GCRF AgriFood Africa Innovation Project

Utilizing Bacteria to Quantify Ecological Health

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Background

- Global challenges research fund (GCRF) was awarded to:
- To build an integrated programme for ‘Rapid Assessment of Water and Sediment to Support Safe Aquaculture in Ghana

- By securing a rapid diagnostic kit for detecting microbes

- The Objective was to **validate the use of Bacterisk+ kits** at selected aquaculture sites/wild in Ghana to **rapidly assess water quality**

- Objective 2: was to build capacity within Ghanaian responsible authorities to rapidly monitor the ecological health of aquaculture development zones to support sustainable aquaculture production and consumption.

- **Basically, to demonstrate that deploying rapid diagnostic kits to assess aquatic microbes, water quality parameters can generate useful data on the ecological health of aquaculture and capture fisheries sites**

- **Data would in turn help explore the linkages to ecosystem function and services for improved food safety, security and health.**

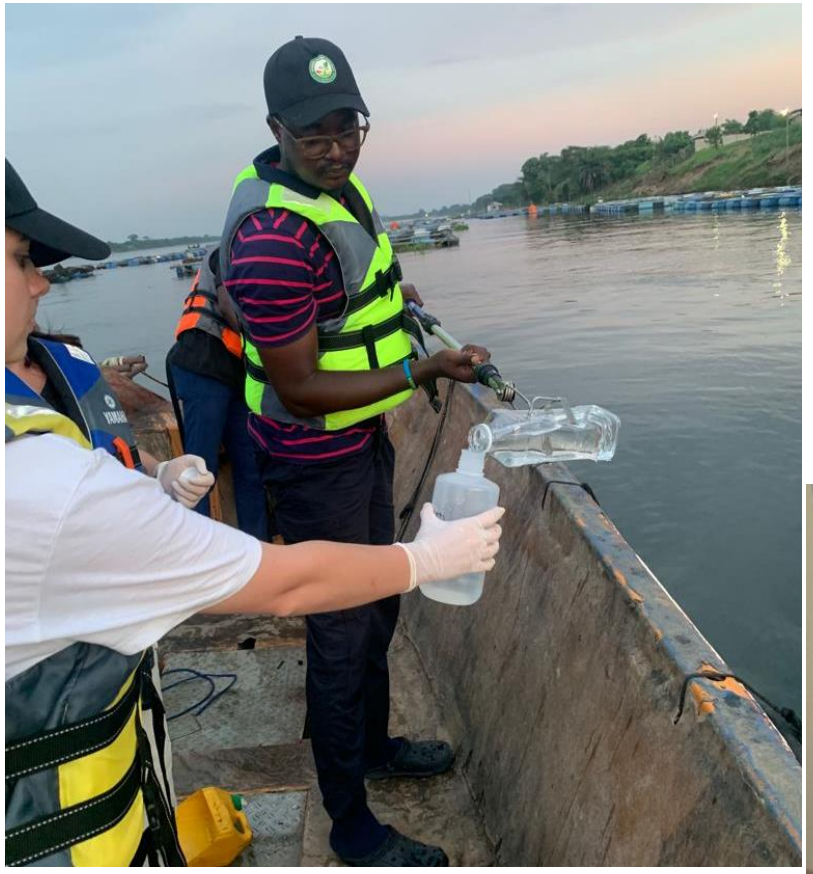
Methodology

Sample Collection

- Water and sediment samples were collected from the 8 Eight water bodies/sites along the coastal shoreline of Ghana

- Site selection targeted areas that support commercial shellfisheries (Amanzule Estuary, Whin Estuary, Amissano Estuary, Narkwa Lagoon, Densu Delta, Volta Estuary (Tunu), Volta Estuary (Big Ada), and Keta Lagoon)

- Three replicates of water samples were collected from a location far away from the aquaculture/ fisheries activity **to determine background concentrations away from cages**, a minimum distance of 100 m (Control).
- On-site sample analysis within 24hrs, and training on use of kit were also conducted.




BacterisK+
BacterisK+

Results

Site 1 E	Site 2 E	Site 3 E	Site 4 E	Site 5 V	Site 6 V
NC =237 PC = 11057 E1A= 939 E1B=1123.5 E1C= 1004.5	NC = 269 PC = 144413 E2A = 2495 E2B = **3214** E2C = 3061	NC = 490 PC = 10557 E3A = 2172.5 E3B= 1546.5 E3C= 1740	NC = 362 PC = 9237 E4 A= 0 E4 B= 436 E4 C= 469	NC = 334 PC = 7372 V1-A =7385 V1-B=7985.5 V1-C=6878	NC= 305 PC=6038 V2=8145 V2-B=**7614.5** V2-C=5201
AV=1022.33	**AV=2923.33**	**Av= 1819.67**	**AV= 452.5**	**AV=7,416.17**	**AV=6,986.83**

Positive Control (PC), Negative Control (NC)

Results

Site 7 (G)	Site 8 (C)	Site 9 (C)	Site 10 (W)	Site 11 (W)
NC =360	NC= 0	NC= 184	NC= 134	NC= 736
PC =7527	PC (C1) =0	PC(C2) =4617	PC (W1) =3214	PC (W2) =14130
G1=2648	C1-A= 0	C2-A= 810	W1-A= 244	W2-P1 = 22596.5
G2=1814	C1-B= 6708	C2-B= 597	W1-B= 301	W1-Es = 18939
G3=2922.5	C1-C=13,601	C2-C=814	W1-C= 464	W2-P2=24108.5
AV= 2461.5	**AV= 10,154.5**	**AV=740.33**	**AV=336.33**	**AV = 21,881.3**

BacterisK+ Results Interpretation

Table 1. Endotoxin Risk Interpretation for Coastal bathing waters.

Endotoxin Risk (ER)	Interpretation	Classification**
< 6900	Low risk	Sufficient or better
6900 – 10000	Medium risk (Investigation advised*)	Poor quality
>10,000	High risk	Poor quality

AV=1022.33	AV=2923.33	Av= 1819.67	AV= 452.5	AV=7416.17	AV=6,986.83

Table 2. Endotoxin Risk Interpretation for Inland bathing waters.

Endotoxin Risk (ER)	Interpretation	Classification**
< 10,000	Low risk	Sufficient or better
10,000 – 13,000	Medium risk (Investigation advised*)	Poor quality
> 13,000	High risk	Poor quality

AV= 2461.5	AV= 10,154.5	AV=740.33	AV=336.33	AV = 21,881.3

Microbiological Analysis

- Enterococci Colony Forming Units (CFU) were evaluated **as red, pink, or reddish-brown** colonies with a diameter of 0.5–2 mm.
- *E. coli* CFU were evaluated as **dark blue to violet colonies**

- On TCBS, ***V. cholerae*** isolates were evaluated as **yellow colonies**, 2 to 4 mm in diameter
- *V. parahaemolyticus*, were evaluated **as green to blue-green** colonies 0.5 to 1.5 mm in diameter

BacterisK+ Results Interpretation

- BacterisK+ measures the amount of endotoxin (a molecule present/secreted in Gram-negative bacteria) that is present in a water sample.
- It quantifies the level of gram-negative endotoxins associated with anthropogenic pollution and aquatic disease.
- The more endotoxin detected in a sample, the higher the Endotoxin Risk (ER) and therefore the higher the chance the water contains Gram-negative bacteria.

- Globally, faecal indicators are used to assess environmental, potable and recreational water quality.

- Faecal indicators such as *E. coli* can be used to assess for the risk of pathogenic organisms which could represent a risk to the public health.

- However, with respect to individual farms, result ranges that coincide with disease symptoms on your farm, but far below the ER range could be your indicator value to take the necessary precaution – thus adding on to the validation of protocol

Conclusion

- Objectives were met
- Ecological Health assessed by the kit

Thank you