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INTERIM ECOLOGICAL MONITORING REPORT ON THE PRIORITY INDICATORS FOR THE BANC-DES-AMÉRICAINS MARINE PROTECTED AREA

Context

In March 2019, a marine protected area (MPA) was established under the *Oceans Act* (SOR/2019-50) in the Banc des Américains area. This area was also granted proposed aquatic reserve status under Quebec's *Natural Heritage Conservation Act* as part of the Canada-Quebec joint project agreement regarding the Banc-des-Américains MPA. Following MPA status designation, an ecological monitoring plan must be developed, and monitoring must be implemented to provide information on the achievement of the conservation objectives (CO) for the MPA. There are three conservation objectives for the Banc-des-Américains MPA:

1. conserve and protect benthic habitats;

2. conserve and protect pelagic habitats and forage species and

3. promote the recovery of at-risk whale and wolffish species (Gauthier et al. 2013).

A preliminary version of the ecological monitoring plan for the MPA underwent peer review in 2018. At the time, an initial list of indicators was drawn up for the conservation objectives and pressures, and the surveys that could be used as a source of data were identified (Faille et al. 2019; DFO 2019a). Following the peer review, in January 2019 a scientific monitoring committee (SMC-BDA) was established to finalize the choice of indicators and associated measures, calculate the results, and identify methods for assessing status and trends in the MPA.

A regional peer review held in 2021 (Faille et al. 2023; DFO 2023a) provided the opportunity to review the methodology for presenting the indicator results, including the spatial and temporal scales to be considered and methods for evaluating the status of each indicator. It was recommended that an interim ecological monitoring report focusing on specific priority indicators be produced every three years. The goal is to have a succinct and realistic interim report that can be produced at shorter intervals, thereby providing management with results in a timely manner. A complete monitoring report with updated information on all the indicators will be produced at a lower frequency (e.g., every 10 years).

In 2023, the **Marine Planning and Conservation Division** (MPC) of Fisheries and Oceans Canada (DFO), Quebec Region, asked Science to produce an interim ecological monitoring report for the Banc-des-Américains MPA based on the methodology identified at the peer review in 2021 (DFO 2023a). Accordingly, Science assessed the status of the priority indicators using the data collected until December 2022, thereby providing information to help the MPC team ensure optimal management of the MPA. This Science Response Report results from the regional peer review meeting held on January 31, 2024 to discuss the Intermediary Ecological Monitoring Report of the Banc-des-Américains Marine Protected Area on Priority Indicators.

Background

Priority issues

Since the three conservation objectives are very broad, priority issues were identified to better guide the assessment of the status of the indicators and measures as well as clarify the direction of expected changes (Faille et al. 2023). Therefore, the priority issues should help to guide the monitoring and interpretation of results. Overall, the MPA should allow to minimize the impact of anthropogenic pressures on the environment and maintain the integrity of the ecosystem. Accordingly, the objective of this document is to compare the status of the indicators for the Banc-des-Américains MPA over the past three years to the period (varies from one indicator to another) preceding its designation in 2019.

Priority indicators

Fourteen priority indicators were selected for the production of the interim report; they were selected on the basis of ease of access (e.g. data available annually), specificity to the MPA and capacity to trigger management action in response to a change observed in the short term (DFO 2023a). Three indicators associated with conservation objectives CO1 and CO3 were selected as priority indicators, along with 11 pressure indicators (Table 1). This list may be reviewed in the future depending on the availability of new data.

Calculation of indicators

The data used to calculate the different indicators come from annual surveys conducted by DFO and external partners (Table 1). For each indicator, one or more measures to be calculated were selected during the 2021 peer review (DFO 2023a). For details on each measure, refer to Appendices F and G of the research document written by Faille et al. (2023). The spatial scale used for the calculations varies from one indicator to the next and, in certain cases, an area larger than the MPA is used (Table 1).

Method for assessing the status of the indicators

The indicator results are assessed using three status categories: "Good," "Medium," and "Poor" for the conservation priorities, and "Low," "Medium," and "High" for pressures (Table 2). Where there is a lack of data, information may be presented without a score being assigned. In such cases, the "Not Assessed" category is used.

During the peer review in 2021, two methods for assessing the status of the indicators were selected: anomaly and fixed threshold (Table 2) (DFO 2023a).

- **Anomaly method**: anomalies (deviation from the standardized mean) are used to highlight the variation of the estimate of a measure at time X relative to the mean for a reference period.

- **Fixed threshold method**: thresholds are used when threshold values with known biological effects are available from the scientific literature.

For seven priority indicators, the anomaly method is used, and for one indicator, a threshold approach is used. For the other six indicators, no method has been selected to date due to the available data (length of time series, uncertainty, precision, etc.), and therefore no status is assigned (Table 1). The reference period used for the assessment of indicators was reviewed

using the available databases and the interpretation of results (DFO 2023a). For most of the priority indicators, the reference period used is 2004 to 2018 (Table 1).

The annual status of the indicator was calculated by summing the anomalies of each associated measure. In addition, for each indicator an overall rating was obtained by calculating the mean of the past three years (2020-2021-2022). Using this mean makes it possible to provide a clearer and more stable signal, and avoids placing emphasis on a sudden variation in a given year. Thus, the overall rating is intended to be representative of the current status of the indicator and to provide accurate information for management.

Analysis and Response

Status of priority indicators for CO1

BD11 – Snow crab (*3 measures*)

The abundance of commercial-sized male snow crab (≥95 mm)[1] has been increasing in the MPA since 2018. Since 2020, snow crab density has been higher than the reference period mean (MeanR =2,811 ind./km^2) (Figure 1). An upward trend is also observed in **catch per unit effort (CPUE)** values of the snow crab fishery since 2019. In contrast, the **density of mature females** has remained well below the reference period mean (MeanR=10,246 ind./km^2) since 2013. The mean density of mature females over the last three years, 3,170 ind./km^2, is nonetheless similar to the abundance of commercial-sized males, despite the fact that, historically, the abundance of females was 5 to 10 times higher than that of males.

Status

The overall rating for the **BD11** indicator is "Good" (Figure 2). This rating is mainly attributable to the two measures related to the density of male snow crab and the commercial fishery, which are close to the reference period mean. In the Gulf of St. Lawrence, crab abundance varies naturally on a cycle of about 7 years (Ernst et al. 2012). It is therefore normal to see fluctuations in these three measures in the MPA.

Context and interpretation

On a broader scale, the results of the assessment of snow crab in the southern Gulf of St. Lawrence (sGSL) indicate that the stock is stable and falls within the healthy zone according to the precautionary approach (PA) (Surette and Chassé 2023). Population recruitment and spawning stock abundance remain at high levels in the southern Gulf. However, the results for the Banc-des-Américains area show that since 2011, the densities of the three categories of snow crab considered in the stock assessment (mature females, instar VIII crab, commercial-sized crab) have decreased considerably, particularly in the western part of the MPA, but also in the south and east. There appears to have been a shift in large concentrations of commercial-sized male crab to areas farther south of the boundaries of the MPA (DFO 2020; Surette and Chassé 2023). Similarly, over the past 10 years, concentrations of mature females and male instar VIII crab have moved towards the Shediac Valley and the Magdalen Islands (Surette and Chassé 2023). However, the spatial distribution maps in Surette and Chassé (2023) for 2021 and 2022 appear to show that some commercial-sized male crab are returning to the MPA. Furthermore, in 2019 and 2020, the catch per unit effort (CPUE) in the MPA was lower than the value recorded in Area 12; however, since 2021, the CPUE values have been similar.

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[1] The names of the measures used to calculate each indicator are indicated in bold text.

It should be noted that for the past 10 years, the proportion of mature females relative to commercial-sized males in the MPA has changed significantly (Figure 3). In the late 1990s and in the early 2000s, females were very abundant and dominated the sex ratio (females accounted for more than 80% of the total population). Since 2020, the ratio of females to males has been closer to 1:1. Reproductive potential can be affected if the sex ratio is not optimal; however, an ideal sex ratio has not yet been determined (Sainte-Marie et al. 2002; DFO 2006). An excessively low relative number of mature females could limit the production of eggs and larvae and therefore affect reproductive potential (Zisserson et al. 2019). Concerns have also been raised about warming bottom temperatures on the Magdalen Shallows (Surette and Chassé 2023). In recent years, the volume of the cold intermediate layer (CIL) has been very low, causing a decrease in the area of the CIL and, therefore, a contraction in snow crab habitat. These changes in the CIL could influence the spatial distribution of crab.

- The indicator is assessed as "Good" but need to be watch more closely, especially the situation of mature females to ensure long-term recruitment.

- The sGSL snow crab stock is considered to be in good condition, but its spatial distribution appears to be changing, particularly in the MPA.

- For about 10 years, snow crab migration toward the southern boundary of the MPA has been observed; however, in the past two years, it appears that commercial-sized males have been returning to the MPA.

- It is recommended that the assessment method be reviewed, taking into account the expected natural cyclicity of snow crab. The linear anomaly method may not be entirely suitable for snow crab, a species whose abundance fluctuates in a cyclical manner. For example, the current method would not allow a "Poor" rating to be calculated, not even after a collapse of the mature female component of the stock. A method that takes into account variations in natural densities of snow crab should be given priority.

BD12 – Harvested groundfish (*3 measures*)

Over the last three years, the **estimated biomass of Atlantic halibut** has remained well above the reference period mean (7.2 kg/tow), at about 15 kg/tow (Figure 4). Although the biomass value fell slightly below the reference mean in 2019, since then much higher values than in the 1980s and 1990s and even in the early 2000s have been observed. In 2020, **the mean abundance of Atlantic cod** in this area reached a level that has not been seen since the 1980s. In 2021 and 2022, cod abundance remained well above the reference period mean of 59 ind./tow (Figure 4). The **catch per unit effort (CPUE)** for **harvested groundfish (longline)** has remained above the reference level of 0.22 kg/hook since 2015, with recorded values varying between 0.31 kg and 0.41 kg/hook (Figure 4). Since 2020, Atlantic halibut landings (80% of catches) have made the largest contribution to this CPUE.

Status

The overall rating for the **BD12** indicator is "Good" (Figure 5). The values of all three measures used to calculate the indicator are above the reference period mean, and have exhibited peaks much higher than the reference mean over the last three years.

Context and interpretation

In 2021 and 2022, based on the stock assessment of Gulf of St. Lawrence Atlantic halibut (DFO 2021; DFO 2023b), the biomass indices for commercial-sized Atlantic halibut (≥85 cm) were among the highest in the trawl survey time series, for both the northern and the southern Gulf. The size and average weight of landed halibut have been increasing since 2006. Although the

biomass of Atlantic cod in the MPA has been increasing, the sGSL population was still considered to be in decline in 2019 (Swain et al. 2019). Owing to grey seal predation, the distribution of Atlantic cod has gradually shifted away from shallow inshore areas to the deeper waters of the Laurentian Channel (including the MPA) over the last 20 years (DFO 2019b). A review of the biomass and abundance data for stratum 416 (R10-Multi sGSL) in 2020 pointed to the presence of smaller cod, a potential sign of recruitment. The length frequencies clearly show a cohort made up of smaller cod in 2020 relative to other years (Figure 6). The CPUE values for the longline fishery in the MPA are similar to those recorded throughout Divisions 4RST (DFO 2023b). In the GSL, CPUE values for the directed Atlantic halibut fishery increased gradually from the early 2000s until 2015 and have remained high and stable since then (DFO 2023b).

- The indicator is assessed as "Good," and is primarily influenced by the biomass of Atlantic halibut which has followed an upward trend in the MPA since 2009.

- Atlantic cod biomass has also been increasing, with high abundances being recorded in the MPA area compared to elsewhere in the southern Gulf. The situation should be monitored because, on a broader scale, the southern Gulf stock is considered to be in a precarious situation, or in decline.

Status of priority indicators for CO3

EP6 – Cetacean mortality/accidents (*2 measures*)

Over the years, the **total number of reports of sick, injured, stranded individuals and carcasses for species at risk** and **other species (large marine mammals, dolphins, porpoises)** in the Percé-Gaspé area appears to have followed an upward trend based on the data collected by the Quebec Marine Mammal Emergency Response Network (QMMERN). The means for the reference period (2012 to 2018) are 1.3 reports for species at risk (Beluga, North Atlantic Right Whale, Blue Whale, Fin Whale) and 6.1 reports for other species (large marine mammals, dolphins, porpoises) (Table 3). Since the MPA was designated, specifically from 2019 to 2022, the mean was 2.5 reports of species at risk and 11.3 reports of other species.

Status

The status of this indicator was not assessed.

Context and interpretation

Reports of carcass sightings appear to be more frequent than reports of sick, injured or live stranded individuals. Toothed cetaceans not designated at risk seem to account for more of the incidents than species at risk and baleen whales (Figure 7). Over time, there appears to have been an increase in reports for all three groups of species, with a more pronounced increase for toothed cetaceans. Note, however, that this increase could be linked to a higher reporting rate due to enhanced public awareness; it does not necessarily indicate a greater number of incidents. It should be kept in mind that this indicator is not specific to the MPA and it is not precise, given that individuals/carcasses may drift or sink (therefore incidents may be underestimated) and that the data cover a large area (Figure 8). There have been only four reports in the MPA since 2012 (Figure 8).

- There appears to be a slight increase in the number of reports, but it is not possible to confirm whether the actual number has increased, since not enough data are available for statistical analysis.

- This indicator is not precise; it would be helpful to identify other data that would support a more accurate assessment.

Status of priority pressure indicators

Pr7 – Traffic intensity (*2 measures*)

After reaching a peak of 538 transits in 2019, the **total number of transits per year for vessels in the commercial category**[2] fell by more than 30% in 2020 (Figure 9). Since then, however, the number of transits has increased steadily. In 2022, 473 transits of commercial vessels (merchant and passenger ships: cargo ships, tankers, international cruise ships and ferries) were recorded in the MPA, which represents an average of 1.3 vessels transiting the MPA each day. A similar trend has been observed for marine operations transits (tugboat, dredger, pilot boat, search and rescue, scientific research, icebreaker, military, patrol vessel), which reached a peak of 229 transits in 2019. This number fell sharply in 2020 and reached a level closer to the reference mean (MeanR = 165) in 2022.

Status

The overall rating for the **Pr7** indicator is "Low" (Figure 10), but very close to "Medium." Over the past three years, the two measures used to calculate the indicator have ranged from "Low" to "High," with their value fluctuating considerably around the reference mean of 421 transits by commercial vessels and 165 transits by marine operations vessels. An upward trend is nonetheless observed.

Context and interpretation

The number of commercial vessel transits has been influenced primarily by a marked decrease in transits by international cruise vessels. The commercial vessel category includes merchant ships and passenger vessels, with most of the latter consisting of international cruise ships (Table 4). The proportion of passenger vessels relative to the total number of merchant ships decreased from an average of 41% prior to 2018, to nearly 20% in 2018 and to 1% in 2020 and 2021 (Table 4). Two elements must be taken into consideration to explain these fluctuations:

1. the speed reduction measures that Transport Canada implemented in 2017 to protect the North Atlantic Right Whale in the Gulf of St. Lawrence, and

2. COVID-19 in 2020.

In response to the introduction of speed restrictions, some cruise lines have modified their itineraries and go through the MPA area less often. The COVID-19 pandemic had a major impact on tourism and cruise ship traffic around the world. This may explain the very low number of transits made by cruise ships in the MPA in 2020 and 2021 (n=4). By contrast, merchant vessel transits have increased considerably over the past four years (except in 2020), contributing to an upward trend in the indicator. The number of transits of marine operations vessels has fluctuated widely and shows no clear trend.

- While the status of this indicator is currently assessed as "Low," careful monitoring is required because if international cruise traffic were to increase, the status of the indicator could quickly change to "High."

Pr9 – Vessel speed (*3 measures*)

During the peer review process, it was recommended that the method used to assess the Pr9 indicator be reviewed, and that the threshold method be used instead of the anomaly method for the three measures associated with the indicator. It is recognized that the likelihood of impact and the risk of serious injury and lethal collisions decreases significantly at speeds

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[2] Commercial vessel traffic does not include marine observation activities (MOA).

below 10 knots (Vanderlaan and Taggart 2007; Chion et al. 2012). Consequently, for the two measures of average speed, the thresholds used are based on 10 knots speed value, below which mortality decreases significantly, and 12.5 knots, a speed above which the likelihood of collisions increases significantly (Vanderlaan and Taggart 2007; Guzman et al. 2013; Lammers et al. 2013; Van Der Hoop et al. 2013; Currie et al. 2014, 2017; Laist et al. 2014; Constantine et al. 2015). The status categories retained are therefore as follows: <10 knots (Low); 10 to 13 knots (Medium); >13 knots (High). The threshold method is used to assess the percentage of transits made at a speed over 10 knots using the following categories: <20% (Low); 20% to 50% (Middle); >50% (High).

The values for **average annual speed of commercial vessel transits** through the MPA have remained slightly above the 10-knot threshold over the past three years, with a maximum average speed of 10.2 knots (Figure 11). **The average speed of marine operations vessels** has remained below 10 knots since 2015. The **percentage of transits that reached a speed greater than 10 knots** for commercial vessels has remained at an average level since 2017. Since 2020, less than 36% of transits have exceeded the recommended speed of 10 knots.

> *Status*

The overall rating for the **Pr9** indicator is "Medium" (Figure 12). In 2022, the status of the indicator was assessed as "Low."

> *Context and interpretation*

As mentioned for Pr7, the speed limits that Transport Canada put in place to protect the North Atlantic Right Whale have had a direct effect on the average speed of vessels travelling in the MPA. Since 2017, these measures have caused a marked decrease in the average annual speed of both commercial ships and marine operations vessels. The 10-knot limit is in effect from late April to mid-November, except in 2017 (mid-August to mid-January) for vessels over 13 m (20 m from 2017 to 2019). Furthermore, during adverse weather, the slowdown measures are lifted by Transport Canada. In 2022, the speed restrictions were in force for 209 days. Thus, for more than 5 months of the year, a large proportion of ships (90%) may exceed a speed of 10 knots in the MPA (Figure 11, Table 5), which partly explains the values related to number of transits exceeding 10 knots. In addition, on average 10% of commercial vessel transits in the MPA exceed 10 knots during the speed restriction period, which points to a possible compliance problem.

- The indicator is "Medium" and greatly influenced by the slowdown measures implemented to protect the North American Right Whale.

- Vessel speed is currently governed by temporary measures that are renewed on an annual basis by Transport Canada, but no specific and permanent measures are in place in the MPA.

- The anomaly method has been replaced by the threshold method, because fixed thresholds have been identified in the literature, making it possible to provide a clearer picture of vessel traffic.

> **Pr8 – Intensity of observation and recreational activities (*4 measures*)**

The **total number of marine observation trips** was fairly similar for 2019 and 2022, at 163 and 176 trips, respectively (Table 6). However, the number of trips appears to have decreased in 2020 (n = 97 trips) and then increased slightly in 2021 (n = 126 trips). The most popular months are July and August. **Average trip duration** seems to be fairly stable, varying between 162 and 168 minutes. The number of vessels has increased. In 2020 and 2021, the two marine

observation companies each had one vessel, whereas in 2023, they each had two vessels (one acquired in 2022 and the other in 2023). Thus, the **number of marine observation vessels** has doubled over the past three years. The **length of the marine observation season** appears to have increased slightly over the years, from 116 days in 2019 to 138 days in 2022.

Status

The status of the indicator was not assessed.

Context and interpretation

The marked decline in the number of trips recorded in 2020 is probably due to the COVID-19 pandemic. In 2019, four companies submitted an activity plan and received DFO's approval to conduct commercial tourism activities in the MPA. However, owing to the inaccurate data reported in 2019 by the applicants, it was impossible to determine the total number of marine observation tours run by the four companies that year. For this indicator, it is difficult to compare the situation before and after MPA designation because no precise annual survey data exist for the period prior to creation of the marine protected area. In addition, the data collected in activity reports are not specific to the MPA, since they also include the Baie de Gaspé. However, new measures that are more specific to the MPA will be developed using AIS beacon data. In addition, measures associated with recreational activities will also be developed based on surveys of marinas conducted through an agreement with the Mi'gmaq Wolastoqey Indigenous Fisheries Management Association (MWIFMA).

- The intensity of observation activities in the MPA has increased slightly.

- Over the past two years, the marine observation season has extended into October.

- More specific measures related to activities carried out within the perimeter of the MPA will be integrated on the basis of AIS data.

- Recreational activities are not assessed at the present time.

Pr11 – Relative footprint of the snow crab fishery (*2 measures*) and **Pr15 – Snow crab fishing (*2 measures*)**

Since 2018, the relative footprint of the crab fishery has decreased in the MPA, remaining in the "Low" category (Figure 13). **Fishing effort**, calculated on the basis of the number of trap hauls in the MPA, has remained below the reference mean of 4,809 traps for four years (except in 2020) after peaking at 9,545 traps in 2018. Similarly, the **proportion of the MPA affected by the fishery** has remained below the reference value of 7.8% since 2019, ranging from 3.3% to 6.2%. The **snow crab exploitation rate** has followed the same pattern and has been slightly below the reference mean of 22% for three years. After falling to about 80 tonnes in 2019, **biomass removal** by the fishery rose to values slightly below the reference mean of 239 tonnes in 2020 and 2022 (Figure 14). In 2021, the biomass harvested totalled 152 tonnes.

Status

The overall rating for the **Pr11** indicator is "Low" (Figure 15). From 2020 to 2022, the two measures associated with the indicator mostly show negative anomalies. Similarly, the **Pr15** indicator has an overall rating of "Low" (Figure 16). After a peak in snow crab fishing activities in 2017 and 2018, which resulted in a status rating of "Medium," the two measures declined in a staggered fashion in 2019 and 2020.

Context and interpretation

Snow crab fishery indicators **Pr11** and **Pr15** may be influenced by snow crab abundance in the MPA, but also by harvesters' behaviour. Despite the fact that the status of the BD11 indicator is "Good" and the abundance of commercial-sized male snow crab has been increasing since 2019, relatively little fishing took place in the MPA. Over the past three years, the exploitation rate has fallen below 20% (Table 7, Figure 14). This level of harvesting is similar to the level observed in the MPA prior to the large increase in the exploitation rate recorded between 2016 and 2019. The density of commercial-sized male crab in the MPA fell to the lowest level in the historical series between 2016 and 2018. Considering that the exploitation rate is calculated as the ratio of the landed biomass in year *y* to the estimated commercial biomass in the previous year (*y-1*), this decrease in density greatly contributed to the increase in the exploitation rate observed between 2017 and 2019. Overall, the exploitation rates in the MPA are lower (below 20%) than in Area 12 where the rate has ranged from 32% to 44% since 2016 (DFO 2020; Surette and Chassé 2023). Note that a small proportion of the data for the snow crab fishery in this area are not georeferenced (Mean$_{2004-2022}$ = Quebec [1%]; Gulf [5%]). For the next complete monitoring report, the plan is to spatially refine the footprint of the fishery using data from the vessel monitoring system (VMS).

Two fisheries management measures that have been in place in the MPA since 2020 may have caused a decrease in snow crab fishing effort within the boundaries of the MPA despite the increase in the species abundance. The first management measure relates to catches of white crab. White crabs are newly moulted crabs with a soft shell, which makes them more vulnerable to fishing gear. At-sea observers on board vessels are responsible for estimating the number of white crab that are caught in traps and relaying this information to DFO. When the incidence of white crab in a given grid is 20% or greater (proportion of total catch), the grid is closed to fishing for the rest of the season. In the MPA, grids GT36 and GU36 were closed, respectively, for 17 and 25 days in 2020, 8 and 16 days in 2021 and 39 days in 2022 (Figure 17, Table 8) during the crab fishing season.

The second management measure relates to the dynamic closure protocol for the North Atlantic Right Whale (NARW). When a NARW is sighted, the grids concerned are closed to fishing for a period ranging from 15 days to the end of the fishing season. This protocol applies to fisheries that use gear with vertical ropes and gear that cannot be monitored, such a longlines and traps. Since 2020, 6 grids overlapping the MPA have been closed for between 50 and 180 days a year (Table 9).

- Both indicators are "Low" even though crab fishing is the most important fishing activity carried out in the MPA.

- Temporary closures (fisheries management measure) could explain the low level of fishing compared to historical period despite the slight increase in abundance in commercial-sized male crab.

Pr12 – Relative footprint of the groundfish fishery (*2 measures*) and **Pr16 – Groundfish fishing (*1 measure*)**

Since 2019, **longline fishing effort (number of hooks)** has greatly exceeded the reference period mean of 43,093 hooks. Similarly, the **proportion of the MPA affected by the groundfish fishery** has been increasing since 2016. The proportion is much greater than the reference period mean (0.84% of the MPA since 2019) and reached a value of over 7% in 2022 (Figure 18). Consequently, the **biomass of groundfish landings** has also showed an important increase since 2019, to more than 100 tonnes in 2021 and 2022 (Figure 19). The groundfish

fishery has targeted Atlantic halibut exclusively in the MPA since 2009, but the total landed biomass also includes Atlantic cod, Greenland halibut and a few other species (Table 9).

Status

The overall rating for the **Pr12** indicator is "High" (Figure 20). The two measures associated with this indicator show very high anomalies in relation to the reference mean. The **Pr16** indicator has an overall rating of "High" too (Figure 19).

Context and interpretation

Since 2016, longline fishing pressure has increased significantly in the MPA, primarily in the southwestern part of Area 2a (Figure 21). During the reference period (2004 to 2018), fishing levels were very low, or non-existent (2004 to 2006), which led to very low reference means and had a direct effect on the assessment of status. This partly explains why a "High" pressure level was reached with the rapid development of longline fishing. This increase is similar to the trend observed since the beginning of the 2000s in all NAFO divisions 4RST where landings of Atlantic halibut have also been on the rise (DFO 2023b). As in the case of the BD12 indicator, this increase in longline fishing is consistent with a marked increase in Atlantic halibut biomass throughout the Gulf of St. Lawrence (**DFO 2023b).** It should be noted that longline fishing also results in cod bycatch, which can be significant in the MPA. The mean percentage of cod bycatch has been 20% since the MPA was established, but a level higher than 50% was reached between 2007 and 2011 (Table 10). Although the mean percentage of cod bycatch has remained around 20%, the landed biomass has increased over the past four years (Table 10). Note that a small proportion of the data for longline fishing in this area are not georeferenced (Mean$_{2004-2022}$ = Quebec (2%); Gulf (7%)).

Since 2017, longline fishing in the area has been limited by periodic closures. The protocol that regulates the cod bycatch in the directed Atlantic halibut fishery is a management measure that has affected this type of fishing in the MPA. When the cod bycatch exceeds 30% or reaches 45 kg per fishing trip, the fishery in the area concerned can be closed or restricted. DFO can either ask fishers to move to a different area or it can officially close the area for a set period of time. In 2022, this protocol led to the closure of certain portions of grids overlapping the MPA (Figure 17). Excessive bycatch of cod also caused a temporary closure of the Atlantic halibut fishery in 2017, which is still in effect. The area concerned overlaps a section of the MPA and affects the distribution of fishing effort within and around the MPA (Figure 21). Since 2019, groundfish fishing effort seems to be more concentrated in the southwestern part of the MPA. Longline fishing in the MPA has been limited, since 2020, by the management measure consisting of the dynamic closure protocol to protect the NARW, as is the case for the snow crab fishery (Table 9).

The increase in longline fishing raises questions about the long-term vision for this activity (identified as a pressure in the MPA) and its impacts on the conservation objectives. Although the increase in harvested biomass may not seem worrisome since it coincides with an increase in halibut abundance, it is important to take a closer look at the spatial footprint of the fishery and its impacts on the seabed.

- Both indicators are assessed as "High," which can be explained by the significant increase in fishing activity (which was almost non-existent before the MPA was created) in relation to the baseline.

- Atlantic halibut abundance and biomass are increasing in NAFO Divisions 4RST, including the Banc-des-Américains MPA.

- Longline fishery closures (since 2017) may have forced harvesters to change location and concentrate their fishing activities in the southwestern portion of the MPA.

- It is recommended that this activity be analyzed in greater depth, including the potential impacts of hooks on the seabed and of ghost gear and the risk of entanglement for marine mammals.

Pr13 – Footprint of scientific activities (*1 measure*) and Pr17 – Biomass removal by scientific activities (*1 measure*)

In 2021 and 2022, **the footprint of scientific activities (area affected)** increased slightly, but the area concerned nonetheless makes up less than 0.1% of the total area of the MPA (Figure 22). Similarly, **biomass removal by scientific activities** has increased gradually since 2020 to about 0.8 tonne (Figure 23).

Status

The overall rating for the **Pr13** and **Pr17** indicators was not assessed because no method has been selected for this purpose. It has been recommended that the threshold method be used to assess their status, but thresholds have not yet been defined. It should be noted that the footprint of scientific activities and the associated biomass removal are at very low levels.

Context and interpretation

The variations observed in the spatial footprint of scientific activities and biomass removal can be explained mainly by the change in the number of tows made annually in the sGSL ecosystem survey. The area affected by an ecosystem survey tow (0.1402 km^2)[3] is more than 10 times the area covered in the sGSL snow crab survey (0.0083 km^2). In addition, the number of tows performed in the ecosystem survey follows a stratified random sampling plan. Since 2019, the number of stations visited on an annual basis in the MPA has ranged from zero to four (Table 11). The number of stations has increased in 2021 or 2022 since a calibration was performed for the new research vessel (CCGS *Capt Jacques Cartier*). The number of stations ended up doubling relative to the number covered by the old vessel. However, the new trawl covers a smaller area than the Western IIA trawl used prior to 2022, on the old vessel. Note that the stations sampled in 2020 by the imagery survey were not included for now but will be in future reports.

- The intensity of scientific activities has remained at a low level.

- A review is under way to define a method for assessing the status of the Pr13 and Pr17 indicators. The use of a threshold is one option.

Pr14 – Fishing activities – violations

The measures to be used for this indicator have not yet been determined. However, the available raw data have been obtained from DFO's Conservation and Protection division. In 2019, fishery officers carried out a great deal of outreach and education with users of the marine environment, since it was the first year after designation of the marine protected area, and a violation had occurred. In 2020, a written warning was issued and four prosecutions resulted in four convictions. In 2021, there was one prosecution and it resulted in a conviction. In 2022, four written warnings were issued and there was one report of an offence.

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[3] The areas specified take into account the distance between the trawl doors.

Status

The status of this indicator was not assessed.

Context and interpretation

With regard to the surveillance activities database, the 2019 and 2020 data are limited, because data were not collected for marine protected areas specifically. The situation was corrected in 2021 with the addition of human resources for this purpose. From now on, aerial and vessel-based surveillance data will be automatically processed specifically for the Banc-des-Américains MPA. Now that recurrent data are available for the MPA, it is possible to define measures for the Pr14 indicator.

Pr18 – Number of new pressures

During the last three years, no new pressure was observed in the MPA. However, an accident occurred on October 6, 2022. A barge measuring 22 feet by 60 feet, with an excavator on board, sank off Pointe-Saint-Pierre (position 48°35.527998 N, -064°06.934698W, Figure 24). The Canadian Hydrographic Service has estimated that the barge and excavator are located at a depth of about 94 m. In the fall of 2022, a science table composed of provincial and federal government representatives and external stakeholders involved in the environmental response program conducted a net environmental benefit analysis. This analysis led to natural attenuation being selected as an option (leaving the barge and associated pollutants on the bottom) since it presents the lowest risk to the environment.

Status

The status of this indicator was not assessed. This shipwreck is not considered to be a new pressure. It should, however, be considered a one-time event and the environmental impact is considered to encompass a very small proportion of the MPA.

Conclusions

The 14 priority indicators were reviewed using data available up to 2022. No overall rating was assigned to six of these indicators since no assessment method was selected during the peer review of 2021 (DFO 2023a) (Table 12). It was nonetheless considered important to report the raw data available on cetacean mortality/accidents, the intensity of marine observation activities, scientific activities and violations, in order to have baseline information on these topics. The overall rating for the assessed indicators associated with conservation objectives, i.e. snow crab and groundfish fishing, is "Good" (Table 12). As regards the pressure indicators presented, most of them were assessed as "Low," except for the two indicators associated with the groundfish fishery, which are "High," and the indicator associated with vessel speed, which is "Medium."

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Appendices

Table 1. List of priority indicators. The status assessment method, reference period, spatial scale and the survey(s) from which the data used to define the indicator status are derived are specified (see Faille et al. 2023, Appendices E, F and G).

	Priority indicators	Method of status assessment	Reference period	Spatial scale	Surveys
Conservation Priorities					
Benthic and demersal commercial species	BD11) Snow crab	Directional anomaly	2004-2018	BDA	R13-Snow crab sGSL, R14-ZIFF
	BD12) Harvested groundfish	Directional anomaly	2004-2018	Stratum 416*	R10-Multi sGSL, R14-ZIFF
Whales	EP6) Cetacean mortality/accidents	na	2013-2018	Gaspé and Percé sector	R17- QMMERN
Pressures					
Noise	Pr7) Traffic intensity	Directional anomaly	2013-2018	BDA	R18-AIS
Disturbance	Pr8) Intensity of observation and recreational activities	na	na	BDA + Gaspé sector	R22-Act. report, R18-AIS
Collisions	Pr9) Vessel speed	Fixed threshold	2013-2018	BDA	R18-AIS
Physical disturbance of the bottom	Pr11) Relative footprint of the snow crab fishery	Directional anomaly	2004-2018	BDA	R14-ZIFF
	Pr12) Relative footprint of the groundfish fishery	Directional anomaly	2004-2018	BDA	R14-ZIFF
	Pr13) Footprint of scientific activities	na	2004-2018	BDA	R10-Multi sGSL, R13-Snow crab sGSL, RD1-Imagery
	Pr14) Fishing activities – violations	na	na	BDA	na
Biomass removal	Pr15) Snow crab fishing	Directional anomaly	2004-2018	BDA	R14-ZIFF
	Pr16) Groundfish fishing	Directional anomaly	2004-2018	BDA	R14-ZIFF
	Pr17) Biomass removal by scientific activities	na	2004-2018	BDA	R10-Multi sGSL, R13-Snow crab sGSL, RD1-Imagery
New pressure	Pr18) Number of new pressures	na	na	BDA	na

Table 2. Methods for assessing the status of measures and indicators of conservation priorities and pressures. 1) directional anomaly calculated as the mean and standard deviation (SD) of the reference period; 2) known fixed threshold.

Status (conservation priority/pressure)	Anomaly (Conservation priority)	Anomaly (Pressure)	Fixed threshold (Ex : % passages > 10 knots)
Good / Low (3)	Average of the reference period ± 1 SD or higher	Average of the reference period ± 1 SD or lower	< 20%
Medium / Medium (2)	- 1 SD to - 2 SD	+ 1 to + 2 SD	20–50%
Poor / High (1)	< - 2 SD	> 2 SD	> 50%
Not assessed	Insufficient data	Insufficient data	Insufficient data

Table 3. Number of individuals reported to QMMERN for each type of incident involving cetaceans in the municipalities of Gaspé and Percé during the 2012–2020 period. The total, mean number of incidents and standard deviation are presented for the reference period (2012–2018) and after designation (2019–2022). Other = baleen whales and toothed whales designated not at risk; SAR = species at risk.

Reference period

Year	Sick/injured individuals		Live strandings		Carcasses		Total incidents	
	Other	SAR	Other	SAR	Other	SAR	Other	SAR
2012	0	0	0	0	3	0	3	0
2013	0	0	0	0	7	0	7	0
2014	0	0	0	0	3	0	3	0
2015	0	0	0	0	3	4	3	4
2016	2	0	0	0	8	0	10	0
2017	0	0	0	0	11	2	11	2
2018	0	0	0	0	6	3	6	3
Total	2	0	0	0	41	9	43	9
Mean	**0.3**	**0.0**	**0.0**	**0.0**	**5.9**	**1.3**	**6.1**	**1.3**
Standard deviation	0.8	0.0	0.0	0.0	3.1	1.7	3.4	1.7

After designation

Year	Sick/injured individuals		Live strandings		Carcasses		Total incidents	
	Other	SAR	Other	SAR	Other	SAR	Other	SAR
2019	0	2	0	0	8	1	8	3
2020	0	0	1	0	14	1	15	1
2021	0	0	0	0	9	5	9	5
2022	0	0	0	0	13	1	13	1
Total	0	2	1	0	44	8	45	10
Mean	**0.0**	**0.5**	**0.3**	**0.0**	**11.0**	**2.0**	**11.3**	**2.5**
Standard deviation	0.0	1.0	0.5	0.0	2.9	2.0	3.3	1.9

Table 4. Number of transits in the MPA by each type of vessel between 2013 and 2022. The commercial category includes merchant and passengers ships. The total is the sum of marine and commercial operations.

Year	Marine operations	Merchant	Passenger	Commercial (Merchant + Passenger)	% Passenger /Commercial	Total
2013	**169**	247	181	**428**	42 %	**597**
2014	**162**	218	154	**372**	41 %	**534**
2015	**183**	239	176	**415**	42 %	**598**
2016	**154**	263	173	**436**	40 %	**590**
2017	**170**	260	196	**456**	43 %	**626**
2018	**151**	282	135	**417**	32 %	**568**
2019	**229**	418	120	**538**	22 %	**767**
2020	**147**	354	4	**358**	1 %	**505**
2021	**209**	423	3	**426**	1 %	**635**
2022	**175**	408	65	**473**	14 %	**648**

Table 5. Number of transits by commercial vessels through the Banc-des-Amérciains MPA on days with the 10-knot right whale speed limit in effect in the Gulf of St. Lawrence and on days without speed limit. Speed limits have been in effect between late April and mid-November since 2018; 2017 was a transition year with limits from mid-August to mid-January.

Year	Nb transits days, speed limit			Nb transits days, no speed limit		
	> 10 knots	< 10 knots	% Excessive speed	> 10 knots	< 10 knots	% Excessive speed
2013	0	0	0	407	21	95
2014	0	0	0	356	16	96
2015	0	0	0	395	20	95
2016	0	0	0	419	17	96
2017	49	189	21	199	19	91
2018	35	264	**12**	113	5	**96**
2019	32	288	**10**	198	20	**91**
2020	24	197	**11**	114	23	**83**
2021	8	254	**3**	153	11	**93**
2022	48	291	**14**	116	18	**87**

Table 6. Summary of data on intensity of marine observation activities, 2019–2022, based on activity reports submitted to DFO.

Measures	2019	2020**	2021	2022
Number of companies	4*	2	2	2
Total number of observation trips	163 (n = 2)	97	126	176
Total number of observation trips (June)	12	0	17	9
Total number of observation trips (July)	67	57	45	54
Total number of observation trips (August)	66	34	47	75
Total number of observation trips (September)	17	6	15	25
Total number of observation trips (October)	1	0	2	13
Average trip duration	2h48 (n = 2)	2h45	2h43	2h42
Number of observation boats	6 (n = 4)	2	2	3
Length of the observation season	June 15 to October 8 (116 days, n = 3)	June 1 to September 24 (116 days)	June 2 to October 6 (127 days)	June 1 to October 16 (138 days)

* Only two of the four companies provided complete data.
** COVID-19

Table 7. Comparison of snow crab exploitation rate and landings (tonnes) in the MPA and throughout the sGSL.

Year	Biomass (y-1) BDA	Exploitation rate (%) BDA	Exploitation rate (%) sGSL	Landings (tonnes) BDA	Landings (tonnes) sGSL
2016	593.1	36.4	36.9	215.7	21,725
2017	352.6	73.7	44.4	259.8	43,656
2018	569.4	55.2	36.9	314.4	24,260
2019	155.0	51.2	39.3	79	31,707
2020	1,084.6	18	35.6	195	28,156
2021	773.0	19.6	31.5	152	24,479
2022	1,673.7	12.1	39.1	202	31,682

Table 8. Total number of snow crab fishing closure days in North Atlantic right whale (NARW) grids.

Grid closures	Total number of fishing closure days		
	April 3 to June 30 2020	April 3 to June 30 2021	April 13 to June 30 2022
GT36	17	8	39
GT37	17	8	39
GT38	17	10	42
GU36	25	16	39
GU37	25	16	39
GU38	25	10	42

Table 9. Total number of longline fishing closure days in North Atlantic right whale (NARW) grids.

Grid closures	Total number of fishing closure days		
	2020	2021	2022
GT36	155	146	177
GT37	155	146	177
GT38	155	50	180
GU36	163	154	177
GU37	163	154	177
GU38	163	126	180

Table 10. Landings (kg) from the longline fishery in the Banc-des-Américains MPA between 2004 and 2022. Percentage of total landings is shown in brackets.

Year	Atlantic halibut	Atlantic cod	Greenland halibut	White hake	American plaice	Total landings (kg)
2004	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
2005	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
2006	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
2007	865 (30%)	2,043 (70%)	0 (0%)	0 (0%)	0 (0%)	2,909
2008	1,702 (22%)	5,869 (77%)	80 (1%)	0 (0%)	0 (0%)	7,651
2009	4,045 (72%)	1564 (28%)	11 (0%)	0 (0%)	0 (0%)	5,619
2010	73 (32%)	158 (68%)	0 (0%)	0 (0%)	0 (0%)	230
2011	2,907 (48%)	3,101 (52%)	11 (0%)	0 (0%)	0 (0%)	6,018
2012	1,910 (62%)	1,169 (38%)	0 (0%)	0 (0%)	0 (0%)	3,079
2013	4,949 (55%)	4,075 (45%)	5 (0%)	0 (0%)	0 (0%)	9,029
2014	16,928 (52%)	15,595 (48%)	42 (0%)	0 (0%)	0 (0%)	32,565
2015	11,966 (51%)	11,677 (49%)	38 (0%)	5 (0%)	1 (0%)	23,687
2016	3,017 (52%)	2,822 (48%)	0 (0%)	0 (0%)	1 (0%)	5,839
2017	17,127 (72%)	6,585 (28%)	68 (0%)	0 (0%)	0 (0%)	23,781
2018	19,030 (72%)	7,496 (28%)	35 (0%)	0 (0%)	0 (0%)	26,561
2019	30,148 (80%)	7,737 (20%)	4 (0%)	0 (0%)	2 (0%)	37,892
2020	55,186 (76%)	16,666 (23%)	487 (1%)	0 (0%)	16 (0%)	72,355
2021	87,116 (85%)	14,646 (14%)	874 (1%)	0 (0%)	21 (0%)	102,657
2022	85,402 (78%)	22,111 (20%)	1,453 (1%)	4 (0%)	6 (0%)	108,976

Table 11. Number of stations conducted in the of Banc-des-Américains (BDA) MPA and stratum 416 by DFO scientific research surveys between 1986 and 2022. Asterisks indicate comparative fishing years for the sGSL ecosystem survey.

	Number of stations			
	R10-Multi sGSL		R13-Snow crab sGSL	RD1-Imagery
Year	BDA	Stratum 416	BDA	BDA
1986	3	9	0	0
1987	3	9	0	0
1988	2	13	0	0
1989	1	7	7	0
1990	2	8	5	0
1991	0	9	6	0
1992*	3	10	6	0
1993	4	9	6	0
1994	2	8	6	0
1995	2	8	7	0
1996	2	9	0	0
1997	2	8	6	0
1998	3	8	6	0
1999	2	8	6	0
2000	3	8	6	0
2001	2	7	6	0
2002	3	9	6	0
2003	2	3	6	0
2004*	2	12	6	0
2005	3	8	6	0
2006	0	8	7	0
2007	0	8	7	0
2008	1	8	7	0
2009	3	8	7	0
2010	2	8	7	0
2011	1	6	7	0
2012	1	5	4	14
2013	1	6	4	69
2014	1	8	6	0
2015	1	8	5	3
2016	2	8	5	27
2017	2	6	5	0
2018	2	8	6	0
2019	0	5	7	27
2020	1	4	7	0
2021*	3	13	8	0
2022*	4	5	6	0

Table 12. Status assessment results for priority indicators. The overall rating corresponding to the average results for 2020–2021 and 2022 is presented for each indicator. The trend is not shown for the moment, as only a few years have passed since the MPA was established.

	Priority indicators	STATUS Overall Rating	Trend
Conservation priority			
Benthic and demersal commercial species	BD11) Snow crab	Good	*na*
	BD12) Harvested groundfish	Good	*na*
Whales	EP6) Harvested groundfish	Not assessed	*na*
Pressures			
Noise	Pr7) Traffic intensity	Low	*na*
Disturbance	Pr8) Intensity of observation and recreational activities	Not assessed	*na*
Collisions	Pr9) Vessel speed	Medium	*na*
Physical disturbance of the bottom	Pr11) Relative footprint of the snow crab fishery	Low	*na*
	Pr12) Relative footprint of the groundfish fishery	**High**	*na*
	Pr13) Footprint of scientific activities	Not assessed	*na*
	Pr14) Fishing activities – violations	Not assessed	*na*
Biomass removal	Pr15) Snow crab fishing	Low	*na*
	Pr16) Groundfish fishing	**High**	*na*
	Pr17) Biomass removal by scientific activities	Not assessed	*na*
New pressure	Pr18) Number of new pressures	Not assessed	*na*
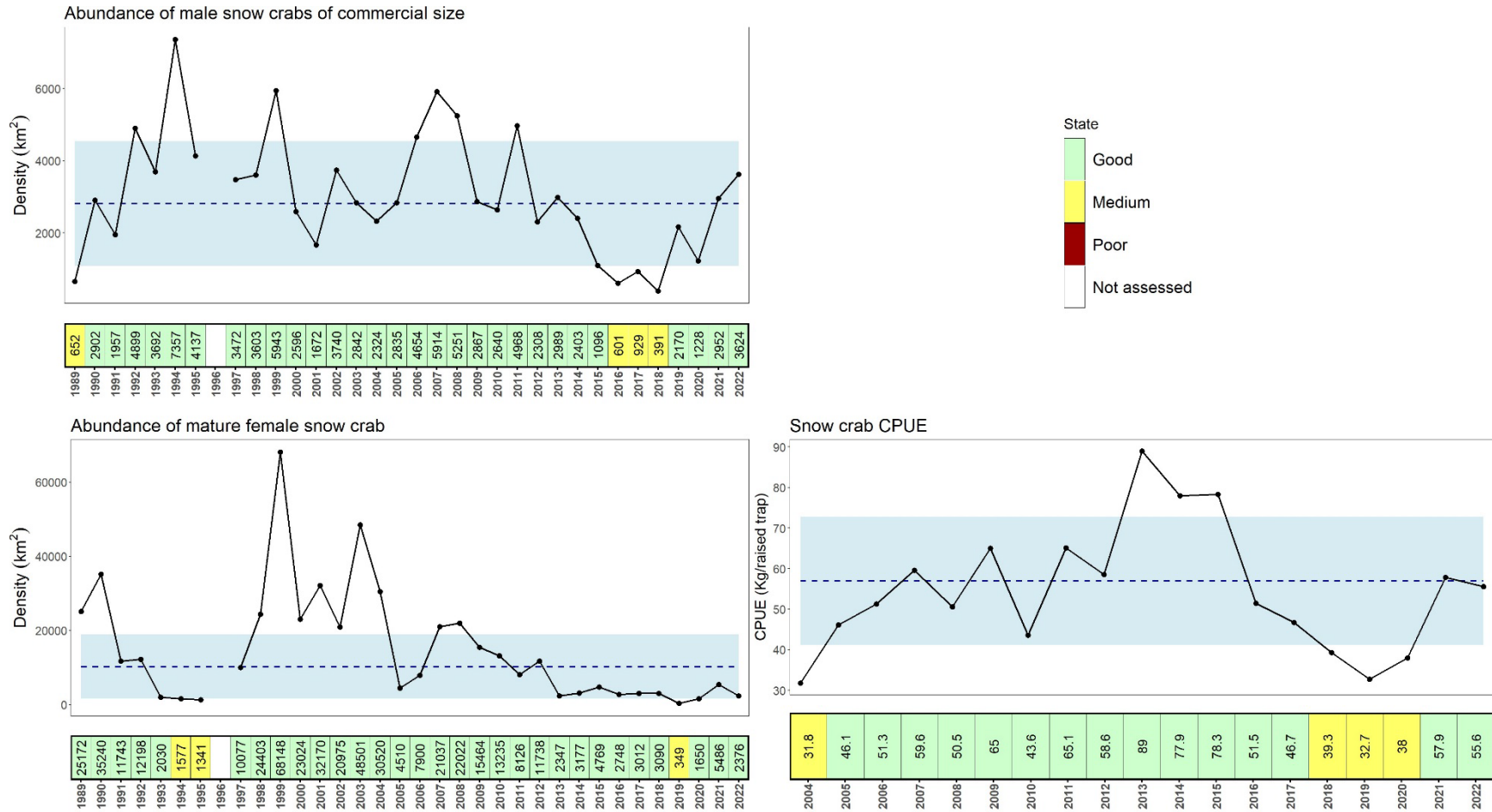
Figure 1. Status and trend of the time series of the measures associated with the BD11 indicator (snow crab). The blue dashed line represents the mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).
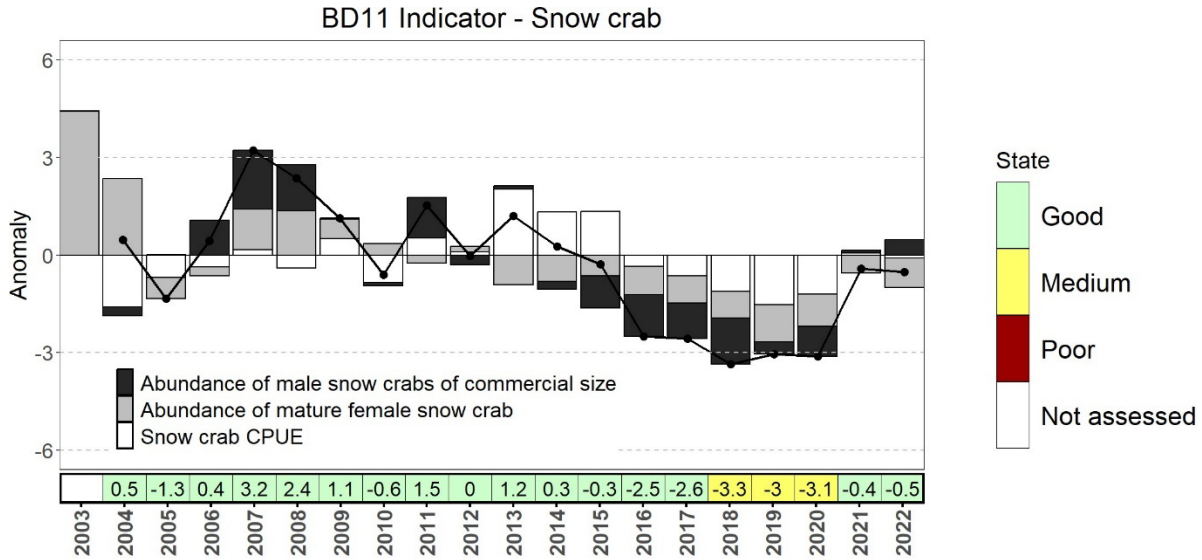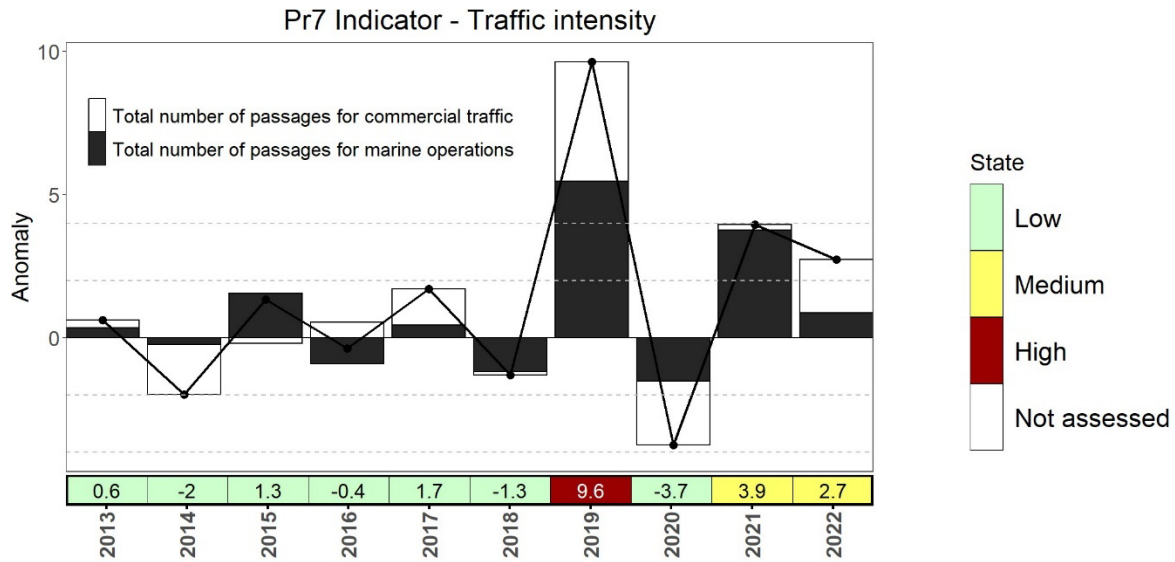
Figure 2. Status and trend of the time series for the BD11 indicator (snow crab). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown below the graph, colour coded according to its status.
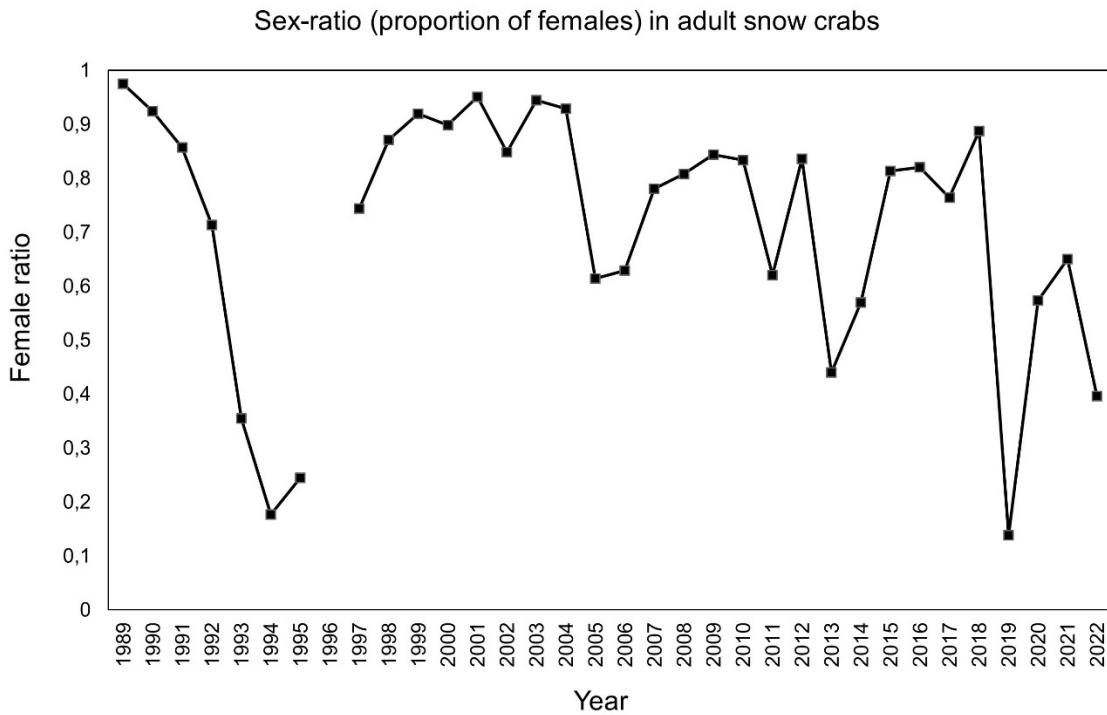
Figure 3. Distribution of snow crab sex ratios between 1989 and 2022 in the Banc-des-Américains MPA. The sex ratio corresponds to the abundance of mature females divided by the sum of the abundance values for mature females and commercial-sized males. The dashed line represents a balanced sex ratio (50% females).
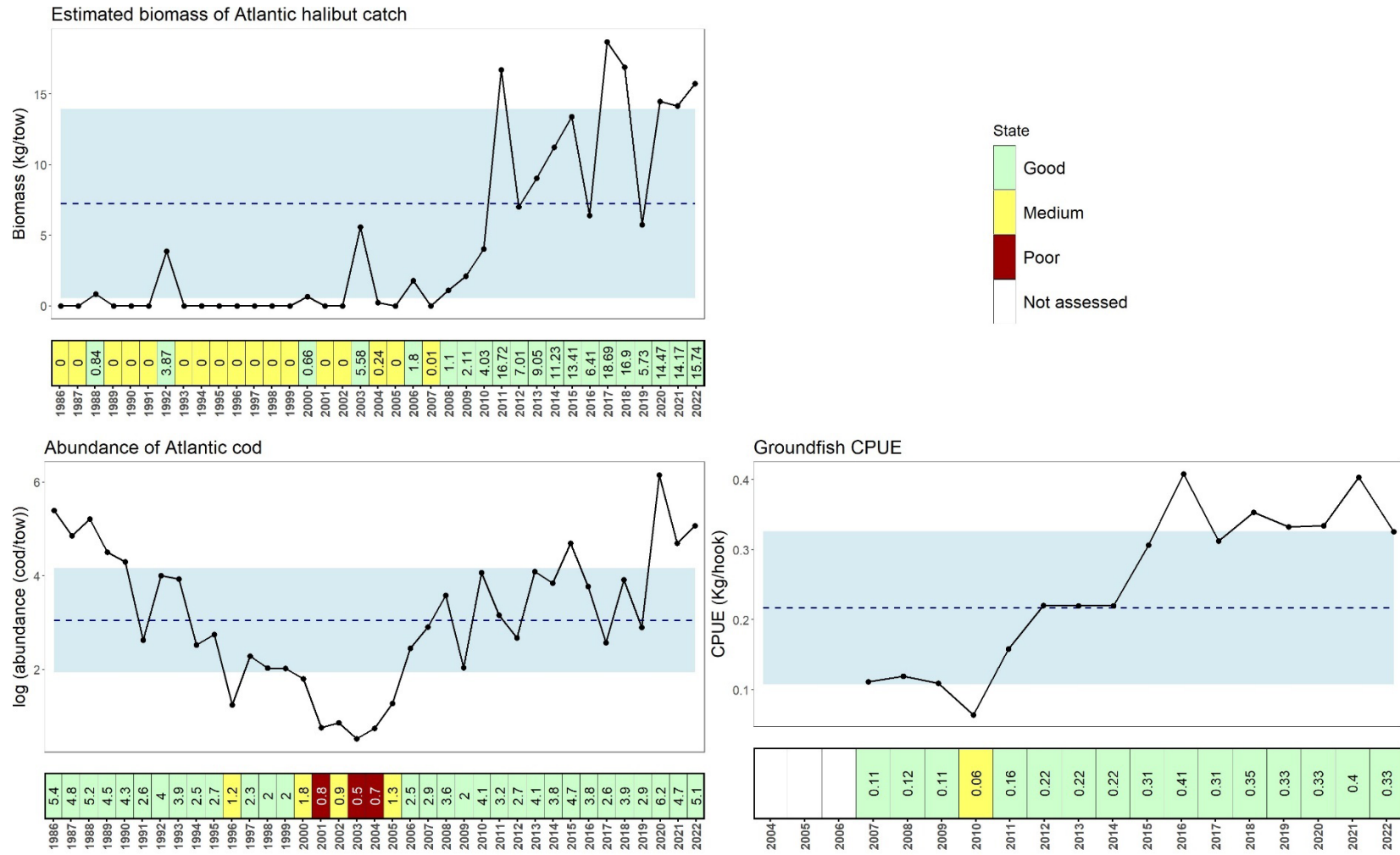
Figure 4. Status and trend of the time series of the measures associated with the BD12 indicator (Harvested groundfish). The blue dashed line represents the mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).
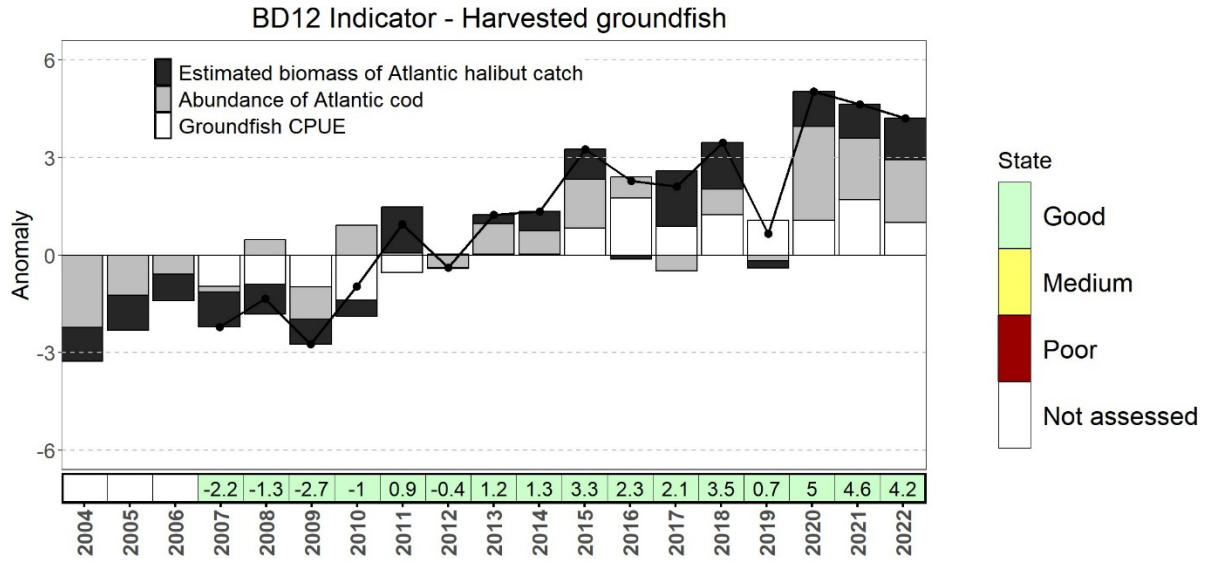
Figure 5. Status and trend of the time series for BD12 indicator (Harvested groundfish). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown below the graph, colour coded according to its status.
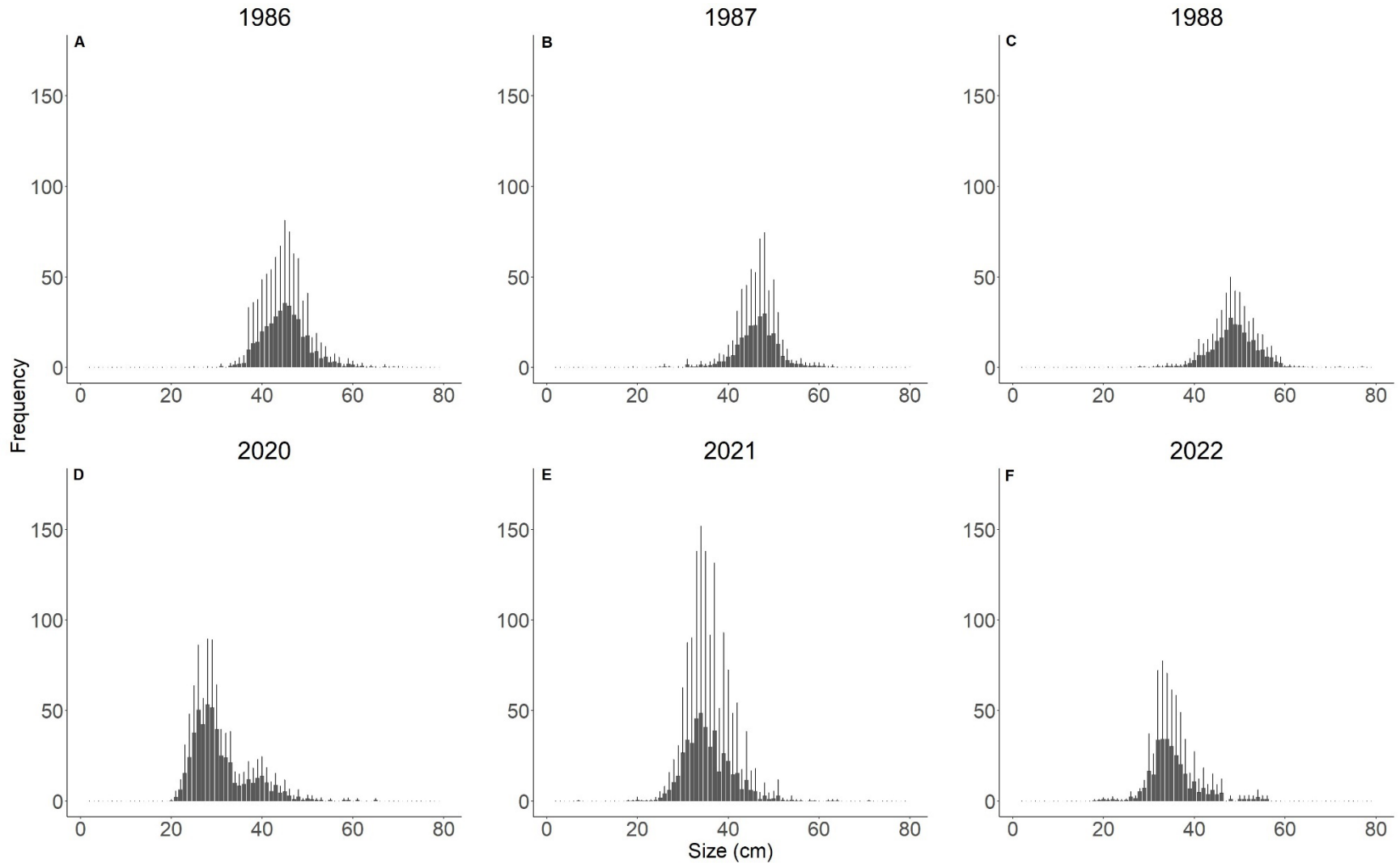
Figure 6. Size frequency distribution of Atlantic cod caught in trawls in stratum 416 during the sGSL ecosystem survey between 1986 and 1988 (A, B, C) and between 2020 and 2022 (D, E, F). Dark grey: mean number of tows in stratum 416 by year; Pale grey: standard deviation.
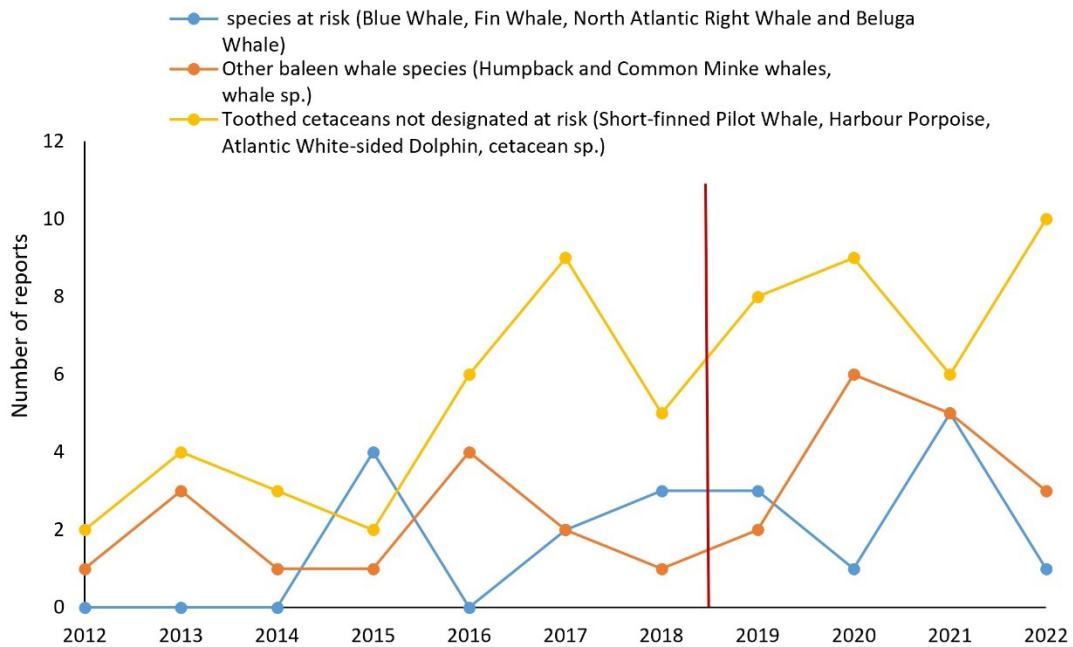
Figure 7. Number of reports of carcasses, live strandings and sick or injured animals (species at risk, baleen whales and toothed whales) recorded by QMMERN from 2012 to 2022 in the municipalities of Gaspé and Percé. The vertical red line represents the point in time at which the MPA was established.
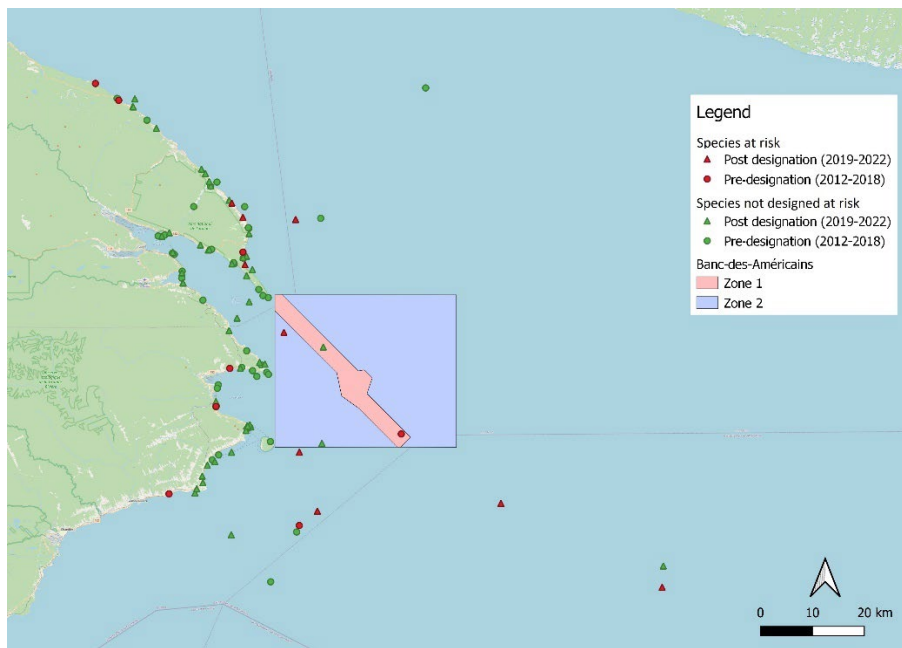
Figure 8. Locations of QMMERN reports for the 2012–2022 period for the Gaspé and Percé sectors. Reports of species at risk are shown in red and reports of other species, in green. The triangles represent reports made after designation of the MPA and the circles, before designation.
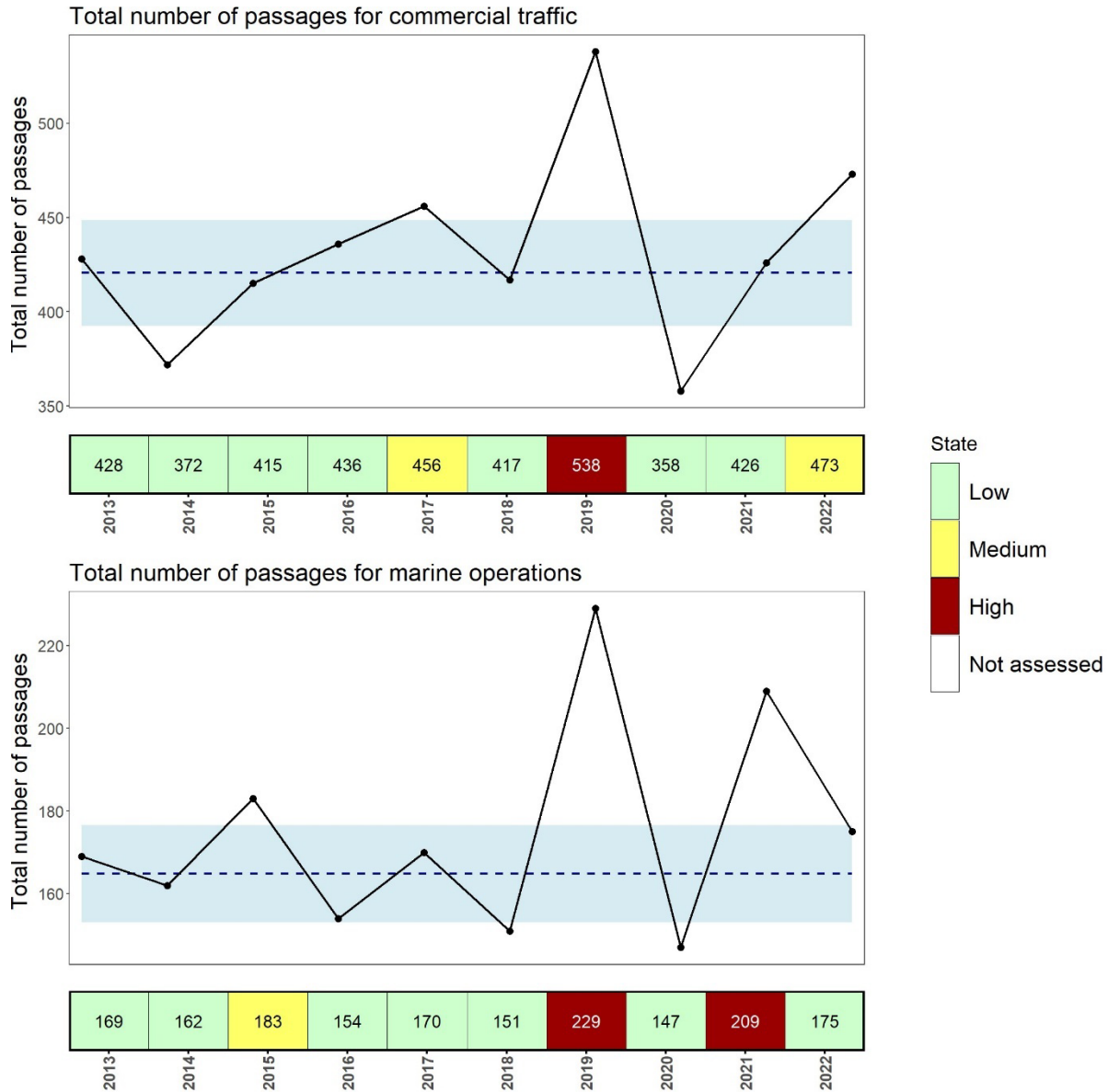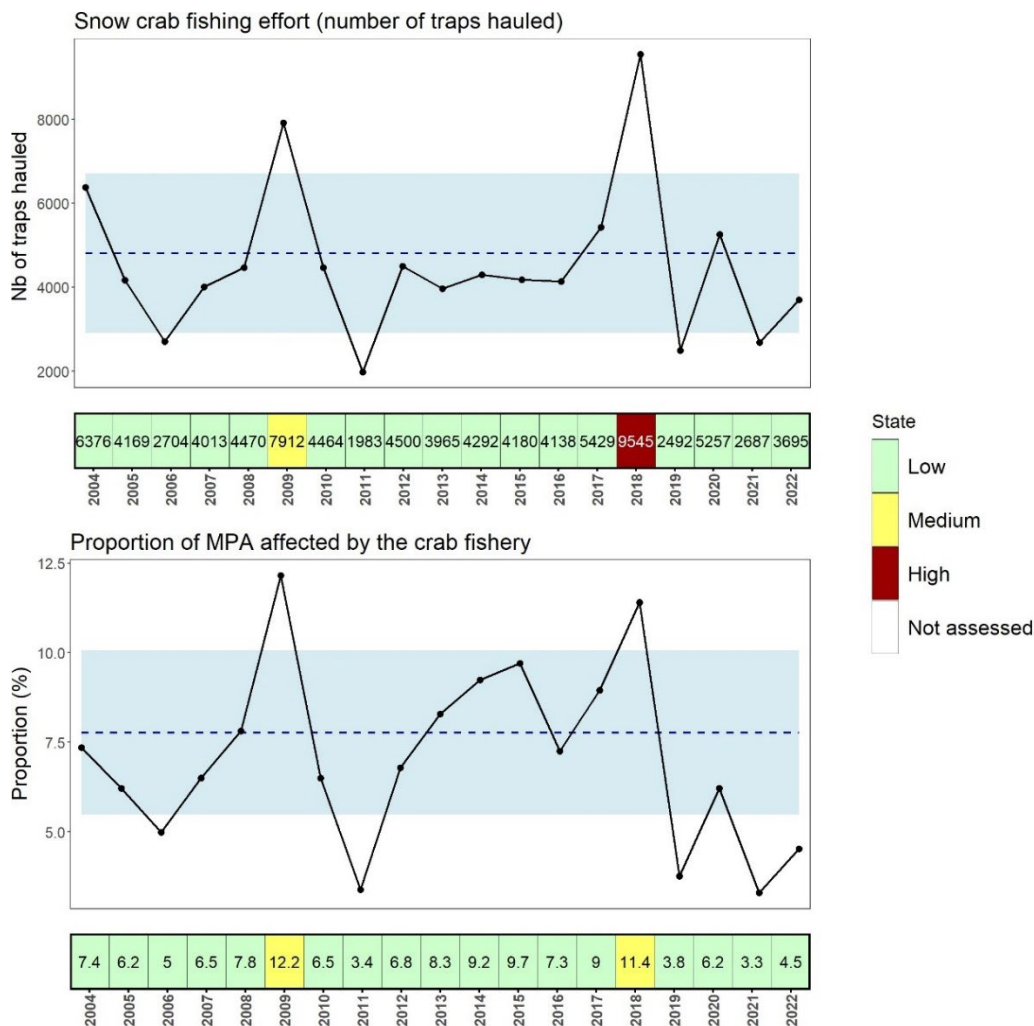
Figure 9. Status and trend of the time series of measures associated with the Pr7 pressure indicator (Traffic intensity). The blue dashed line represents mean conditions during the reference period (2013–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).

Figure 10. Status and trend of the time series for Pr7 pressure indicator (Traffic intensity). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown below the graph, colour coded according to its status.
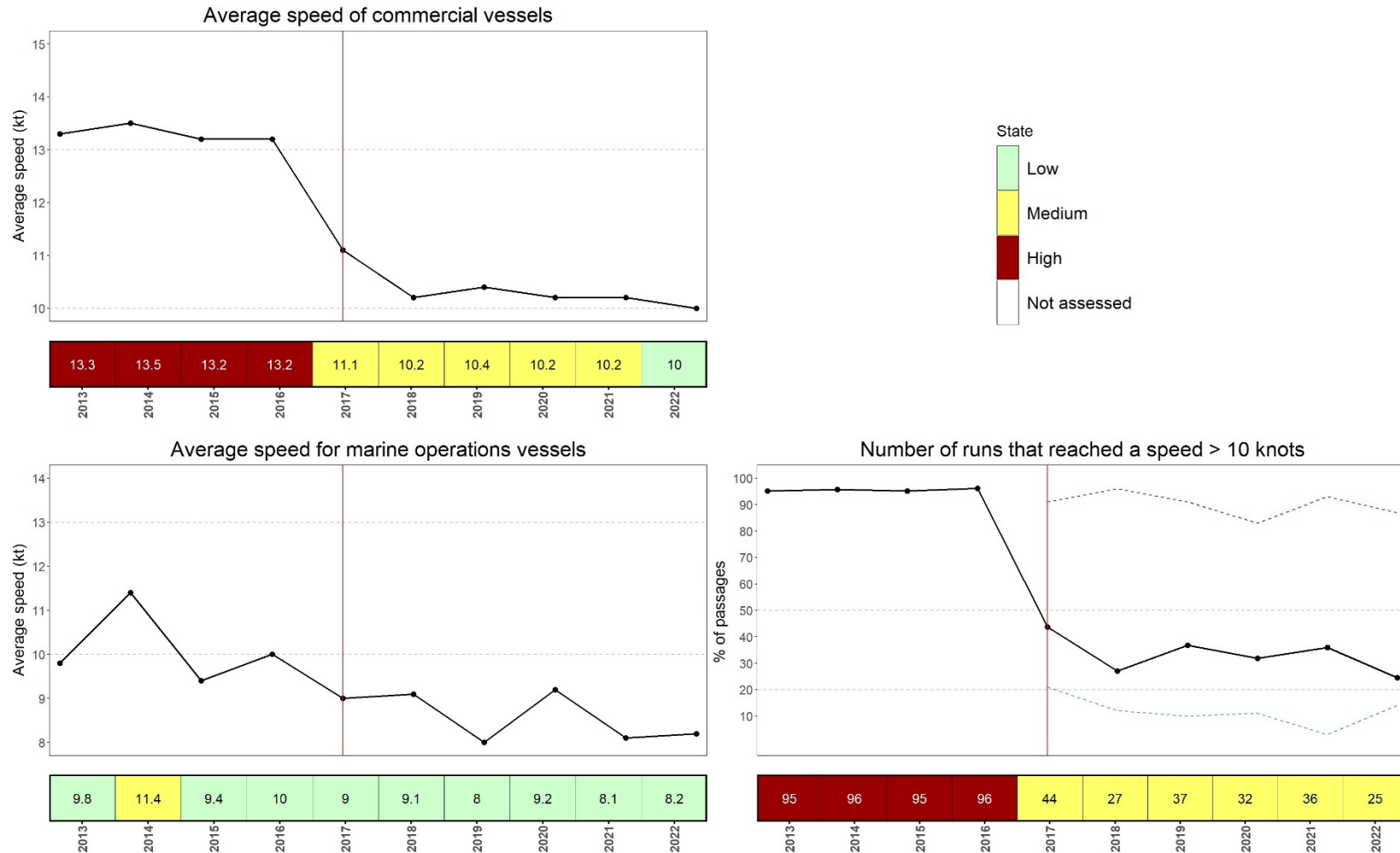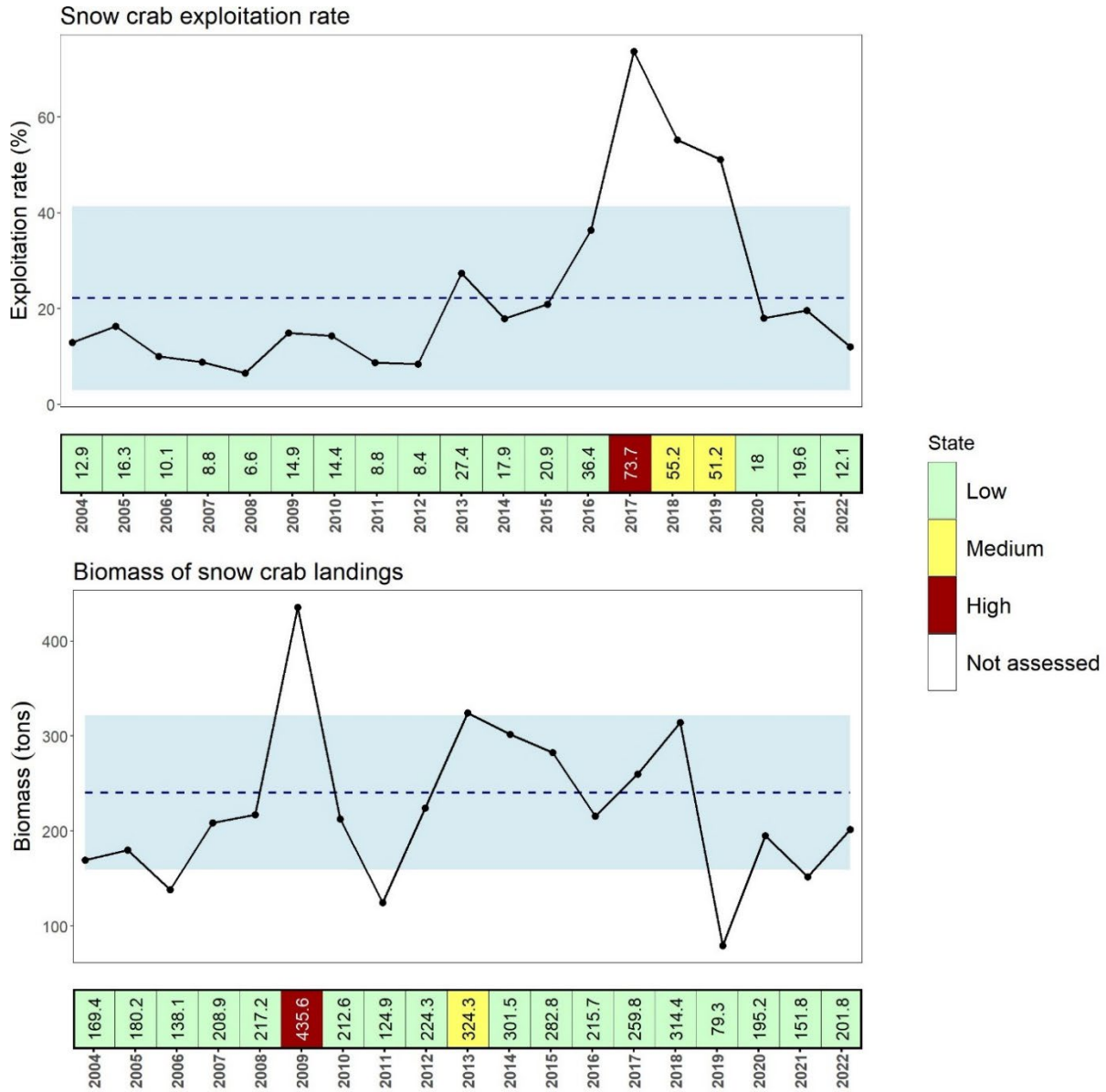
Figure 11. Status and trend of the time series of the measures associated with the Pr9 pressure indicator (Vessel speed). The grey dashed lines represent the limits of the intervals associated with the different statuses (speed and % transits). The red vertical line indicates the year that the slowdown measures were implemented to protect right whales (2017). The dashed curves illustrate the percentage of transits that exceeded a speed of 10 knots (in red: period without speed restriction; blue: period with speed restriction of 10 knots). The strip below each graph shows the value obtained for each year, colour-coded according to the know threshold criterion.

State

Low

Medium

High

Not assessed

Pr9 indicator - Vessel speed	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Average speed of commercial vessels	1	1	1	1	2	2	2	2	2	3
Average speed for marine operation vessels	3	2	3	3	3	3	3	3	3	3
Number of runs that reached a speed > 10 knots	1	1	1	1	2	2	2	2	2	2
Sum of scores	5	4	5	5	7	7	7	7	7	8
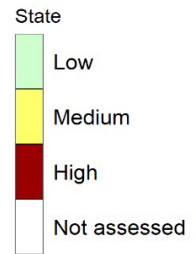
Figure 12. Sum of the scores assigned to each of the measurements associated with the Pr9 pressure indicator (vessel speed) for the entire time series. The sum of the scores is used to assign an annual status to the Pr9 indicator, which is represented according to a color code described in the legend on the right.

Figure 13. Status and trend of the time series of measures associated with the Pr11 pressure indicator (Footprint of the snow crab fishery). The blue dashed line represents mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).
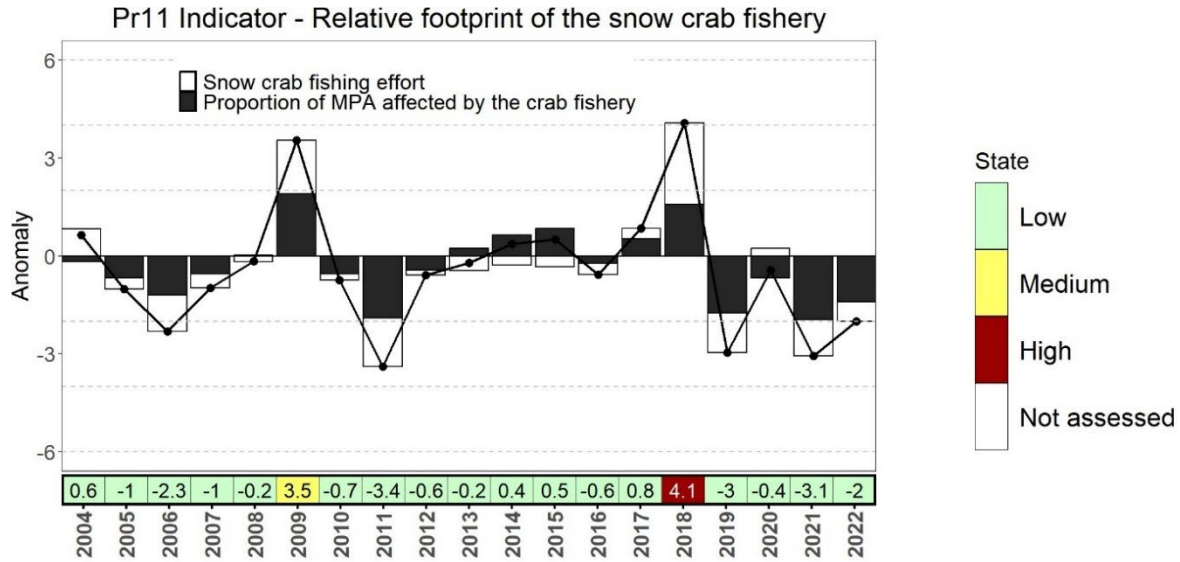
Figure 14. Status and trend of the time series of measures associated with the Pr15 pressure indicator (Snow crab fishing). The blue dashed line represents mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).
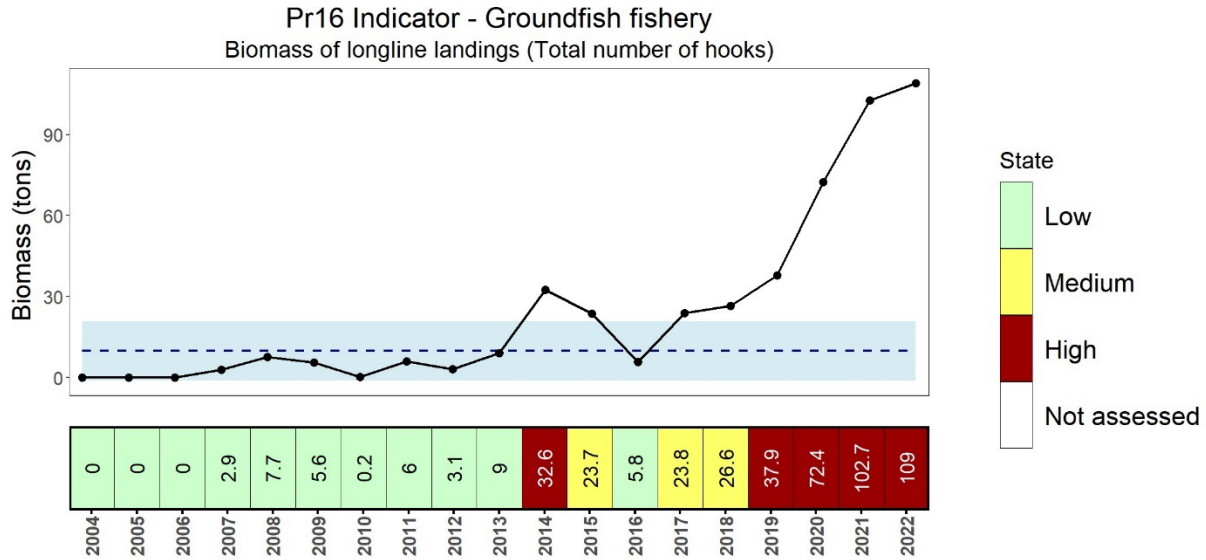
Figure 15. Status and trend of the time series for Pr11 pressure indicator (Footprint of the snow crab fishery). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown in the strip below the graph, colour coded according to its status.
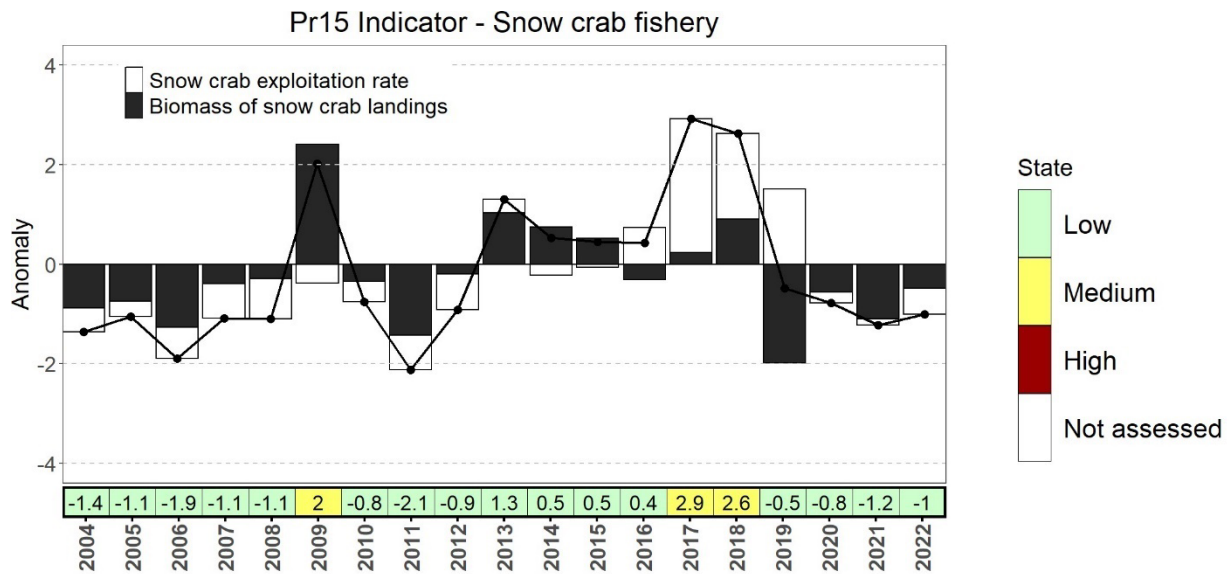
Figure 16. Status and trend of the time series for Pr15 pressure indicator (Snow crab fishing). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown in the strip below the graph, colour coded according to its status.
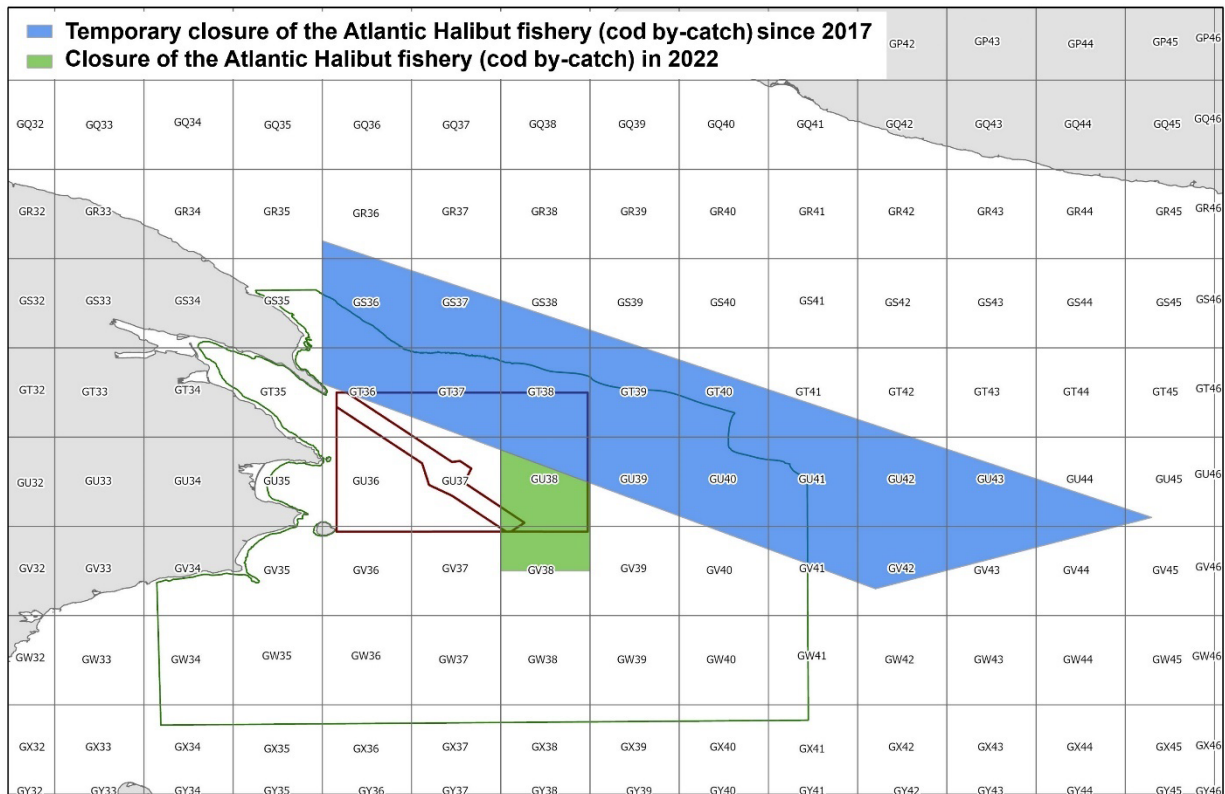
Figure 17. Compilation of closures in areas near or overlapping the Banc-des-Américains MPA. The grids affected by the closure protocol designed to protect the NARW and white crab are shown.

Longline fishing effort (total number of hooks)

0	0	0	28	73	42	4	34	14	42	154	88	14	70	83	134	250	283	319
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022

State

- Low
- Medium
- High
- Not assessed

Proportion of MPA affected by the groundfish fishery

0	0	0	0.6	1.1	0.8	0.1	0.5	0.3	1.1	2.6	1.1	0.7	1.6	2.3	3.5	4.4	4.4	7.3
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022

Figure 18. Status and trend of the time series of the measures associated with the pressure indicator Pr12 (Footprint of the groundfish fishery). The blue dashed line represents mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).
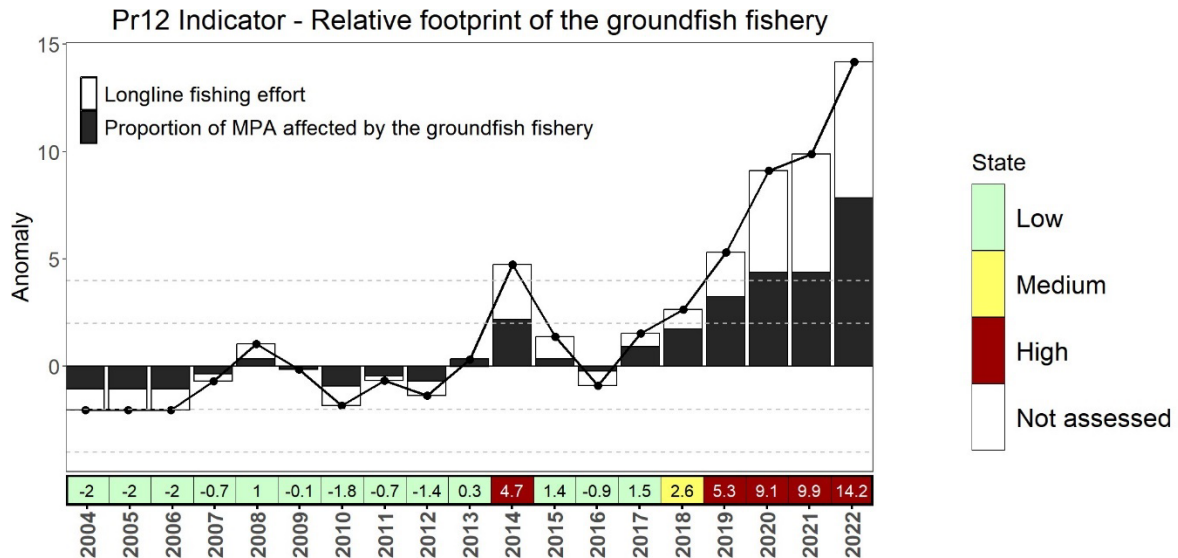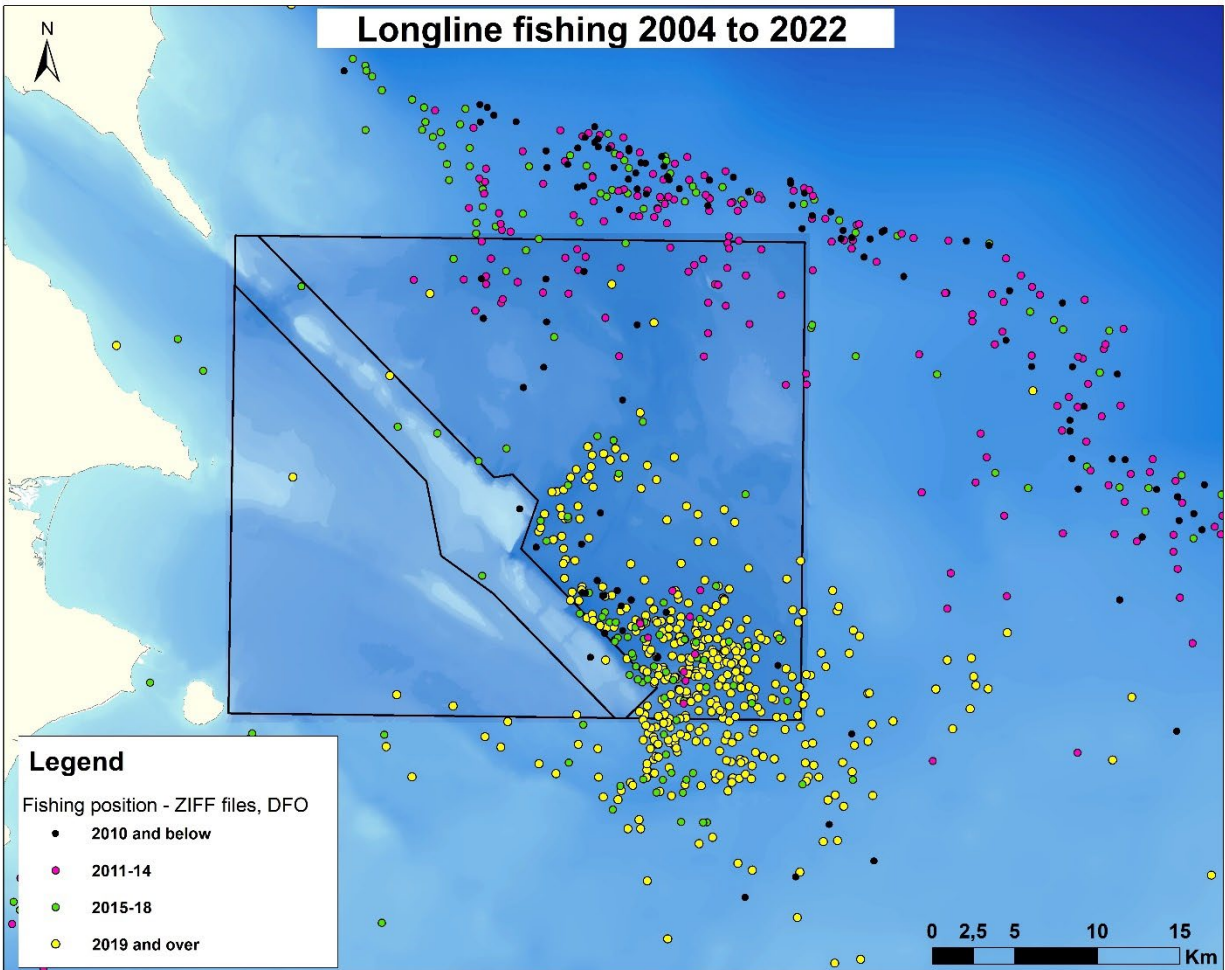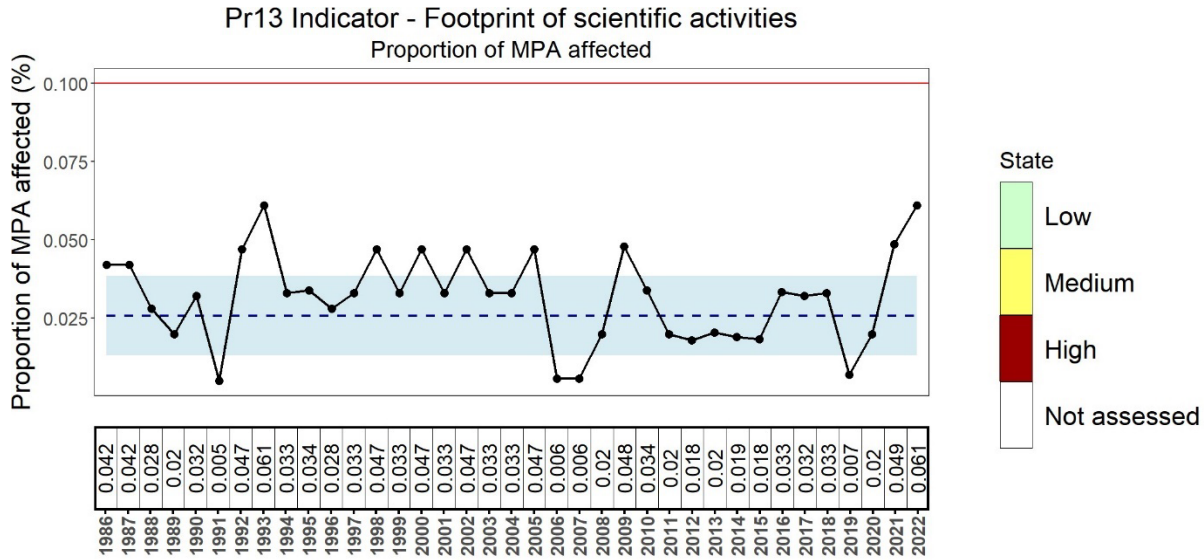
Figure 19. Status and trend of the time series of the measure associated with the Pr16 pressure indicator (Groundfish fishing). The blue dashed line represents mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The strip below each graph shows the value obtained for each year, colour-coded according to the magnitude and direction of the change observed in relation to the reference period (directional anomaly).

Figure 20. Status and trend of the time series for Pr12 pressure indicator (Footprint of the groundfish fishery). The black line corresponds to the sum of the actual anomaly values that are used to assign an annual status to the indicator, which is shown below the graph, colour coded according to its status.

Figure 21. Spatial distribution of longline fishing effort in the Banc-des-Américains MPA between 2004 and 2022.

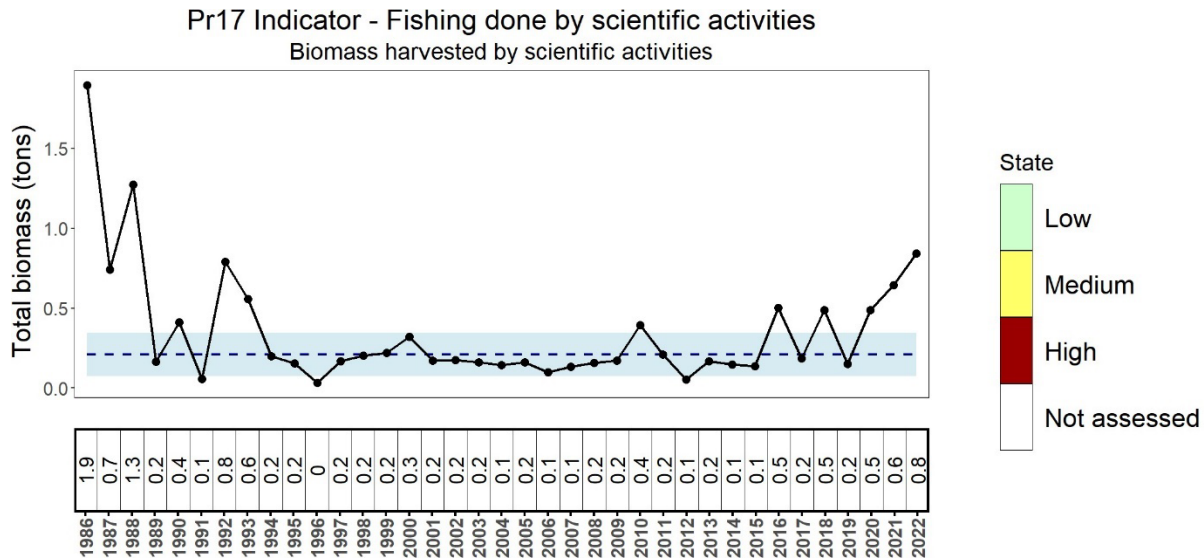*Figure 22. Status and trend of the time series of the measure associated with the Pr13 pressure indicator (Footprint of scientific activities). The blue dashed line represents the mean conditions during the reference period (2004–2018) and the blue shading, the ± 1 standard deviation around this mean. The status of this indicator could not be assessed. The red line represents 0.1% of the total area of the MPA (1 km²).*

Figure 23. Status and trend of the time series of the measure associated with the Pr17 pressure indicator (Biomass removal by scientific activities). The blue dashed line represents the mean conditions during the reference period (2004–2018), and the blue shading, the ± 1 standard deviation around this mean. The status of this indicator could not be assessed.
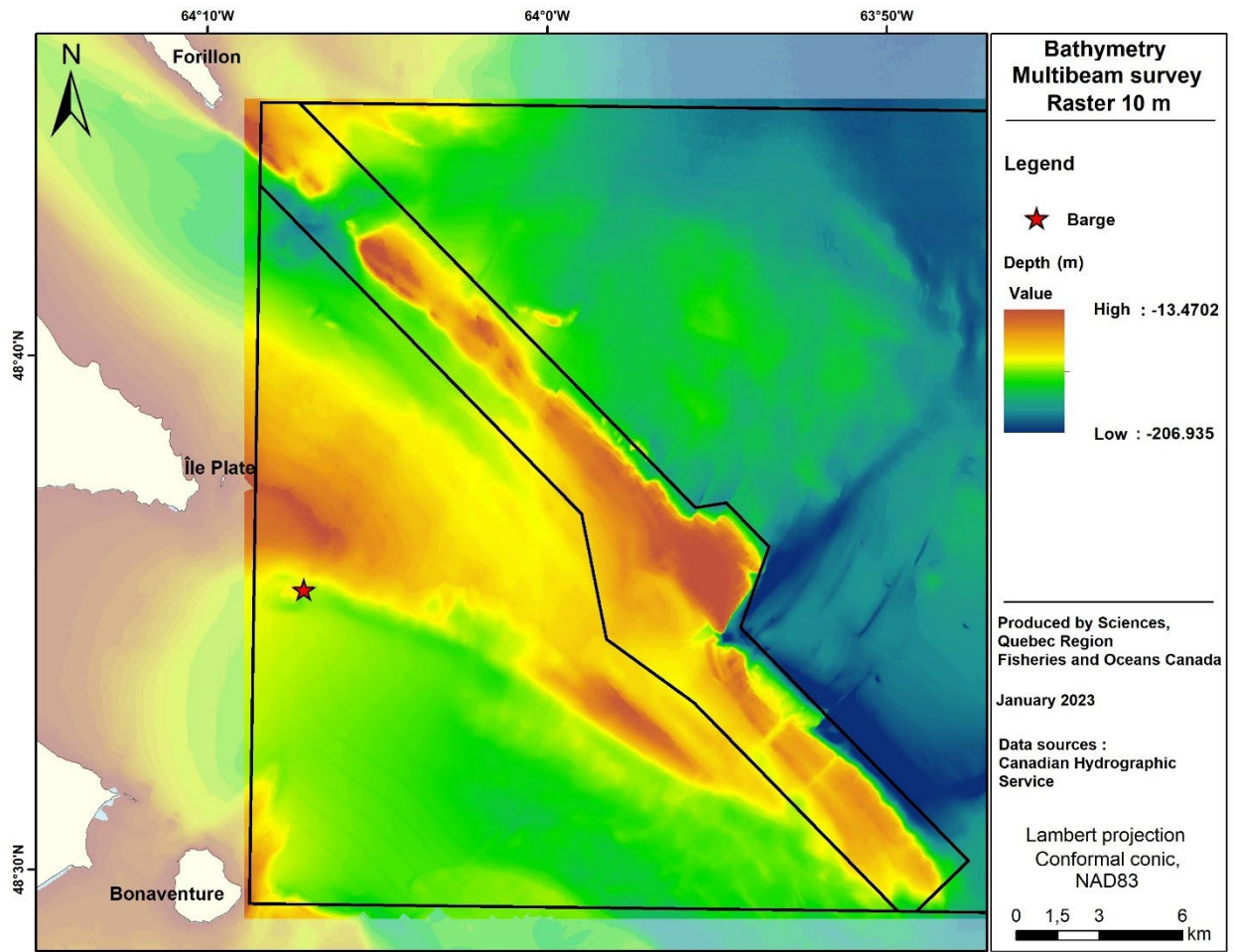
Figure 24. Location of barge that went aground on October 6, 2022.

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