

THE USE OF TRANSCRIPTOMICS TO STUDY THE RETURN OF REDFISH IN THE ESTUARY AND GULF OF ST. LAWRENCE

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Redfish populations in the Northwest Atlantic have been extensively fished since the late 1950s. Two species are present, *Sebastes mentella* and *Sebastes fasciatus*.

COSEWIC designated *Sebastes mentella* as endangered in 2010.

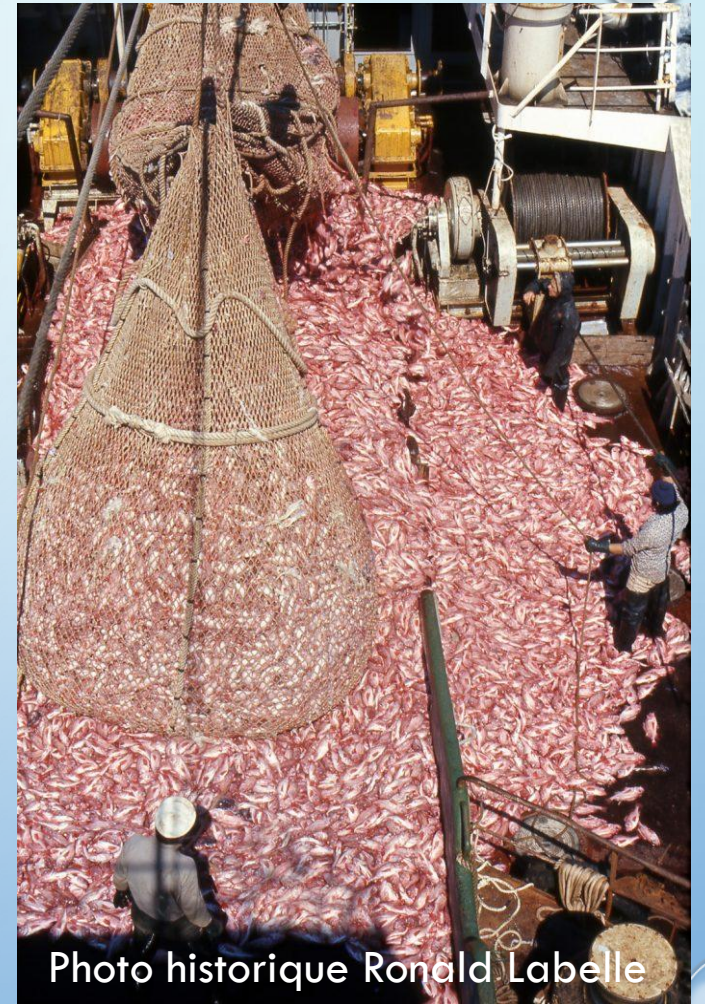
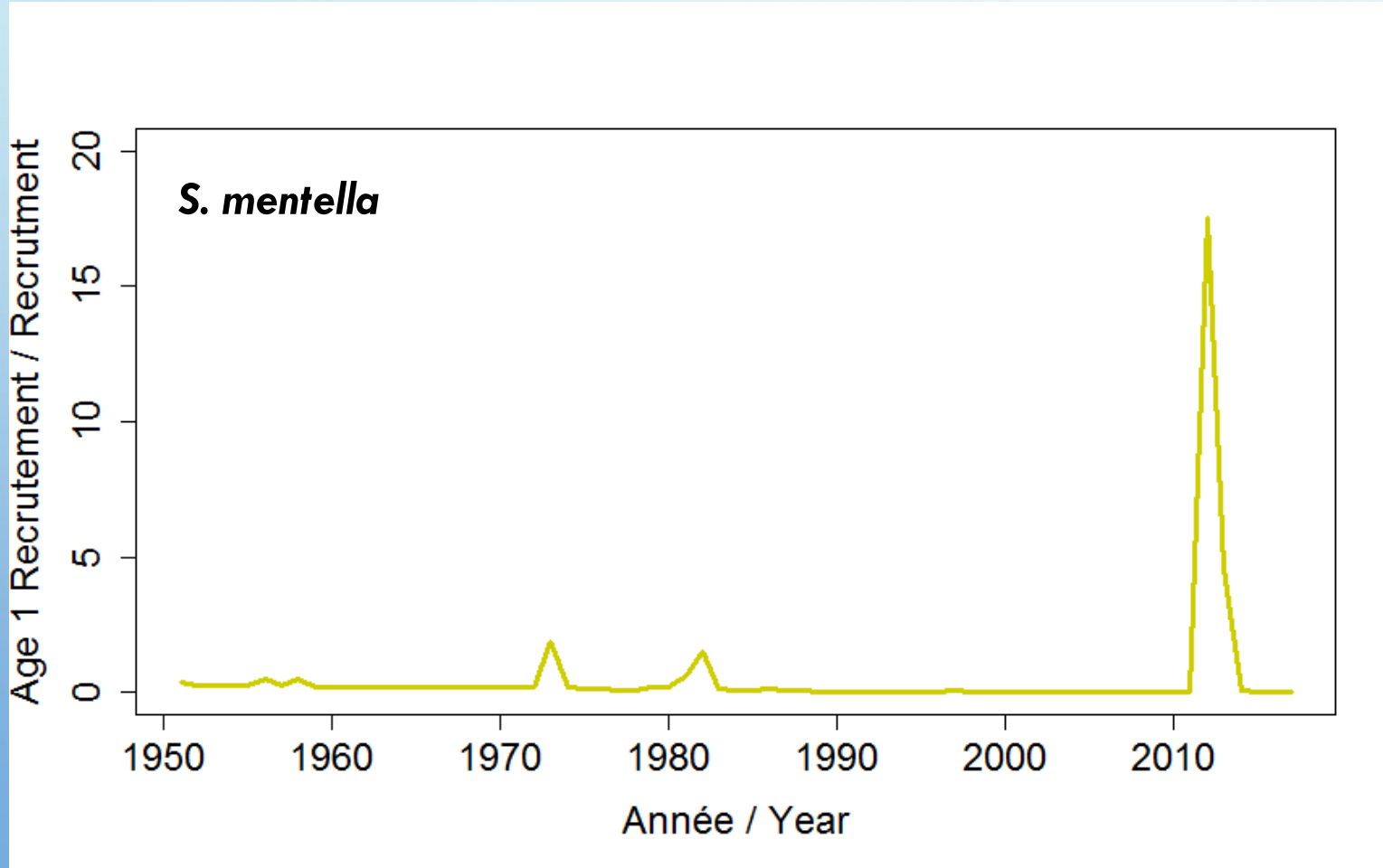


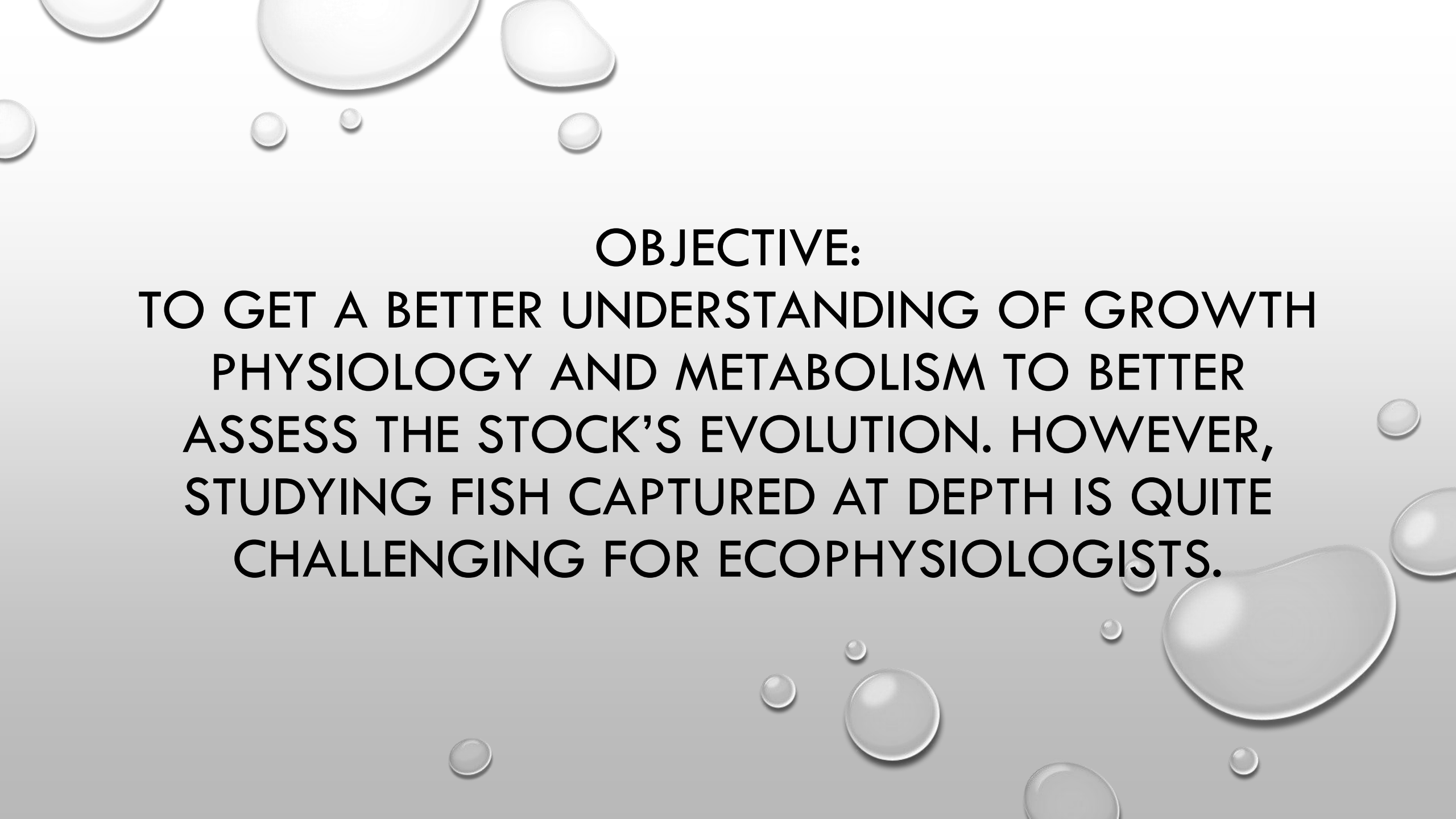
Photo historique Ronald Labelle

Three strong cohorts recruited to the stock from 2011 to 2013.

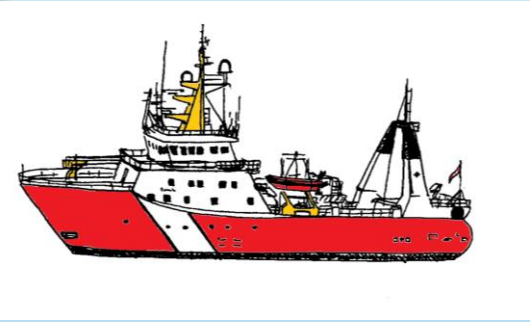


Source: DFO





OBJECTIVE:
**TO GET A BETTER UNDERSTANDING OF GROWTH
PHYSIOLOGY AND METABOLISM TO BETTER
ASSESS THE STOCK'S EVOLUTION. HOWEVER,
STUDYING FISH CAPTURED AT DEPTH IS QUITE
CHALLENGING FOR ECOPHYSIOLOGISTS.**



- DFO - August 2018
scientific campaign

- Aboard the
CCGS Teleost

- Campelen 1800 trawl

- Tows lasted 15 min at a
speed of 3 knots



Redfish were captured at 7 different locations in the estuary and Gulf of St. Lawrence



At each site, heart, liver and muscle tissue were extracted on 10 individuals, from 20 to 23 cm, to insure having the same cohort

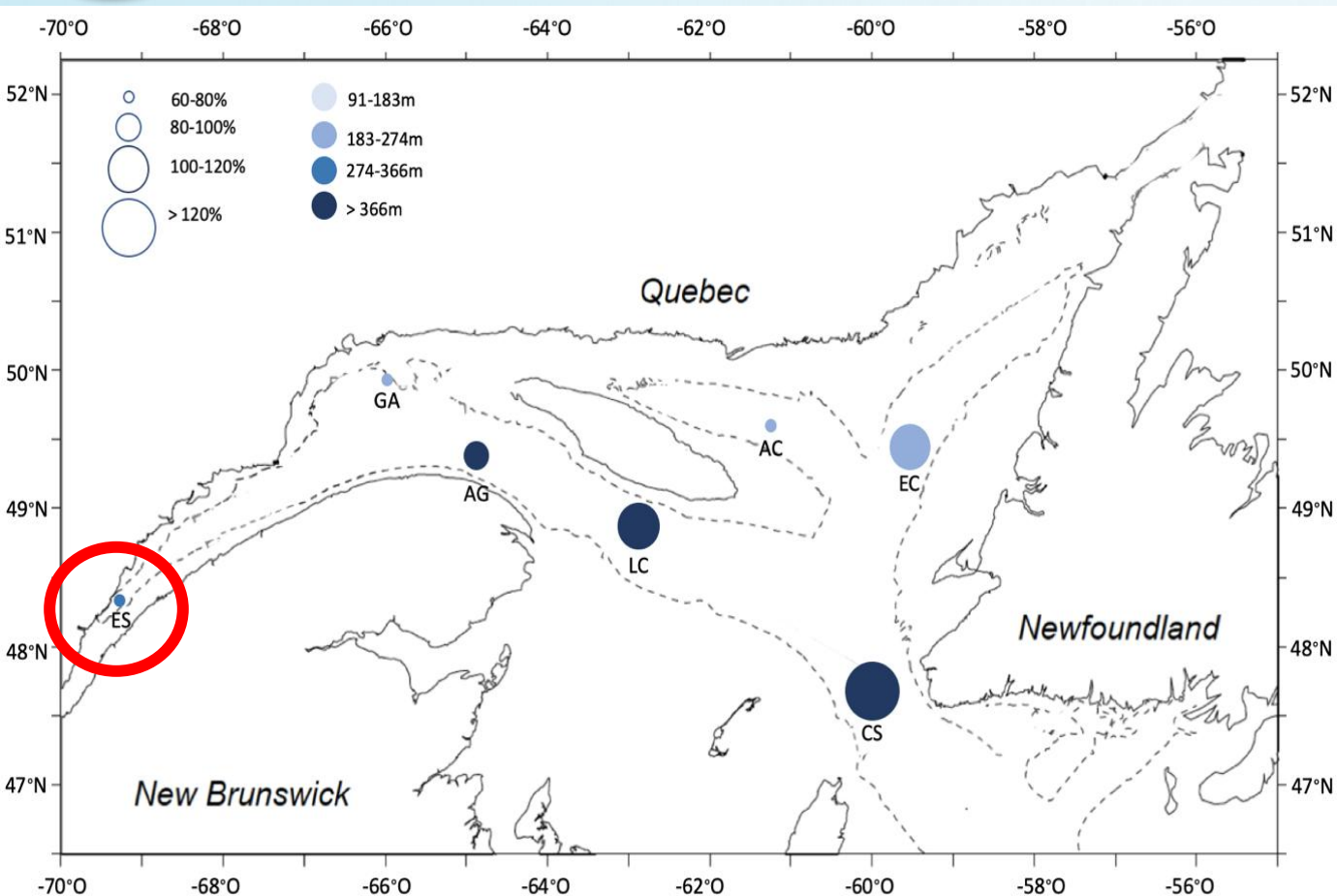


DNA was extracted



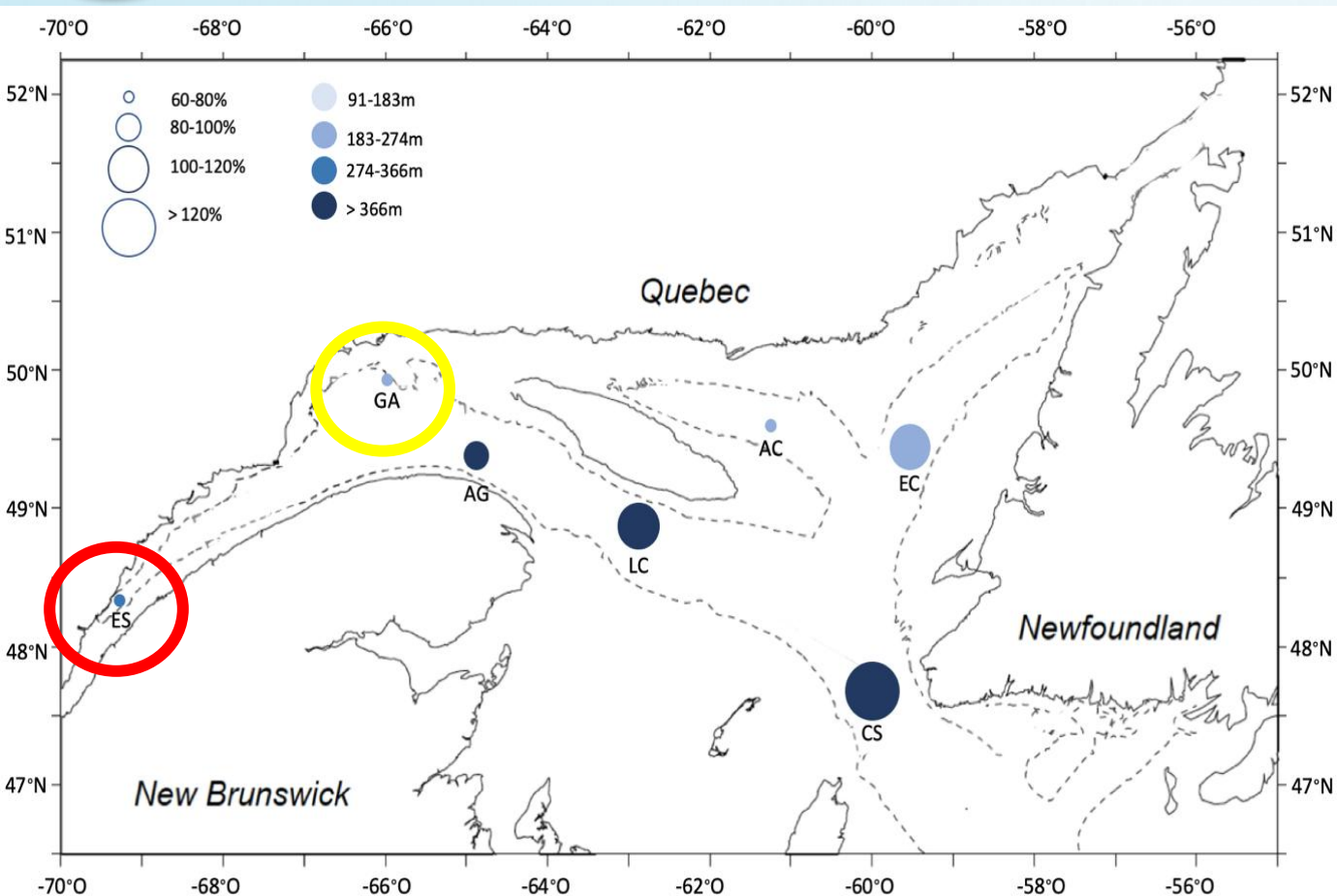
Microsatellite analysis confirmed
S. mentella identification

Sites of capture



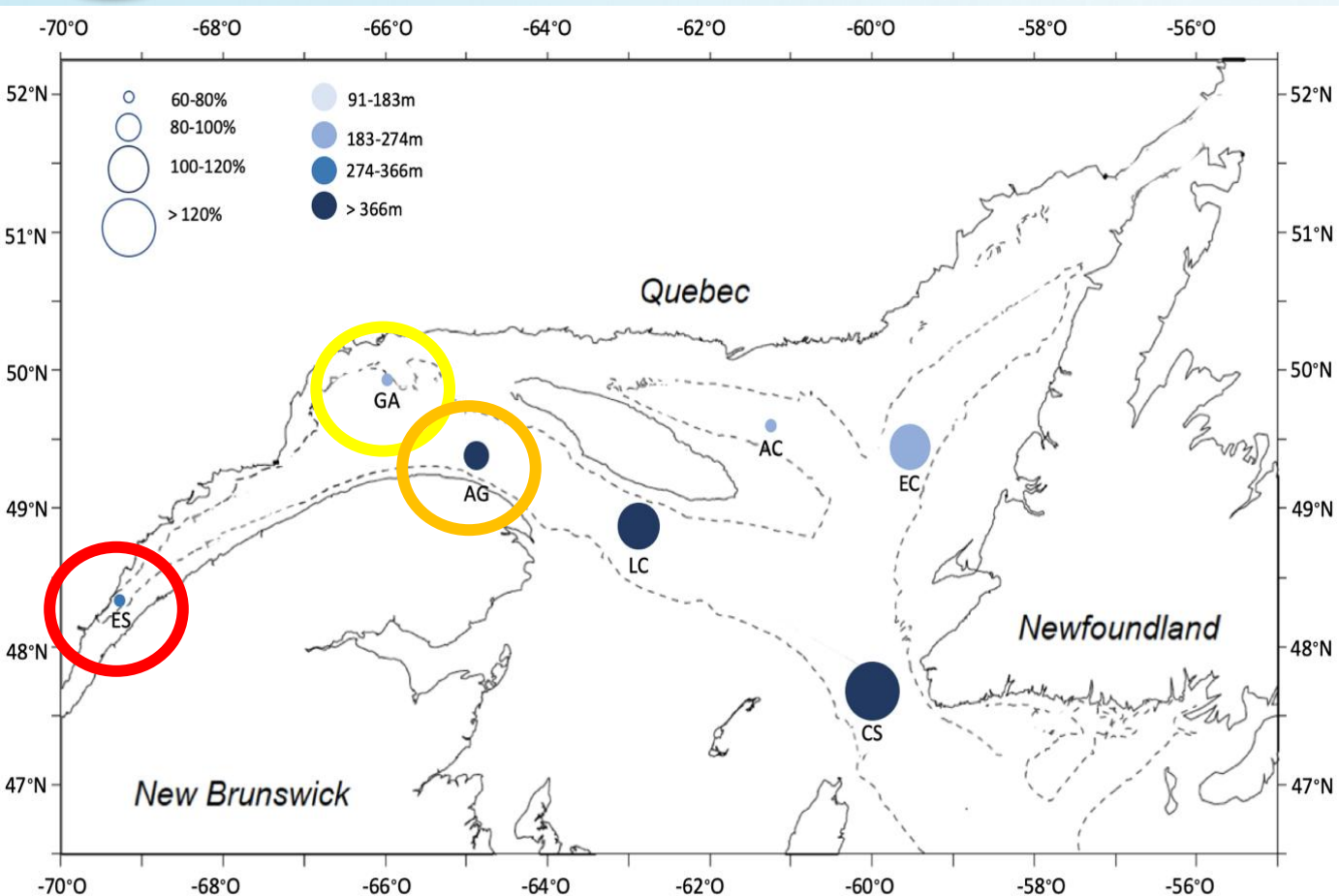
Zone	Depth (m)	Salinity	Temp (°C)	Oxygen (μmol/kg)
Estuary	306	34.45	5.67	60.85

Sites of capture



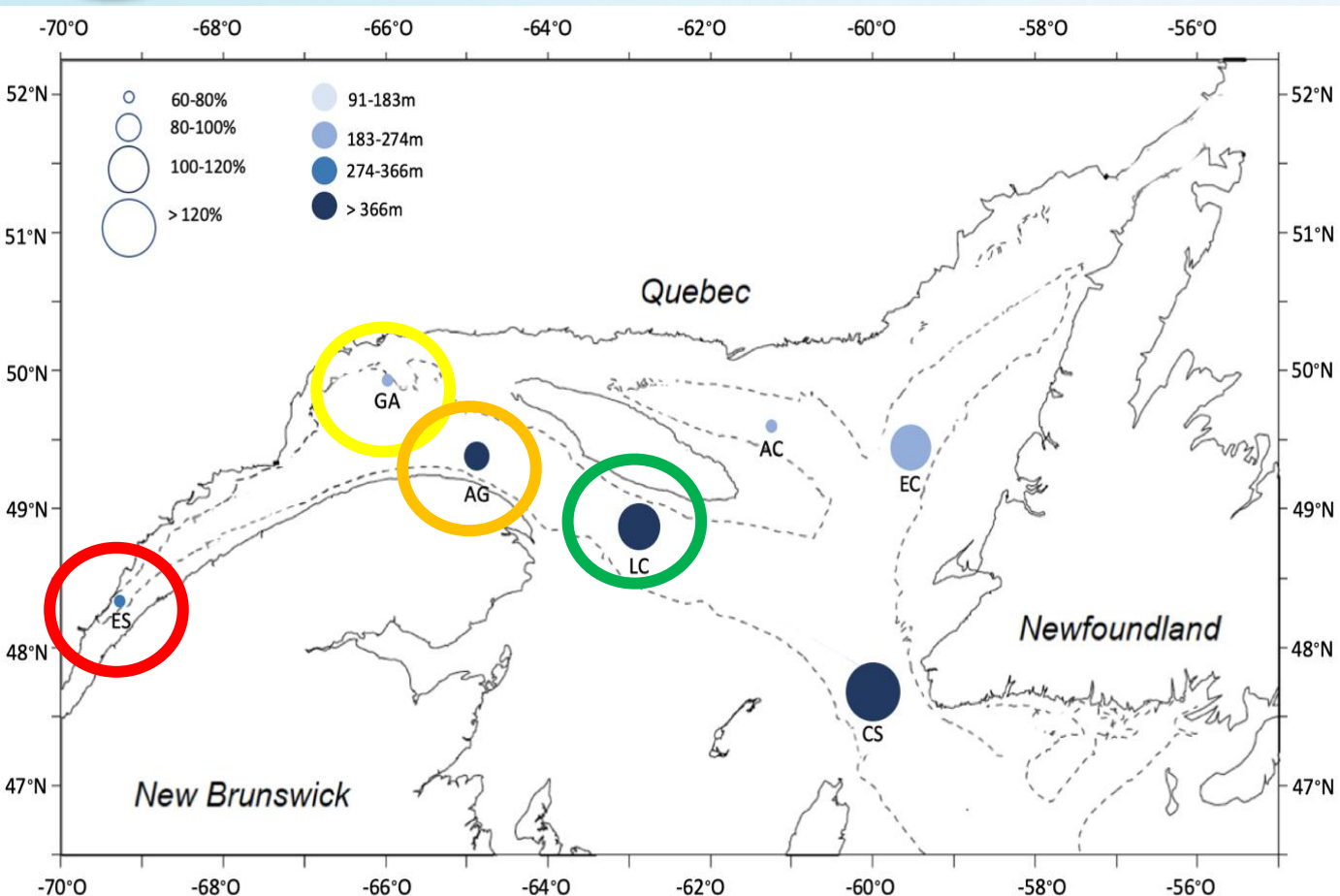
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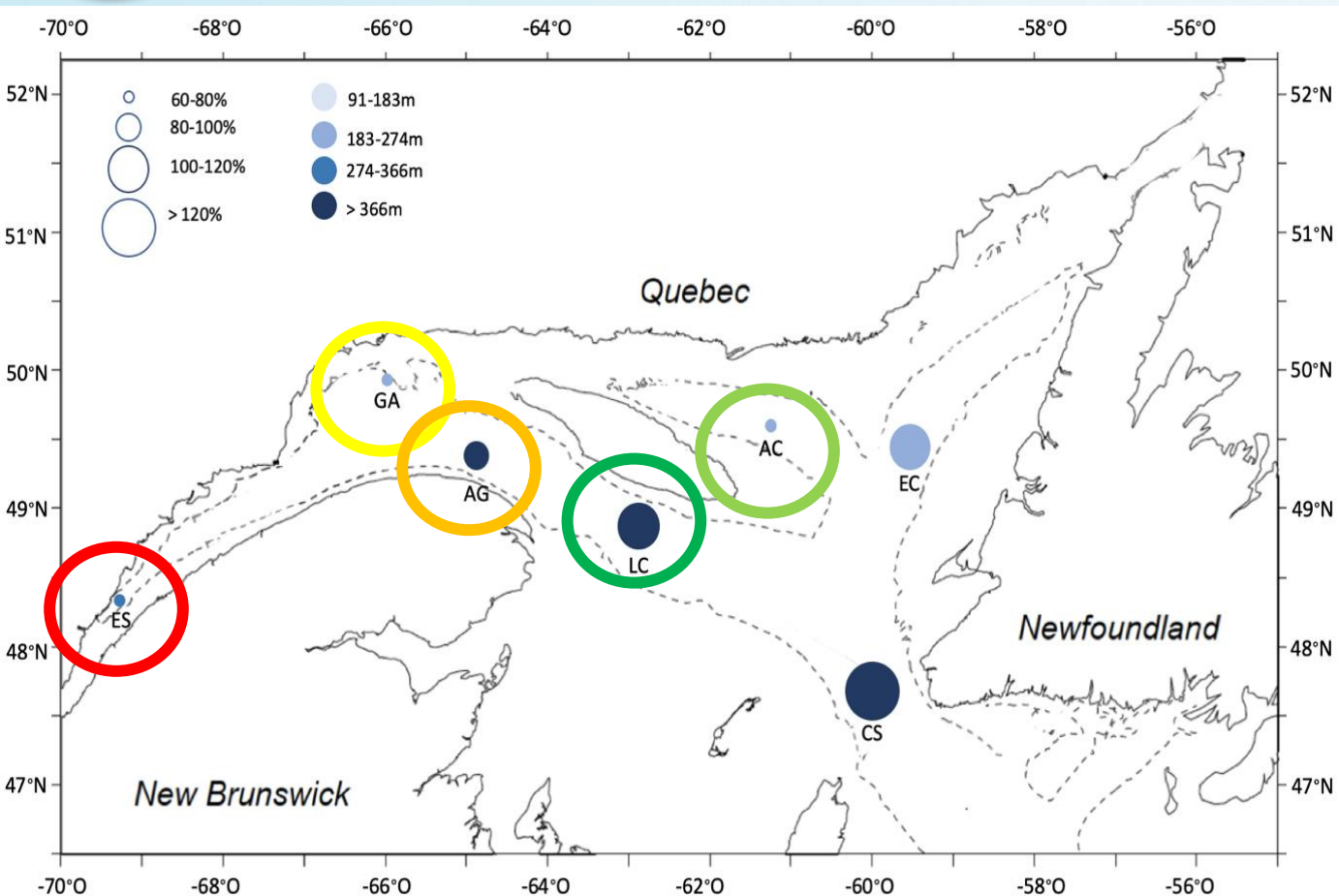
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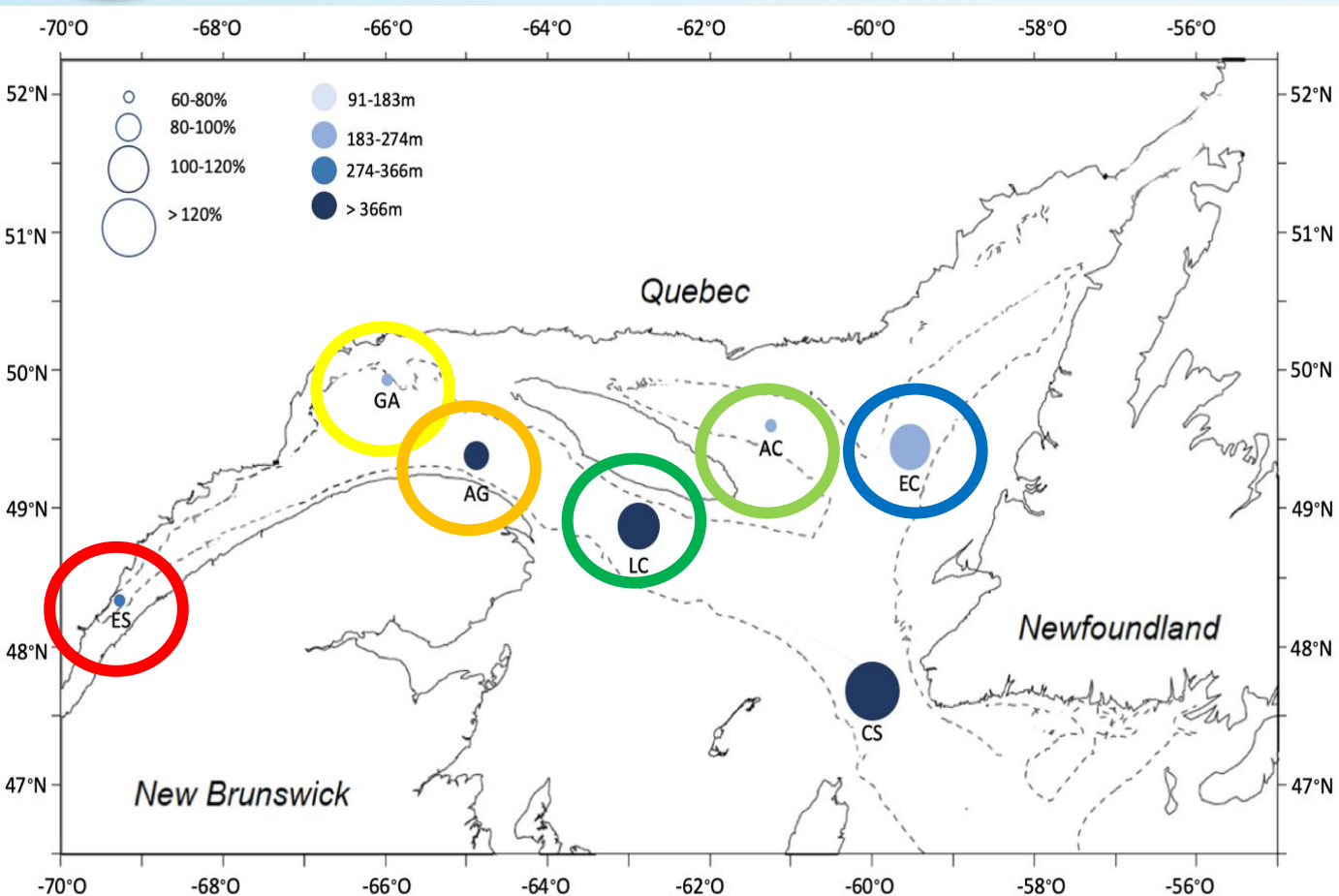
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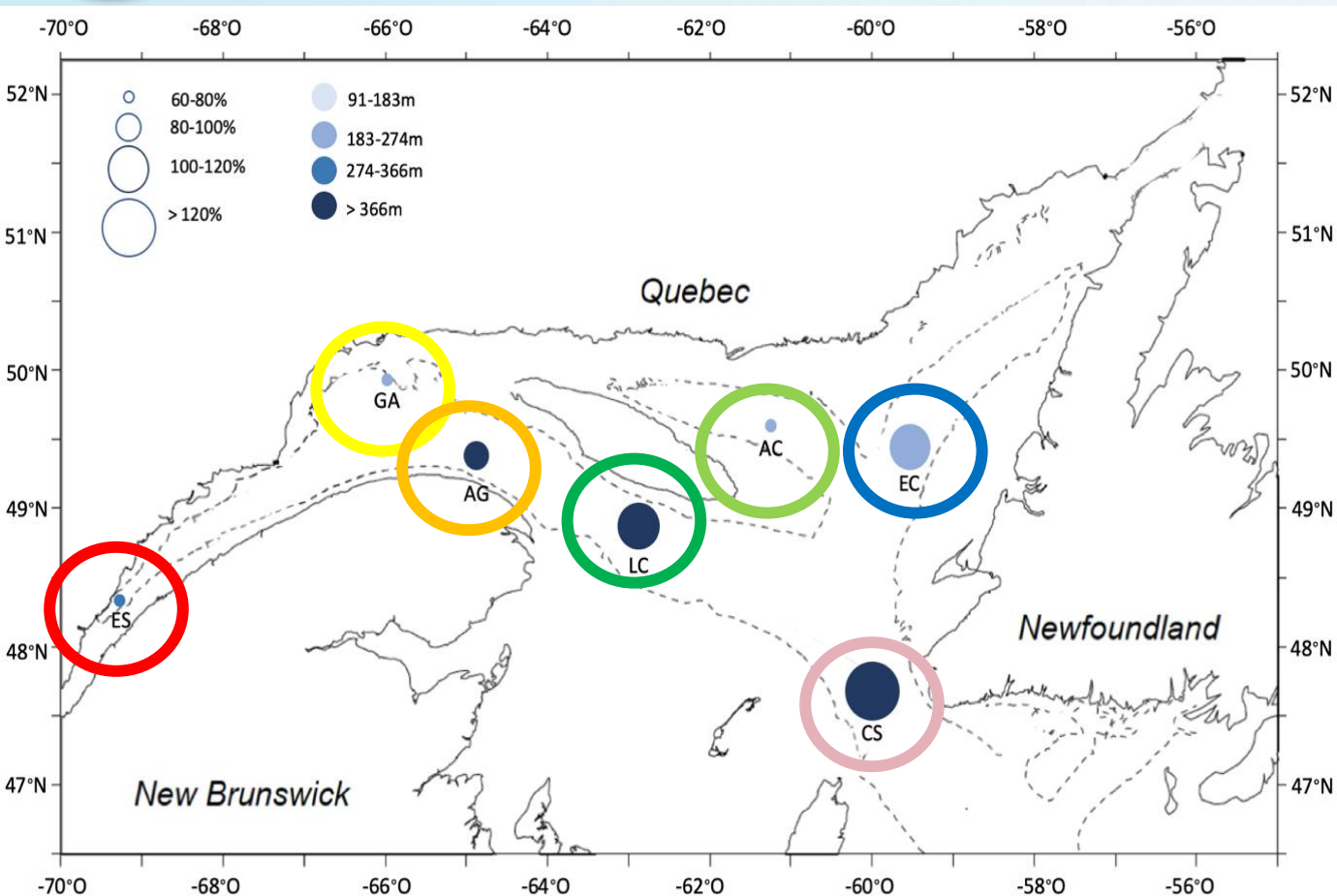
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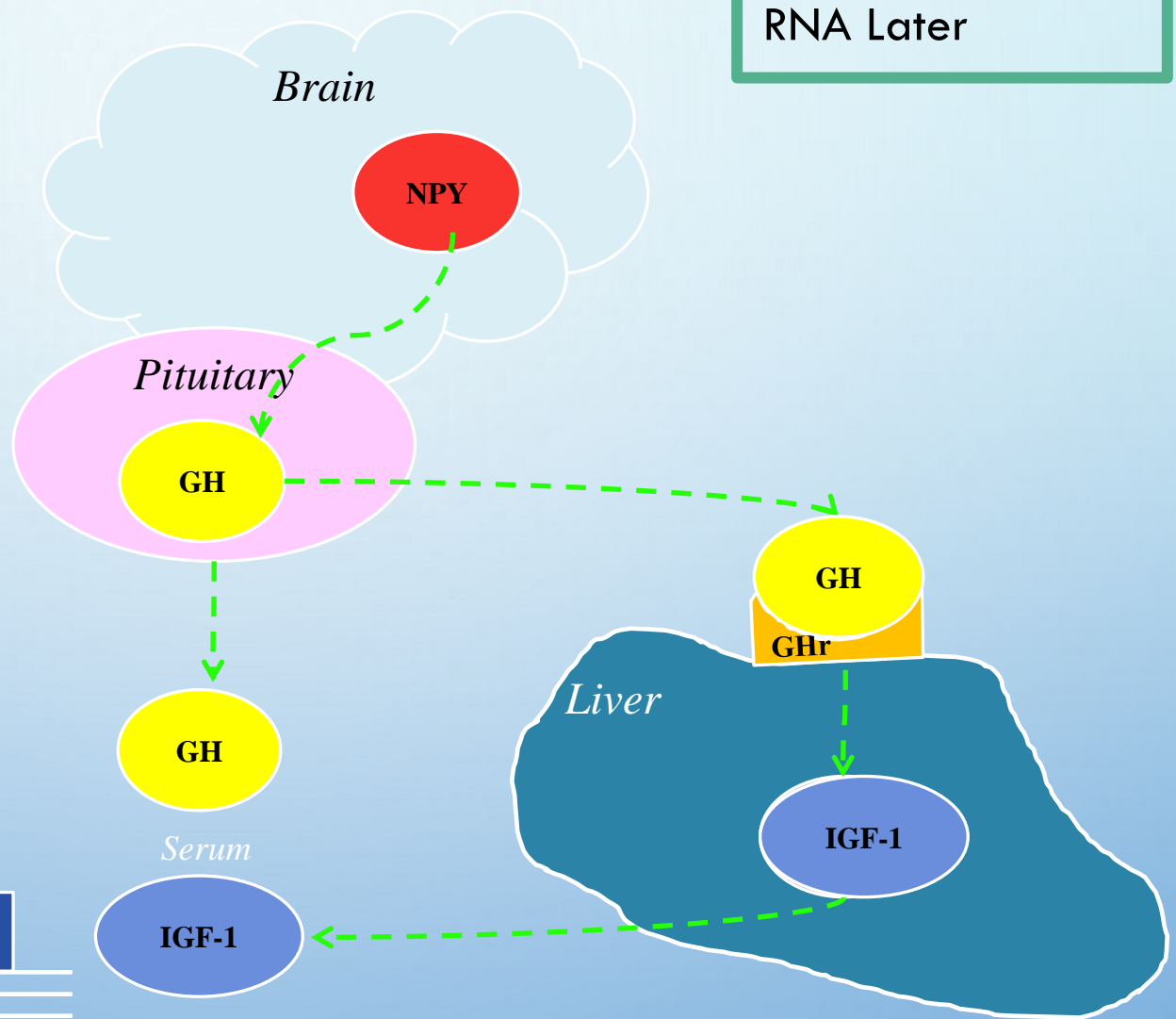
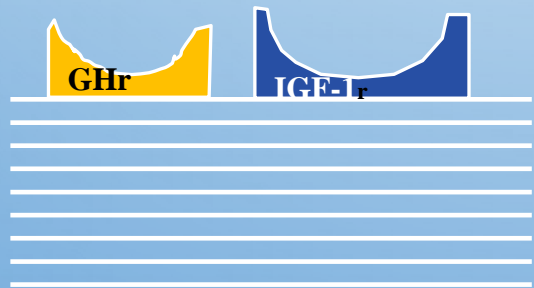


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Cabot Strait	501	34.95	5.89	158.51

Growth Indicators

Relative gene expression

Muscle

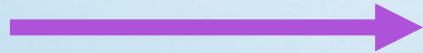
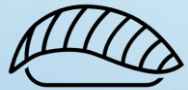


Sampling on board
RNA Later

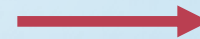
Sampling on board
RNA Later

Metabolic Indicators

Relative gene expression



Anaerobic
metabolism

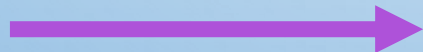


LDH
PK

Muscle growth



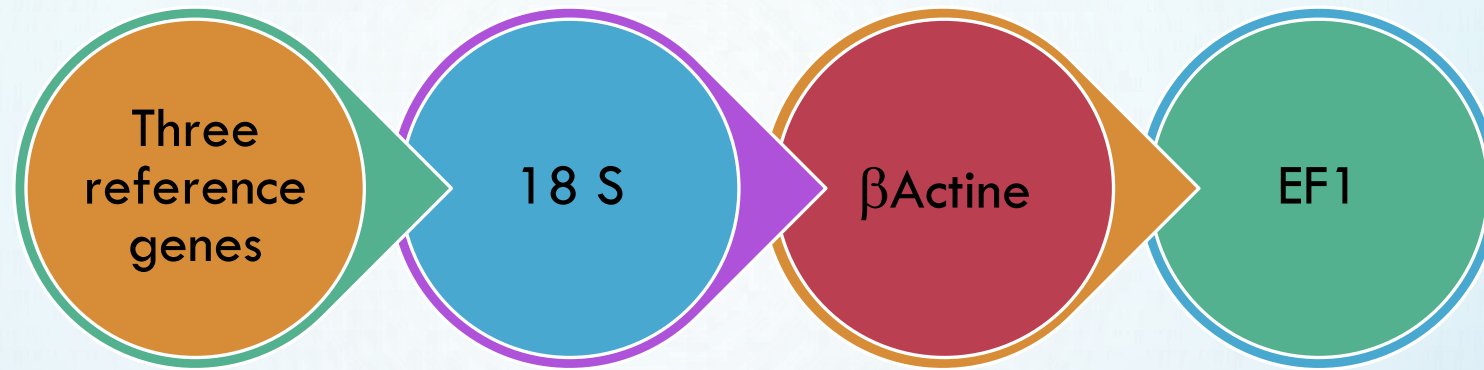
Myosin



Aerobic
metabolism



COX
CS



2- $\Delta\Delta$ CT method

Livak and Schmittgen
(2001)

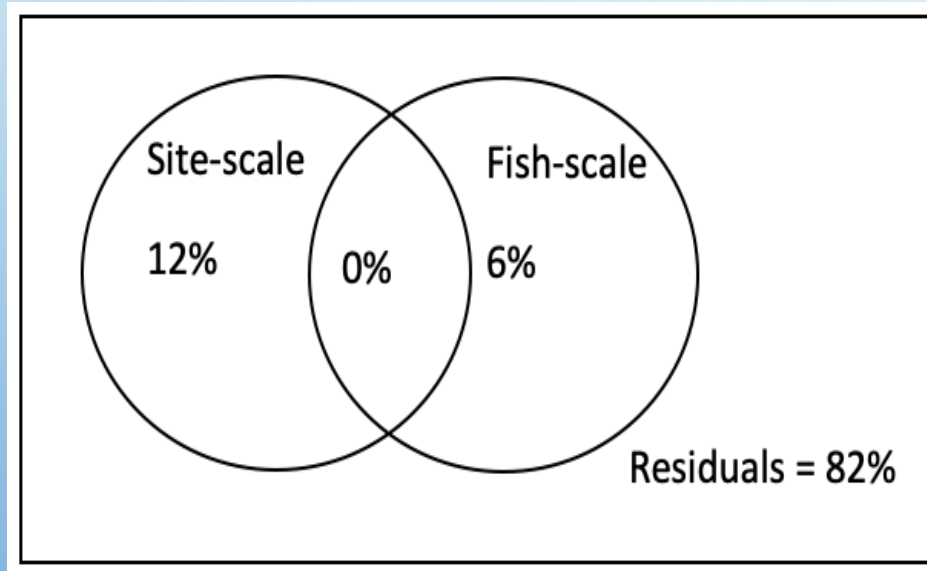
Calibrator site

Cabot strait: the deepest, the saltiest, and the highest oxygen content

PRELIMINARY RESULTS

Redundancy analysis (RDA)

Variation partitioning, relationship between genetic markers (Y), Site variables (X1) and Fish variables (X2).



Site:

Depth, Temperature, Oxygen concentration,
and Redfish Biomass

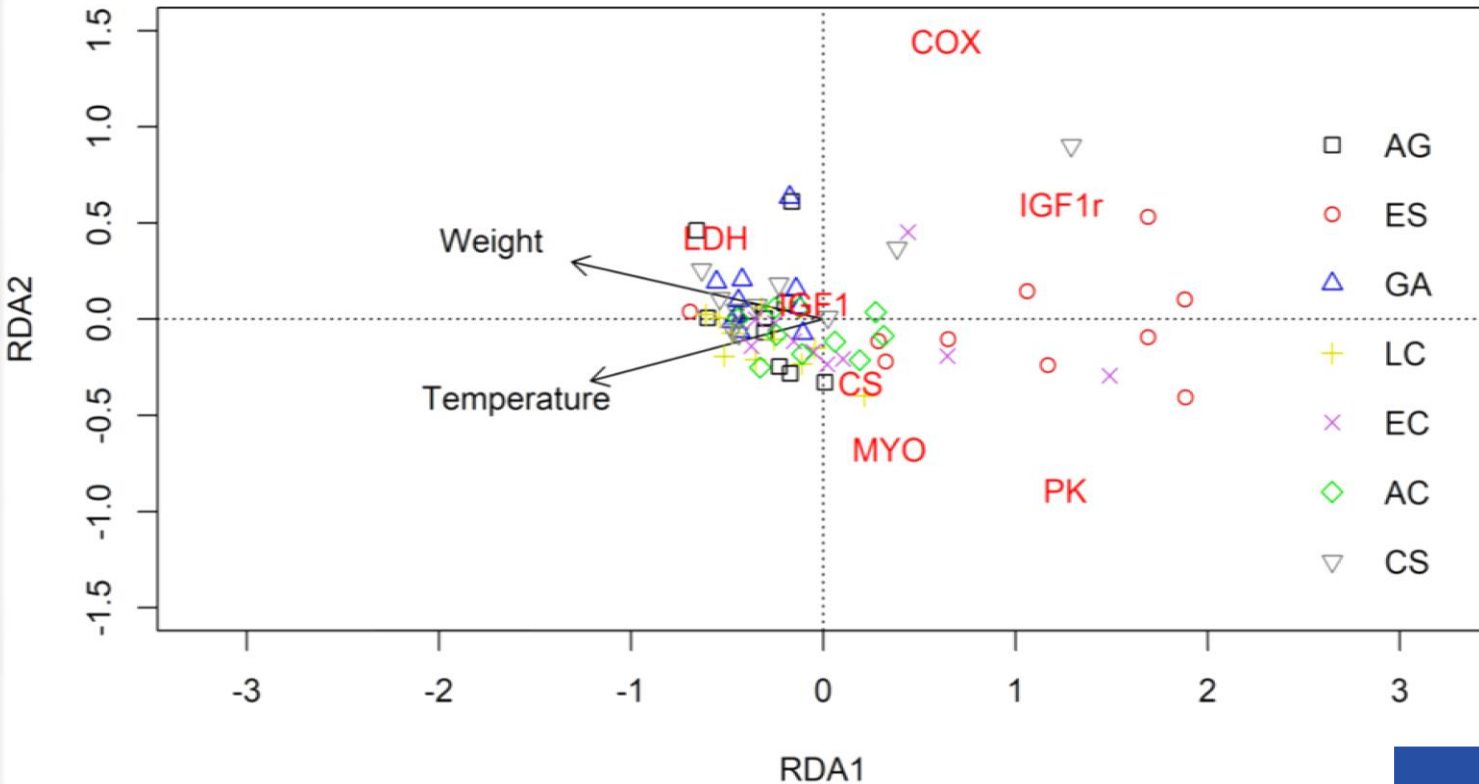
$p = 0.002$

Fish:

Length, Weight, Fulton condition index

$p = 0.011$

PRELIMINARY RESULTS

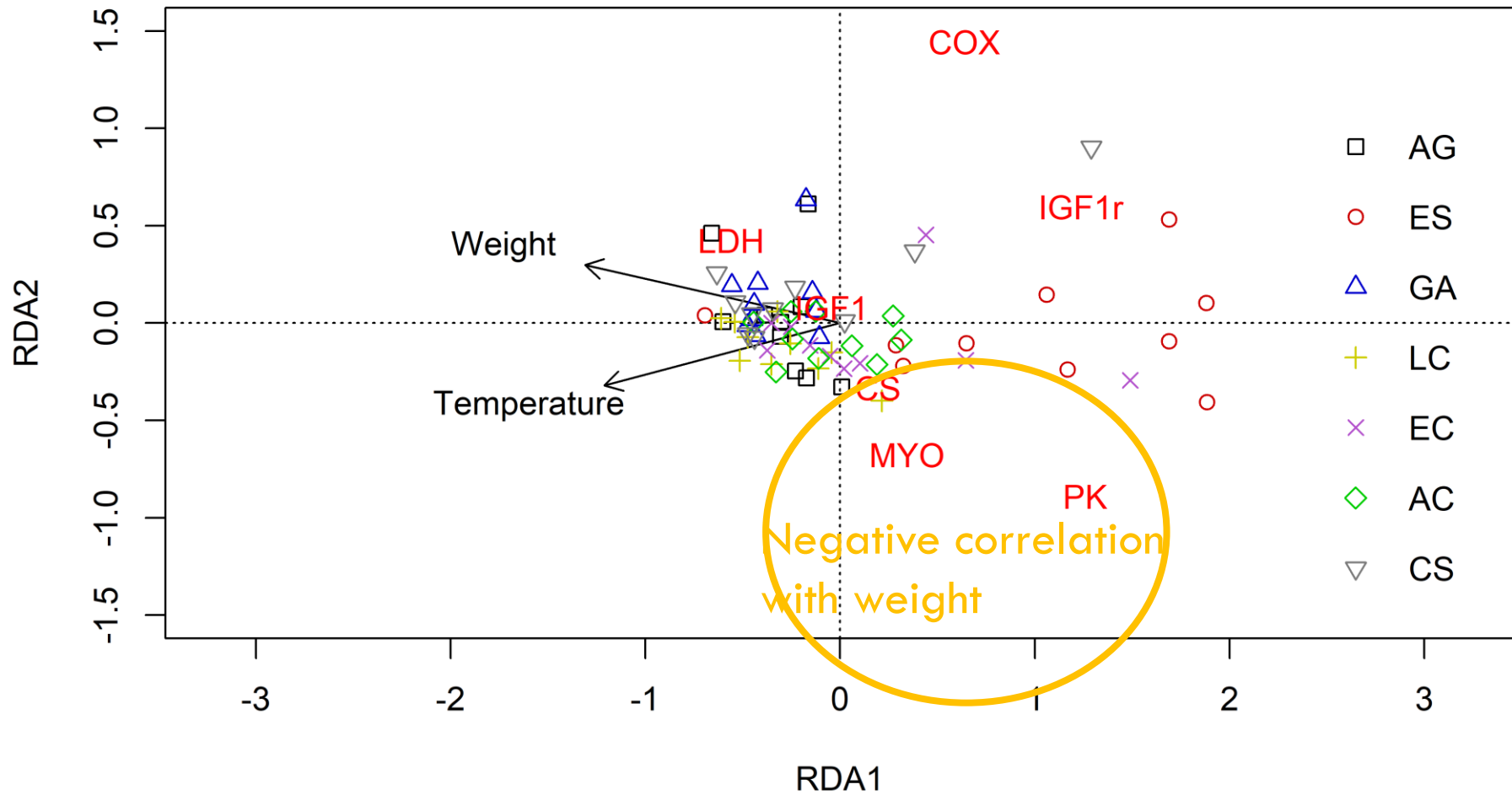


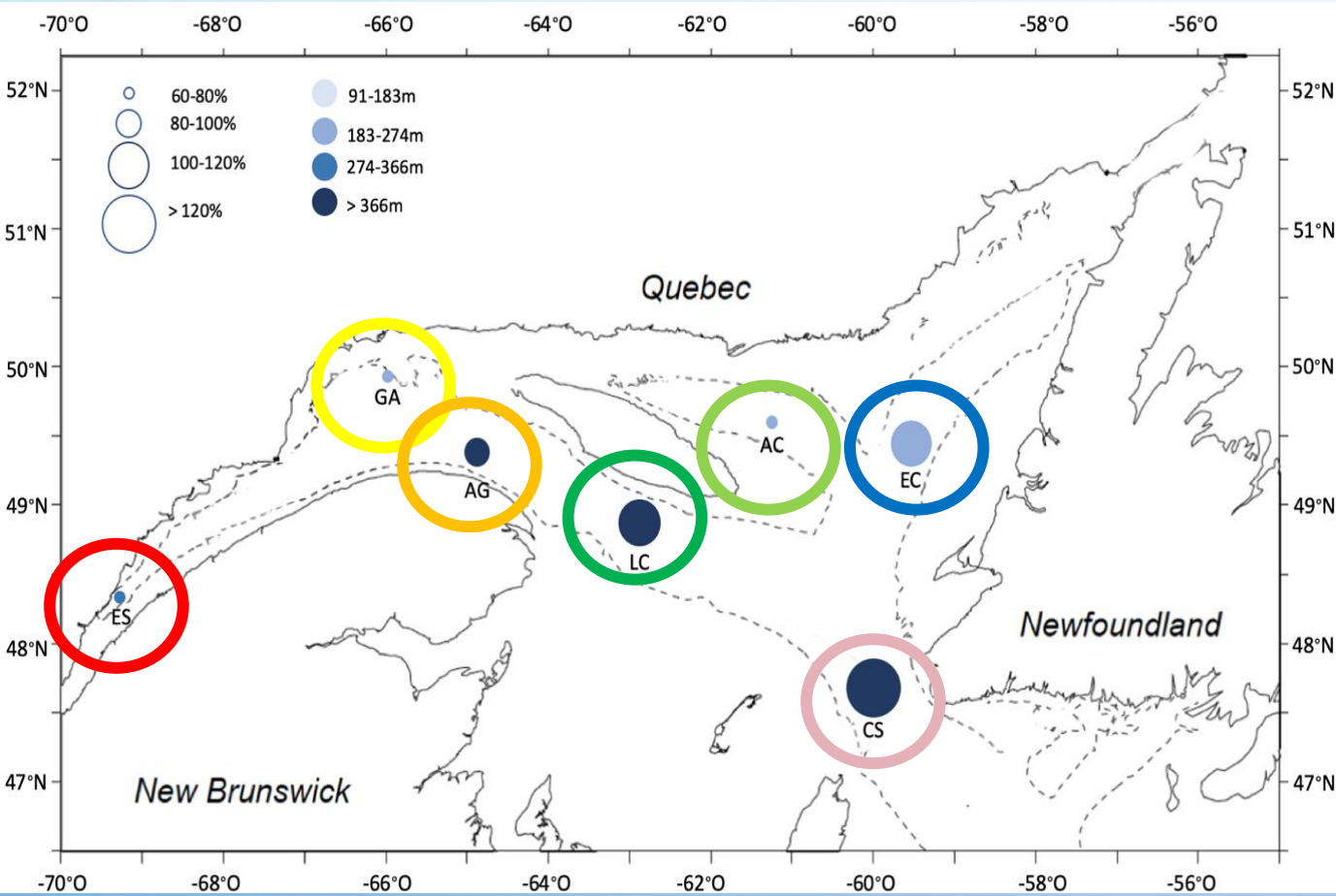
Two variables were retained and explained 11% of the variation ($p = 0.001$).

They have similar importance.

	R2.adj	Df	AIC	F	Pr(>F)
Weight	0.058524	1	151.62	5.2892	0.002
Temperature	0.113586	1	148.37	5.224	0.006
All variables	0.162329				

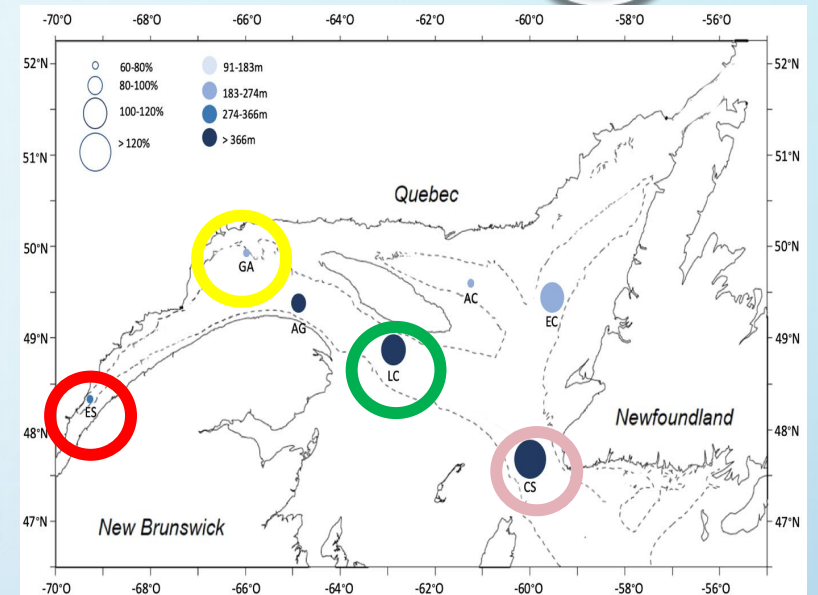
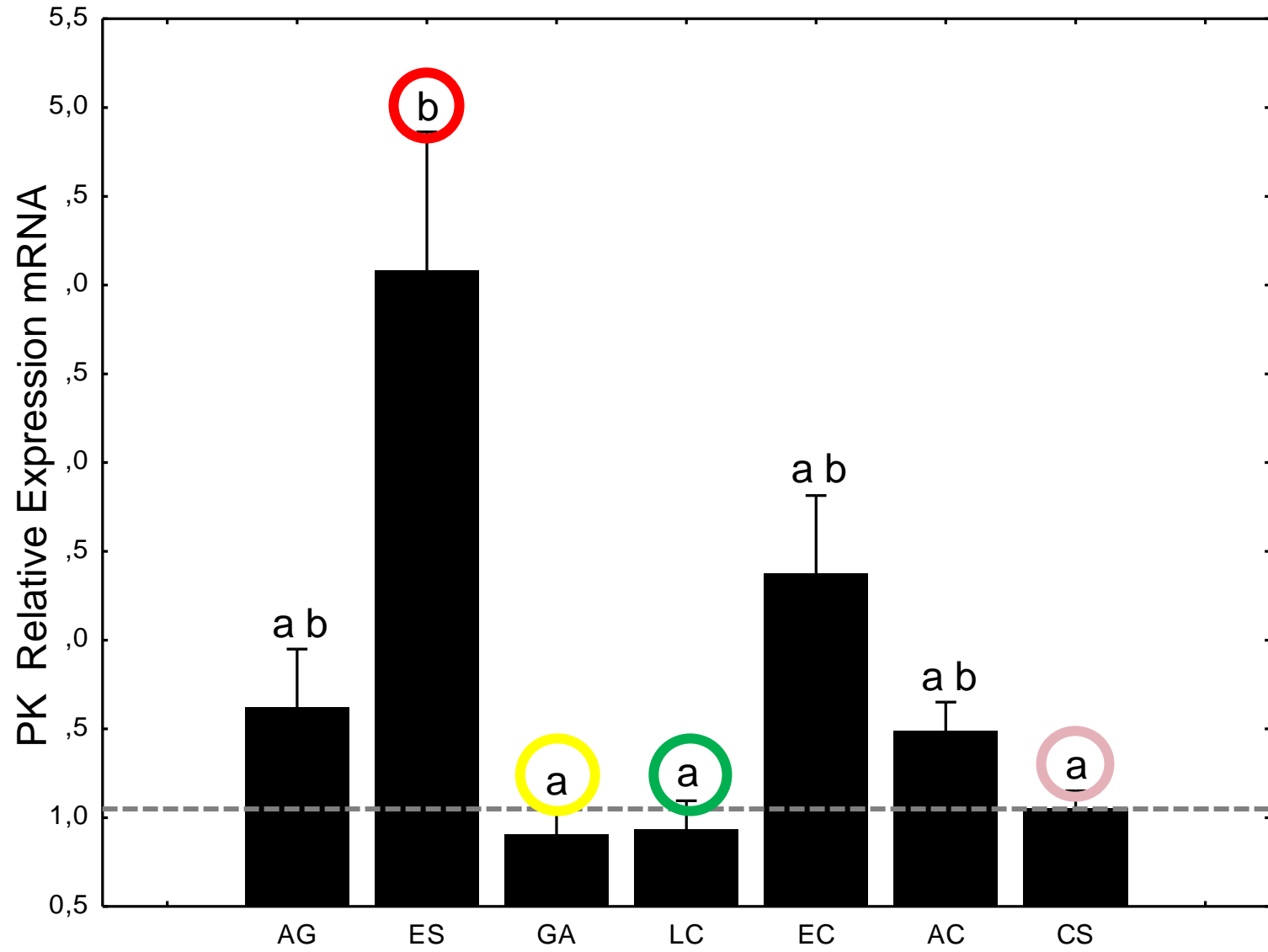
PRELIMINARY RESULTS





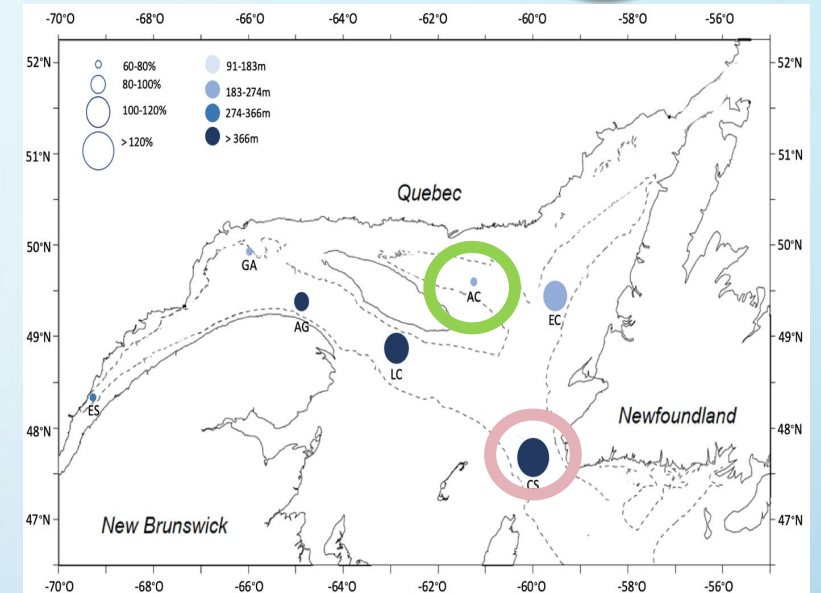
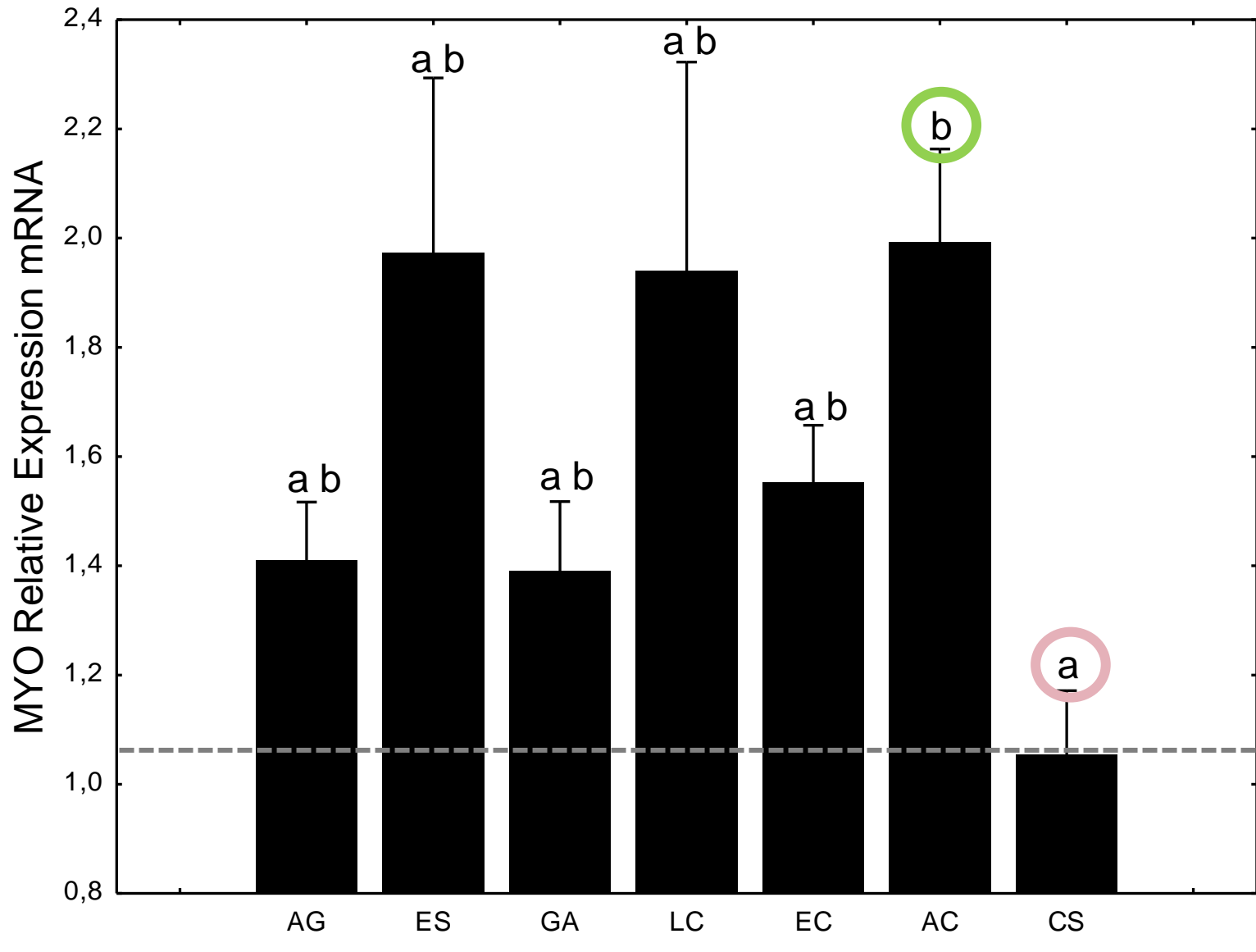
Zone	Weight (g)	Length (cm)	Condition Factor
Estuary	56 ± 42	16 ± 5	1.07 ± 0.19
Gyre Anticosti	134 ± 116	19 ± 7	1.23 ± 0.25
Anticosti-Gaspé	148 ± 63	22 ± 6	1.29 ± 0.17
Laurentian Channel	366 ± 350	27 ± 8	1.27 ± 0.16
Anticosti Channel	137 ± 125	19 ± 6	1.22 ± 0.22
Esquiman Channel	256 ± 229	25 ± 8	1.28 ± 0.18
Cabot Strait	372 ± 294	28 ± 7	1.41 ± 0.13

PRELIMINARY RESULTS

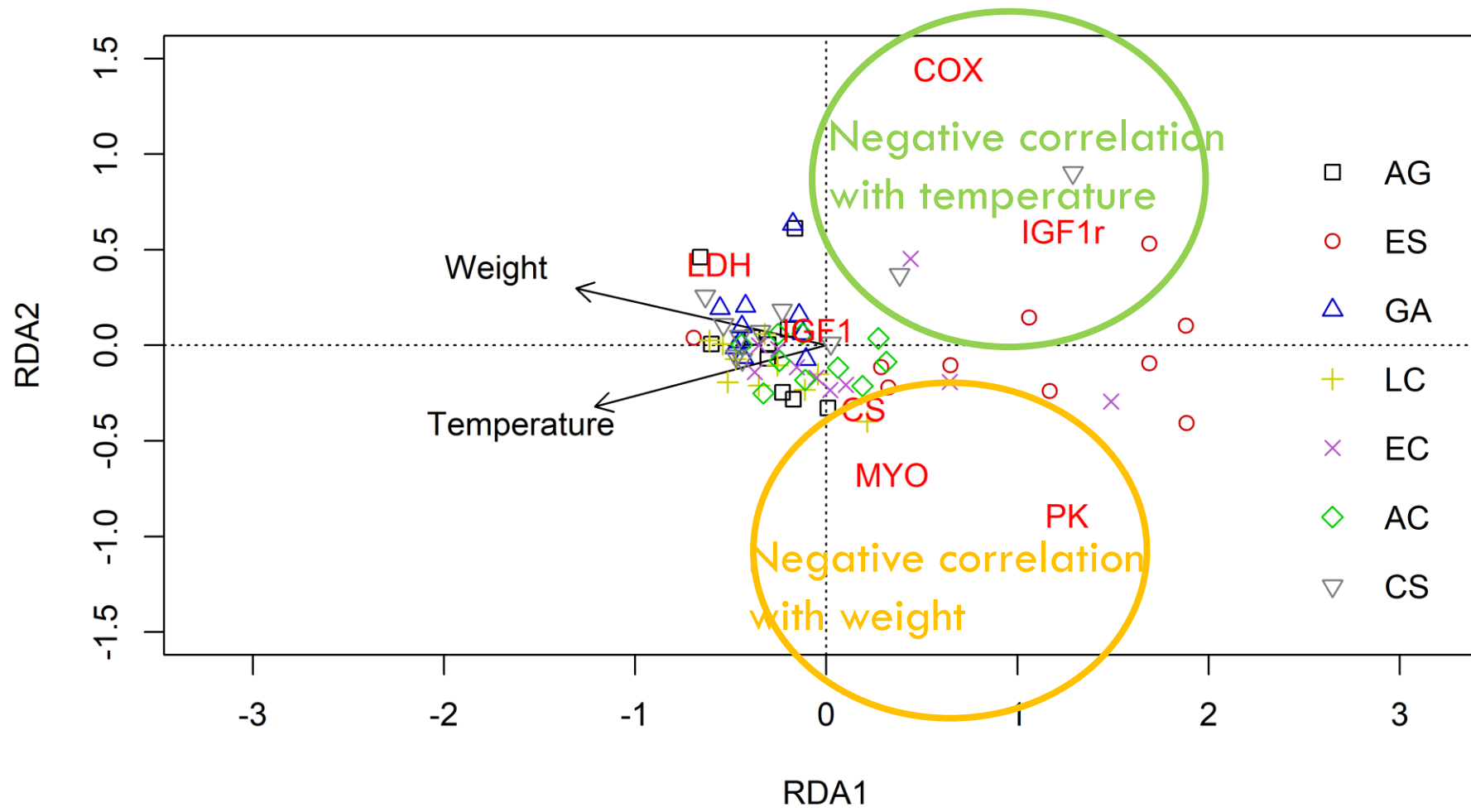


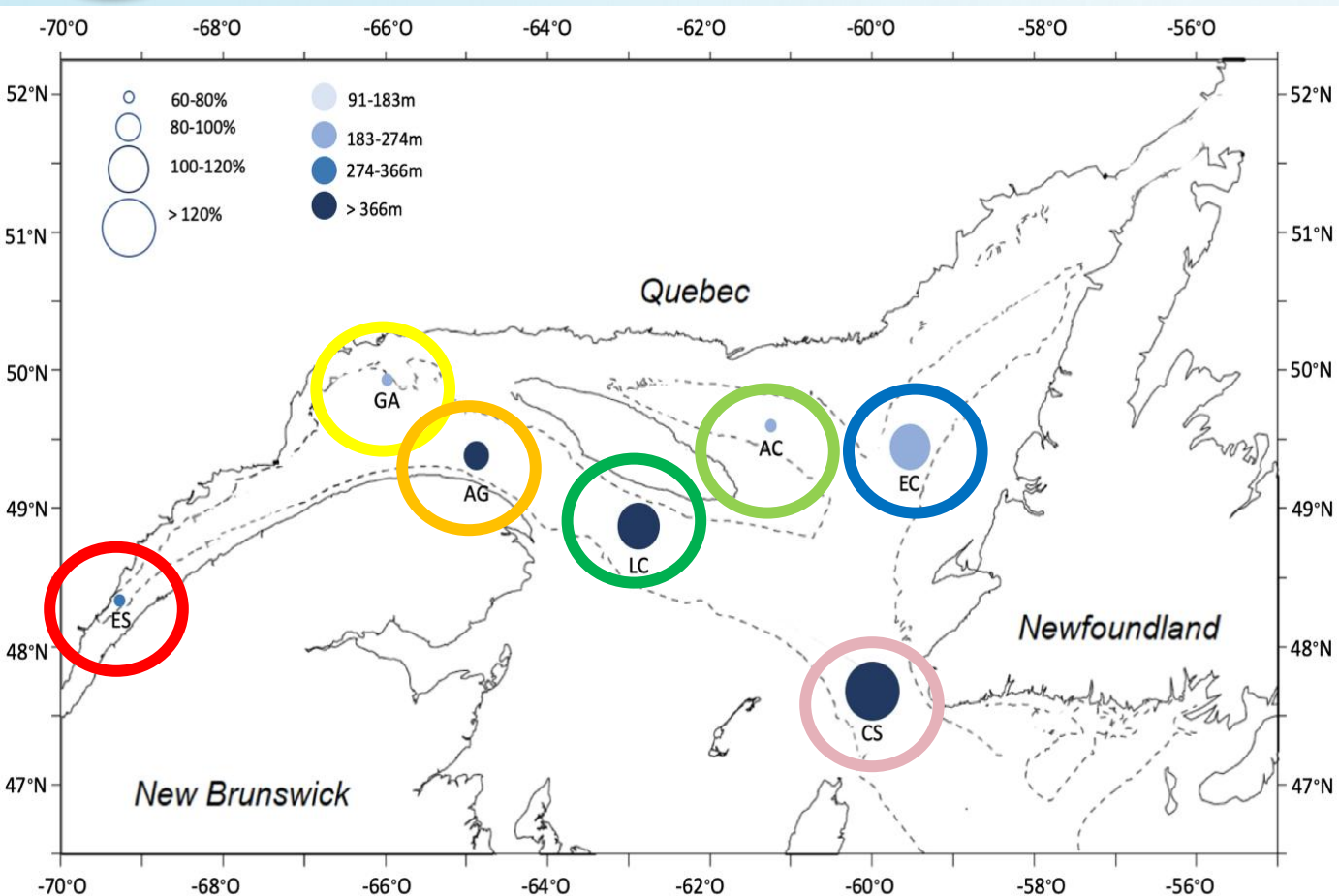
PK (anaerobic metabolism indicator) is overexpressed at the site where the smallest *S. mentella* were captured

PRELIMINARY RESULTS



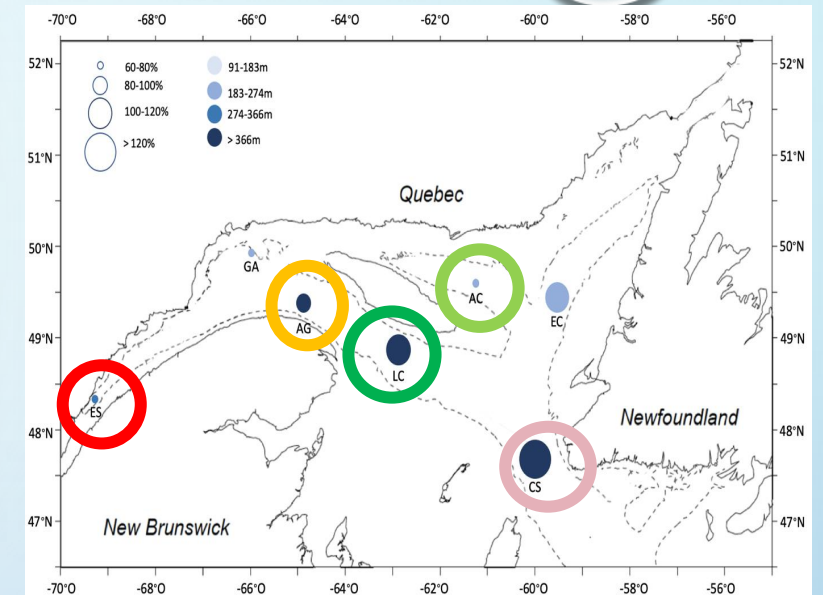
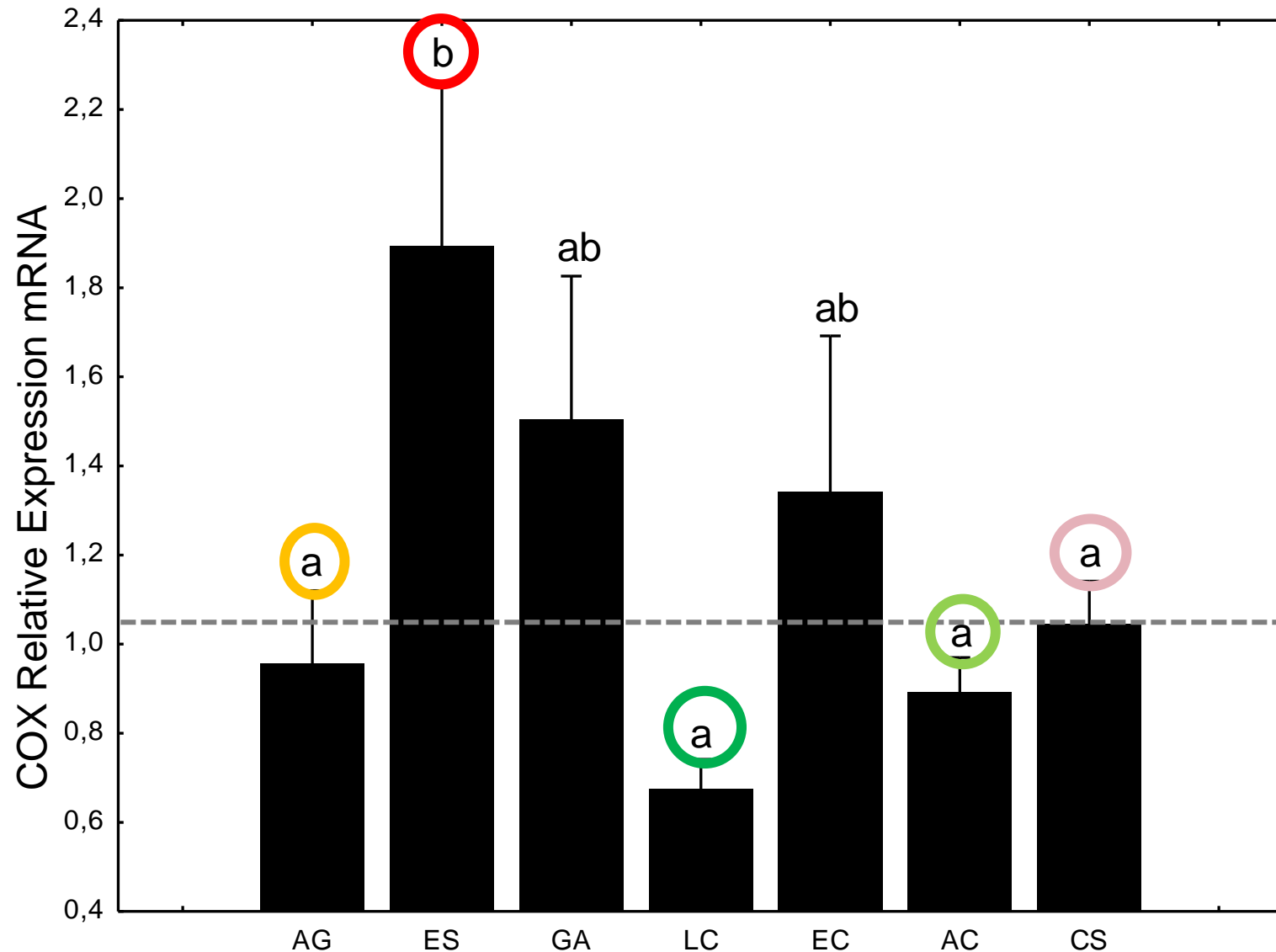
The lowest expression of Myosin is observed at the site where the largest fish were captured





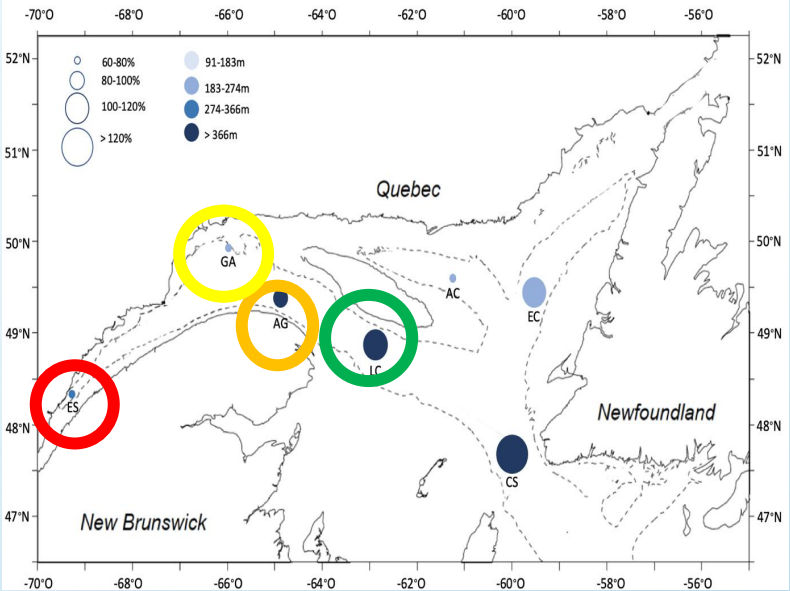
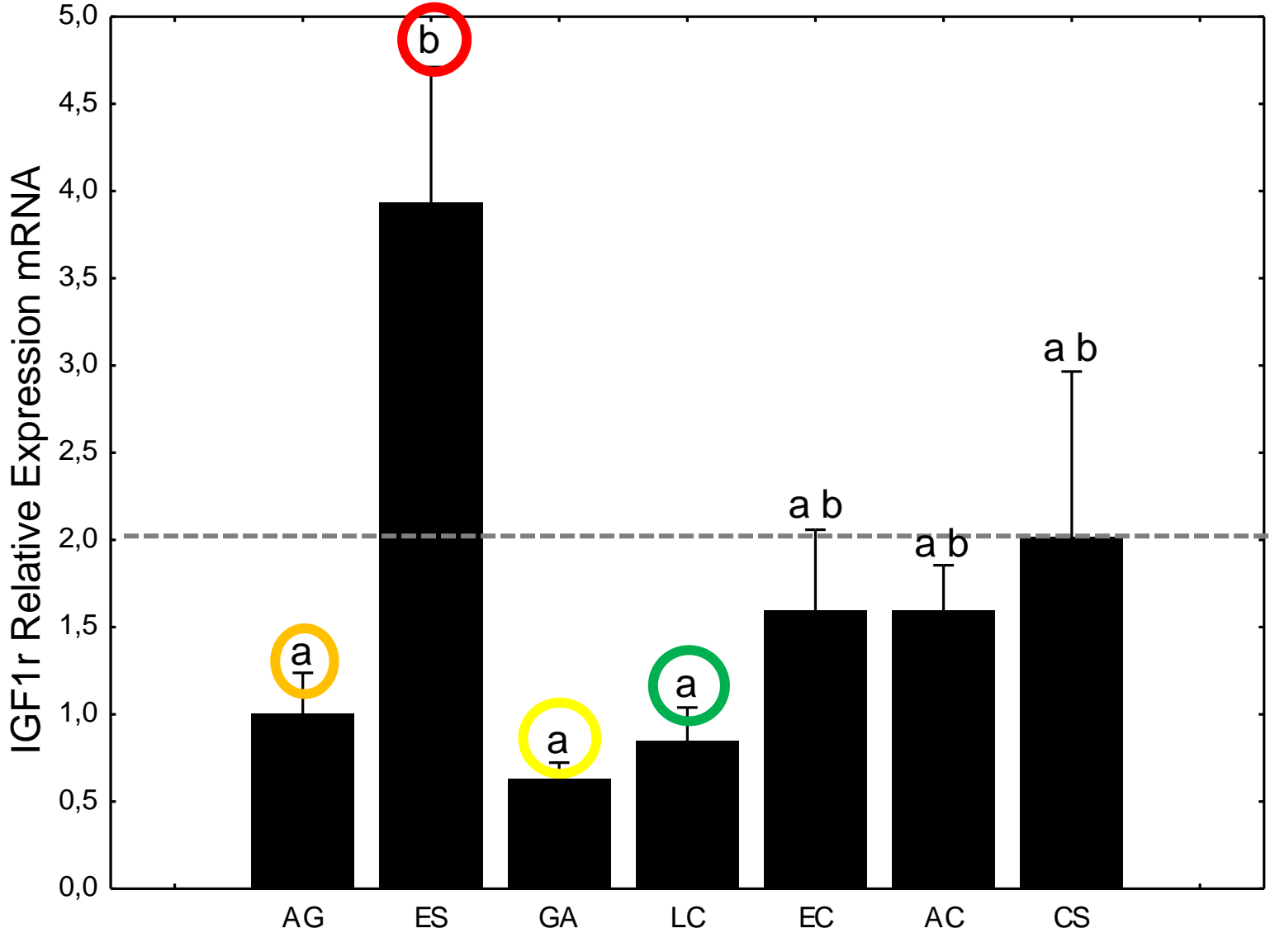
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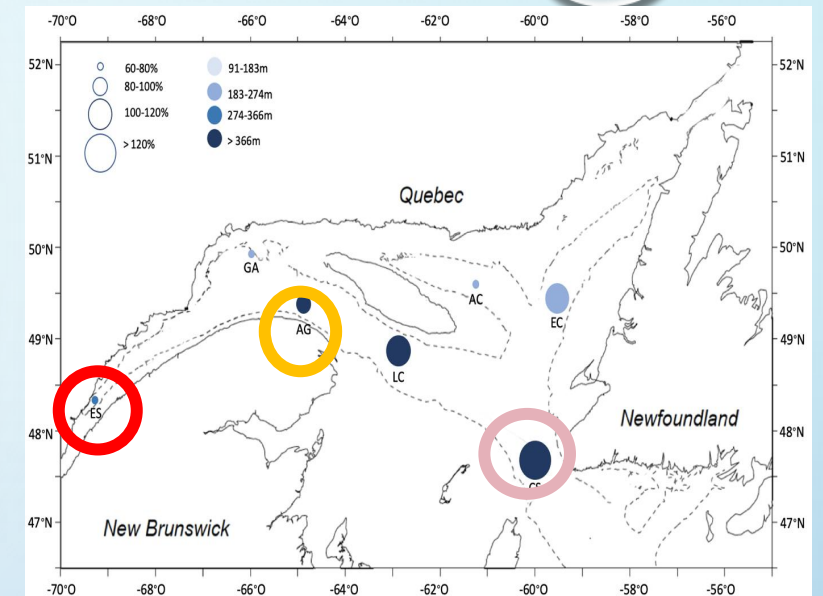
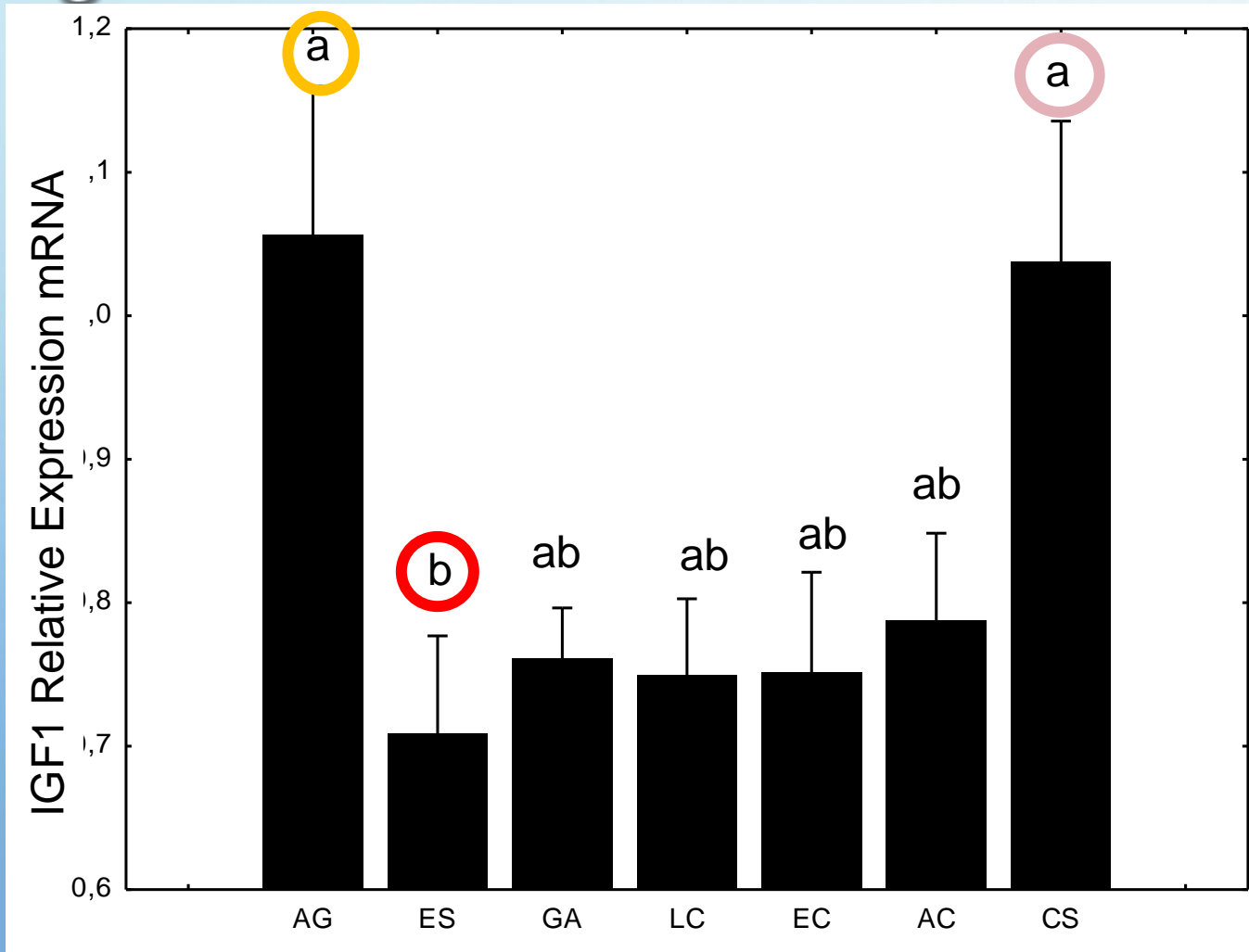
Interestingly, COX is also overexpressed at ES (coldest site, smallest fish) and differences with some of the warmest sites

PRELIMINARY RESULTS



Again, overexpression at the coldest site where the smallest redfish were captured

PRELIMINARY RESULTS



But expression of IGF-1 seems related to average weight for the two extreme sites...

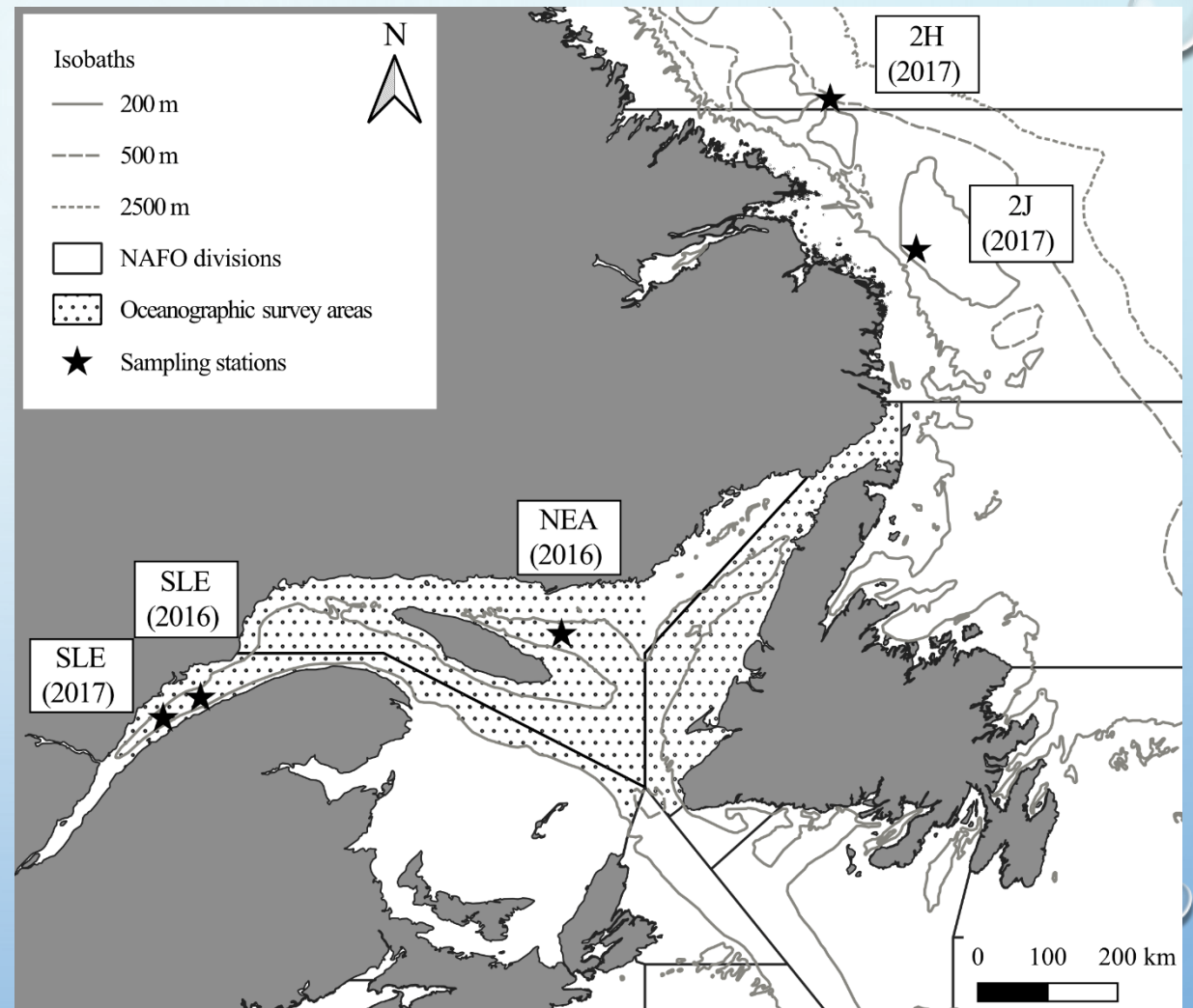


**WORK ON RESULTS
CONTINUES**

**BUT NOT ONLY ON
REDFISH**

**COULD WE FIND
INDICATORS OF
INTEREST TO
EVALUATE GROWTH
POTENTIAL AT
DIFFERENT SITES ?**

Ghinter, L. (UQAR), Lambert Y. (DFO), Morgan J (DFO)

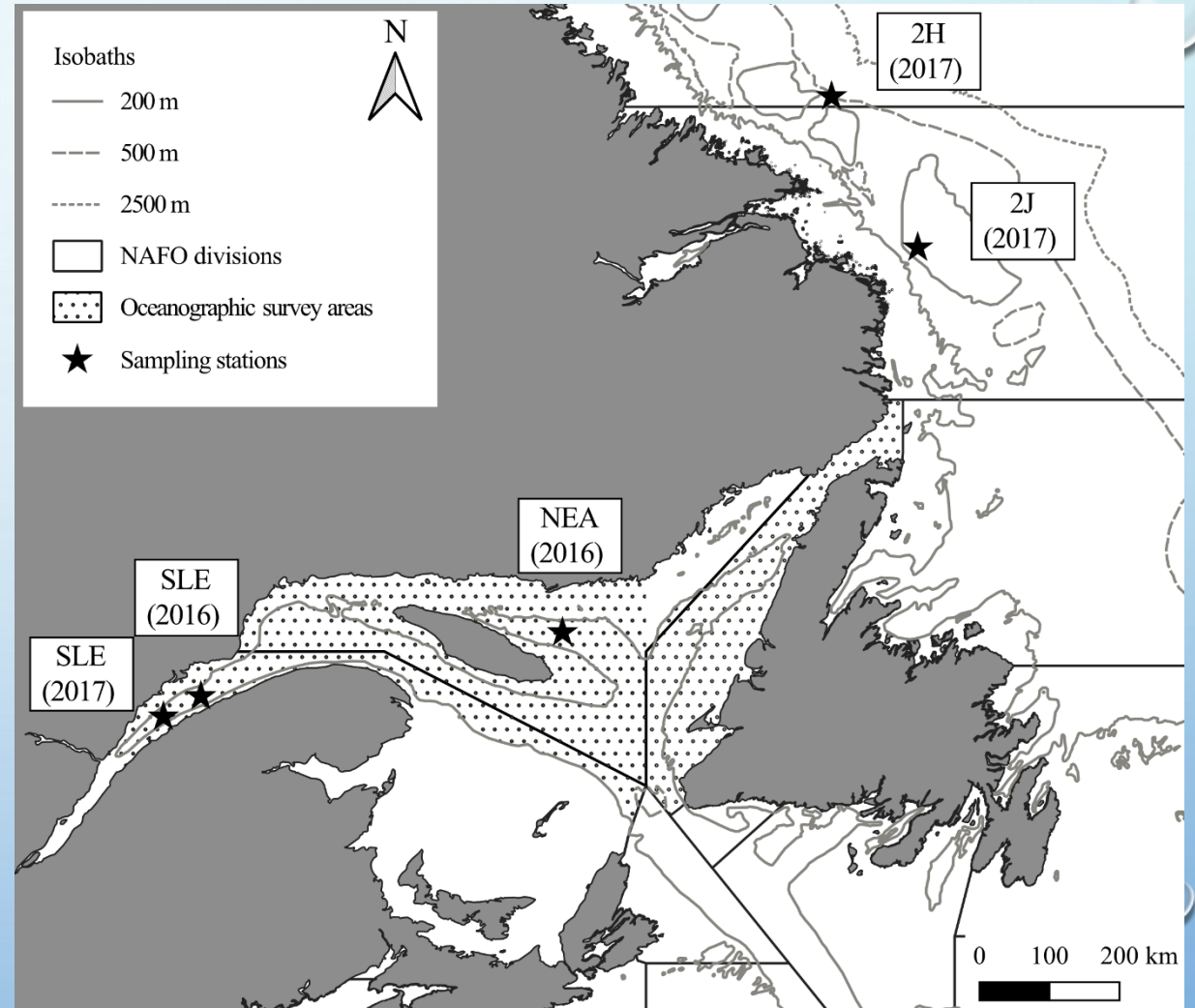


Juvenile Greenland halibut captured in the Northwest Atlantic and the Estuary and Gulf of St. Lawrence



Juveniles maintained in captivity over one year at different temperatures

Ghinter, L. (UQAR), Lambert Y. (DFO), Morgan J (DFO)



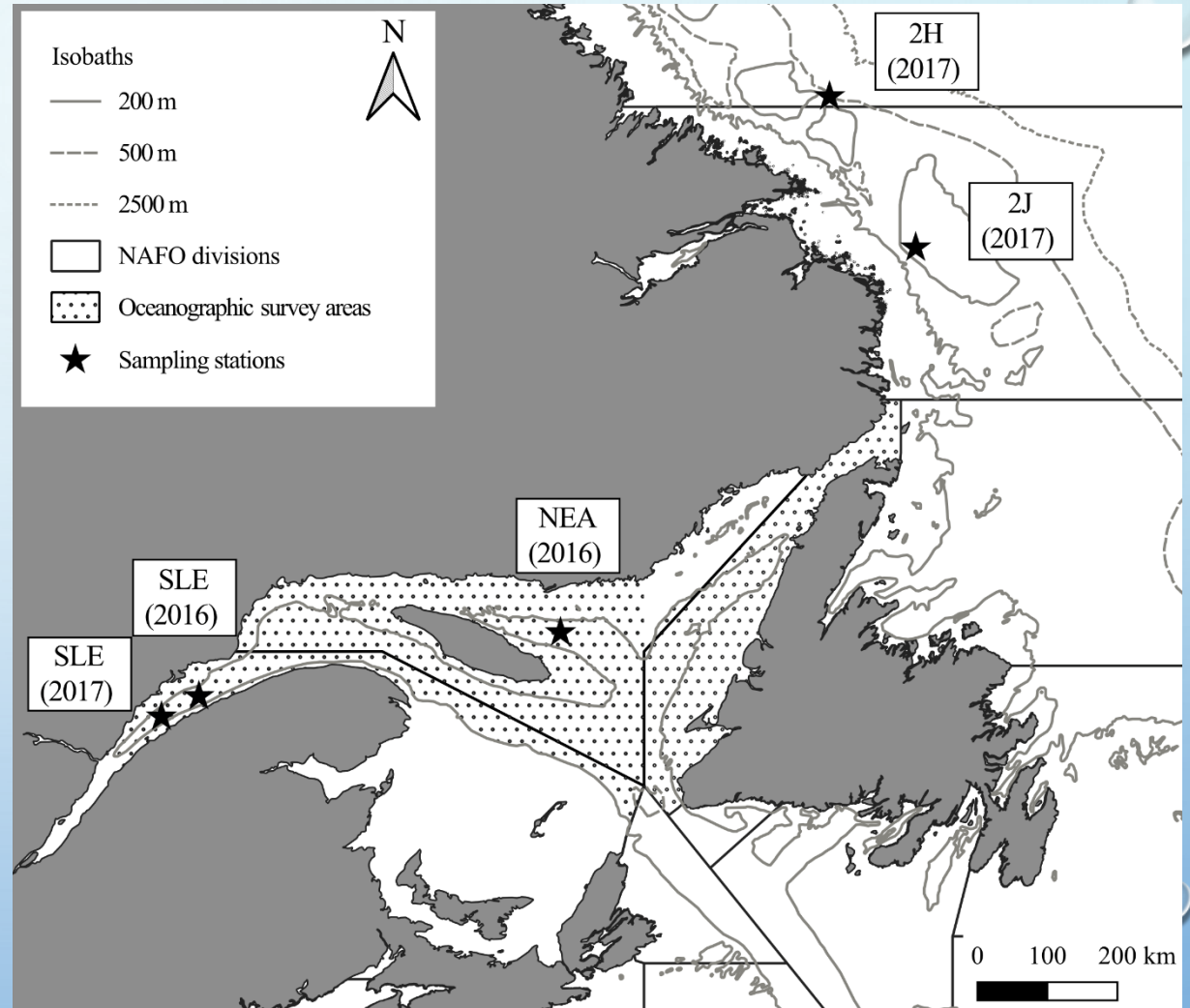
Juvenile Greenland halibut captured in the Northwest Atlantic and the Estuary and Gulf of St. Lawrence



Juveniles maintained in captivity over one year at different temperatures

Transcriptomics: wild juveniles, and juveniles maintained in captivity at 4°C, 5.5°C and 7.5°C for one year (seasonal samplings)

Ghinter, L. (UQAR), Lambert Y. (DFO), Morgan J (DFO)



Juvenile Greenland halibut captured in the Northwest Atlantic and the Estuary and Gulf of St. Lawrence

ACKNOWLEDGMENTS

THIS WORK WAS SUPPORTED BY THE PROGRAMME DE PARTENARIAT DU MPO

