

7.–8. nóvember í Hörpu

**Stjórnun
fiskveiða**

– svo miklu meira en kvóti

Influence of River Proximity on Water Quality and Its Impact on Caribbean Mangrove Oyster Populations: A Case Study in Bowden Bay, St. Thomas, Jamaica

Leanne Morris Bennett^{1,2}, Krystal Facey², Gabrielle Ladurée¹, David Benhaïm¹

1. Hólar University, Dept of Aquaculture and Fish Biology, Hólar 551, Iceland

2. National Fisheries Authority, P.O Box 833, Twickenham Park, Spanish Town, St Catherine, Jamaica

leanne@holar.is



HAMPIÐJAN



HÁSKÓLINN Í REYKJAVÍK
REYKJAVÍK UNIVERSITY

ICELANDAIR
CARGO

ISI ICELAND
SEAFOOD



marel

Pipar\TBWA



SJÁVARÚTVEGS
RÁÐSTEFNAN
2024

JAMAICA



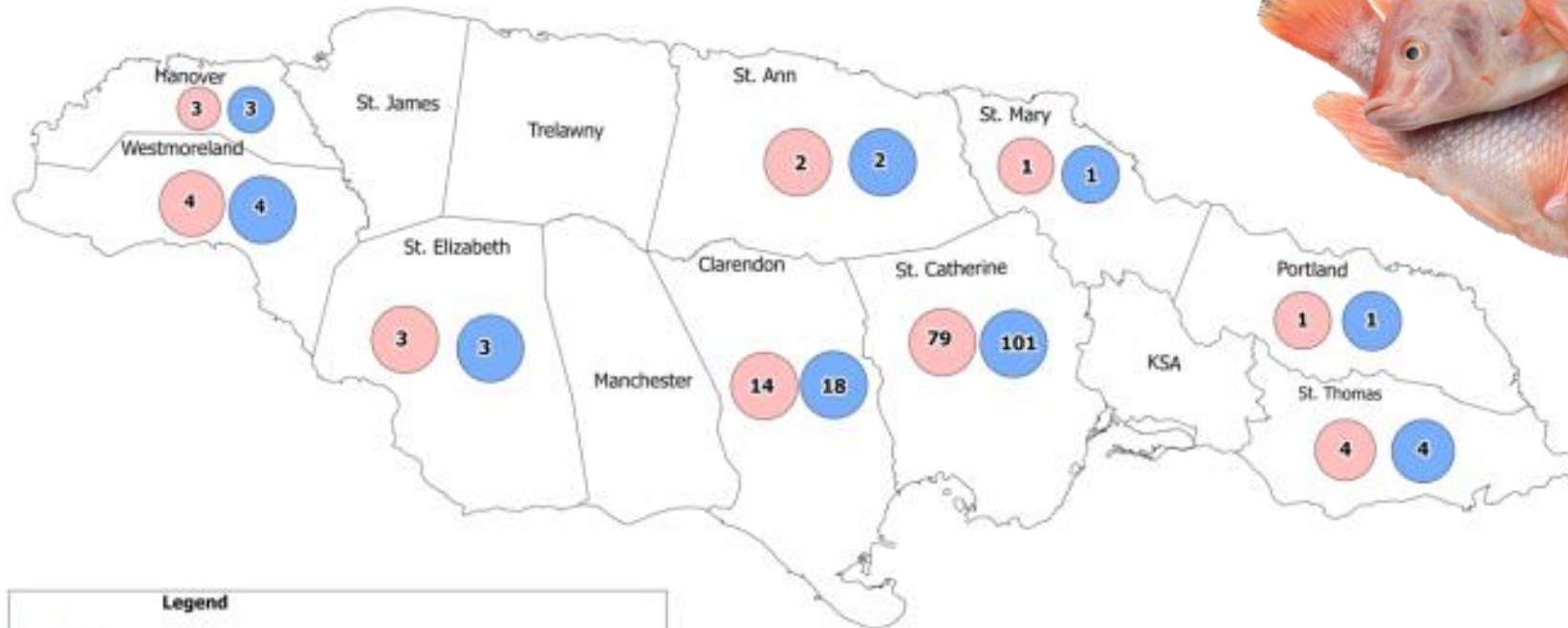
Aquaculture in Jamaica



716.01 MT

December 2023

LOCAL CONSUMPTION,
NO EXPORT



Legend



Fish Farm



Registered Fish Farmers

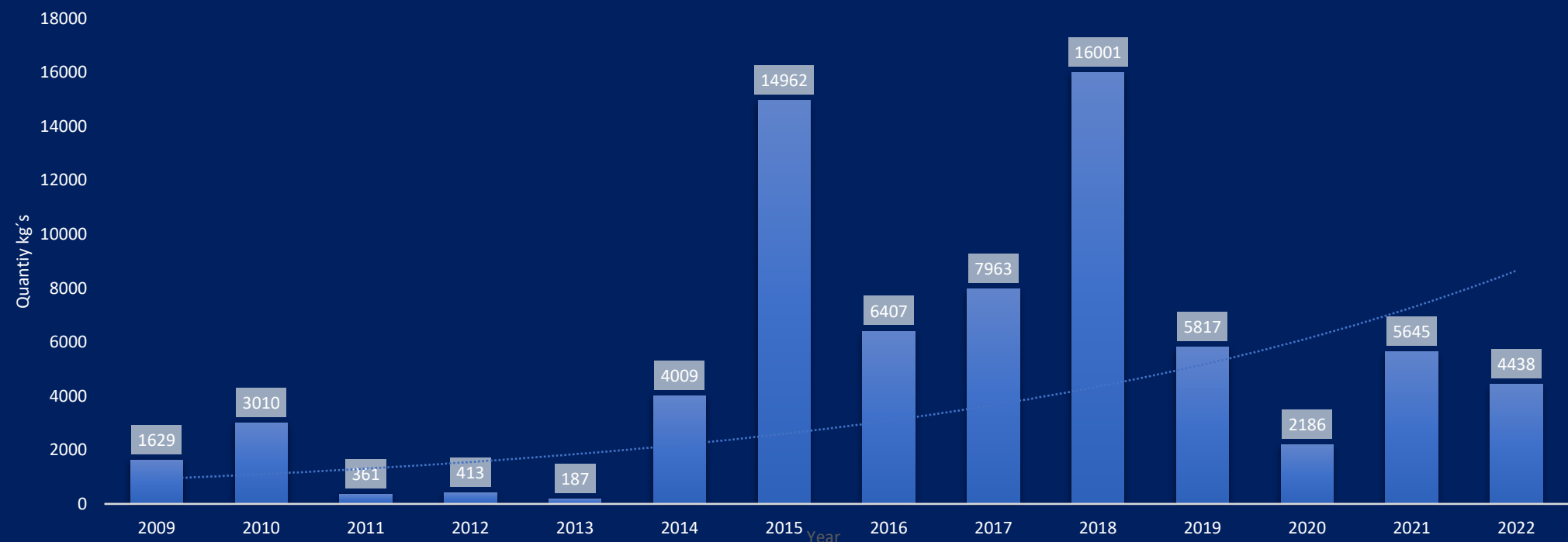
Fig. 11: Number of aquaculture farms and registered fish farm workers by parish, as of December 2023.

OTHER SPECIES



Encouraging Alternative Livelihoods Mariculture Production - Oysters

Importation of Processed Oyster Products in Jamaica 2009-2022



MANGROVE HABITAT

Crassostrea rhizophorae (Guilding 1898)

Isognomon Alatus (Gmelin, 1791)



Found in
Tropical and Subtropical

Provide Habitat
Coastline stabilisation

Aquaculture development
26.7% in 2020 (FAO, 2023)



- Worldwide estimated coverage - 135,822 km²
- North and Central America estimated coverage 20,962 km²

Common Caribbean species

- A. *Rhizophora mangle*
&
B. *Rhizophora racemosa*



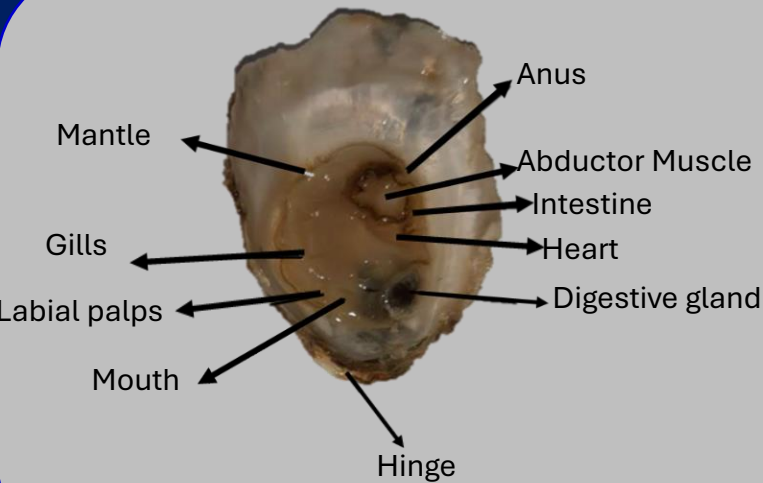
SJÁVARÚTVEGS
RÁÐSTEFNAN
2024

Crassostrea rhizophorae (Guilding 1898)

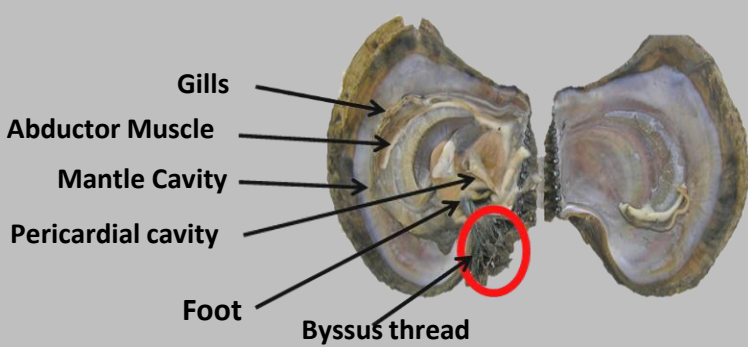
Ostreidae (Order), Crassostreinae (Subfamily)

Isognomon Alatus (Gmelin, 1791)

Ostreidae (Order), Pterioidea (Superfamily)



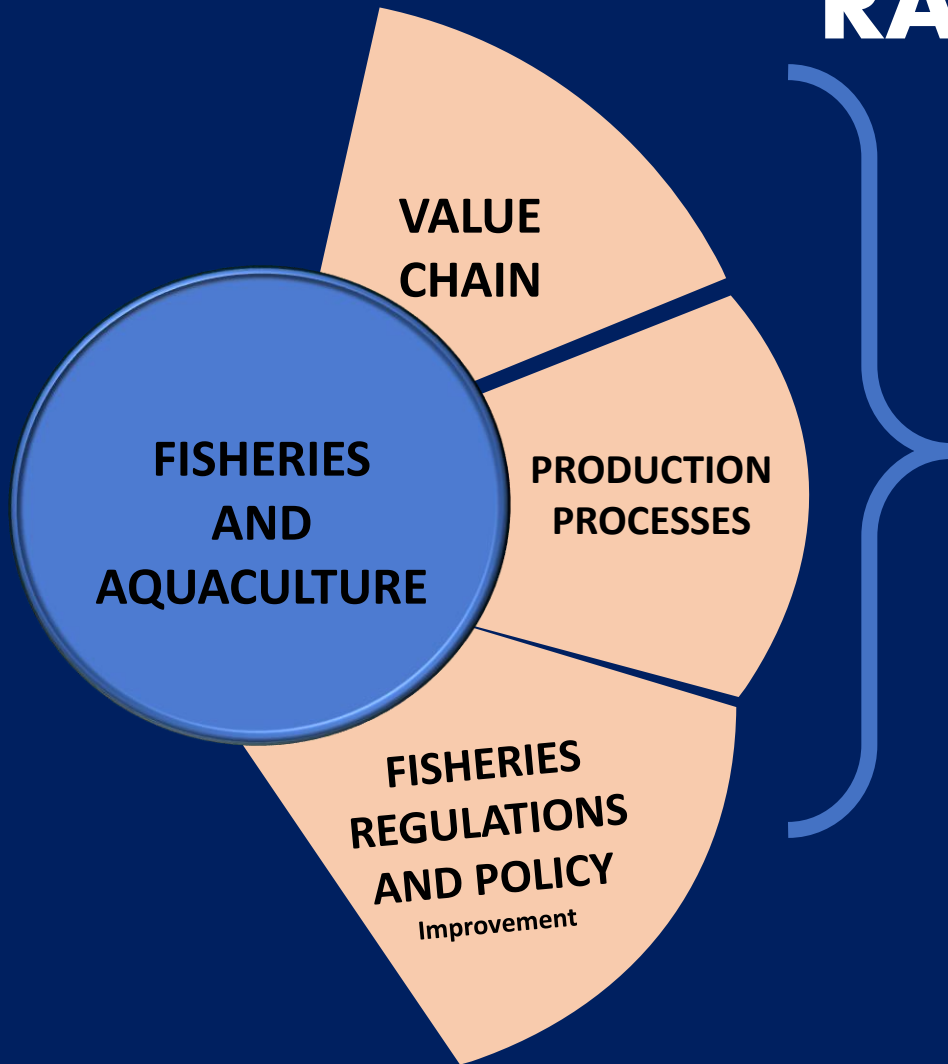
Optimal Water Parameters		
	CR	IA
Temperature	22°C-28°C	26°C-30°C
Salinity	15 ppt-25 ppt	10.9 ppt-40 ppt
pH	7	7.1-8.0
DO	2mg/l-5mg/l	5.30 mg/l-7.9 mg/l
TDS	Ideal TDS -Unknown	Ideal TDS -Unknown



- Leafy, deep cup-shaped (convex) left valve.
- Small, flat upper right valve fits into the cup of the left valve an unpigmented muscle scar.
- Coast, between intertidal or shallow subtidal water level aerial roots (*Rhizophorae mangle*).
- Coastal aerial roots via cementing.

- Sessile and typically found in mangrove environments near streams.
- Exterior irregular shaped, flat, plate-like, (encrusted surface).
- Interior is pearly white.
- Coastal aerial roots via byssus threads.

RATIONALE AND OBJECTIVE



Ecology of species-Interaction in natural environment

1. Analyse the effect of distance from river within an estuary on bivalve population and shell size.
2. Analyse the prevalence among existing oyster species.
3. Water quality parameters based on different stations according to the distance to the river.

Research questions

01

Does distance from the river impact the mangrove oyster population's prevalence and size (length and height)?

02

Is there is a link between water parameters, mangrove oyster population prevalence and size (length and height)?



RESEARCH AREA



Yellow - 0m and 10m mark
Red - 5m marks

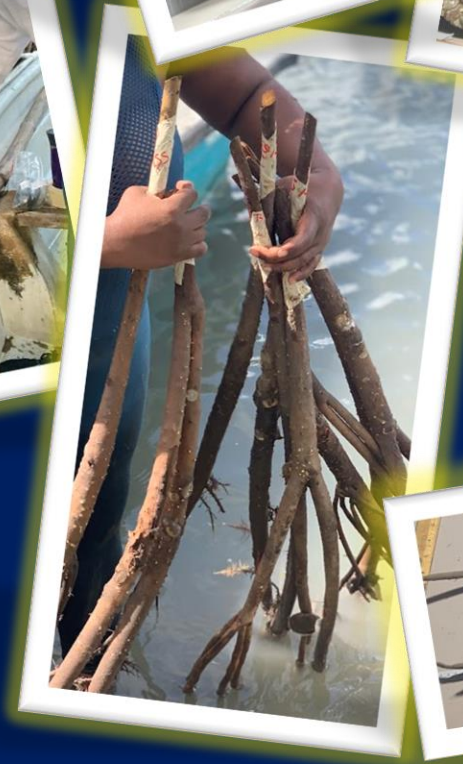
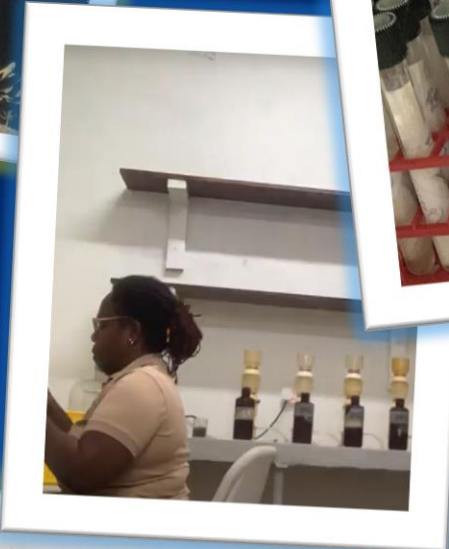
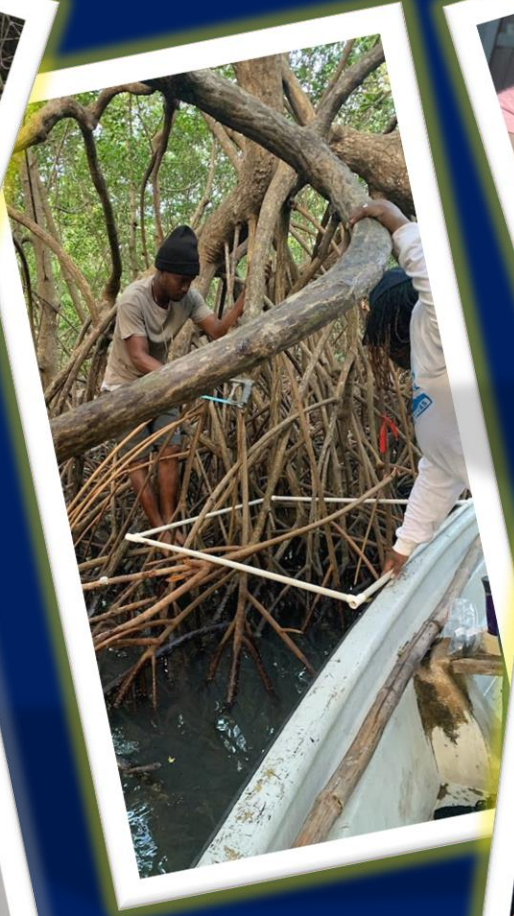
- 154 m from the Ginger River
- Sampling periods
Period 1, January 10, 2023;
Period 2-February 7, 2023;
Period 3, March 10, 2023)
- **396 m line transect**



SAMPLING COLLECTION, LABELING and GROUPING

30

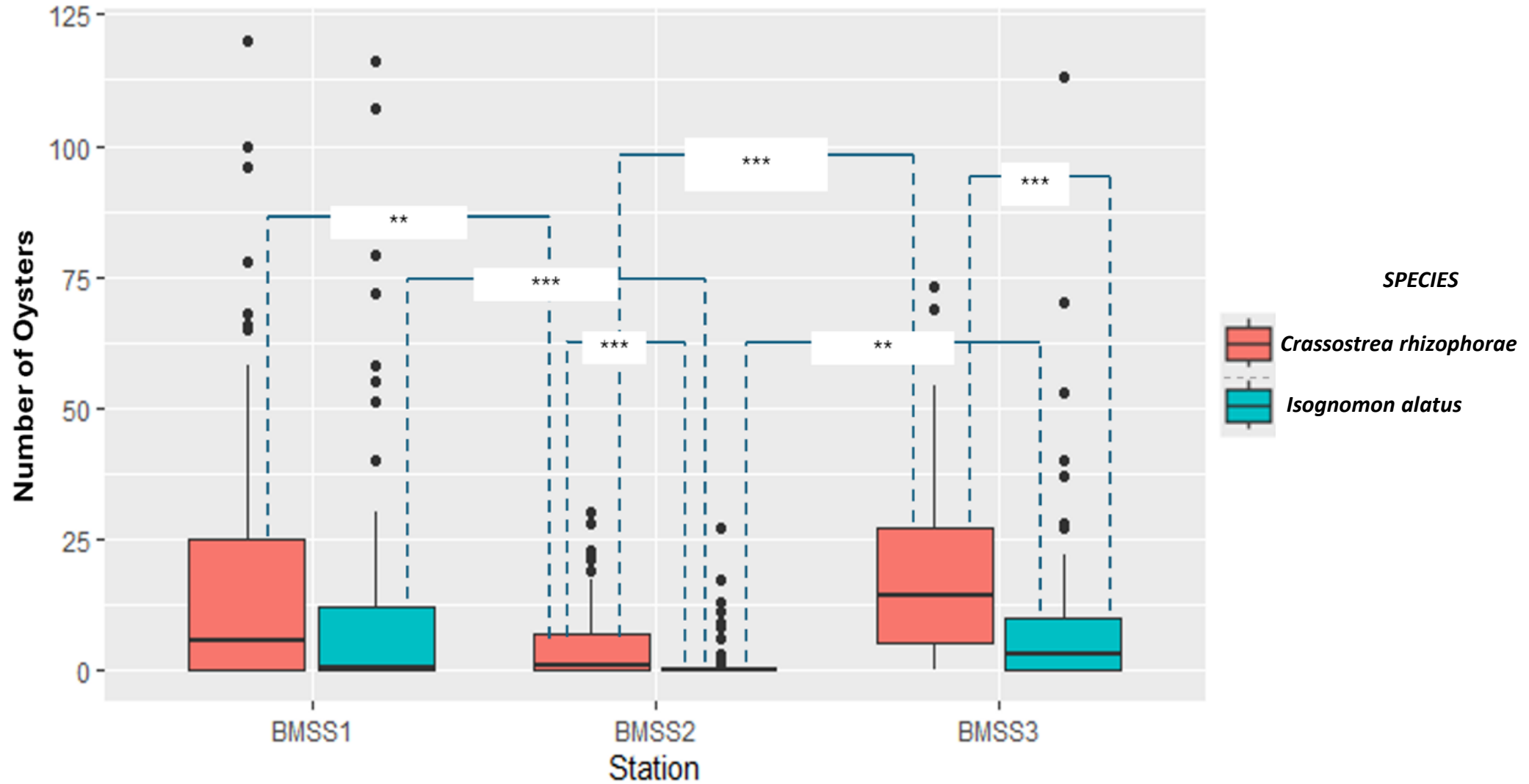
|||||
|||||



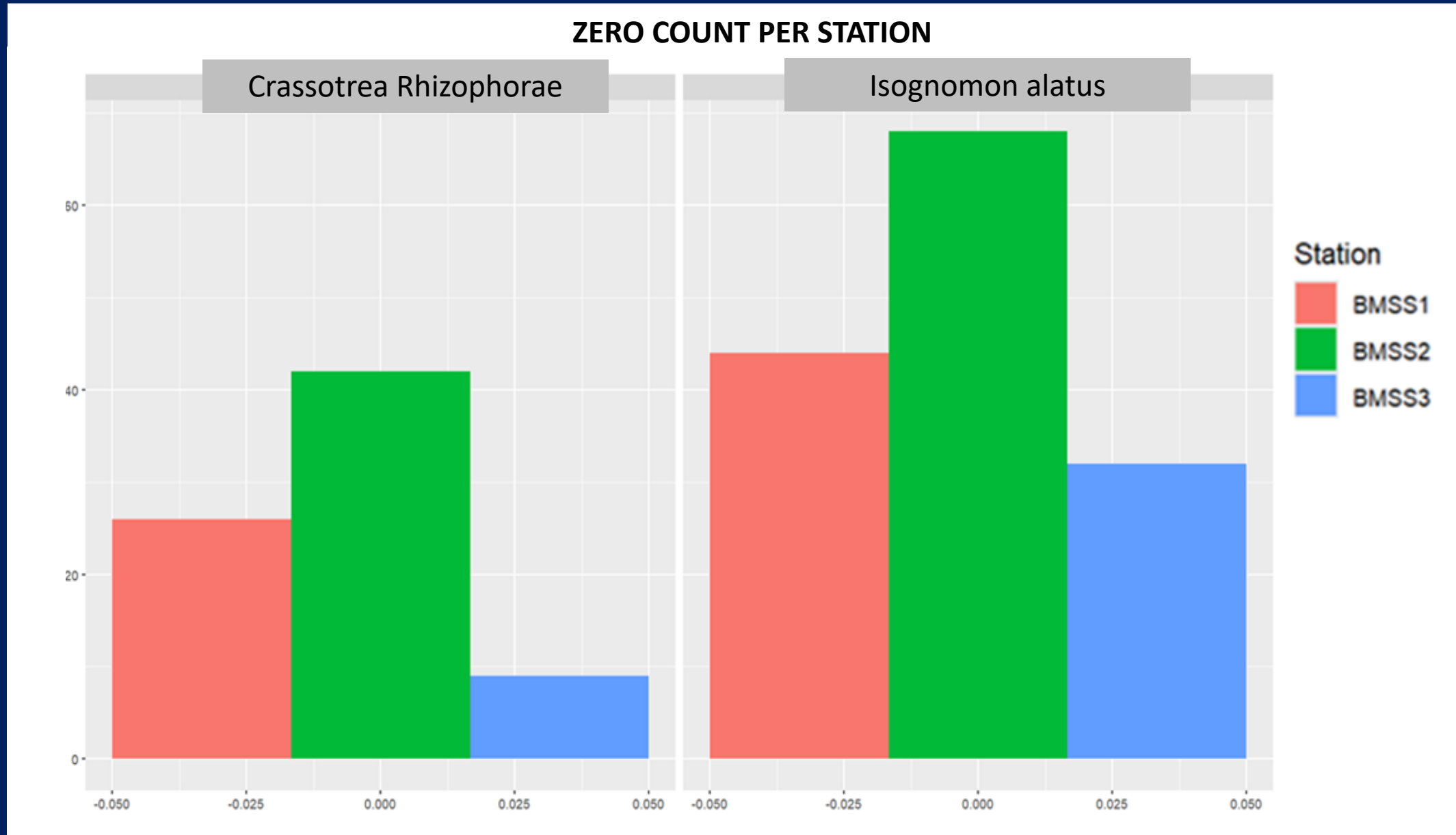
OYSTER COUNT

ABUNDANCE OF OYSTERS ON ROOT

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$



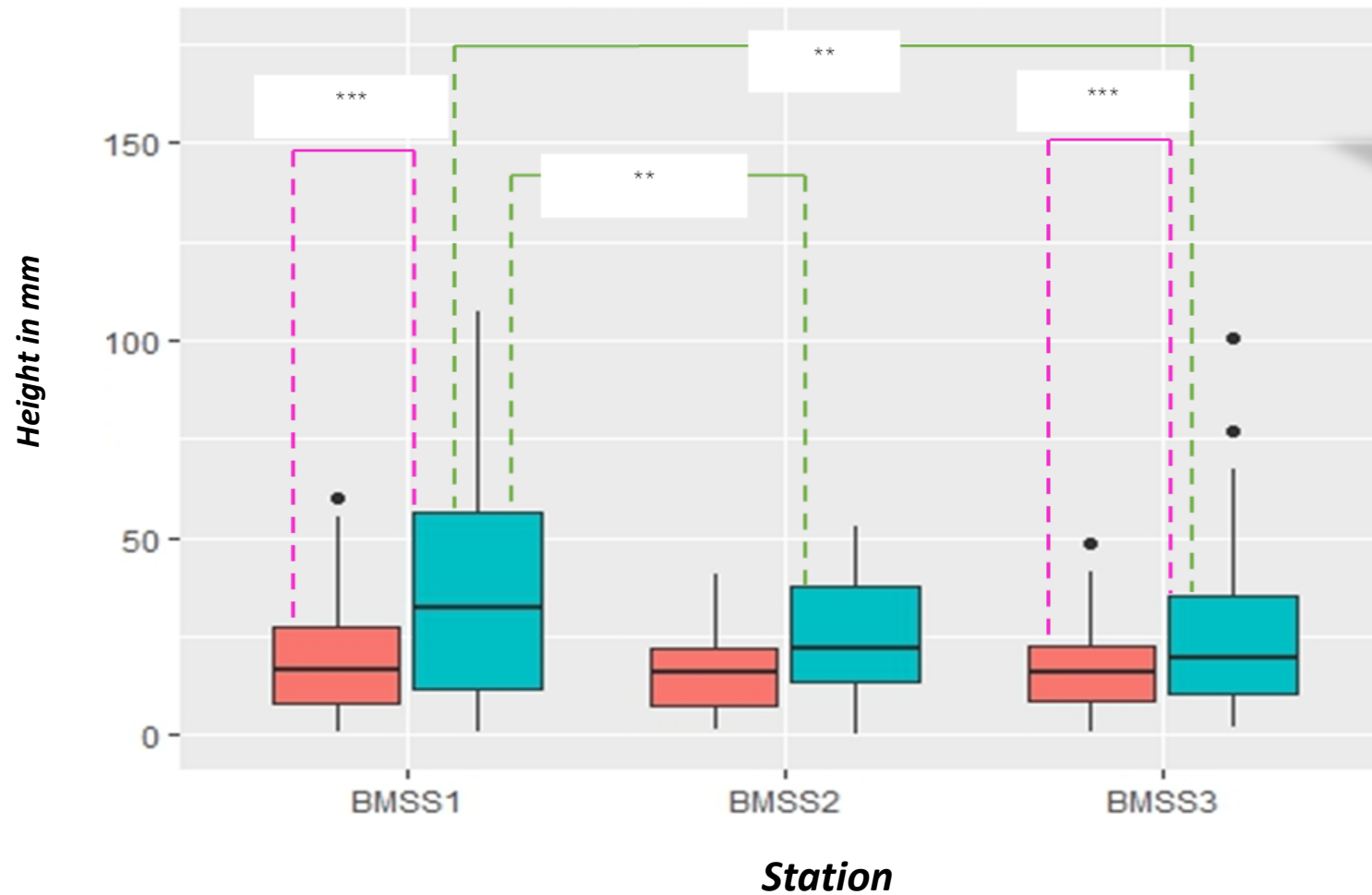
OYSTER COUNT-Specimen Presence Absence on Root



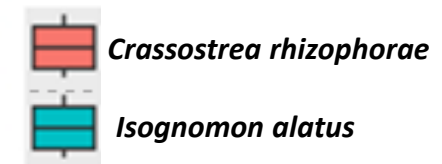
OYSTER HEIGHT

OYSTER HEIGHT PER STATION

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$



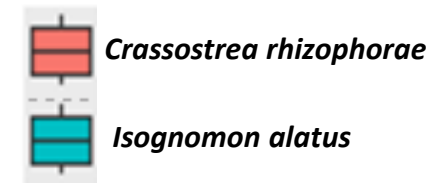
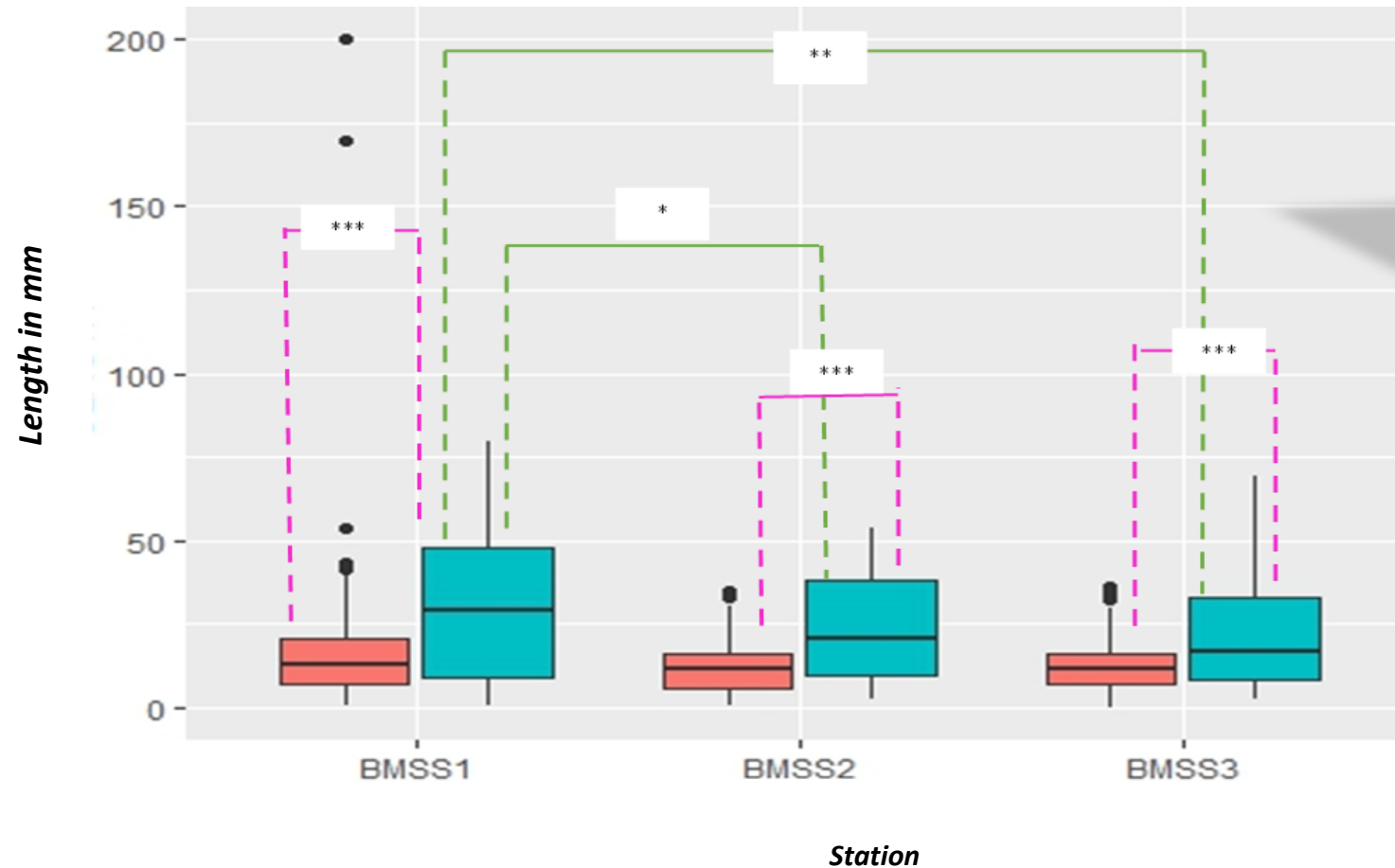
SPECIES



OYSTER LENGTH

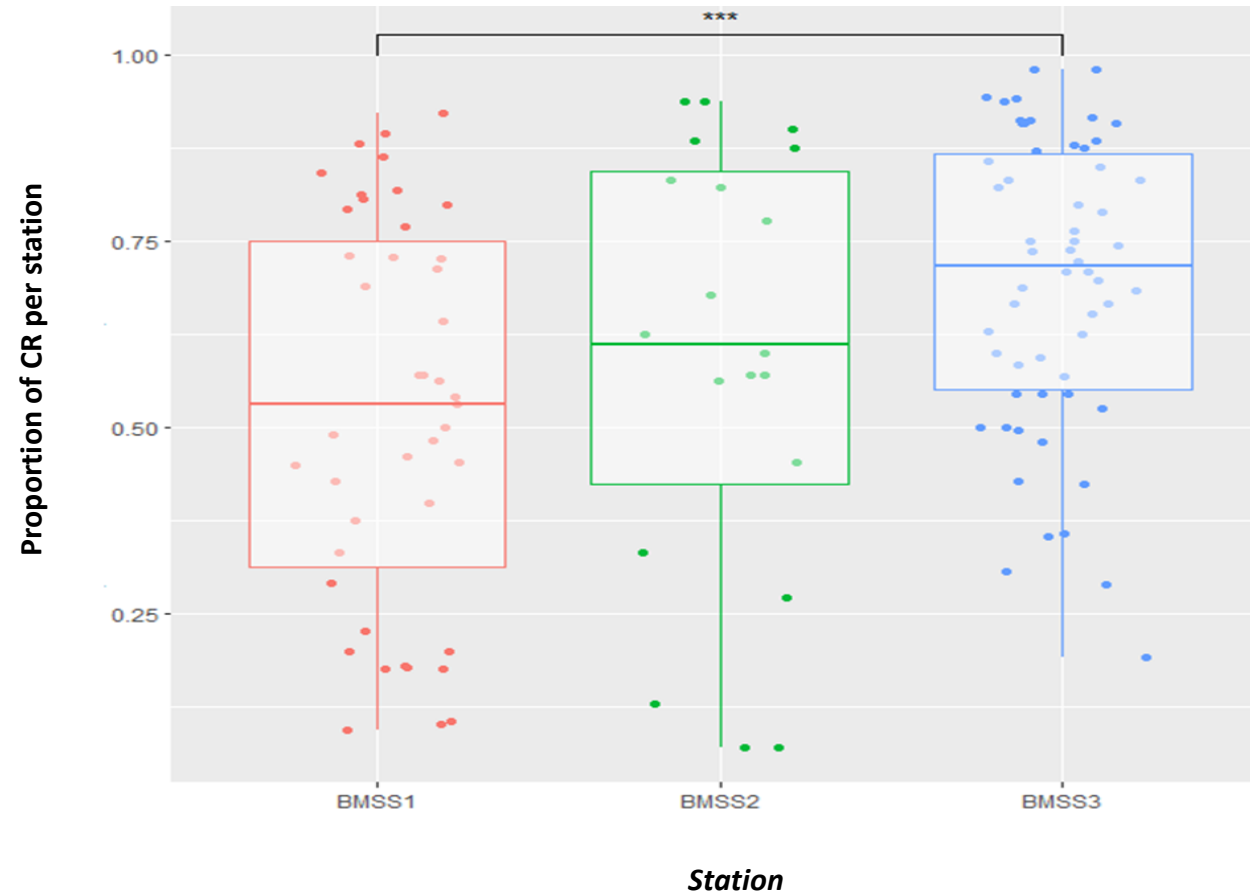
OYSTER LENGTH PER STATION

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$



OYSTER COMPETITION

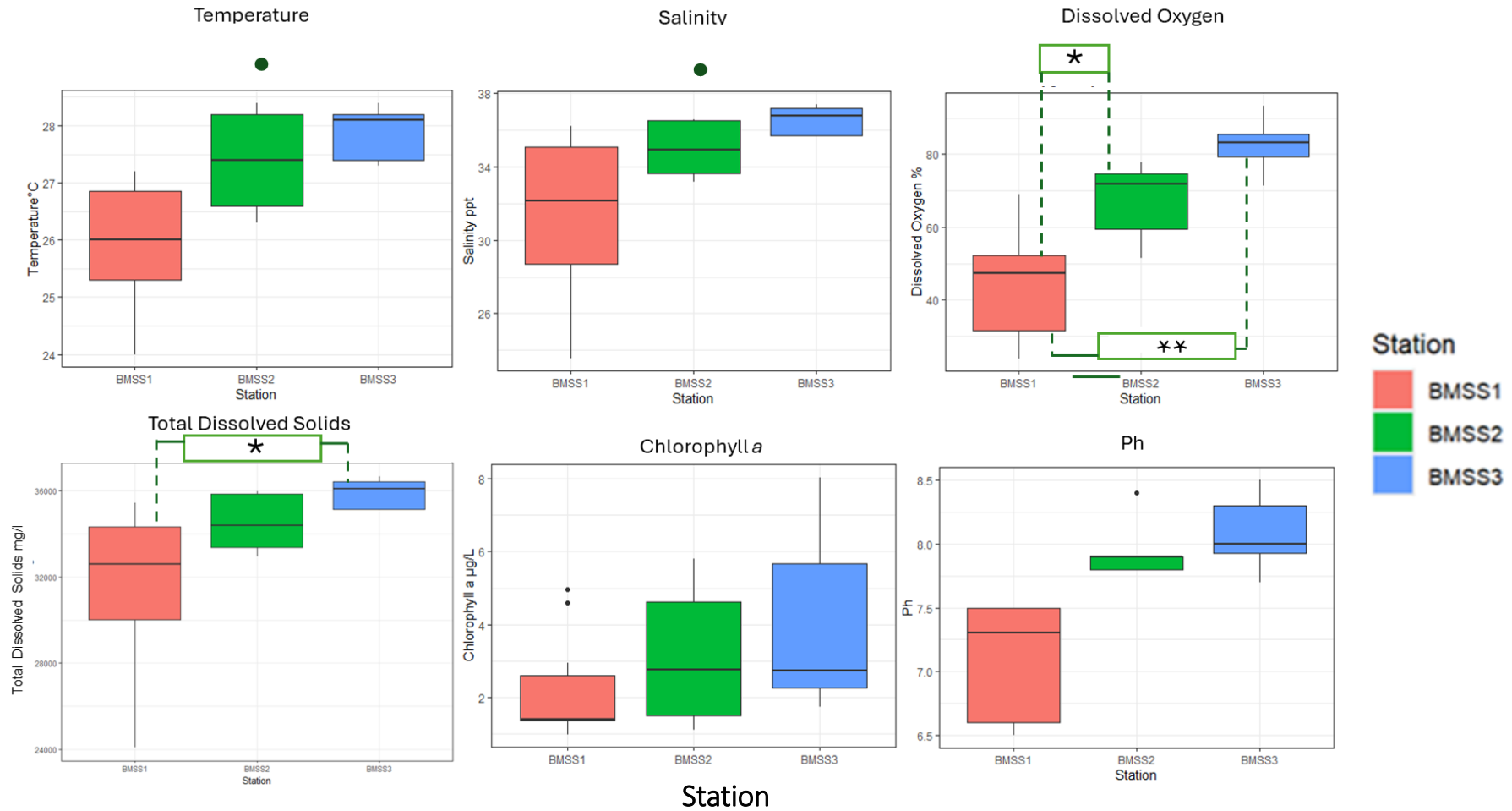
COMPARISON OF SPECIES PROPORTION ON MANGROVE ROOT



WATER PARAMETERS

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, * $P < 0.1$

Water parameter reading per station



RESEARCH QUESTION 1 & 2

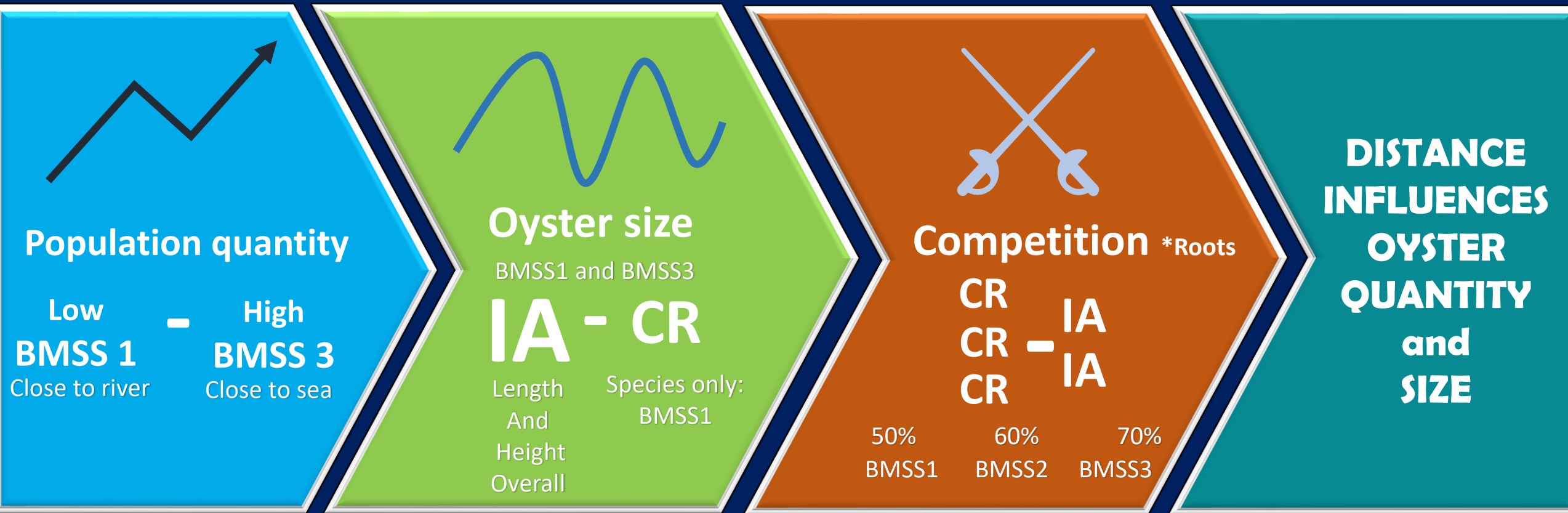
01

Does distance from the river impact the prevalence and size (length and height) of the mangrove oyster population?

02

Is there is a link between water parameters, mangrove oyster population prevalence and size (length and height)?





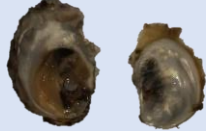
OPTIMAL WATER PARAMETER REQUIREMENTS

Mean and SD Water Parameter Readings Per Station

1

STATION	TEMPERATURE °C	SALINITY µg L ⁻¹	DISSOLVED OXYGEN mg L ⁻¹	CHLA µg/L	TDS µg/L	pH
BMSS1	26.00 ± 1.12	30.9 ± 4.37	3.05 ± 0.91	2.29 ± 1.52	31464 ± 3527	6.98 ± 0.49
BMSS2	27.40 ± 0.83	35.00 ± 1.40	4.69 ± 0.28	3.39 ± 1.82	34516 ± 1236	7.98 ± 0.29
BMSS3	28.00 ± 0.44	36.60 ± 0.71	5.65 ± 0.36	4.25 ± 2.51	35925 ± 622	8.10 ± 0.34

Crassostrea rhizophorae
(Guilding 1898)



Temperature 22°C-28°C

Salinity 15 ppt-25 ppt

pH 7

DO 2mg/l-5mg/l

TDS Ideal TDS -Unknown

Isognomon Alatus
(Gmelin, 1791)



26°C-30°C

10.9 ppt-40 ppt

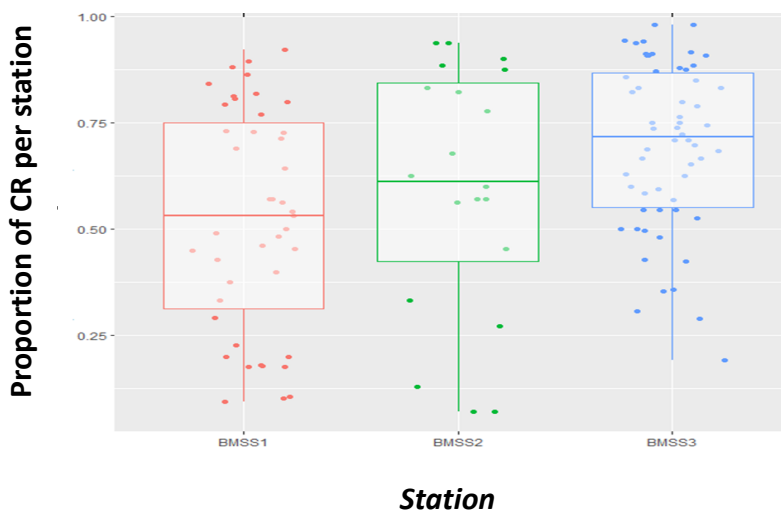
7.1-8.0

5.30 mg/l-7.9 mg/l

Ideal TDS - Unknown

2

COMPARISON OF SPECIES PROPORTION ON MANGROVE ROOT



3

Chlorophyll *a*
Food availability

DO- Improve growth rate low mortality

TEMP- Influences metabolic rate

pH- Shell formation and hardness

TDS- Sedimentation that can affect filtration rate

Salinity-Reproduction and growth stability

WATER PARAMETER FUNCTIONS and OYSTER OBSERVATIONS

4

SIZE VARIATION

POPULATION VARIATION

5

ROOT SURFACE CONSTITUTION- BIOFILM

ENVIRONMENTAL & CONSPECIFIC CUES

CONCLUSION

1. More CR is present than IA overall.
2. Increase in population and dimension across stations.
3. Water quality parameters within the ideal range.
4. Additional factors of encouragement are unlimited. So far, I have identified - Biofilm on roots, environmental and conspecific cues.

FUTURE RESEARCH

What changes that are likely to occur over the long term for oyster populations within Bowden Bay, considering climate change?

Implications of specific environmental factors on oyster survival and growth? (chemical composition and sanitation of water within the estuary , biofilm constitution)

Impact of effective, efficient, climate-smart aquaculture production processes for the culture of oysters within the estuary.

Assessment of both species' spawning patterns and life cycles for aquaculture considering climate change and its impact on the natural environment.

Made possible by



United Nations
Educational, Scientific and
Cultural Organization

GRO
FTP

- Fisheries Training Programme
- Under the auspices of UNESCO



NATIONAL
FISHERIES
AUTHORITY



University of the West Indies-Centre for Marine Studies



SJÁVARÚTVEGS
RÁÐSTEFNAN
2024