# Assessment of the Fishery Resource (Crabs and Fish) Harvested from the Caroni Swamp

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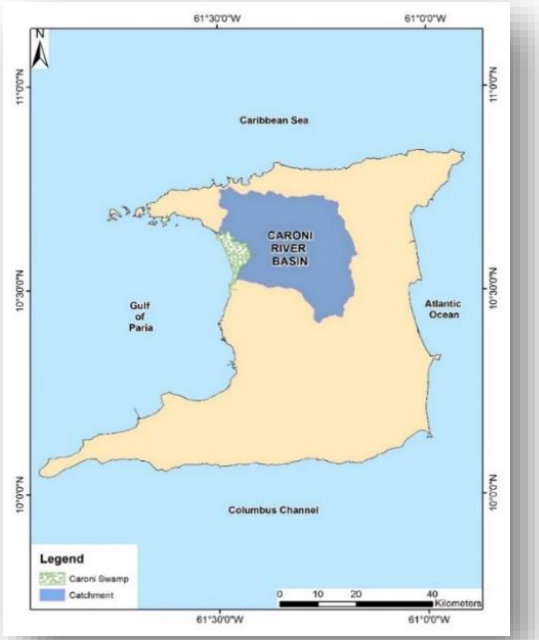
Community and Ecosystem Connections

Improving Human Wellbeing Sustaining Livelihoods

# Goals

**To conduct an assessment of:**

- heavy metals in the blue land crab (*Cardisoma guanhumi*)
- pesticides in black tilapia (*Oreochromis mossambicus*)



# Target Analytes: Heavy Metals

- Arsenic, barium, cadmium, chromium, copper, mercury, nickel, selenium, vanadium, zinc

- Occur naturally
- Some required by living things but all toxic in excess
- Persistent
- Accumulate in organisms
- Risk to human health

# Target Analytes: Organochlorine Pesticides

- 23 pesticides (banned 1989- 2010, or never registered for use)
- Agriculture, mosquito control
  - Toxic
  - Persistent
  - Accumulate in fatty tissue
  - Travel great distances
  - Risk to human health

*Trade Names (selected pesticides)*

- ***DDT*** *- Agritan, anofex, bosan supra, bovidermol, cezarex, chloroophenothan, chloropenothane, clofenotane, dedelo, deoval, detox, detoxan, dicophane, estonate, genitox, gesafid, guesarol, gyron, havero-extra, ivoan, ixodex, kopsol, mutoxin, neocid, parachnorocidum, petachlorin, rudseam, santobane, zerdane*
- ***Dieldrin*** *- Alvit, dieldrite, dieldrix, illoxol, octalox, panorama D-31, quintox, red shield*
- ***Hexachlorobenzene*** *- Amaticin, anticarie, benzene hexachloride, BHC, bunt-cure, bunt-no-more, co-op hexa, HCB, granox, no bunt, perchlorobenzene, sanocide, smut-go, sniecotox*

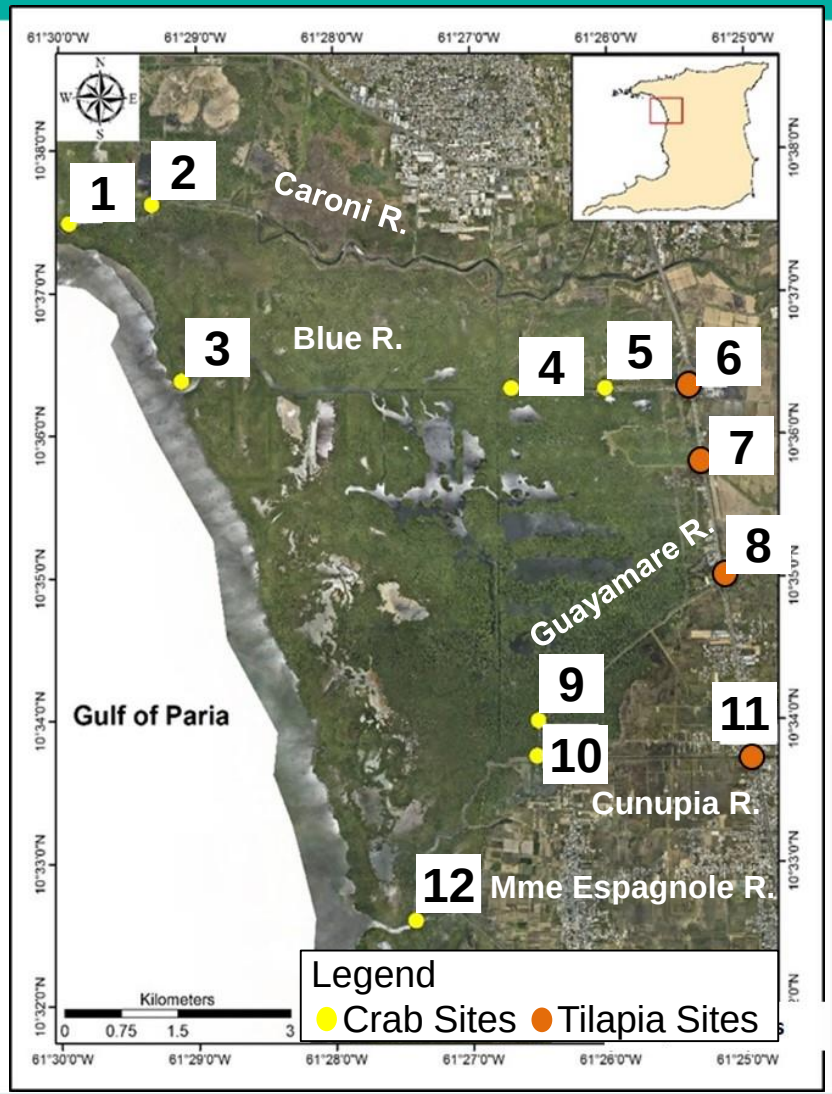
# Target Species

## Blue Land Crab

- Main crab *sp*. harvested locally; CS the largest most popular mangrove harvesting site
- Good indicator of heavy metal pollution
- Less mobile than fish

## Black Tilapia

- Commercially harvested
- Restricted to the upper reaches of the watercourses flowing through the swamp




# Sampling

## Crabs

- Caroni R., Blue R. ,Guayamare R., Cunupia R. and Madame Espagnole
- Bamboo traps (Dec 2017 & May 2018)

## Fish

- Blue R., Guayamare R. and Cunupia R.
- Gillnets (Aug 2020)

# RESULTS & DISCUSSION

# Metals in Crabs from the Caroni Swamp µg/g ww

| Site | Description | Arsenic | | Cadmium | | Copper | | Mercury | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Wet | Dry | Wet | Dry | Wet | Dry | Wet | Dry | Wet | Dry |
| 1 | Caroni River Mouth | 0.13 | 0.28 | 0.405 | 0.06 | 19.92 | 8.83 | 0.04 | 0.14 | 122.07 | 53.41 |
| 2 | Halfway up Caroni River | 0.23 | 1.31 | 0.003 | 0.03 | 21.50 | 11.59 | 0.03 | 0.13 | 93.25 | 57.03 |
| 3 | Blue River Mouth | 0.51 | 0.29 | <0.001 | 0.04 | 18.72 | 5.66 | 0.33 | 0.36 | 77.44 | 42.88 |
| 4 | North-South Intersection | 0.53 | 1.16 | <0.001 | 0.06 | 19.17 | 10.99 | 0.22 | 0.22 | 75.05 | 63.08 |
| 5 | Visitor's Centre | 0.19 | 1.07 | 0.273 | 0.04 | 30.12 | 12.45 | 0.24 | 0.16 | 94.12 | 64.11 |
| 6 | Blue River, East of Hwy | 0.94 | 0.21 | 0.452 | 0.04 | 28.36 | 12.23 | 0.13 | 0.14 | 92.68 | 61.60 |
| 7 | New Guayamare River | 0.06 | 0.34 | <0.001 | 0.06 | 21.76 | 13.35 | 0.05 | 0.16 | 95.45 | 73.29 |
| 8 | Old Guayamare River | 0.04 | 0.32 | <0.001 | 0.05 | 31.75 | 13.99 | 0.06 | 0.14 | 81.78 | 84.78 |
| 9 | Along Old Guayamare R. | 0.13 | 0.29 | 0.839 | 0.03 | 23.04 | 11.19 | 0.06 | 0.14 | 95.01 | 62.41 |
| 10 | Along Cunupia River | 0.07 | 0.25 | 0.106 | 0.07 | 19.01 | 6.08 | 0.04 | 0.17 | 79.74 | 27.63 |
| 11 | Cunupia R., East of Hwy | 0.12 | NS | <0.001 | NS | 31.56 | NS | 0.08 | NS | 105.59 | NS |
| 12 | Madame Espagnole R. | 0.38 | 0.32 | 0.004 | 0.05 | 17.02 | 7.19 | 0.04 | 0.13 | 82.99 | 39.39 |

NS- no samples available; other metals within ranges in other studies worldwide

# Risk Assessment- Heavy Metals

- Levels of metals in crabs
- Other factors (body weight, ingestion rate, length of time exposed, level expected to cause harmful effects over a lifetime)
- Minimal health risk due to consumption of metals in the blue land crab

# Pesticides in Tilapia from the Caroni Swamp (µg/kg ww)

| Site | Description | pp-DDE | pp-DDD | Dieldrin | Hexachloro benzene |
|---|---|---|---|---|---|
| **6** | Blue River, East of Hwy | ND | 0.021 | 0.056 | ND |
| **7** | New Guayamare River | 0.348 | 0.044 | 0.086 | 0.024 |
| **8** | Old Guayamare River | 0.153 | 0.048 | 0.053 | ND |
| **8** | Old Guayamare River | 0.123 | 0.058 | ND | ND |
| **11** | Cunupia R., East of Hwy | 0.215 | 0.069 | 0.118 | ND |
| **11** | Cunupia R., East of Hwy | 0.316 | 0.139 | 0.250 | ND |
| **Sampath 1980- tilapia; grey snapper** | | no info; 0.3 | | 0.3; 0.5 | |

ND- not detected

19 pesticides (α-HCH, β-HCH, Lindane (γ-HCH), pentachlorobenzene, heptachlor, aldrin, α-chlordane (cis), γ-chlordane (trans), cis-nonachlor, trans-nonachlor, o,p'-DDE, o,p'-DDD, o,p'-DDT, pp-DDT, endrin, mirex, endosulphan I, endosulphan II, endosulphan sulphate) were not detected

# Conclusions

- Activities upstream of, within the swamp, & possibly downstream of the swamp (through tidal exchanges), may be contributing pollutants to the system.
- Seasonal differences in metals
  - May be due to increased land-based run-off (wet season), or undiluted point source discharges (dry season).
  - Influenced by other factors- size, age, sex, diet, moulting stage, ability of the crab to regulate metals in body.
- Minimal health risk due to consumption of metals in the blue land crab.
- Organochlorine pesticide levels generally very low/ not detected; similar compounds detected in the past.

# Recommendations

- Measures to address pollution in the Caroni Swamp.
  - Control of point sources- Water Pollution Rules.
  - Control of non point sources- good agricultural practices.
  - Outreach, education for relevant stakeholders.
- Further research on pesticide levels in the swamp.

# Acknowledgements


- Navin Kalpoo
- Dr. Darryl Banjoo
- Tyann Henry, Salinas James, Amara Prevatt, Colin Romain, Jonathon Gomez
- Hamish Asmath, Nikia Gooding, Gyasi Collins

# Thank You!

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