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**Gulf Region**

### **Review of the 2021 snow crab (*Chionoecetes opilio*) fishery in the southern Gulf of St. Lawrence (Areas 12, 12E, 12F and 19)**

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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

The review of the 2021 snow crab (*Chionoecetes opilio*) fishery in the southern Gulf of St. Lawrence (sGSL; Areas 12, 12E, 12 F and 19) is presented. Total landings in the sGSL in 2021 were 24,479 t out of a revised quota of 24,125 t. The allowable quota in the notice to harvesters was 23,810 t. For Area 12 harvesters, landings were 20,842 t (revised quota of 20,402 t). The mean catch-per-unit-of-effort (CPUE) from logbooks increased in 2021 (57.4 kg per trap hauled (kg/th)) compared to 2020 (44.1 kg/th). In Areas 12E and 12F, landings were 296 t (revised quota of 288 t) and 1,100 t (revised quota of 1,192 t), respectively. Due to North Atlantic Right whale closures in Areas 12E and F, approximately 24.6% (73 t) and 46.2% (508 t) of the quota allocations in these Areas respectively, were fished in Area 12. In Area 12E, the mean CPUE increased in 2021 (55.7 kg/th) compared to 2020 (45.9 kg/th). In Area 12F, the mean CPUE remained high in 2021 at 59.1 kg/th, an increase compared to 2020 (45.2 kg/th). In Area 19, landings reached 2,241 t (revised quota of 2,244 t). The mean CPUE remained high in 2021 at 121.0 kg/th, an increase from 2020 (101.7 kg/th).

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## 1. INTRODUCTION

Snow crab, *Chionoecetes opilio*, has been commercially exploited in the southern Gulf of St. Lawrence (sGSL) since the mid-1960s. There are currently four management Areas in the sGSL: 12, 12E, 12F and 19 (Fig. 1), with Area 12 being the largest in terms of area, number of participants, and landings.

The fishing season in Areas 12, 12E and 12F generally starts as soon as the sGSL is clear of ice in late April to early May and until mid-July or when the Area quota is caught. In Area 19, the fishing season starts in July and ends in mid-September or when the quota is caught. The number of traps per license varies by harvester group and management Area. Conical traps are set mainly on mud or sand-mud bottoms at temperatures ranging from -0.5 to 4.5 °C, with depths ranging from 50 to 280 m. Management of these fisheries is based on quotas and effort controls (trap allocations, trap dimensions and seasons). Only hard-shelled males  $\geq 95$  mm of carapace width (CW) are commercially exploited and landing of female crab is prohibited.

Local Area-closures during the season arise from the application of a soft/white crab protocols, that aims to limit the quantity of vulnerable newly-moulted crab occurring in at-sea catches, as they represent future recruits to the fishery (Hébert et al. 1992). At-sea soft/white shelled catch monitoring allows for the closure of portions of fishing Areas when the proportion of these males exceeds 20% in the catch. Local Area-closures are also used to minimize risks of entanglement of Northern Atlantic Right Whales (NARW) with fishing gear, which has been an ongoing concern since 2018. Large-scale closures from either source can result in significant displacements in fleet fishing effort.

## 2. METHODS

### 2.1. FISHERY LOGBOOK DATA

Raw data on reported landings and fishing effort (number of trap hauls) were obtained from mandatory fishery logbooks and dockside monitoring data, compiled by the Department of Fisheries and Oceans (DFO) Statistics Branches from the Quebec and Gulf Regions. Post-processing of these data by Science staff involves verification, correction or deletion of erroneous data. This includes corrections for fishing dates, fishing coordinates, landings and effort data. Three to six percent of landings could not be georeferenced due to erroneous or missing coordinate data.

Only data with reliable effort data were used for calculating catch-per-unit-of-effort (CPUE). Landings that arise from the first trip of the season were not used when calculating CPUEs, as these initial catches are not considered representative of fishery performance. CPUEs were calculated as the ratio of landings over the fishing effort. To account for missing effort data, total effort was estimated from the landings divided by the CPUE estimate.

### 2.2. AT-SEA OBSERVER DATA

Since 1990, DFO has implemented an observer sampling program onboard commercial vessels which provides data on the size-composition of catches, discard practices, as well as the condition of the crab carapace. After a hiatus in 2020 due to Covid-19 restrictions, observer sampling resumed in 2021, though at reduced coverage.

Newly moulted crab are called soft-shelled and have low commercial value due to their lower meat content. Discarding of these vulnerable crab by harvesters can result in mortality of

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commercial-sized soft/white-shelled crabs and may reduce the recruitment to the fishery for the following years (Dufour et al. 1997). In Areas 12, 12E and 12F (spring fishery), crabs with a claw hardness of less than 68 units on the durometer reading were categorized as soft-shelled crabs (Hébert et al. 1992). In Area 19 (summer fishery), crabs with a claw hardness less than 72 units on the durometer reading were considered as soft and white crabs.

High incidence of soft/white-shell crab in catches can lead to local Area closures, in the form of 10X10 minute grids or sectors within the affected management Areas. Grids are closed in the affected Areas for the remainder of the season when the incidence of sampled soft/white-shelled crab exceed 20% within a 15-day period. Crab harvesters are given 2 days (Area 19) or 5 days (Area 12, 12E, 12F) to remove their fishing gear upon grid closure.

### **2.3. NORTH ATLANTIC RIGHT WHALE CLOSURES**

With less than 400 North Atlantic right whales (NARW) remaining in the world, the Government of Canada continues to take action to protect this species. Since 2018, protective measures have focused on minimizing risks of NARW entanglements with fishing gear, as well as vessel collisions.

#### **2.3.1. Fishing closures**

Protective measures for 2021 included both temporary and season-long fishing NARW Area closures ([2021 fisheries management measures to protect North Atlantic Right Whales in Canadian waters \(dfo-mpo.gc.ca\)](https://www.dfo-mpo.gc.ca)). Upon detection of a right whale, either visually or acoustically, a region consisting of nine 10x10 minute grids, centered on the whale's location was closed to non-tended fixed gear fisheries for 15 days. If a right whale was detected again within days 9-15 of the closed Area, then the Area remained closed until November 15, 2021. If a whale was not re-detected within the closed Area, then the Area was re-opened to fishing after day 15. A minimum of two flights with no right whale detections was required for a closed Area to be re-opened to fishing.

## **3. RESULTS**

### **3.1. FISHERY PERFORMANCE**

Since 1969, four periods of high landings exceeding 20,000 t have been observed in the sGSL: 1981-1986, 1994-1995, 2002-2009 and more recently from 2012 to 2021 (Fig. 2). Amid concerns of overestimation in recent survey biomass indices, DFO took the unusual step of applying a 15% reduction to the 2020 commercial biomass estimate before establishing the total allowable catch (TAC) for 2021. With this correction, applying the harvest decision rules resulted in a target exploitation rate of 38.3% rather than 40.4%. Landings in the sGSL were 24,479 t in 2021 (revised quota of 24,125 t ) while they were 28,156 t in 2020 (revised quota of 31,152 t) (Table 1; Fig. 2). By reason of quota adjustments and reconciliations, the revised quota does not exactly match the TAC given in the notice to harvesters, which was 23,810 t in 2021.

#### **3.1.1. Area 12**

The 2021 fishing season in Area 12 opened on April 3<sup>rd</sup> and closed on June 30<sup>th</sup> with last landings reported on June 17<sup>th</sup> (Table 2). A total of 319 fishing vessels participated in the fishery, representing harvesters from New Brunswick, Quebec, Nova Scotia and Prince Edward Island.

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Observer sea-sampling in Area 12 consisted of 214 trips sampled, with a total of 1,397 traps sampled and 54,372 crabs measured (Table 3). Fishing grids in Area 12 that were closed due to the occurrence of soft-shelled crab were mainly concentrated in and around Bradelle Bank and Shediac Valley (Fig. 3). Later in the fishery on June 16<sup>th</sup>, sector 1 in Baie des Chaleurs also closed due to high incidence of soft shelled crab. A total of 156 grids or partial grids were closed in Area 12 due to the presence of NARW during the snow crab fishery (Fig. 3).

Reported landings from Area 12 fish harvesters were 20,842 t from a revised quota of 20,402 t, representing 102.16% of the quota (Table 1). The TAC from the notice to harvesters was initially 20,128 t. Due to NARW closures in Areas 12E and 12F, harvesters within these Areas were granted temporary access to fish in Area 12. As a result, harvesters from Area 12E fished 73 t and Area 12F harvesters fished 508 t within the bounds of Area 12. Including catches from Area 12E and 12F harvesters, total landings within Area 12 were 21,423 t (Table 1). The spatial distribution of landings for 2021 was similar to 2020, with observable increases in the western part of Chaleur Bay, a slight decrease in landings in Shediac Valley and high landings in the southern part of the Magdalen Channel (Fig. 4). Catch size composition for 2021 are shown in Fig. 5 where sub-legal crab represented 18.3% of catches prior to discarding.

Fishing effort in Area 12 increased from 496,468 traps hauled (th) in 2019 to its highest level of 556,780 th in 2020 and then decreased considerably to 363,136 th in 2021 (Table 1). The spatial distribution of fishing effort in 2021 was similar to those of recent years, with concentrations in Baie des Chaleurs, the Shediac Valley, the Bradelle Bank, the Magdalen Channel and the Cape Breton Corridor (Fig. 6).

Average CPUE for Area 12 was 57.4 kg/th in 2021, an increase from 44.1 kg/th in 2020 (Table 1). Increases in CPUE were observed in the Bradelle Bank, Orphin Bank and south of the Magdalen Channel and a strong increase was observed in Baie des Chaleurs, relative to 2020 (Fig. 7). CPUEs by fish harvesting group are presented in Table 4. The average trap immersion time for Area 12 was 81 hours in 2021, which was comparable to 73 hours in 2019 and 75 hours in 2020.

### **3.1.2. Area 12E**

The 2021 fishing season in Area 12E opened on April 2<sup>rd</sup> and closed on June 30<sup>th</sup> with last landings reported on June 24<sup>th</sup> (Table 2). A total of 4 fishing vessels participated in the fishery, representing harvesters from New Brunswick, Quebec, and Prince Edward Island.

Observer sea-sampling in Area 12E consisted of 3 trips sampled, with a total of 28 traps sampled and 1,120 crabs measured (Table 3). As the majority of fishing grounds in Area 12E were closed on May 11<sup>th</sup> for the protection of NARW, snow crab harvesters from this fishing Area were permitted temporary access to fishing Area 12 until June 30<sup>th</sup> (Fig. 3). No grids were closed due to soft-shelled crab.

Reported landings from Area 12E fish harvesters were 296 t from a revised quota of 288 t, representing 102.81% of the quota (Table 1). The TAC from the notice to harvesters was initially 288 t. Approximately 73 t (24.5%) of the quota from fishing Area 12E was fished in Area 12. Fishing in Area 12E is limited to a small area in the southeastern portion of the Area, adjacent to Areas 12 and 12F (Fig. 4). Catch size composition for 2021 are shown in Fig. 5 where sub-legal crab represented 21.8% of catches prior to discarding.

Fishing effort in Area 12E has increased gradually from 3,415 th in 2019 to 5,314 th in 2021 (Table 1, Fig. 6). The average CPUE for Area 12E was 55.7 kg/th in 2021, an increase compared to 45.9 kg/th in 2020 (Table 1, Fig. 7). Immersion time increased to 73 hours in 2021, from 66 hours in 2019 and 54 hours in 2020.

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### 3.1.3. Area 12F

The 2021 fishing season in Area 12F opened on April 3<sup>rd</sup> and closed on June 30<sup>th</sup> with last landings reported on June 29<sup>th</sup> (Table 2). A total of 32 fishing vessels participated in the fishery, representing harvesters from Quebec and Nova Scotia.

Observer sea-sampling in Area 12F consisted of 3 trips sampled, with a total of 31 traps sampled and 1,240 crabs measured (Table 3). As the majority of fishing grounds in Area 12F were closed on April 29<sup>th</sup> for the season for the protection of NARW, snow crab harvesters from this fishing Area were permitted temporary access to fishing Area 12 until June 30<sup>th</sup> (Fig. 3). In 2021, no grids were closed due to soft-shelled crab.

Reported landings from Area 12F fish harvesters were 1,100 t from a revised quota of 1,191 t, representing 92.33% of the quota (Table 1). The TAC from the notice to harvesters was initially 1,192 t. Approximately 508 t (46.2%) of the quota from fishing Area 12F was fished in Area 12. Landings in Area 12F were concentrated along the central portion of the Area (Fig. 4). Catch size composition for 2021 are shown in Fig. 5 where sub-legal crab represented 23.3% of catches prior to discarding.

Fishing effort in Area 12F increased from 18,083 th in 2019 to 22,168 th in 2020 and then decreased again in 2021 to 18,612 th (Table 1, Fig. 6). The Area 12F mean CPUE estimated from logbooks remained high in 2021 (59.1 kg/th) which is an increase from 2020 (45.2 kg/th) (Table 1, Fig. 7). Immersion time slightly decreased in 2021 (82 hours) compared to 2020 (88 hours) and was similar to 2019 (83 hours).

### 3.1.4. Area 19

The 2021 fishing season in Area 19 opened on July 13<sup>th</sup> and closed on September 13<sup>th</sup> with last landings reported on August 18<sup>th</sup> (Table 2). A total of 108 fishing vessels from Nova Scotia participated in the fishery.

Observer sea-sampling in Area 19 consisted of 67 trips sampled, with a total of 201 traps sampled and 7,931 crabs measured (Table 3). During the snow crab fishery, 6 sectors and 7 grids were closed in Area 19 due to soft-white crab and the presence of NARW, respectively (Fig. 3).

Reported landings from Area 19 were 2,241 t from a revised quota of 2,244 t, representing 99.87% of the quota (Table 1). The TAC from the notice to harvesters was initially 2,202 t. The spatial distribution of landings for 2021 was similar to 2020, with the bulk of landings occurring the southern portion of the Area, around the tips of the two Cape Breton Troughs (Fig. 4). Catch size composition for 2021 are shown in Fig. 5 where sub-legal crab represented 20.3% of catches prior to discarding.

Fishing effort in Area 19 has steadily decreased since 2019 from 24,518 th to 18,384 th in 2021 (Table 1, Fig. 6). The average CPUE remained high in 2021 at 121.0 kg/th, an increase from 101.7 kg/th in 2020 (Table 1, Fig. 7). In 2021, the mean trap immersion time was 31 hours, comparable to 31 hours in 2019 and 33 hours in 2020.

## 4. CONCLUSION

An early start to the 2021 fishing season, ostensibly prior to the arrival of NARW, along with a precautionary reduction of 15% on the estimated commercial biomass, likely contributed to the observed increases in fishery CPUE in 2021. Although CPUE of a given fishing year may correlate to the biomass estimated from the preceding survey, many other factors unrelated to



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crab biomass, such as environmental conditions, local Area closures, fishing gear and fishing practices likely obscure the relationship between these two.

## **5. ACKNOWLEDGEMENTS**

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## 7. TABLES

*Table 1. Landings, fishing effort and catch-per-unit-of-effort (CPUE) from logbooks in the southern Gulf of St. Lawrence snow crab, Chionoecetes opilio, fisheries (Areas 12, 12E, 12F and 19) since 1987.*

Year	Landings (t)					Effort (number of trap hauls)				CPUE (kg / trap haul)			
	12	12E	12F	19	Total	12	12E	12F	19	12	12E	12F	19
1987	11,782	-	-	1,151	12,933	449,293	-	-	37,987	26.2	-	-	30.3
1988	12,355	-	-	1,337	13,692	528,844	-	-	22,794	23.4	-	-	58.7
1989	7,882	-	-	1,334	9,216	356,442	-	-	29,978	22.1	-	-	44.5
1990	6,950	-	-	1,333	8,283	254,578	-	-	28,422	27.3	-	-	46.9
1991	10,019	-	-	1,337	11,356	326,671	-	-	16,733	30.7	-	-	79.9
1992	11,235	-	-	1,678	12,913	362,967	-	-	17,140	31.0	-	-	97.9
1993	14,336	-	-	1,678	16,014	344,698	-	-	18,204	41.6	-	-	92.2
1994	19,995	-	-	1,672	21,667	390,833	-	-	24,495	51.2	-	-	68.3
1995	19,944	217	317	1,575	22,053	416,890	4,033	11,561	24,854	47.8	53.8	27.4	63.4
1996	15,978	164	238	1,342	17,722	318,796	2,714	5,604	24,583	50.1	60.3	42.4	54.6
1997	15,413	163	287	1,386	17,249	303,286	4,695	6,390	21,930	50.8	34.7	44.9	63.2
1998	11,136	161	290	1,988	13,575	243,339	5,624	6,035	31,232	45.8	28.6	48.1	63.1
1999	12,682	159	290	1,979	15,110	289,003	5,415	5,072	19,088	43.9	29.4	57.2	103.7
2000	15,046	150	291	3,225	18,712	436,782	6,528	5,136	55,977	34.5	22.9	56.7	64.1
2001	13,819	155	378	3,910	18,262	326,382	6,700	5,736	46,251	42.3	23.2	63.0	88.5
2002	21,869	165	378	3,279	25,691	544,454	2,916	4,437	43,662	40.2	56.6	85.2	72.3
2003	16,898	345	817	3,103	21,163	337,960	5,471	10,460	29,952	50.0	63.1	78.1	103.6
2004	26,626	349	806	3,894	31,675	484,991	6,277	10,775	56,517	54.9	55.6	74.8	68.9
2005	32,363	449	479	2,827	36,118	508,053	5,571	5,112	41,512	63.7	80.6	93.7	68.1
2006	25,934	411	787	1,989	29,121	402,702	10,074	14,079	23,566	64.4	40.8	55.9	84.4
2007	23,243	220	370	3,034	26,867	353,775	5,914	12,252	42,553	65.7	37.2	30.2	71.3
2008	20,911	187	431	2,929	24,458	370,762	9,232	15,504	38,388	56.4	20.3	27.8	76.3
2009	20,896	67	309	2,370	23,642	433,527	4,653	14,045	33,193	48.2	14.4	22.0	71.4
2010	7,719	50	420	1,360	9,549	161,148	1,825	14,335	11,138	47.9	27.4	29.3	122.1
2011	8,618	76	313	1,701	10,708	162,604	2,413	9,631	12,761	53.0	31.5	32.5	133.3
2012	18,159	185	706	2,906	21,956	267,044	5,623	16,890	16,317	68.0	32.9	41.8	178.1
2013	22,645	204	543	2,657	26,049	296,398	5,097	11,086	17,890	76.4	40.1	49.0	148.5
2014	19,674	178	882	3,745	24,479	317,689	3,765	23,163	25,407	61.8	47.3	38.1	147.4
2015	23,080	192	510	2,129	25,911	339,912	2,918	13,351	14,703	67.9	65.8	38.2	144.8
2016	19,499	144	381	1,701	21,725	304,624	2,796	8,667	11,937	64.0	51.5	43.9	142.5
2017	39,825	203	684	2,944	43,656	553,125	3,333	9,421	20,616	72.0	60.9	72.6	142.8
2018	20,769	260	1,183	2,048	24,260	469,887	5,579	17,120	13,120	44.2	46.6	69.1	156.1
2019	27,554	224	1,166	2,763	31,707	496,468	3,415	18,083	24,518	55.5	65.7	64.5	112.7
2020	24,554	234	1,084	2,284	28,156	556,780	5,098	22,168	22,458	44.1	45.9	45.2	101.7
2021	21,423 *	223	592	2,241	24,479	363,136	5,314	18,612	18,384	57.4	55.7	59.1	121.0

\* Total landings in Area 12 include landings allocated to Areas 12E (73 t) and 12F (508 t) that were fished in Area 12. Landings exclusive by Area 12 harvesters were 20,842 t.

*Table 2. Number of allocation shares, number of active vessels, season opening and closing dates, dates last landing dates, revised quotas, and total landings of the snow crab fishery by management Area in the southern Gulf of St. Lawrence in 2021.*

Characteristics	Area 12	Area 12E	Area 12F	Area 19	Southern Gulf
Allocation shares	243	4	43	158	448
Active vessels	319	4	32	108	464
Season opening date	April 3	April 2	April 3	July 13	-
Season closing date	June 30	June 30	June 30	September 13	-
Last day of landings	June 17	June 24	June 29	August 18	-
Revised quota (t) <sup>1</sup>	20,402	288	1,191	2,244	24,125 <sup>2</sup>
Landings (t)	21,423 <sup>3</sup>	223	592	2,241	24,479

<sup>1</sup> For reasons of annual quota adjustments, reconciliations, and re-distribution of the scientific quota among Areas, the revised quota does not necessarily correspond to the TAC in the notice to harvesters.

<sup>2</sup> Quota includes 450 t set aside to finance the trawl survey in 2021 (under Section 10 of the Fisheries Act).

<sup>3</sup> Total landings in Area 12 include landings allocated to Areas 12E (73 t) and 12F (508 t) that were fished in Area 12. Landings exclusive by Area 12 harvesters were 20,842 t.

*Table 3. Fishery characteristics and at-sea observer coverage by management Area in the southern Gulf of St. Lawrence snow crab fisheries in 2021.*

Characteristics	12	12E	12F	19
Fishing effort (traps hauled)	363,136	5,314	18,612	18,384
Fishing trips	2,558	27	93	1,093
Trips with observers	214	3	3	67
Traps sampled by observers	1,397	28	31	201
Crab sampled	54,372	1,120	1,240	7,931

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Table 4. Catch-per-unit-of-effort (CPUE; kg per trap haul) by Area 12 harvester group.

Year	Traditional Area 12	Traditional Area 18	Traditional Area 25-26	First Nations	New entrants
2001	43.5	-	62.7	38.8	32.3
2002	42.3	-	45.2	33.8	31.0
2003	50.5	66.0	43.6	51.4	45.6
2004	55.5	64.4	63.9	55.8	48.4
2005	66.2	70.3	80.2	64.5	50.3
2006	68.7	66.2	79.8	59.7	53.8
2007	69.4	61.4	66.2	65.8	54.4
2008	57.3	77.3	54.6	56.0	49.3
2009	46.6	76.7	48.3	49.8	48.7
2010	48.7	36.3	54.0	45.2	51.0
2011	54.3	53.3	46.6	50.9	51.6
2012	67.7	133.1	66.0	67.8	60.5
2013	77.0	114.5	71.1	75.4	69.6
2014	62.1	88.6	53.4	61.4	57.8
2015	70.1	78.9	61.6	66.0	61.1
2016	64.6	69.6	71.0	61.8	61.5
2017	77.6	77.8	76.4	65.0	65.7
2018	43.4	84.5	45.5	42.5	43.5
2019	58.2	72.8	56.3	52.5	47.1
2020	42.9	61.9	54.2	46.5	41.5
2021	60.0	60.2	76.4	52.6	51.1

## 8. FIGURES

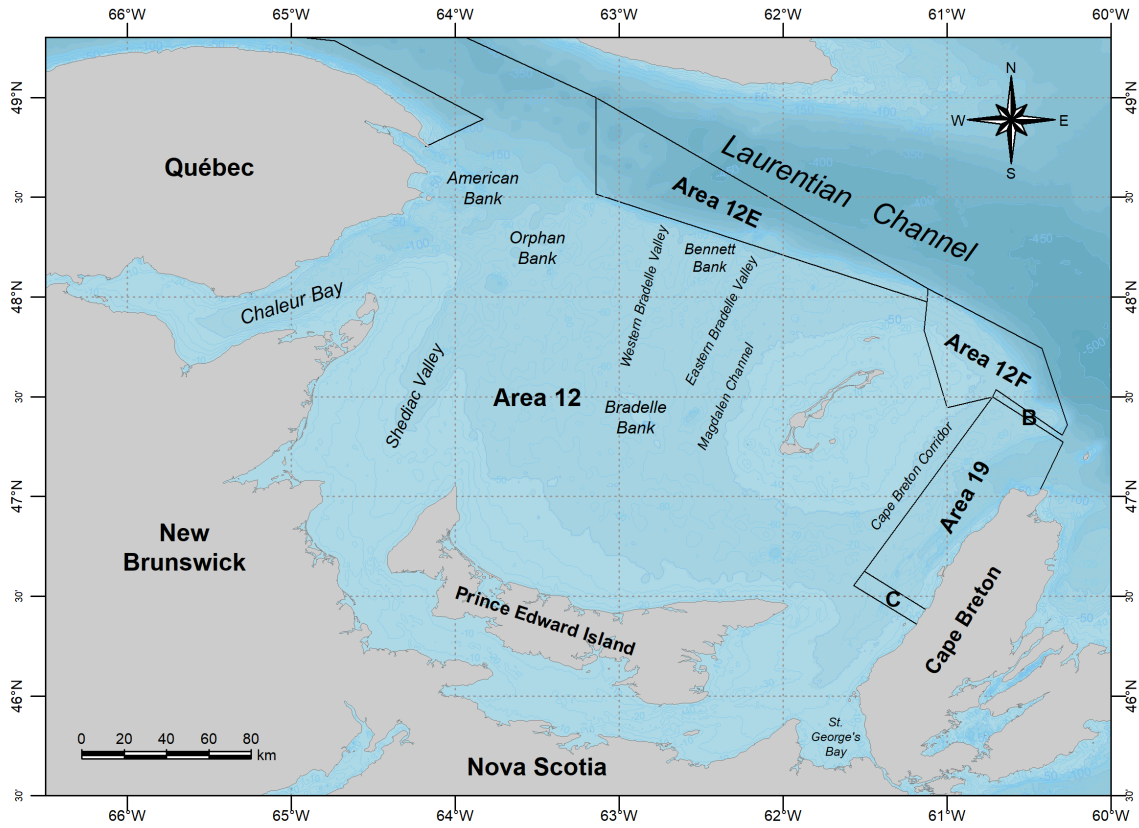


Figure 1. Locations of snow crab (*Chionoecetes opilio*) fishing grounds and management Areas in the southern Gulf of St. Lawrence. Areas B and C are buffer zones.

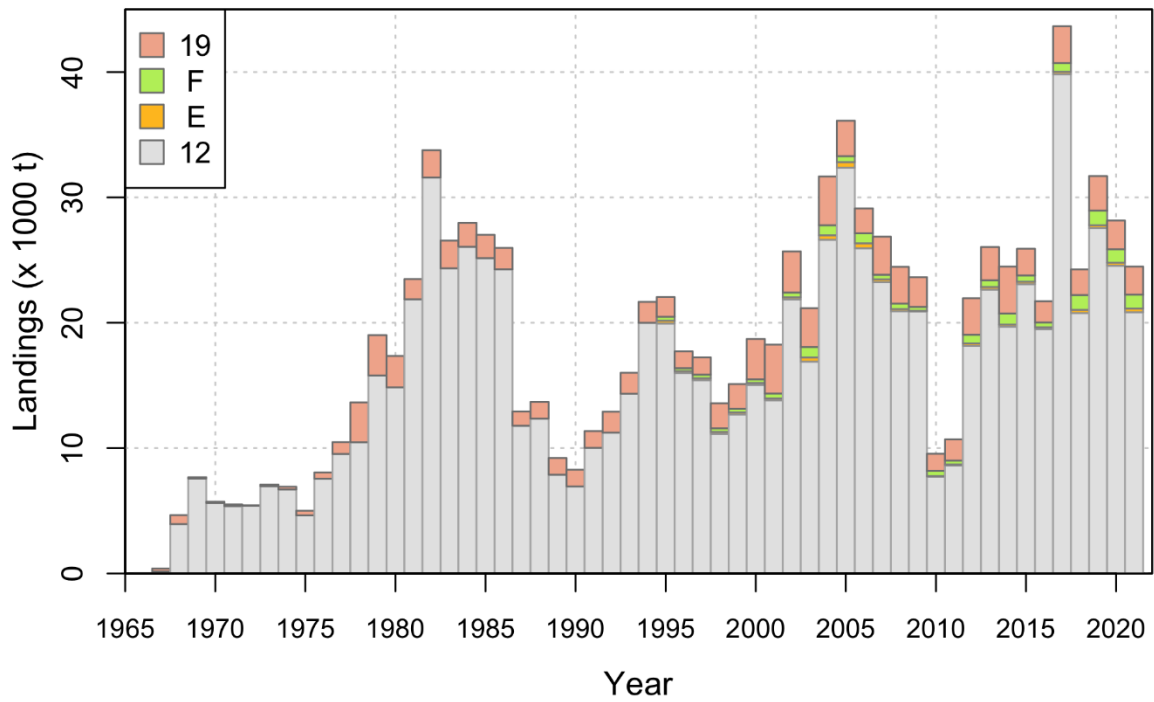


Figure 2. Annual landings (t) by fishing Area in the southern Gulf of Saint Lawrence snow crab fishery by fishing Area.

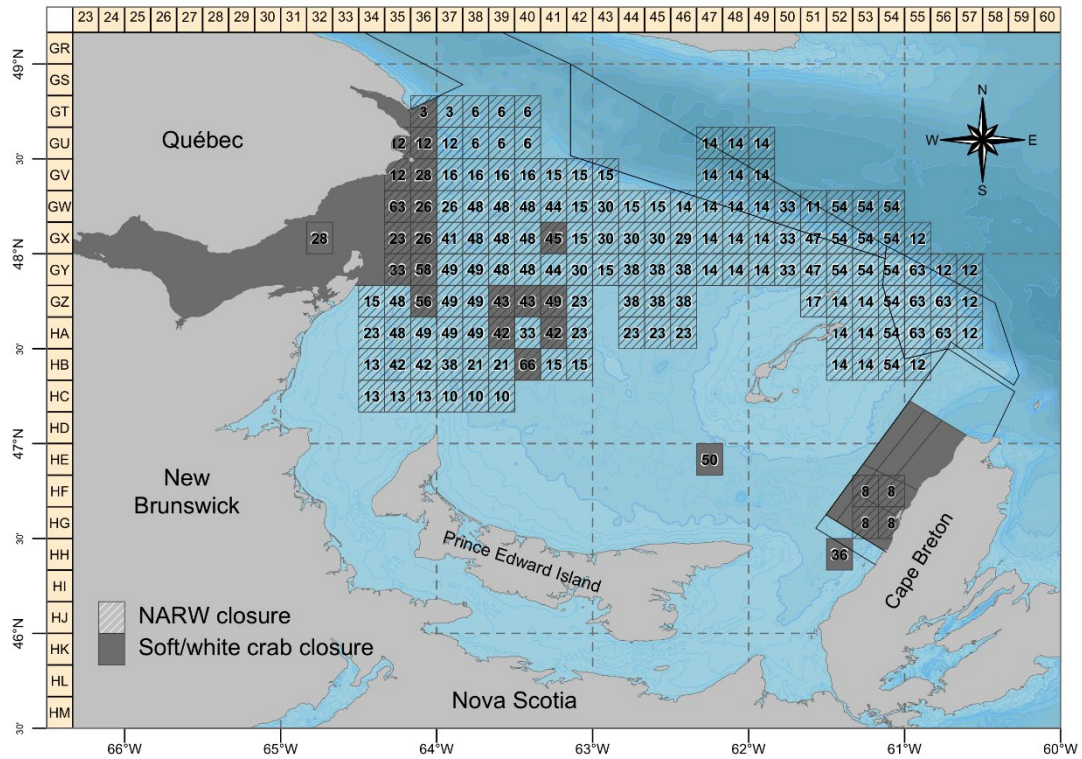


Figure 3. Local Area closures of soft/white crab (solid grey area) and for the protection of North Atlantic Right whales (NARW) (hatched area) in 2021. Numbers represent the total number of days grids were closed during the fishery. The Baie des Chaleurs sector closed on June 16<sup>th</sup> while in Area 19, five sectors closed on July 30<sup>th</sup> and a 6<sup>th</sup> sector closed on August 6<sup>th</sup>.

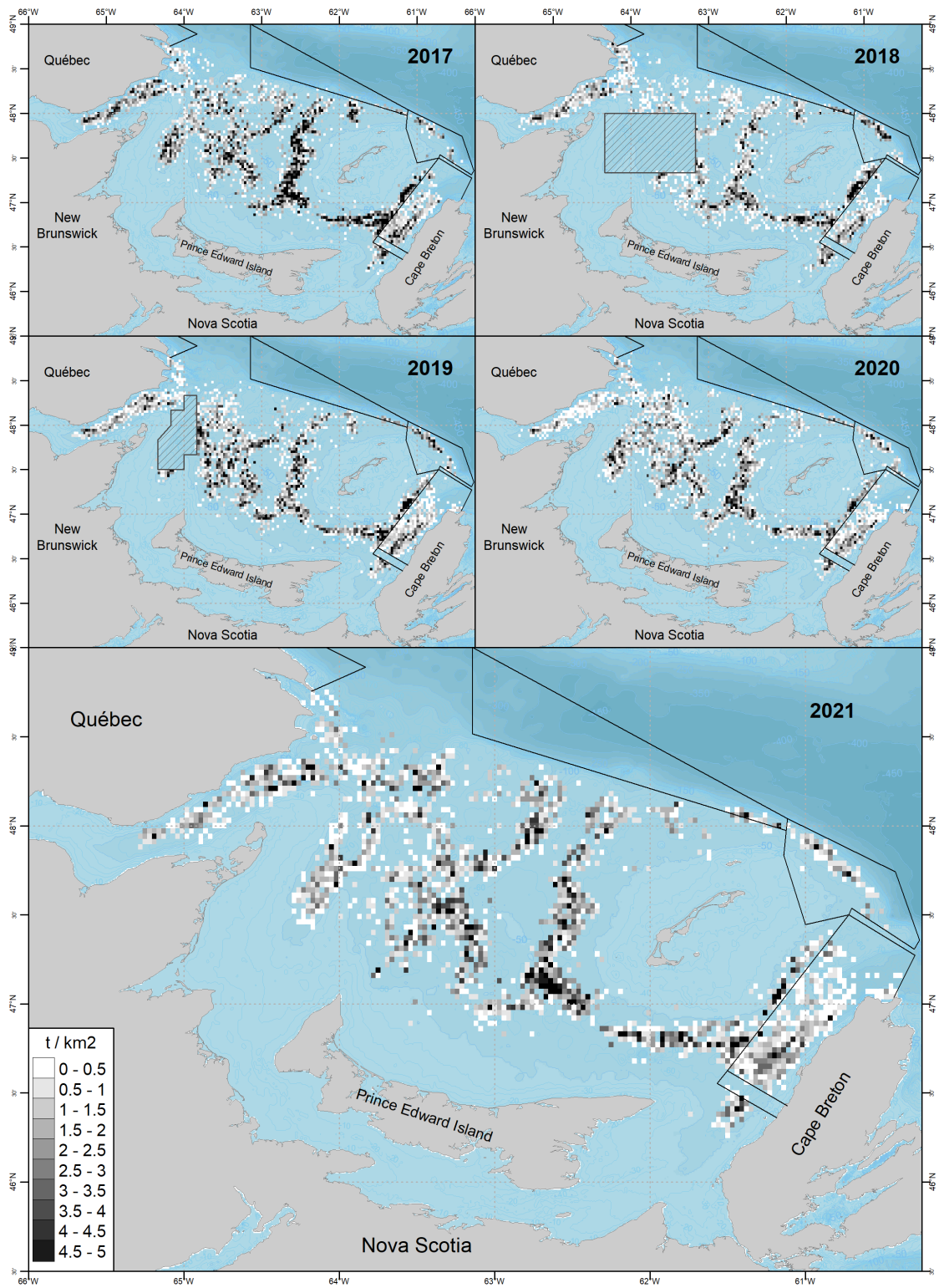


Figure 4. Geographic distribution of landings (kg) in snow crab fishing management Areas from the 2017-2021 fishing seasons. Static closures for the protection of NARW are represented by shaded areas in 2018 and 2019.



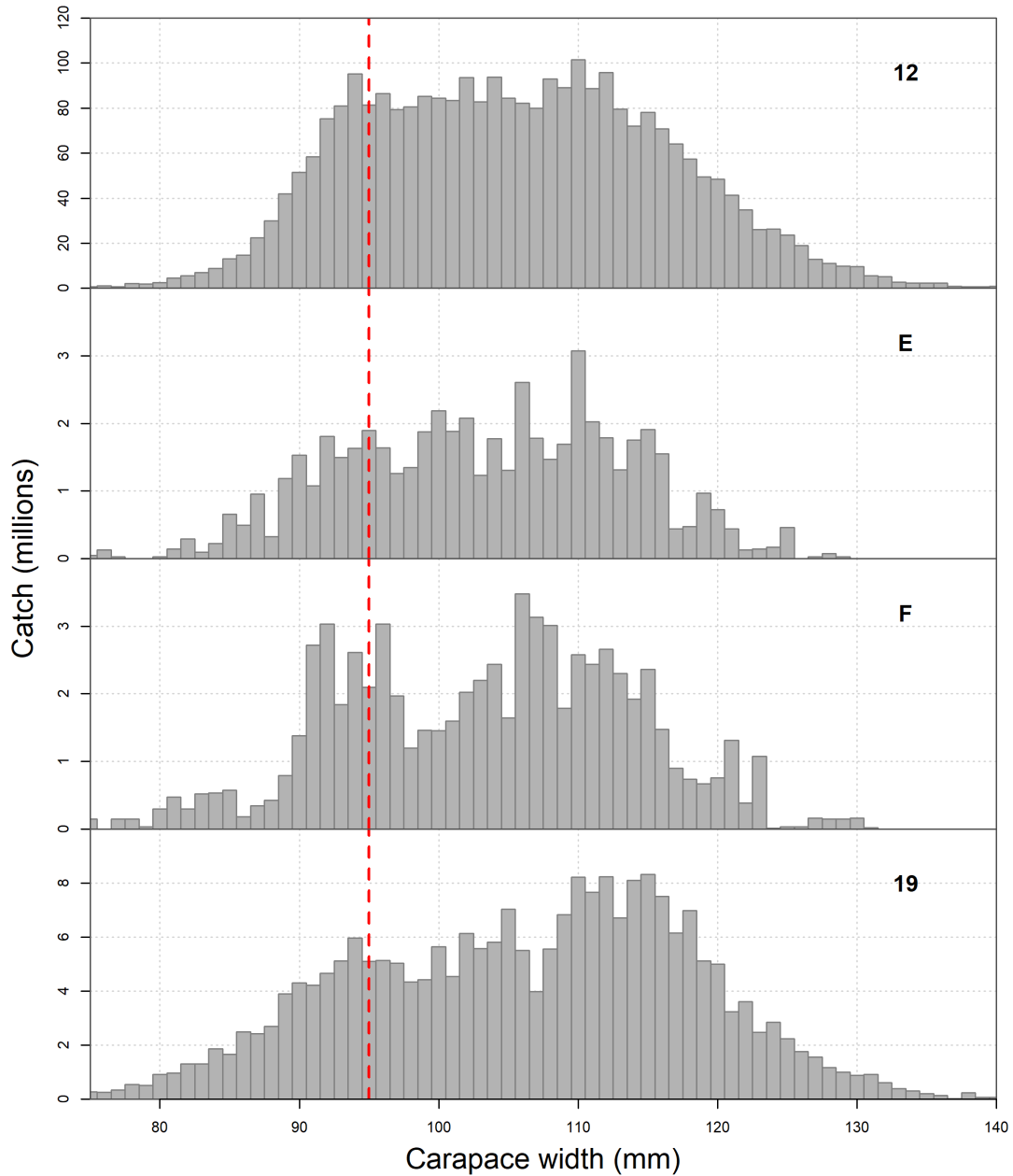


Figure 5. Size frequency distributions of all males crabs measured during the at-sea sampling (before discarding) in Areas 12, 12E, 12F and 19 in 2021. The red stippled line indicates the legal sized of 95 mm carapace width.

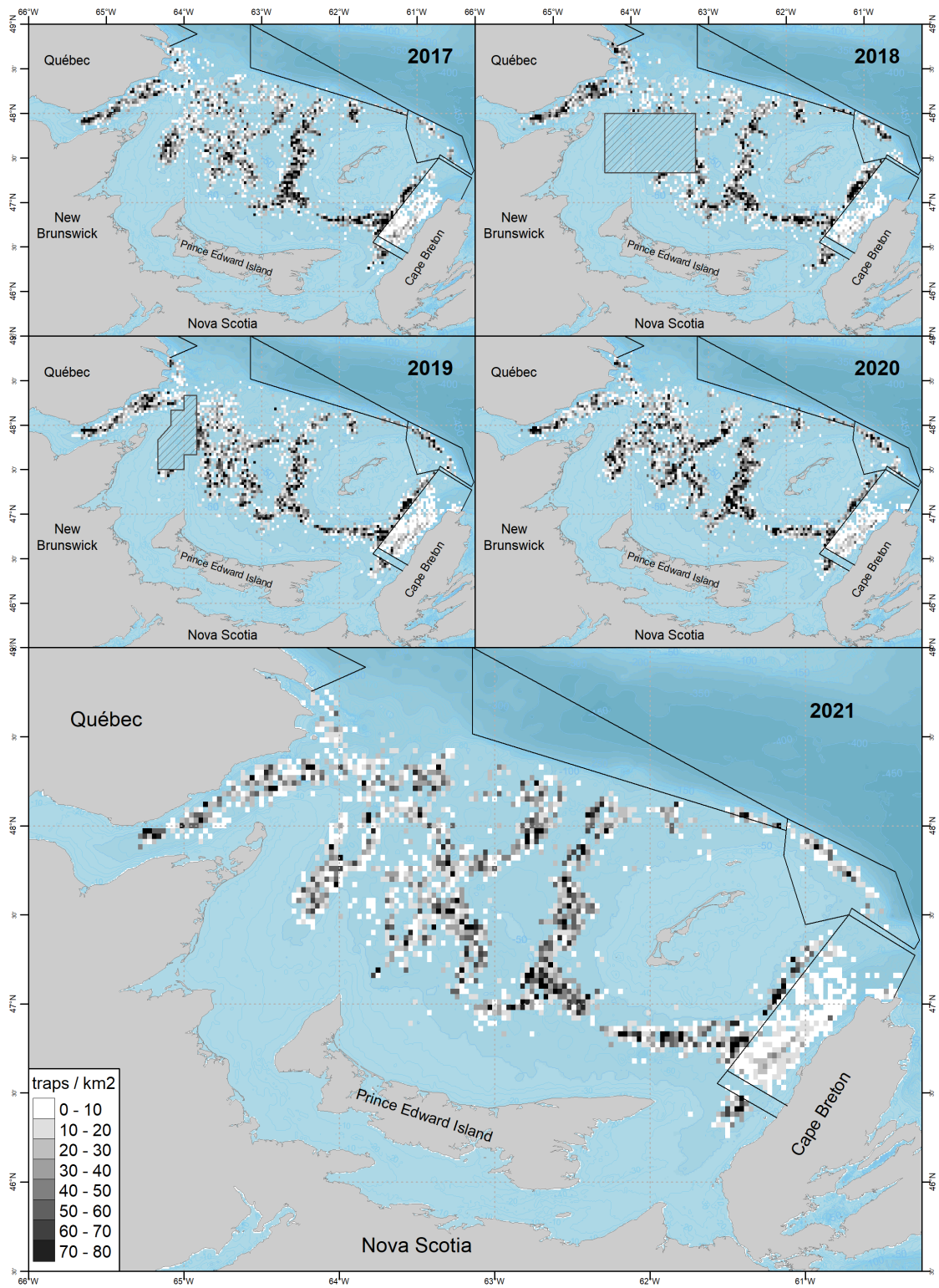


Figure 6. Geographic distribution of fishing effort (trap hauls) by snow crab fishery management Area from the 2017-2021 fishing seasons. Seasonal closures for the protection of NARW are represented by shaded areas in 2018 and 2019.

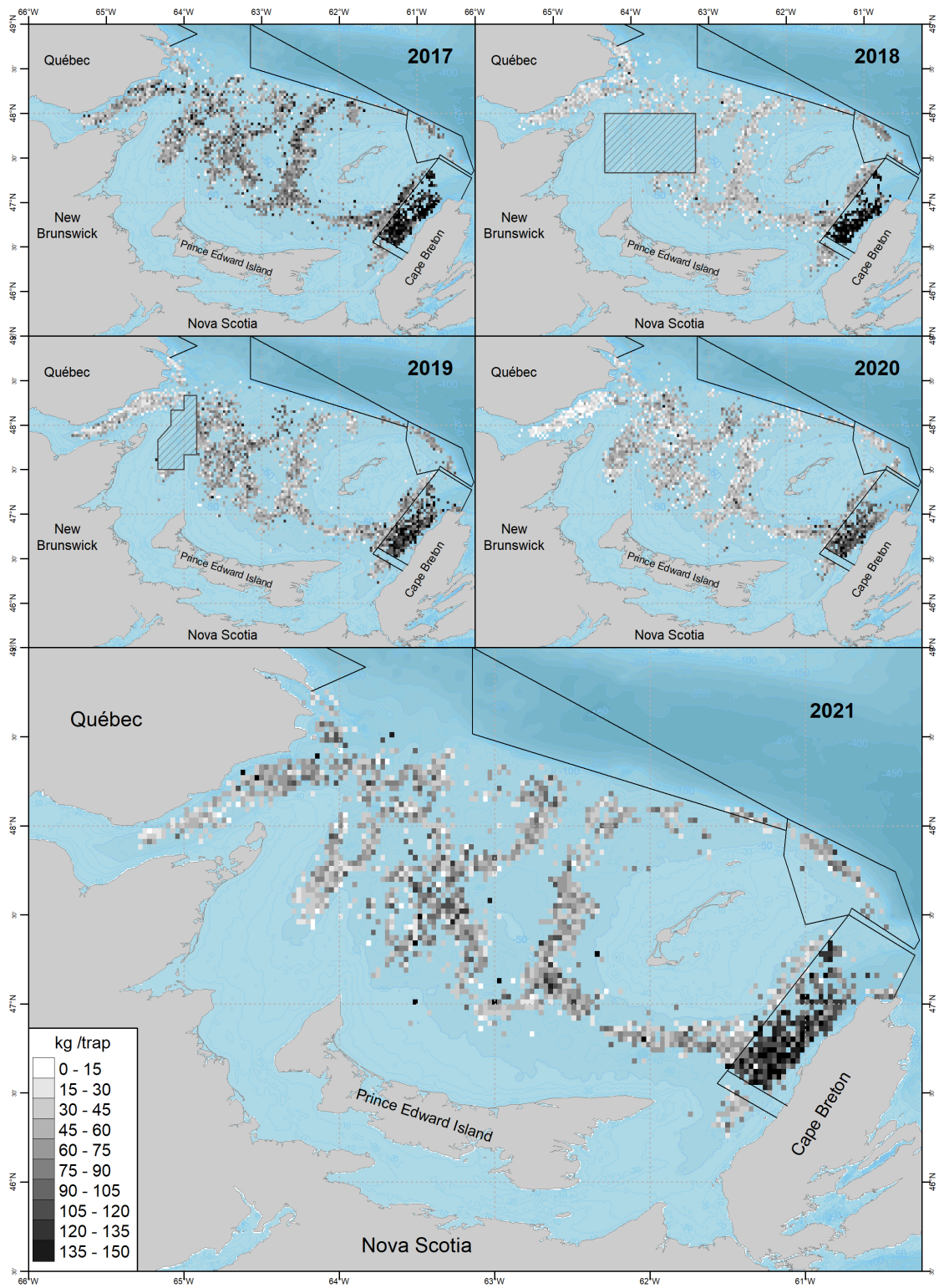


Figure 7. Geographic distribution of mean catch-per-unit-of-effort (CPUE; kg/th), in the snow crab fishery management Areas from the 2017-2021 fishing seasons. Seasonal closures for the protection of NARW are represented by shaded areas in 2018 and 2019.