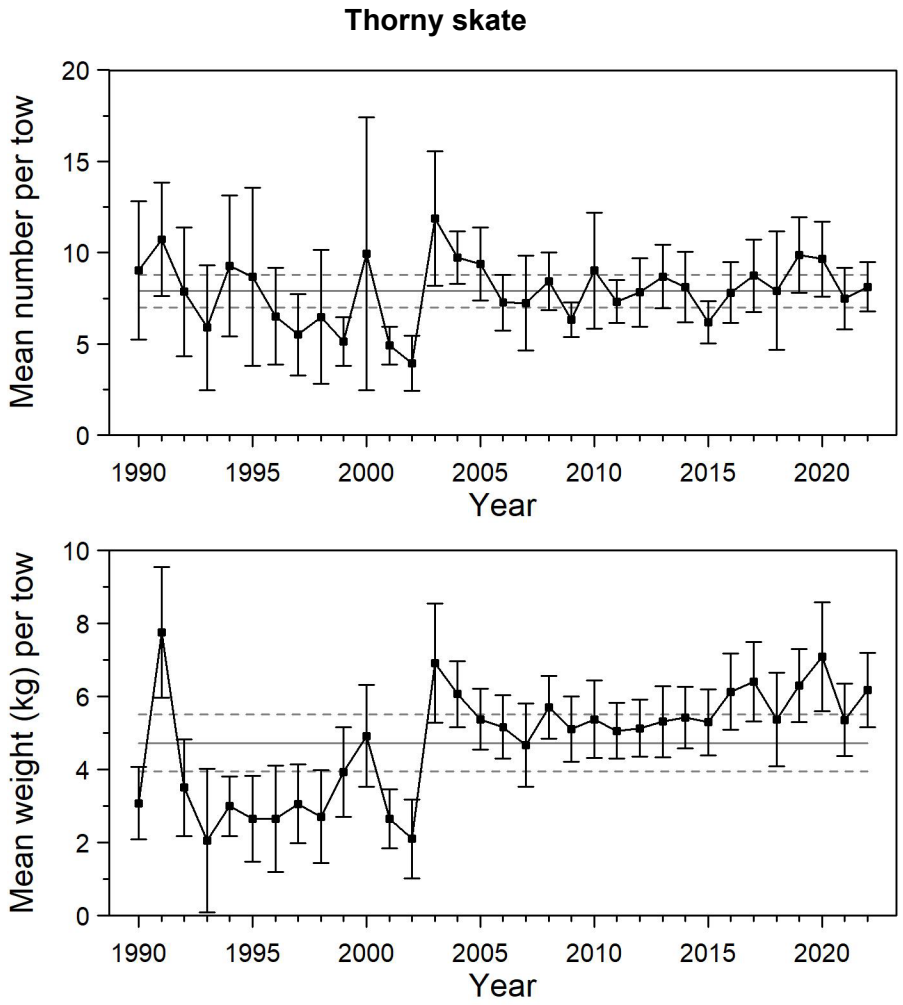

Figure 39. Mean numbers and mean weights per 15 minute tow observed during the survey for thorny skate in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

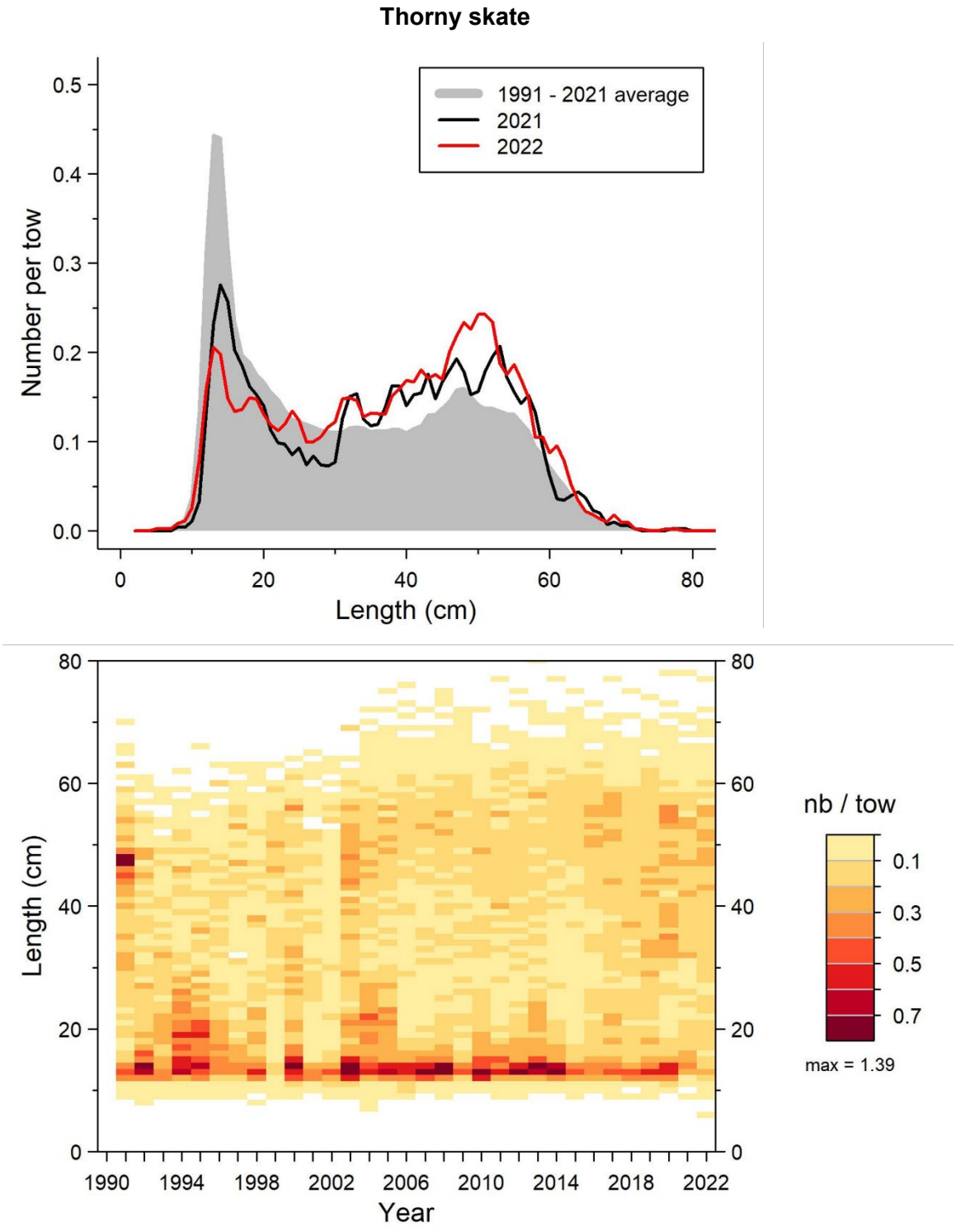

Figure 40. Length frequency distributions (mean number per 15 minute tow) observed during the survey for thorny skate in 4RST.

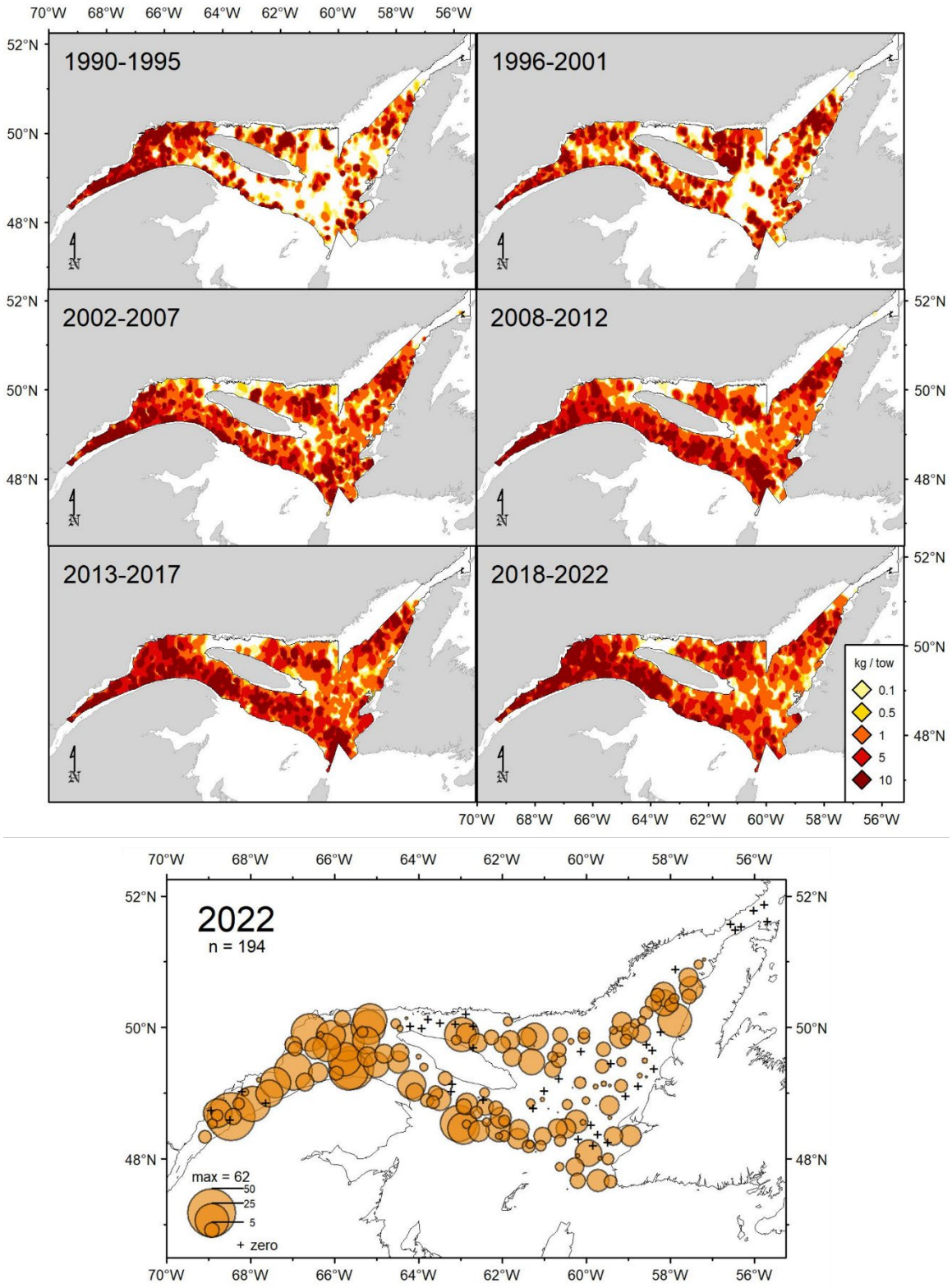

Figure 41. Thorny skate catch rate (kg/15 minute tow) distributions.

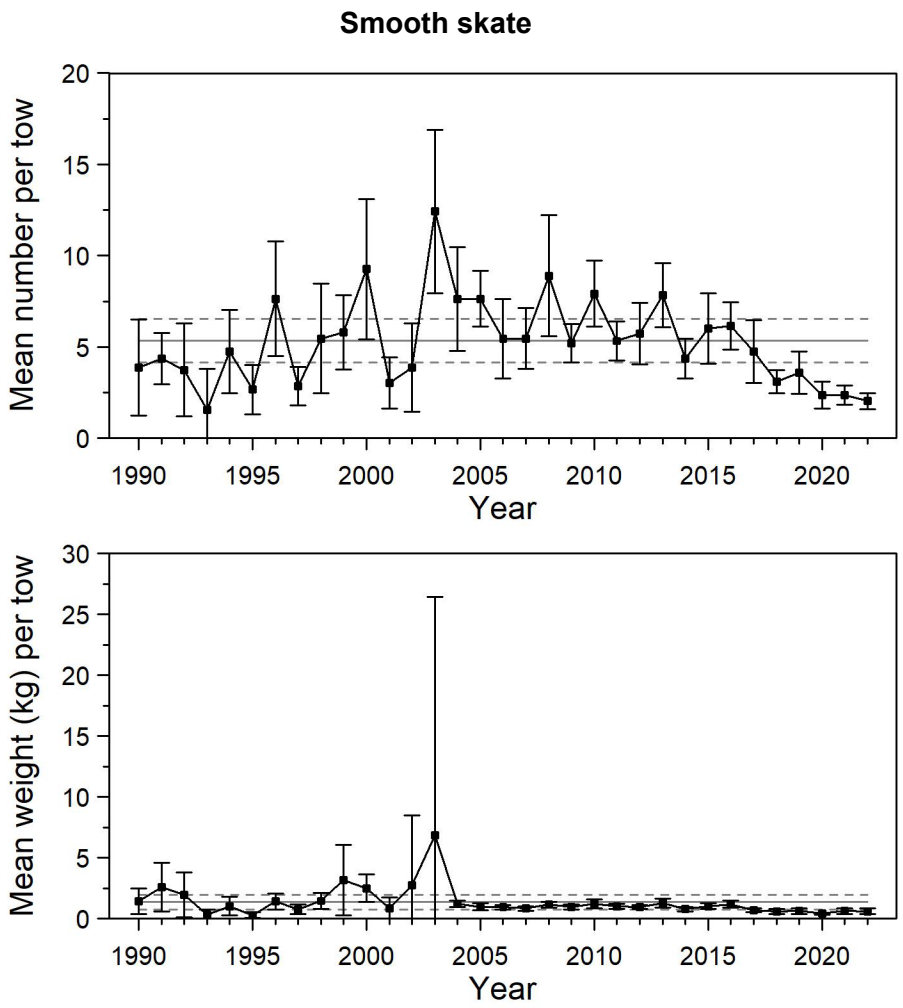

Figure 42. Mean numbers and mean weights per 15 minute tow observed during the survey for smooth skate in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

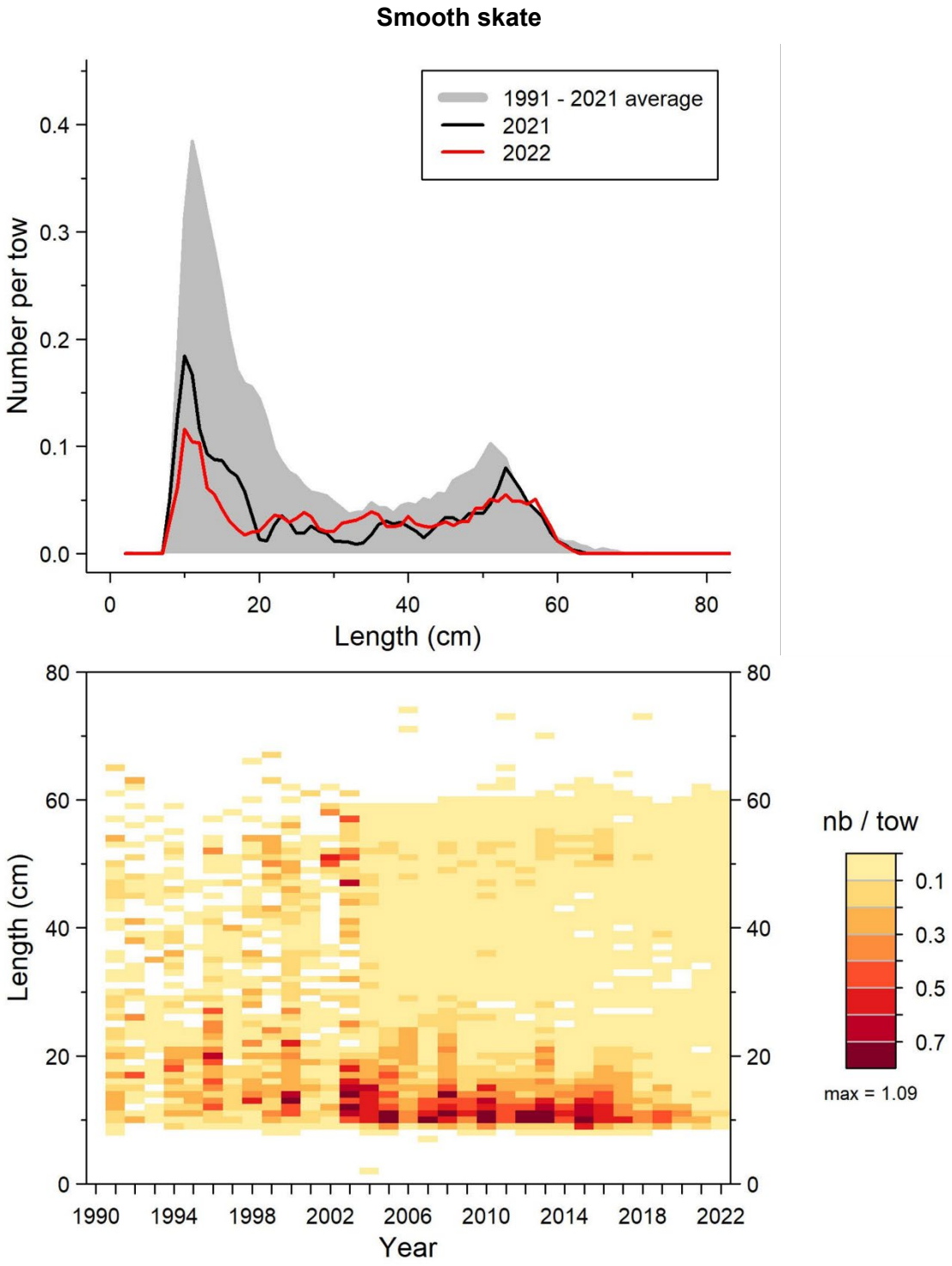

Figure 43. Length frequency distributions (mean number per 15 minute tow) observed during the survey for smooth skate in 4RST.

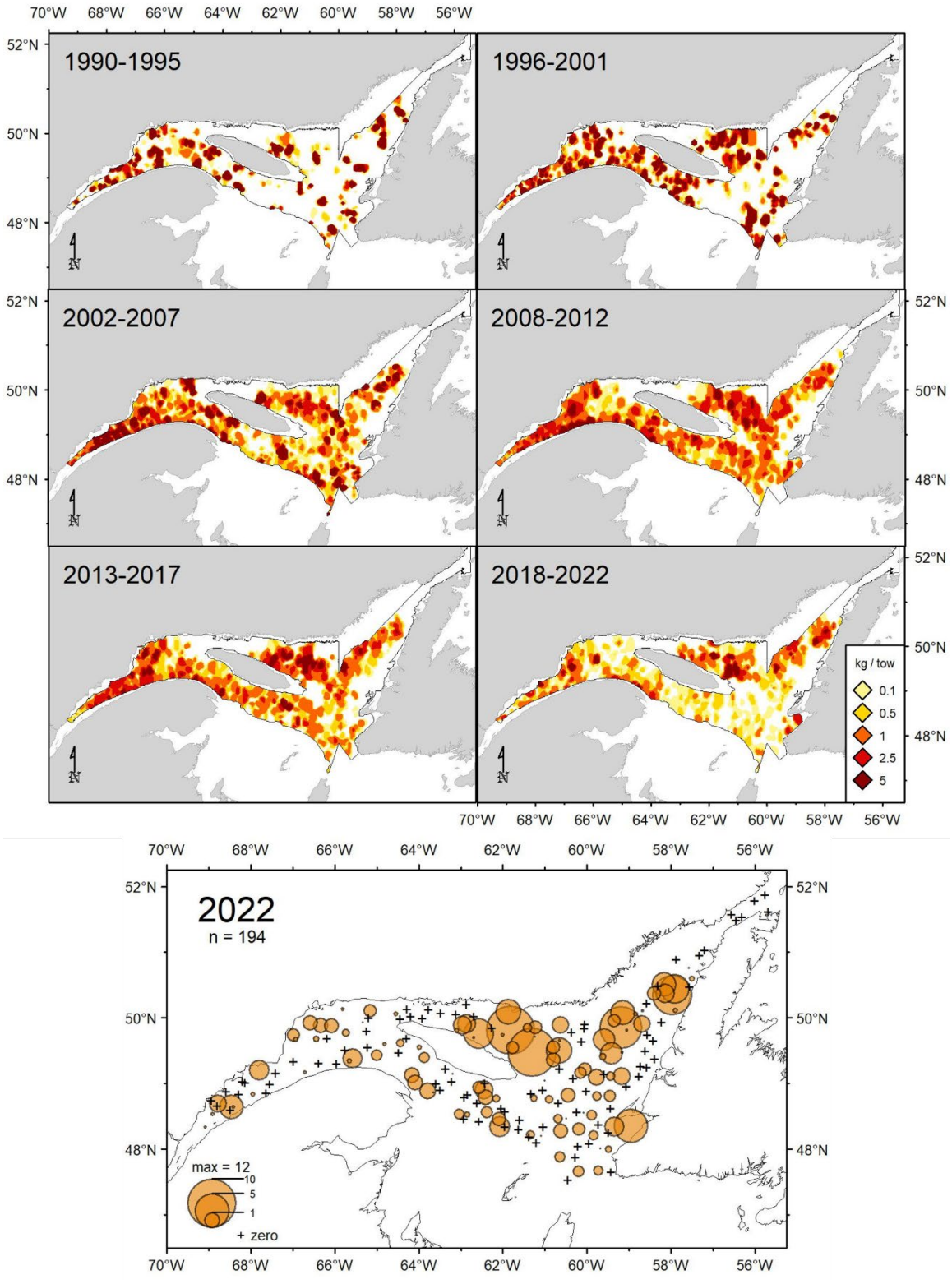

Figure 44. Smooth skate catch rate (kg/15 minute tow) distributions.

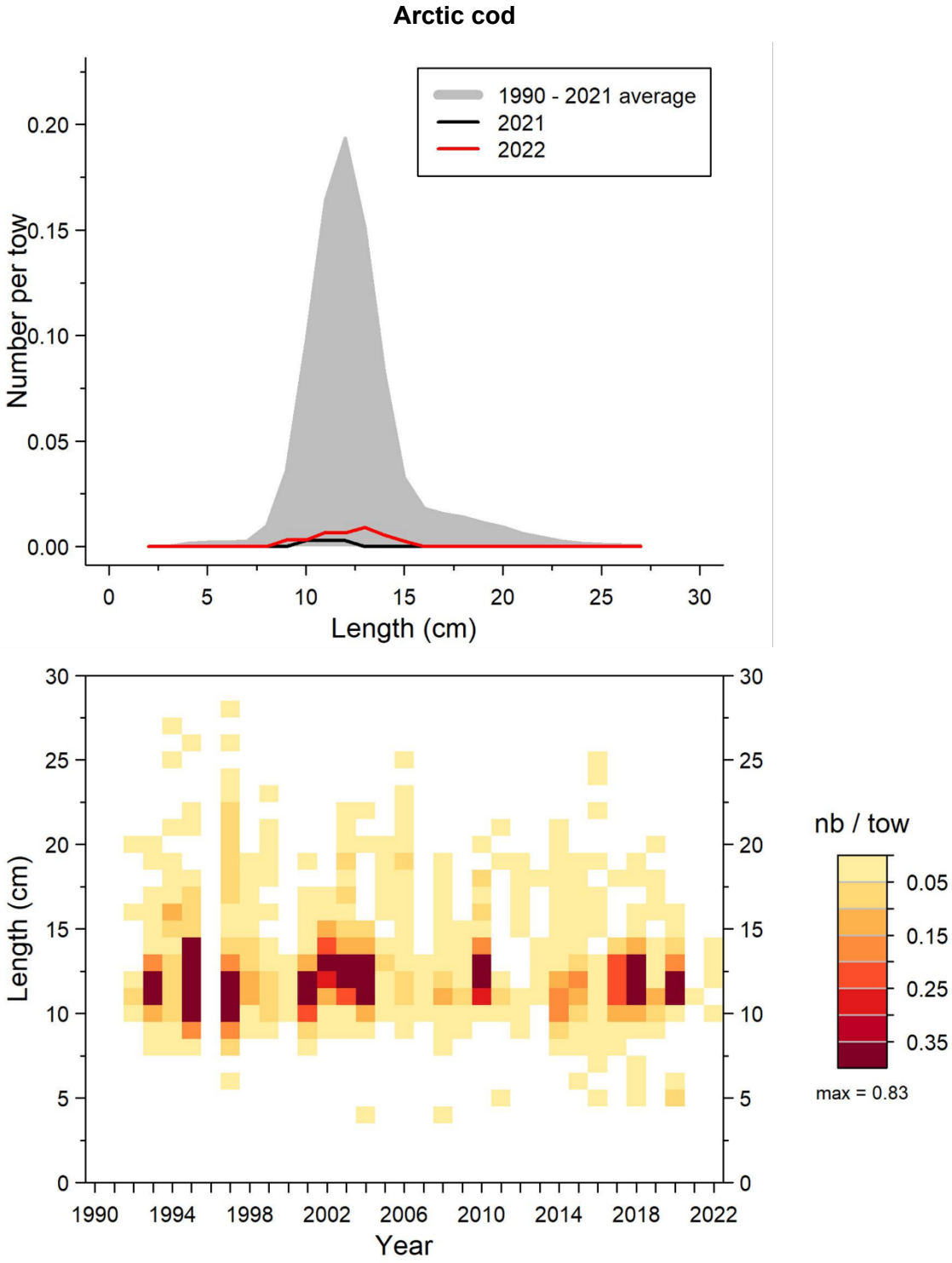

Figure 45. Length frequency distributions (mean number per 15 minute tow) observed during the survey for Arctic cod in 4RST.

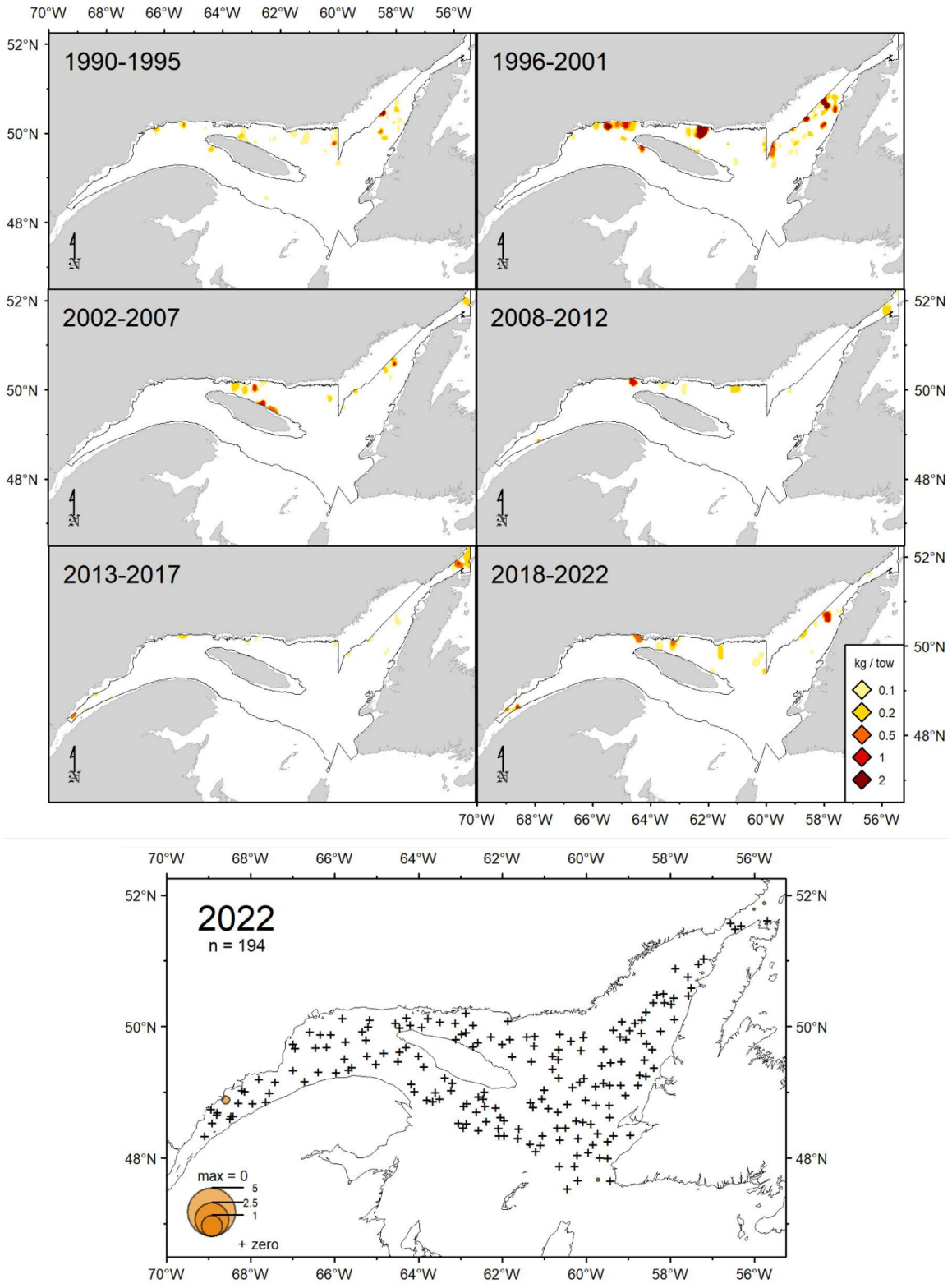

Figure 46. Arctic cod catch rate (kg/15 minute tow) distributions.

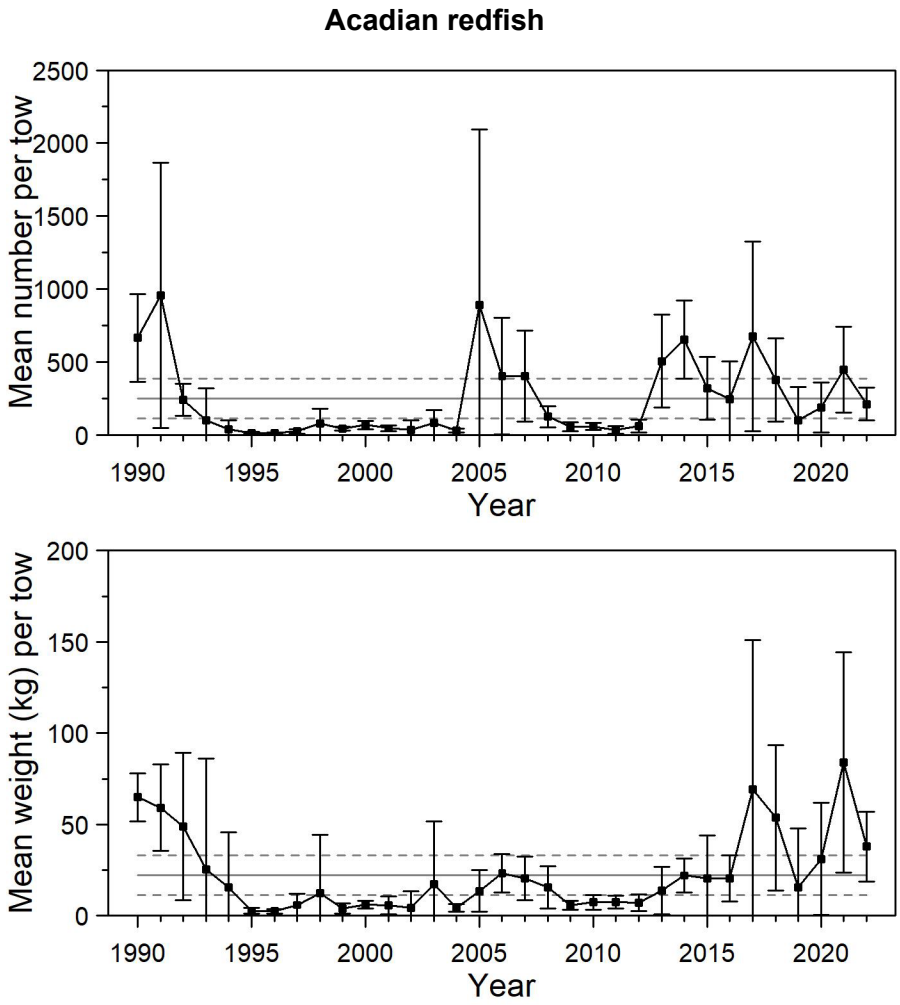

Figure 47. Mean numbers and mean weights per 15 minute tow observed during the survey for Acadian redfish in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

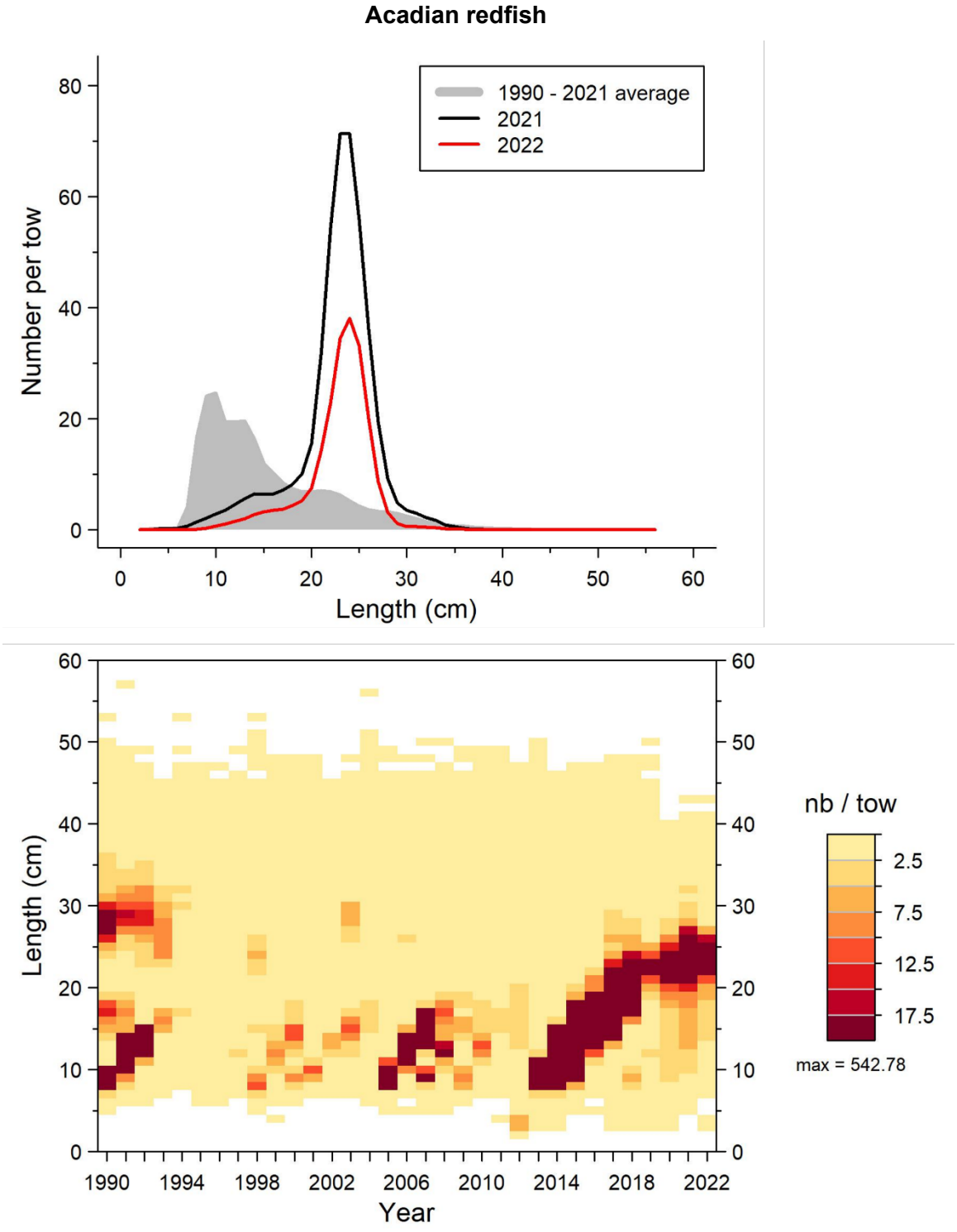

Figure 48. Length frequency distributions (mean number per 15 minute tow) observed during the survey for Acadian redfish in 4RST.

Acadian redfish

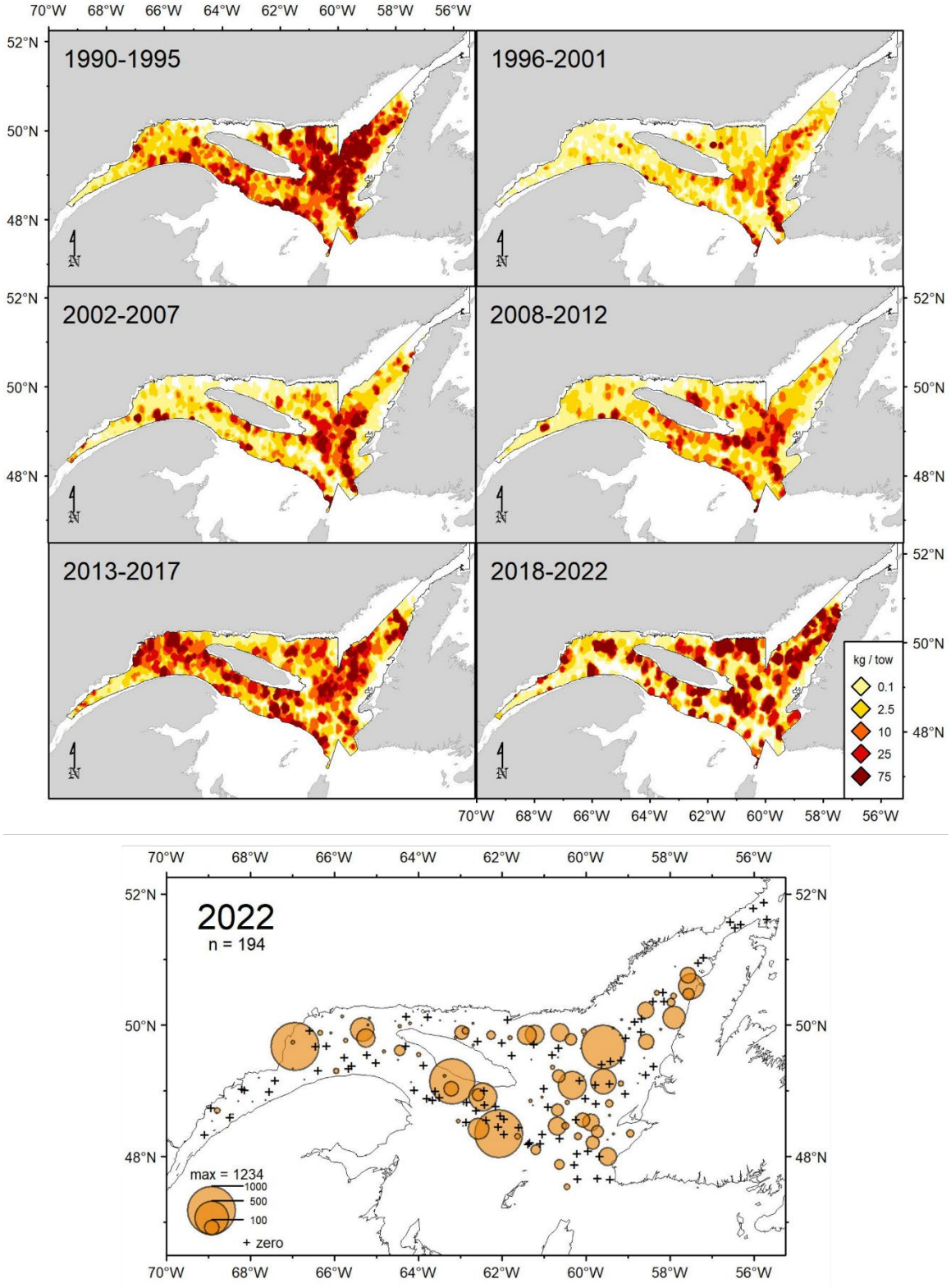

Figure 49. Acadian redfish catch rate (kg/15 minute tow) distributions.

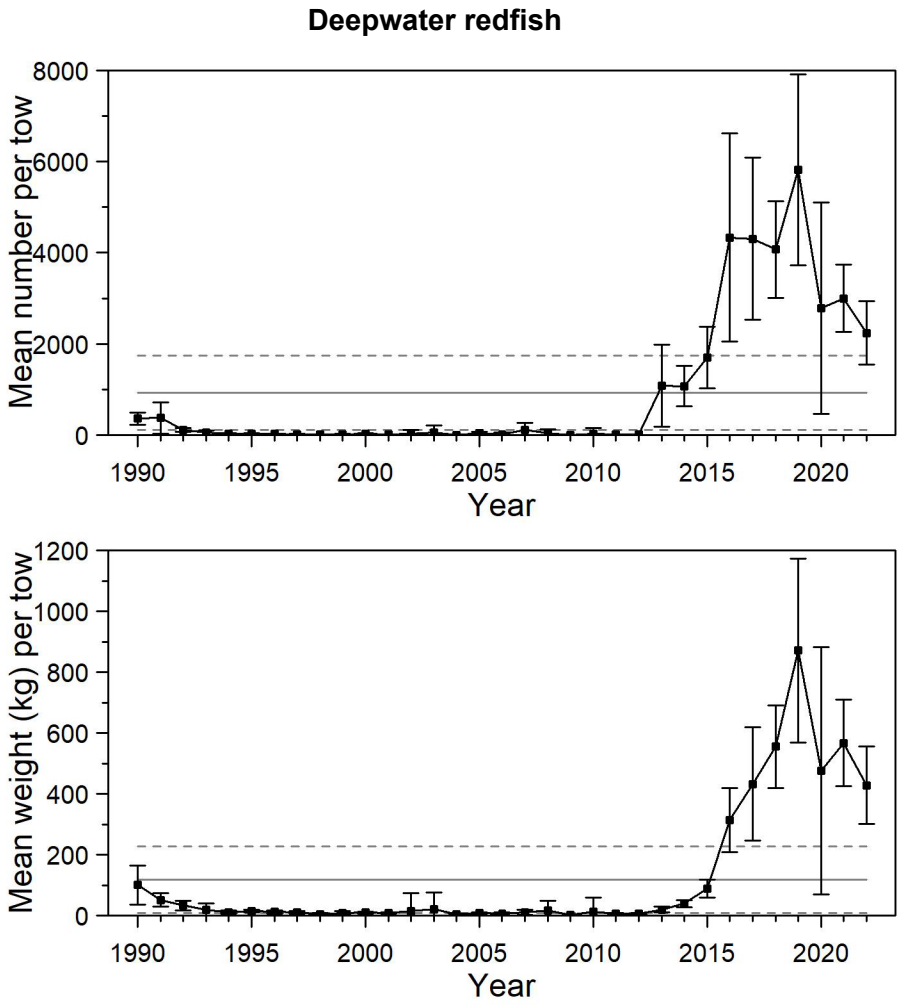

Figure 50. Mean numbers and mean weights per 15 minute tow observed during the survey for deepwater redfish in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

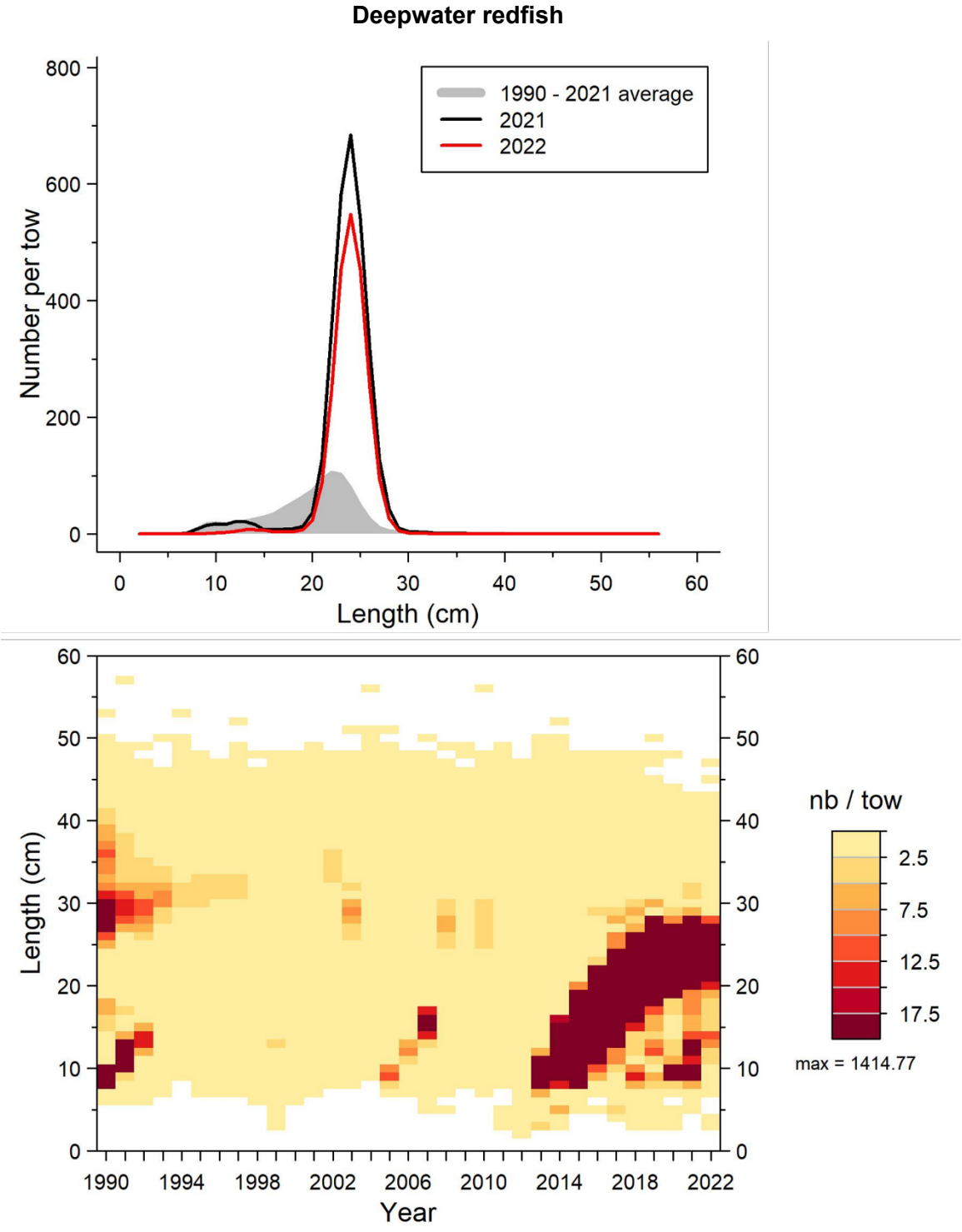

Figure 51. Length frequency distributions (mean number per 15 minute tow) observed during the survey for deepwater redfish in 4RST.

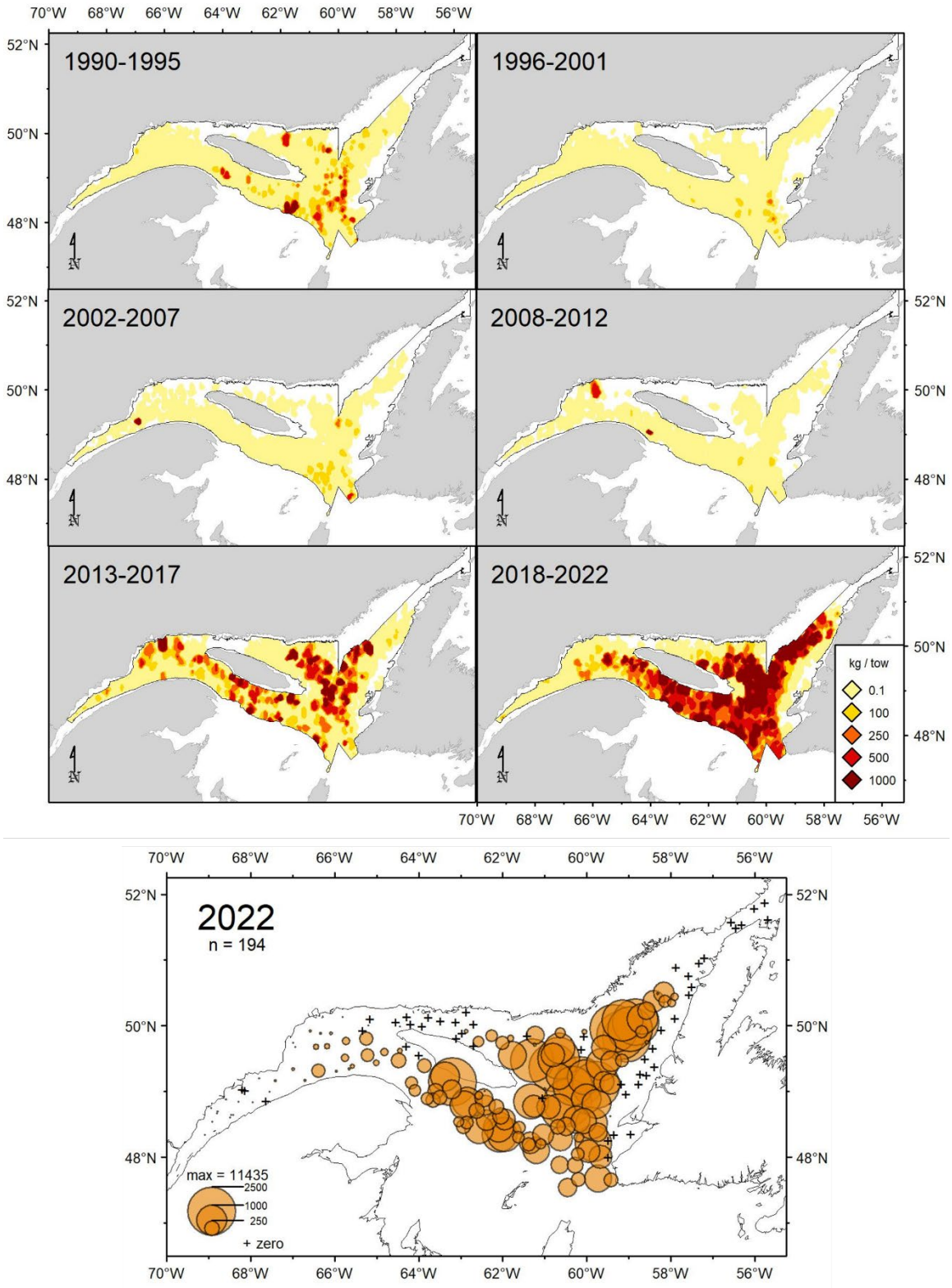

Figure 52. Deepwater redfish catch rate (kg/15 minute tow) distributions.

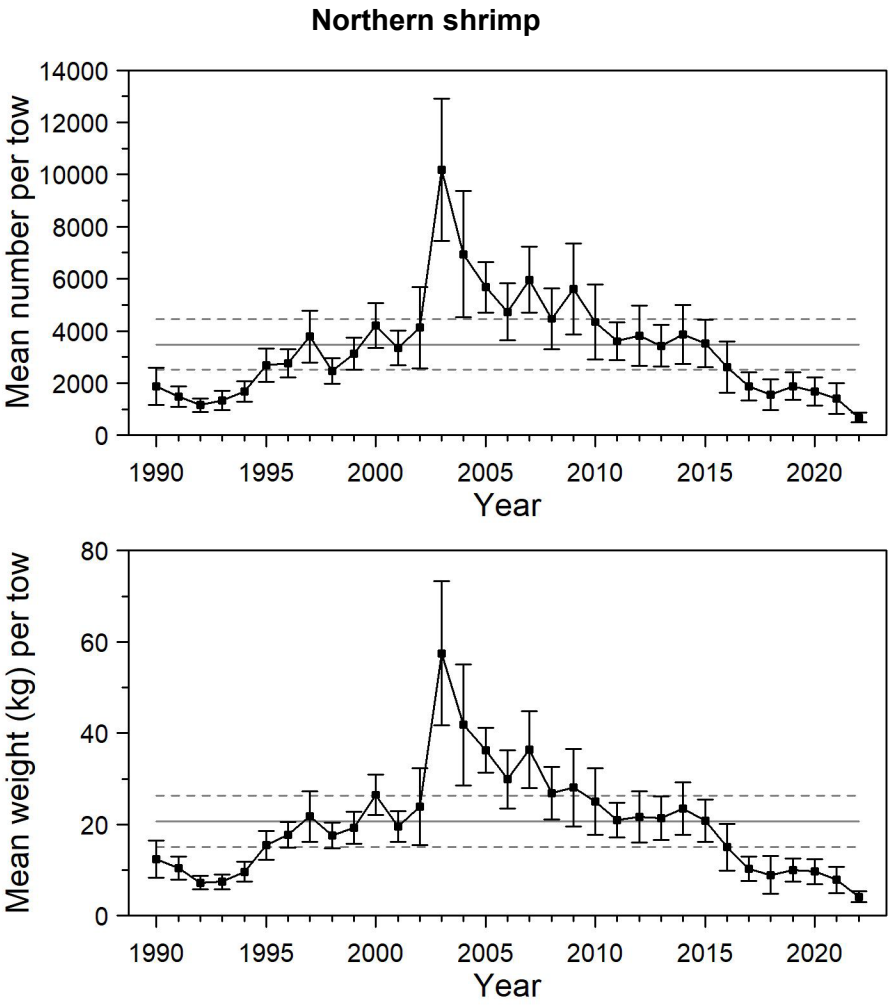

Figure 53. Mean numbers and mean weights per 15 minute tow observed during the survey for northern shrimp in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

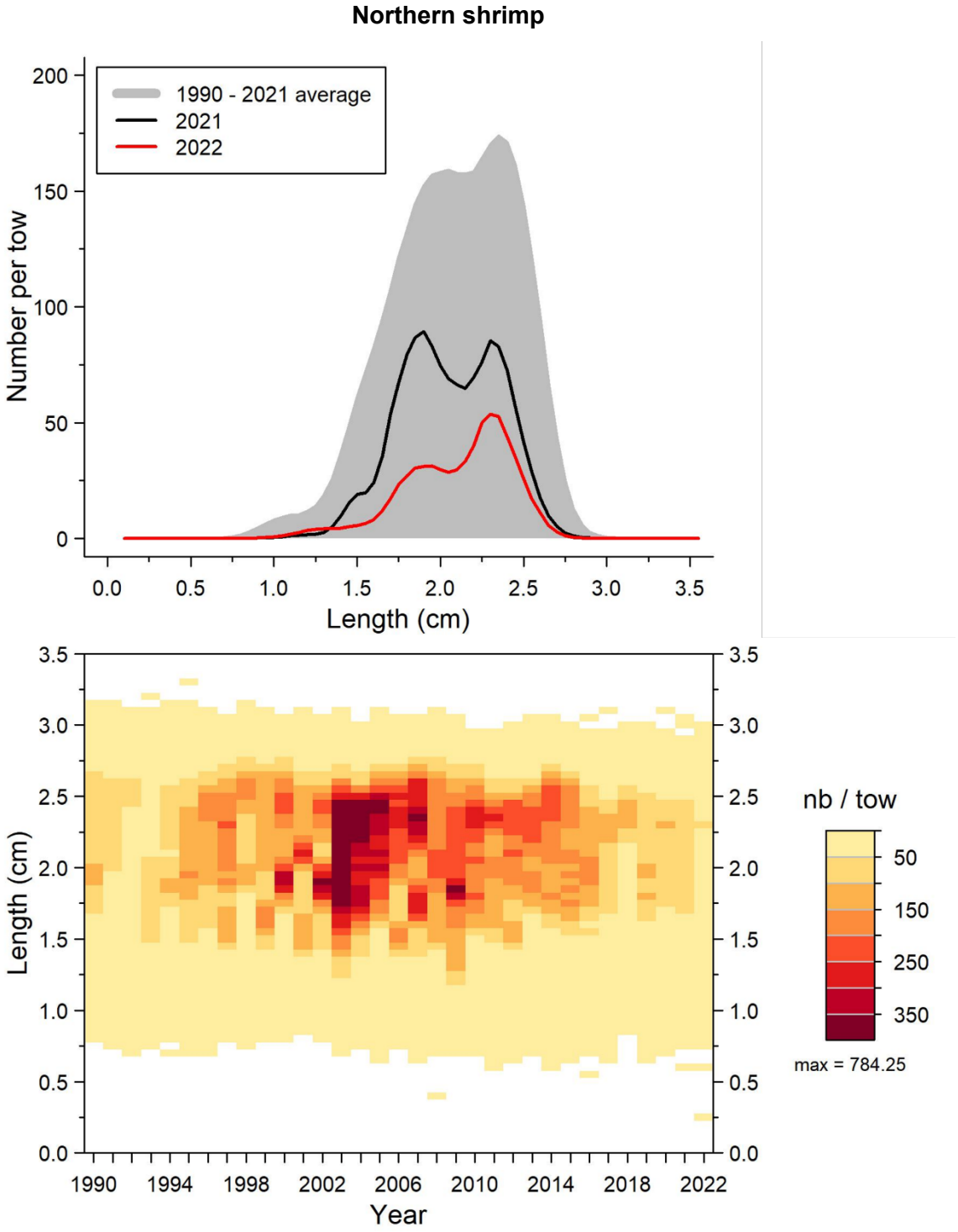

Figure 54. Carapace length frequency distributions (mean number per 15 minute tow) observed during the survey for northern shrimp in 4RST.

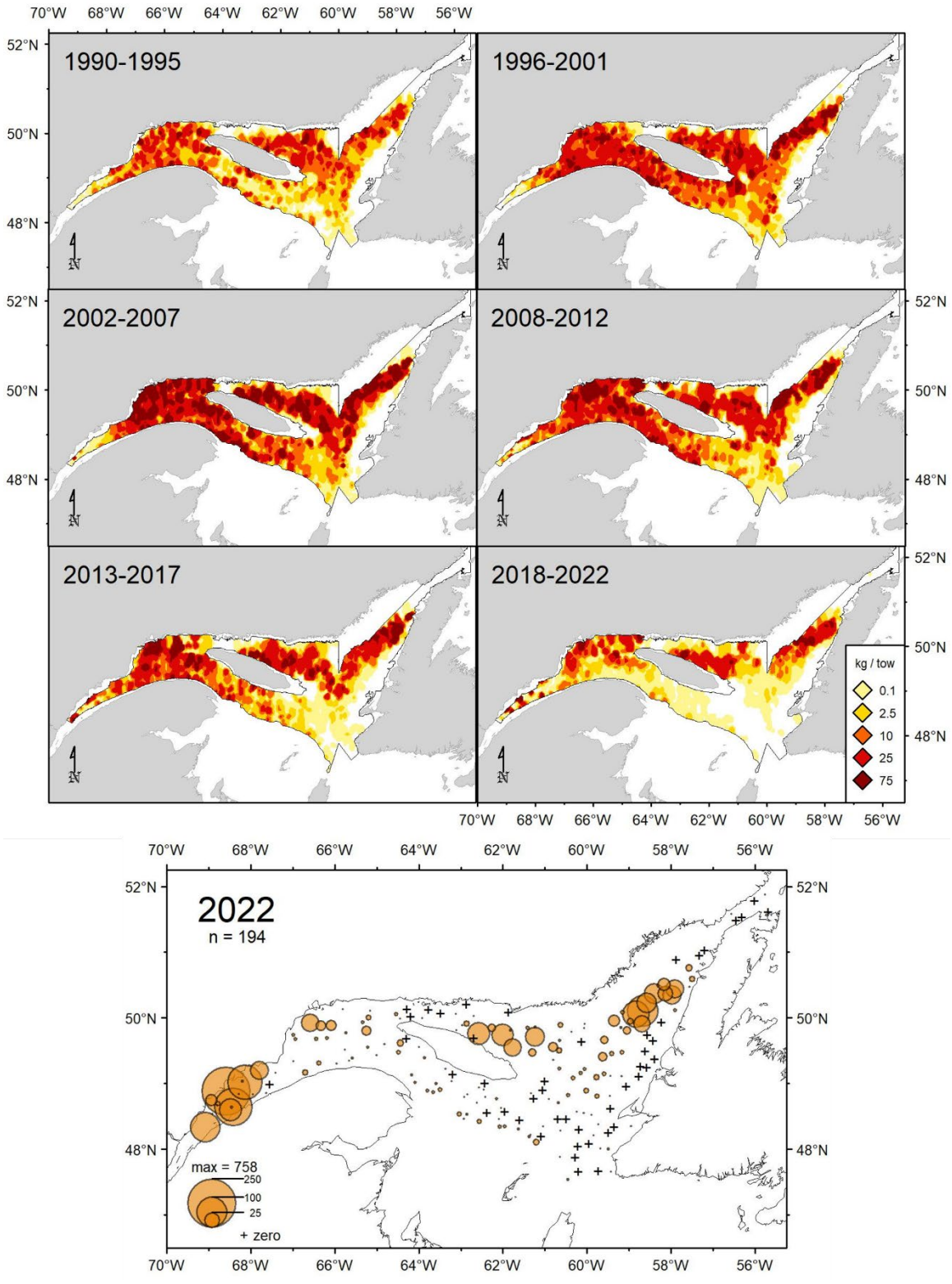

Figure 55. Northern shrimp catch rate (kg/15 minute tow) distributions.

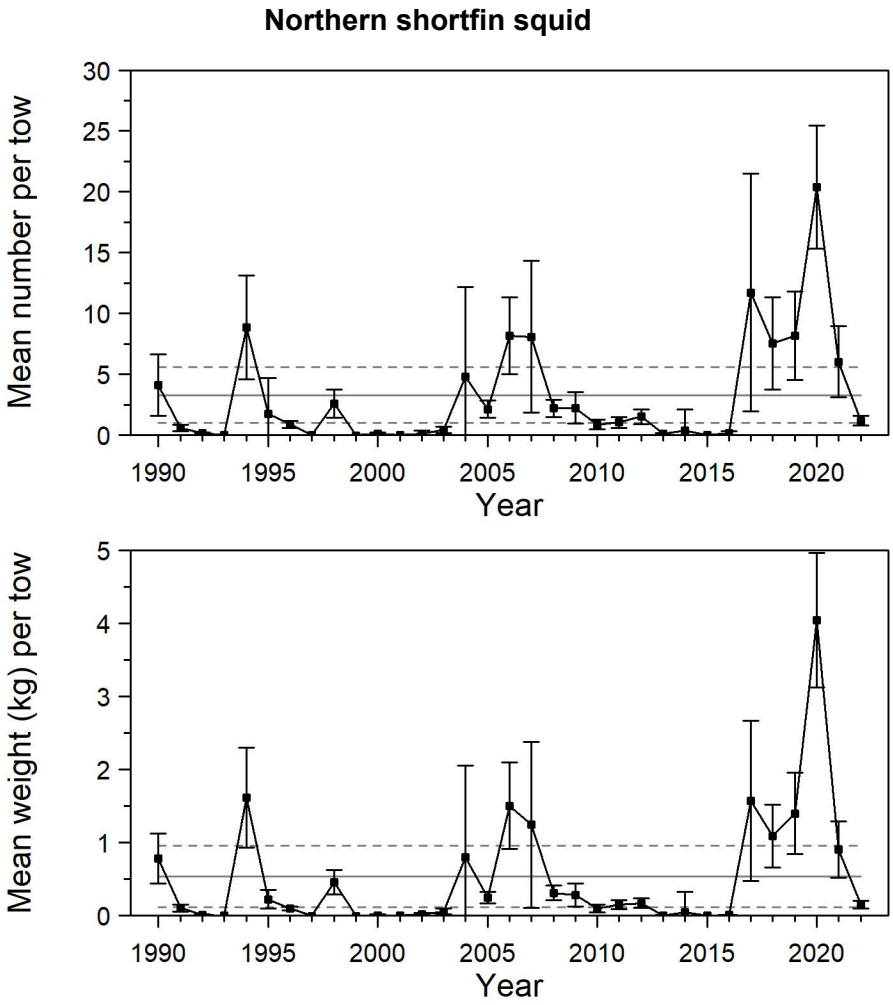

Figure 56. Mean numbers and mean weights per 15 minute tow observed during the survey for northern shortfin squid in 4RST. Error bars indicate the 95% confidence interval and the horizontal lines indicate the mean of the 1990-2021 period (solid line) and upper and lower reference (see text) limits (dashed lines).

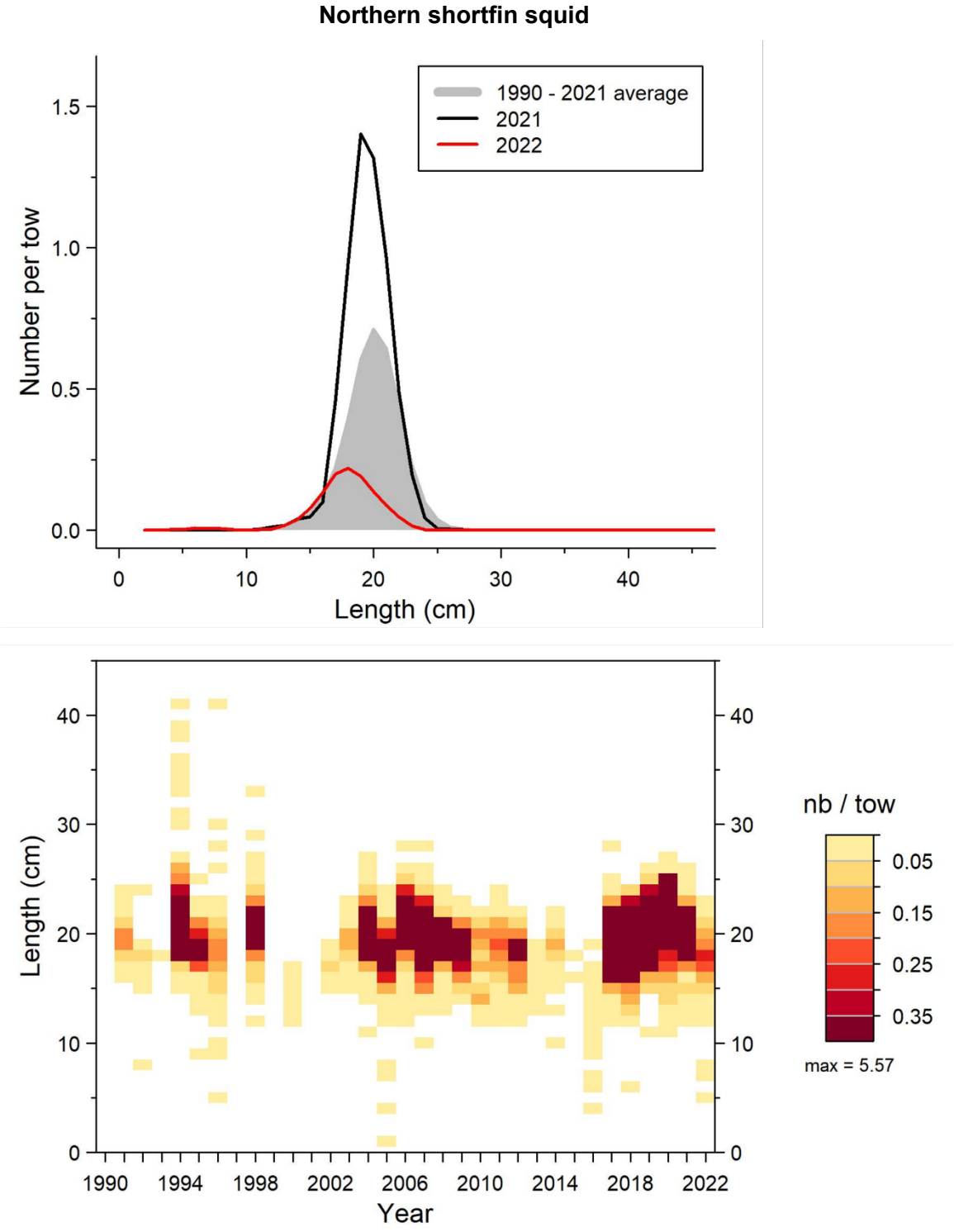

Figure 57. Mantle length frequency distributions (mean number per 15 minute tow) observed during the survey for northern shortfin squid in 4RST.

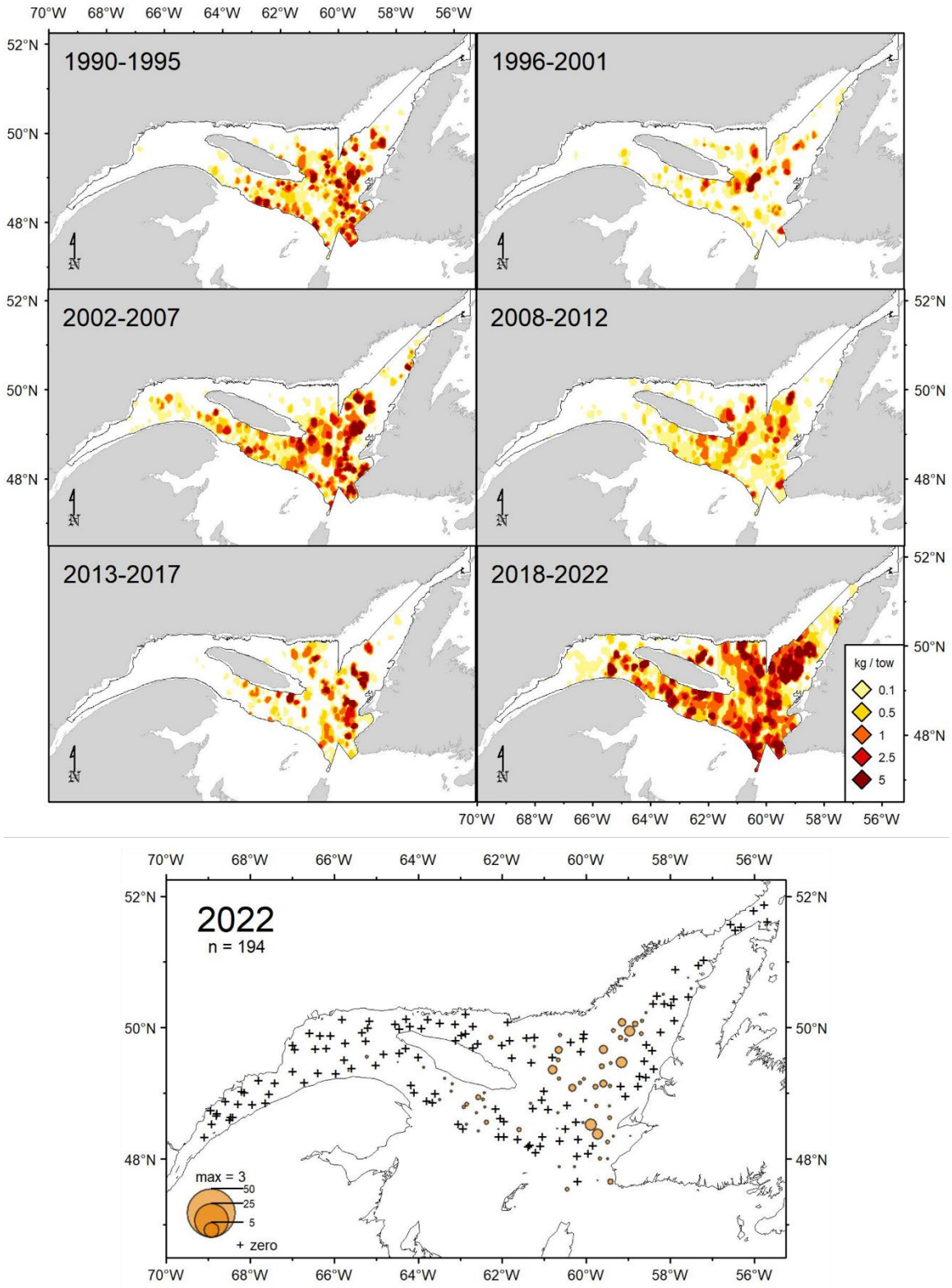

Figure 58. Northern shortfin squid catch rate (kg/15 minute tow) distributions.

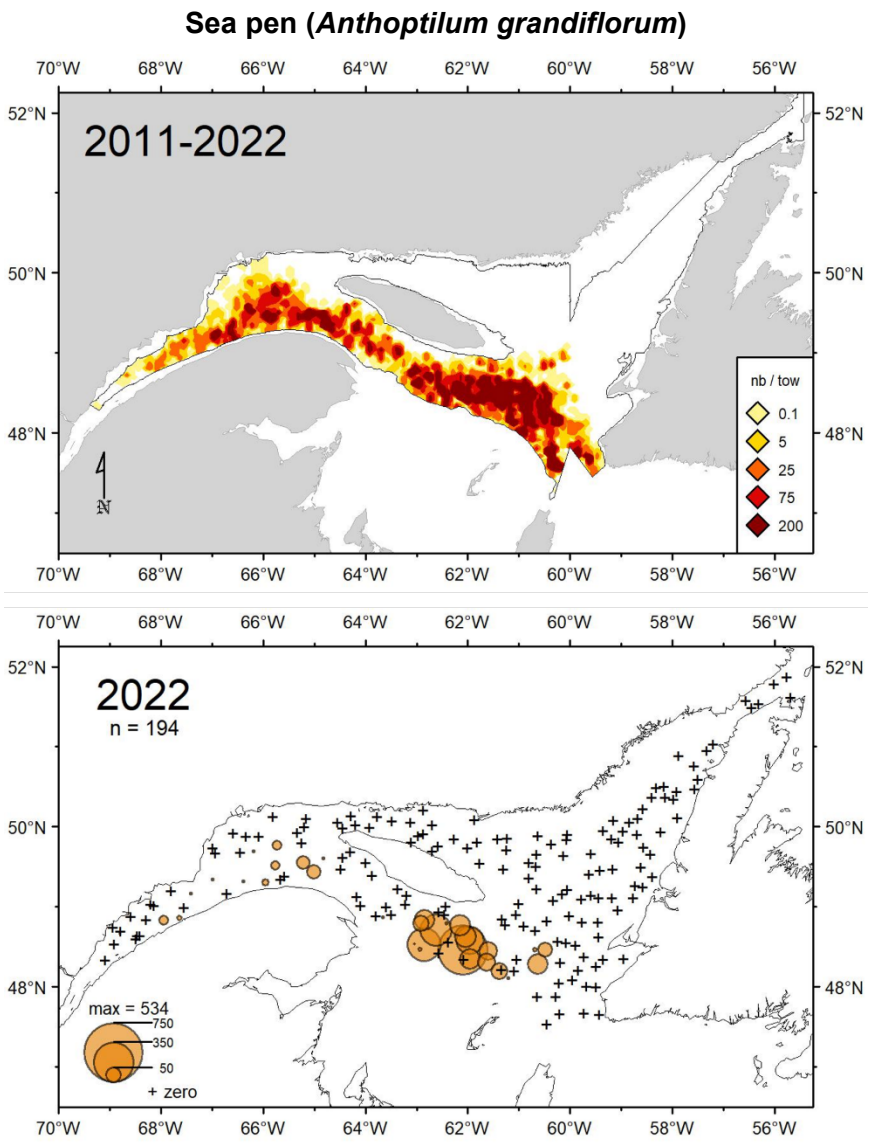

Figure 59. Sea pen (Anthoptilum grandiflorum) catch rates (nb/15 minute tow) distribution.

Sea pen (*Halipteris finmarchica*)

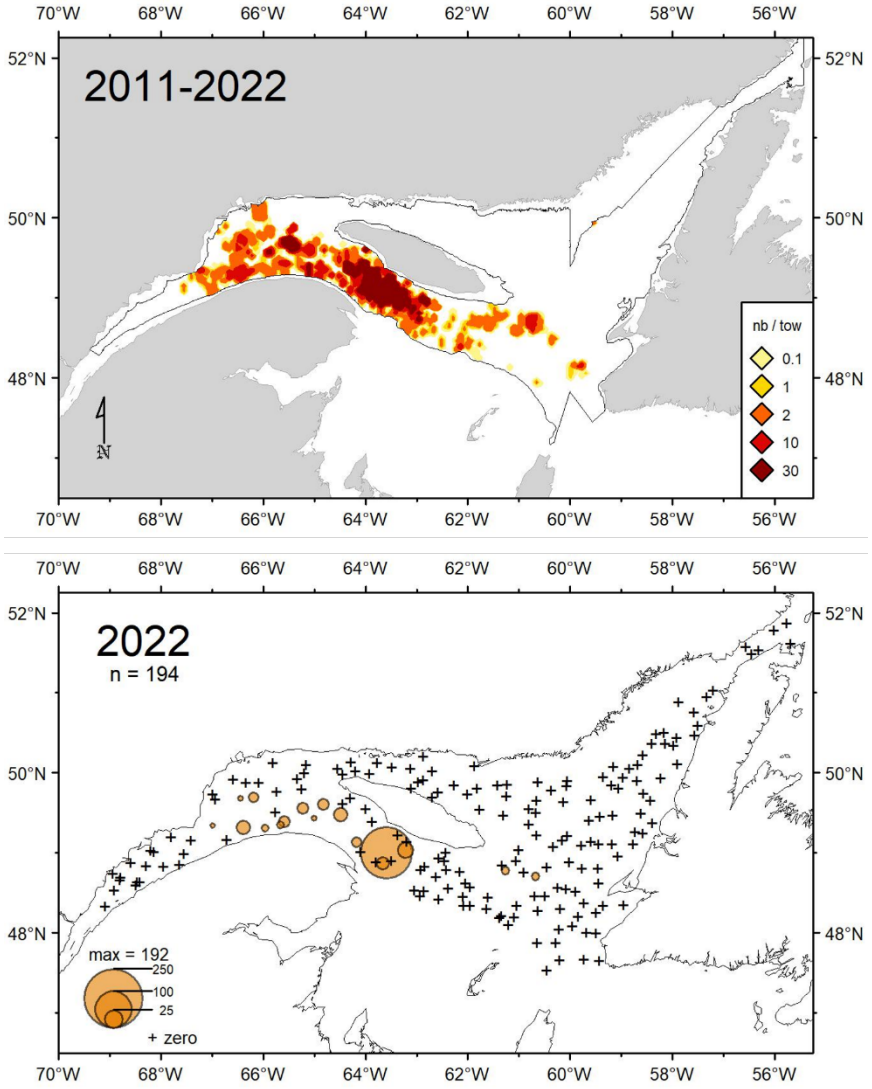

Figure 60. Sea pen (Halipteris finmarchica) catch rates (nb/15 minute tow) distribution.

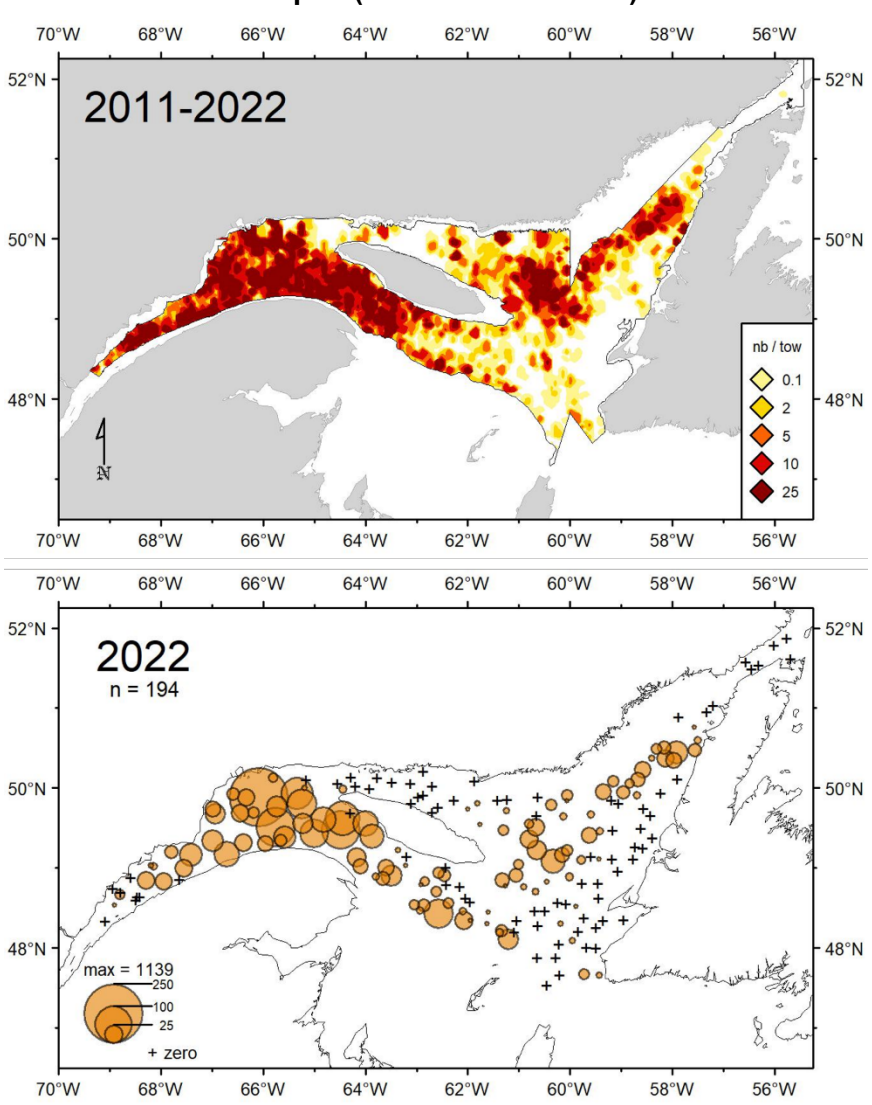

Figure 61. Sea pen (Pennatula aculeate) catch rates (nb/15 minute tow) distribution.

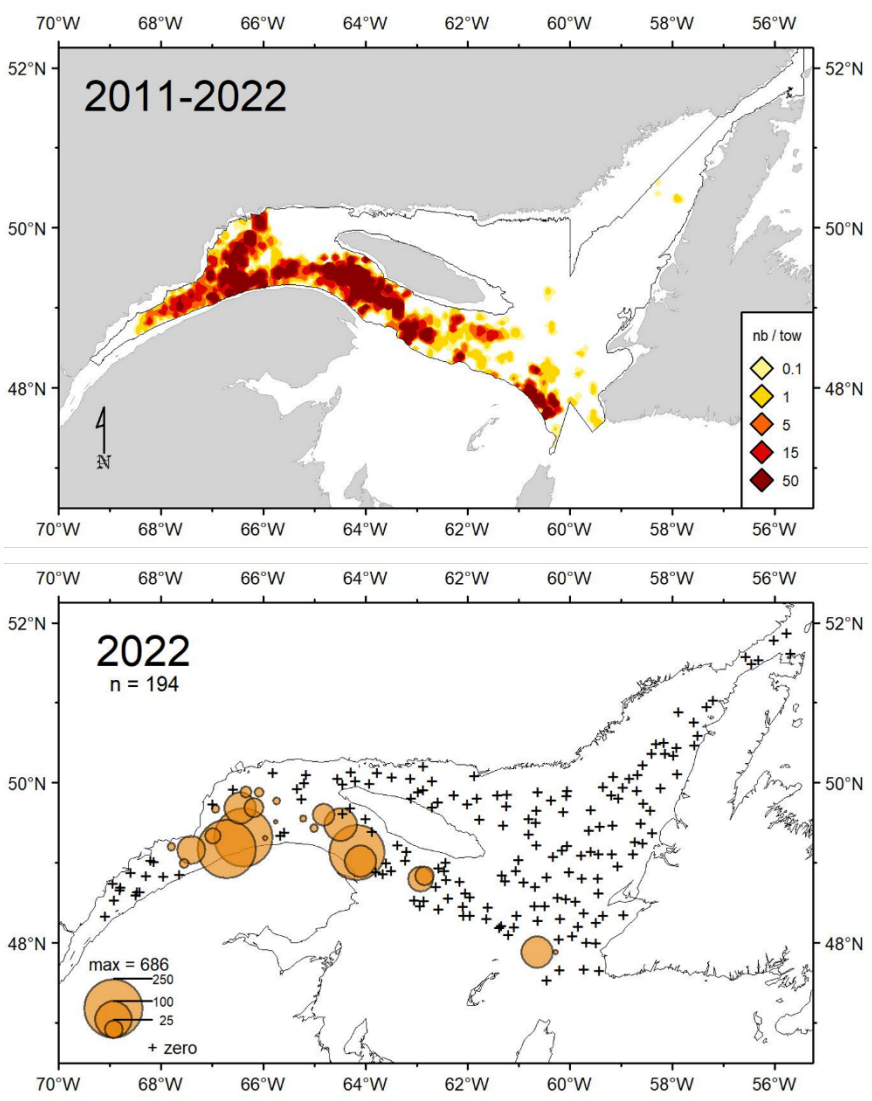

Figure 62. Sea pen (Ptilella grandis) catch rates (nb/15 minute tow) distribution.

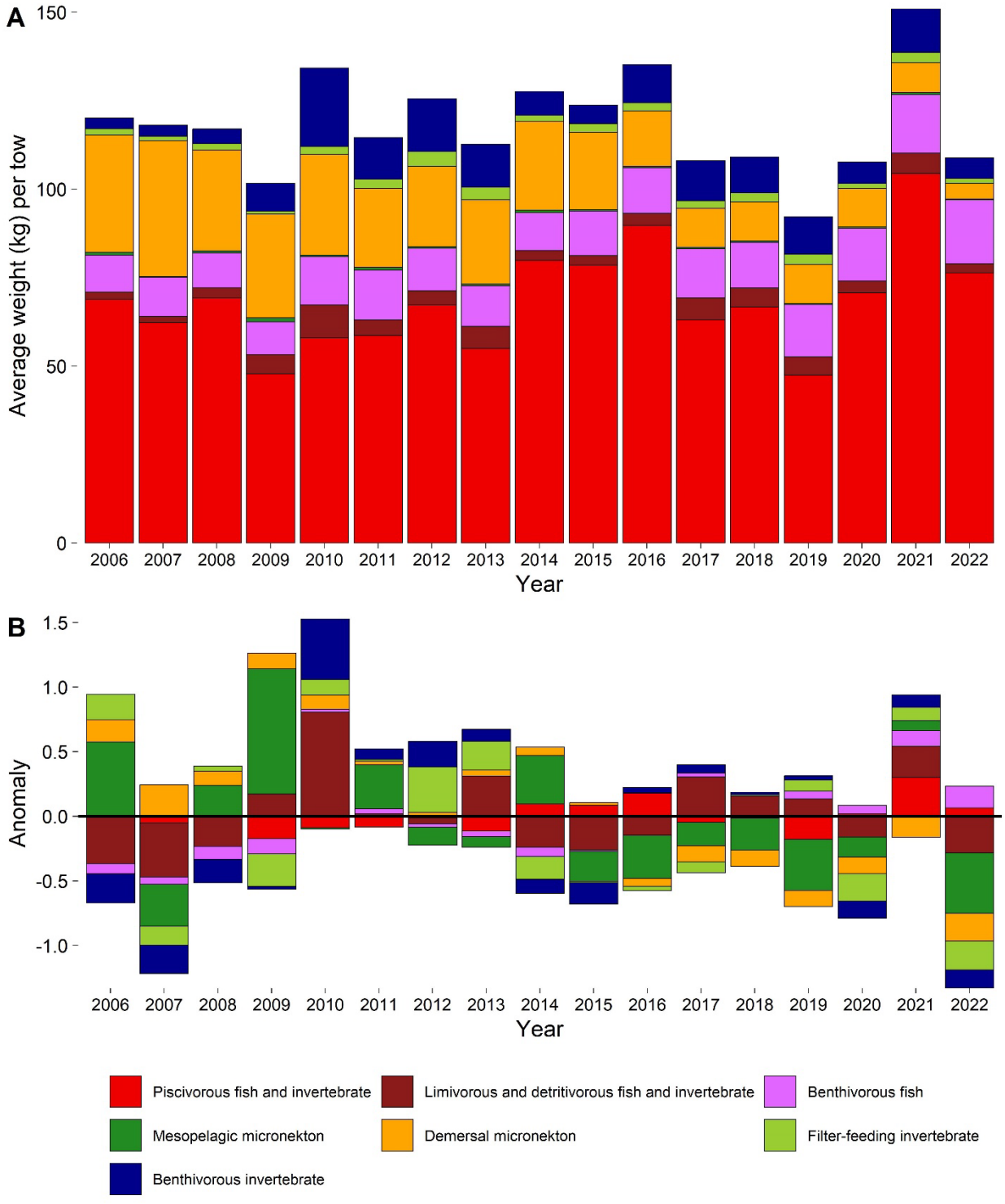

Figure 63. Ecological index based on trophic guilds for the period 2006 to 2022 represented in (A) mean weight (kg) per tow and in (B) anomalies.

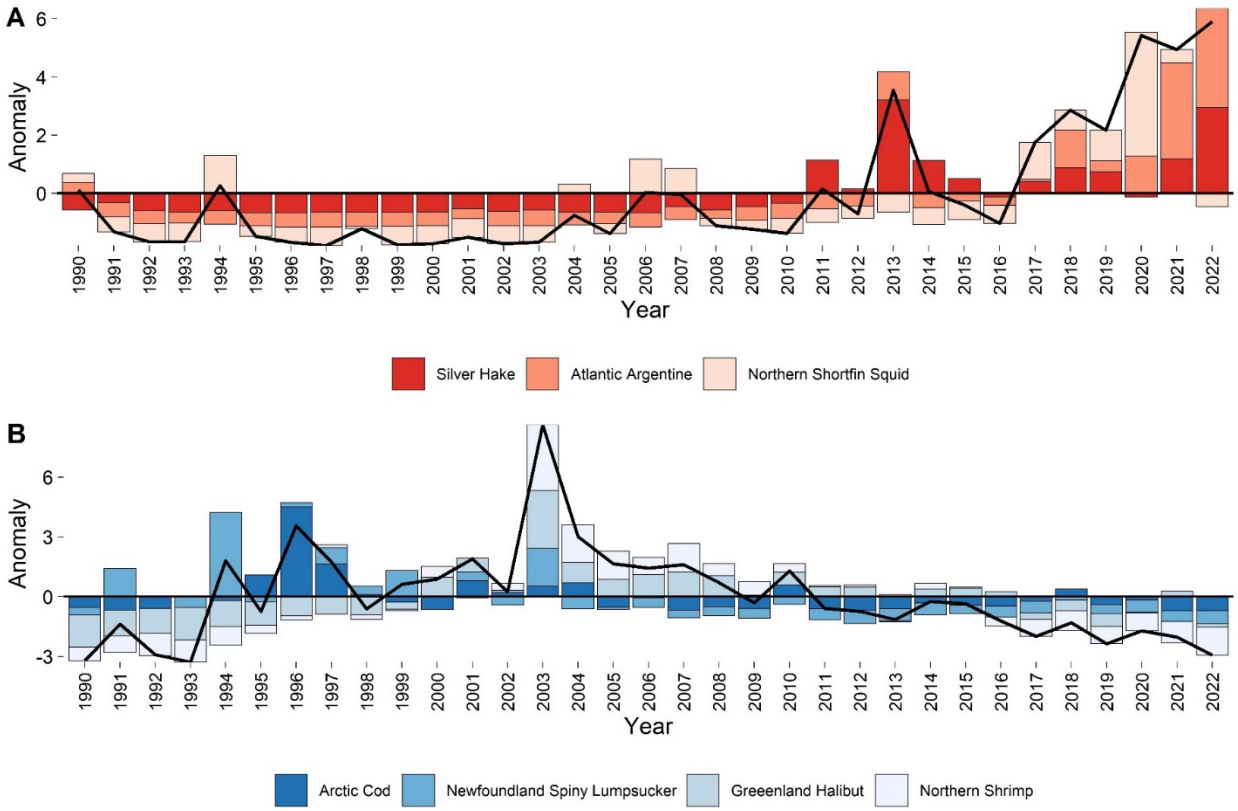

Figure 64. Ecological indices based on thermal groups for the period 1990 to 2022 for (A) warm water species (Merluccius bilinearis, Illex illecebrosus, Argentina silus) and (B) cold water species (Boreogadus saida , Eumicrotremus terraenovae, Pandalus borealis and Reinhardtius hippoglossoides), represented as anomalies. The black line represents the sum of the annual anomaly of each species.

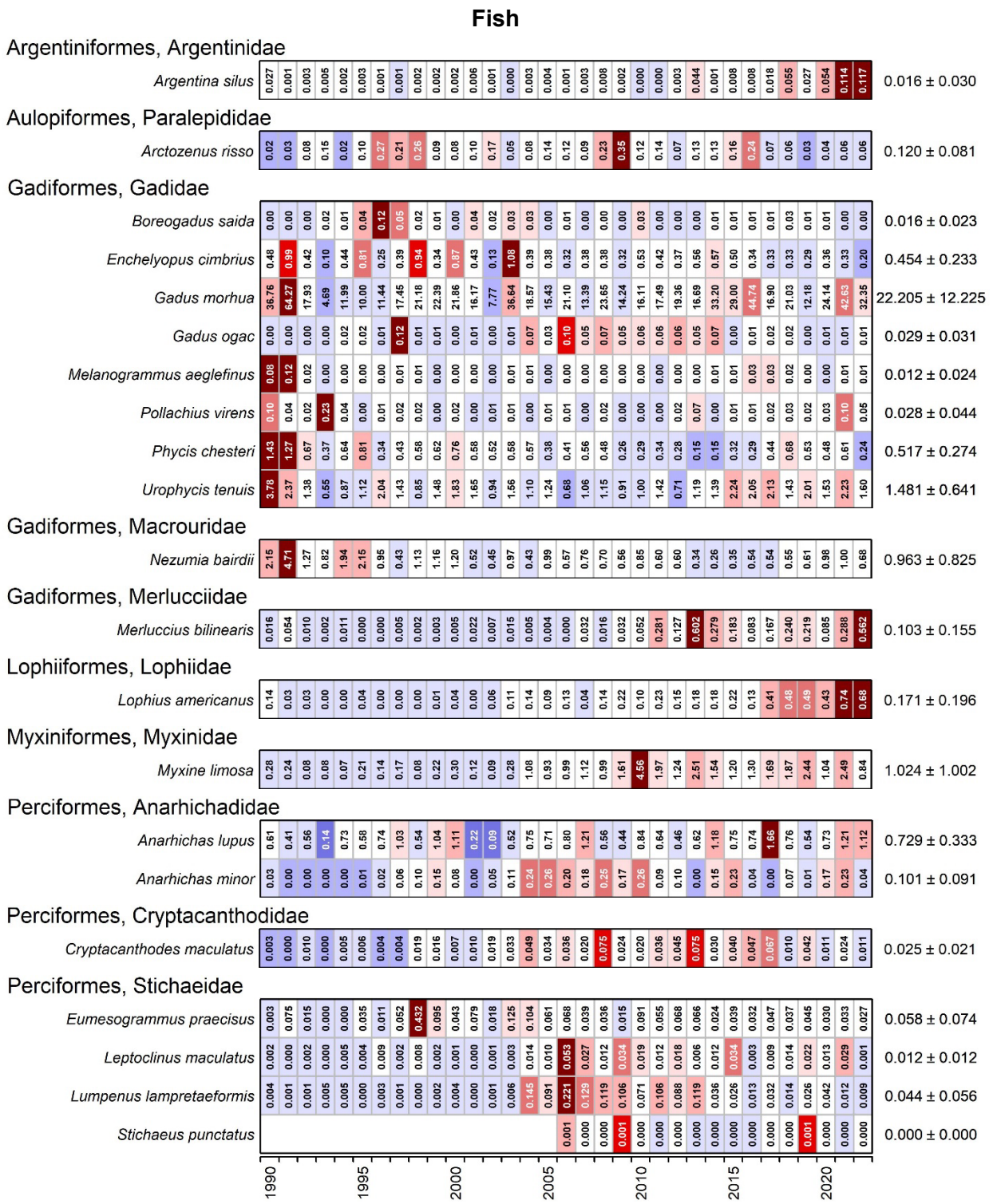

Figure 65. Average weight per 15-minute tow during the fish taxa survey. The colour code represents the anomaly value of the difference between the CPUE in a given year and the average CPUE in the time series divided by the standard deviation of this average for each taxon.

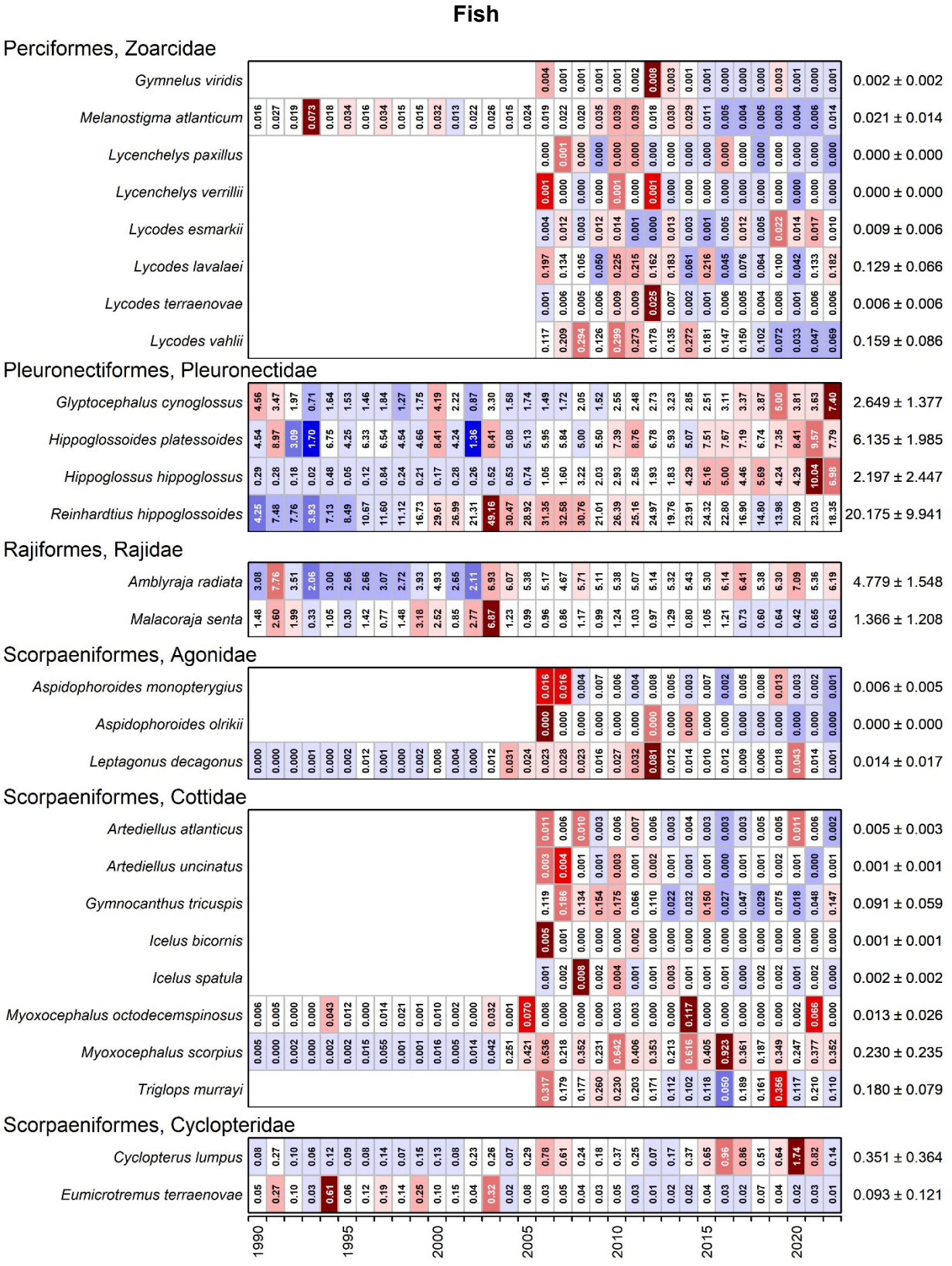

Figure 65. Continued.

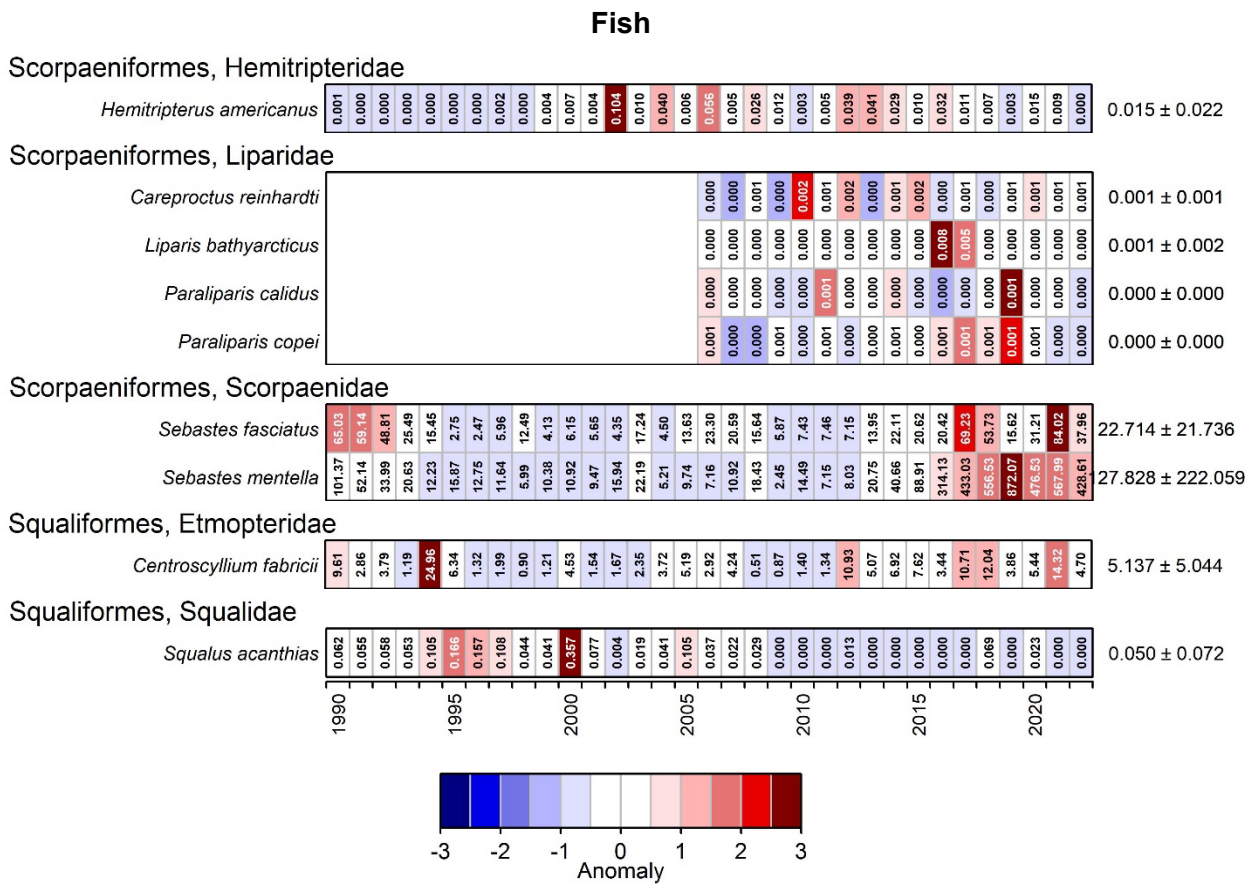

Figure 65. Continued.

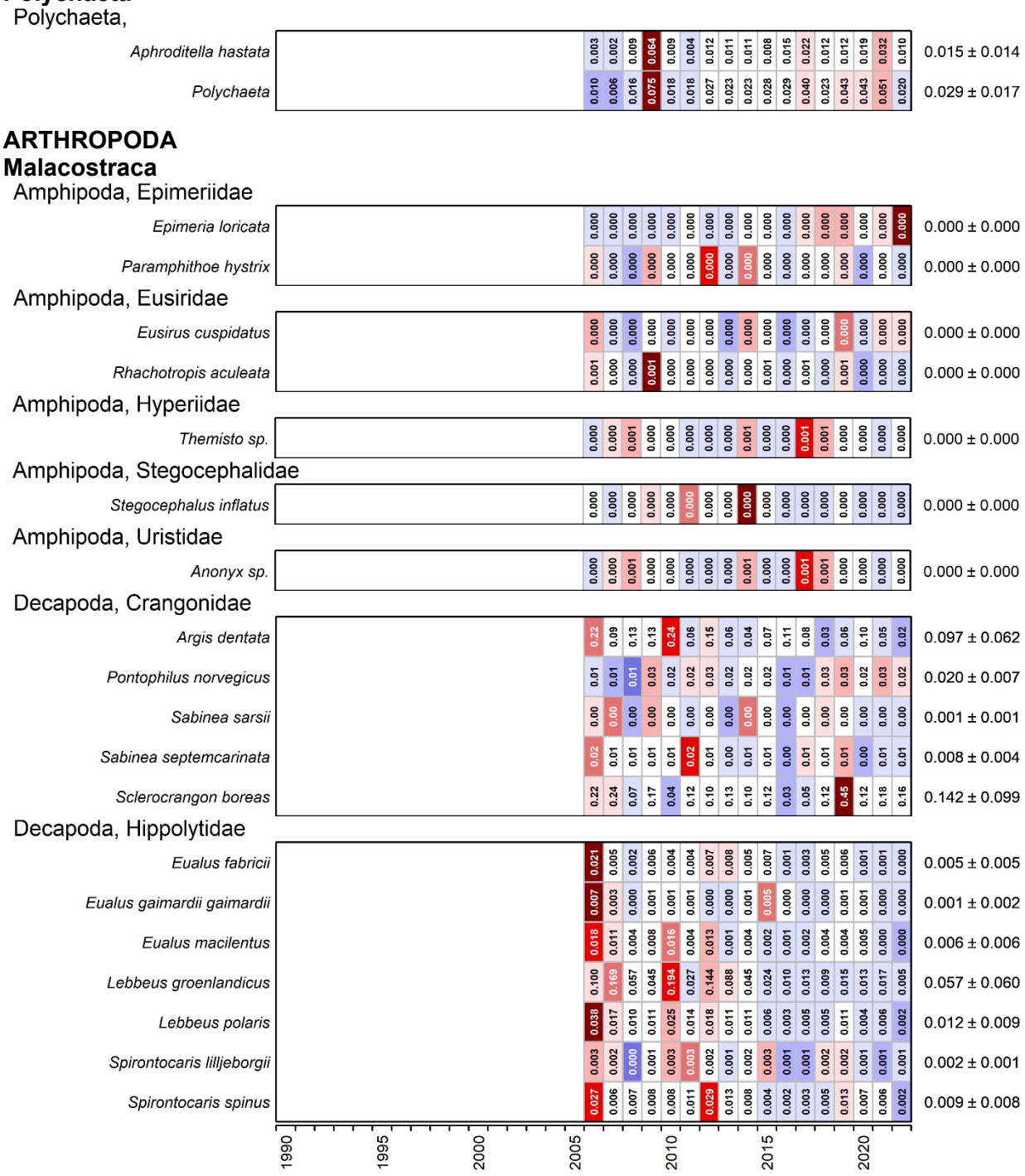

Figure 66. Average weight per 15-minute tow during the invertebrates. The colour code represents the anomaly value of the difference between the CPUE in a given year and the average CPUE in the time series divided by the standard deviation of this average for each taxon.

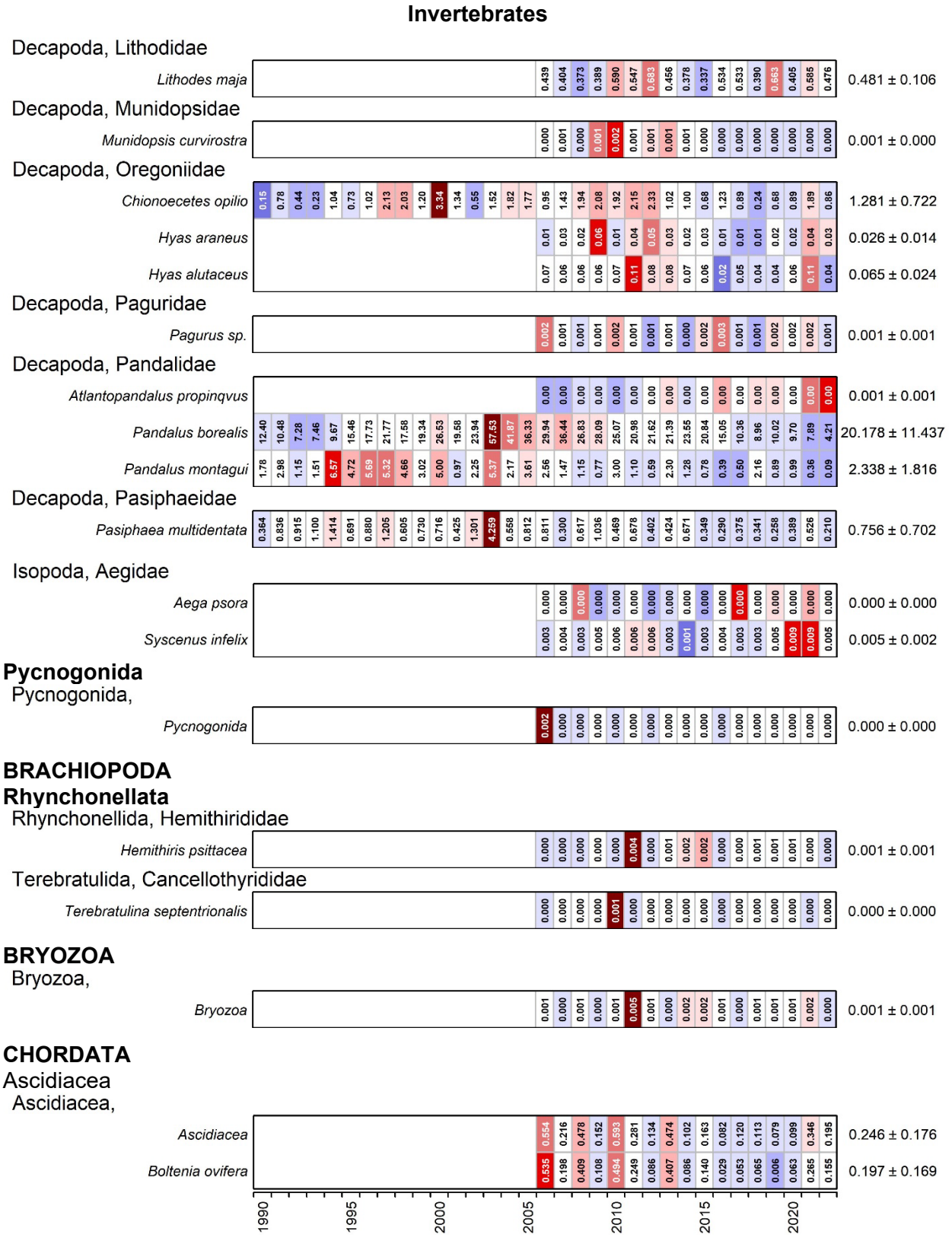

Figure 66. Continued.

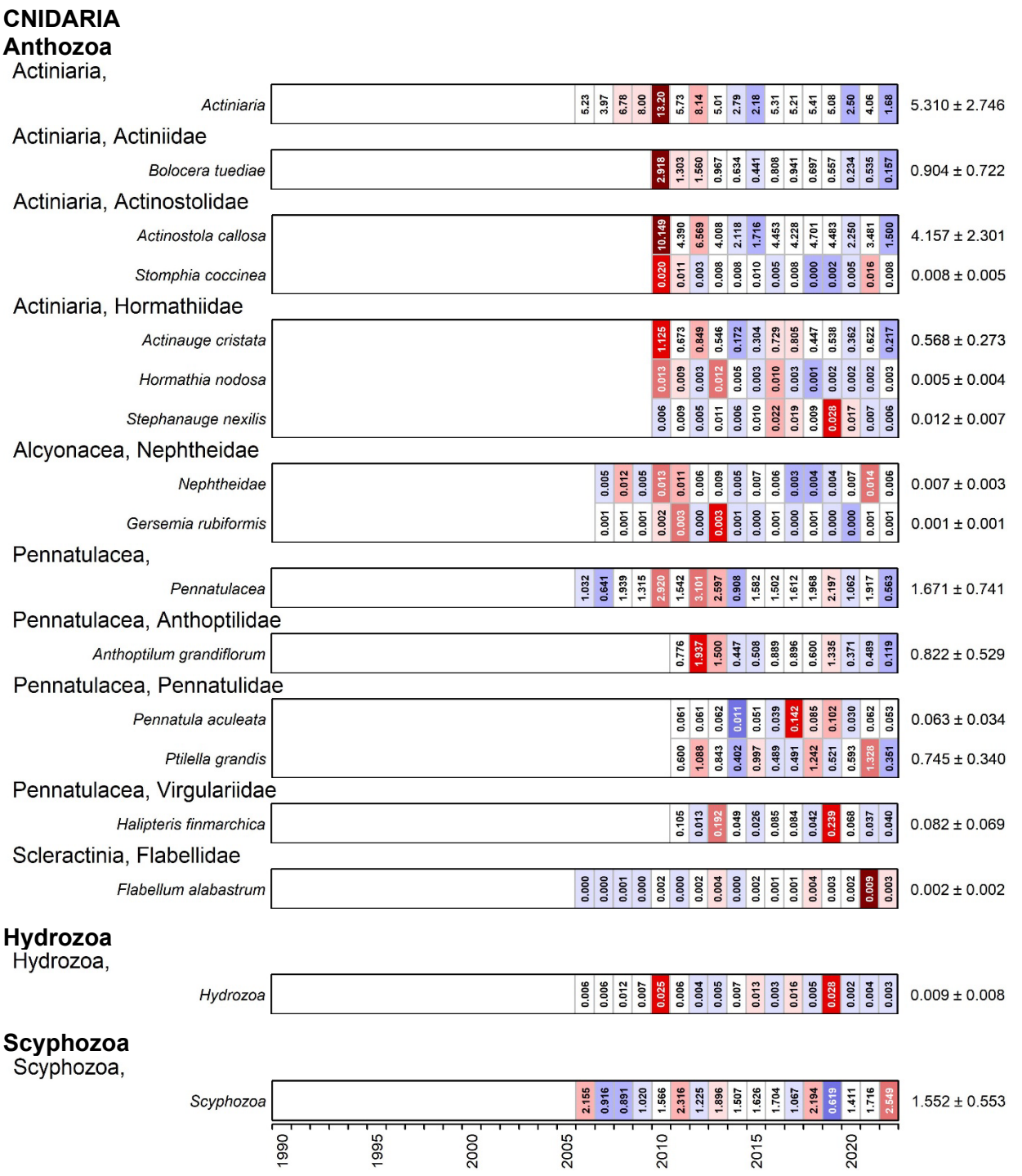

Figure 66. Continued.

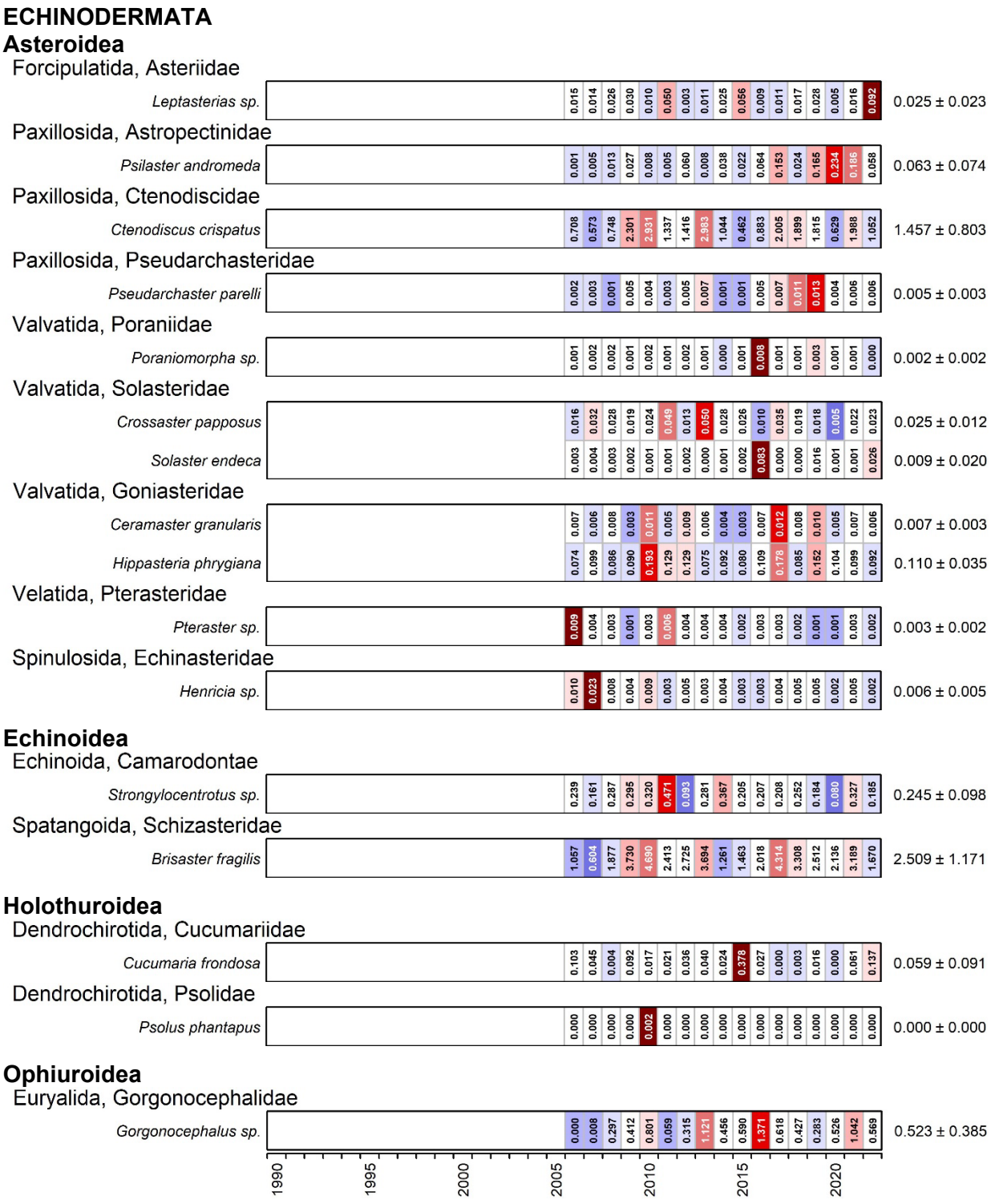

Figure 66. Continued.

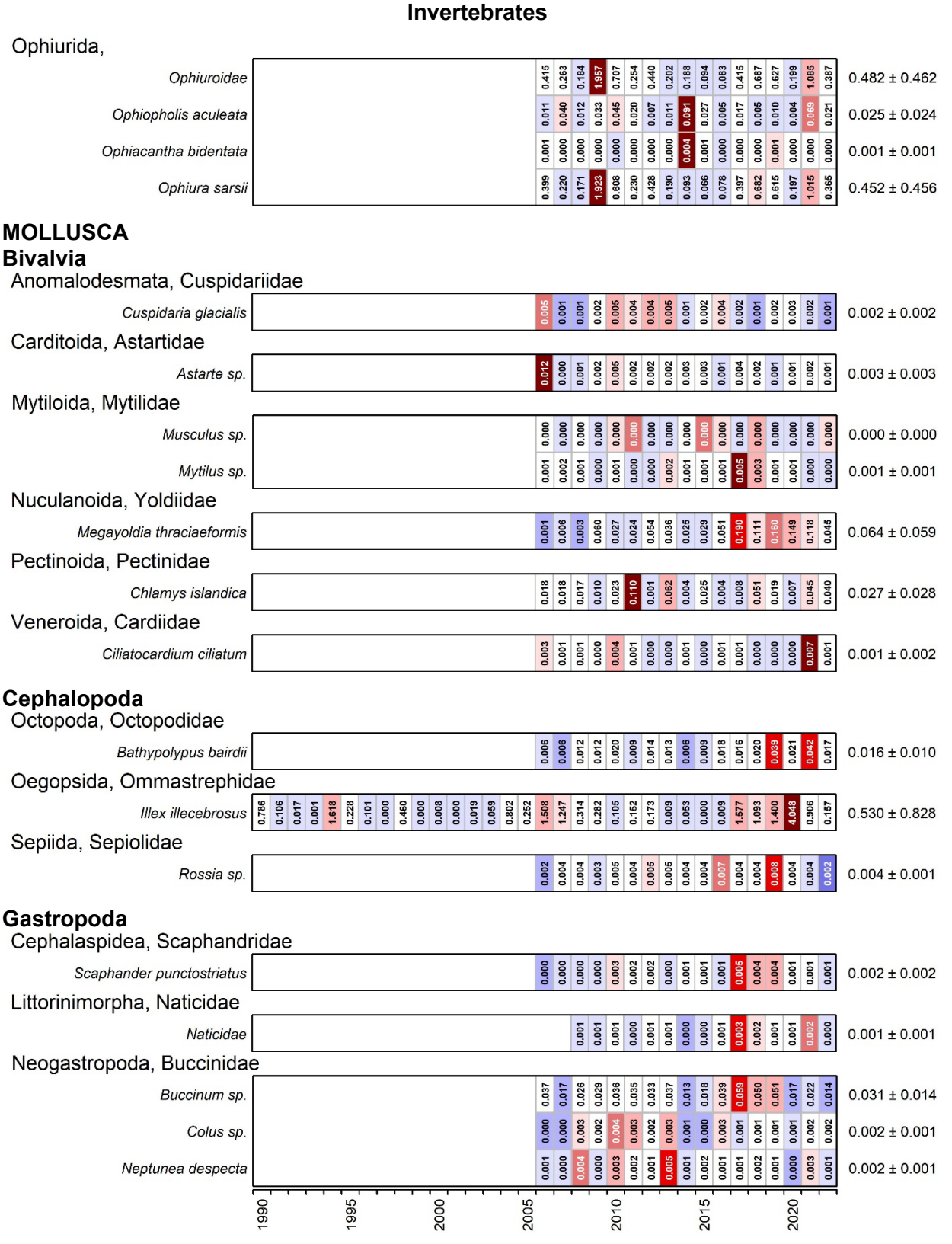

Figure 66. Continued.

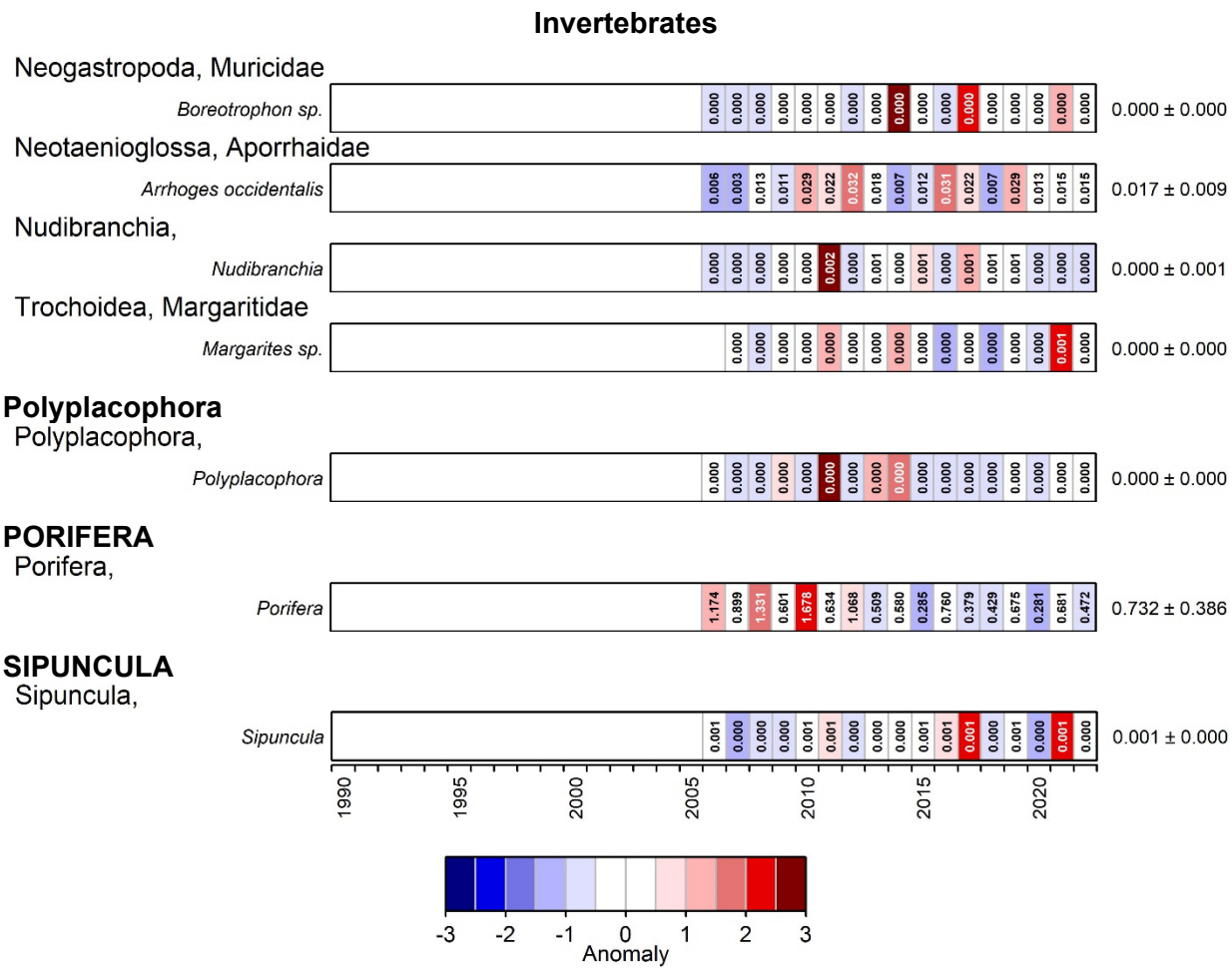

Figure 66. Continued.

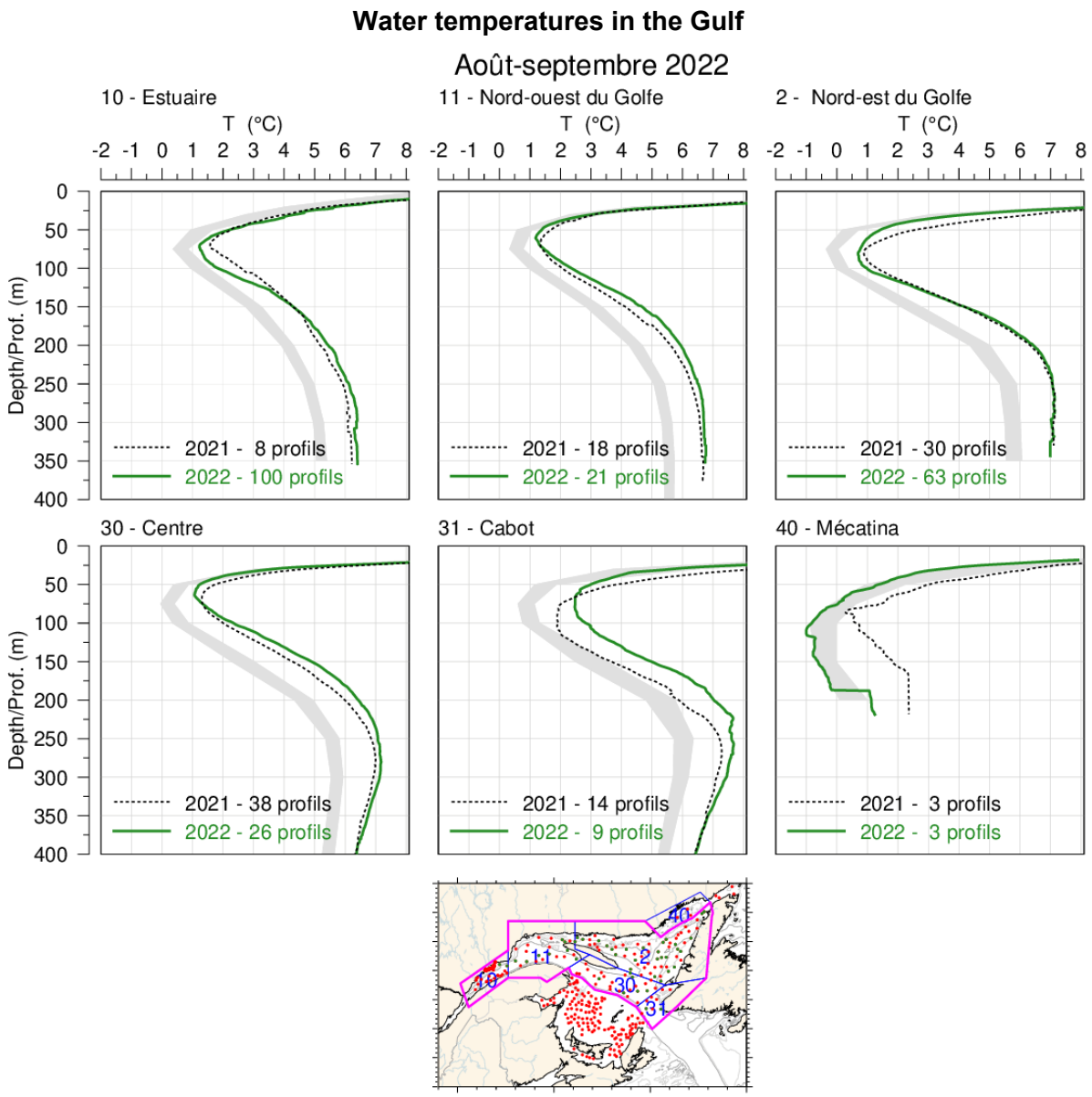

Figure 67. Mean temperature profiles observed in each region of the Gulf during August 2022 obtained from rosette profiles (red dots on the map) as well as from the trawl-mounted instrument when no rosettes were sampled within a 10 nautical mile radius (green dots). The shaded area represents the 1991–2020 climatological monthly mean ± 0.5 SD for August. Mean profiles for August and September 2021 are also shown for comparison. The violet outline on the map shows the area over which sea surface temperature is averaged for figure 68.

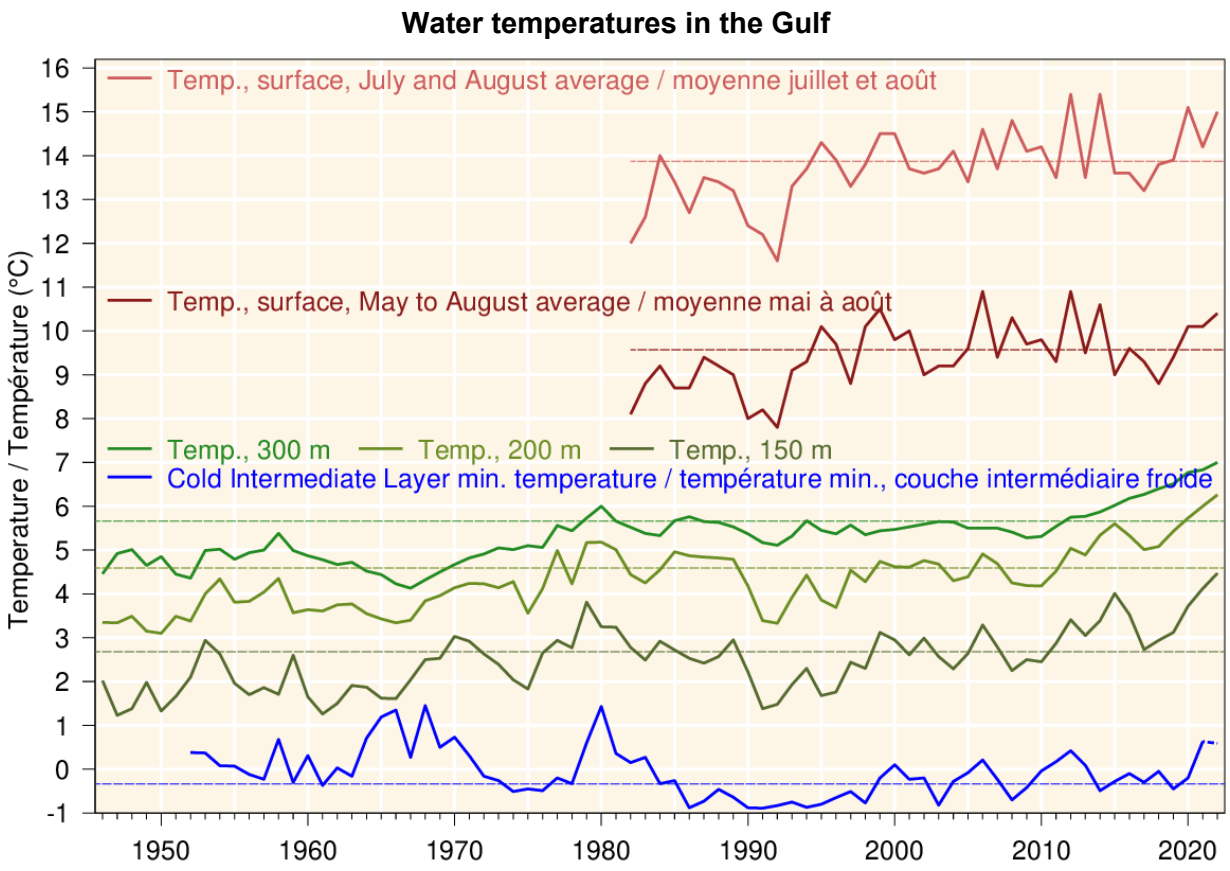

Figure 68. Water temperatures in the Gulf. Sea-surface temperature averaged over the Estuary and the northern Gulf (see violet outline on map of figure 67) for July–August and May-August (1982–2022) (red lines). Layer-averaged temperature for the Gulf of St. Lawrence at 150, 200 and 300 m (green lines). Cold intermediate layer minimum temperature index in the Gulf of St. Lawrence adjusted to July 15, with 2022 value estimated only from August survey data (blue line).

APPENDICES

Appendix 1. Equations of estimators of the mean, variance and confidence intervals for random stratified sampling used for computing annual indices.

$$N = \sum_{h=1}^{L} N_h$$

$$f_h = \frac{n_h}{N_h}$$

$$W_h = \frac{N_h}{N}$$

$$\bar{y}_h = \frac{\sum_{i=1}^{n_h} y_{hi}}{n_h}$$

$$s_h^2 = \frac{\sum_{i=1}^{n_h} (y_{hi} - \bar{y}_h)^2}{n_h - 1}$$

$$\bar{y} = \sum_{h=1}^{L} W_h \bar{y}_h)$$

$$s_{\bar{y}}^2 = \sum_{h=1}^{L} \frac{W_h^2 s_h^2 (1 - f_h)}{n_h}$$

Where

L : Total number of strata (h = 1, 2, …, L)

n_h : Stratum h sample size, that is total number of sampled units

N_h : Stratum h size (here expressed as the number of trawlable units)

N : Survey area size

f_h : Sampling fraction in stratum h

W_h : Weight of stratum h

y_{hi} : Observation i of stratum h

$\bar{y}_h$: Mean of stratum h

s_h^2 : Variance of stratum h

$\bar{y}$: Annual estimate of the mean

$s_{\bar{y}}^2$: Estimated variance of $\bar{y}$

With confidence intervals and degrees of freedom given by

$$\bar{y} - t_{(\alpha/2,d)}\, s_{\bar{y}} < \bar{Y} < \bar{y} + t_{(\alpha/2,d)}\, s_{\bar{y}} \text{ and}$$

$$d = \left(\sum_{h=1}^{L} a_h s_h^2 \right) \Bigg/ \left[\sum_{h=1}^{L} \left(a_h s_h^2 \right)^2 / (n_h - 1) \right]$$

where $a_h = N_h (N_h - n_h)/n_h$

Appendix 2. List of species used for the ecological indicator based on trophic guilds.

STRAP code	Scientific name	French name	English name	Trophic guild
Invertebrates				
2182	*Actinauge cristata*	Anémone de mer	Anemone	Benthivorous invertebrate
2162	*Actinostola callosa*	Anémones de mer	Anemone	Benthivorous invertebrate
2218	*Anthoptilum grandiflorum*	Plume de mer	Sea pen	Filter-feeding invertebrates
5002	*Aphroditella hastata*	Souris de mer	Sea Mouse	Benthivorous invertebrate
8138	*Argis dentata*	Crevette verte	Arctic Argid	Demersal micronekton
3418	*Arrhoges occidentalis*	Pied-de-pélican	American Pelicanfoot	Limivorous and detritivorous fish and invertebrate
4227	*Astarte sp.*	Astartes	Astartes	Filter-feeding invertebrates
8113	*Atlantopandalus propinqvus*	Crevette	Shrimp	Demersal micronekton
4904	*Bathypolypus bairdii*	Poulpe	North Atlantic Octopus	Piscivorous fish and invertebrate
2158	*Bolocera tuediae*	Anémone de mer	Anemone	Benthivorous invertebrate
8792	*Boltenia ovifera*	Patate de mer	Sea Potato	Filter-feeding invertebrates
8378	*Brisaster fragilis*	Oursin coeur	Heart Urchin	Limivorous and detritivorous fish and invertebrate
2670	*Bryozoa*	Bryozoaires	Bryozoans	Filter-feeding invertebrates
3516	*Buccinum sp.*	Buccins	Whelk	Benthivorous invertebrate
8429	*Ceramaster granularis*	Étoile de mer	Sea Star	Benthivorous invertebrate
8213	*Chionoecetes opilio*	Crabe des neiges	Snow Crab	Benthivorous invertebrate
4167	*Chlamys islandica*	Pétoncle d' Islande	Iceland Scallop	Filter-feeding invertebrates
3575	*Colus sp.*	Buccins	Whelks	Benthivorous invertebrate
8447	*Crossaster papposus*	Soleil de mer épineux	Spiny Sun Star	Benthivorous invertebrate
8407	*Ctenodiscus crispatus*	Étoile de mer	Mud Star	Benthivorous invertebrate
8312	*Cucumaria frondosa*	Concombre de mer	Orange Footed Sea Cucumber	Filter-feeding invertebrates
4526	*Cuspidaria glacialis*	Mye	Gacial Dipperclam	Benthivorous invertebrate
7383	*Epimeria loricata*	Gammaride	Gammarid	Demersal micronekton
8075	*Eualus fabricii*	Bouc Arctique	Arctic Eualid	Demersal micronekton
8077	*Eualus macilentus*	Bouc du Groenland	Greenland Shrimp	Demersal micronekton
2184	*Gersemia rubiformis*	Corail mou	Sea Strawberry	Filter-feeding invertebrates
8540	*Gorgonocephalus sp.*	Gorgonocéphales	Basket Stars	Benthivorous invertebrate
2217	*Halipteris finmarchica*	Plume de mer	Sea pen	Filter-feeding invertebrates

STRAP code	Scientific name	French name	English name	Trophic guild
8483	*Henricia sp.*	Étoiles de mer	Sea Stars	Benthivorous invertebrate
8431	*Hippasteria phrygiana*	Étoile de mer	Sea Star	Benthivorous invertebrate
8219	*Hyas alutaceus*	Crabe lyre arctique	Arctic Lyre Crab	Benthivorous invertebrate
8217	*Hyas araneus*	Crabe lyre	Atlantic Lyre Crab	Benthivorous invertebrate
1341	*Hydrozoa*	Hydrozoaires	Hydrozoans	Filter-feeding invertebrates
4753	*Illex illecebrosus*	Encornet rouge nordique	Northern Shortfin Squid	Piscivorous fish and invertebrate
8093	*Lebbeus polaris*	Bouc	Polar Lebbeid	Demersal micronekton
8510	*Leptasterias sp.*	Étoiles de mer	Sea Stars	Benthivorous invertebrate
8196	*Lithodes maja*	Crabe épineux du Nord	Norway King Crab	Benthivorous invertebrate
4025	*Megayoldia thraciaeformis*	Bivalve	Broad Yoldia	Limivorous and detritivorous fish and invertebrate
8164	*Munidopsis curvirostra*	Munidopsis curvirostra	Squat Lobster	Benthivorous invertebrate
4121	*Mytilus sp.*	Moules	Mussels	Filter-feeding invertebrates
3420	*Naticidae*	Lunaties	Moonsnails	Benthivorous invertebrate
2219	*Nephtheidae*	Coraux mous	Soft corals	Filter-feeding invertebrates
3565	*Neptunea sp.*	Buccins	Whelks	Benthivorous invertebrate
5961	*Nymphon sp.*	Araignées de mer	Sea Spiders	Benthivorous invertebrate
8575	*Ophiacantha bidentata*	Ophiure épineuse	Brittle Star	Benthivorous invertebrate
8583	*Ophiopholis aculeata*	Ophiure paquerette	Daisy Brittle Star	Benthivorous invertebrate
8553	*Ophiura sarsii*	Ophiure	Brittle Star	Benthivorous invertebrate
8178	*Pagurus sp.*	Bernard hermite droitier	Hermit Crab	Benthivorous invertebrate
8111	*Pandalus borealis*	Crevette nordique	Northern Shrimp	Demersal micronekton
8112	*Pandalus montagui*	Crevette ésope	Striped Pink Shrimp, Aesop Shrimp	Demersal micronekton
8057	*Pasiphaea multidentata*	Sivade rose, Crevette blanche	Pink Glass Shrimp	Mesopelagic micronekton
2203	*Pennatula aculeata*	Plume de mer	Sea Pen	Filter-feeding invertebrates
8135	*Pontophilus norvegicus*	Crevette	Norwegian Shrimp	Demersal micronekton
1101	*Porifera*	Éponges	Sponges	Filter-feeding invertebrates
8433	*Pseudarchaster parelii*	Étoile de mer	Sea Star	Benthivorous invertebrate
8520	*Psilaster andromeda*	Étoile de mer	Sea Star	Benthivorous invertebrate
8409	*Pteraster sp.*	Étoiles de mer	Sea stars	Benthivorous invertebrate
2210	*Ptilella grandis*	Plume de mer	Sea Pen	Filter-feeding invertebrates
1353	*Ptychogena lactea*	Méduse	Jellyfish	Mesopelagic micronekton

STRAP code	Scientific name	French name	English name	Trophic guild
4557	*Rossia sp.*	Sépioles	Bobtails	Demersal micronekton
8128	*Sabinea septemcarinata*	Crevette	Sevenline Shrimp	Demersal micronekton
3715	*Scaphander punctostriatus*	Céphalaspide	Giant Canoe Bubble	Limivorous and detritivorous fish and invertebrate
2040	*Scyphozoa*	Scyphozoaires	Scyphozoans	Piscivorous fish and invertebrate
8087	*Spirontocaris liljeborgii*	Bouc épineux	Friendly Blade Shrimp	Demersal micronekton
8085	*Spirontocaris spinus*	Bouc perroquet	Parrot Shrimp	Demersal micronekton
2159	*Stephanauge nexilis*	Anémone de mer	Sea anemone	Filter-feeding invertebrates
2173	*Stomphia coccinea*	Anémone marbrée	Anemone	Benthivorous invertebrate
8363	*Strongylocentrotus sp.*	Oursins	Sea Urchins	Benthivorous invertebrate
Fish				
90	*Amblyraja radiata*	Raie épineuse	Thorny Skate	Piscivorous fish and invertebrate
700	*Anarhichas lupus*	Loup atlantique	Atlantic Wolffish	Benthivorous fish
811	*Artediellus atlanticus*	Hameçon atlantique	Atlantic Hookear Sculpin	Benthivorous fish
812	*Artediellus uncinatus*	Hameçon neigeux	Arctic Hookear Sculpin	Benthivorous fish
838	*Aspidophoroides monopterygius*	Poisson-alligator atlantique	Alligatorfish	Benthivorous fish
27	*Centroscyllium fabricii*	Aiguillat noir	Black Dogfish	Piscivorous fish and invertebrate
461	*Enchelyopus cimbrius*	Motelle à quatre barbillons	Fourbeard Rockling	Benthivorous fish
711	*Eumesogrammus praecisus*	Quatre-lignes atlantique	Fourline Snakeblenny	Benthivorous fish
847	*Eumicrotremus terraenovae*	Petite poule Terre-Neuve	Newfoundland Spiny Lumpsucker	Benthivorous fish
438	*Gadus morhua*	Morue franche	Atlantic Cod	Piscivorous fish and invertebrate
890	*Glyptocephalus cynoglossus*	Plie grise	Witch Flounder	Benthivorous fish
823	*Gymnocanthus tricuspis*	Tricorne arctique	Arctic Staghorn Sculpin	Benthivorous fish
889	*Hippoglossoides platessoides*	Plie canadienne	American Plaice	Benthivorous fish
893	*Hippoglossus hippoglossus*	Flétan atlantique	Atlantic Halibut	Piscivorous fish and invertebrate
836	*Leptagonus decagonus*	Agone atlantique	Atlantic Poacher	Benthivorous fish
717	*Leptoclinus maculatus*	Lompénie tachetée	Daubed Shanny	Benthivorous fish
966	*Lophius americanus*	Baudroie d'Amérique	Monkfish, Goosefish	Piscivorous fish and invertebrate
716	*Lumpenus lampretaeformis*	Lompénie-serpent	Snakeblenny	Benthivorous fish
728	*Lycodes lavalaei*	Lycode du Labrador	Newfoundland Eelpout	Benthivorous fish
730	*Lycodes vahlii*	Lycode à carreaux	Vahl's Eelpout	Benthivorous fish

STRAP code	Scientific name	French name	English name	Trophic guild
91	*Malacoraja senta*	Raie lisse	Smooth Skate	Piscivorous fish and invertebrate
449	*Merluccius bilinearis*	Merlu argenté	Silver Hake	Piscivorous fish and invertebrate
819	*Myoxocephalus scorpius*	Chaboisseau à épines courtes	Shorthorn Sculpin	Piscivorous fish and invertebrate
13	*Myxine limosa*	Myxine de vase	Mud hagfish	Limivorous and detritivorous fish and invertebrate
478	*Nezumia bairdii*	Grenadier du grand Banc	Common Grenadier	Benthivorous fish
444	*Phycis chesteri*	Merluche à longues nageoires	Longfin Hake	Piscivorous fish and invertebrate
892	*Reinhardtius hippoglossoides*	Flétan du Groenland, turbot	Greeenland Halibut, Turbot	Piscivorous fish and invertebrate
814	*Triglops murrayi*	Faux-trigle armé	Moustache Sculpin	Benthivorous fish
447	*Urophycis tenuis*	Merluche blanche	White Hake	Piscivorous fish and invertebrate

Appendix 3. Abundance of taxa captured at stations carried out in the Mécatina Trought in 2022.

STRAP	Scientific name	French name	English name	Station 43	Station 44
Fish					
838	*Aspidophoroides monopterygius*	Poisson-alligator atlantique	Alligatorfish	1	-
451	*Boreogadus saida*	Saïda franc (Morue arctique)	Arctic Cod	407	8
849	*Cyclopterus lumpus*	Grosse poule de mer	Lumpfish	18	14
438	*Gadus morhua*	Morue franche	Atlantic Cod	18	69
823	*Gymnocanthus tricuspis*	Tricorne arctique	Arctic Staghorn Sculpin	2	-
889	*Hippoglossoides platessoides*	Plie canadienne	American Plaice	70	116
832	*Icelus spatula*	Icèle spatulée	Spatulate Sculpin	2	-
836	*Leptagonus decagonus*	Agone atlantique	Atlantic Poacher	60	17
717	*Leptoclinus maculatus*	Lompénie tachetée	Daubed Shanny	37	4
868	*Liparis bathyarcticus*	Limace nébuleuse	Nebulous Snailfish	48	1
859	*Liparis fabricii*	Limace gélatineuse	Gelatinous Seasnail	5	-
728	*Lycodes lavalaei*	Lycode du Labrador	Newfoundland Eelpout	15	3
187	*Mallotus villosus*	Capelan	Capelin	600	231
892	*Reinhardtius hippoglossoides*	Flétan du Groenland, turbot	Greeenland Halibut	5	6
792	*Sebastes* sp.	Sébastes	Rockfishes	-	2
814	*Triglops murrayi*	Faux-trigle armé	Moustache Sculpin	2	-
815	*Triglops nybelini*	Faux-trigle à grands yeux	Bigeye Sculpin	2	-
447	*Urophycis tenuis*	Merluche blanche	White Hake	-	1
Invertebrates					
2165	*Actiniaria*	Anémone de mer	Sea Anemones	1	-
8138	*Argis dentata*	Crevette verte	Arctic Argid	67	19
8742	*Ascidia* sp.	Ascidie	Sea squirts	1	1
3583	*Aulacofusus brevicauda*	Buccin	Whelk	-	7
2085	*Aurelia aurita*	Méduse de lune	Moon Jelly	1	-
3995	*Bivalvia*	Bivalves	Bivalves	-	184
8792	*Boltenia ovifera*	Patate de mer	Sea Potato	1	-
2670	*Bryozoa*	Bryozoaires	Bryozoans	-	10
3516	*Buccinum* sp.	Buccins	Whelk	111	216
8213	*Chionoecetes opilio*	Crabe des neiges	Snow Crab	471	742
4351	*Ciliatocardium ciliatum*	Coque d'Islande	Iceland Cockle	31	96
8447	*Crossaster papposus*	Soleil de mer épineux	Spiny Sun Star	1	-
3422	*Cryptonatica affinis*	Lunaties	Arctic moonsnail	-	106
8407	*Ctenodiscus crispatus*	Étoile de mer	Mud Star	3451	12345
2080	*Cyanea capillata*	Crinière de lion	Lion's Mane	7	1
4268	*Cyclocardia borealis*	Vénéricarde boréale	Northern Cyclocardia	1	-
2191	*Drifa glomerata*	Corail mou	Soft coral	2	-
8081	*Eualus belcheri*	Bouc	Circumpolar Eualid	-	10
8077	*Eualus macilentus*	Bouc du Groenland	Greenland Shrimp	8505	1106
3437	*Euspira pallida*	Lunatie du Groenland	Pale Moonsnail	5	18
8540	*Gorgonocephalus* sp.	Gorgonocéphales	Basket Stars	6	-
8219	*Hyas alutaceus*	Crabe lyre arctique	Arctic Lyre Crab	1	-
8513	*Leptasterias groenlandica*	Étoile de mer du Groenland	Greenland Sea Star	2	-
4395	*Macoma calcarea*	Bivalve	Chalky Macoma	2	250
4025	*Megayoldia thraciaeformis*	Bivalve	Broad Yoldia	-	22
5646	*Melinna cristata*	Polychète	Seaworm	-	-
2585	*Nematoda*	Nématode	Nematode	-	1
3567	*Neptunea despecta*	Neptunée commune du nord	Lader Whelk	12	-
4019	*Nuculana* sp.	Bivalves	Nutclams	-	86
8583	*Ophiopholis aculeata*	Ophiure paquerette	Daisy Brittle Star	3	-
8553	*Ophiura sarsii*	Ophiure	Brittle Star	-	150
8178	*Pagurus* sp.	Bernard hermite droitier	Hermit Crab	6	-
8111	*Pandalus borealis*	Crevette nordique	Northern Shrimp	248	1362
8112	*Pandalus montagui*	Crevette ésope	Striped Pink Shrimp	757	107
2255	*Pleurobrachia pileus*	Groseille de mer ronde	Sea Gooseberry	1	-
4950	*Polychaeta*	Polychètes	Polychaetes	1	107
2573	*Priapulus caudatus*	Priapulide	Priapulid	1	1
7211	*Rhachotropis aculeata*	Gammaride	Gammarid	-	1
8128	*Sabinea septemcarinata*	Crevette	Sevenline Shrimp	49	-
8119	*Sclerocrangon boreas*	Crevette de roche (ciselée)	Scultured Shrimp	20	-
2679	*Securiflustra securifrons*	Bryozoaires marins	Marine bryozoans	1	-
8570	*Stegophiura nodosa*	Ophiure	Brittle Star	16	-
2173	*Stomphia coccinea*	Anémone marbrée	Anemone	106	18
8363	*Strongylocentrotus* sp.	Oursins	Sea Urchins	1	-
3564	*Volutopsius norwegicus*	Buccin	Norway Whelk	2	-
4074	*Yoldia* sp.	Bivalves	Bivalves	6	126