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Functional Group Conversion Factors in Support of Ecosystem Analyses in the Newfoundland and Labrador Region

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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

Comparative fishing (i.e., direct side by side comparison between old and new vessels) occurred from fall 2021 through fall 2023 as the Newfoundland and Labrador Region of Fisheries and Oceans Canada transitioned from the Canadian Coast Guard Ship (CCGS) *Alfred Needler* and CCGS *Teleost* to the CCGS *John Cabot* and CCGS *Capt. Jacques Cartier* for its multispecies surveys. Conversion factors have been estimated for many species, but data are not sufficient to estimate conversions for all taxa. To support ecosystem-based analyses, conversions are estimated here with fish and commercial shellfish species grouped at the functional group level (i.e., groupings of species based on size and general feeding habits), with conversions estimated for total catch weight and total catch numbers. Results vary across vessels, areas, and between functional groups. Conversions are intended to be applied to the vessel, season, and area for which they were derived, and are to be used at the grouped level only.

1. INTRODUCTION

Multispecies bottom trawl surveys have been conducted annually in the spring and fall in the Newfoundland and Labrador (NL) Region aboard the Canadian Coast Guard Ship (CCGS) *Teleost* (hereafter the "Teleost" [TEL]) and CCGS *Alfred Needler* (hereafter the "Needler" [AN]), or its sister ship the CCGS *Wilfred Templeman*, using a Campelen 1800 survey trawl since the autumn of 1995. These surveys are used to estimate the distribution, biomass, and abundance of many fish and invertebrate species, to determine species life history characteristics, and form the basis of a number of ecosystem indicators. The Needler and Teleost were no longer used for multispecies surveys after 2022 and 2023, respectively, and have been replaced by new vessels, the CCGS *John Cabot* (hereafter the "Cabot" [CAB]) and CCGS *Capt. Jacques Cartier* (hereafter the "Cartier" [CAR]).

Comparative fishing (i.e., direct side by side comparison between the old and new vessels) occurred from fall 2021 through fall 2023 (Figure 1). This is a standard approach for determining differences in catchability between the outgoing vessels with the standard Campelen trawl and the new vessels with the modified Campelen trawl. Conversion factors have been estimated for many species (DFO 2024; Trueman et al. 2025a, b, and c), but data were not sufficient to estimate conversions for all taxa due to factors such as limited sample size and uncertainty in species identification.

To support ecosystem-based analyses, multispecies survey data are often used at a functional group level, where functional groups are taxa groupings defined based on size and feeding habits. These analyses contribute to the advice for single species assessments and to ecosystem approaches to fishery management (e.g., Total Catch Index, NAFO 2022a; Ecosystem Summary sheets, NAFO 2022b). Functional group-based analyses summarize trends (Koen-Alonso and Cuff 2018) and distribution (Wells et al. 2021) of the fish community, produce estimates of consumption by the fish community to inform stock assessments (e.g., Snow Crab [*Chionoecetes opilio*], Pantin et al. 2023), and estimate predation indices for key prey species (e.g., Capelin [*Mallotus villosus*], Mowbray et al. 2023).

To support these ecosystem-based analyses, conversions are estimated here with species grouped at the functional group level for catch weight and catch numbers. These conversion factors are intended to be used at the grouped level only and are not applicable to any single species within a group.

2. METHODS

Comparative fishing methods for paired tows and analyses are detailed in DFO (2024), Wheeland et al. (2024), and Trueman et al. (2025a, b, and c).

2.1. FUNCTIONAL GROUPS

Species reported in the comparative fishing sets were grouped to the functional group level, with seven groups identified: large benthivores, medium benthivores, small benthivores, piscivores, plank-piscivores, planktivores, and shellfish (see Appendix 1 for details on functional groups). Catch weight and catch numbers of all species within a group were summed for each set to give a functional group weight and number by set.

2.2. SPATIAL CONSIDERATIONS

In order to minimize potential bias in estimated conversions (e.g., due to differences in species composition, geomorphology, thermal habitat, or other factors that may impact relative

catchability), conversion factors should be estimated based on data specific to the area and season for which they will be applied. To support ecosystem-based analyses, paired tow data were grouped by Ecosystem Production Unit (EPU, Pepin et al. 2014) (Figure 2), and by Northwest Atlantic Fisheries Organization (NAFO) Division (Div.) 2J3KL for use in assessments specific to this stock area (e.g., Northern cod [*Gadus morhua*, DFO 2022]; Witch Flounder [*Glyptocephalus cynoglossus*, DFO 2023]).

Physical habitat representation has previously been examined across the comparative fishing program and showed good representation for NAFO Div. 2HJ3K fall survey with the Teleost (comparative fishing conducted in 2021–22), NAFO Div. 3LNO and Div. 3K fall survey with the Needler (comparative fishing in 2022), NAFO Subdiv. 3Ps spring survey with the Needler (comparative fishing conducted in 2022, DFO 2024; Trueman et al. 2025a), and NAFO Div. 3LNO spring survey with the Teleost (comparative fishing in 2023, Trueman et al. 2025b).

Previous analyses did not examine Div. 2H alone, however it was done here as this division falls within a separate EPU (Labrador Shelf). To determine representativeness of the paired sets in 2H to the broader division, a suite of physical habitat characteristics were assessed (Table 1) including depth (GEBCO 2023) and terrain attributes (slope, ruggedness, and benthic position index [BPI]); bottom current velocity (Assis et al. 2017; Tyberghein et al. 2012); and modeled dominant substrate (E. Novaczek, unpublished data). These variables are described in detail in Trueman et al. (2025a).

Table 1. Benthic variables included in habitat and environmental characteristic analysis.

Category	Variable	Description	Source
Current velocity	Current	Bottom current at the Bio-oracle mean bottom depth for “present” time period. unit: m/second, resolution: 8077 m	Bio-oracle; Tyberghein et al. 2012.
Substrate type	Mud	Probability of mud as the primary substrate type (0–1). Resolution: 75 m.	E. Novaczek unpublished models
Substrate type	Sand	Probability of sand as the primary substrate type (0–1). Resolution: 75 m.	E. Novaczek unpublished models
Substrate type	Grav	Probability of gravel as the primary substrate type (0–1). Resolution: 75 m.	E. Novaczek unpublished models
Bathymetry	Bathy	Depth in meters. Resolution: 415 m.	GEBCO
Geomorphometry	Slope	Slope in degrees. Resolution 415 m.	GEBCO, benthic terrain modeler toolbox
Geomorphometry	Rugg	Terrain ruggedness (0–1). Resolution 415 m.	GEBCO, benthic terrain modeler toolbox
Geomorphometry	bBPI	Broad scale Benthic Position Index (i.e., peak or valley); inner radius of 30 cells and outer radius of 90 cells. Resolution 415 m.	GEBCO, benthic terrain modeler toolbox

Category	Variable	Description	Source
Geomorphometry	fBPI	Fine scale BPI; inner radius of 3 cells and outer radius of 9 cells. Resolution 415 m.	GEBCO, benthic terrain modeler toolbox
Latitude	Lat_start	Start latitude of trawl	Ship-mounted GPS
Temperature	bot_temp	Bottom temperature during trawl	Trawl-mounted CTD

Summary statistics were calculated for each variable using the zonal statistics to table tool in ArcGIS Pro for the entire Div. 2H survey area and were repeated for the subset of strata where > 2 successful paired sets were completed. This comparison was limited to quantitative variables, and therefore categorical information on substrate and geomorphology was not included.

2.3. SPECIES COMPOSITION REPRESENTATION OF THE PAIRED SETS

Within each functional group, species composition reported within the paired sets was compared to that observed in the surveys in the previous time period (2017 – 20) in order to determine if paired tows captured a composition representative of that normally encountered in the recent time period. These analyses grouped some species into ‘operational species’ (see Appendix 1) to account for limitations in species identification (e.g., due to inability to reliably identify at sea or inconsistencies in the taxonomic resolution reported).

Using Vegan (Oksanen et al. 2022) in R (4.3.0), community composition was examined using non-metric MultiDimensional Scaling (nMDS) for each EPU and each functional group with all comparative fishing sets and all sets between 2017 – 20. Rare species—defined here as consisting of < 0.1% of biomass across all sets by functional group and EPU—were removed to reduce rare species driving the analyses. Rare species represented a median of five species from each functional group with a higher number in more diverse functional groups such as small benthivores. Bray-Curtis distance matrices were calculated using square root transformed and Wisconsin standardized catch weights. Transformation and standardization of catch weights are commonly used to reduce the impact of large catches. The analyses were conducted using two dimensions when stress was < 0.1, or with three dimensions when stress was > 0.1. If the stress was still > 0.1 but < 0.15 with three dimensions, results were considered reliable. Generally the three benthivore functional groups, which tended to have more species, required three dimensions, while the remaining functional groups required only two. Results were visualized to ensure overlap of paired sets with historical data for the same survey vessel where possible, with the exception of Div. 3LNO-spring where the Teleost comparative fishing community was compared to the Needler and Teleost communities given the limited use of the Teleost for the spring survey. Associated species scores were included alongside community composition of sets.

2.4. SIZE-AGGREGATED CONVERSION FACTORS

Conversion factors by functional group were estimated for total weight and total numbers following the methods outlined in DFO (2024). The conversion factors were defined as an estimate of relative catch efficiency (ρ), with the conversion factor being the ratio of catchabilities between the old and new vessels. When $\rho < 1$, this indicated the new vessels caught a greater amount, while a $\rho > 1$ indicated the new vessel caught less. Catchability between vessels was equal when $\rho = 1$, and in this case conversion of catches between vessels was not required. A conversion factor was considered significant when $p < 0.05$ and the

Confidence Interval (CI) did not overlap with one. For groups where one of the two conversions was significant, the corresponding metric was considered significant if $p < 0.1$ regardless of if the CIs overlapped with one, otherwise only the conversion significant at $p < 0.05$ was recommended to be applied.

We were unable to assess potential size effects for these groupings as length data were not collected for all species.

3. RESULTS

3.1. SPATIAL CONSIDERATIONS (DIV. 2H)

The Div. 2H survey strata where comparative fishing was completed appeared to be representative of the survey area for broad scale characteristics like current velocity and broad BPI. Generally, the substrates also appeared to be well represented, with possible minor overrepresentation of gravel dominant and underrepresentation of mud dominant habitats. However, there was truncation of the sampled range for several other variables, including depth, slope, ruggedness, and fine BPI (Figure 3). This difference was most evident for depth; the depth of the completed comparative fishing strata (mean = 261 m, range = 0–750 m) was much shallower than the overall survey area (mean = 393 m, range = 0–1,500 m). The maximum slope and ruggedness in the completed strata (maximum slope = 28˚, maximum ruggedness = 0.03) were substantially lower than the full survey area (maximum slope = 51˚, maximum ruggedness = 0.11). Similarly, the range of fine BPI was truncated for both peaks and valleys (fine BPI range in completed strata = -155–591, range for 2H survey area = -376–1,147).

These results indicated that deep and structurally complex strata were not well sampled by comparative fishing in Div. 2H. This likely introduced a bias in estimated functional group conversion factors for the Labrador Shelf EPU, as sampling was limited for species that occupy those habitats, however they were considered broadly representative as these habitats were a small proportion of the overall survey area in Div.2 H, and were the areas most often missed in years with lower survey coverage. Div. 2H was the survey area that had the most variable survey coverage of the entire region.

3.2. SPECIES COMPOSITION REPRESENTATION OF THE PAIRED SETS

Species composition of sets conducted in Div. 2H with the Teleost and associated new vessel were generally similar to the survey sets from previous years (Figure 4–Figure 10). The relatively low sample size of 68 comparative fishing sets (34 pairs) resulted in the breadth of community being narrow for most functional groups. In the case of shellfish and plank-piscivore functional groups, there were only two species observed in both the comparative fishing sets and recent survey sets (Northern Shrimp [*Pandalus borealis*] and Striped Shrimp [*Pandalus montagui*], and Arctic Cod [*Boreogadus saida*] and redfish [*Sebastes mentella* and *S. fasciatus*], respectively) making visualization on two dimensions difficult to interpret. For plank-piscivores, the community composition was considered similar as both species were observed at similar levels between the survey and comparative fishing sets (Figure 8). Striped Shrimp were underrepresented in the survey sets in the shellfish functional group, however this underrepresentation was not deemed an issue for the calculation of the conversion factor for the group.

Species composition of sets conducted in Div. 2J3K with the Teleost and associated new vessel were generally similar to the survey sets from previous years (Figure 11–Figure 17).

Species composition for sets conducted in Div. 2J3K with the Needler were similar to survey sets from previous years (Figure 18–Figure 24) with the exception of the planktivore functional group, which had an under representation of Atlantic Herring (*Clupea harengus)*. This was expected with planktivores where there are few species and bottom trawl surveys not being designed to sample species high in the water column. Atlantic Herring are known to show up in the survey inconsistently.

Similar to Div. 2J3K, the community composition for Div. 2J3KL for comparative fishing with the Teleost (Figure 25–Figure 31) was similar to recent survey sets. The community composition for the Needler (Figure 32–Figure 38) was generally similar to recent survey sets but missed some of the diversity in both the small and medium benthivore communities. There was also an under representation of Atlantic Herring and sand lance (*Ammodytes dubius)* in the planktivore functional group, and this was likely a result of bottom trawl surveys not being designed to sample these species well.

The community composition of the comparative fishing sets with the Teleost and Cabot in Div 3LNO in the spring was similar to recent survey sets for both the Teleost and Needler for all functional groups (Figure 39–Figure 45).

The program in Subdiv. 3Ps with the Needler was incomplete, and with the Teleost was targeted for two commercial species and not considered broadly representative of the survey area. As such, we did not present community composition comparisons here for this subdivision.

In several cases, the number of species that made up more than 99.9% of the biomass in some functional groups (i.e., shellfish, piscivores, and plank-piscivores) could be small, with many sets dominated by one or two species. This led to scatterplots with sets falling close to each other or along two dimensional lines. This was not unusual and should not be taken as an indication of poor species representation so long as it was observed in both comparative fishing sets and survey sets. In these situations, there would be a large number of sets plotted on top of each other as they had similar or identical community composition.

3.3. PRESENTATION OF CONVERSION FACTORS

Functional group level conversions were estimated for each area (EPU, Div. 2J3KL) by vessel and season. Results were too numerous to go into detailed explanation for all functional group, vessel, and season combinations and thus results are presented below by EPU and graphically as per the outline in Figure 46.

3.3.1. Labrador Shelf (Div. 2H)—Fall

Results for NAFO Div. 2H were consistent across functional groups (Figure 47–Figure 53), with no conversion required for any group for abundance or biomass (Table 2).

Table 2. Conversion factors estimated by functional group for the Labrador Shelf Ecosystem Production Unit (NAFO Div. 2H) in fall for the CCGS Teleost *and CCGS* John Cabot/Capt. Jacques Cartier.

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weight
Div. 2H	Teleost	Fall	Large Benthivore	No conversion required	0.92 (0.82–1.04)	0.18	0.98 (0.77–1.25)	0.89

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weight
Div. 2H	Teleost	Fall	Medium Benthivore	Conversion on biomass	0.96 (0.73–1.26)	0.77	0.80 (0.64–0.99)	0.04
Div. 2H	Teleost	Fall	Small Benthivore	No conversion required	0.96 (0.70–1.31)	0.79	0.95 (0.74–1.23)	0.71
Div. 2H	Teleost	Fall	Piscivore	No conversion required	0.88 (0.73–1.06)	0.18	0.92 (0.78–1.09)	0.33
Div. 2H	Teleost	Fall	Plank-piscivore	No conversion required	0.83 (0.67–1.02)	0.08	0.94 (0.76–1.16)	0.56
Div. 2H	Teleost	Fall	Planktivores	No conversion required	0.85 (0.46–1.55)	0.59	1.04 (0.60–1.80)	0.88
Div. 2H	Teleost	Fall	Shellfish	No conversion required	1.16 (0.85–1.58)	0.35	1.19 (0.97–1.48)	0.10

3.3.2. Newfoundland Shelf (Div. 2J3K)—Fall

Conversion factors were required for small benthivores, plank-piscivores, planktivores, and shellfish (Figure 54–Figure 67; Table 3). Note that Needler data were from Div. 3K only, however this was consistent with the area of this EPU typically sampled by this vessel.

Table 3. Conversion factors estimated by functional group for the Newfoundland Shelf Ecosystem Production Unit (NAFO Div. 2J3K) in fall for the CCGS Teleost *and CCGS* John Cabot/Capt. Jacques Cartier*, and the CCGS* Alfred Needler *and CCGS* John Cabot*.*

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weights
Div. 2J3K	Teleost	Fall	Large Benthivore	No conversion required.	1.01 (0.94–1.08)	0.86	0.98 (0.88–1.09)	0.68
Div. 2J3K	Teleost	Fall	Medium Benthivore	No conversion required.	1.02 (0.94–1.11)	0.62	1.00 (0.92–1.09)	0.97
Div. 2J3K	Teleost	Fall	Small Benthivore	Conversion required on abundance.	1.17 (1.02–1.35)	0.02	1.06 (0.94–1.20)	0.36
Div. 2J3K	Teleost	Fall	Piscivore	No conversion required.	0.95 (0.89–1.02)	0.13	0.95 (0.88–1.03)	0.24
Div. 2J3K	Teleost	Fall	Plank-piscivore	Conversion required on biomass.	0.98 (0.89–1.08)	0.72	0.88 (0.81–0.96)	<0.01
Div. 2J3K	Teleost	Fall	Planktivores	Conversion required on abundance and biomass.	1.28 (1.06–1.53)	<0.01	1.25 (1.08–1.44)	<0.01
Div. 2J3K	Teleost	Fall	Shellfish	Conversion required on abundance.	1.24 (1.11–1.38)	<0.001	1.02 (0.94–1.10)	0.68
Div. 2J3K	Needler	Fall	Large Benthivore	No conversion required.	1.02 (0.93–1.11)	0.72	1.04 (0.93–1.19)	0.39

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weights
Div. 2J3K	Needler	Fall	Medium Benthivore	Conversion required on abundance and biomass	0.78 (0.68–0.9)	<0.001	0.89 (0.79–1.01)	0.06
Div. 2J3K	Needler	Fall	Small Benthivore	Conversion required on abundance and biomass	0.77 (0.58–1.02)	0.07	0.66 (0.53–0.81)	<0.001
Div. 2J3K	Needler	Fall	Piscivore	Conversion required on abundance	0.91 (0.83–0.99)	0.02	0.95 (0.85–1.07)	0.40
Div. 2J3K	Needler	Fall	Plank-piscivore	No conversion required.	0.91 (0.78–1.06)	0.21	0.95 (0.85–1.06)	0.36
Div. 2J3K	Needler	Fall	Planktivores	No conversion required.	0.92 (0.59–1.43)	0.72	1.02 (0.82–1.28)	0.85
Div. 2J3K	Needler	Fall	Shellfish	Conversion required on abundance and biomass	0.75 (0.66–0.85)	<0.001	0.81 (0.72–0.89)	<0.001

3.3.3. Divisions 2J3KL—Fall

Conversions for Div. 2J3KL were intended to inform analyses completed at the scale of this stock area, and were not directly applicable to a single EPU (Figure 68–Figure 81; Table 4). Between Div. 2J3KL and Div. 2J3K there were notable differences in habitat and species composition (e.g., addition of Yellowtail Flounder [*Myzopsetta ferruginea*] when including Div. 3L) which led to different results by functional group at these different spatial scales.

Note that Needler data were from Div. 3KLNO. Consistent with previous single species analyses (DFO 2024), sets in Div. 3NO were used as a proxy for Div. 3L, giving broader representation of bank habitat and composition of the functional groups (e.g., Yellowtail Flounder prevalence). Paired tows with the Needler did not extend into Div. 2J, however this was consistent with the typical survey coverage with this vessel.

Table 4. Conversion factors estimated by functional group for NAFO Div. 2J3KL in fall for the CCGS Teleost *and CCGS* John Cabot/Capt. Jacques Cartier*, and the CCGS* Alfred Needler *and CCGS* John Cabot*.*

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-values weight
Div. 2J3KL	Teleost	Fall	Large Benthivore	No conversion required.	0.99 (0.93–1.05)	0.73	0.97 (0.88–1.07)	0.54
Div. 2J3KL	Teleost	Fall	Medium Benthivore	No conversion required.	0.99 (0.91–1.07)	0.75	1.01 (0.93–1.09)	0.90
Div. 2J3KL	Teleost	Fall	Small Benthivore	Conversion required on abundance.	1.18 (1.04–1.34)	0.01	1.05 (0.94–1.18)	0.39
Div. 2J3KL	Teleost	Fall	Piscivore	No conversion required.	0.95 (0.90–1.01)	0.12	0.96 (0.89–1.04)	0.36

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-values weight
Div. 2J3KL	Teleost	Fall	Plank-piscivore	Conversion required on biomass.	0.99 (0.90–1.09)	0.85	0.88 (0.80–0.96)	<0.01
Div. 2J3KL	Teleost	Fall	Planktivores	Conversion required on abundance and biomass.	1.29 (1.09–1.52)	<0.01	1.24 (1.08–1.42)	<0.01
Div. 2J3KL	Teleost	Fall	Shellfish	Conversion required on abundance.	1.23 (1.11–1.37)	<0.001	1.02 (0.94–1.01)	0.63
Div. 2J3KL	Needler	Fall	Large Benthivore	No conversion required.	1.04 (0.96–1.12)	0.38	1.05 (0.95–1.16)	0.36
Div. 2J3KL	Needler	Fall	Medium Benthivore	Conversion required on abundance and biomass.	0.87 (0.78–0.97)	0.01	0.98 (0.89–1.08)	0.72
Div. 2J3KL	Needler	Fall	Small Benthivore	Conversion required on abundance and biomass.	0.65 (0.51–0.84)	<0.01	0.62 (0.51–0.76)	<0.001
Div. 2J3KL	Needler	Fall	Piscivore	Conversion required on abundance.	0.91 (0.84–0.99)	0.02	0.96 (0.85–1.08)	0.40
Div. 2J3KL	Needler	Fall	Plank-piscivore	Conversion required on abundance.	0.85 (0.73–0.99)	0.04	0.90 (0.79–1.02)	0.12
Div. 2J3KL	Needler	Fall	Planktivores	No conversion required.	0.74 (0.50–1.08)	0.11	0.91 (0.72–1.15)	0.44
Div. 2J3KL	Needler	Fall	Shellfish	Conversion required on abundance and biomass.	0.64 (0.56–0.75)	<0.001	0.79 (0.71–0.88)	<0.001

3.3.4. Grand Banks (Div. 3LNO)

Conversion factors could not be estimated for the Needler on the Grand Banks in spring or fall due to small sample size and severe truncation of depth and habitat complexity sampled in the paired tows (DFO 2024). The Teleost rarely sampled the Grand Banks in fall (Div. 3NO), but has been used for portions of Div. 3L (Figure 82 – Figure 88; Table 5).

Table 5.Conversion factors estimated by functional group for the Grand Banks Ecosystem Production Unit (NAFO Div. 3LNO) in spring for the CCGS Teleost *and CCGS* John Cabot/Capt. Jacques Cartier*.*

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weight
Div. 3LNO	Teleost	Fall	all	N/A	-	-	-	-

Area	Vessel	Season	Functional Group	Recommendation	ρ (CI) numbers	p-value numbers	ρ (CI) weight	p-value weight
Div. 3LNO	Needler	Fall	all	Data insufficient to estimate conversion factors.	-	-	-	-
Div. 3LNO	Needler	Spring	All	Data insufficient to estimate conversion factors.	-	-	-	-
Div. 3LNO	Teleost	Spring	Large Benthivore	No conversion required.	0.92 (0.84–1.02)	0.11	0.92 (0.81–1.05)	0.23
Div. 3LNO	Teleost	Spring	Medium Benthivore	Conversion required for biomass.	1.08 (0.95–1.23)	0.24	1.15 (1.02–1.30)	0.03
Div. 3LNO	Teleost	Spring	Small Benthivore	No conversion required.	0.95 (0.79–1.15)	0.63	0.95 (0.81–1.11)	0.54
Div. 3LNO	Teleost	Spring	Piscivore	No conversion required.	0.93 (0.82–1.07)	0.33	0.92 (0.77–1.10)	0.37
Div. 3LNO	Teleost	Spring	Plank-piscivore	No conversion required.	1.06 (0.87–1.29)	0.56	0.93 (0.77–1.13)	0.48
Div. 3LNO	Teleost	Spring	Planktivores	No conversion required.	0.84 (0.69–1.03)	0.10	0.99 (0.84–1.16)	0.90
Div. 3LNO	Teleost	Spring	Shellfish	No conversion required.	1.03 (0.81–1.33)	0.80	0.92 (0.71–1.22)	0.59

3.3.5. Subdivision 3Ps—Spring

There were insufficient data to estimate functional group conversions for this EPU. For the Needler, there was an insufficient sample size, with severe truncation of depth and habitat complexity sampled (DFO 2024). For the Teleost, the spring 3Ps comparative program was targeted for Atlantic Cod and Snow Crab and was not broadly applicable across taxa.

4. DISCUSSION

For most areas, the NL comparative fishing program was able to sample conditions that were representative of the broader survey area, and captured the diversity of species typically encountered in the survey. These data supported the calculations of functional group level conversion factors to support ecosystem-based analyses which consider the fish community at higher taxonomic groupings than single species assessments. However, data limitations on the Grand Bank and in Subdiv. 3Ps precluded the estimation of conversion factors for these EPUs, with the exception of Div. 3LNO for the Teleost in the spring.

Conversion factors for abundance ranged from 0.64 (shellfish, Needler, Div. 2J3KL Fall) to 1.29 (planktivores, Teleost, Div. 2J3KL Fall), and for biomass ranged from 0.62 (small benthivores, Needler, Div. 2J3KL Fall) to 1.25 (planktivores, Teleost, Div. 2J3K Fall). While many cases showed no significant conversion, these ranges highlighted the importance of accounting for vessel differences when examining ecosystem composition over time, especially in areas where the Needler and Teleost have worked interchangeably.

Estimated conversion factors differed by functional group, EPU, season, and between vessels. Differences reflected a combination of species and size compositions across space and behavioural and environmental differences which may have impacted relative catchability, and vessel differences (e.g., vessel size and power, winch configurations). Conversions should therefore be applied to the area and season for which they were estimated and are not interchangeable between the Needler and Teleost. The functional group conversions estimated here are applicable at the grouped level only and should not be applied to any single species within a group. It was also important to consider that size data were not collected for all species and therefore it was not possible to test for potential size effects on relative catchability at the functional group level.

In Div. 2H, deep and structurally complex strata were not sampled by comparative fishing, limiting the ability to account for differences in relative catchability in these habitats for this EPU. Species composition in the paired sets in this area reflected what was typically observed in the survey in this area. However, as the composition and size distribution of species is known to change between habitats and across depths, the paired data may underrepresent the portions of the functional groups that are found in these slope habitats. This potential bias should be considered in implementation.

The conversion factors here are reflective of the species composition and size distribution at the time of comparative fishing, and have been compared to the recent survey series (2017 – 20). If there were major changes in the relative abundance or biomass of species within a functional group, or size of individuals within or across species over the time series, applying these conversion factors may introduce an inherent bias which should be considered at the time of implementation.

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6. FIGURES

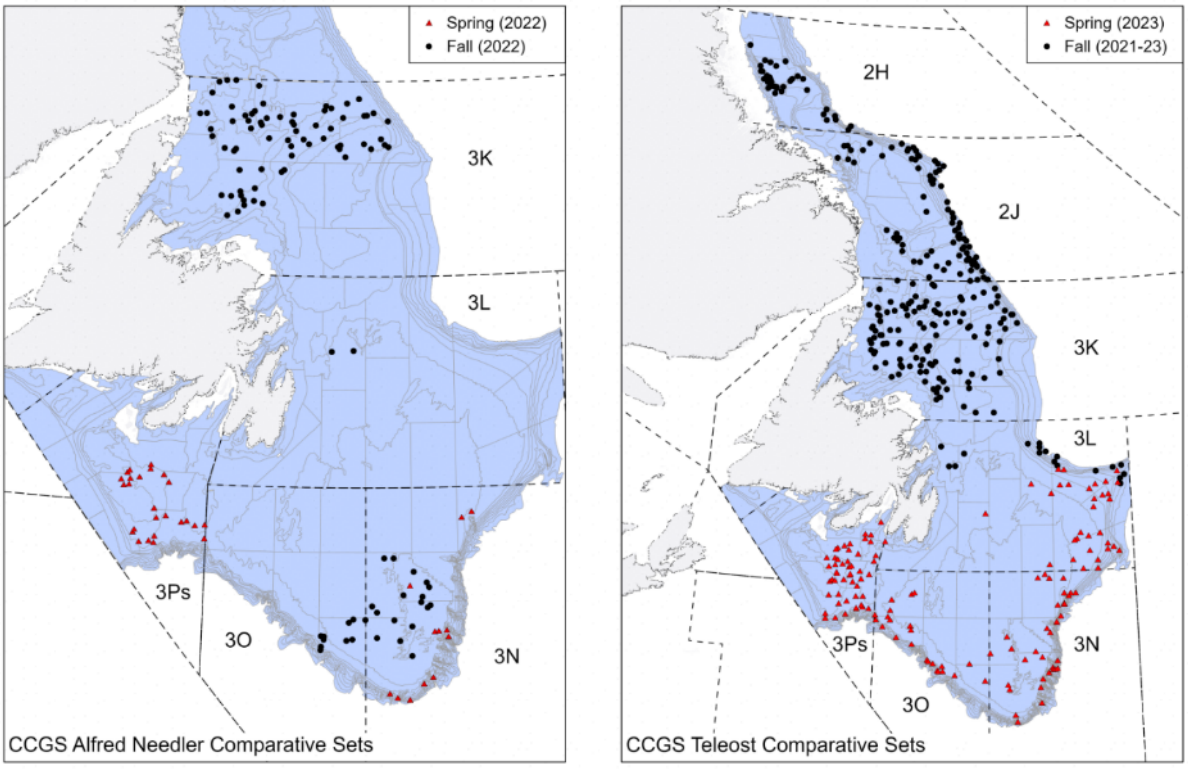

Figure 1. Paired sets completed with the CCGS Alfred Needler *(left) and CCGS* Teleost *(right) during the Newfoundland and Labrador Comparative Fishing program from 2021 – 23.*

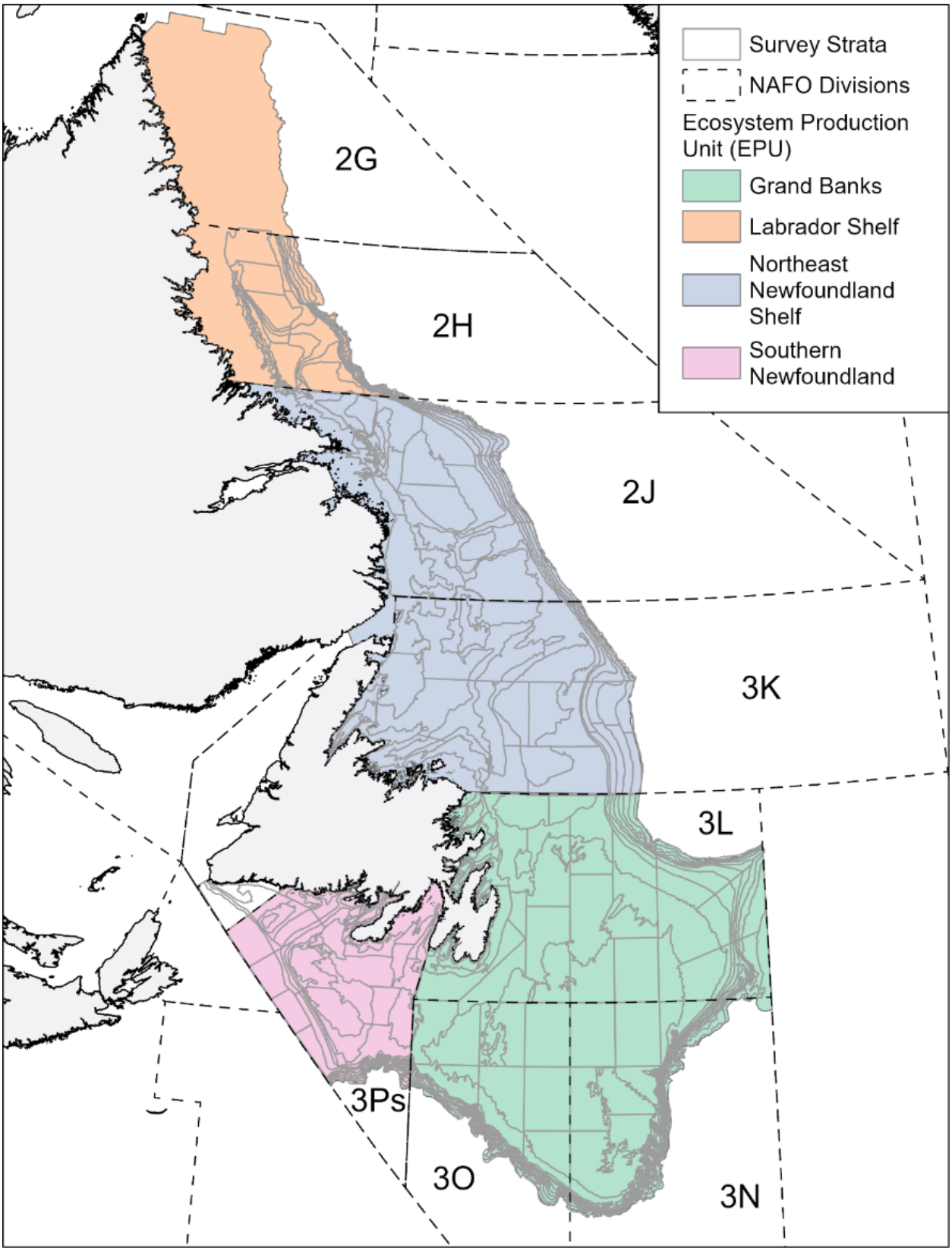

Figure 2. Map of the EPUs, NAFO Divisions, and Survey Strata in the Newfoundland and Labrador Region.

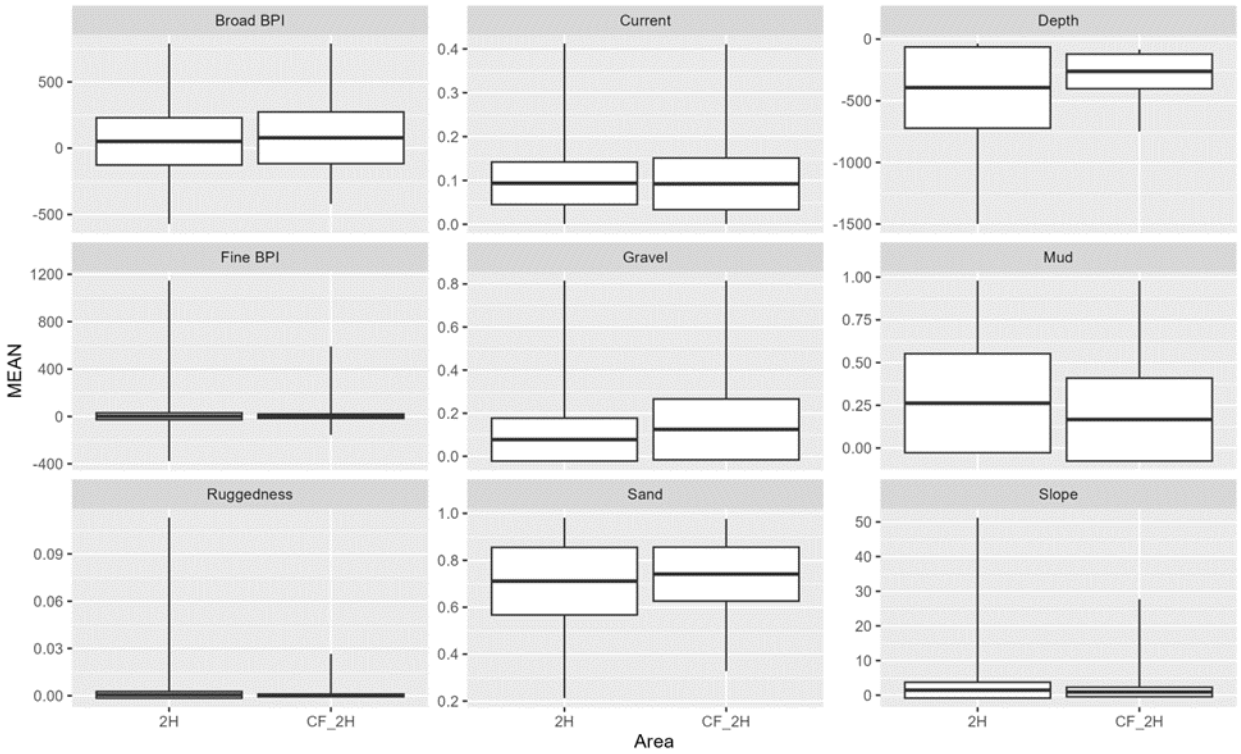

Figure 3. Seabed characteristics of the Newfoundland and Labrador multispecies survey CCGS Teleost *fall survey area in NAFO Division 2H (2H) and for the comparative fishing strata completed with the CCGS* Teleost *(CF_2H), including broad BPI, fine BPI, ruggedness, current (m/s), depth (m), slope, and percent likelihood that sand, gravel, or mud make up the dominant substrate type.*

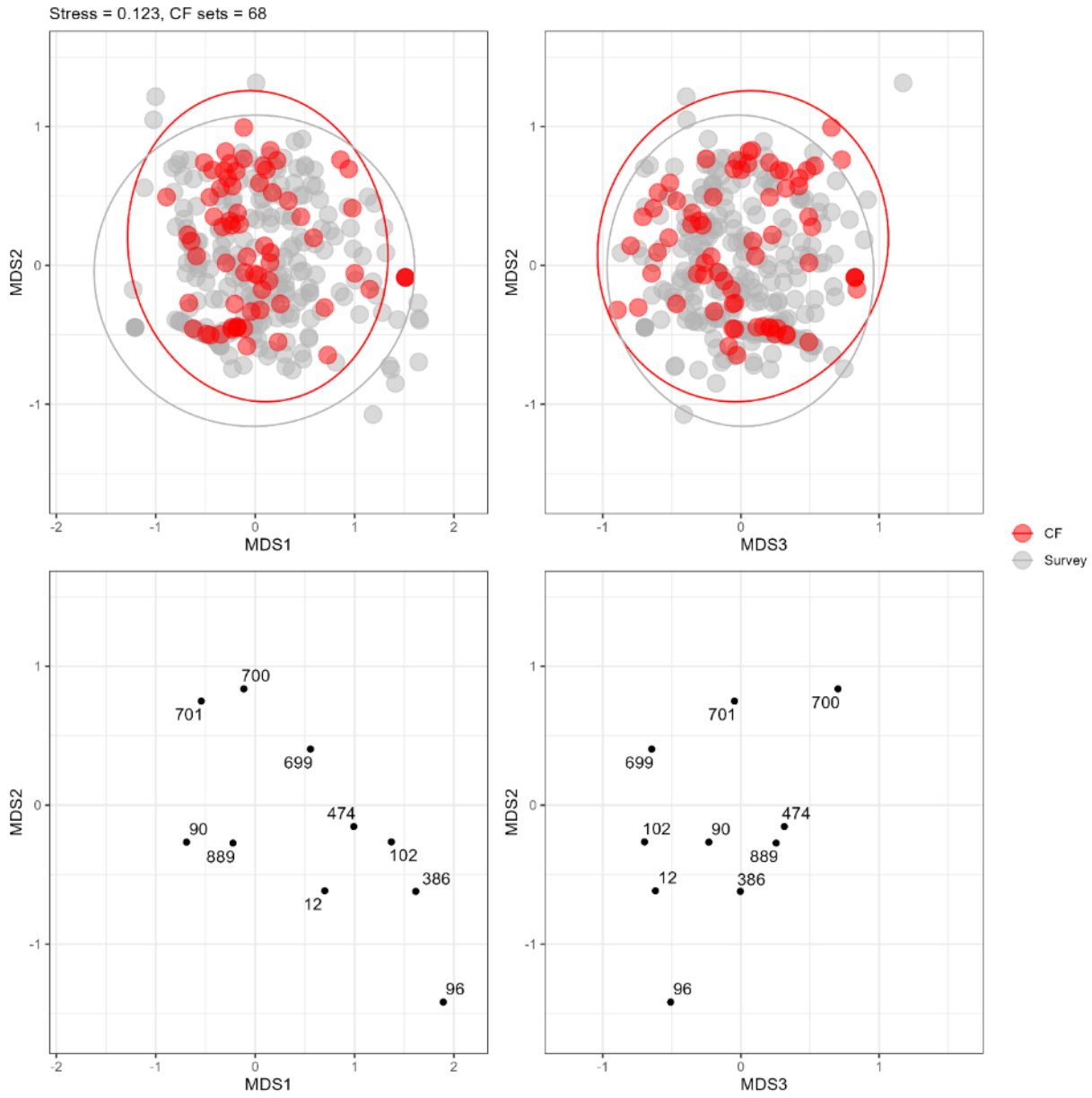

Figure 4. Species composition of the large benthivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first and second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

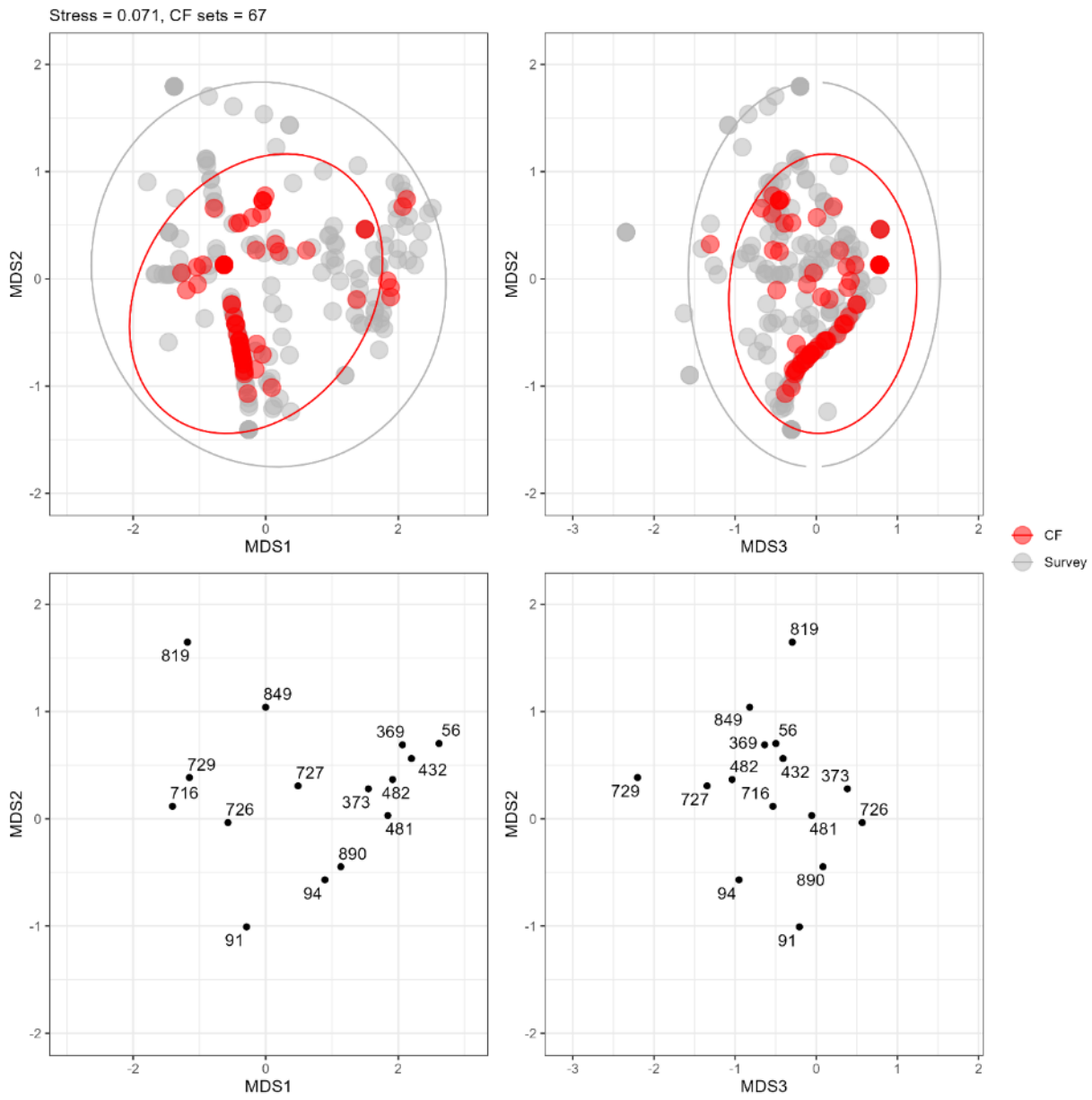

Figure 5. Species composition of the medium benthivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first and second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

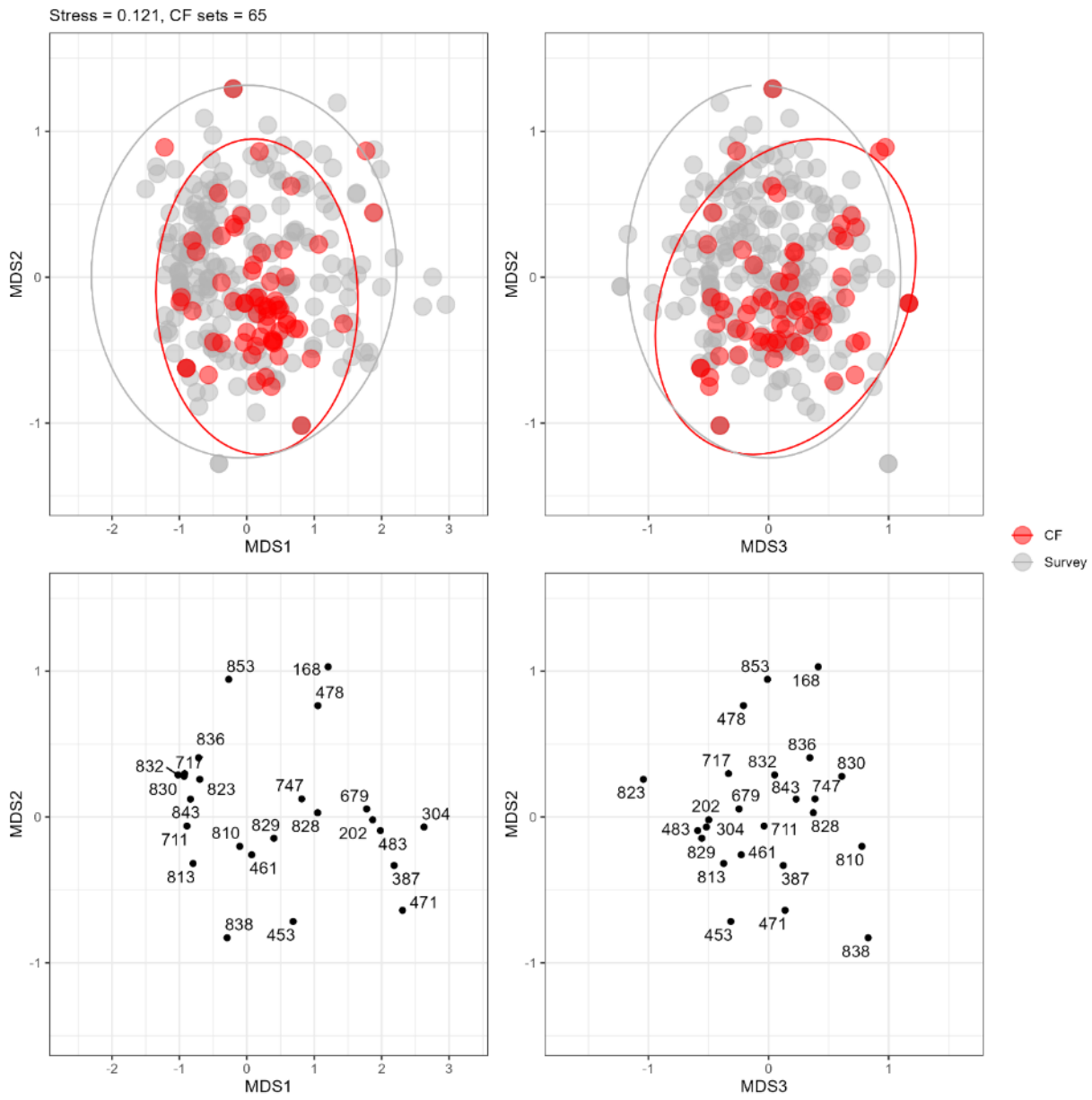

Figure 6. Species composition of the small benthivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first and second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

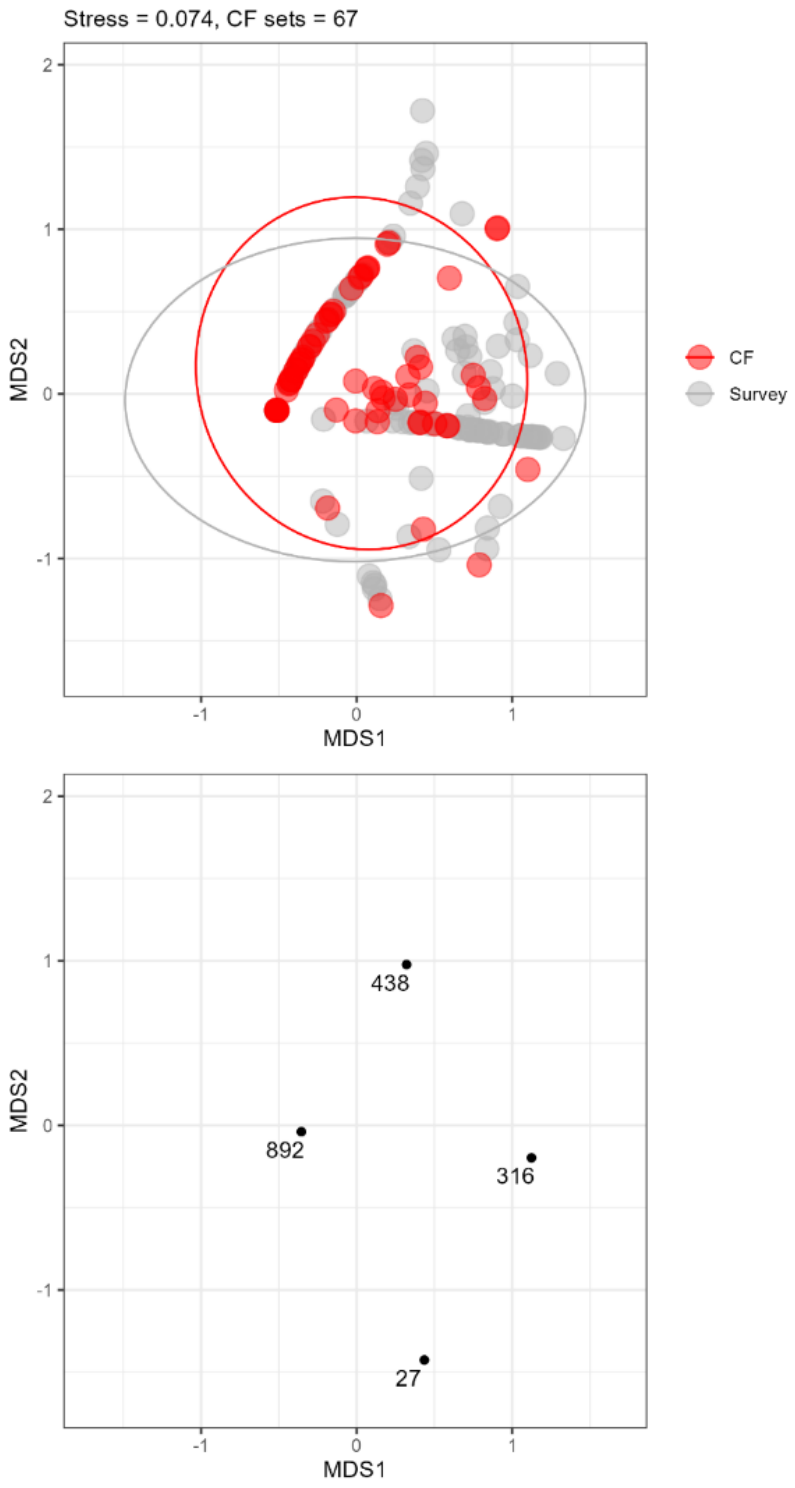

Figure 7. Species composition of the piscivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

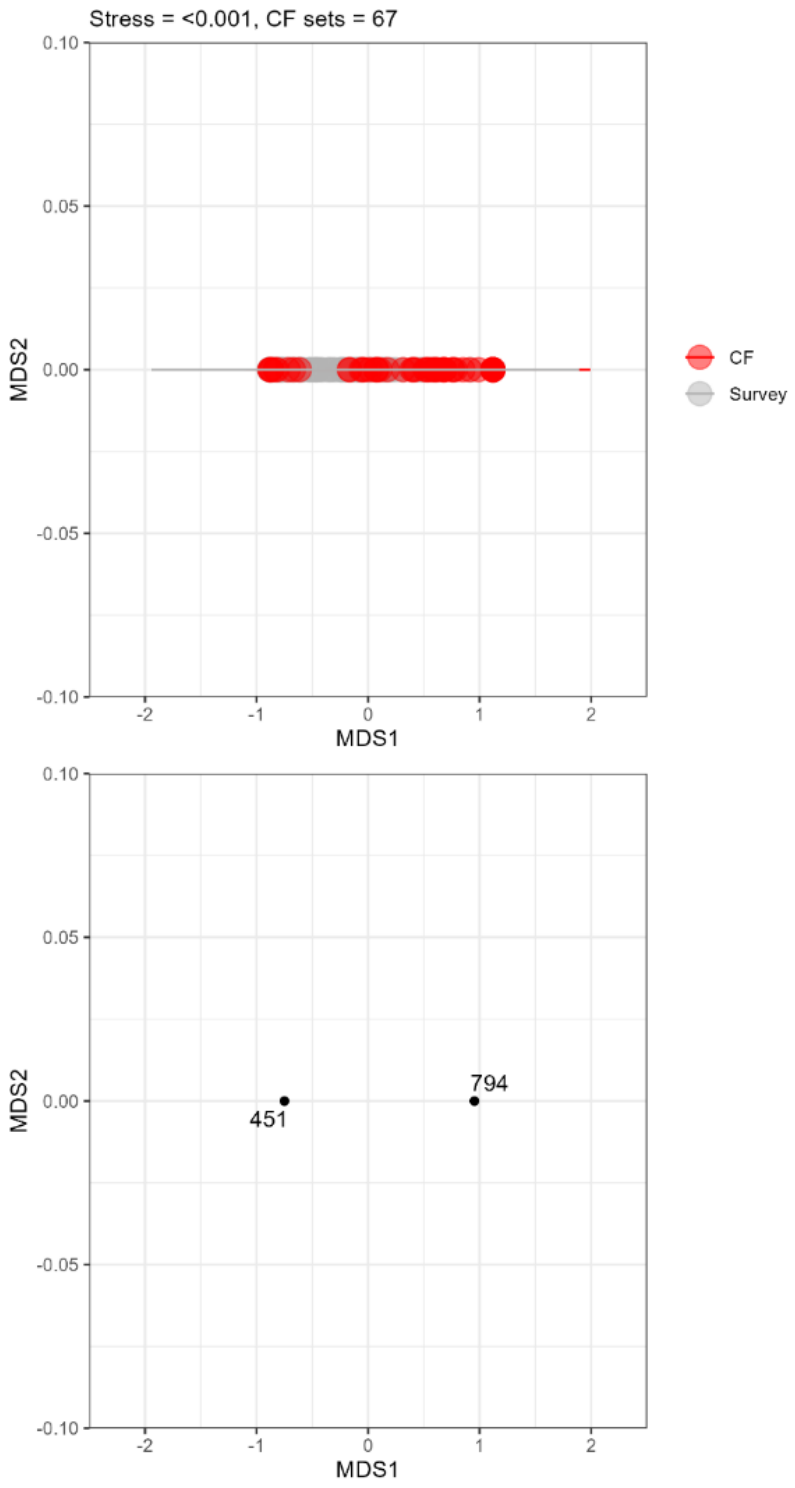

Figure 8. Species composition of the plank-piscivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

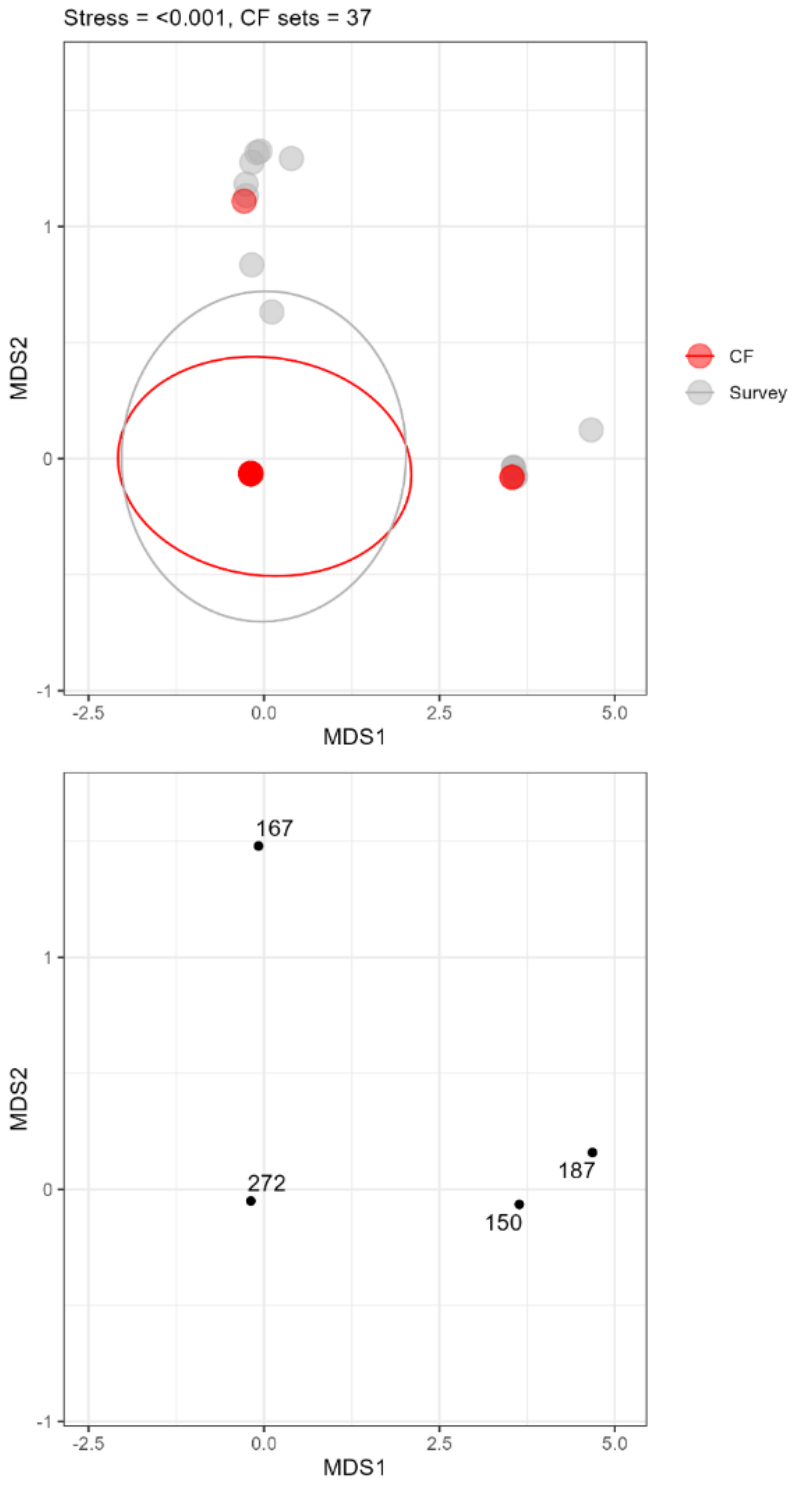

Figure 9. Species composition of the planktivore functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

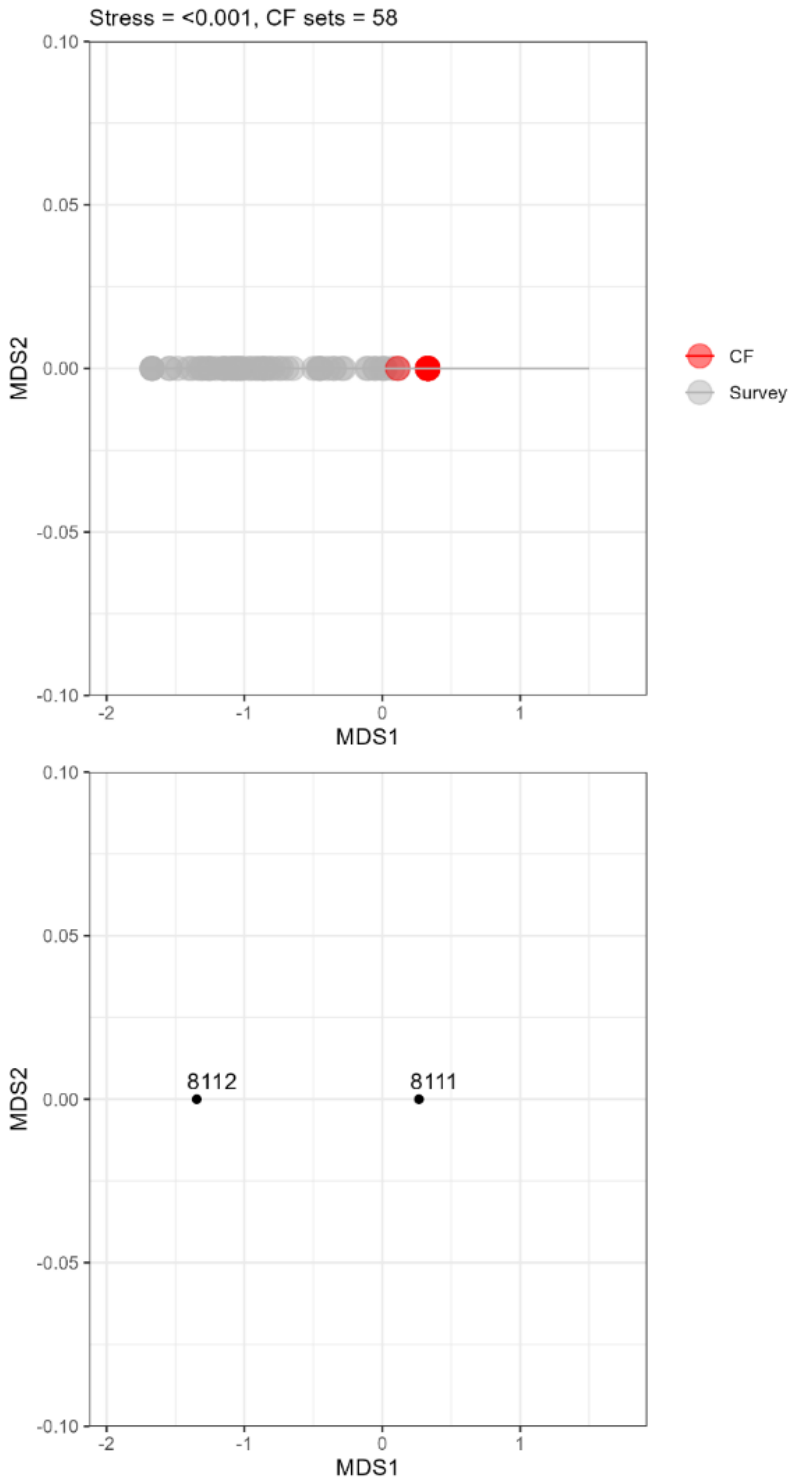

Figure 10. Species composition of the shellfish functional group in NAFO Div. 2H-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

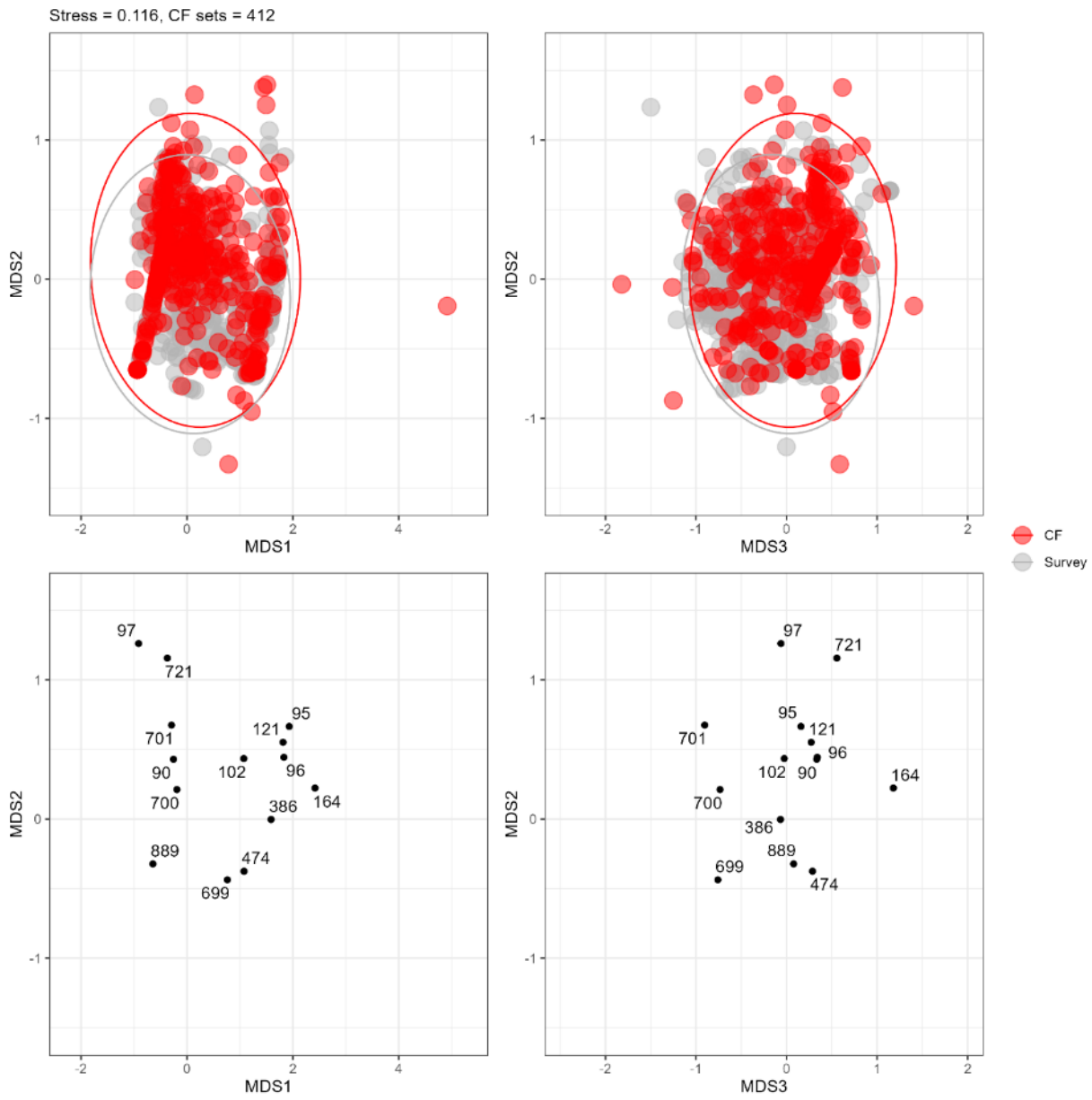

Figure 11. Species composition of the large benthivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

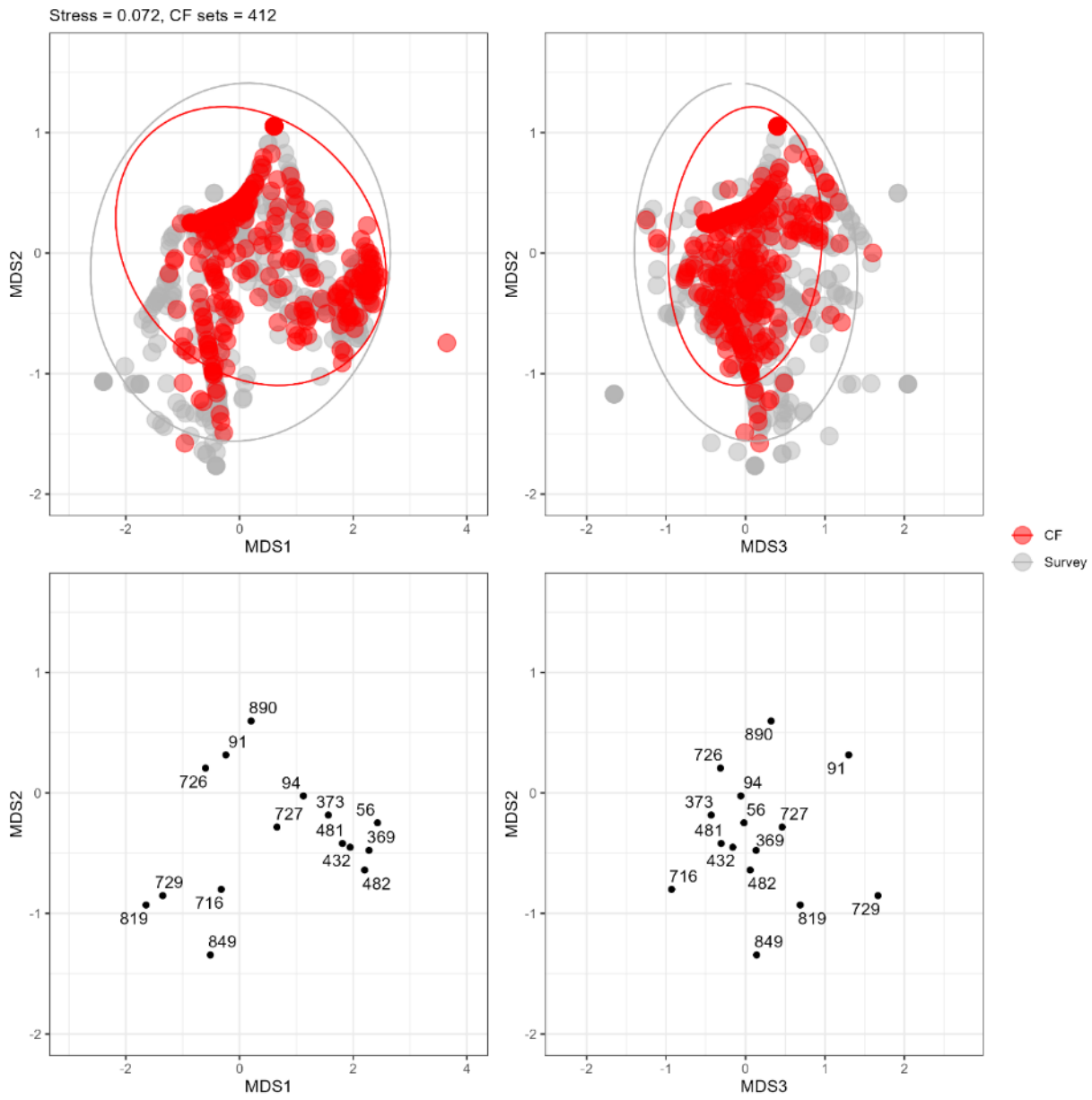

Figure 12. Species composition of the medium benthivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

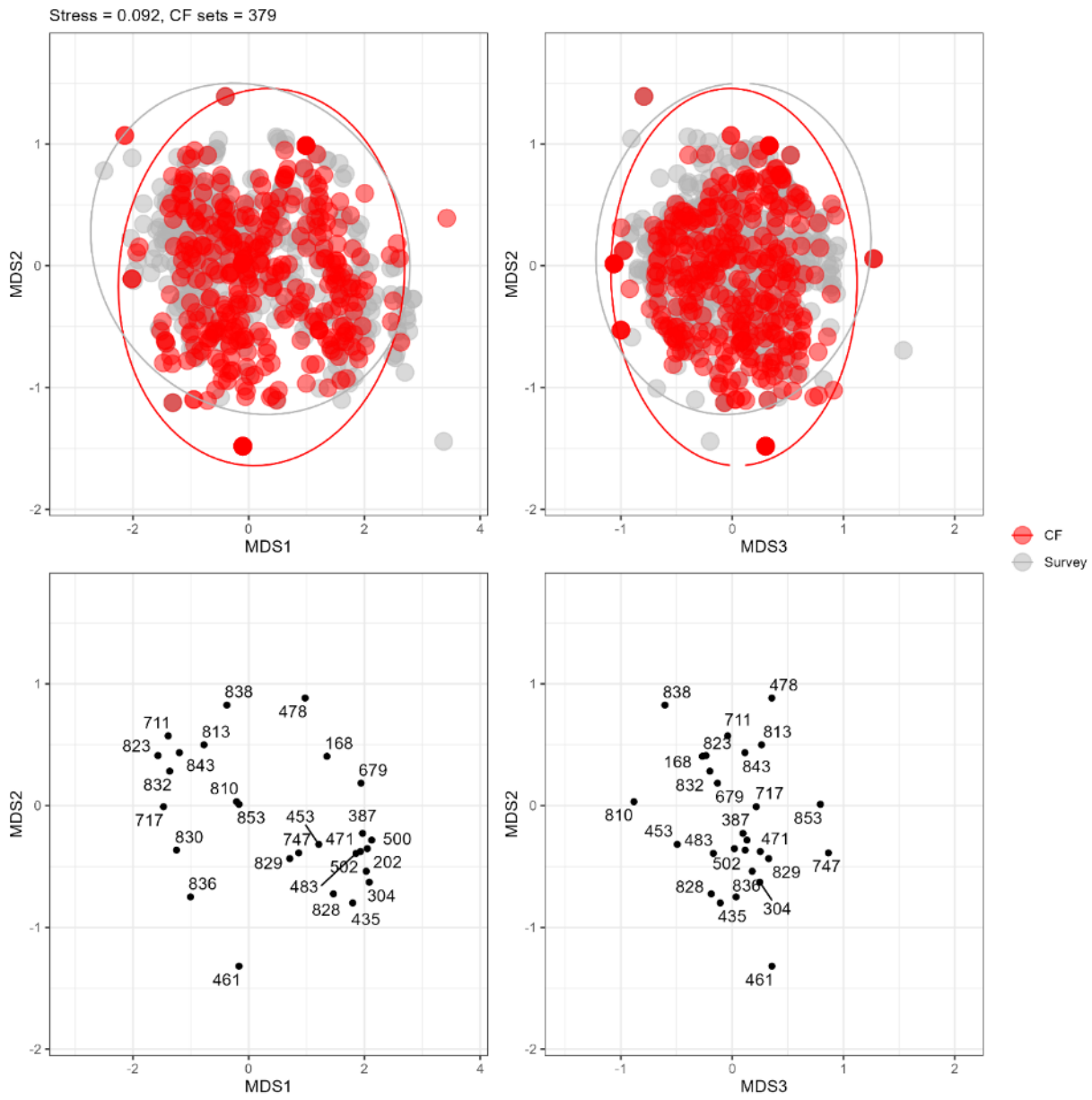

Figure 13. Species composition of the small benthivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

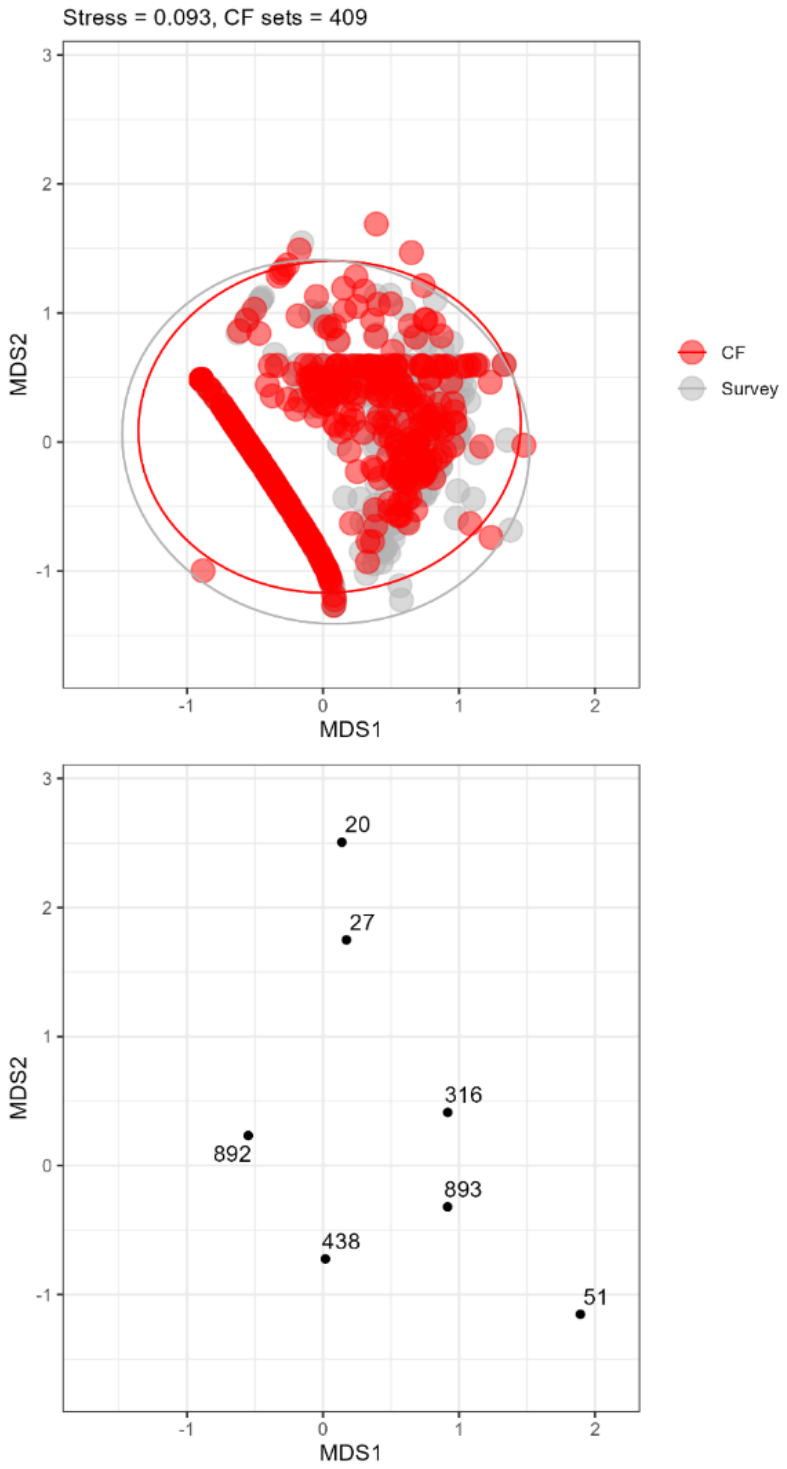

Figure 14. Species composition of the piscivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

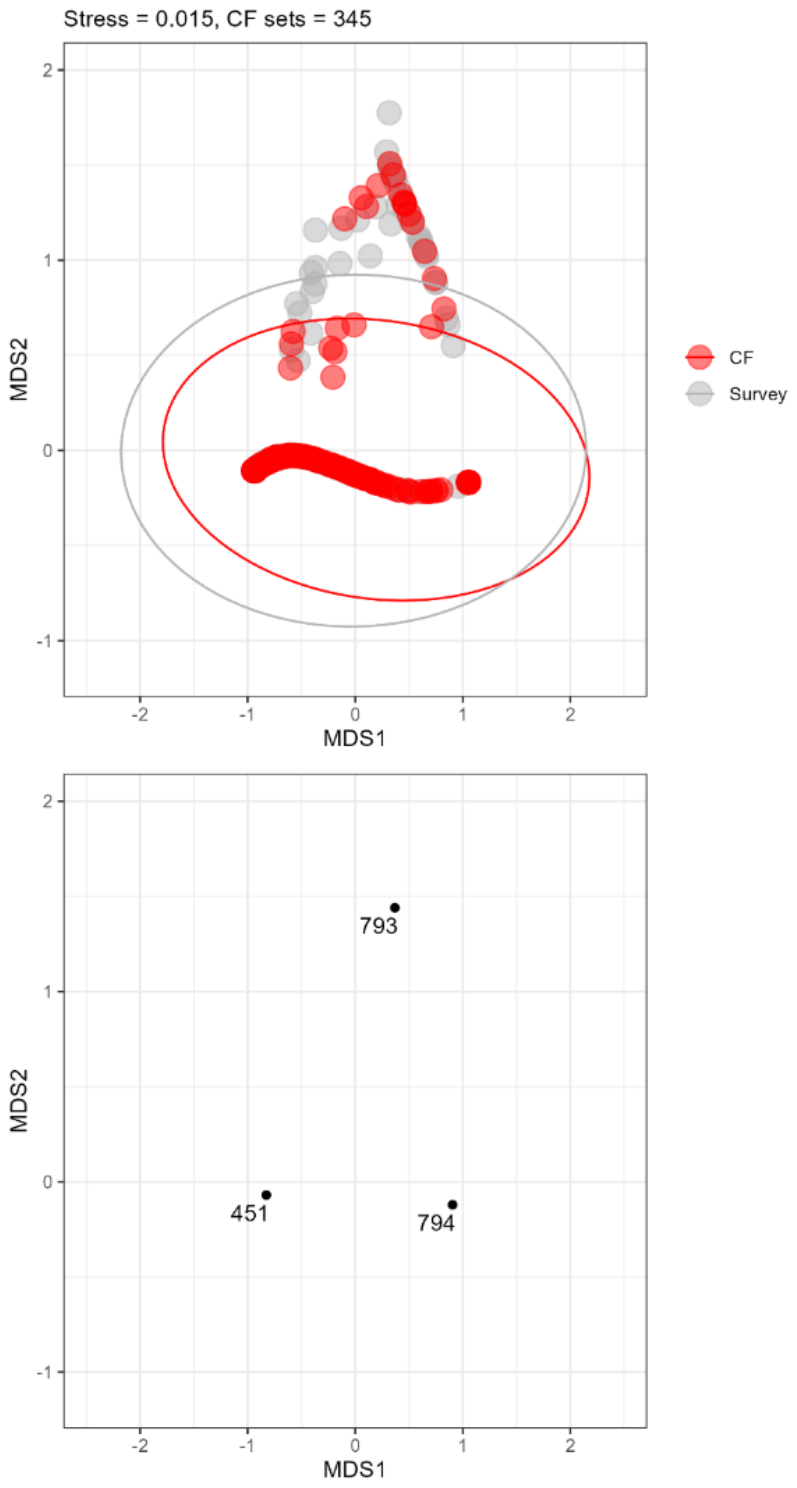

Figure 15. Species composition of the plank-piscivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

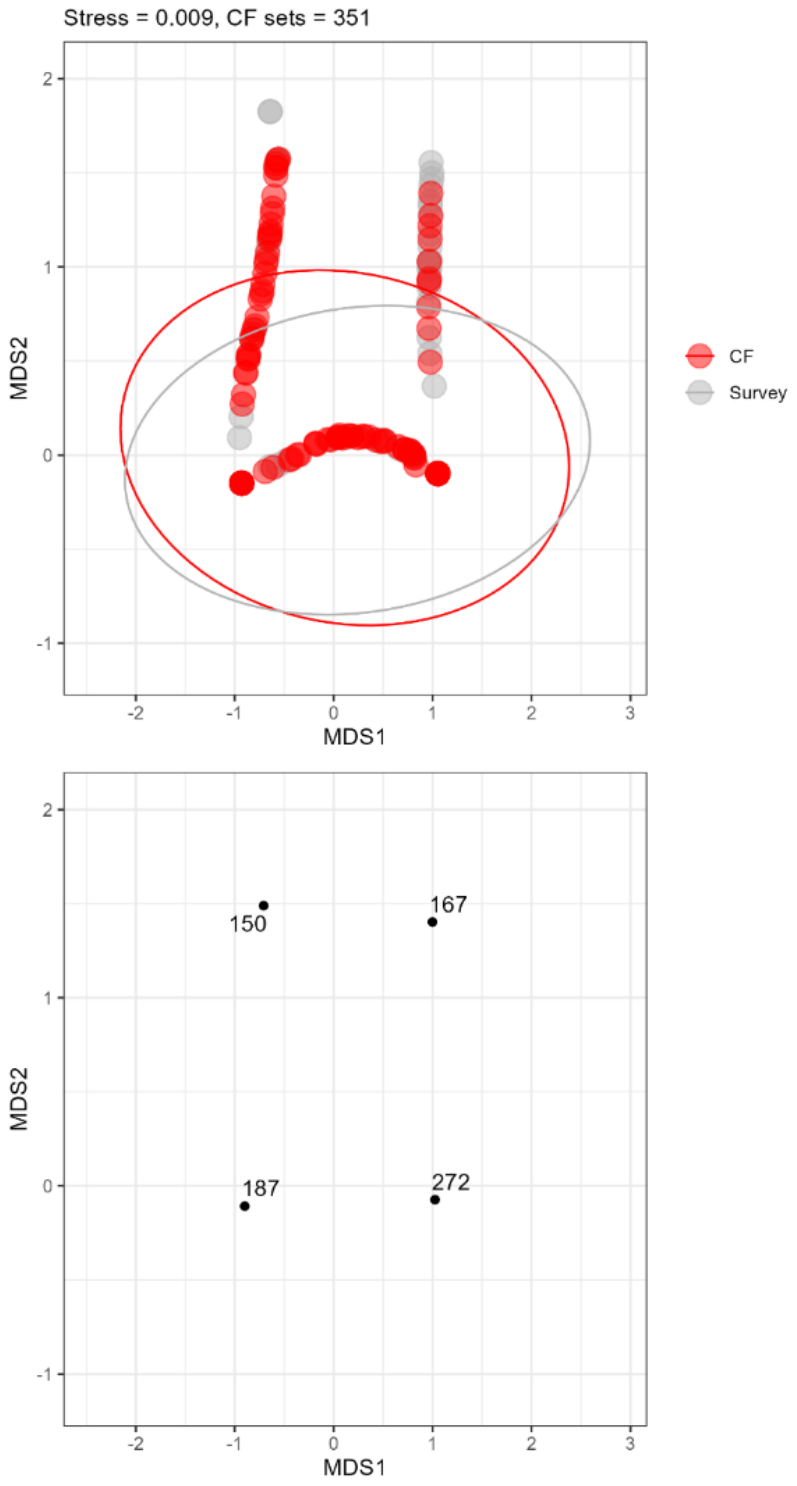

Figure 16. Species composition of the planktivore functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

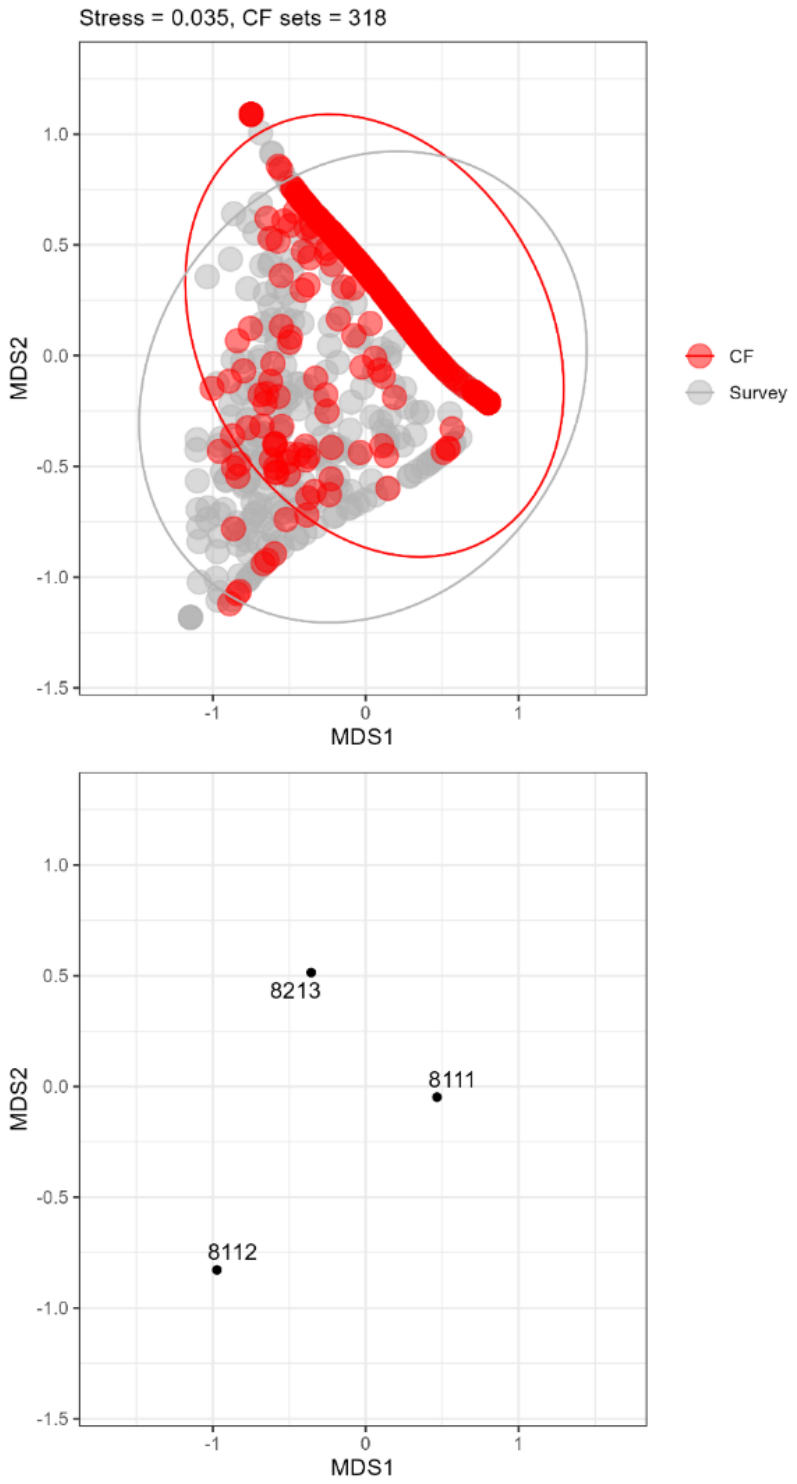

Figure 17. Species composition of the shellfish functional group in NAFO Div. 2J3K-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

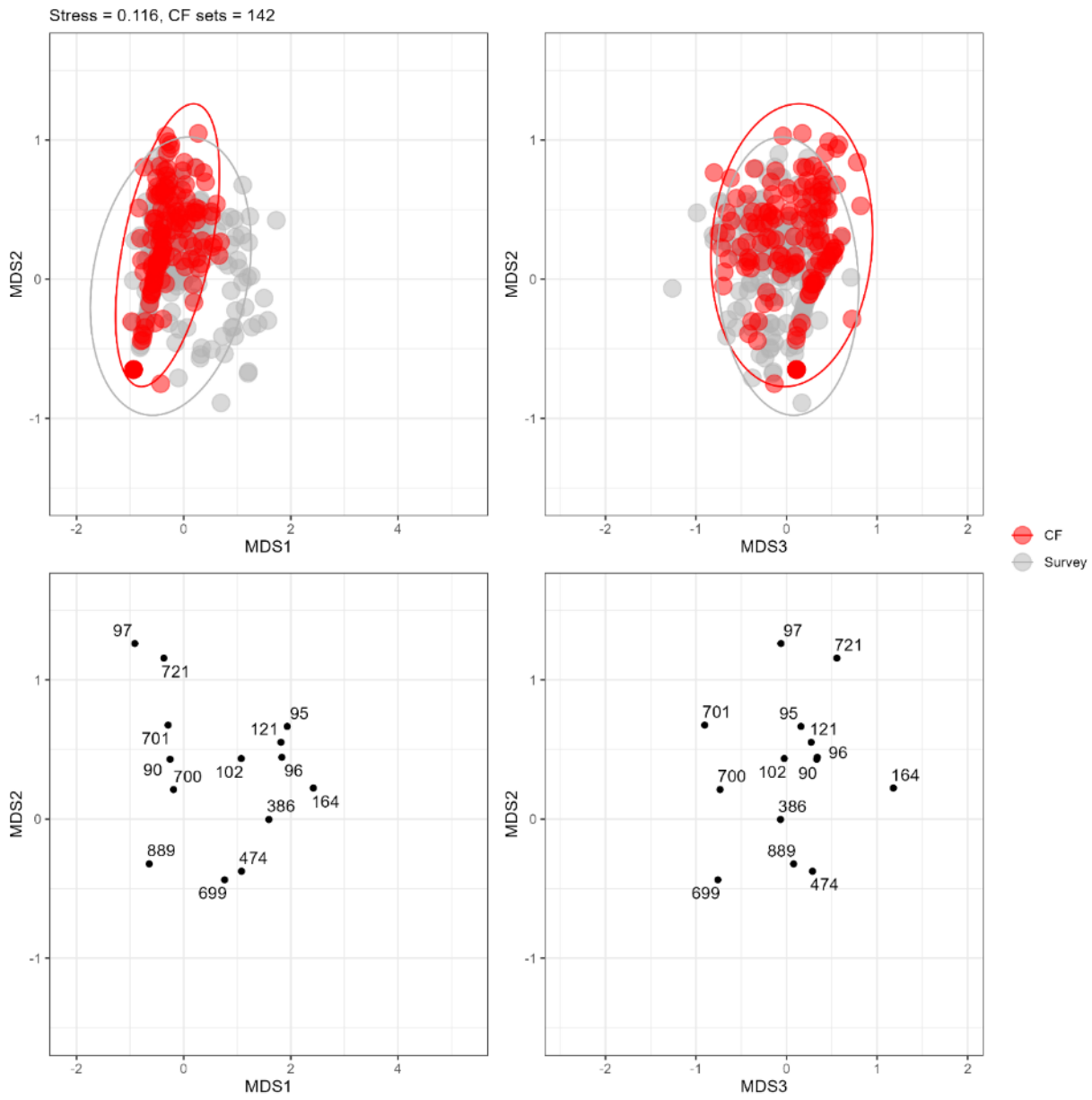

Figure 18. Species composition of the large benthivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for nMDS analyses and number of CF sets are listed on the top.*

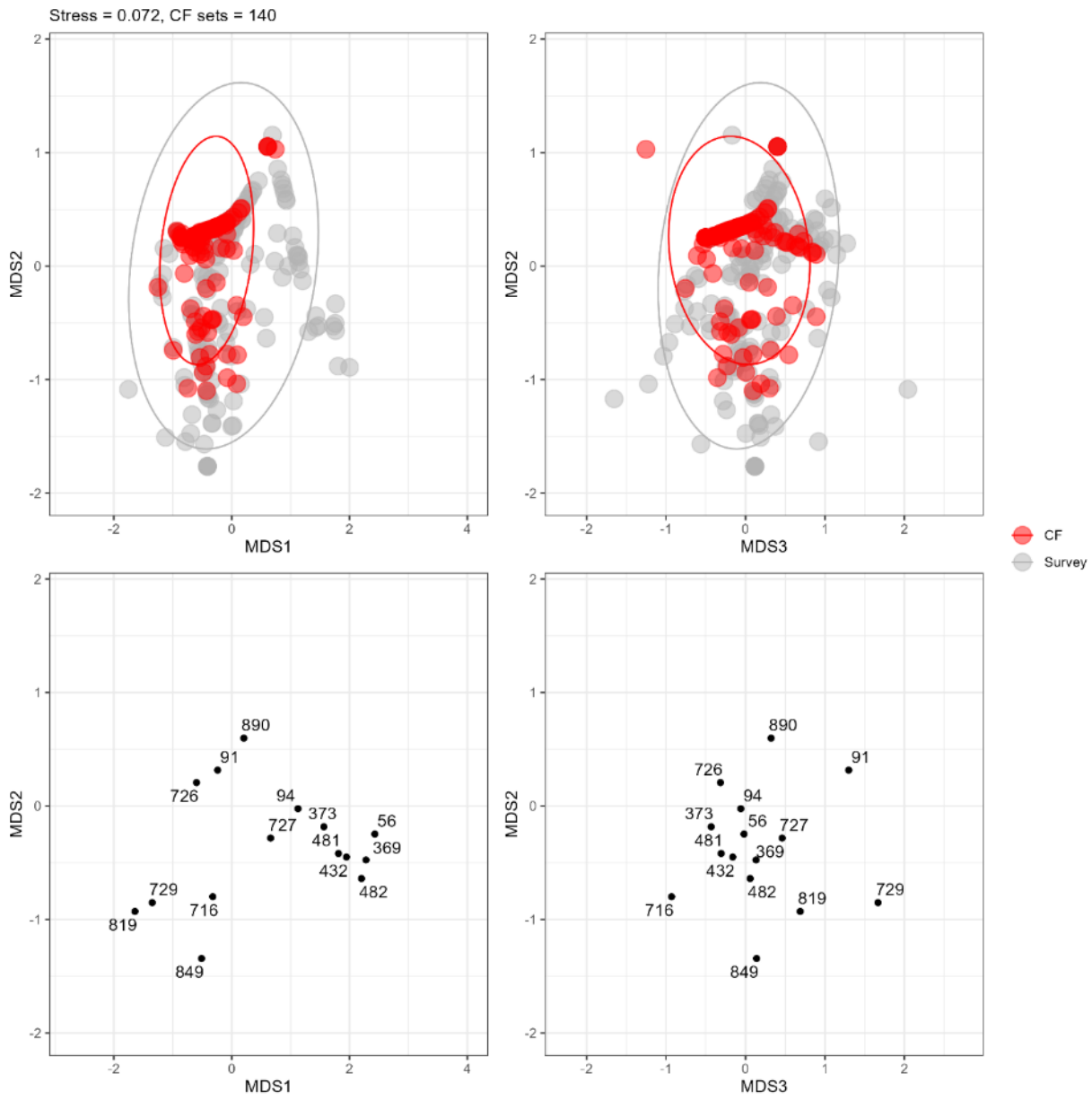

Figure 19. Species composition of the medium benthivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

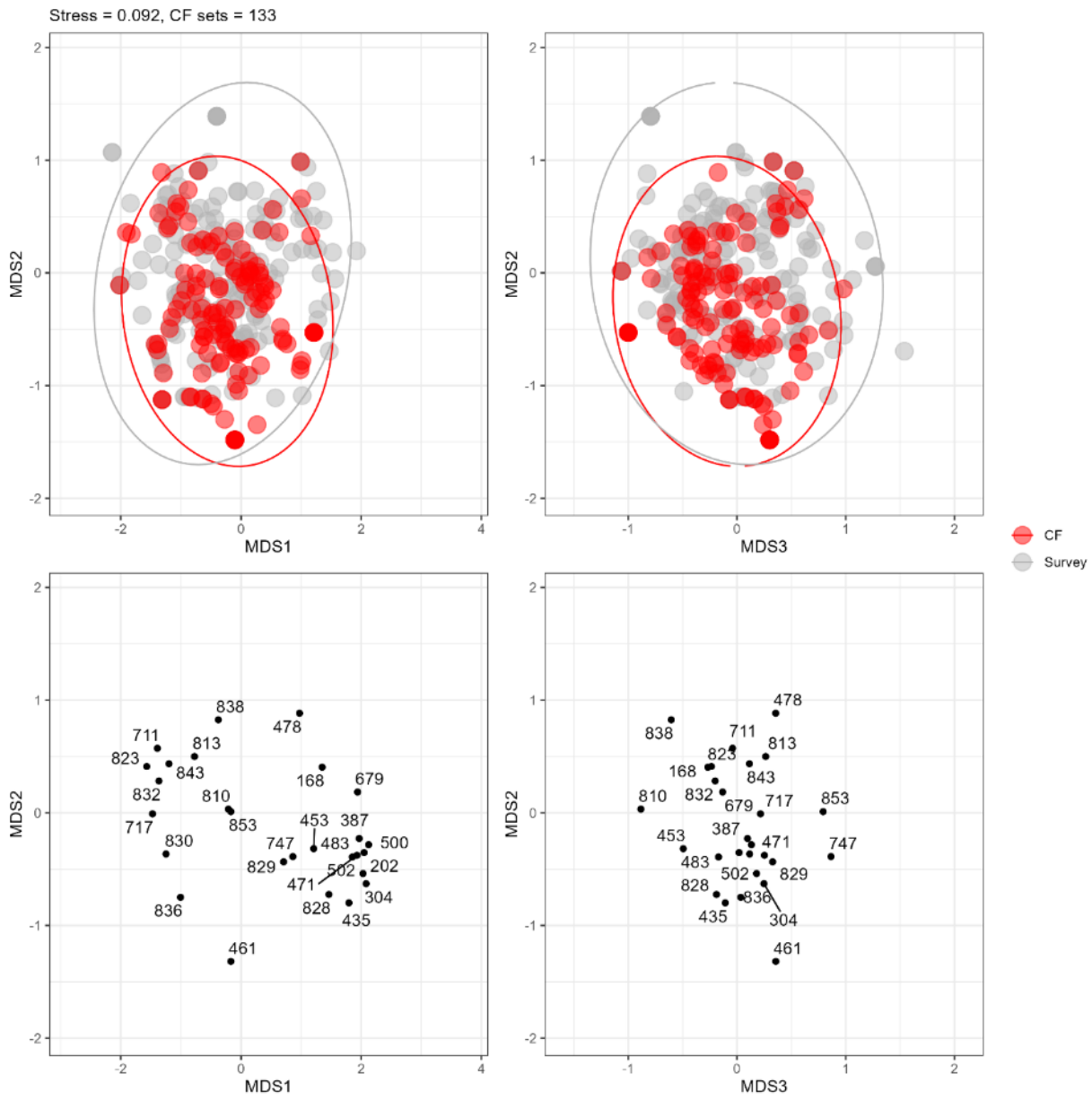

Figure 20. Species composition of the small benthivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

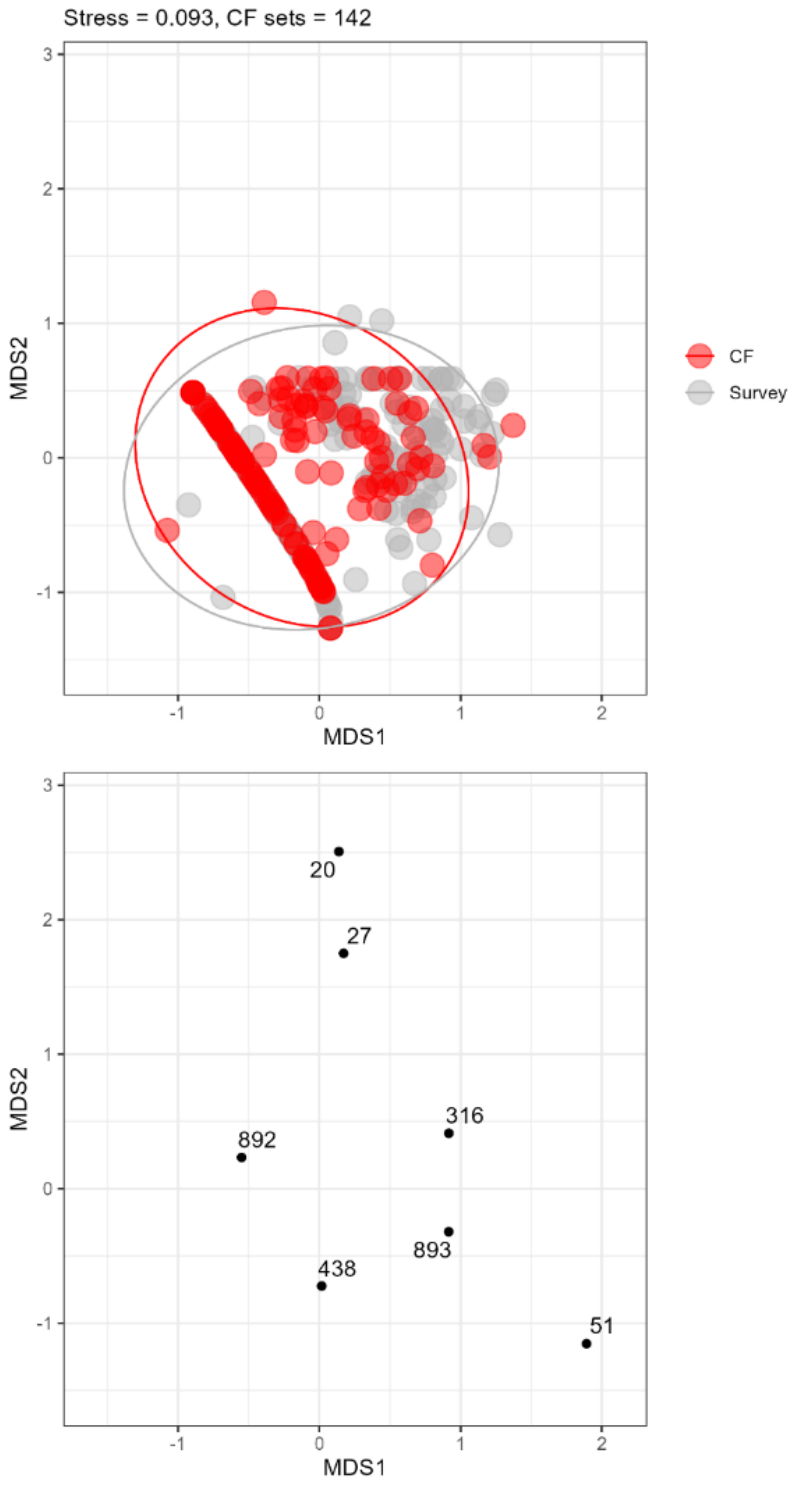

Figure 21. Species composition of the piscivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler. *Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

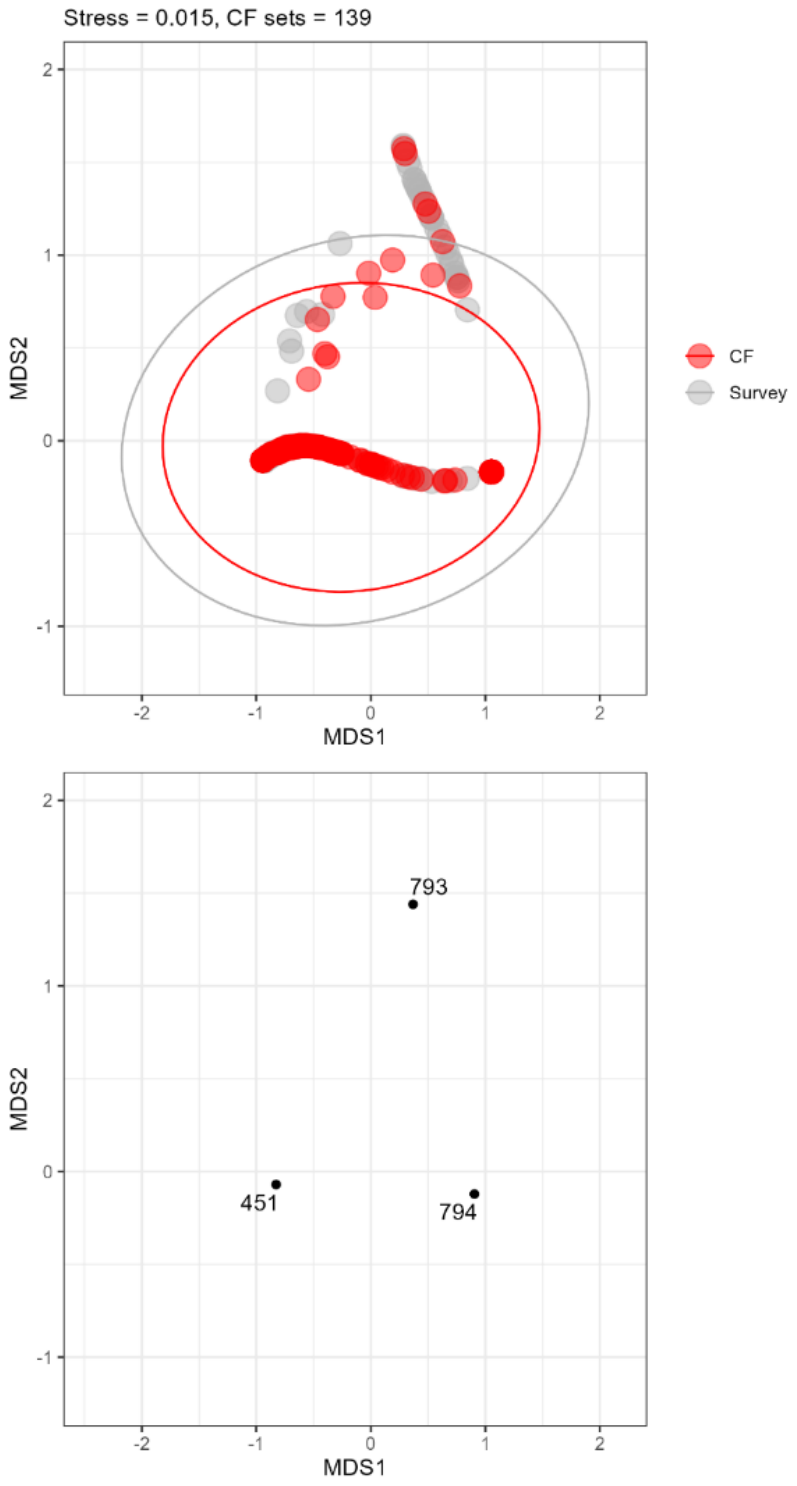

Figure 22. Species composition of the plank-piscivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

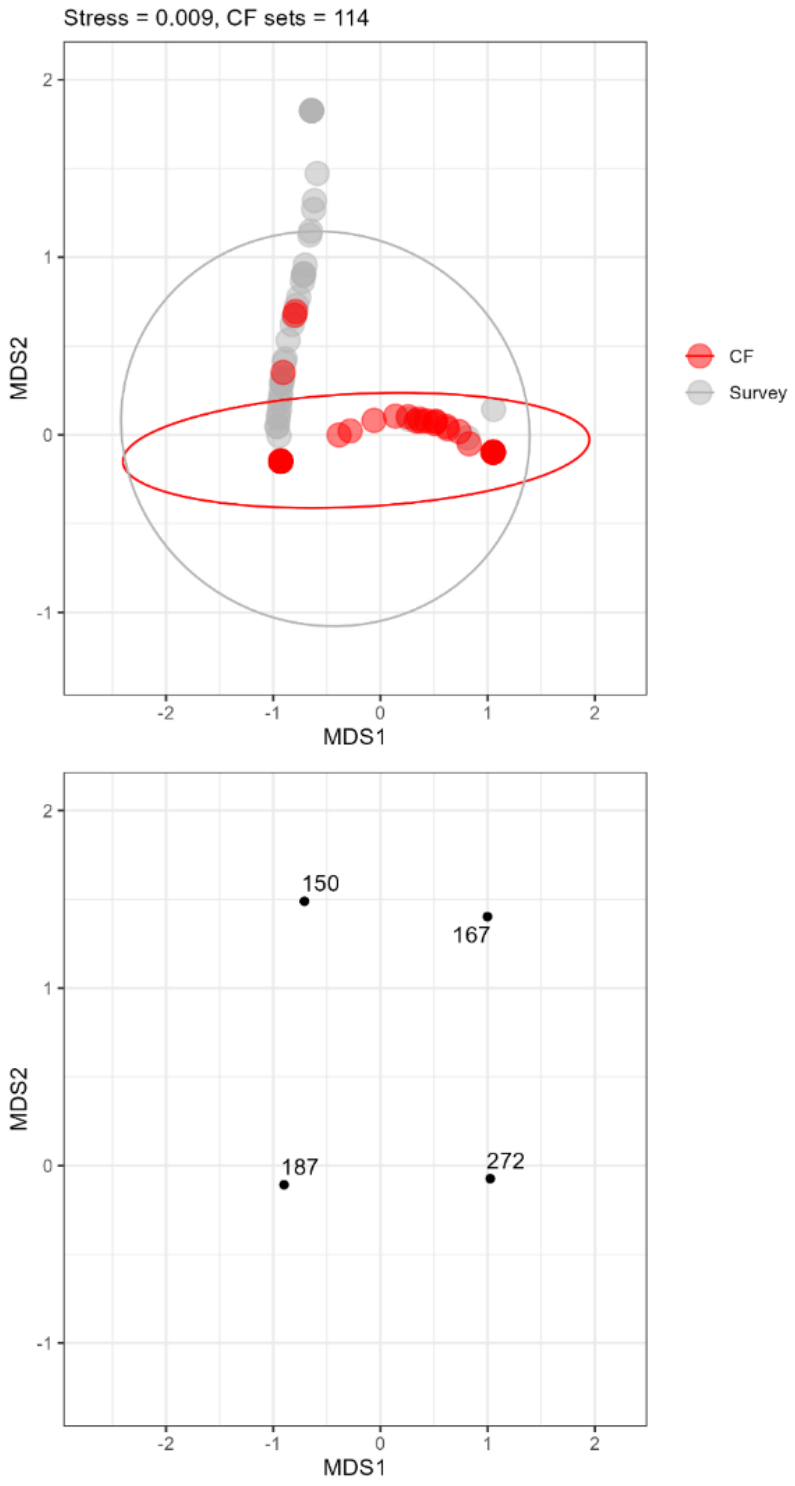

Figure 23. Species composition of the planktivore functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

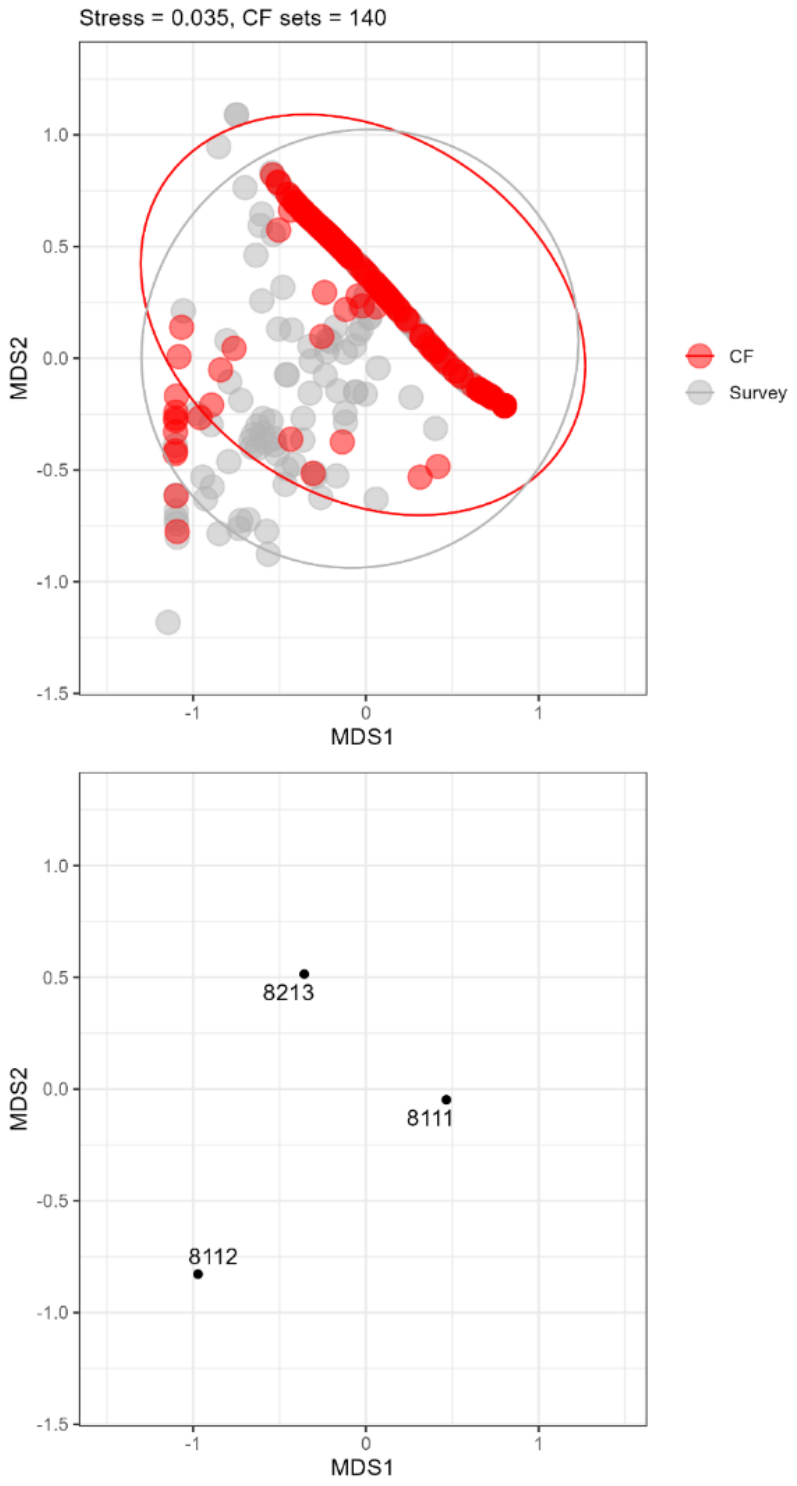

Figure 24. Species composition of the shellfish functional group in NAFO Div. 2J3K-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler. *Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

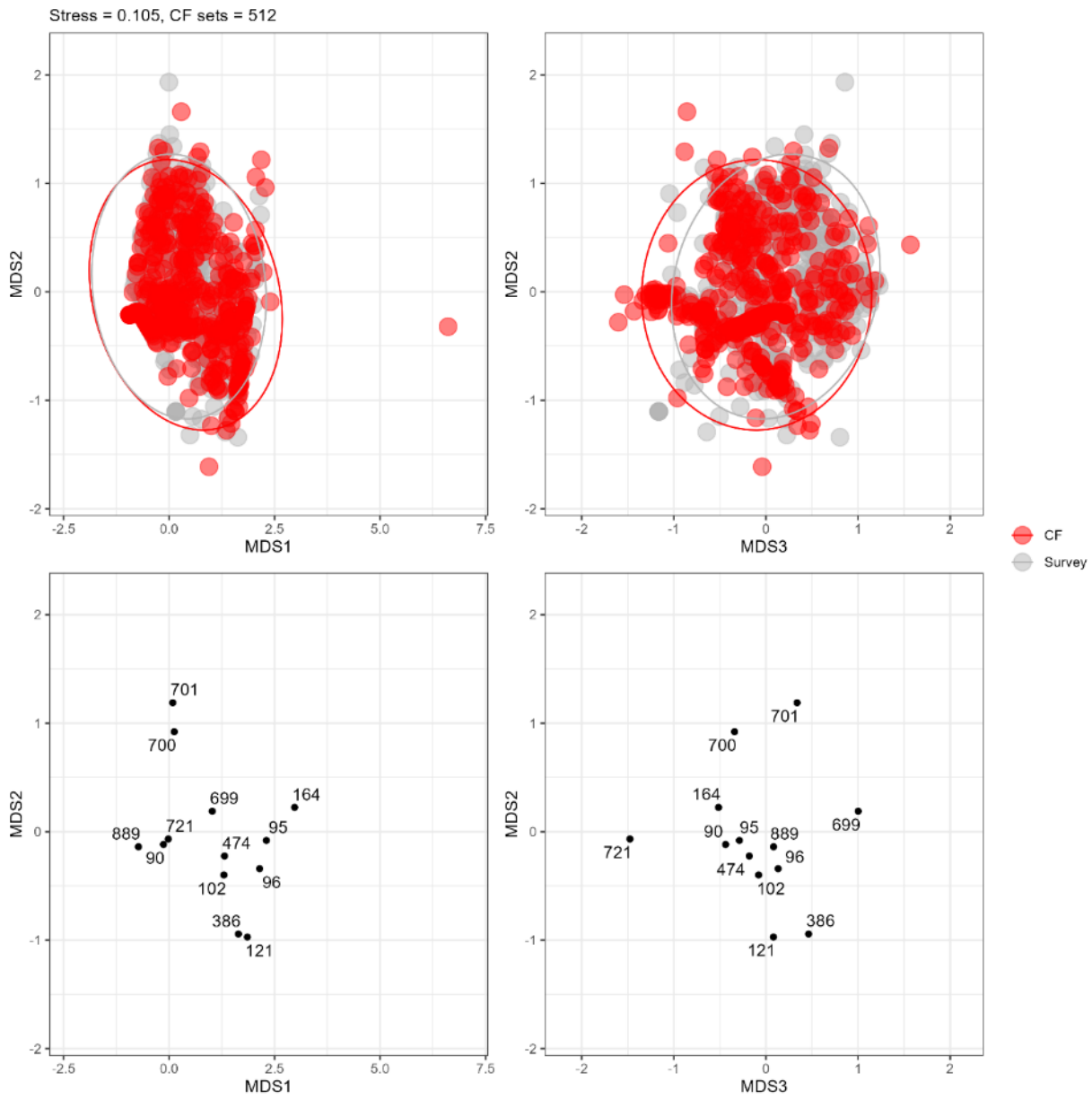

Figure 25. Species composition of the large benthivore functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

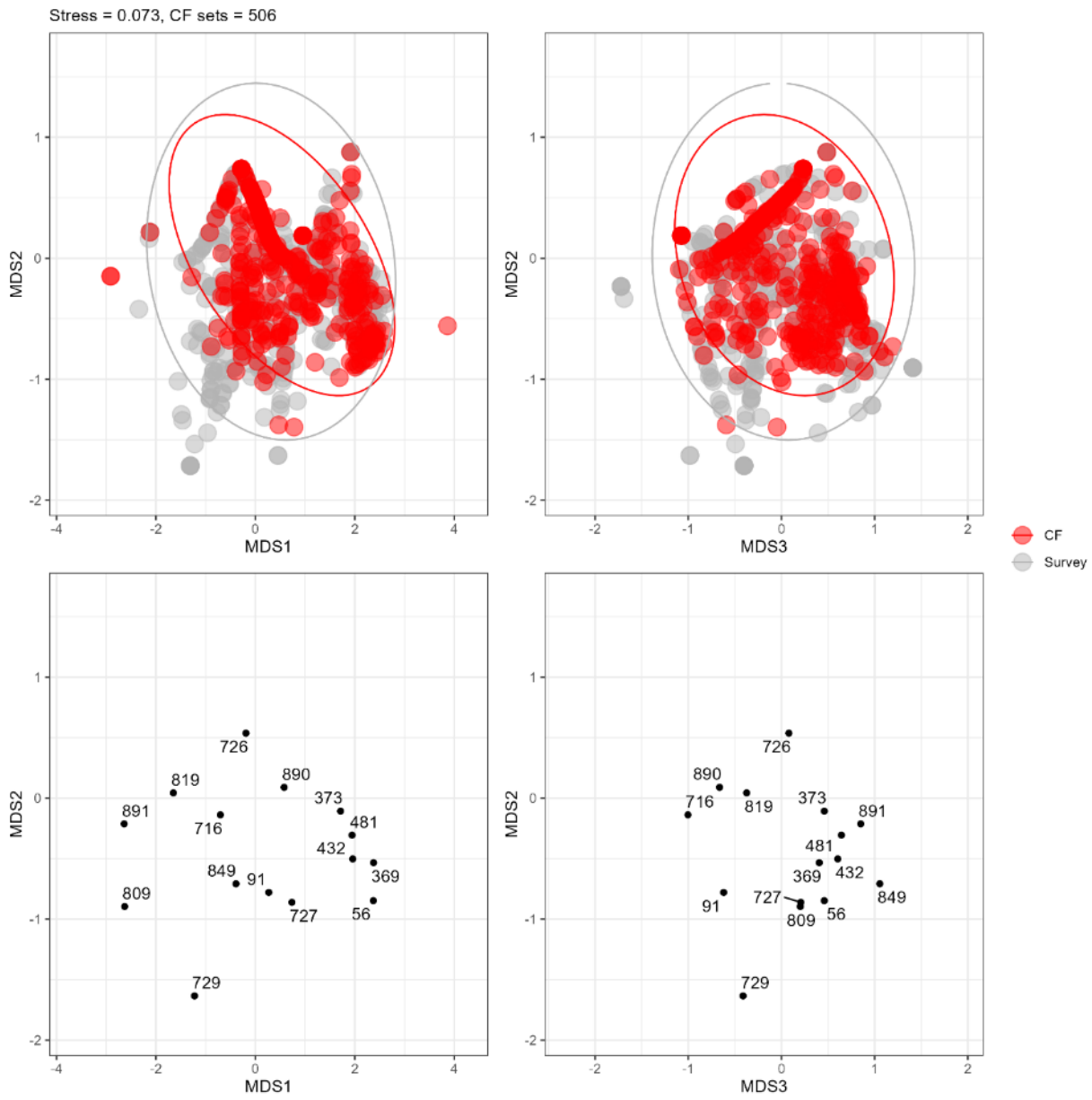

Figure 26. Species composition of the medium benthivore functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

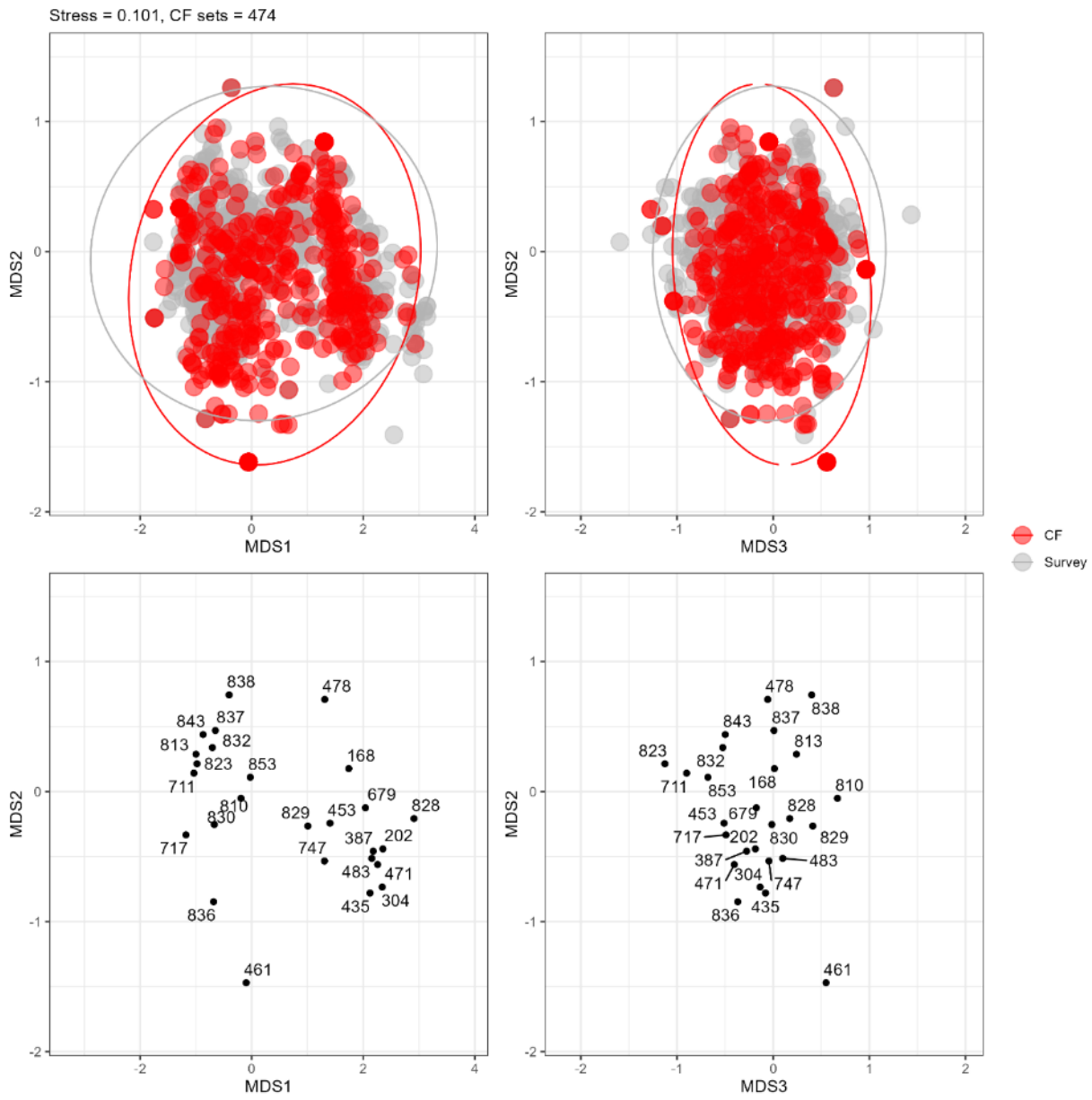

Figure 27. Species composition of the small benthivore functional group in NAFO Div, 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

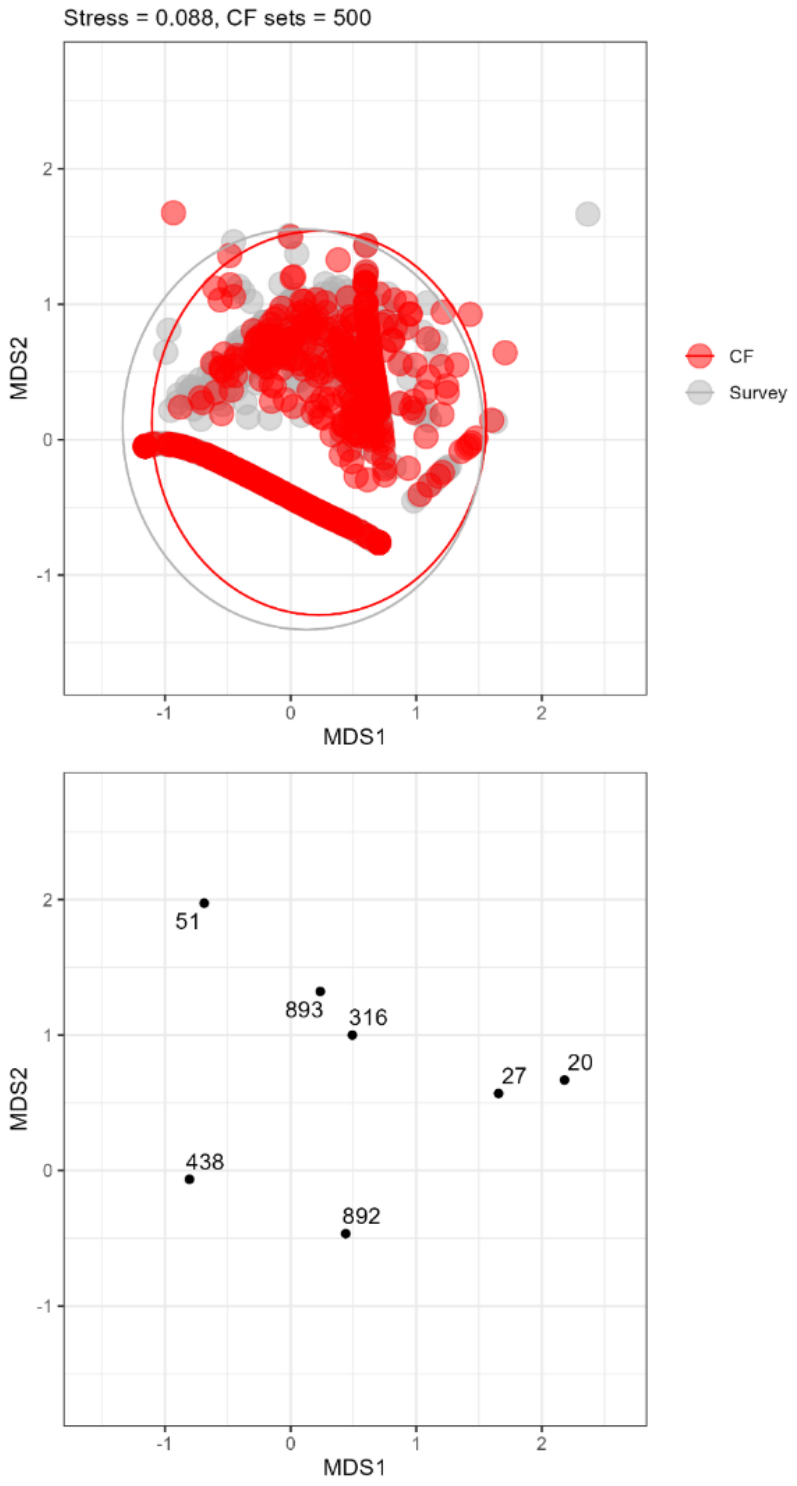

Figure 28. Species composition of the piscivore functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

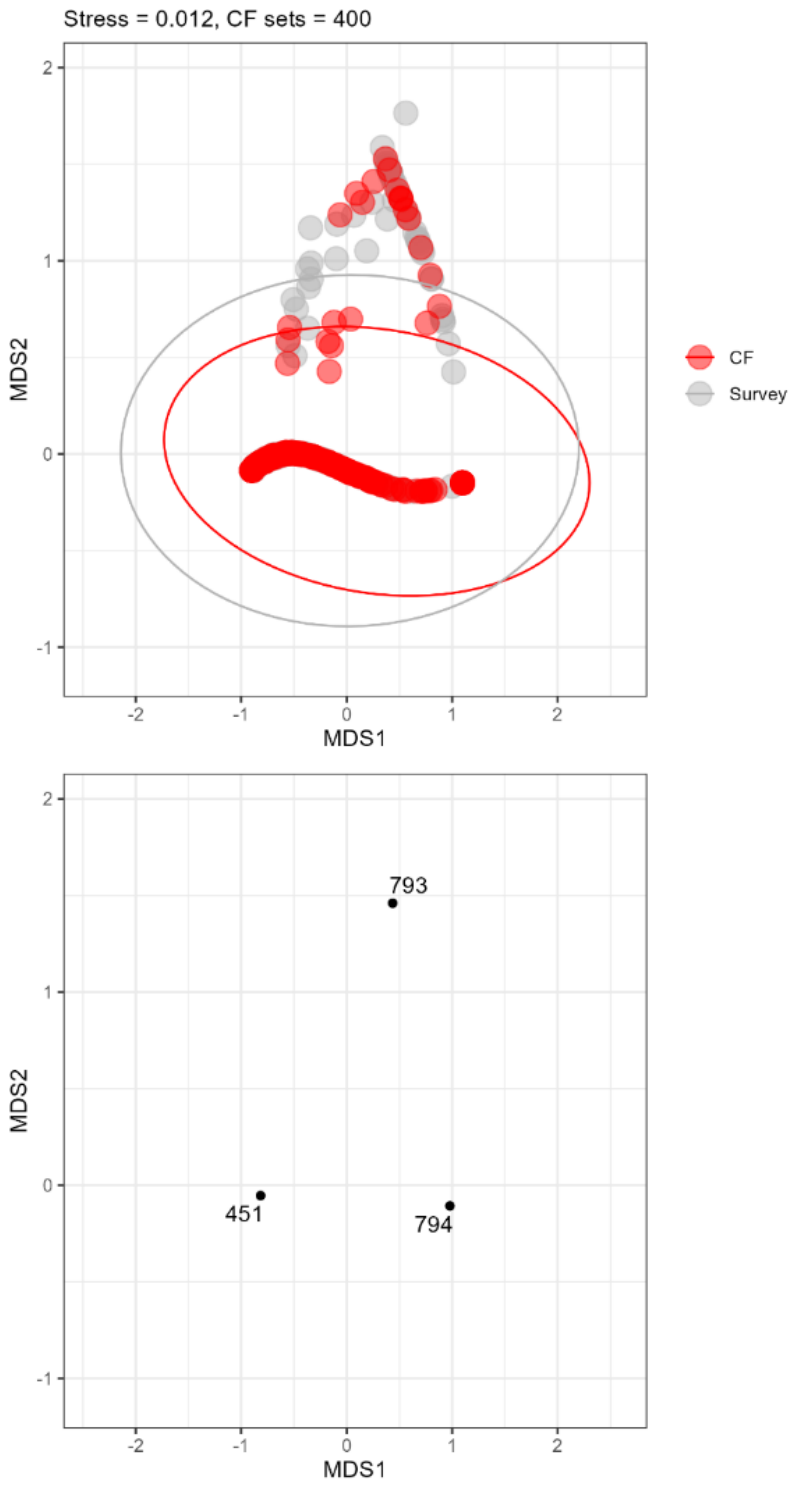

Figure 29. Species composition of the plank-piscivore functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

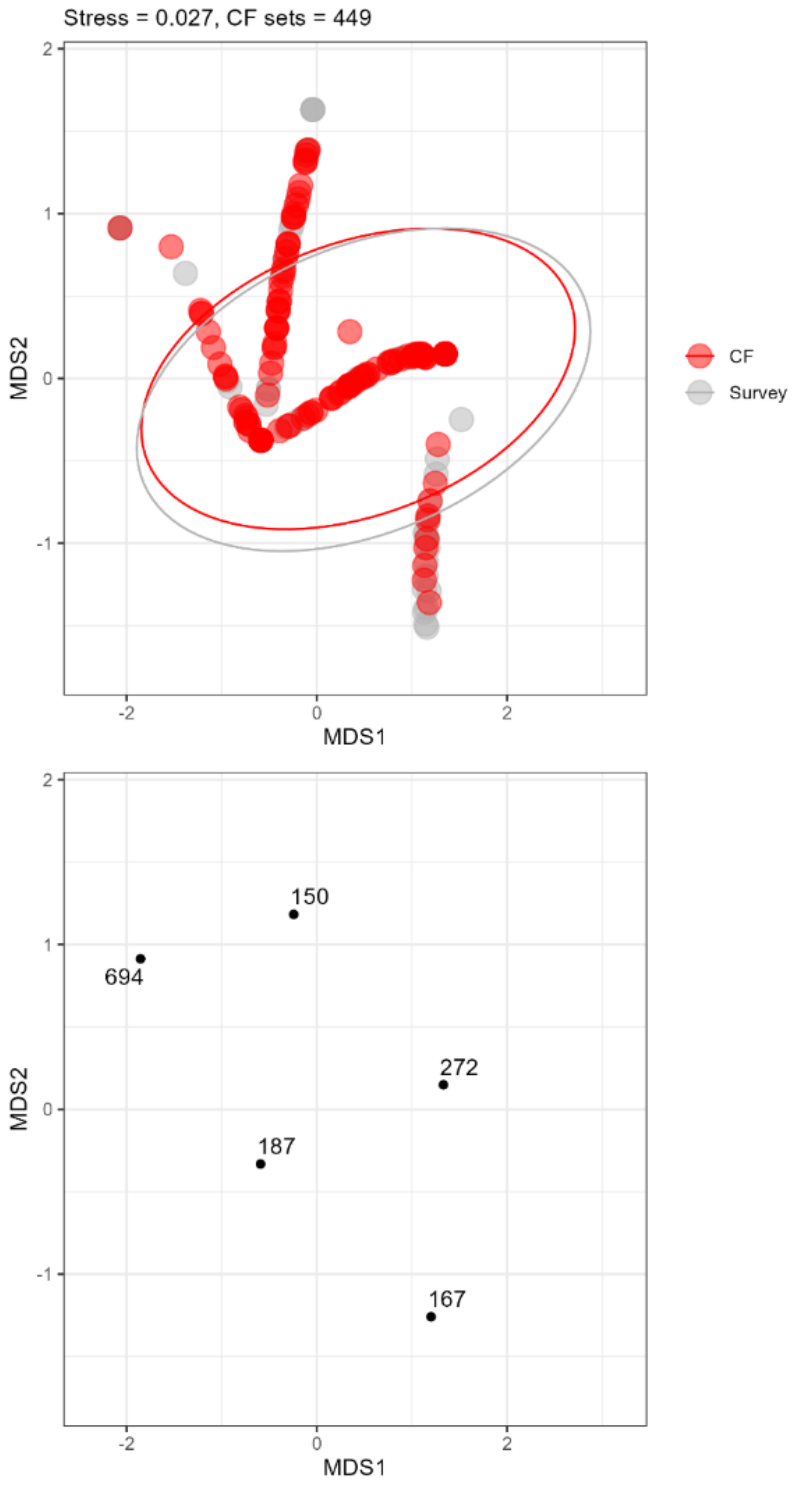

Figure 30. Species composition of the planktivore functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

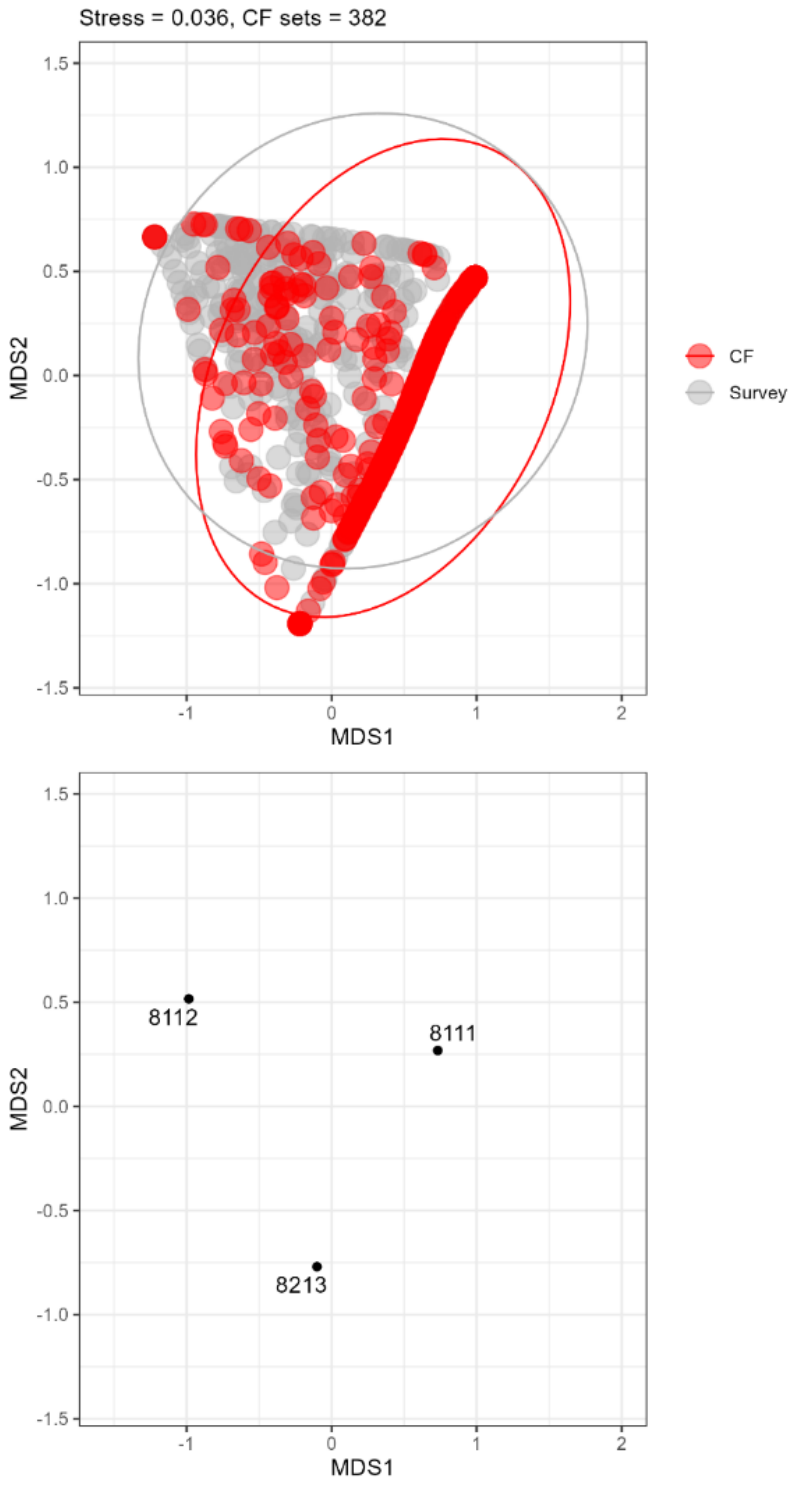

Figure 31. Species composition of the shellfish functional group in NAFO Div. 2J3KL-fall with CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom represents the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

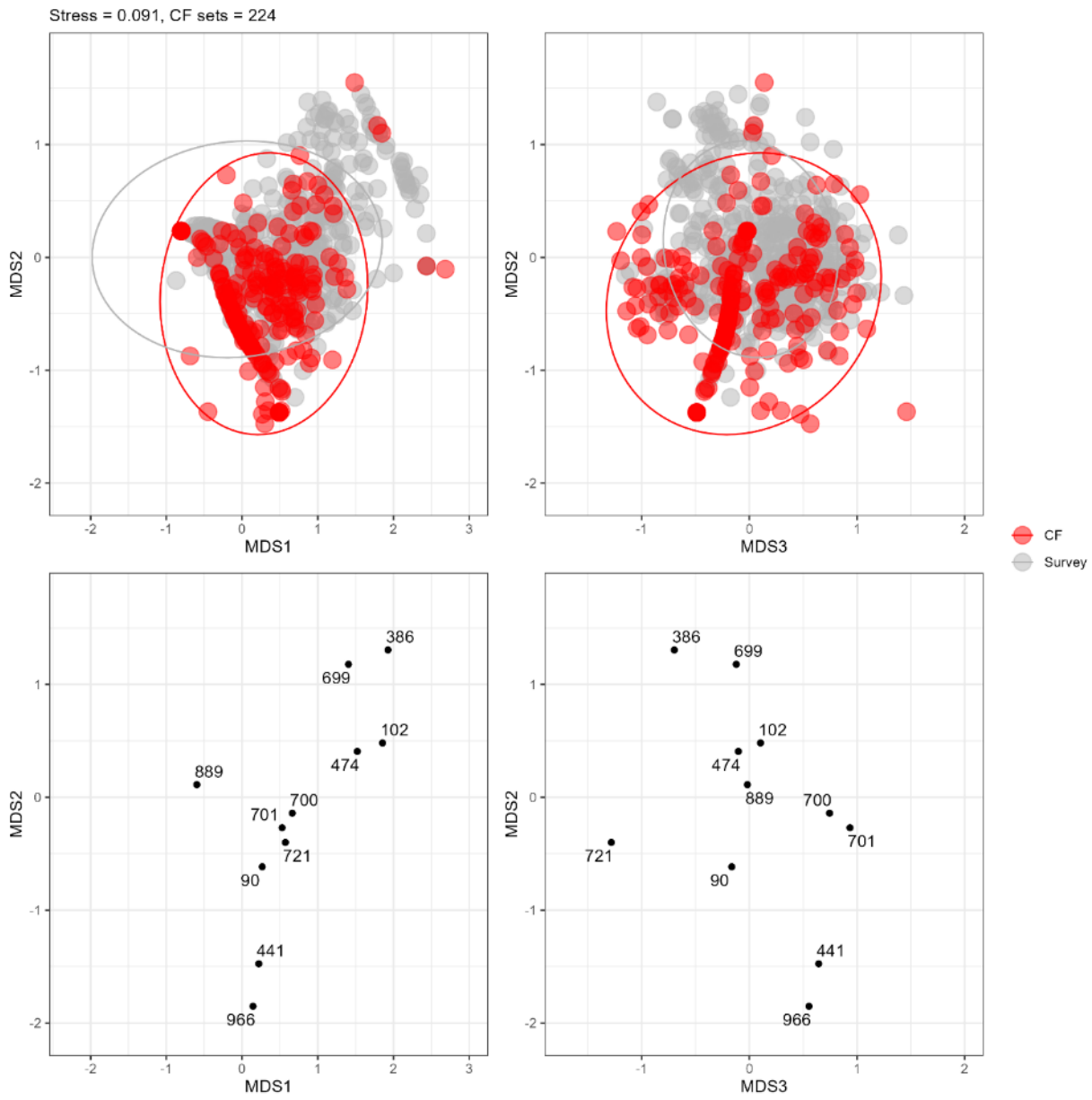

Figure 32. Species composition of the large benthivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

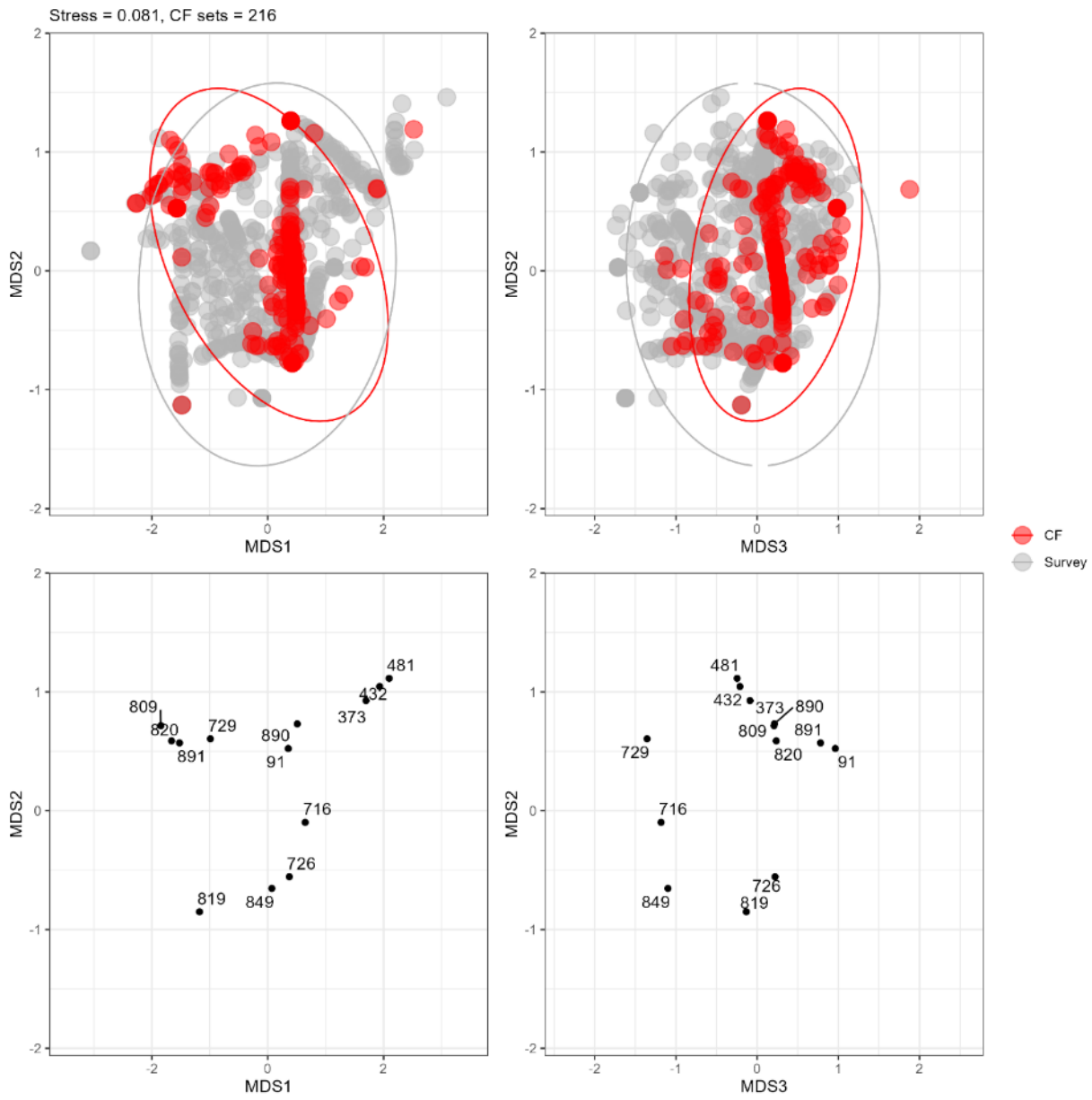

Figure 33. Species composition of the medium benthivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

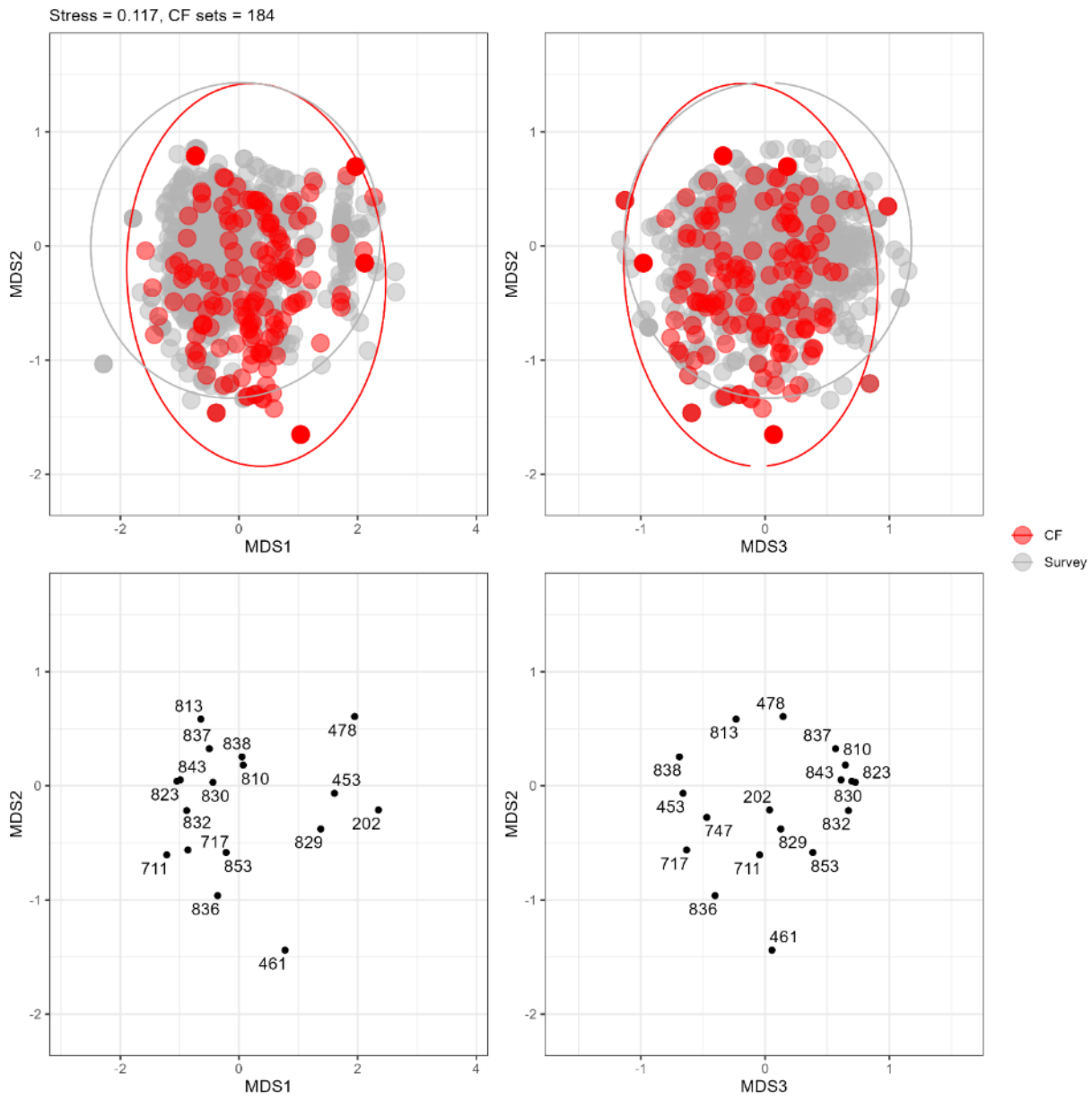

Figure 34. Species composition of the small benthivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler. *Colored ellipses represent 95% CIs. Plots on the bottom represent the individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

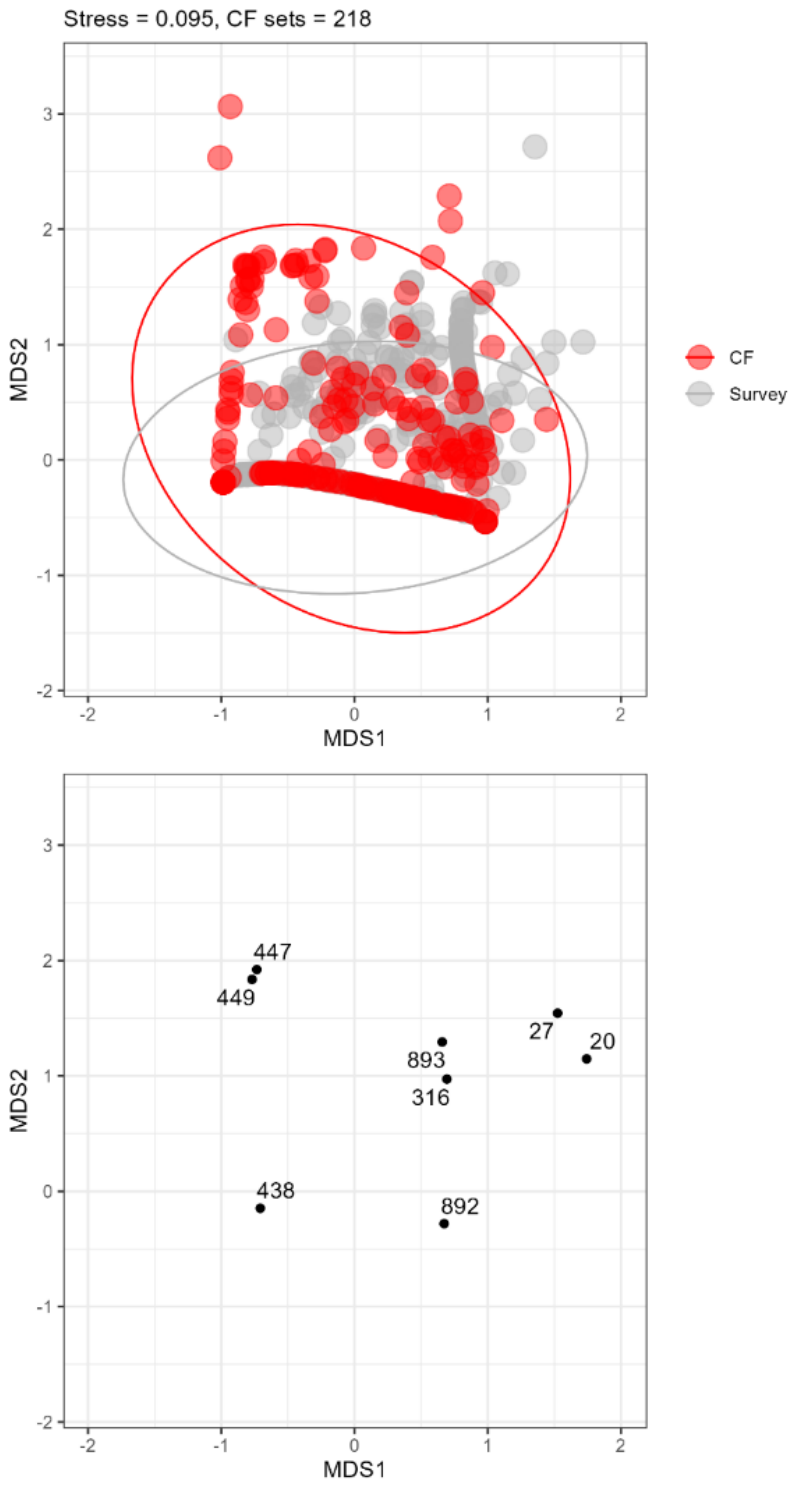

Figure 35. Species composition of the piscivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

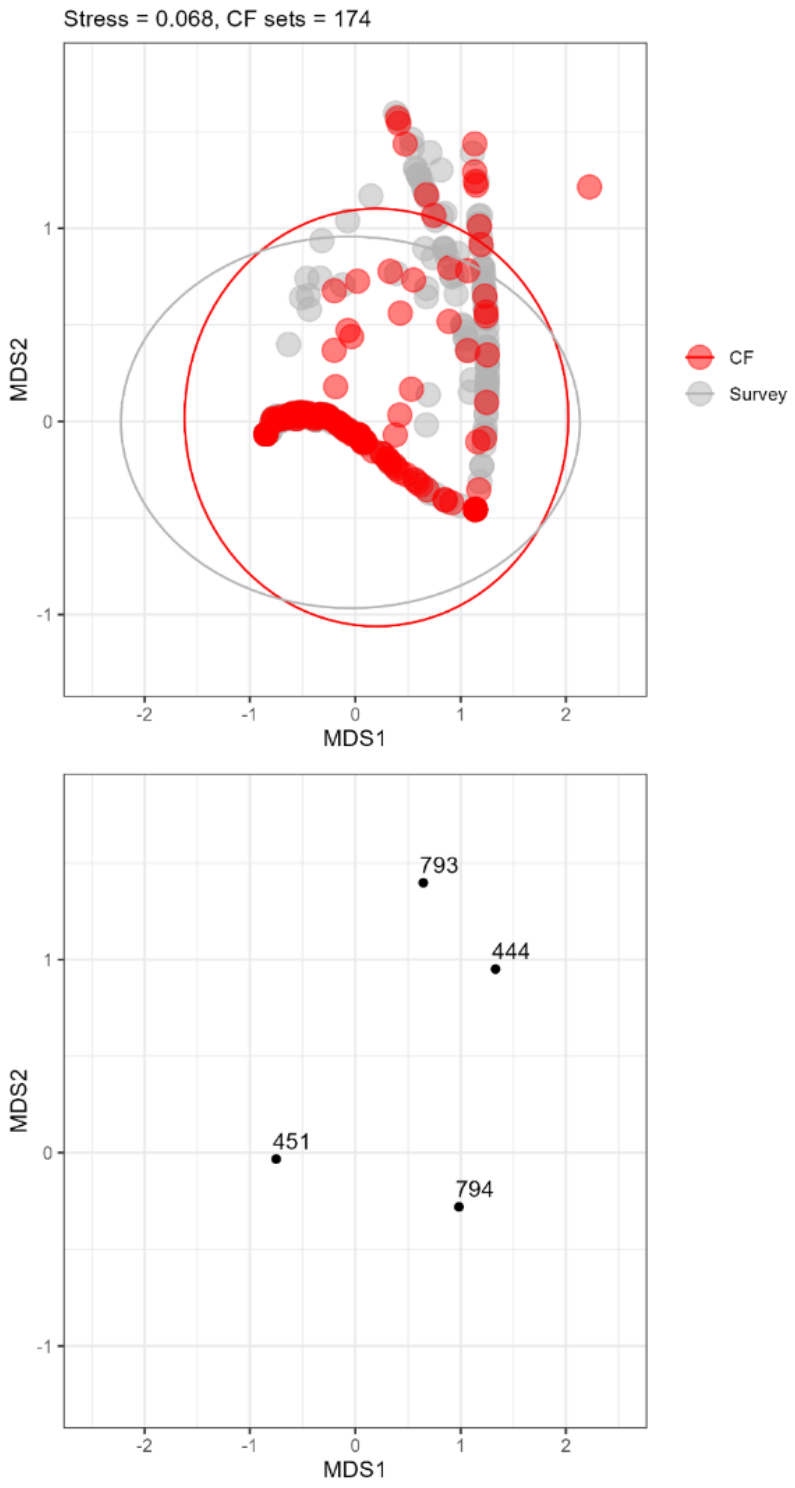

Figure 36. Species composition of the plank-piscivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishiong (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

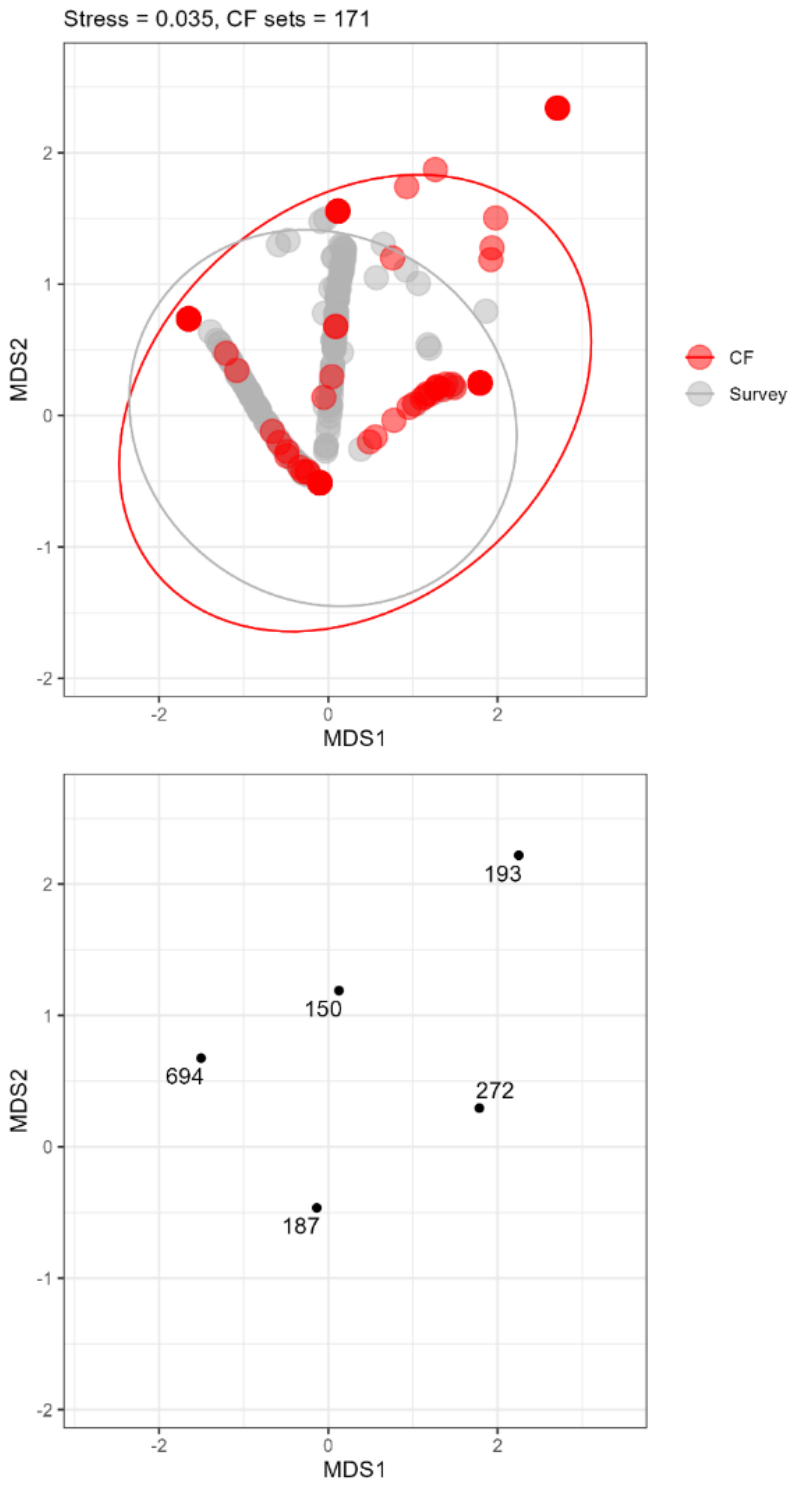

Figure 37. Species composition of the planktivore functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

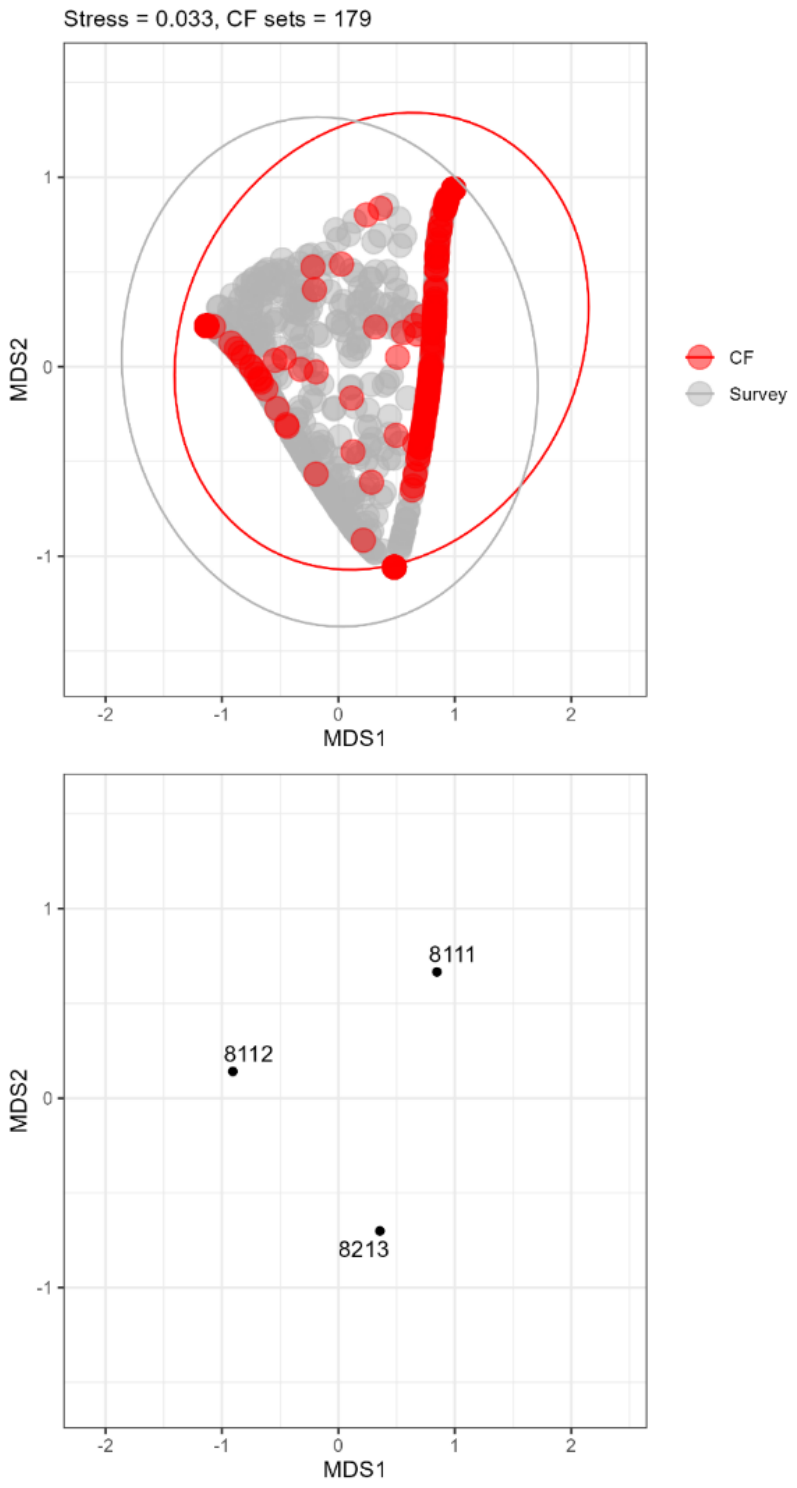

Figure 38. Species composition of the shellfish functional group in NAFO Div. 2J3KL-fall with CCGS Alfred Needler *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Alfred Needler *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for CCGS* Alfred Needler*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

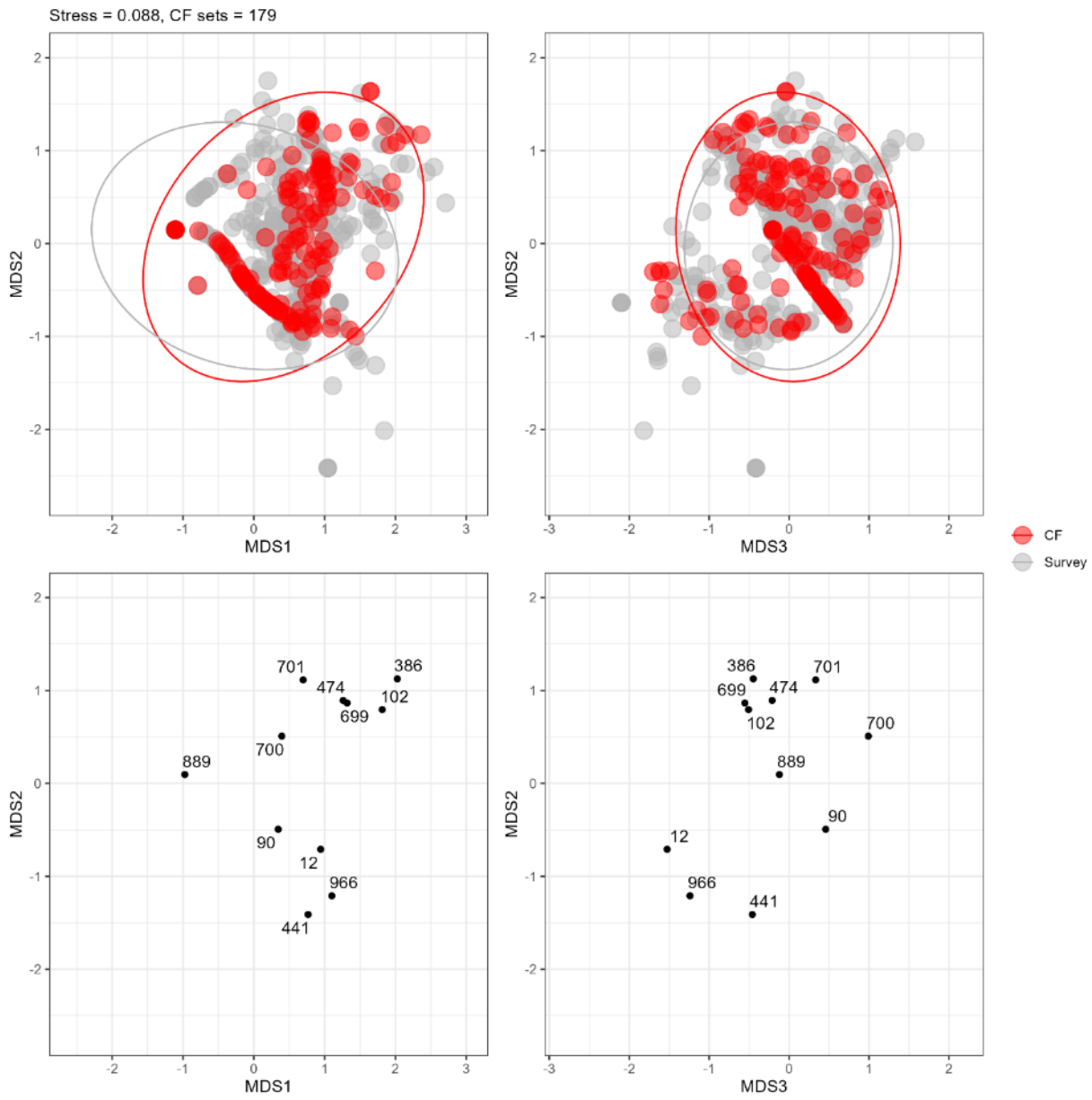

Figure 39. Species composition of the large benthivore functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

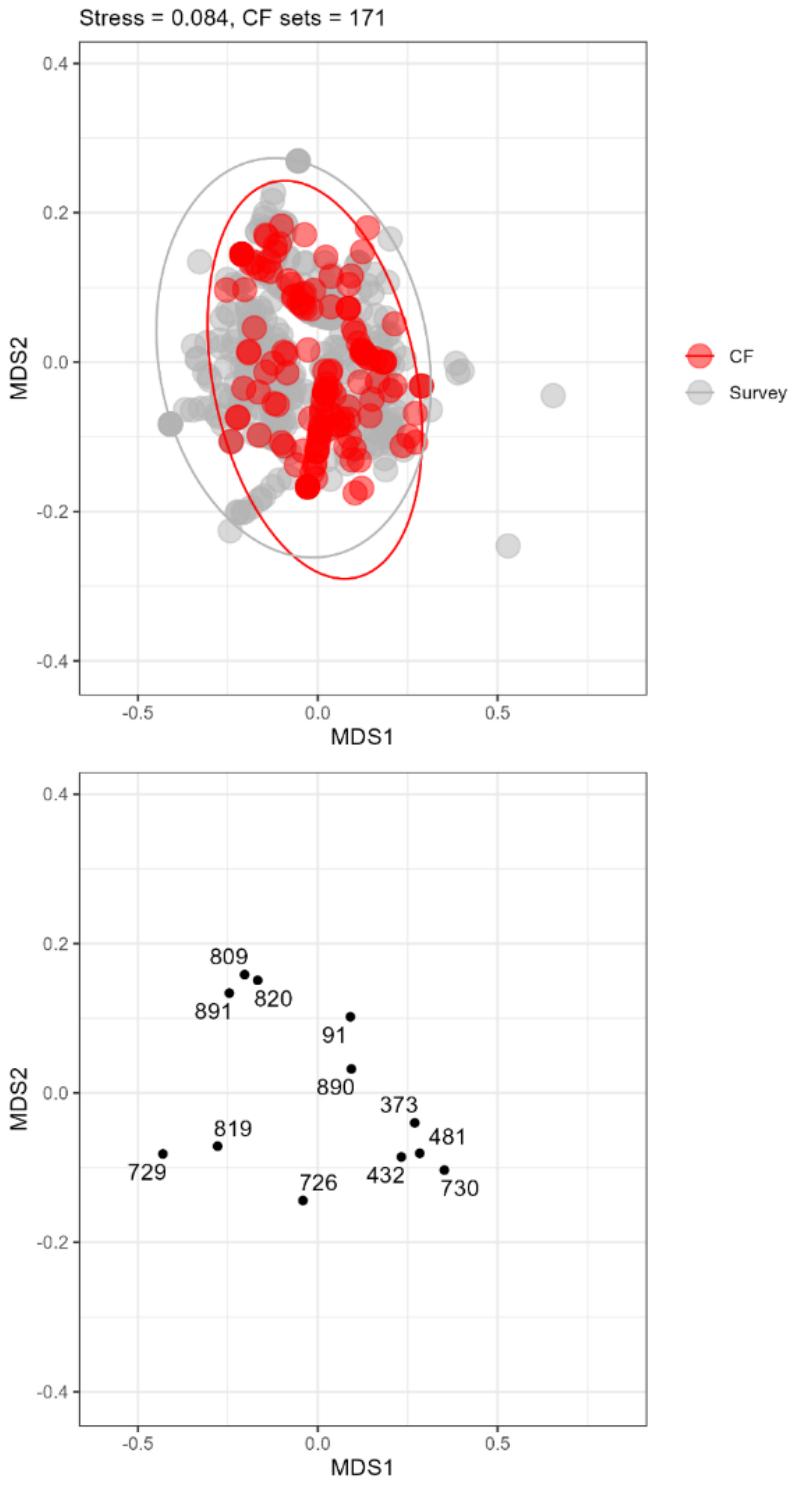

Figure 40. Species composition of the medium benthivore functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

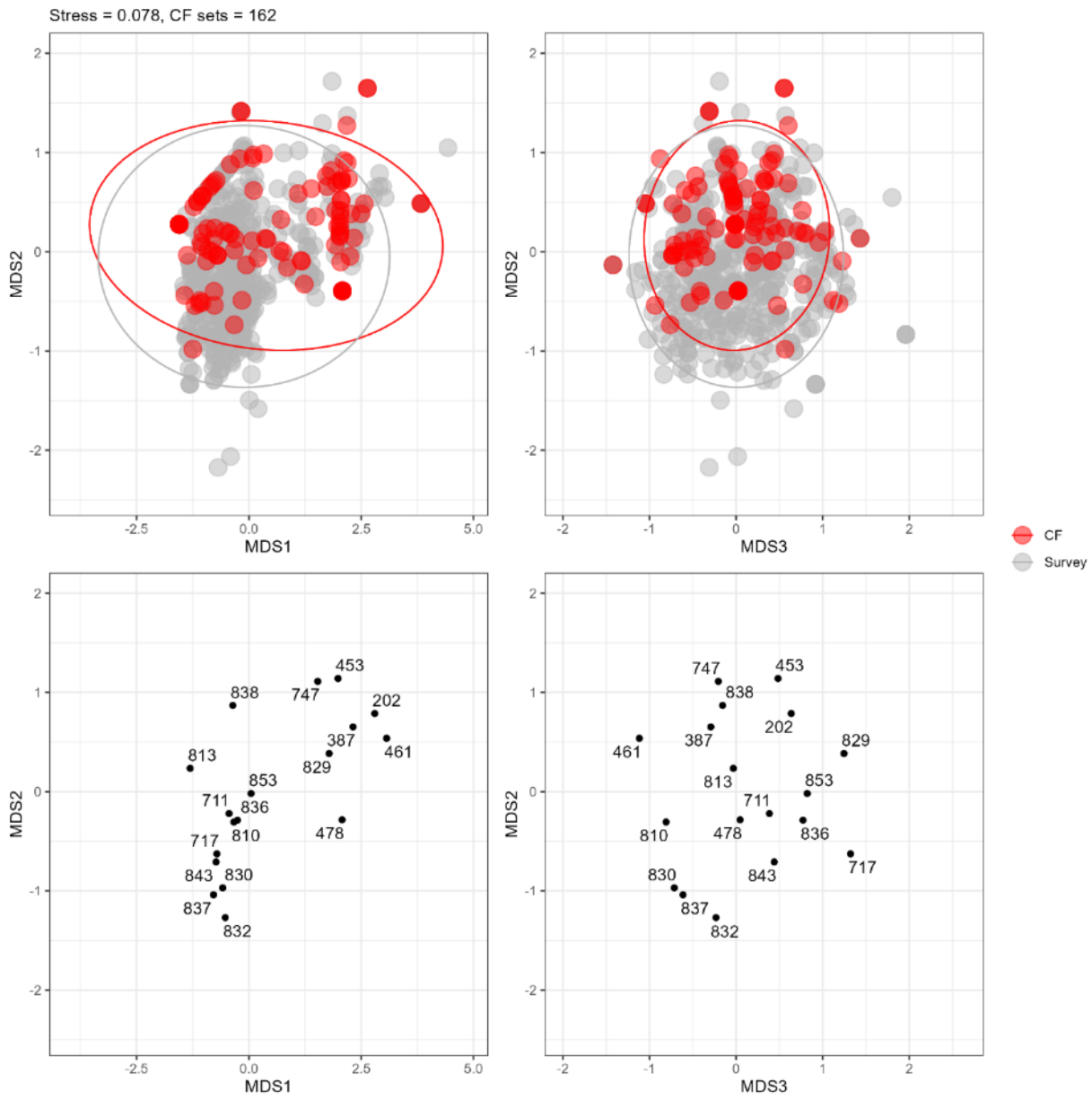

Figure 41. Species composition of the small benthivore functional group NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

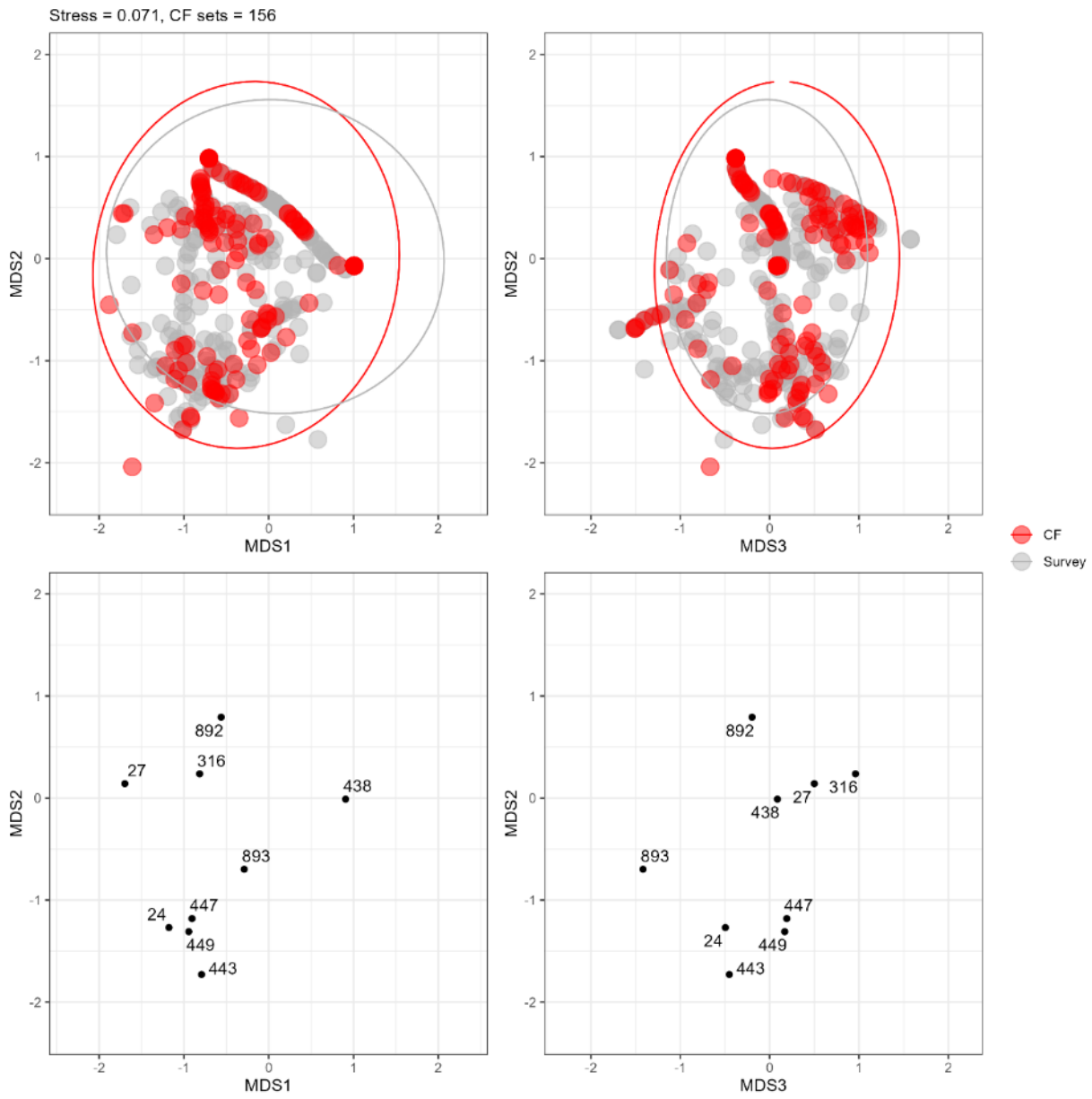

Figure 42. Species composition of the piscivore functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plots on the top represent the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plots on the bottom represent individual species scores with the species codes. Left hand plots are the first the second dimensions, while the right hand plots are the second and third dimensions. The stress for the nMDS analyses and number of CF sets are listed on the top.*

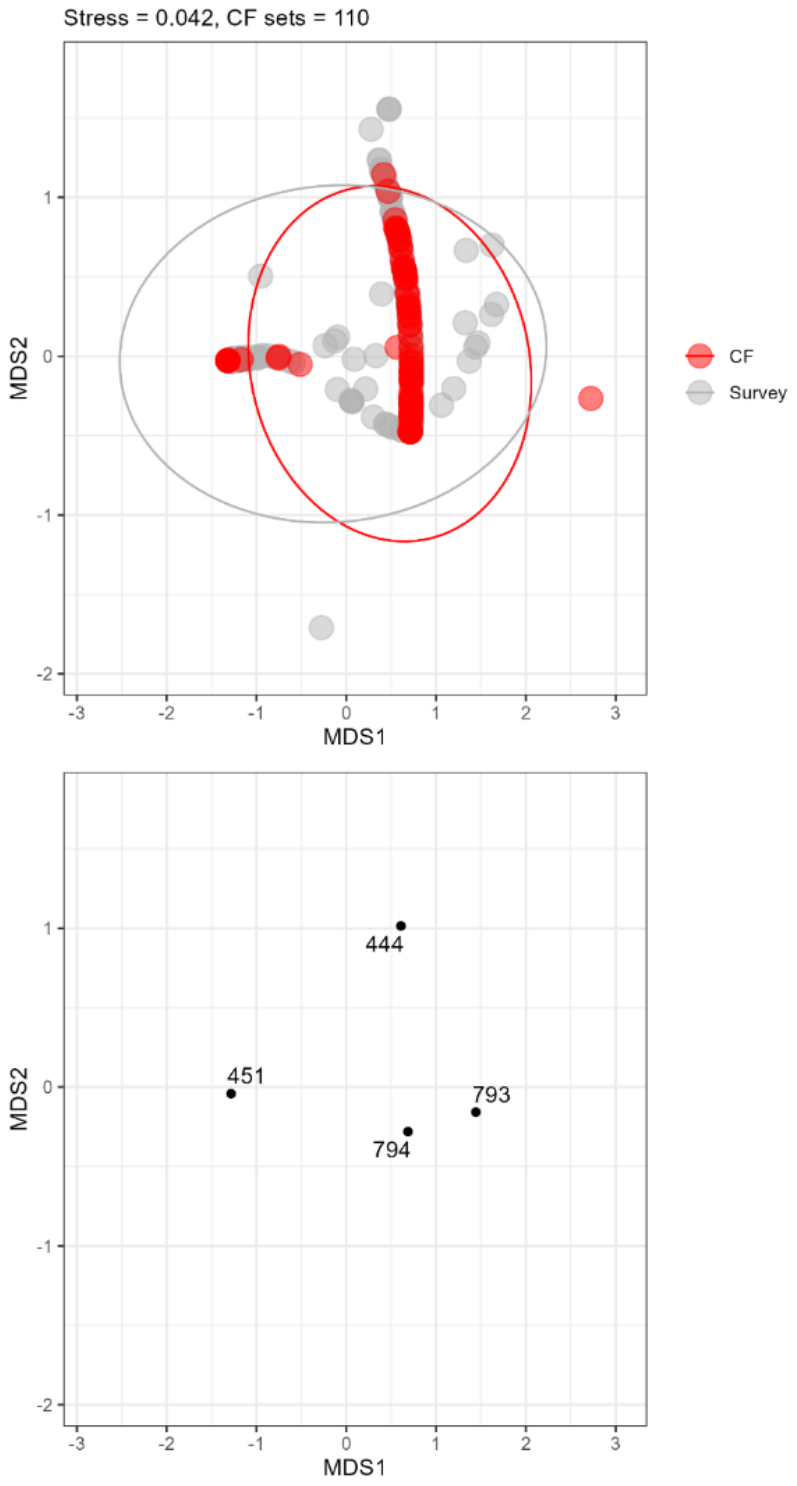

Figure 43. Species composition of the plank-piscivore functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

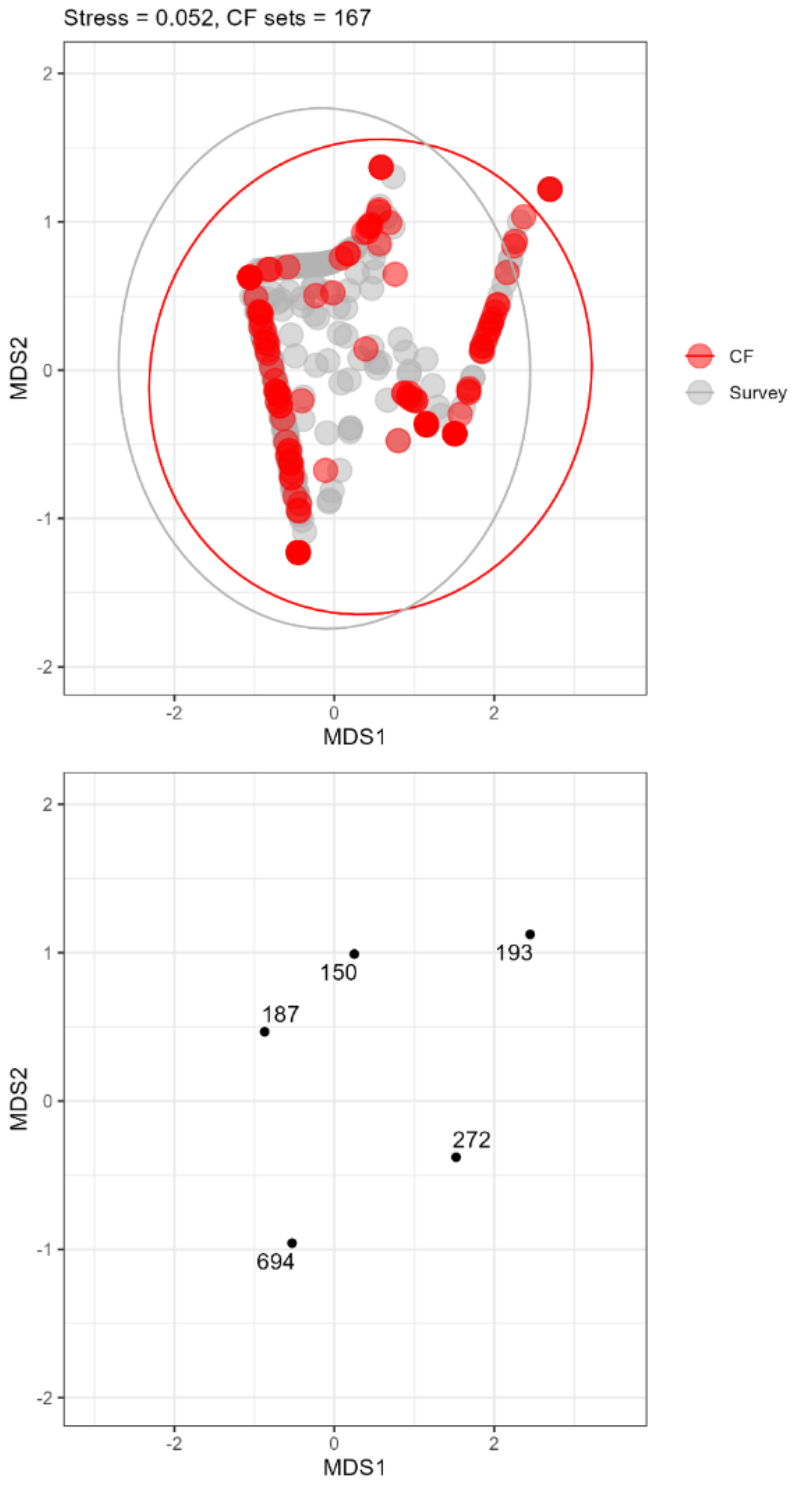

Figure 44. Species composition of the planktivore functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

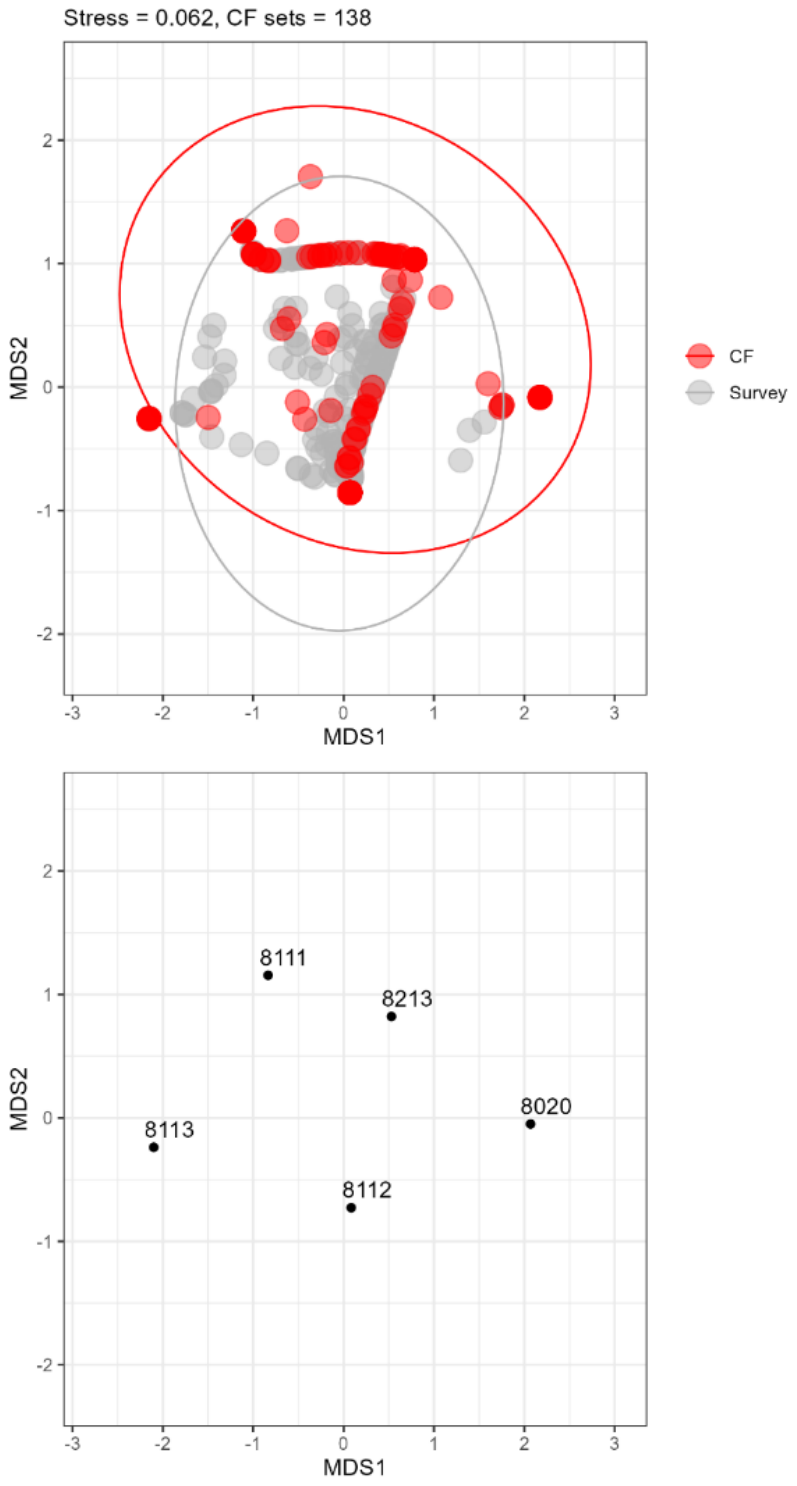

Figure 45. Species composition of the shellfish functional group in NAFO Div. 3LNO-spring for CCGS Teleost *comparative fishing (CF) sets. Plot on the top represents the composition of CF sets conducted with both CCGS* Teleost *and CCGS* John Cabot *(red) and the survey sets from 2017 – 20 (grey) for both CCGS* Alfred Needler *and CCGS* Teleost*. Colored ellipses represent 95% CIs. Plot on the bottom is the individual species scores with the species codes. The stress for the nMDS analyses and number of CF sets are listed on the top.*

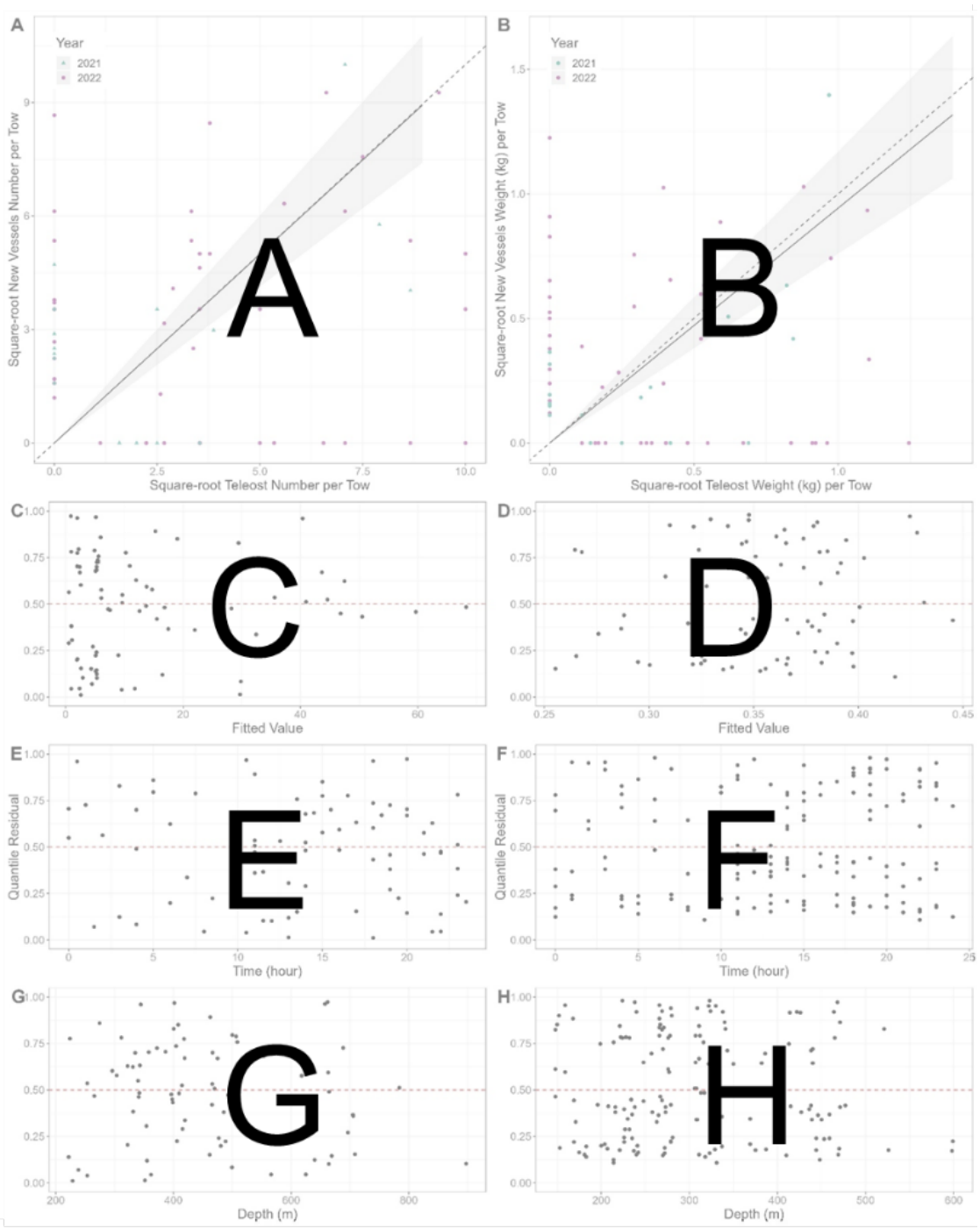

Figure 46. An outline for the interpretation of the figures presenting the data and results for size-aggregated analyses. Panel A is the biplot of the square-root of CCGS Capt. Jacques Cartier/John Cabot *catch numbers against the square-root of CCGS* Teleost *or CCGS* Alfred Needler *catch numbers, where the solid black line and shaded interval show the estimated conversion and approximate 95% CI from the best size-aggregated model. Panel B is the same as A except for catch weights. Below A and B are the quantile residuals from the analysis of catch numbers and weights plotted as a function of the fitted values (panels C and D, respectively), time (panels E and F, respectively), and depth (panels G and H, respectively). Captions for the individual panel figures only state the functional group, area, and vessel pairing visualized in the figure.*

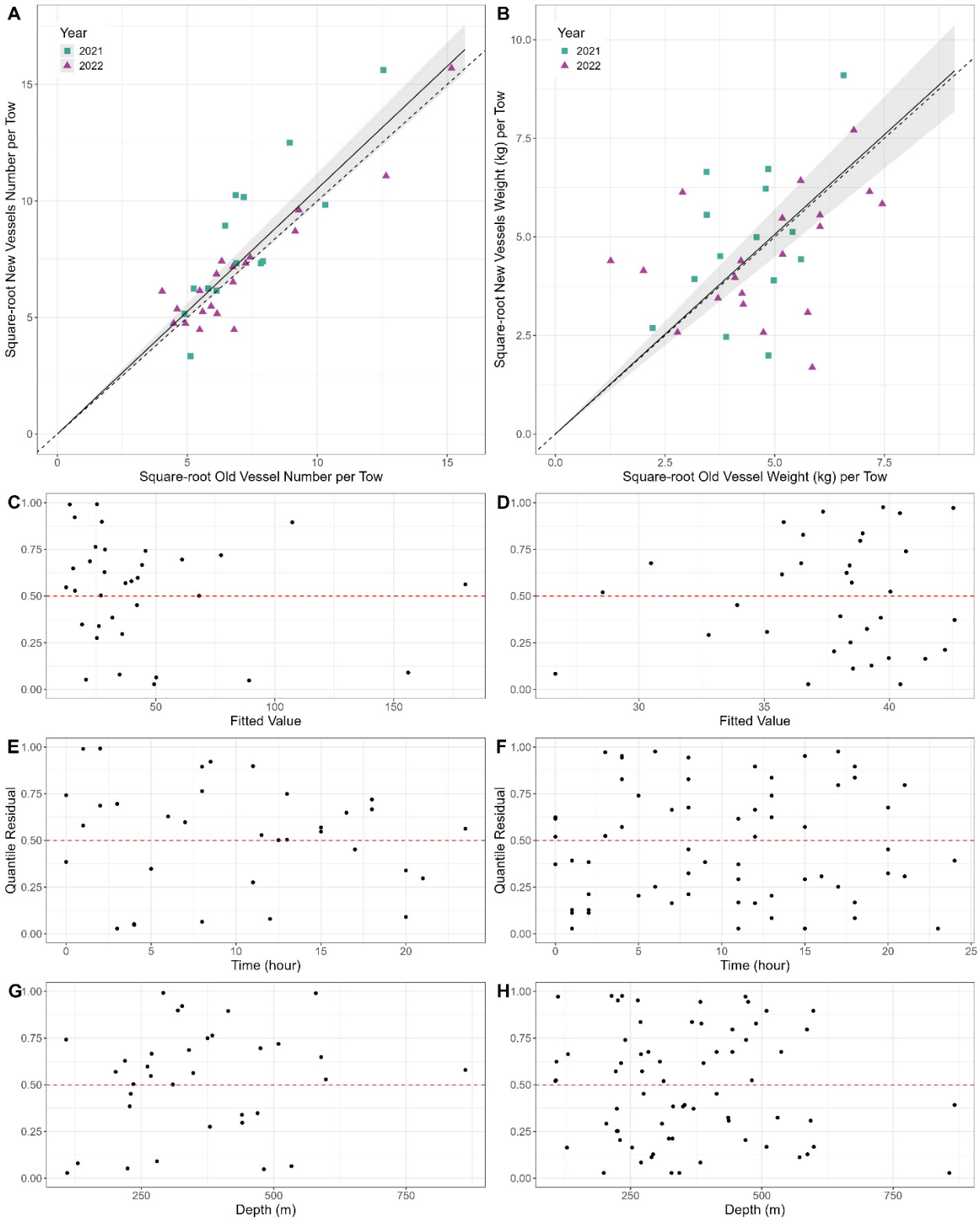

Figure 47. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for large benthivores on the Labrador Shelf (NAFO Div. 2H-fall).*

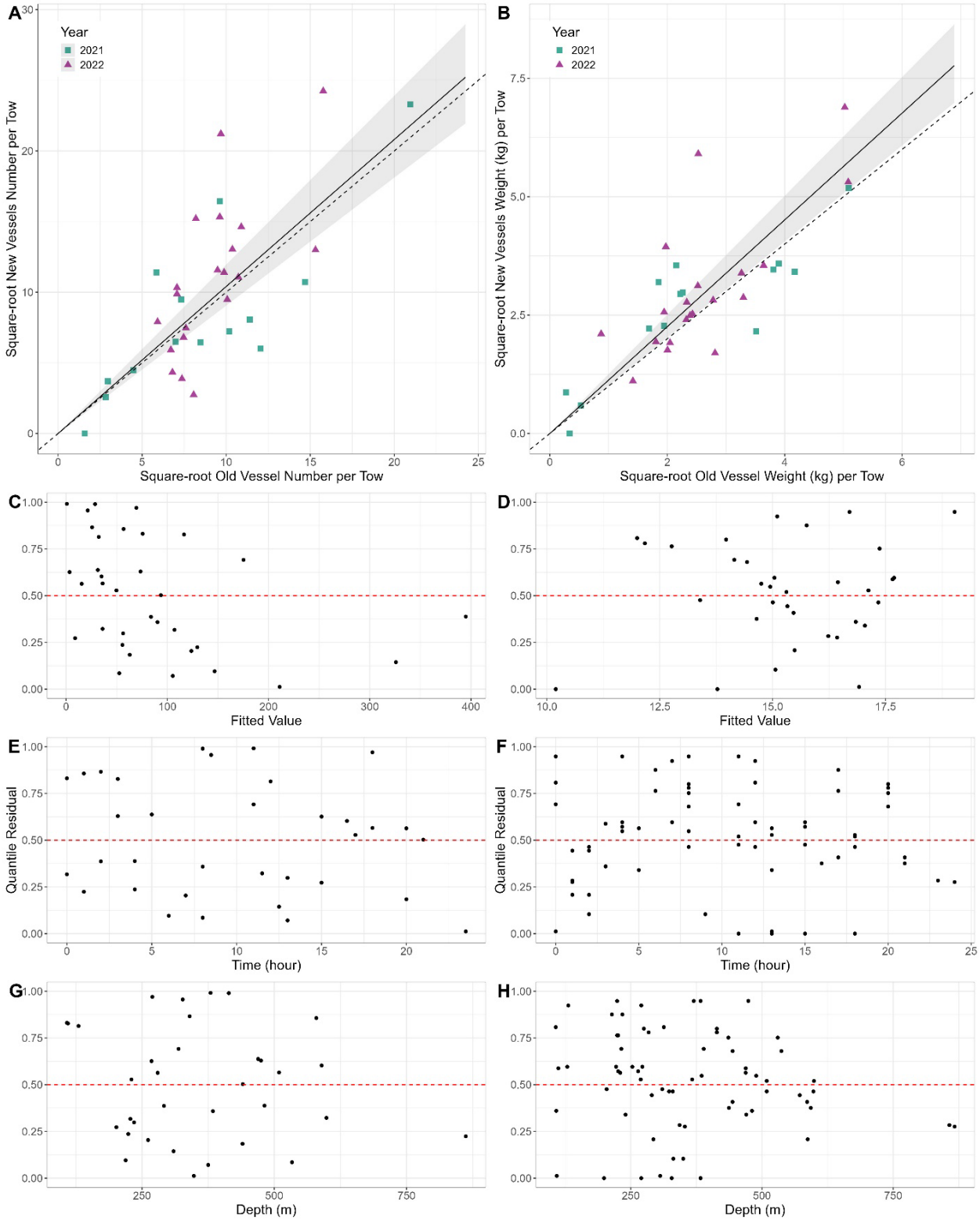

Figure 48. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for medium benthivores on the Labrador Shelf (NAFO Div. 2H-fall).*

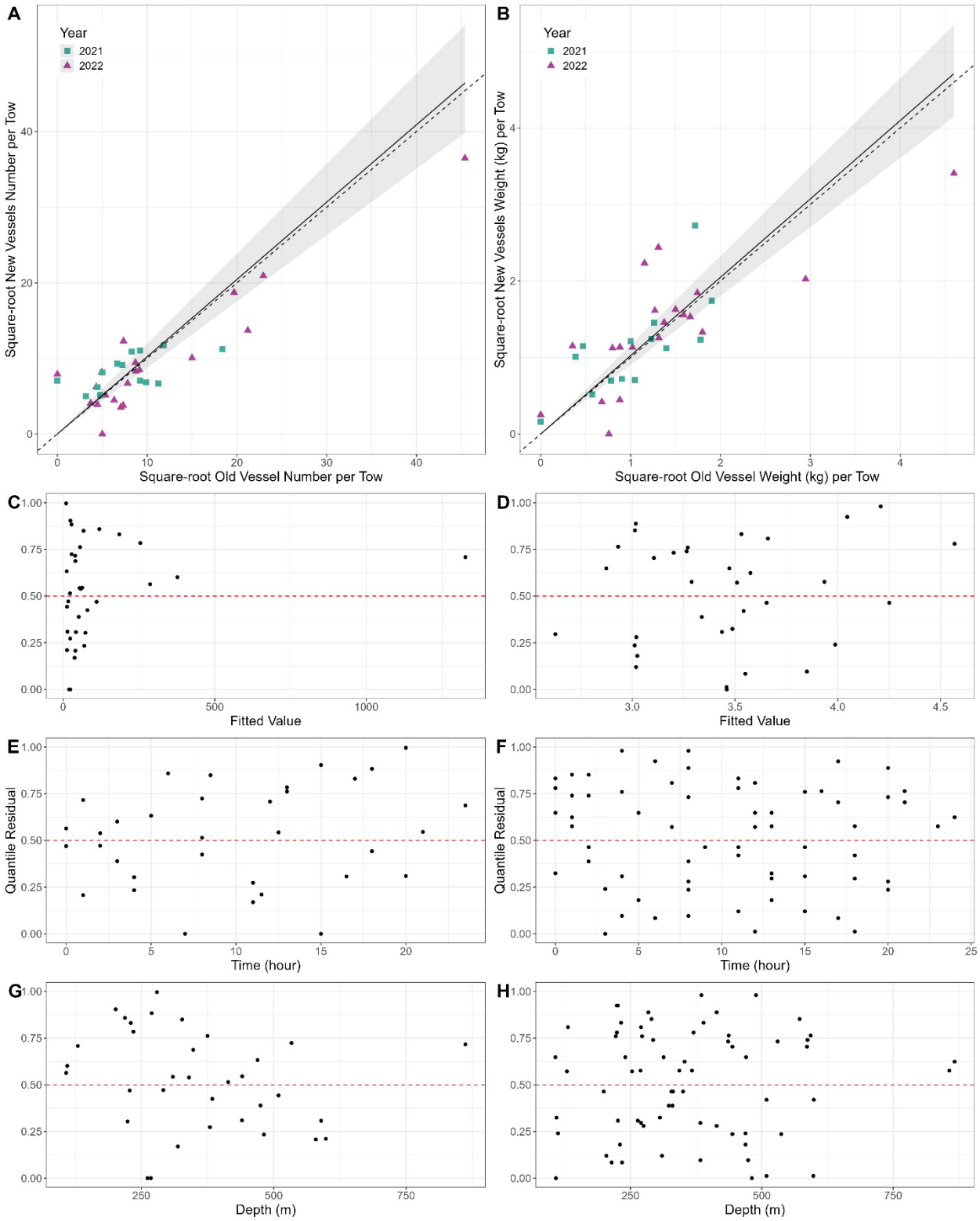

Figure 49. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for small benthivores on the Labrador Shelf (NAFO Div. 2H-fall).*

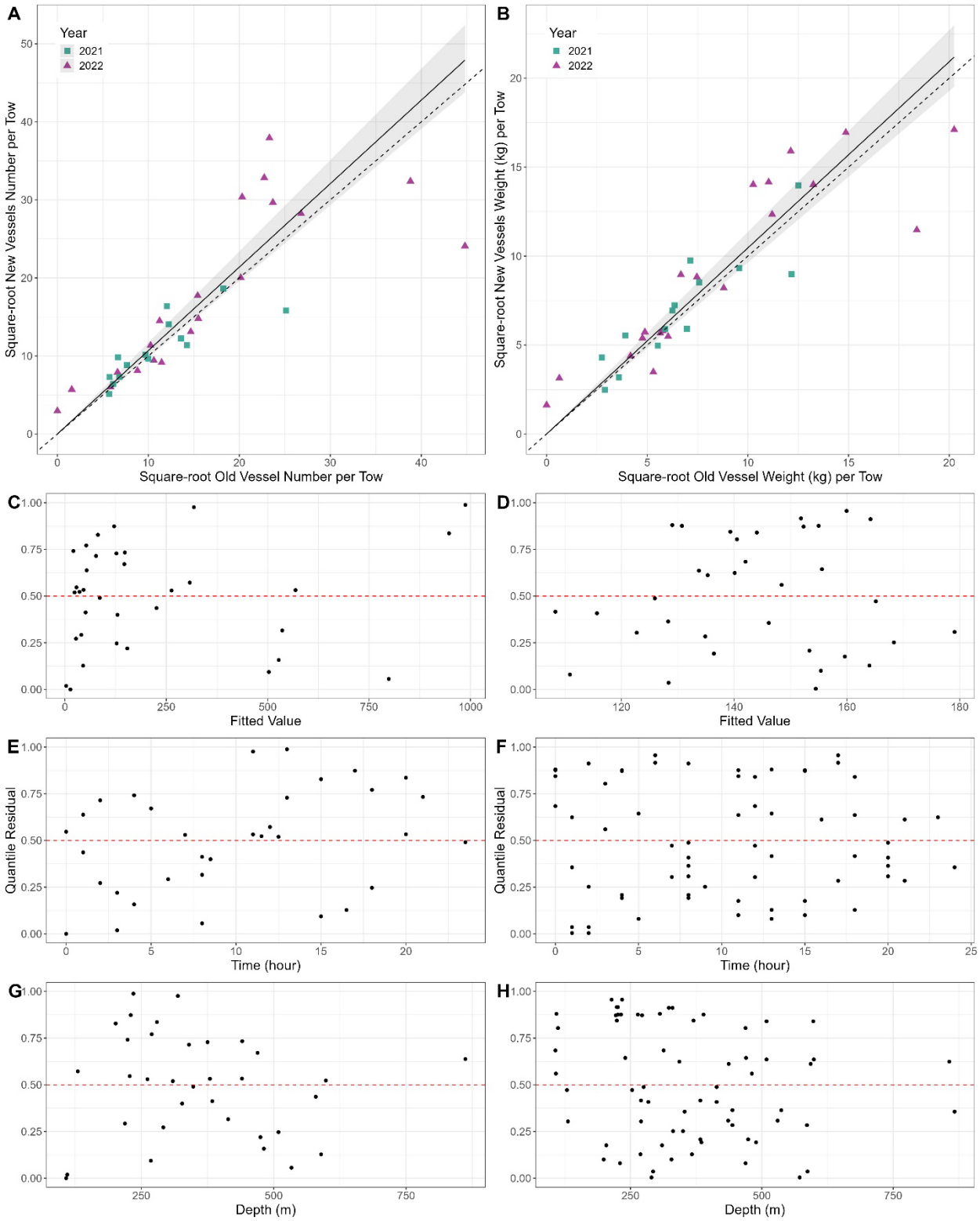

Figure 50. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for piscivores on the Labrador Shelf (NAFO Div. 2H-fall).*

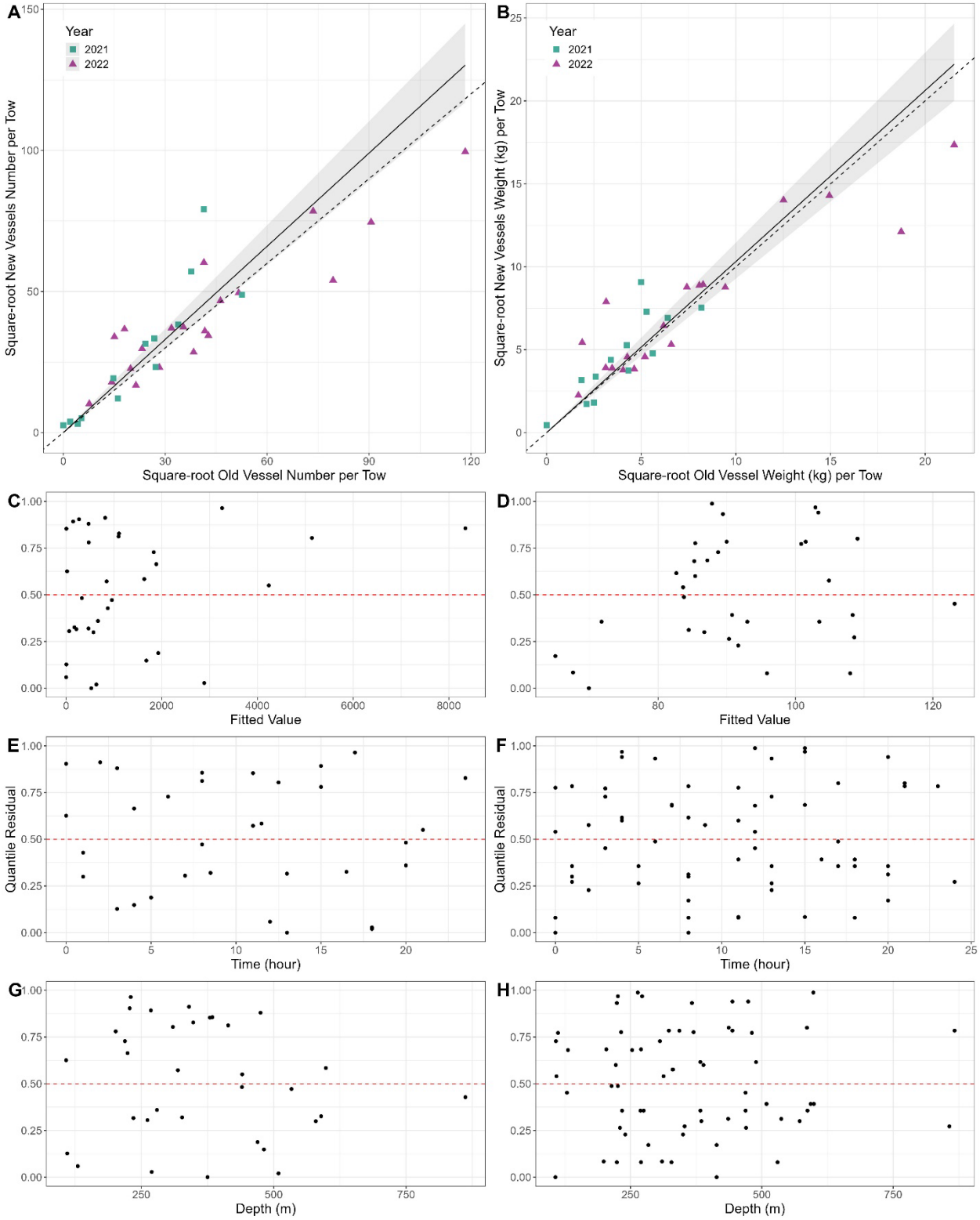

Figure 51. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for plank-piscivores on the Labrador Shelf (NAFO Div. 2H-fall).*

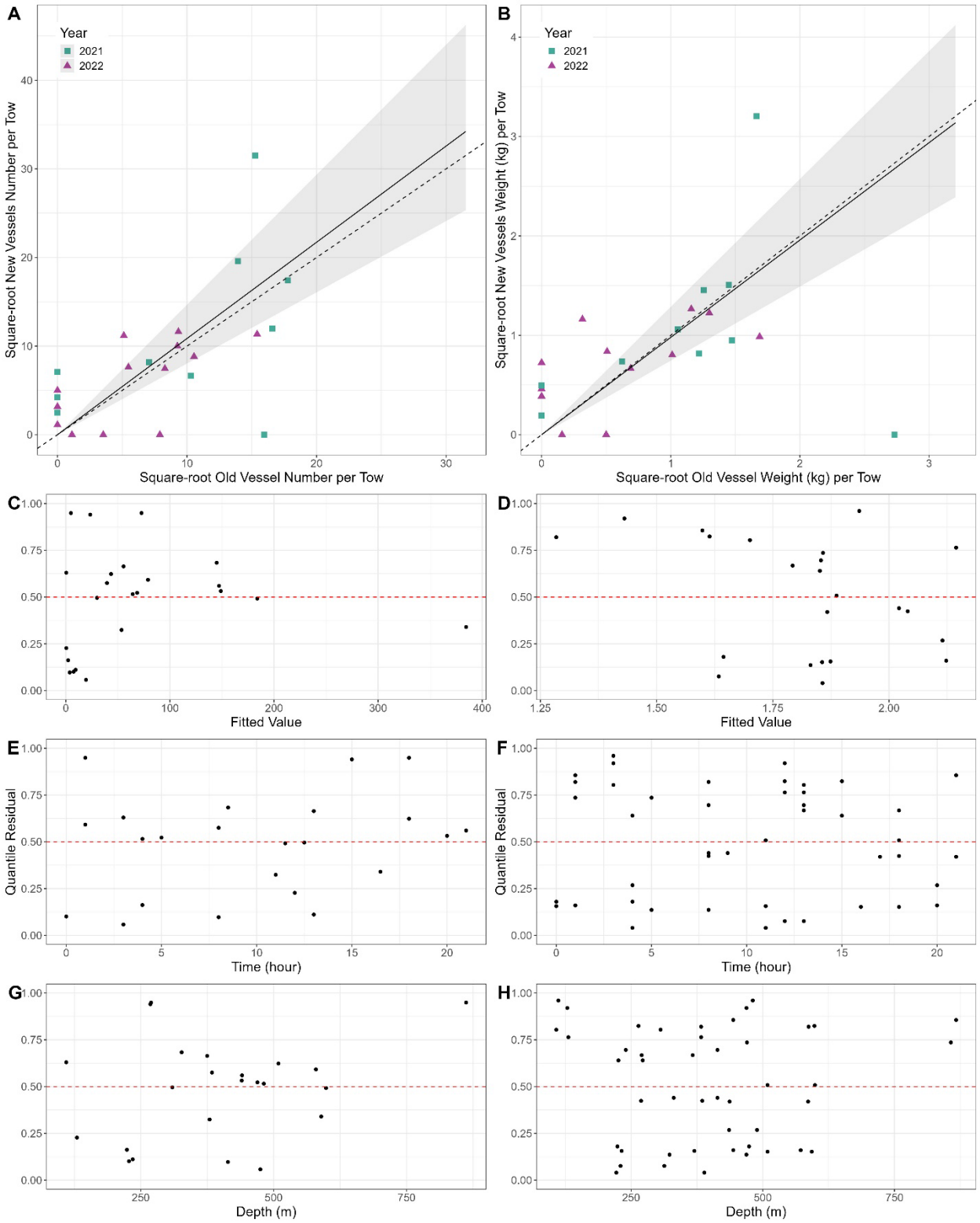

Figure 52. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for planktivores on the Labrador Shelf (NAFO Div. 2H-fall).*

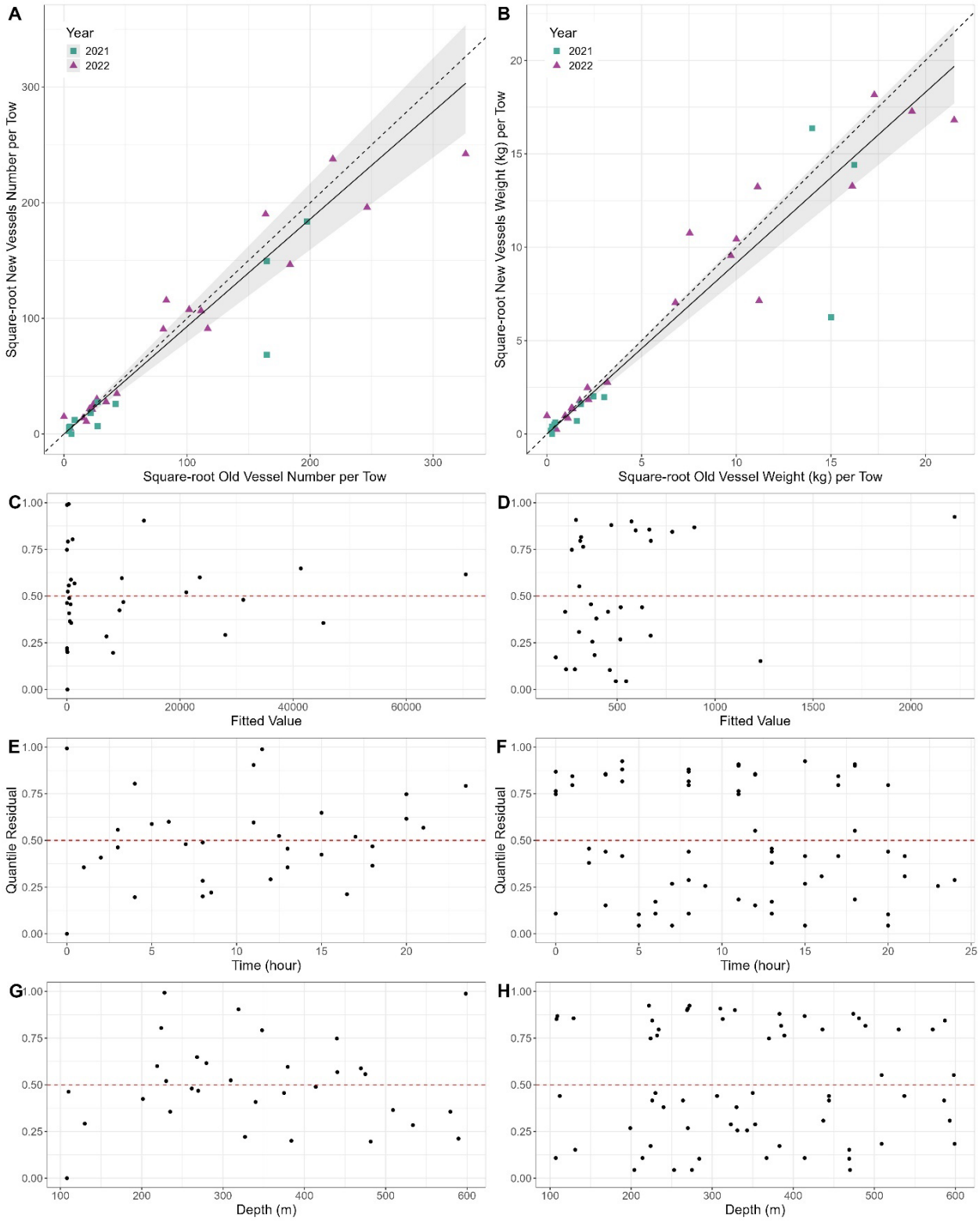

Figure 53. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for shellfish on the Labrador Shelf (NAFO Div. 2H-fall).*

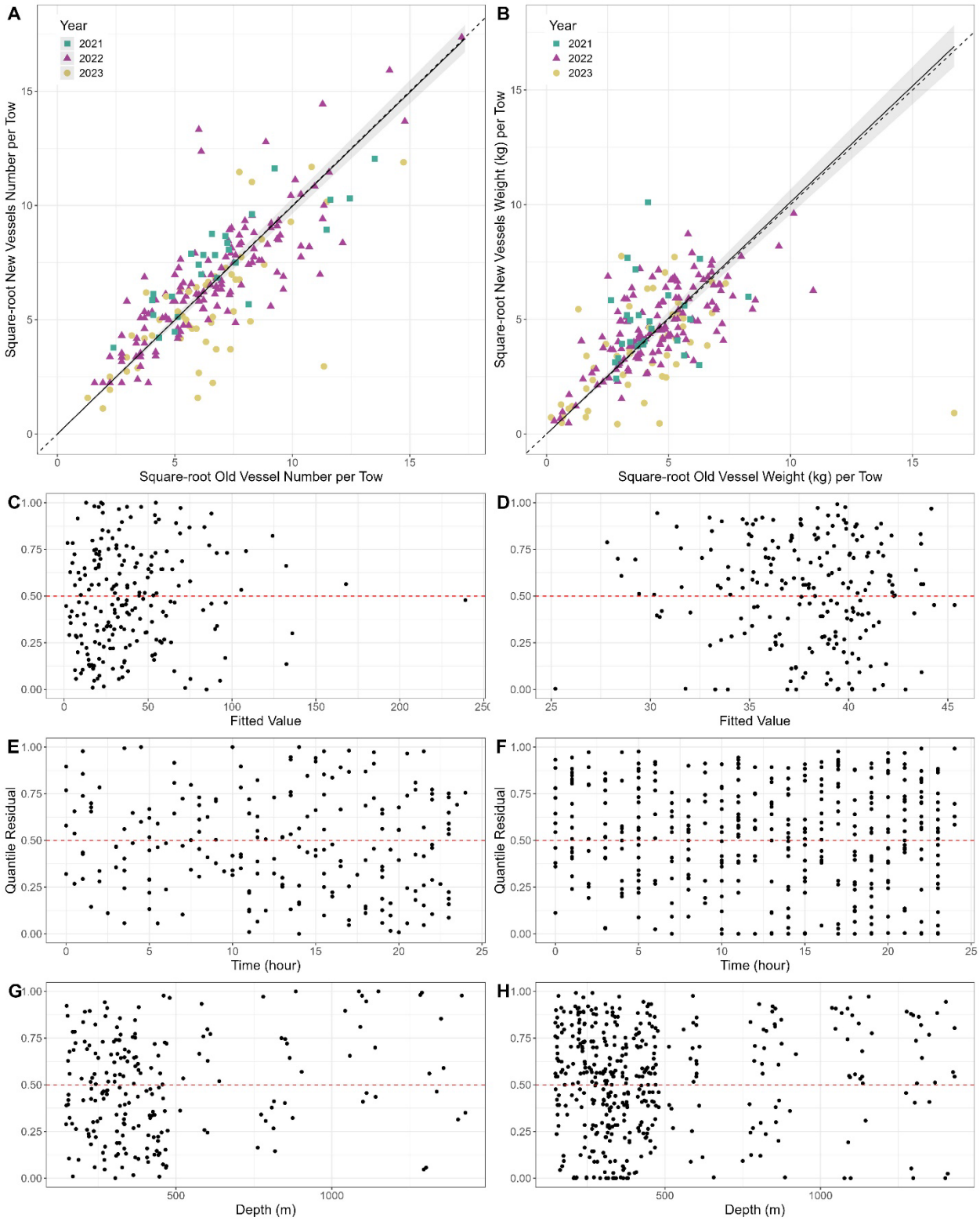

Figure 54. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for large benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

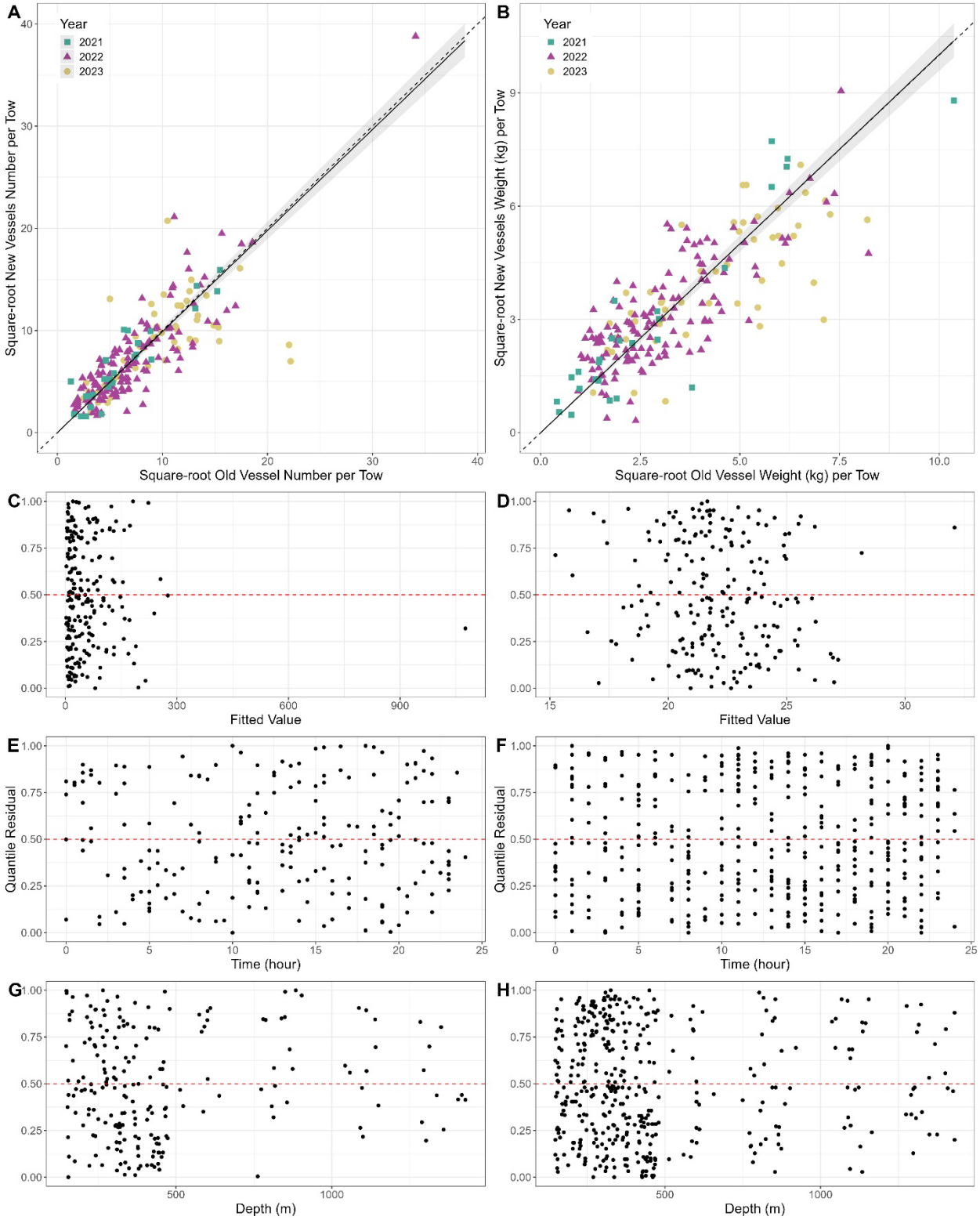

Figure 55. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for medium benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

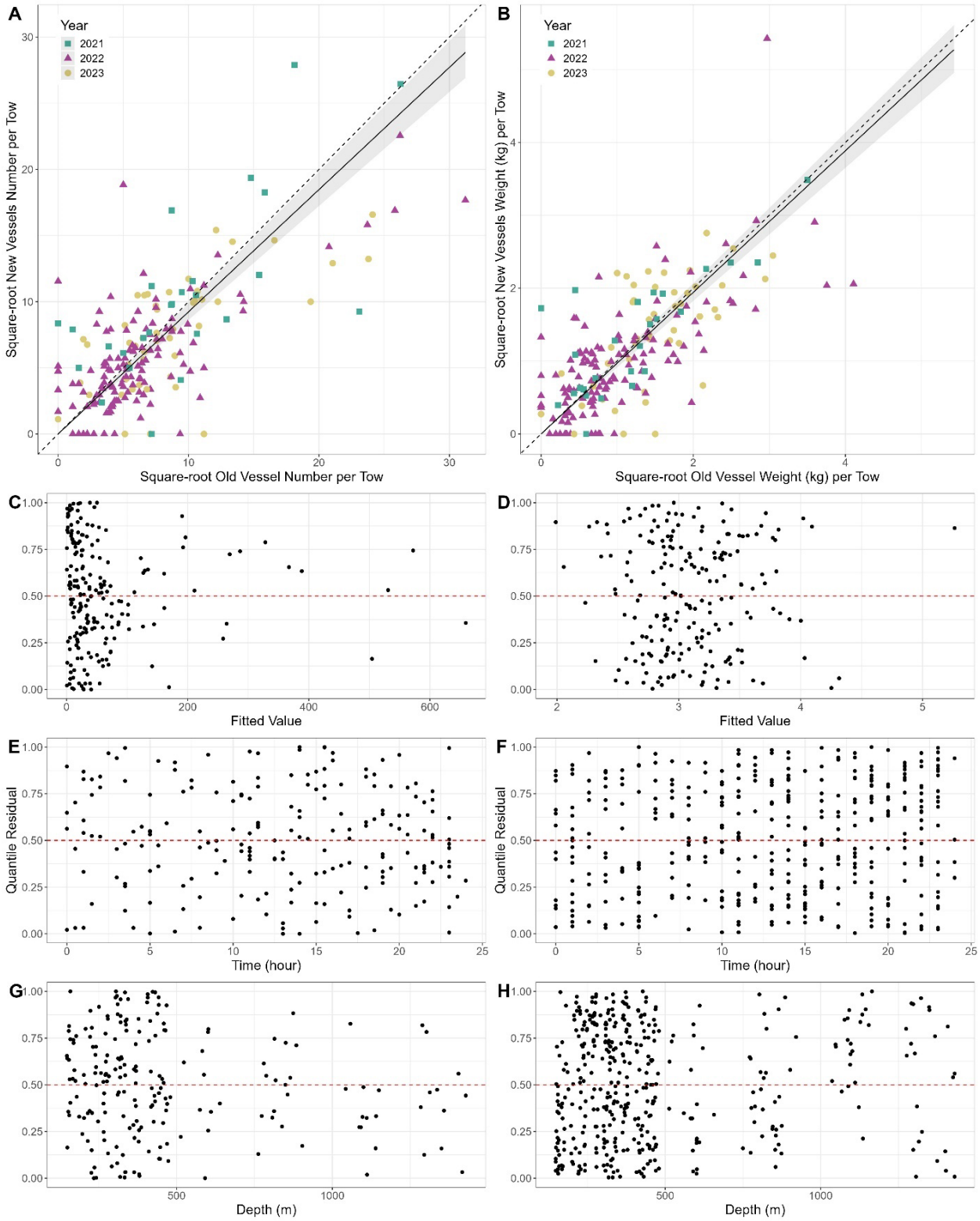

Figure 56. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for small benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

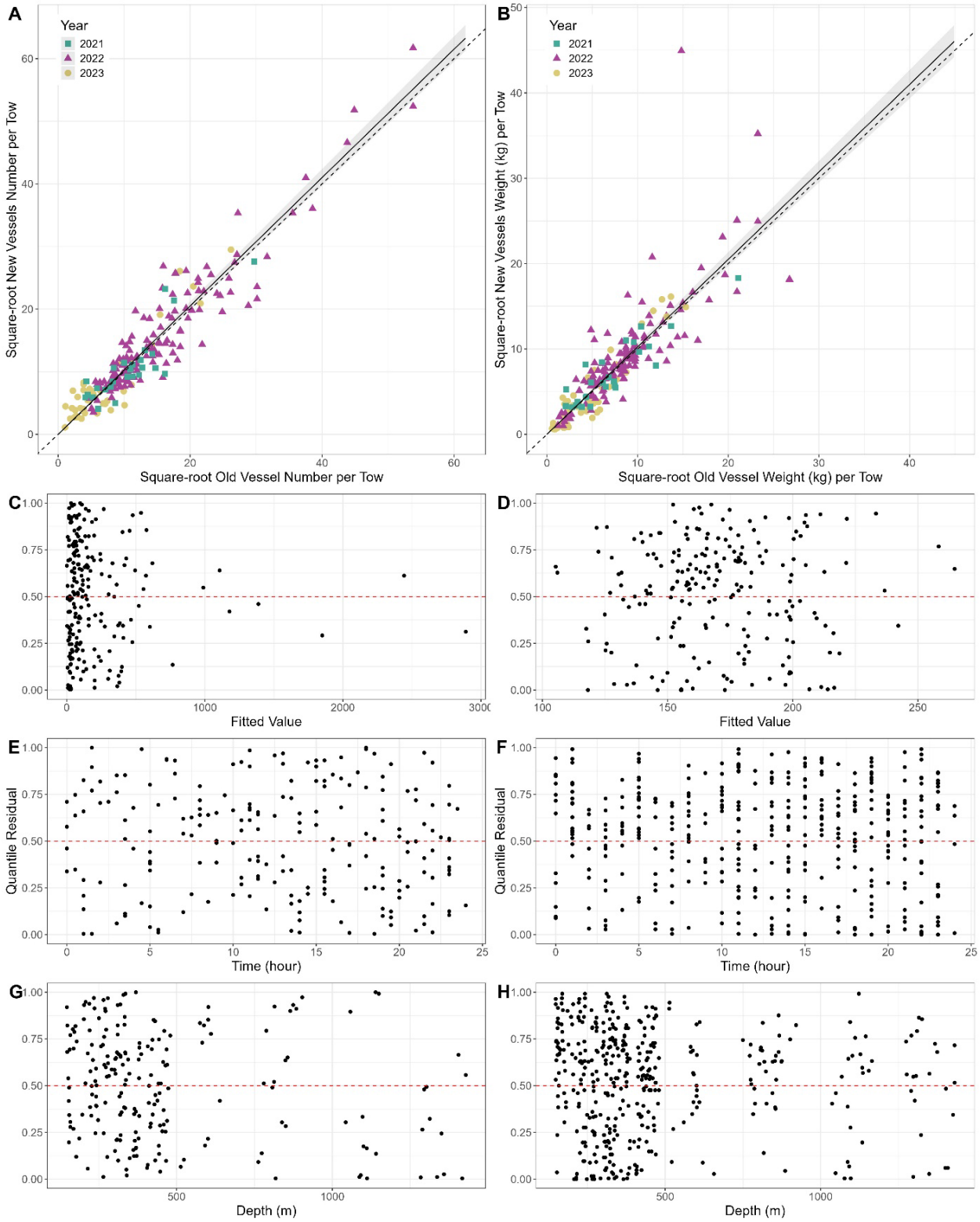

Figure 57. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for piscivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

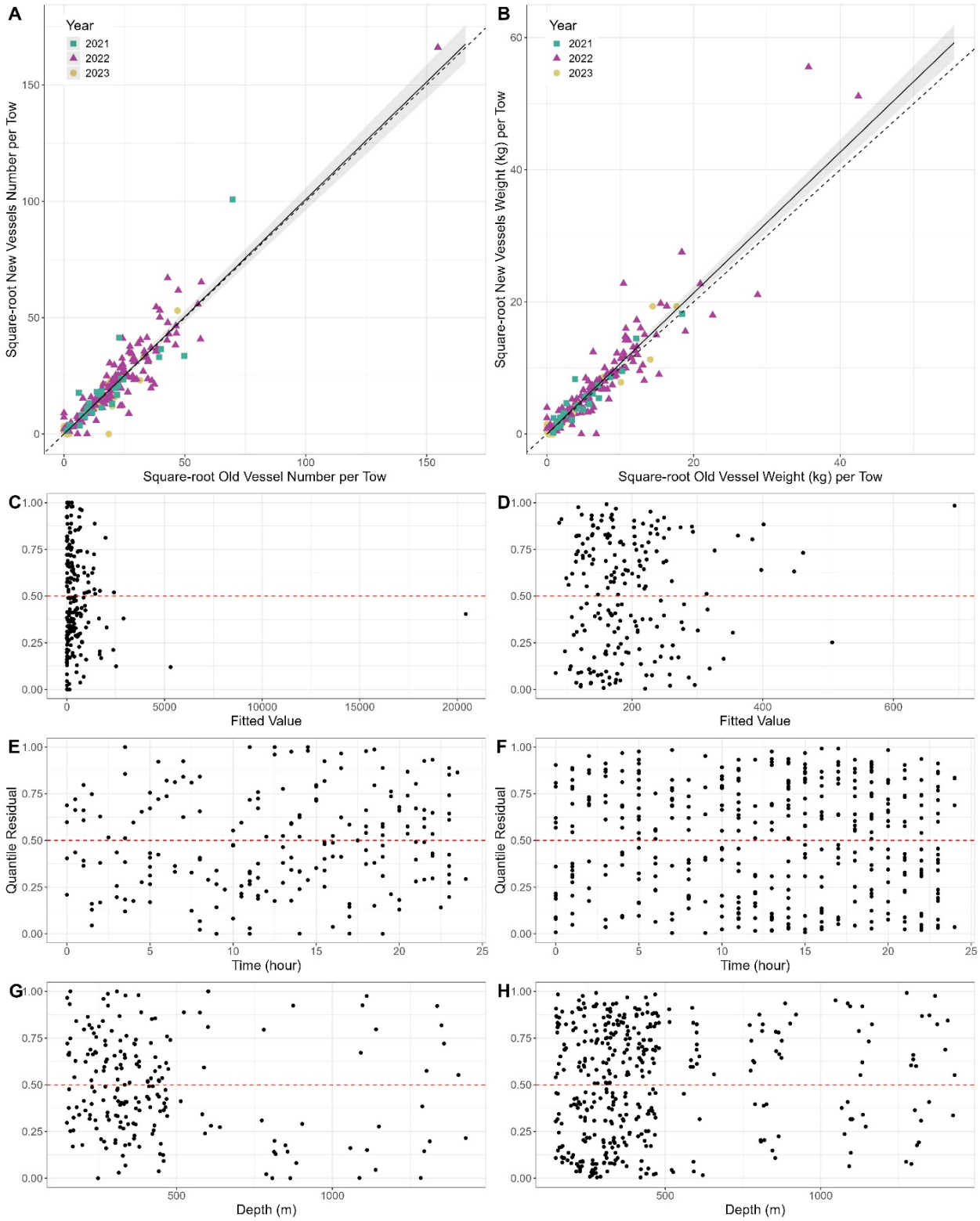

Figure 58. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for plank-piscivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

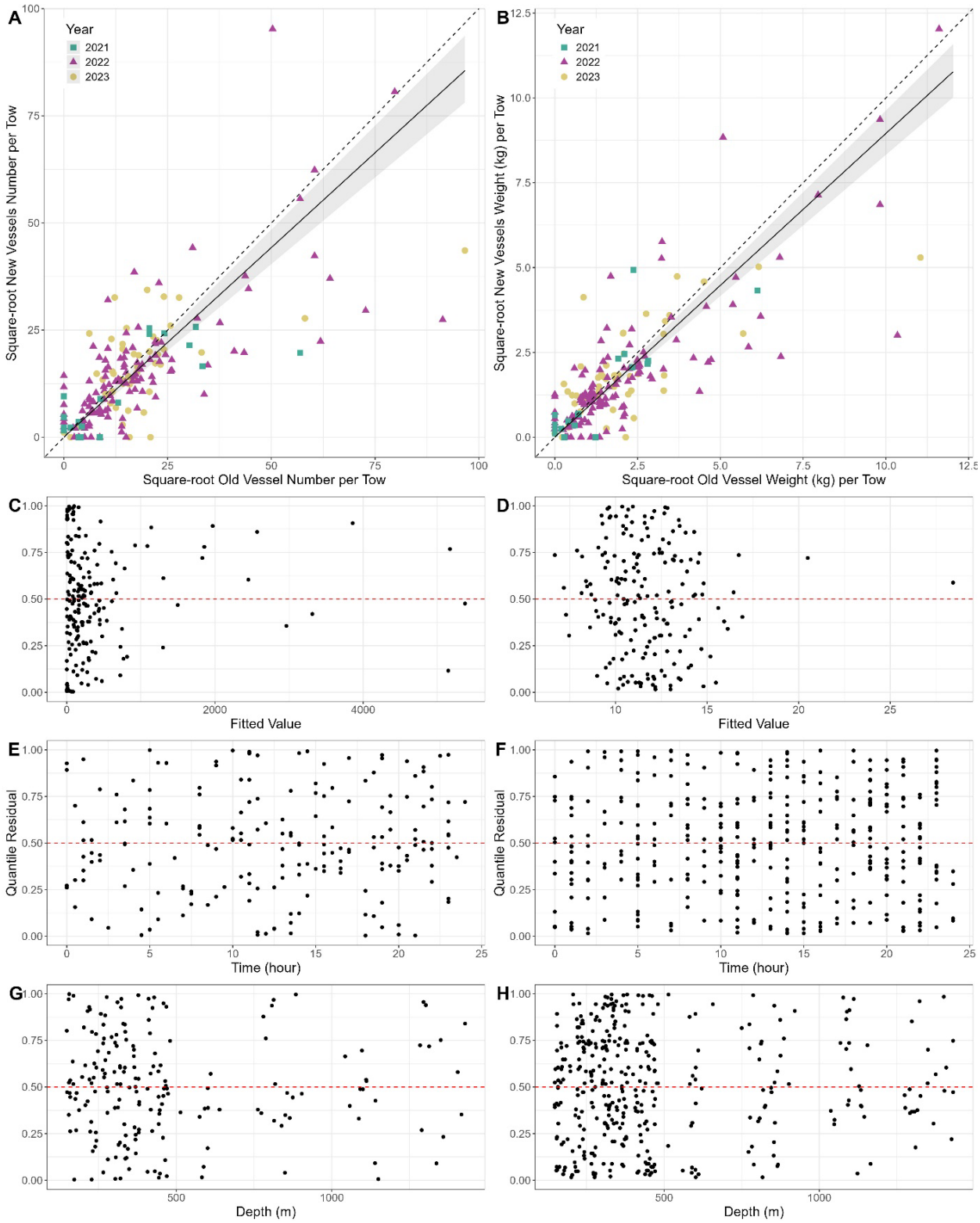

Figure 59. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for planktivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

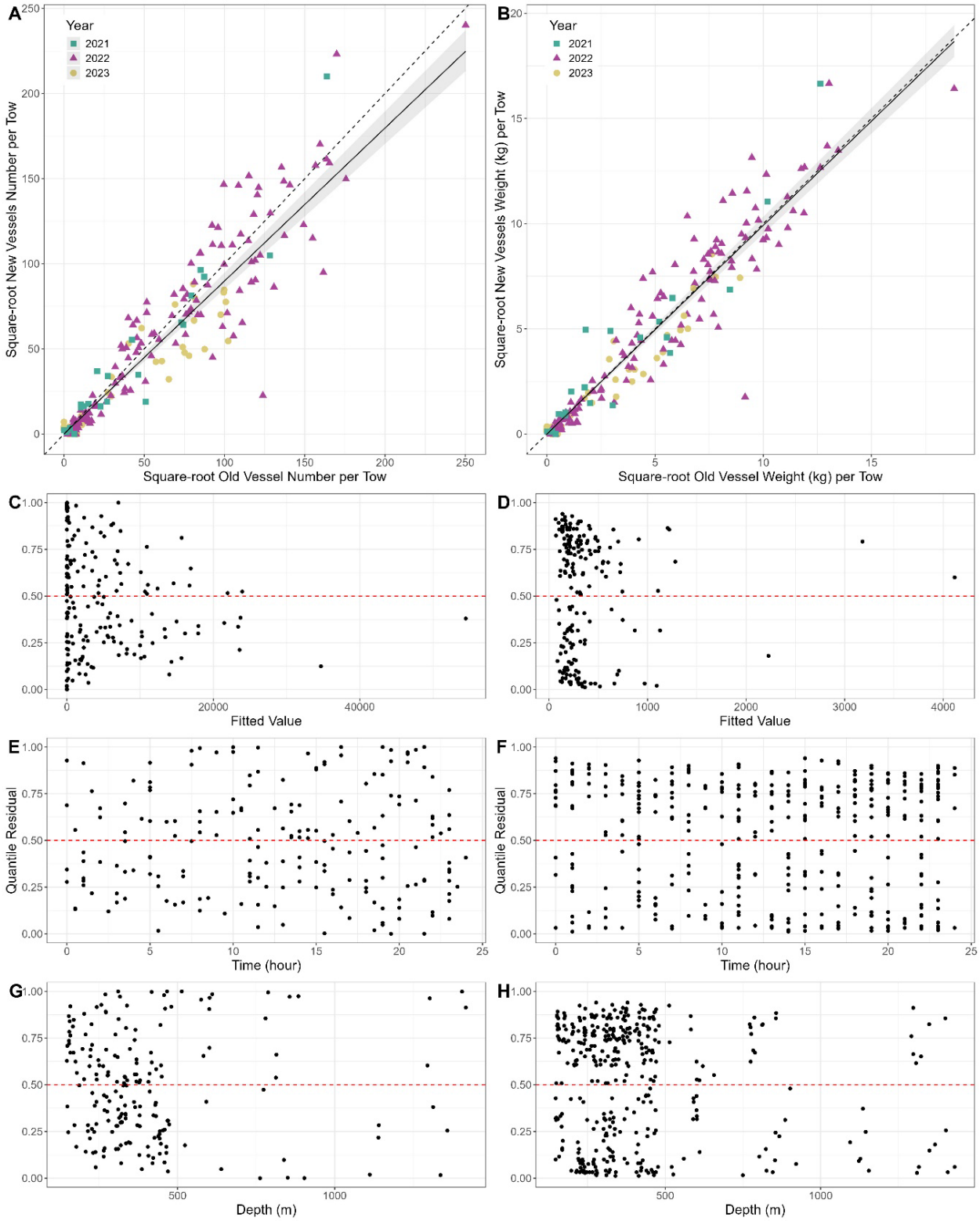

Figure 60. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for shellfish on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

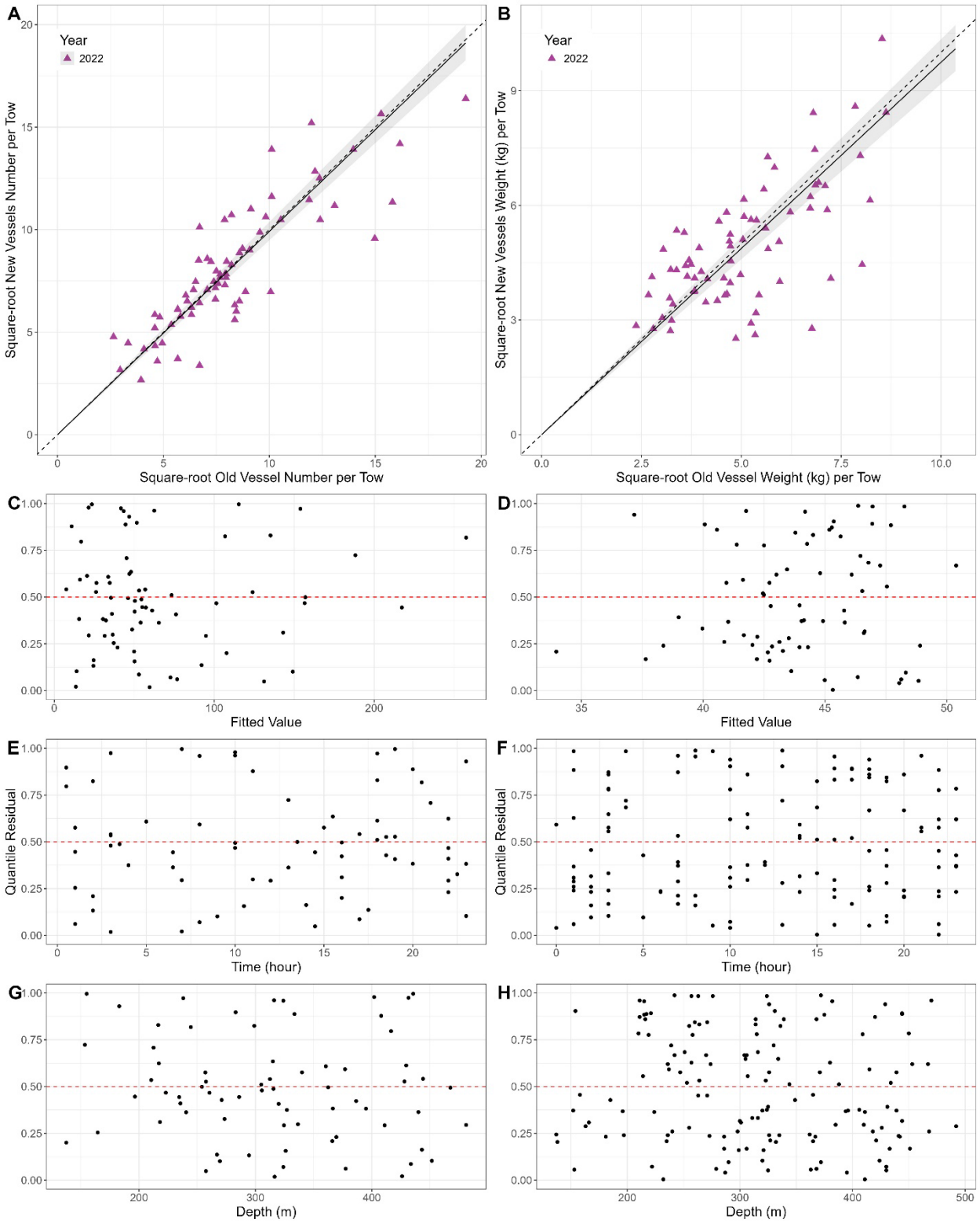

Figure 61. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for large benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

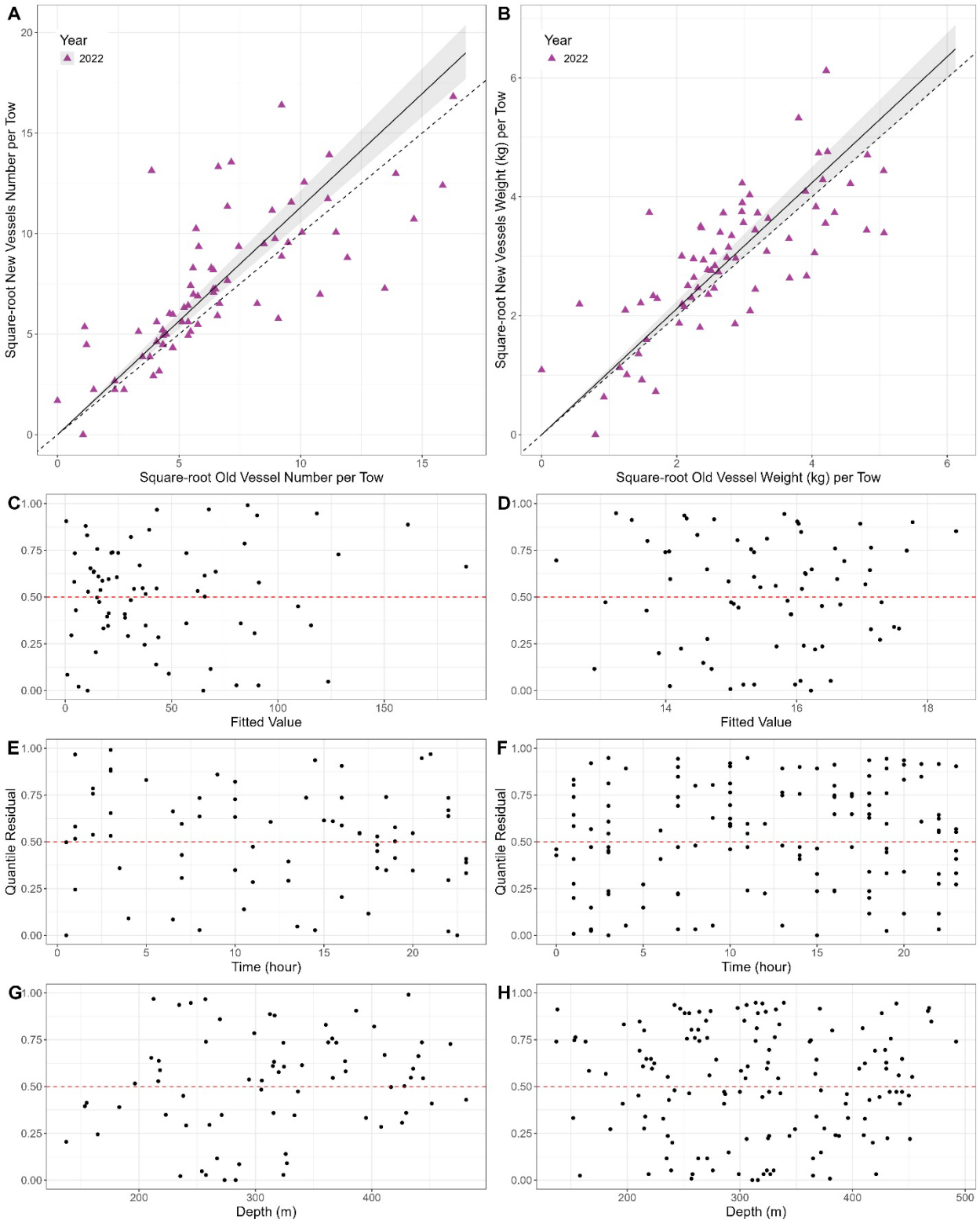

Figure 62. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for medium benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

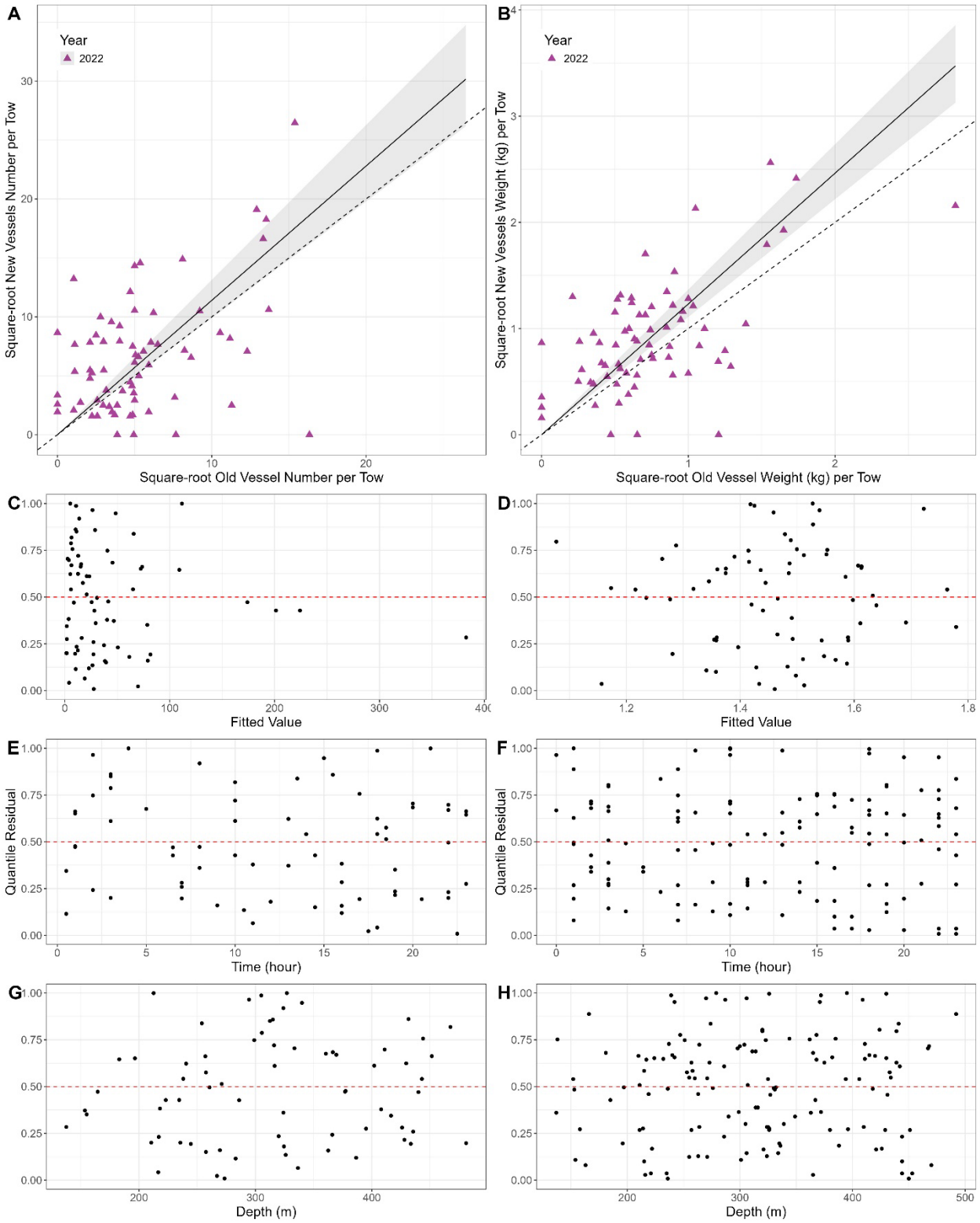

Figure 63. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for small benthivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

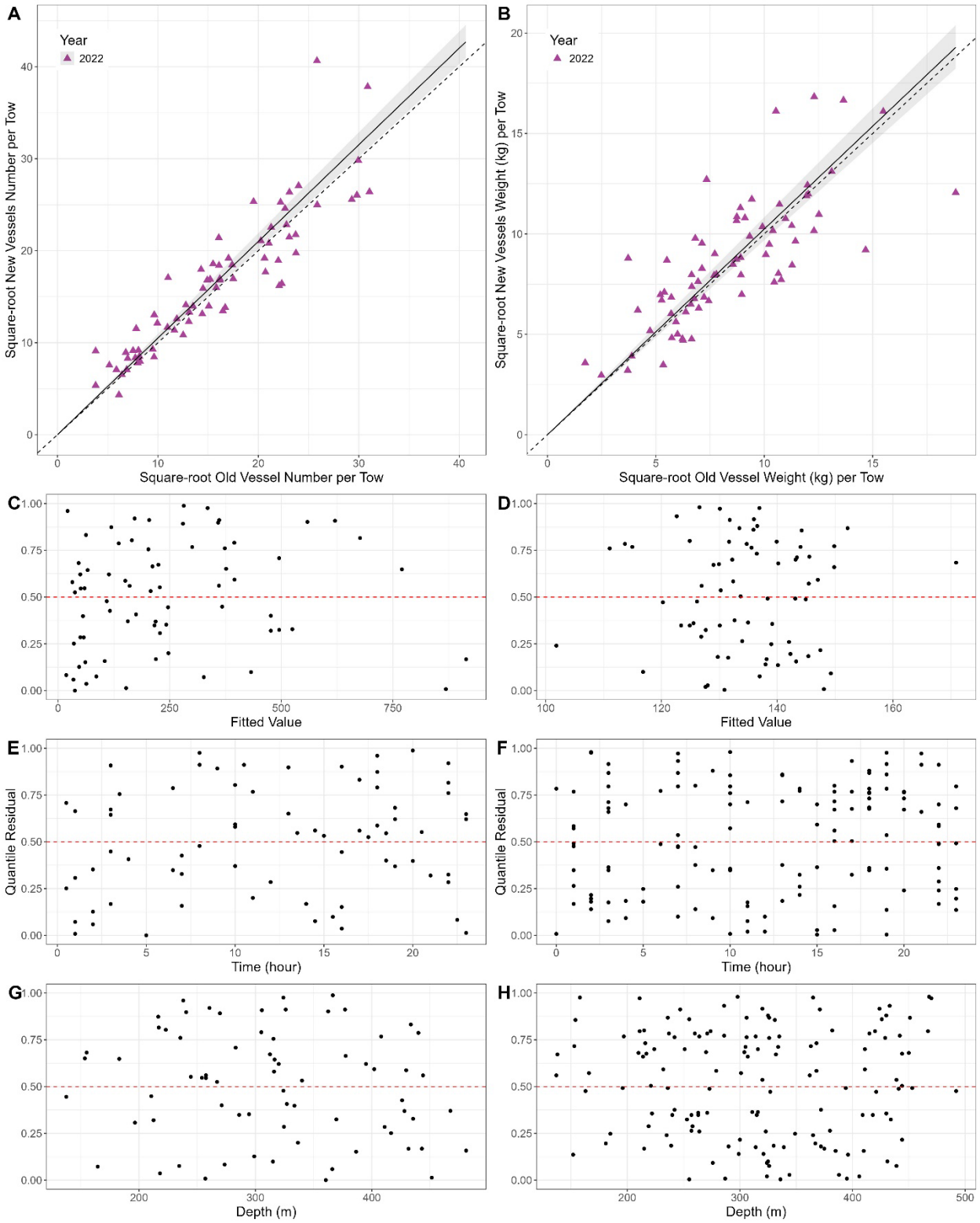

Figure 64. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for piscivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

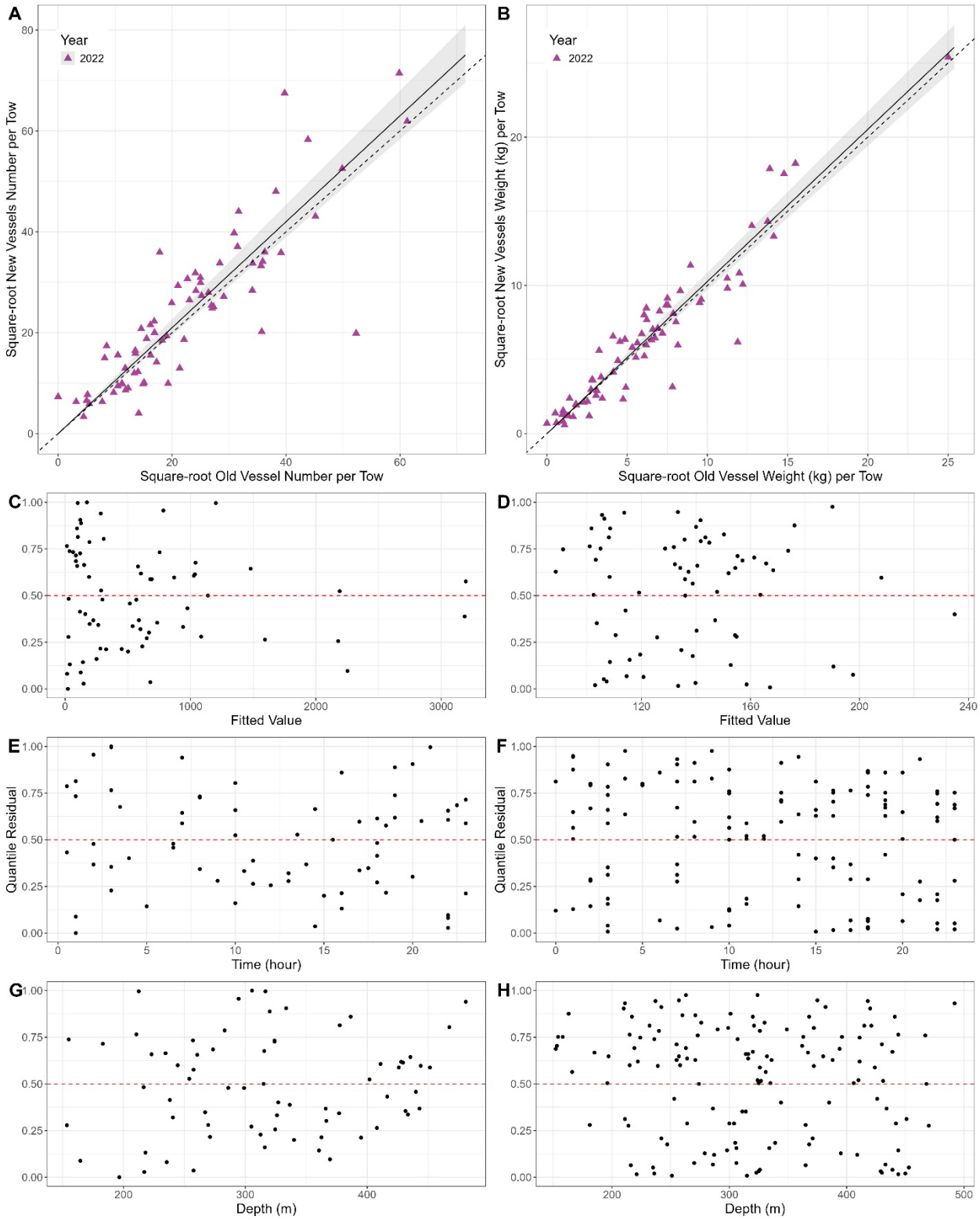

Figure 65. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for plank-piscivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

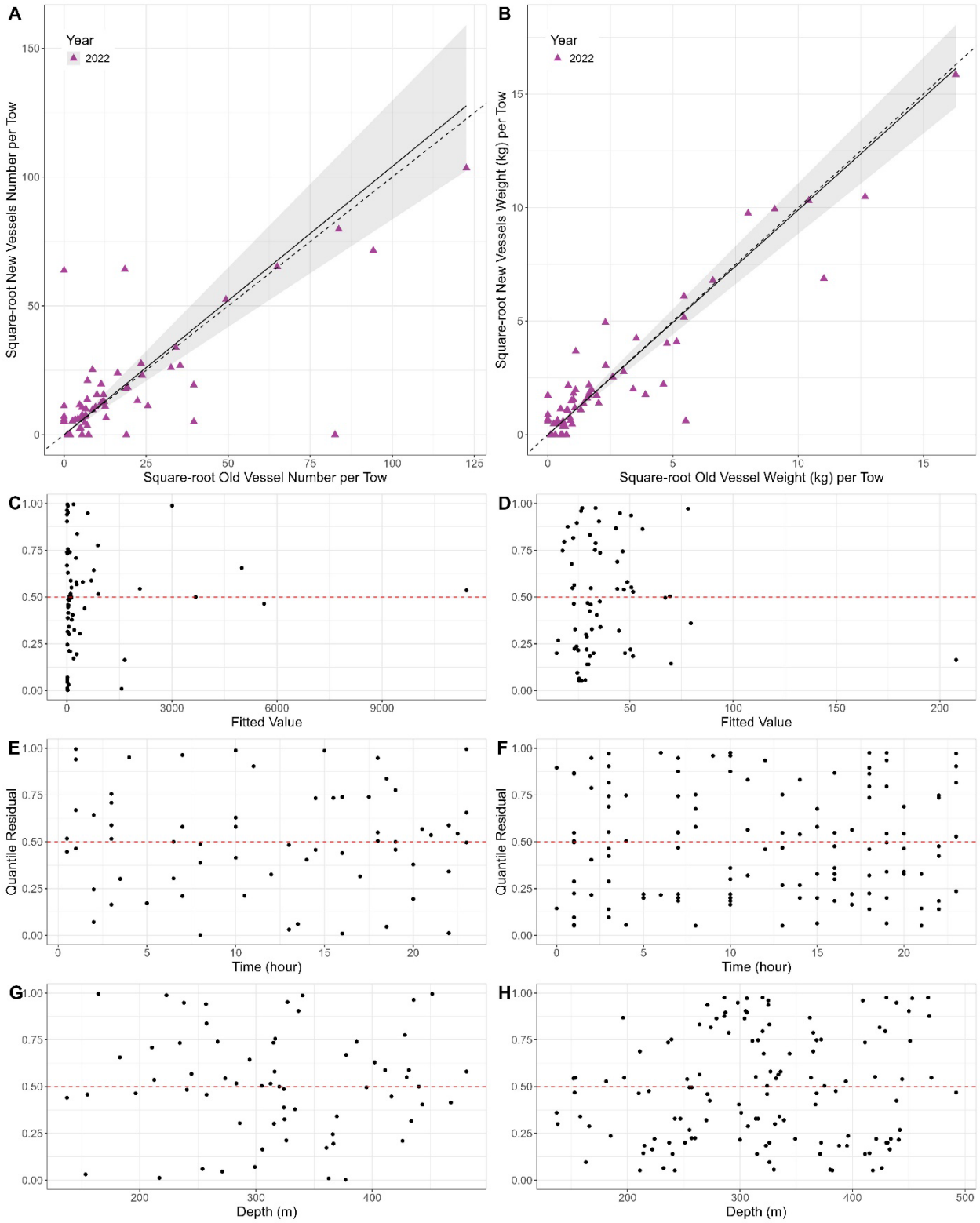

Figure 66. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for planktivores on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

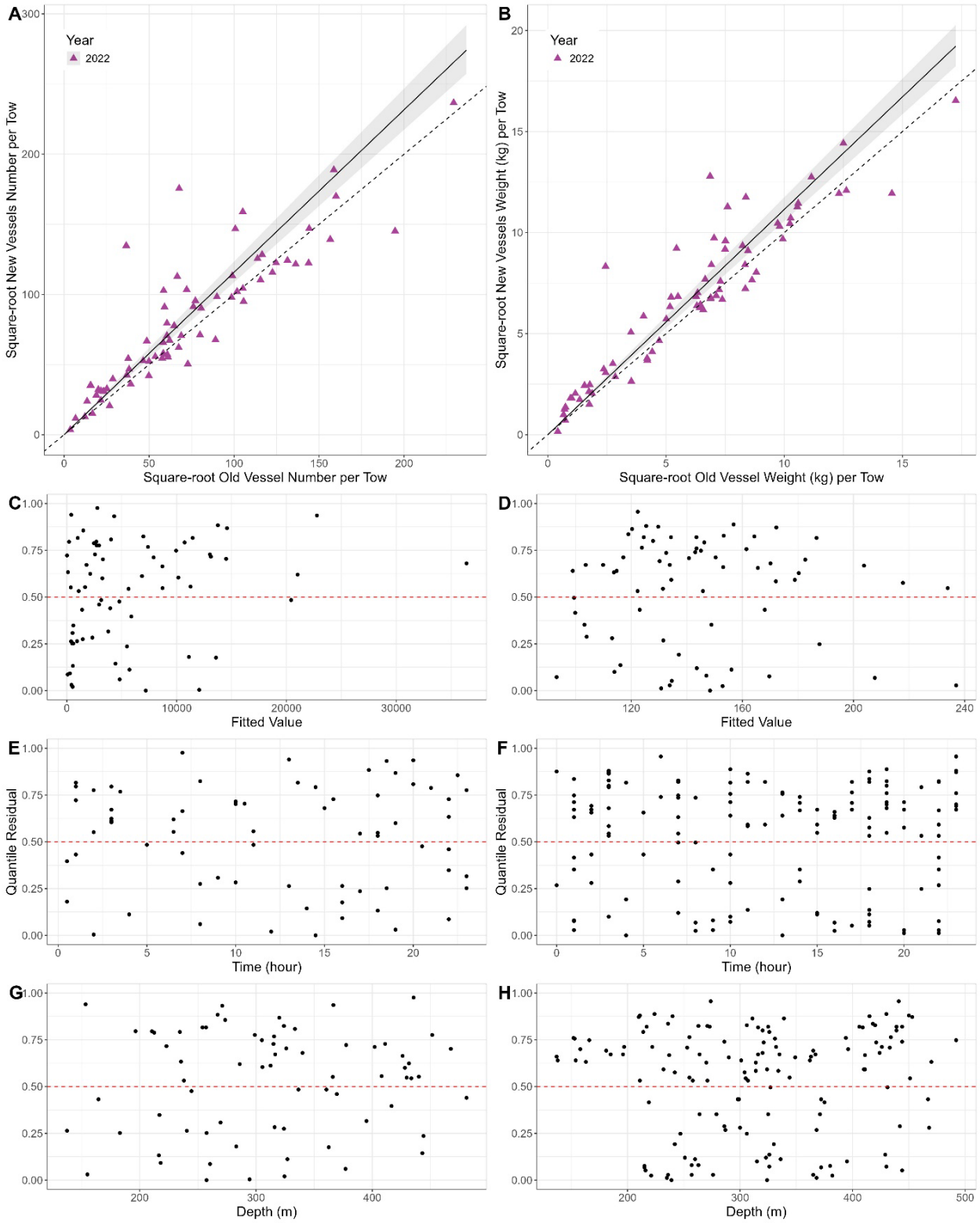

Figure 67. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for shellfish on the Newfoundland Shelf (NAFO Div. 2J3K-fall).*

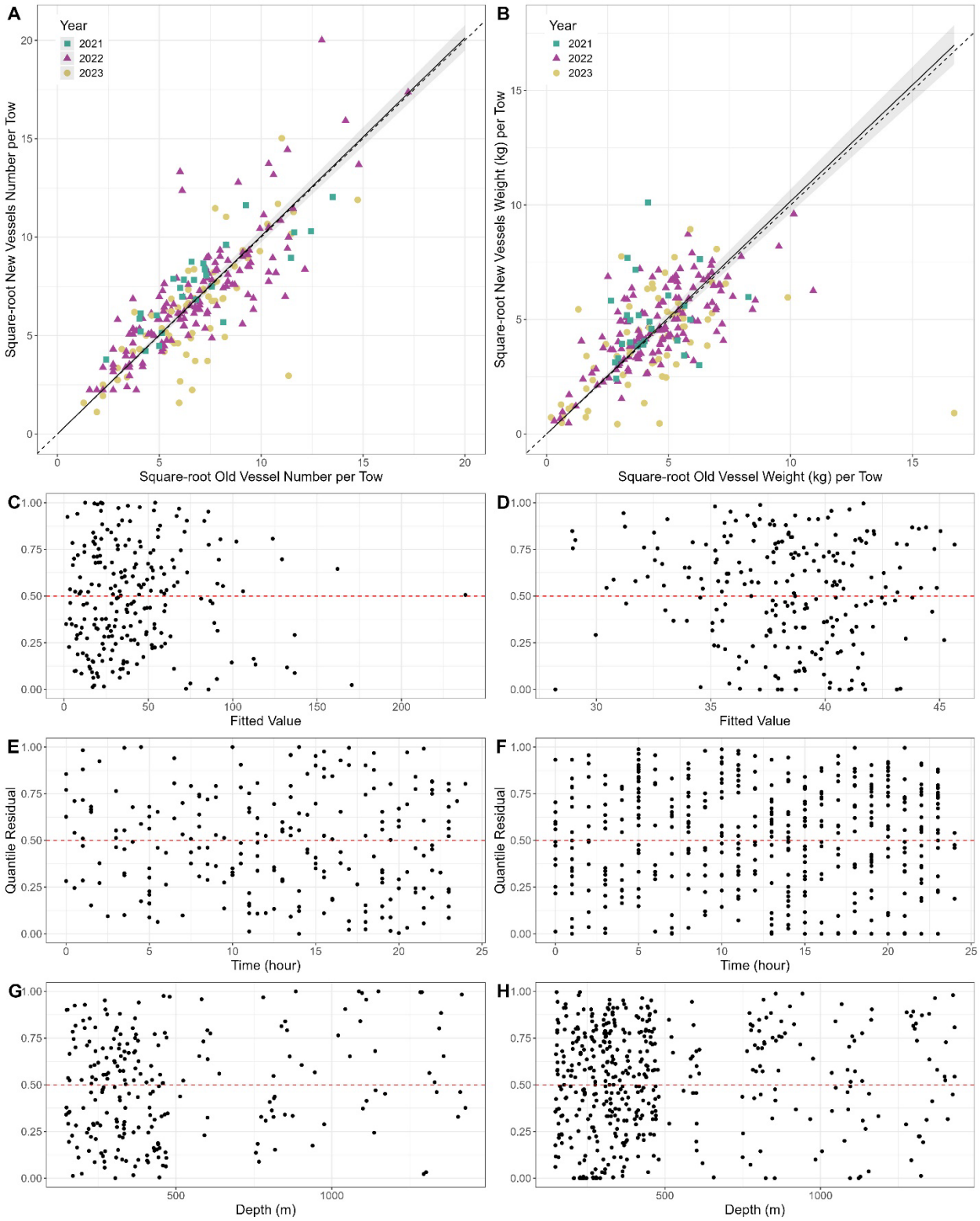

Figure 68. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for large benthivores in NAFO Div. 2J3KL-fall.*

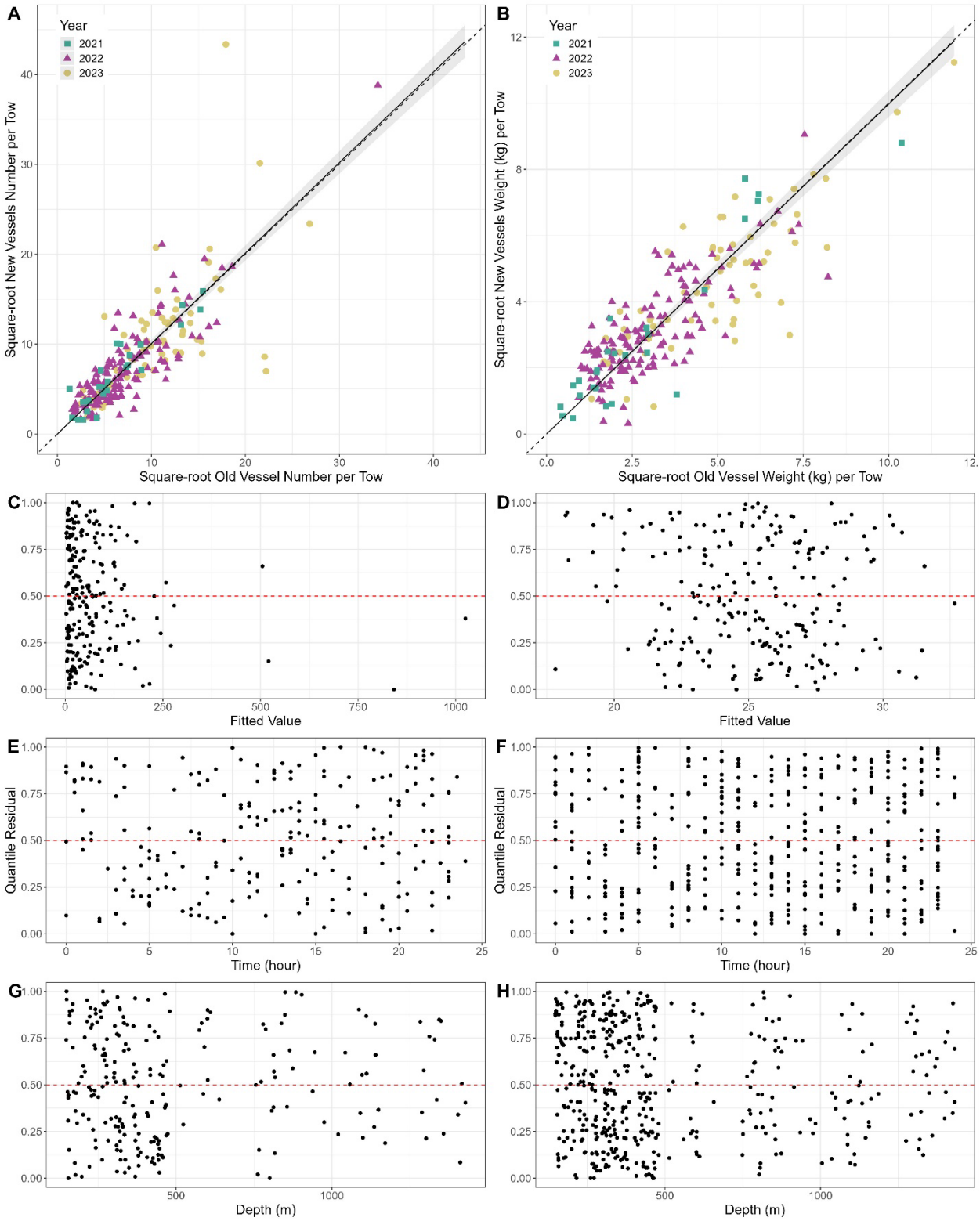

Figure 69. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for medium benthivores in NAFO Div. 2J3KL-fall.*

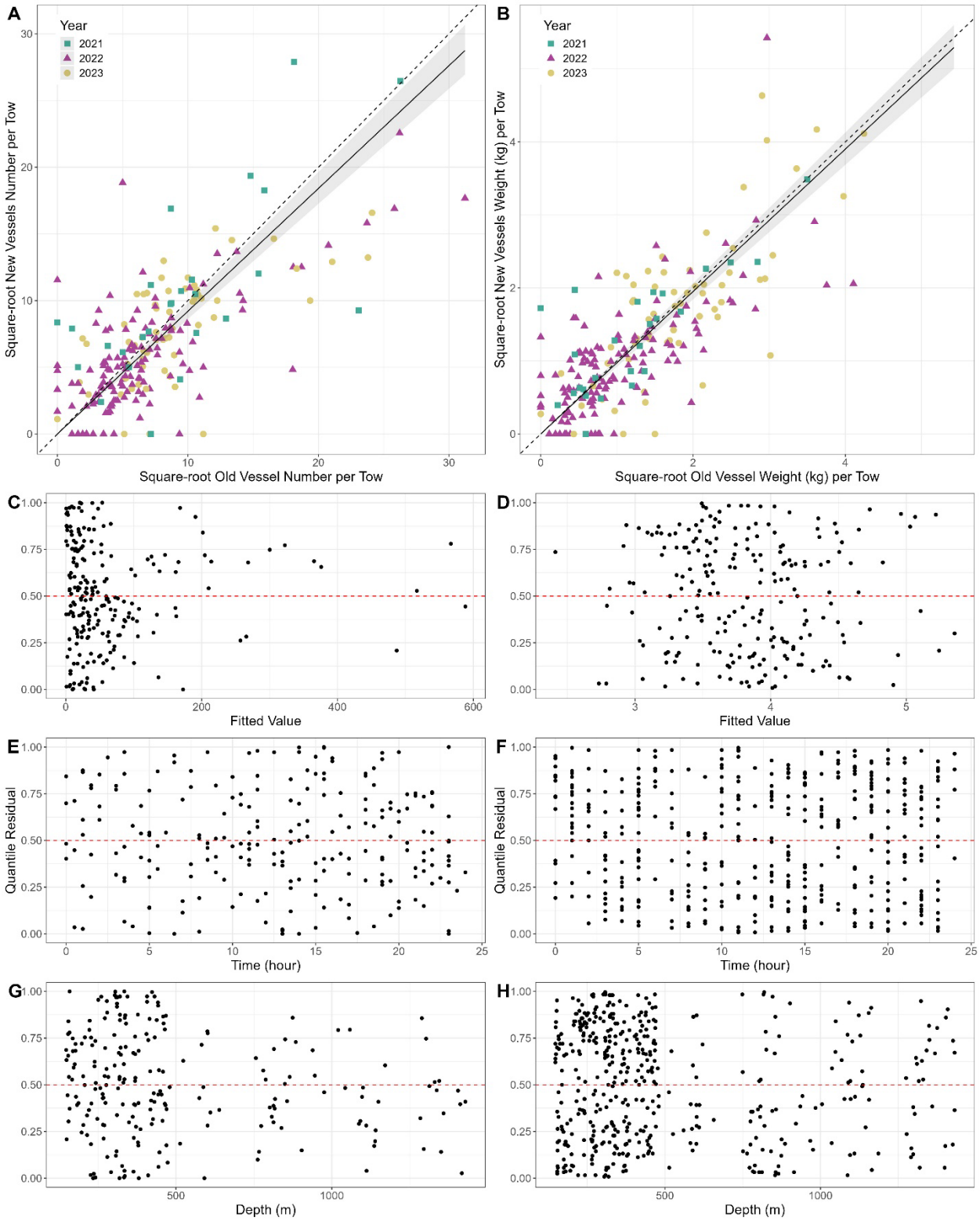

Figure 70. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for small benthivores in NAFO Div. 2J3KL-fall.*

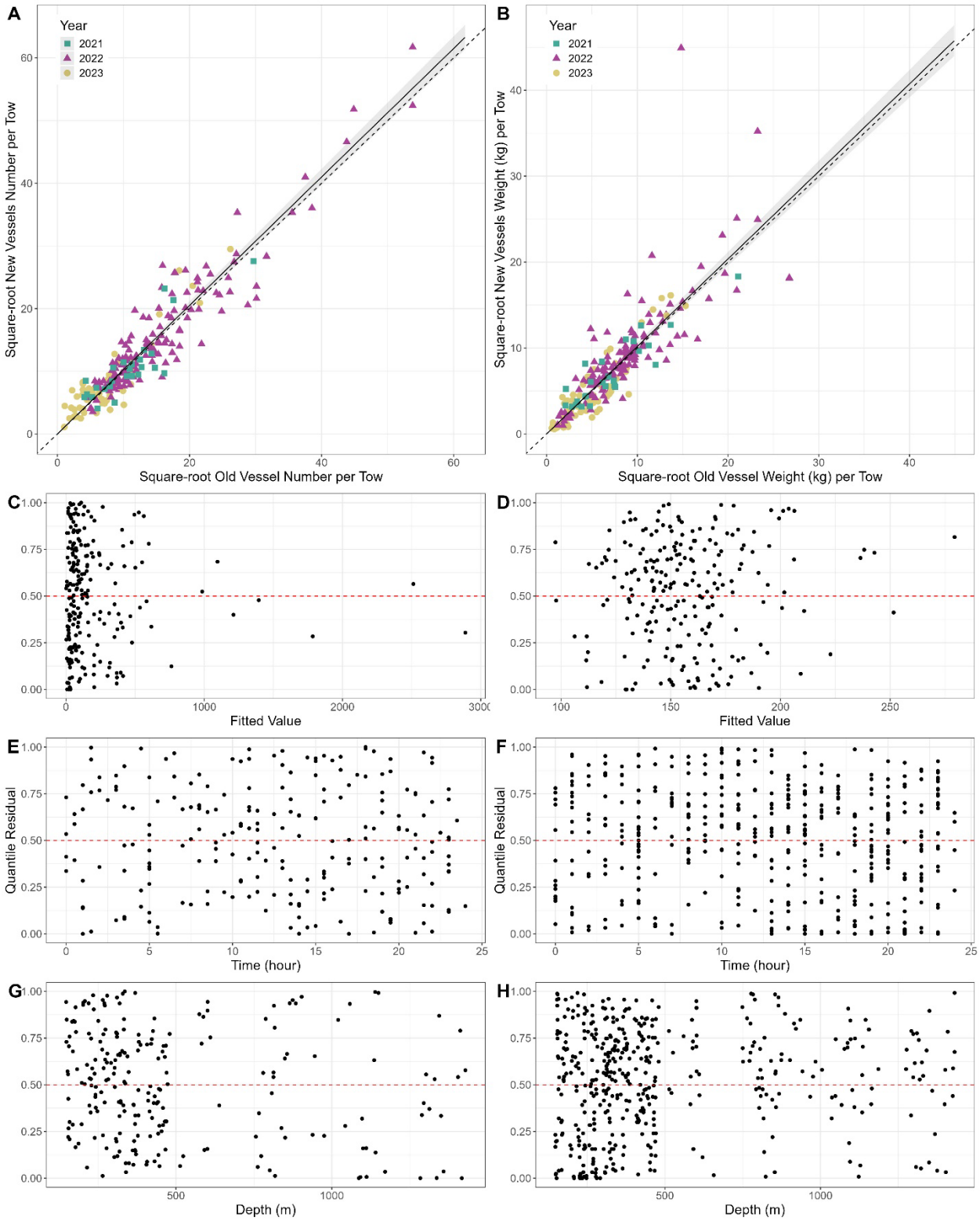

Figure 71. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for piscivores in NAFO Div. 2J3KL-fall.*

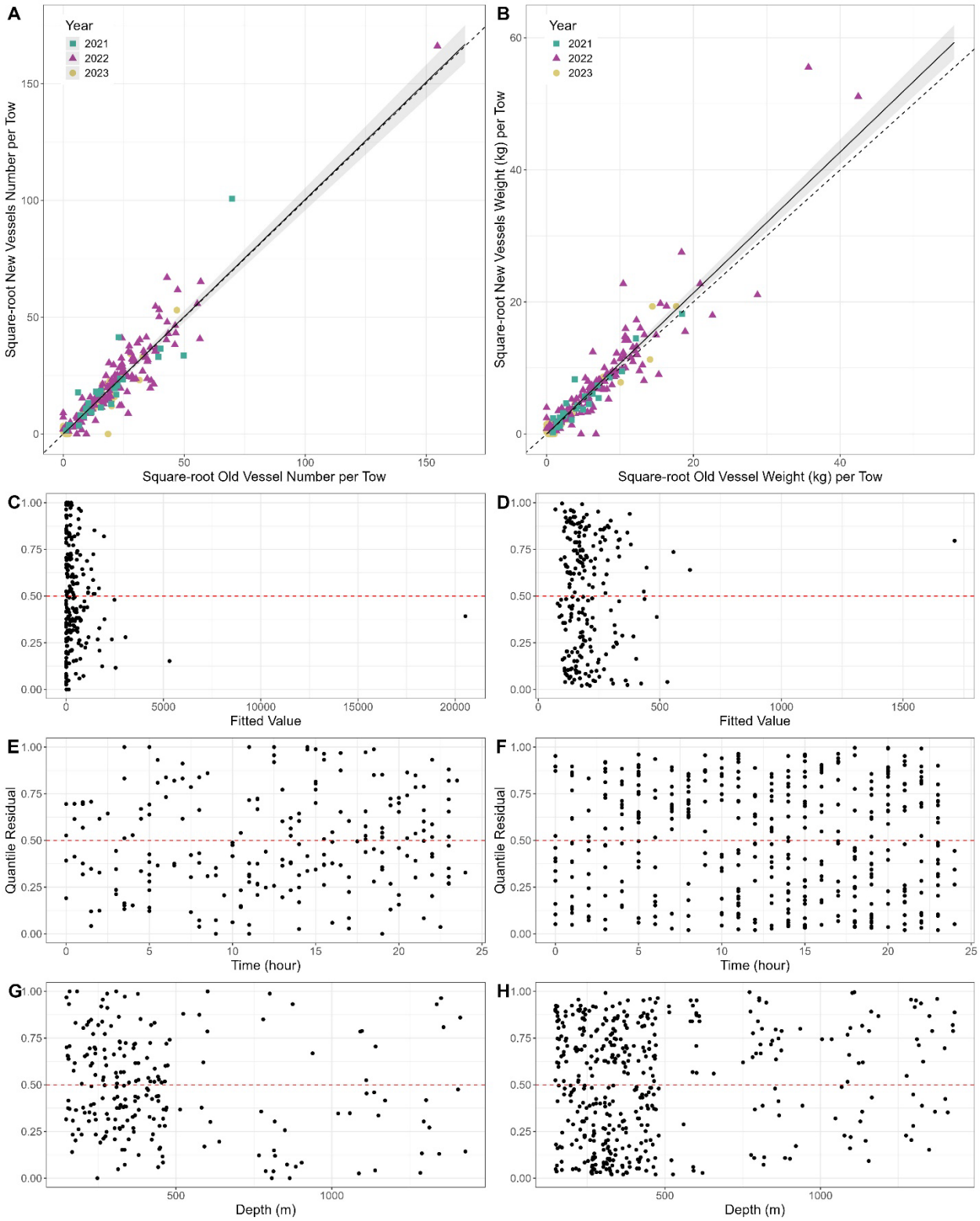

Figure 72. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for plank-piscivores in NAFO Div. 2J3KL-fall.*

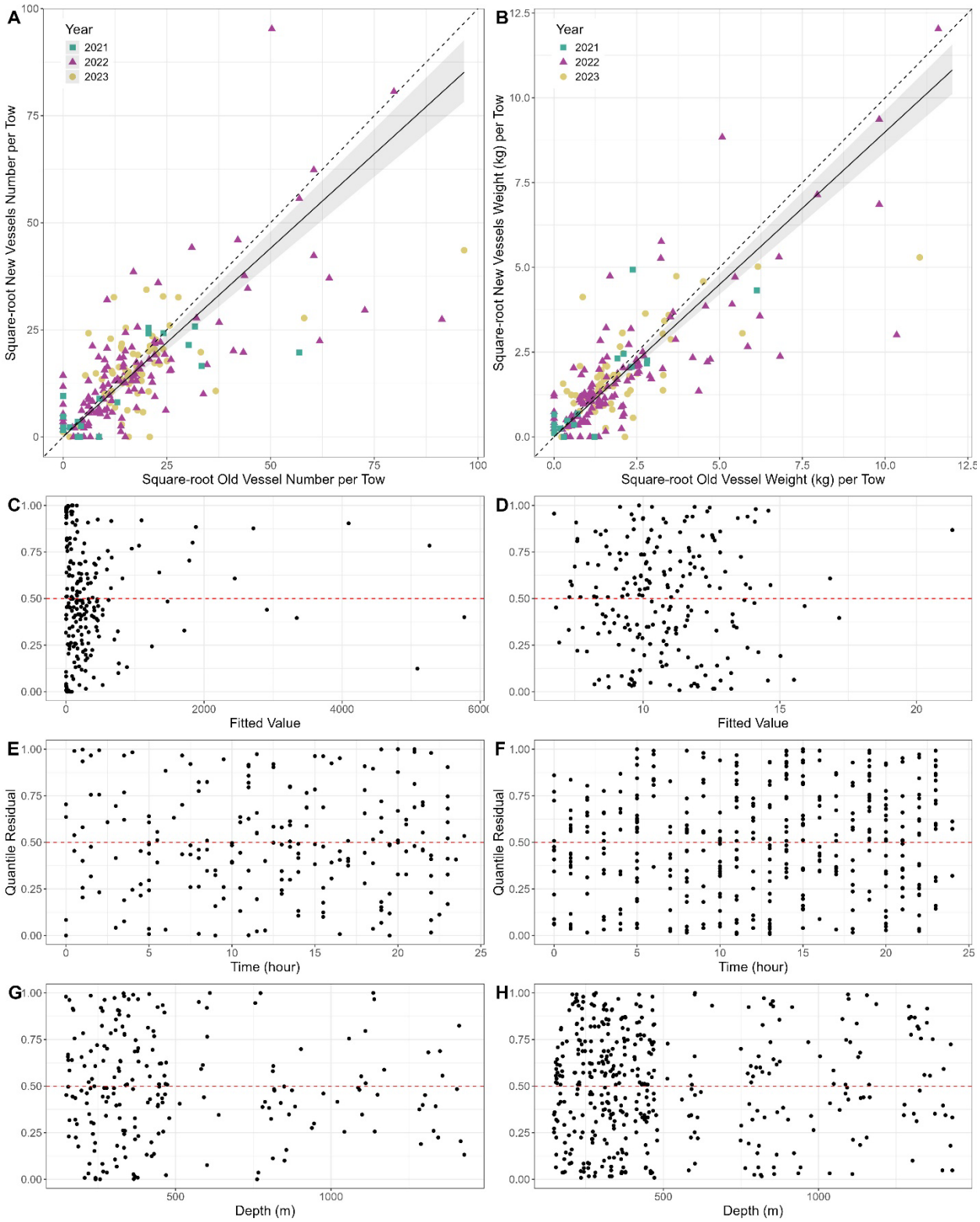

Figure 73. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for planktivores in NAFO Div. 2J3KL-fall.*

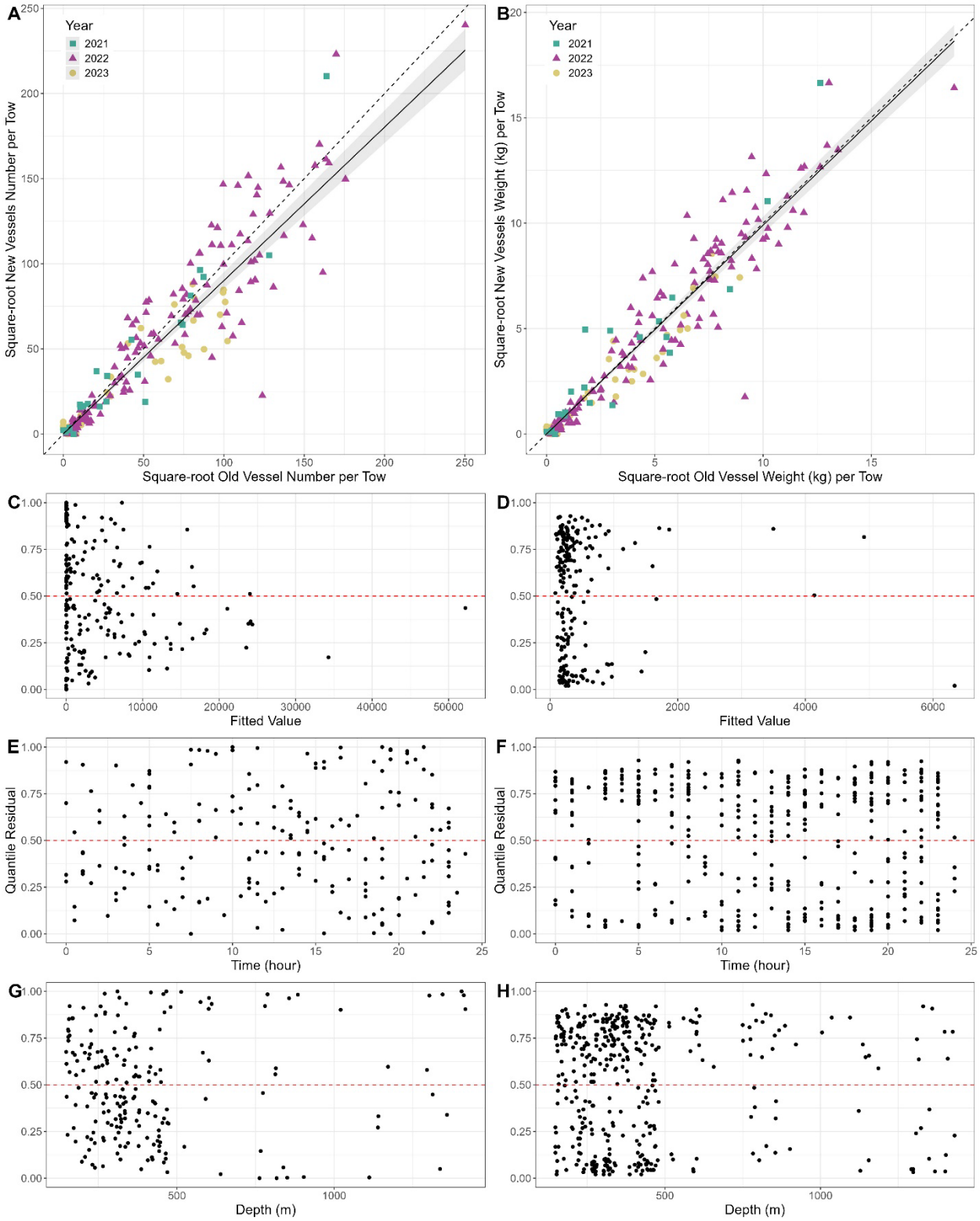

Figure 74. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* Capt. Jacques Cartier/John Cabot *for shellfish in NAFO Div. 2J3KL-fall.*

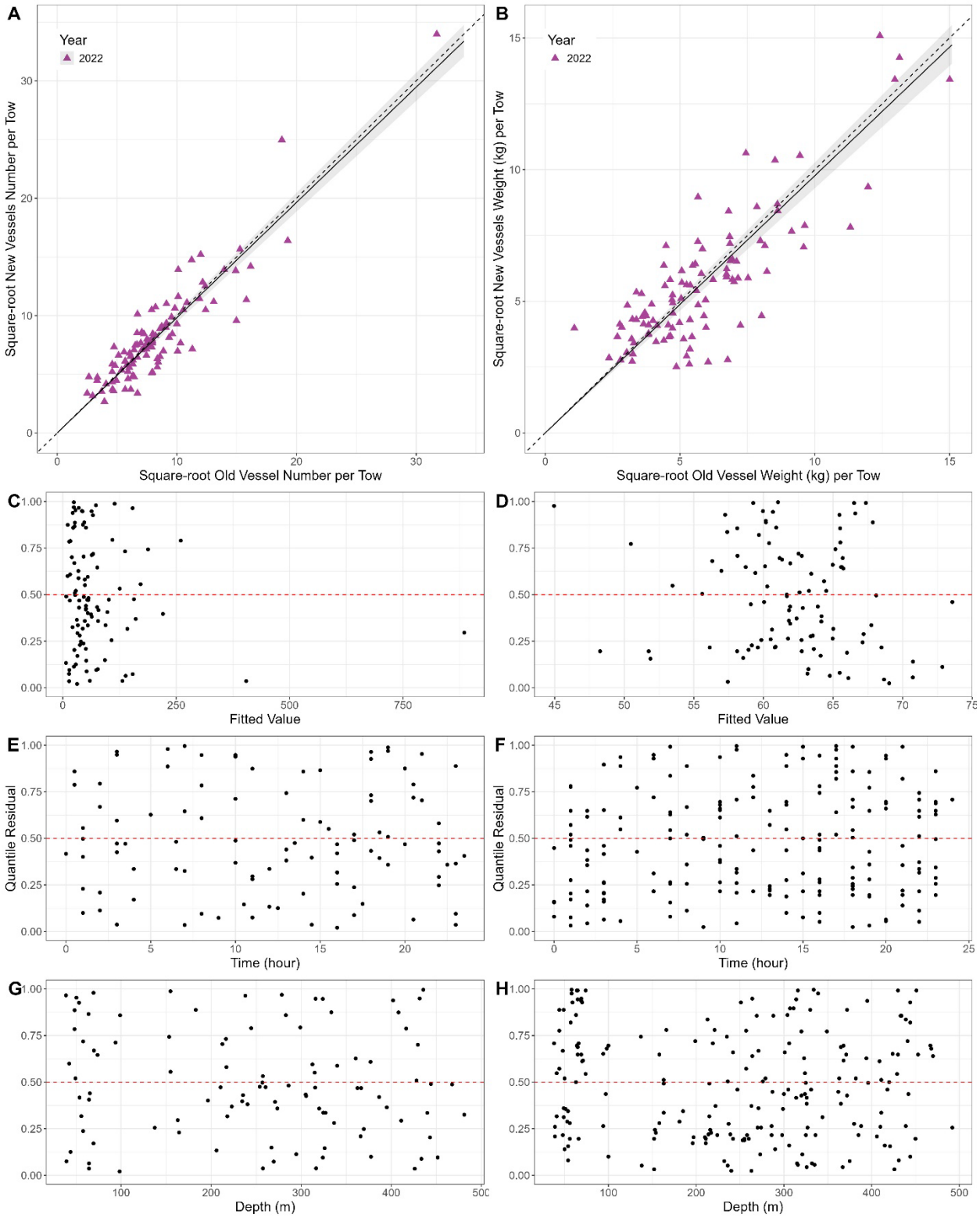

Figure 75. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for large benthivores in NAFO Div. 2J3KL-fall.*

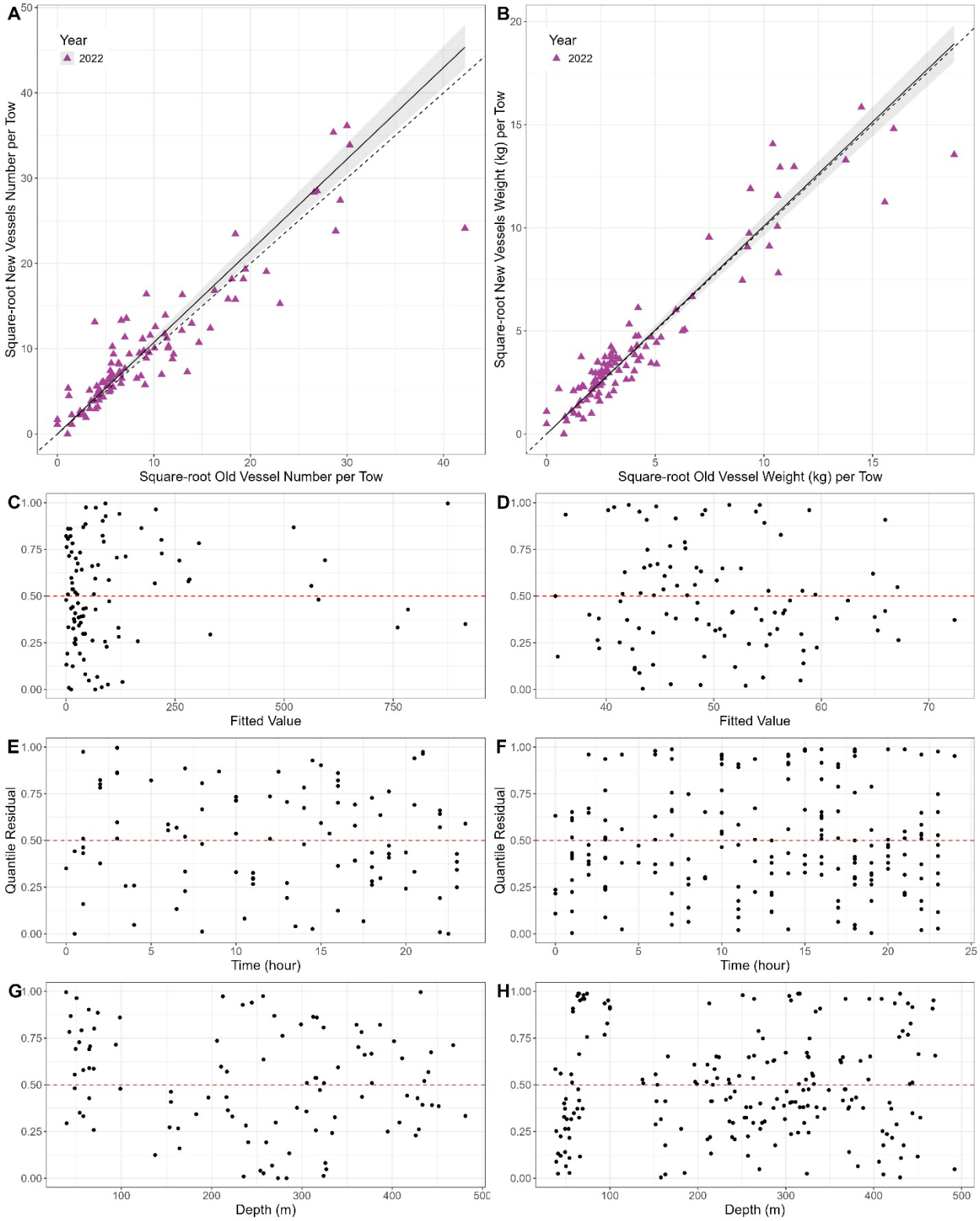

Figure 76. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for medium benthivores in NAFO Div. 2J3KL-fall.*

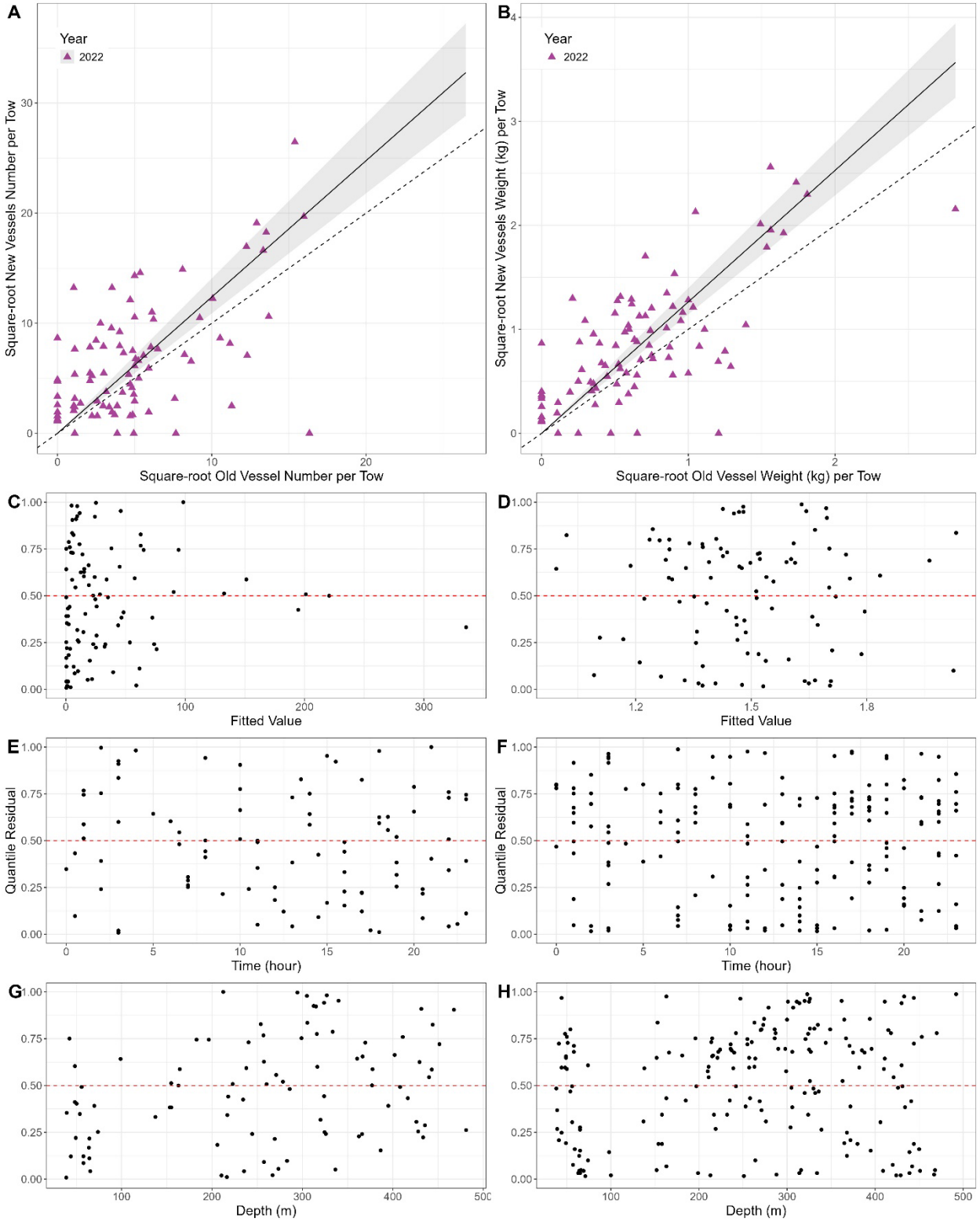

Figure 77. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for small benthivores in NAFO Div. 2J3KL-fall.*

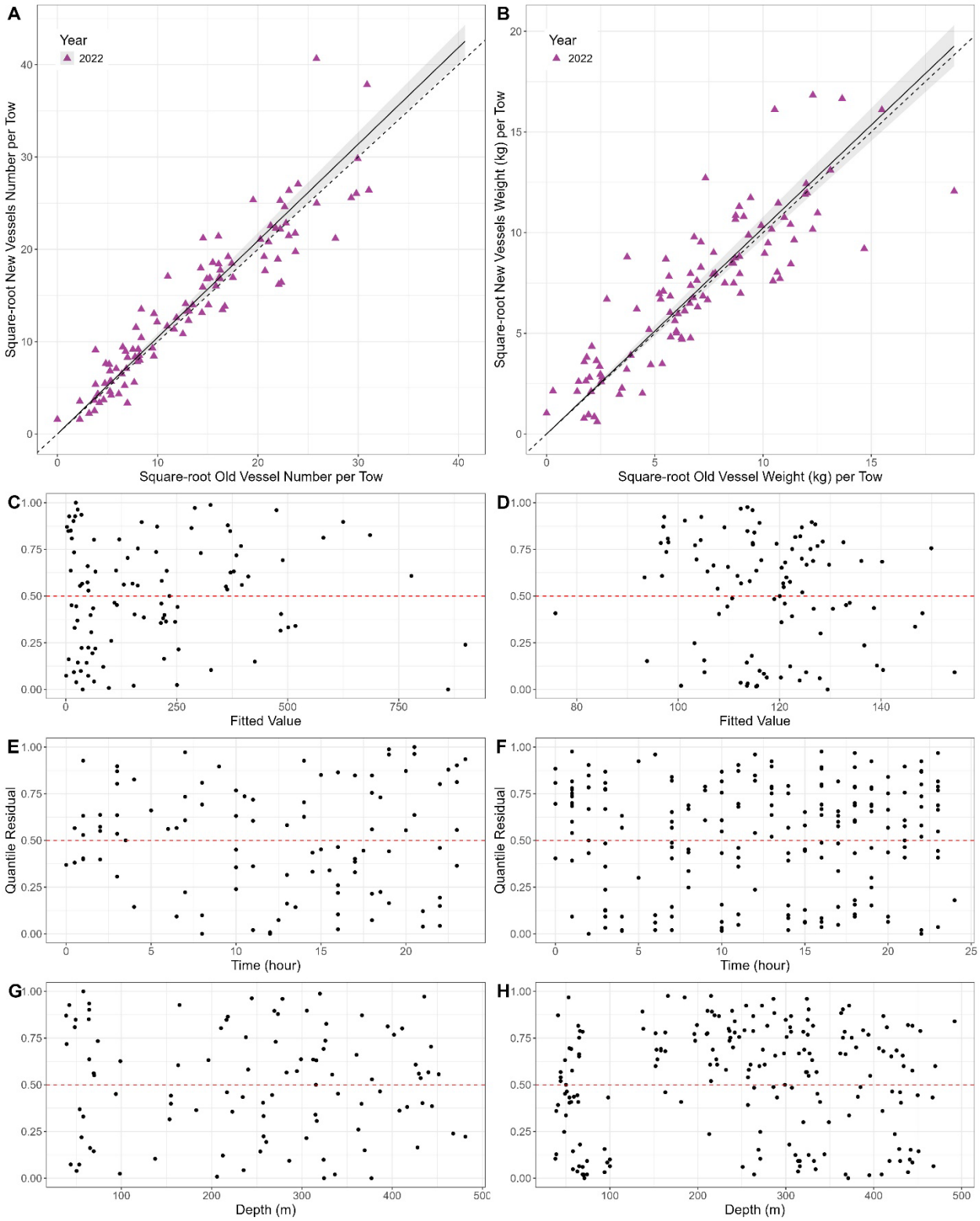

Figure 78. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for piscivores in NAFO Div. 2J3KL-fall.*

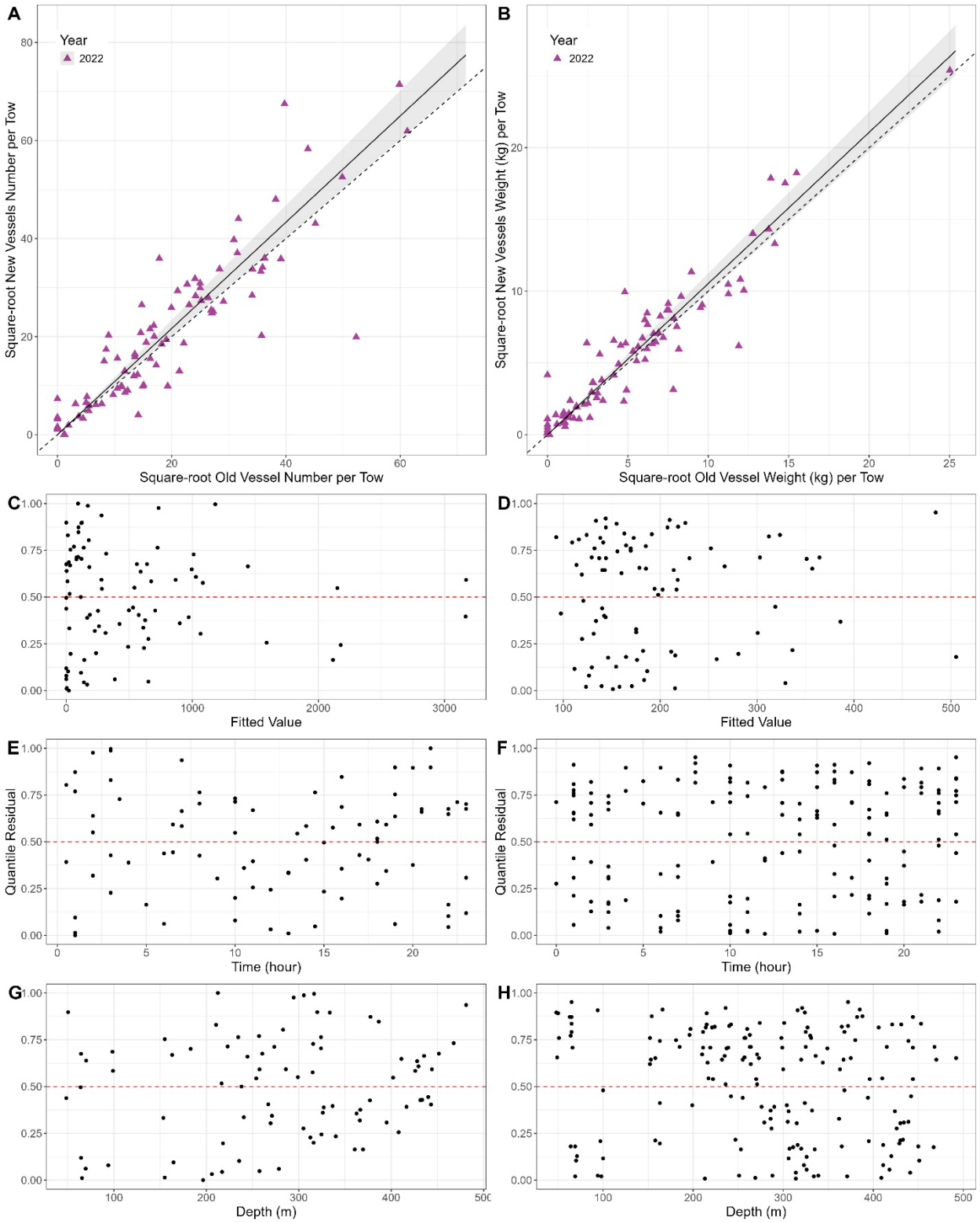

Figure 79. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for plank-piscivores in NAFO Div. 2J3KL-fall.*

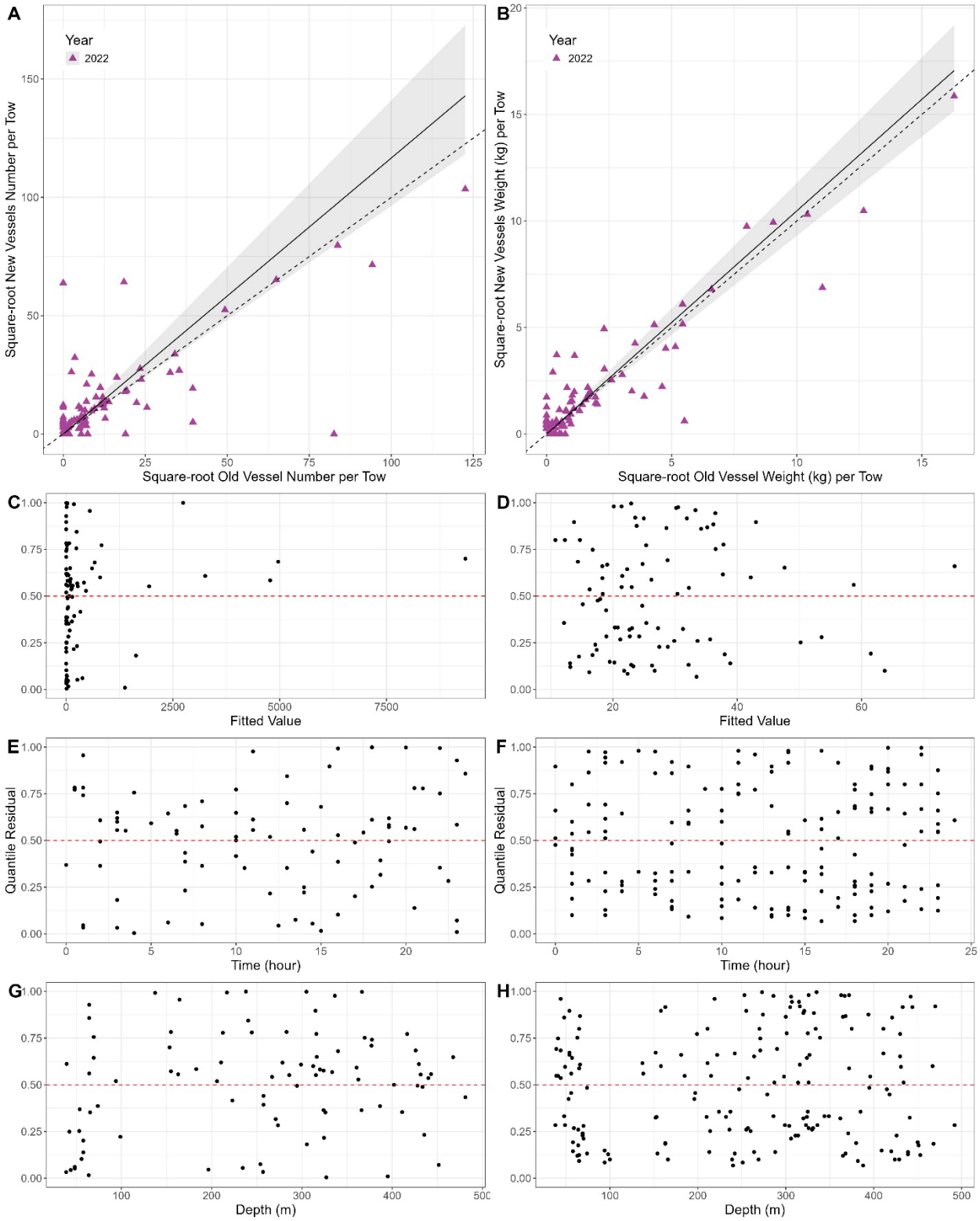

Figure 80. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for planktivores in NAFO Div. 2J3KL-fall.*

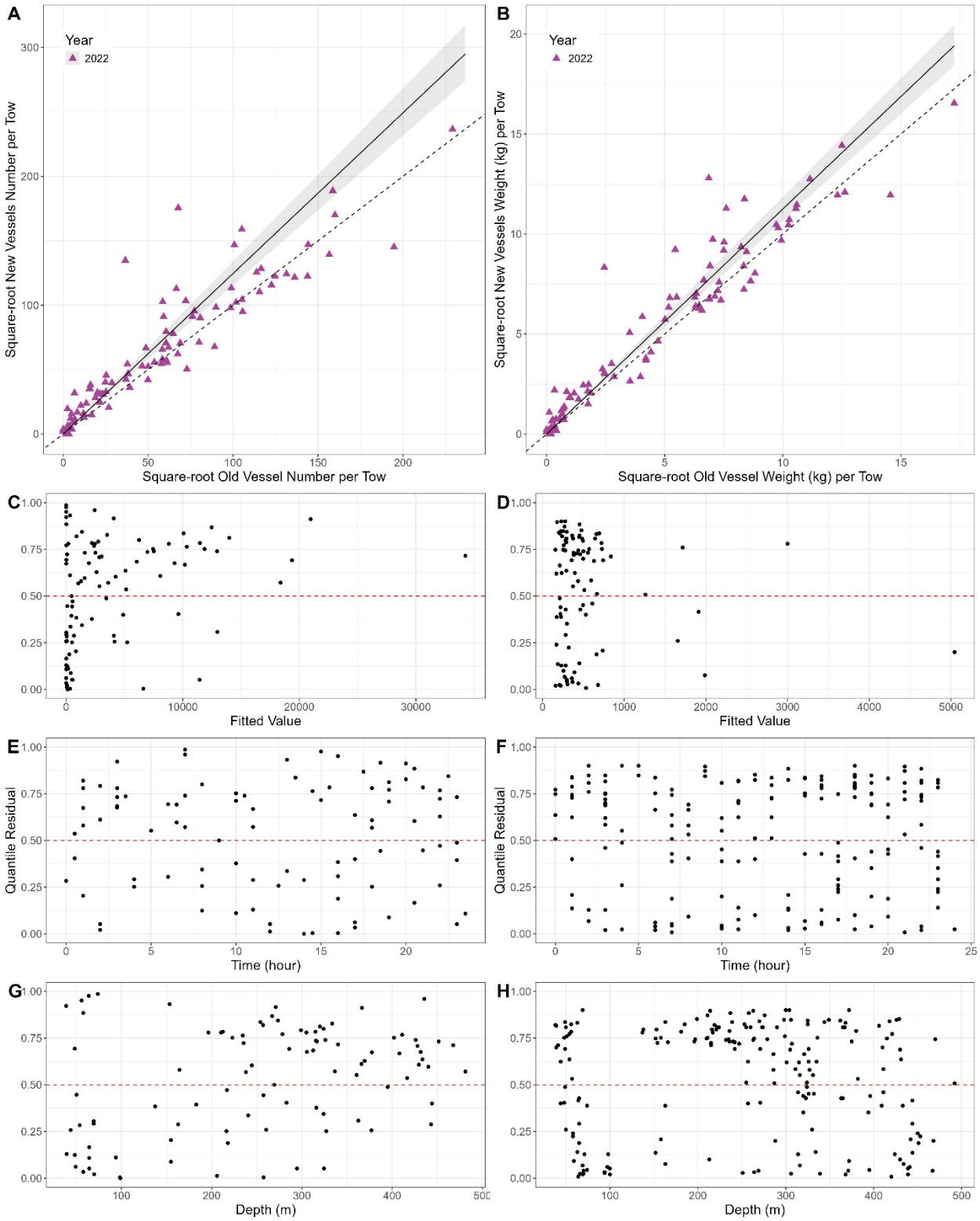

Figure 81. Results of size-aggregated analysis for the CCGS Alfred Needler *and CCGS* John Cabot *for shellfish in NAFO Div. 2J3KL-fall.*

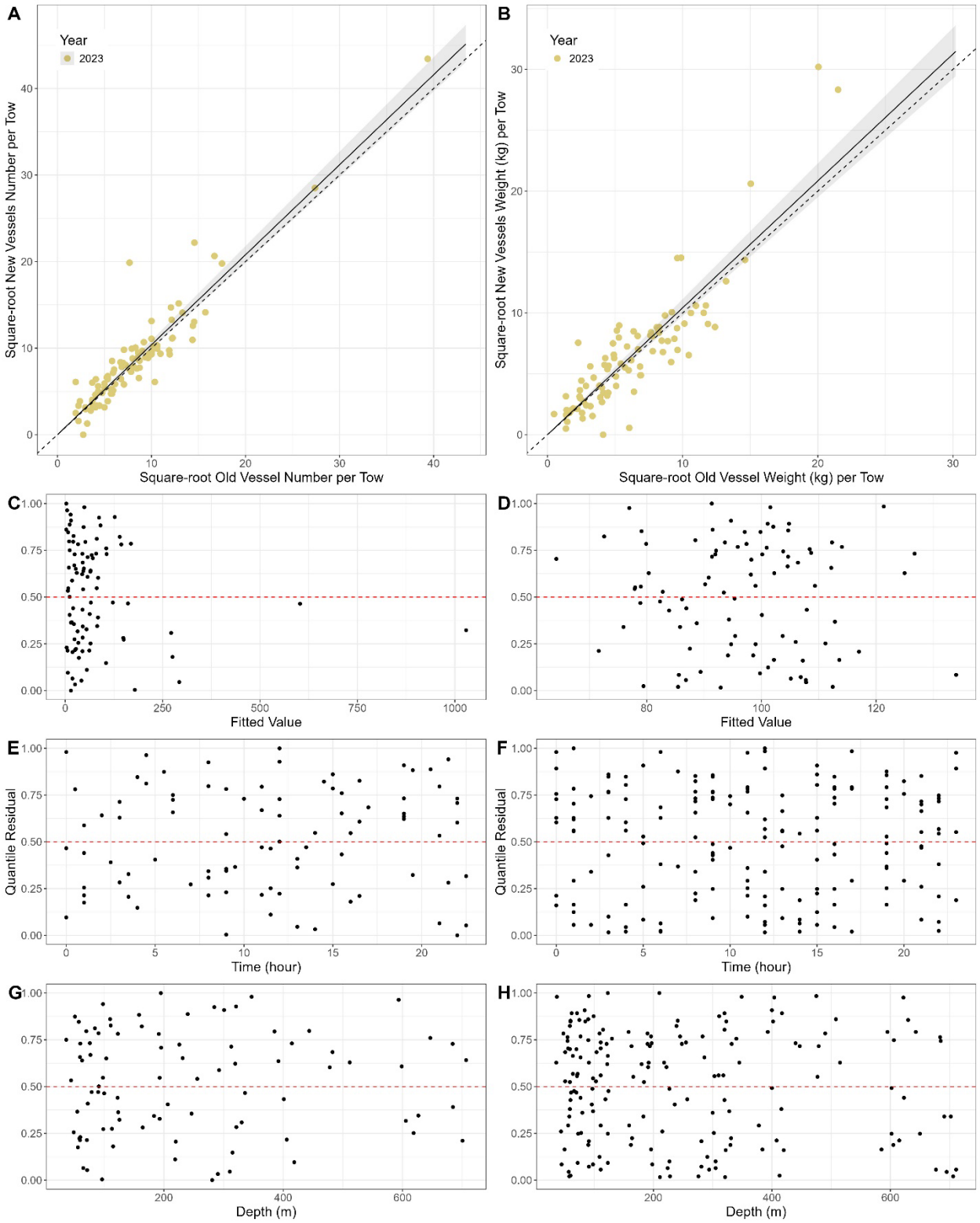

Figure 82. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for large benthivores in NAFO Div. 3LNO-spring.*

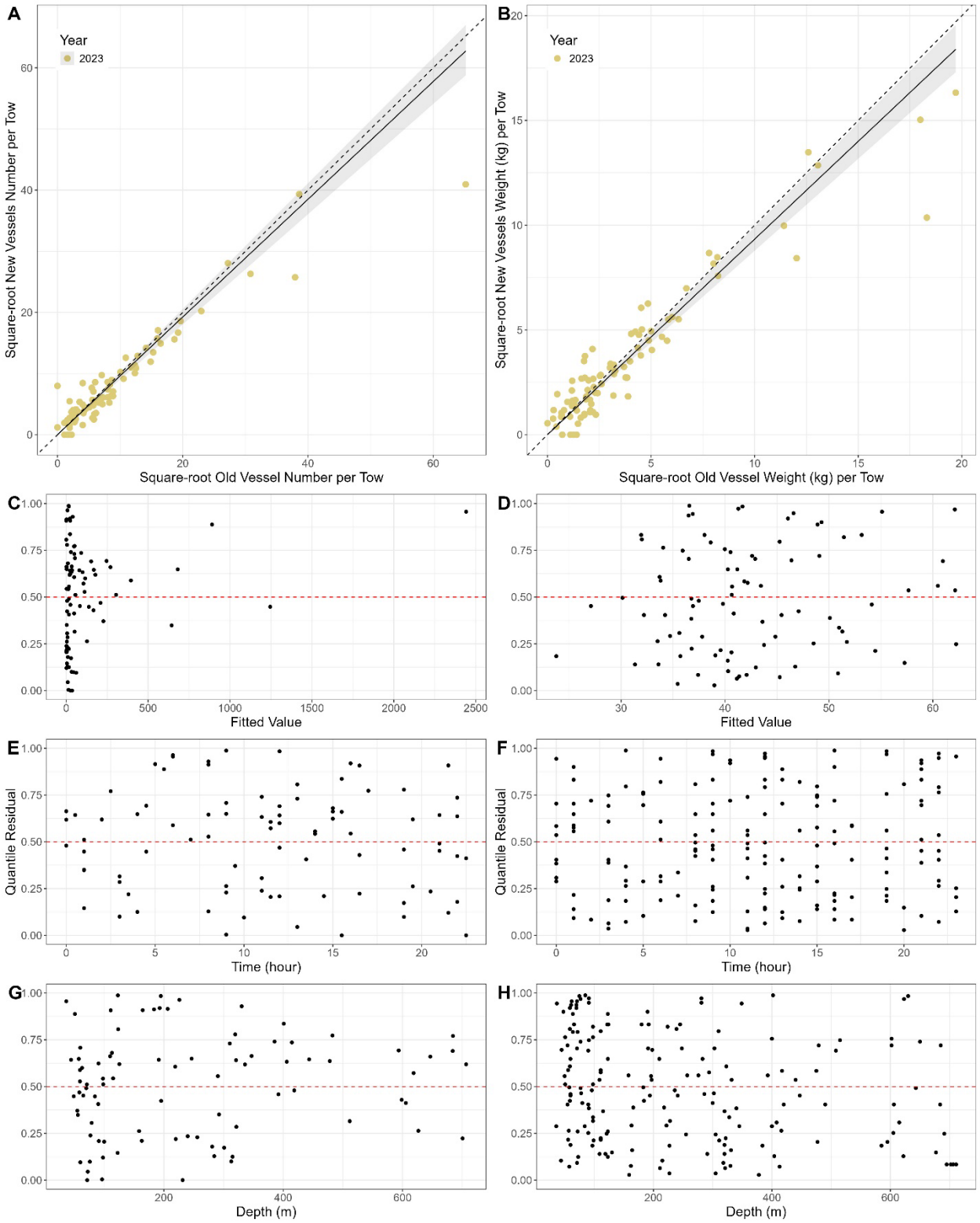

Figure 83. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for medium benthivores in NAFO Div. 3LNO-spring.*

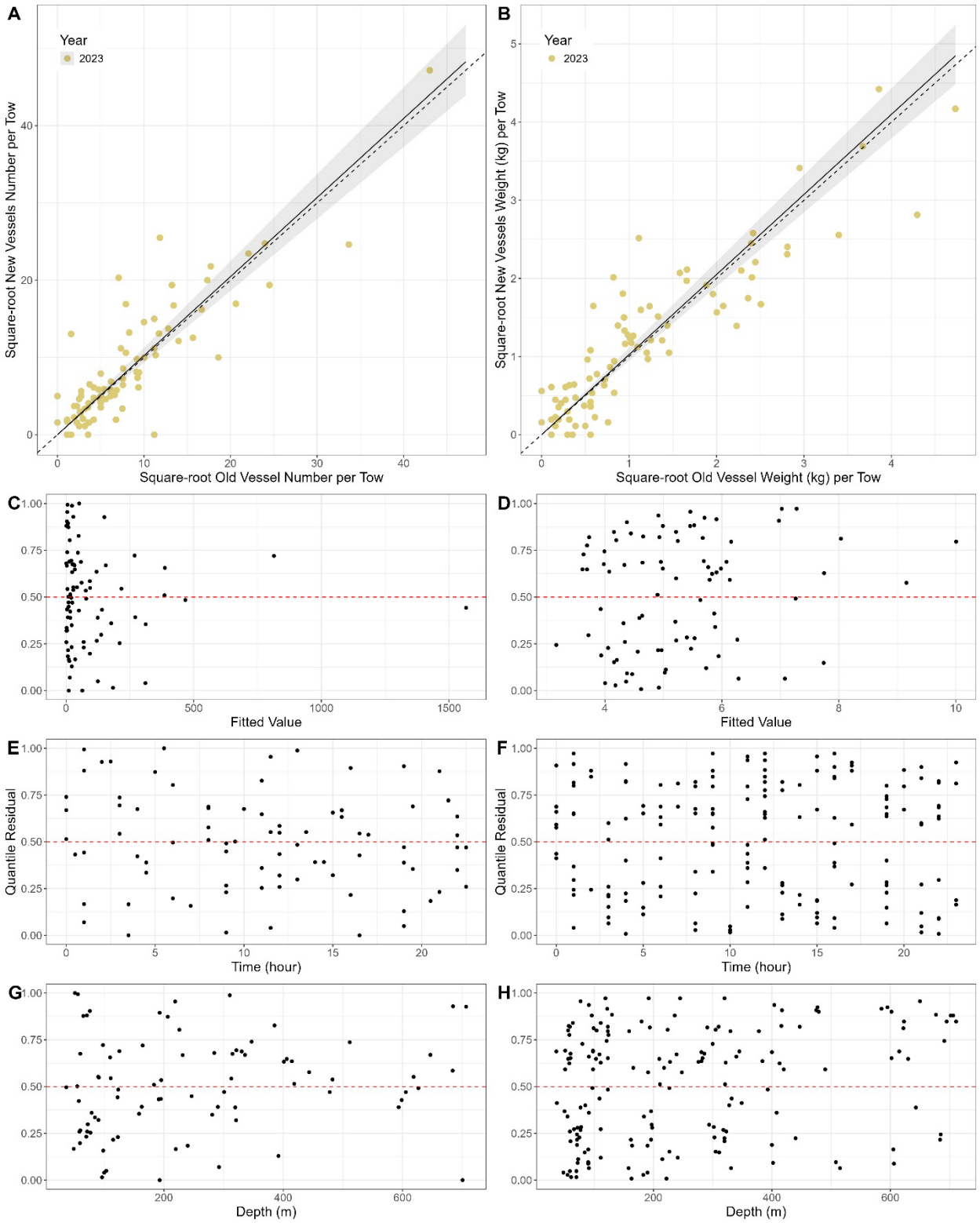

Figure 84. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for small benthivores in NAFO Div. 3LNO-spring.*

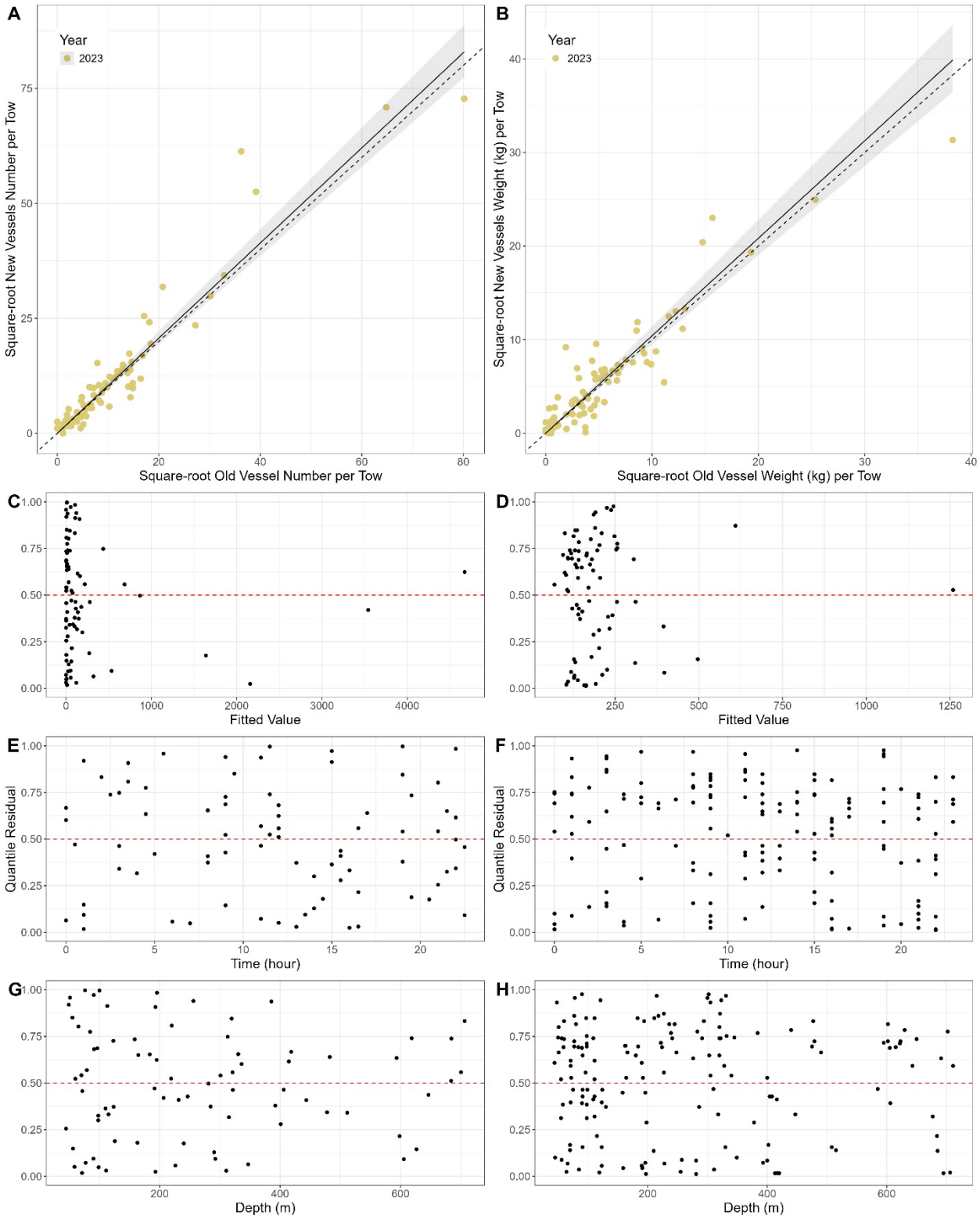

Figure 85. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for piscivores in NAFO Div. 3LNO-spring.*

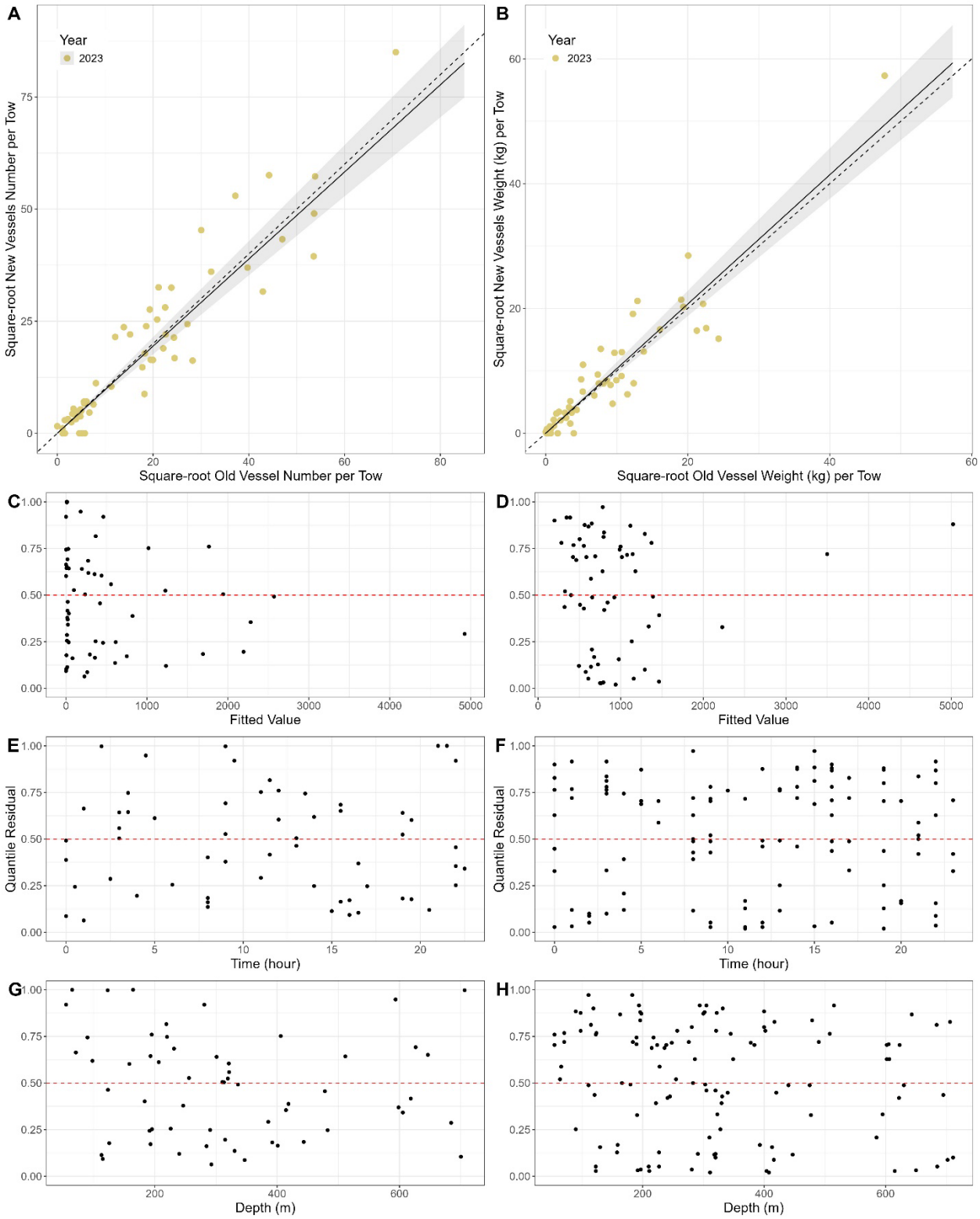

Figure 86. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for plank-piscivores in NAFO Div. 3LNO-spring.*

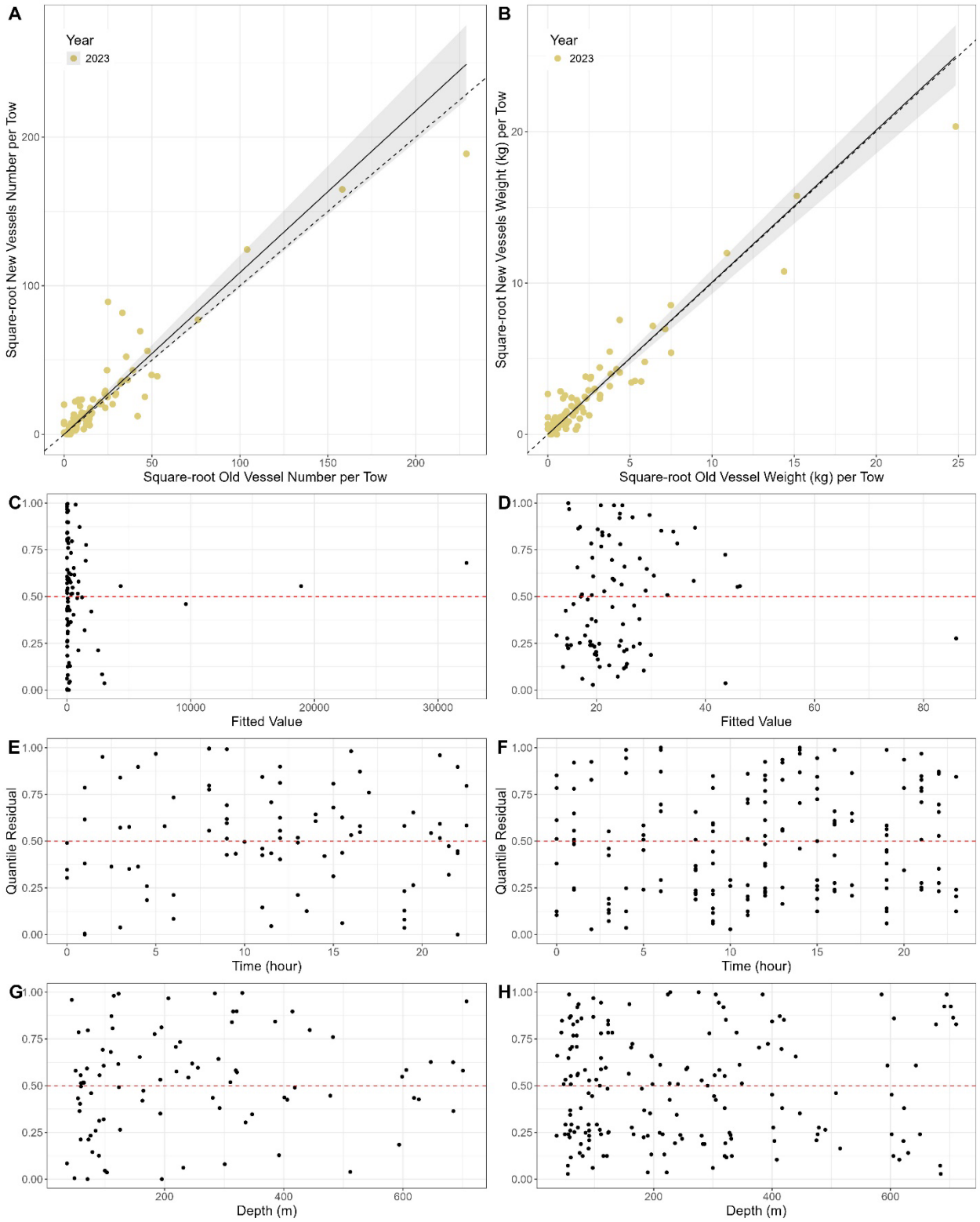

Figure 87. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for planktivores in NAFO Div. 3LNO-spring.*

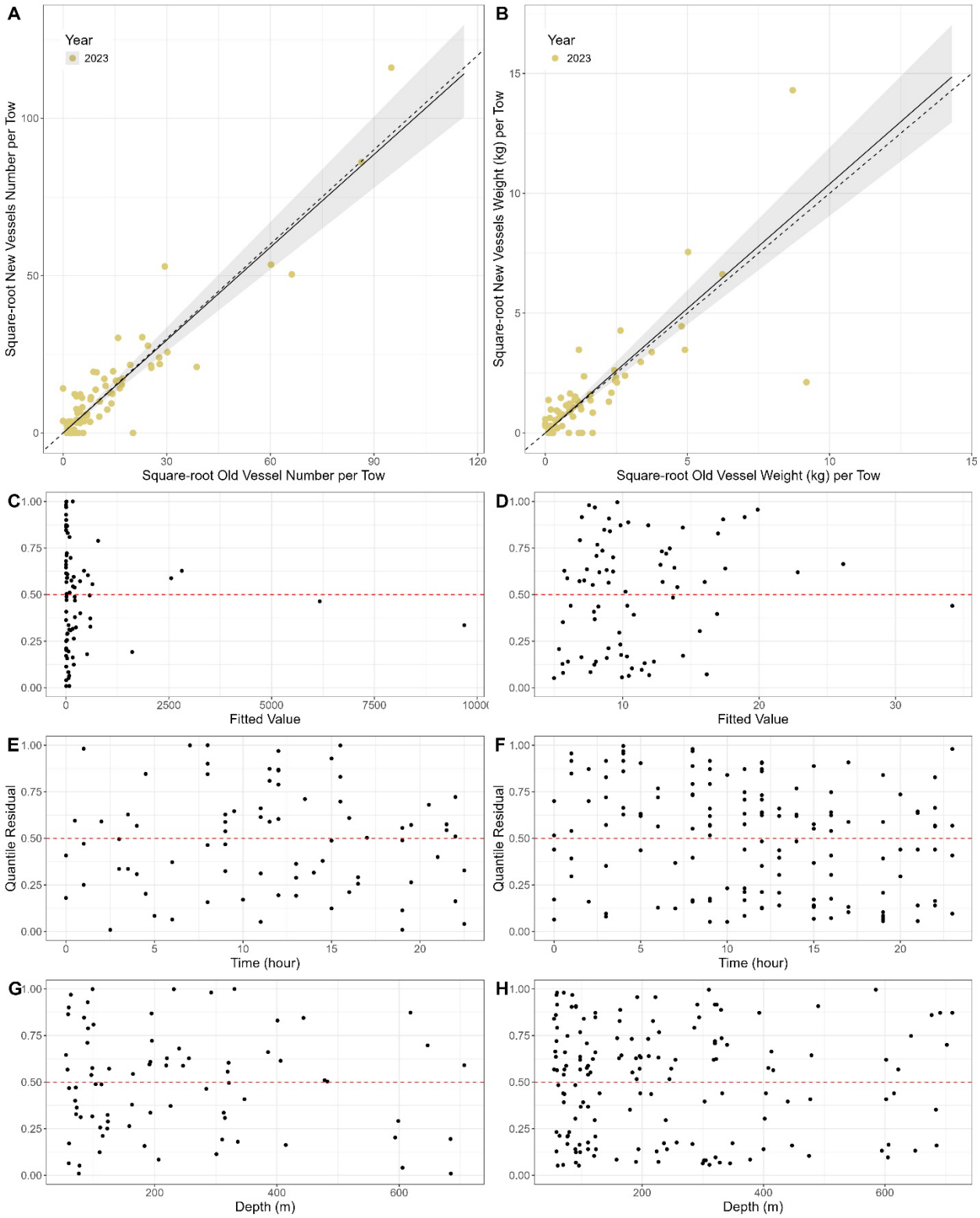

Figure 88. Results of size-aggregated analysis for the CCGS Teleost *and CCGS* John Cabot *for shellfish in NAFO Div. 3LNO-spring.*

APPENDIX 1: FUNCTIONAL GROUPS

Table A1- 1. Species within the large benthivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
10	*Myxiniformes*	x	-
11	*Myxinidae*	x	-
12	*Myxine glutinosa*	x	x
80	*Rajiformes (hypotremata)*	-	-
88	Rays - Multiple families	-	x
89	*Raja* sp.	x	-
90	*Amblyraja radiata*	x	x
92	*Rajella bathyphila*	x	x
95	*Amblyraja hyperborea*	x	x
96	*Amblyraja jenseni*	x	x
97	*Dipturus laevis*	-	x
100	*Leucoraja ocellata*	x	x
102	*Bathyraja spinicauda*	x	x
118	*Chimaeridae*	-	-
120	*Harriotta raleighana*	-	-
121	*Hydrolagus affinis*	x	x
122	*Rhinochimaera atlantica*	-	-
131	*Acipenseriformes (glaniostomi)*	-	-
164	*Alepocephalidae*	x	x
165	*Alepocephalus agassizii*	x	-
166	*Alepocephalus bairdii*	x	-
367	*Nemichthyidae*	-	-
368	*Nemichthys scolopaceus*	x	x
384	*Notacanthiformes*	-	-
385	*Notacanthidae*	-	-
386	*Notacanthus chemnitzii*	x	x
441	*Melanogrammus aeglefinus*	x	x
458	*Brosme brosme*	x	x
474	*Macrourus berglax*	x	x
698	*Anarhichadidae*	-	-
699	*Anarhichas denticulatus*	x	x
700	*Anarhichas lupus*	x	x
701	*Anarhichas minor*	x	x
721	*Cryptacanthodes maculatus*	x	x
744	*Macrozoarces americanus*	x	x
889	*Hippoglossoides platessoides*	x	x
966	*Lophius americanus*	x	x
980	*Ceratiidae*	x	-
981	*Ceratius holboelli*	x	x

Table A1- 2. Species within the medium benthivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
55	*Scyliorhinidae*	-	x
56	*Apristurus profundorum*	x	x
91	*Malacoraja senta*	x	x
94	*Rajella fyllae*	x	x
99	*Malacoraja spinacidermis*	x	x
358	*Simenchelyidae*	x	x
359	*Simenchelys parasiticus*	x	x
365	*Nessorhamphus ingolfianus*	x	x
369	*Serrivomer beani*	x	x
370	*Serrivomer brevidentatus*	-	-
372	*Synaphobranchidae*	-	-
373	*Synaphobranchus kaupi*	x	x
390	*Lipogenyidae*	x	-
391	*Lipogenys gillii*	-	x
393	*Halosauriformes*	-	-
394	*Halosauridae*	x	x
432	*Antimora rostrata*	x	x
433	*Halargyreus affinis*	-	-
434	*Halargyreus johnsonii*	x	-
440	*Micromesistius poutassou*	x	x
445	*Urophycis chuss*	-	-
481	*Coryphaenoides rupestris*	x	x
482	*Coelorinchus caelorhincus*	x	x
697	*Blennioidea*	-	-
714	*Lumpenus* sp.	-	-
715	*Lumpenus fabricii*	x	x
716	*Lumpenus lumpretaeformis*	x	x
725	*Zoarcidae*	x	x
726	*Lycodes* sp.	x	x
727	*Lycodes esmarki*	x	x
728	*Lycodes lavalaei*	-	-
729	*Lycodes reticulatus*	x	x
730	*Lycodes vahlii*	x	-
731	*Lycodes turneri*	-	-
732	*Lycodes atlanticus*	-	-
733	*Lycodes agnostus*	x	-
734	*Lycodes atlanticus*	-	-
737	*Lycodes frigidus*	-	-
739	*Lycodes nigricans*	-	-
740	*Lycodes pallidus*	-	-
746	*Gymnelis viridis*	x	x
817	*Myoxocephalus* sp.	-	x
819	*Myoxocephalus scorpius*	x	x
820	*Myoxocephalus octodecemspinosus*	x	x
821	*Myoxocephalus quadricornis*	x	-
842	*Cyclopteridae*	-	-
849	*Cyclopterus lumpus*	x	x

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
850	*Cyclopteropsis macalpini*	-	-
890	*Glyptocephalus cynoglossus*	x	x
891	*Limanda ferruginea*	x	x
895	*Pseudoplueronectes americanus*	x	x

Table A1- 3. Species within the small benthivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
146	*Searsiidae*	-	-
147	*Platytroctes apus*	-	-
168	*Xenodermichthys (aleposomus) copei*	x	x
195	*Nansenia groenlandica*	x	-
199	*Bathylagidae*	x	-
200	*Bathylagus* sp.	-	-
201	*Bathylagus benedicti*	-	-
202	*Bathylagus euryops*	x	x
205	*Gonostomatidae*	-	-
206	*Cyclothone* sp.	x	x
208	*Cyclothone microdon*	x	-
209	*Cyclothone signata*	-	-
211	*Gonostoma* sp.	x	-
213	*Gonostoma elongatum*	x	-
220	*Sternoptychidae*	x	x
221	*Argyropelecus aculeatus*	x	-
222	*Polyipnus asteroides*	-	-
223	*Sternoptyx diaphana*	-	-
303	*Malacosteidae*	x	-
304	*Malacosteus niger*	x	x
306	*Ipnopidae*	-	-
307	*Bathypterois dubius*	x	-
309	*Synodontidae*	-	-
311	*Synodus poeyi*	-	-
314	*Bathysaurus ferox*	-	-
387	*Polyacanthonotus rissoanus*	x	x
427	*Gasterosteus wheatlandi*	-	x
435	*Lepidion(haloporphyrus) eques*	x	x
453	*Gaidropsarus* sp.	x	x
454	*Gaidropsarus ensis*	x	x
455	*Gaidropsarus argentatus*	x	x
461	*Enchelyopus cimbrius*	x	x
470	*Macrouriformes*	x	x
471	*Macrouridae*	x	-
472	*Coryphaenoides armatus*	-	-
473	*Macrourus* sp.	-	-
475	*Nezumia aequalis*	-	-
476	*Macrourus holotrachys*	-	-
477	*Nezumia* sp.	x	-
478	*Nezumia bairdi*	x	x
480	*Coryphaenoides guentheri*	x	x

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
483	*Trachyrhynchus murrayi*	x	x
484	*Malacocephalus occidentalis*	-	-
485	*Hymenocephalus* sp.	-	-
487	*Corypheanoides brevibarbis*	-	-
498	*Stephanoberyciformes(xenoberyces)*	x	-
499	*Anoplogasteridae*	-	-
500	*Anoplogaster cornuta*	x	x
502	*Melamphaidae*	x	x
504	*Poromitra capito*	x	-
516	*Caristiidae*	-	-
517	*Caristius groenlandicus*	x	x
519	*Diretmidae*	x	-
520	*Diretmus argenteus*	-	-
527	*Hoplostethus* sp.	x	-
615	*Apogonidae*	-	-
616	*Howella sherborni*	x	-
678	*Chiasmodontidae*	-	-
679	*Chiasmodon niger*	x	x
703	*Pholidae*	-	-
704	*Pholis fasciata*	-	-
705	*Pholis gunnellus*	-	-
710	*Stichaeus punctatus*	-	-
711	*Eumesogrammus praecisus*	x	x
713	*Leptoclinus maculatus*	-	-
717	*Lumpenus maculatus*	x	x
745	*Melanostigma atlanticum*	x	x
747	*Lycenchelys* sp.	x	x
749	*Lycenchelys kolthoffi*	x	x
750	*Lycenchelys paxillus*	x	x
751	*Lycenchelys sarsi*	-	-
752	*Lycenchelys verrilli*	x	-
781	*Stromateidae*	x	-
783	*Poronotus (peprilus) triacanthus*	x	x
808	*Cottidae*	x	-
810	*Artediellus* sp.	x	x
811	*Artediellus atlanticus*	x	x
812	*Artediellus uncinatus*	x	x
813	*Triglops* sp.	x	x
814	*Triglops murrayi*	x	x
815	*Triglops nybelini*	x	x
816	*Triglops pingeli*	x	x
818	*Myoxocephalus aeneus*	-	-
822	*Myoxocephalus scorpioides*	x	x
823	*Gymnocanthus tricuspis*	x	x
827	*Cottunculus sp.*	x	-
828	*Cottunculus thompsoni*	x	x
829	*Cottunculus microps*	x	x
830	*Icelus* sp.	x	x
831	*Icelus bicornis*	x	-
832	*Icelus spatula*	x	x
835	*Agonidae*	x	-

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
837	*Aspidophoroides olriki*	x	x
838	*Aspidophoroides monopterygius*	x	x
843	*Eumicrotremus* sp.	x	-
844	*Eumicrotremus spinosus*	x	x
845	*Eumicrotremus spinosus variabilis*	x	x
846	*Eumicrotremus derjugini*	x	x
853	*Liparidae*	x	x
854	*Paraliparis* sp.	x	-
855	*Paraliparis bathybii*	-	-
856	*Paraliparis copei*	x	x
857	*Liparis* sp.	-	-
858	*Liparis atlanticus*	x	-
859	*Liparis fabricii*	x	x
860	*Liparis liparis*	-	x
861	*Liparis tunicatus*	x	-
862	*Liparis gibbus*	x	x
894	*Liopsetta putnami*	-	-
968	*Ogocephalidae*	x	-
969	*Dibranchus atlanticus*	x	x

Table A1- 4. Species within piscivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
15	*Petromyzon marinus*	x	x
18	*Squaliformes*	-	-
20	*Somniosus microcephalus*	x	x
23	*Squalidae*	-	-
24	*Squalus acanthias*	x	x
27	*Centroscyllium fabricii*	x	x
28	*Centroscymnus coelolepis*	-	x
50	*Lamnidae*	-	-
51	*Lamna nasus*	-	x
52	*Isurus oxyrinchus*	-	-
173	*Salmo salar*	-	-
226	*Chauliodontidae*	x	x
227	*Chauliodus sloani*	x	x
229	*Stomiatidae*	-	-
230	*Stomias boa*	x	x
232	*Astronesthidae*	x	x
233	*Borostomias* sp.	-	-
235	*Astronesthes* sp.	-	x
237	*Melanostomiidae (stomiatidae)*	-	-
238	*Echiostoma* sp.	x	-
245	*Idiacanthidae*	-	-
246	*Idiacanthus fasciola*	-	-
249	*Anotopteridae*	x	-
250	*Anotopterus pharao*	x	x
297	*Evermannellidae*	-	-
316	*Paralepididae*	x	-

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
317	*Paralepis* sp.	x	-
318	*Paralepis brevis (atlantica)*	x	x
319	*Paralepis coregonoides borealis*	x	x
320	*Notolepis rissoi kroyeri*	x	x
323	*Alepisauridae (plagyodontidae)*	x	-
324	*Alepisaurus brevirostis*	-	x
325	*Alepisaurus ferox*	-	-
327	*Chlorophthalamidae*	x	-
329	*Parasudis truculentus*	x	x
377	*Saccopharyngiformes*	-	-
378	*Saccopharyngidae*	-	-
379	*Saccopharynx ampullaceus*	-	-
430	*Gadiformes (anacanthini)*	-	-
438	*Gadus morhua*	x	x
439	*Gadus ogac*	x	-
443	*Pollachius virens*	x	x
447	*Urophycis tenuis*	x	x
456	*Molva dypterygia*	-	-
547	*Aphanopus carbo*	x	x
548	*Benthodesmus simonyi*	x	-
892	*Reinhardtius hippoglossoides*	x	x
893	*Hippoglossus hippoglossus*	x	x
964	*Lophiformes (pediculati)*	-	-
988	*Himantolophus groenlandicus*	x	-

Table A1- 5. Species within the plank-piscivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
300	*Scopelosauridae*	x	x
301	*Scopelosaurus* sp.	-	x
381	*Eupharyngidae*	-	x
382	*Eurypharynx pelecanoides*	x	-
444	*Urophycis chesteri*	x	x
451	*Boreogadus saida*	x	x
505	*Beryciformes*	-	-
506	*Polymixiidae*	x	-
791	*Scorpaenidae*	-	-
792	*Sebastes* sp.	-	-
793	*Sebastes norvegicus*	x	x
794	*Sebastes mentella*	x	x
863	*Careproctus* sp.	x	x
865	*Careproctus ranulus*	-	x
866	*Careproctus reinhardti*	x	x

Table A1- 6. Species within the planktivore functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
47	*Cetorhinidae*	-	-
48	*Cetorhinus maximus*	-	-
149	*Clupeidae*	x	-
150	*Clupea harengus*	x	x
151	*Alosa pseudoharengus*	x	x
152	*Alosa sapidissima*	-	-
155	*Brevoortia tyrannus*	-	-
167	*Bathytroctes* sp.	x	x
187	*Mallotus villosus*	x	x
192	*Argentinidae*	x	-
193	*Argentina silus*	x	x
194	*Argentina striata*	x	-
271	*Myctophiformes*	-	-
272	*Myctophidae*	x	x
273	*Notoscopelus* sp.	x	-
275	*Notoscopelus elongatus kroyeri*	x	-
284	*Lampanyctus crocodilus*	-	-
285	*Lampadena speculigera*	x	-
293	*Symbolophorus veranyi*	x	-
375	*Rondeletiidae*	-	-
376	*Rondeletia loricata*	x	-
397	*Scomberesocidae*	-	-
398	*Scomberesox saurus*	x	x
421	*Gasterosteiformes*	-	-
422	*Gasterosteidae*	-	-
423	*Apeltes quadracus*	-	-
426	*Gasterosteus aculateus*	x	x
572	*Scomber scombrus*	x	x
692	*Ammodytoidei*	-	x
693	*Ammodytidae*	x	x
694	*Ammodytes dubius*	x	x
712	*Ulvaria subbifurcata*	x	x

Table A1- 7. Species within the shellfish functional group, including species code used in Multispecies Datalogger program. (x) indicates if a taxa was recorded in the survey (2017 – 20) or during comparative fishing, (-) indicates this code was not recorded. Species codes in bold reflect 'operational species' that were used when grouping codes for community composition analysis.

Species Code	Scientific Name	Survey 2017 – 20	Comparative Fishing
8111	*Pandalus borealis*	x	x
8112	*Pandalus montagui*	x	x
8113	*Atlantopandalus propinqvus*	x	x
8212	*Chionoecetes* sp.	-	-
8213	*Chionoecetes opilio*	x	x