FRESHWATER SYSTEMS · WATER QUALITY

Organic Matter Load and Harmful Algal Blooms

How organic-matter accumulation at the Mulukoba, Anyanga and Ogal cage sites shapes water quality and the risk of harmful algal blooms (HABs) in Lake Victoria.

REFERENCE	ISSUED	REGION
C82_5(2)	**May 2026**	**Mulukoba · Anyanga · Ogal**

FRESHWATER SYSTEMS

3
cage sites profiled for organic matter and water quality

28 to 32%
cyanophyte share, wet (Oct) to dry (Jan) season

2.5 to 6.5 m
depth of thermal stratification at Anyanga

Re-emerged
Merismopedia punctata, once thought locally extinct

Background

Declining fish biomass and catch-per-unit-effort have pushed many fishers and traders into cage culture as an alternative livelihood, often without adherence to sound husbandry. Poor feed quality and feeding practice have been identified as major drivers of environmental degradation that can culminate in mass fish kills, both within the cages and across the wider capture fishery. This study examined how organic-matter content influences water quality and primary producers at three contrasting cage sites: Mulukoba, Anyanga and Ogal.

Methods

Sediment organic matter, depth-profiled dissolved oxygen and temperature, the reduced-nitrogen forms nitrite and ammonium, chlorophyll-*a* and phytoplankton composition were measured across the three sites. Sampling spanned the wet season (October 2025) and the dry season (January 2026), and the results were interpreted against each site's habitat characteristics, such as circulation, mixing, depth and exposure.

Key Findings

Densest cages, heaviest organic load

Sediment organic matter was highest at Anyanga, the most densely caged site, and lowest and least variable at Mulukoba, even though Mulukoba had the second densest practice. Ogal, a shallow bay with restricted circulation and the most sparsely spaced cages, showed the most variable concentrations. Anyanga displayed thermal stratification with a thermocline between 2.5 and 6.5 m, and elevated bottom ammonium and nitrite arising from the decomposition of organic matter, while the nearshore stations at Mulukoba fell below 5 mg L^{-1} of dissolved oxygen.

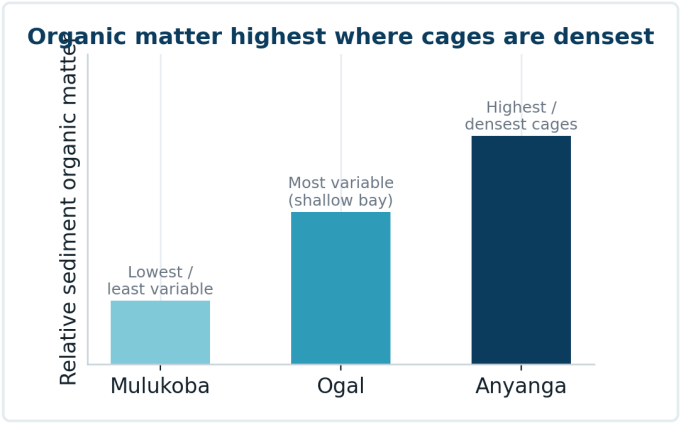


Figure 1. Sediment organic matter tracks cage density: highest at Anyanga, intermediate and variable at shallow Ogal, and lowest at Mulukoba.

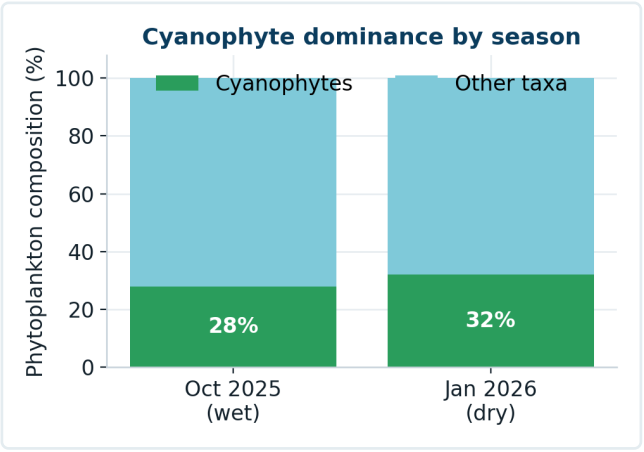


Figure 2. Cyanophytes were the dominant phytoplankton group, rising from 28% in the wet season to 32% in the dry season.

A worrying microbial signal

Cyanophytes dominated the phytoplankton community, contributing on average 28% in October 2025 and 32% in January 2026. Other taxa recorded included *Aulacoseira*, *Nitzschia*, *Synedra*, *Microcystis* and *Anabaena*. Of particular concern, *Merismopedia punctata*, previously thought locally extinct, re-emerged to dominate the Anyanga cages. Overcrowding at Anyanga appears to dissipate wave and current energy, shade light, lower temperature and productivity, and increase both organic loading and the release of reduced nutrients. Combined with an anoxic hypolimnion, this leaves Anyanga vulnerable to fish kills during intense vertical mixing of the lake.

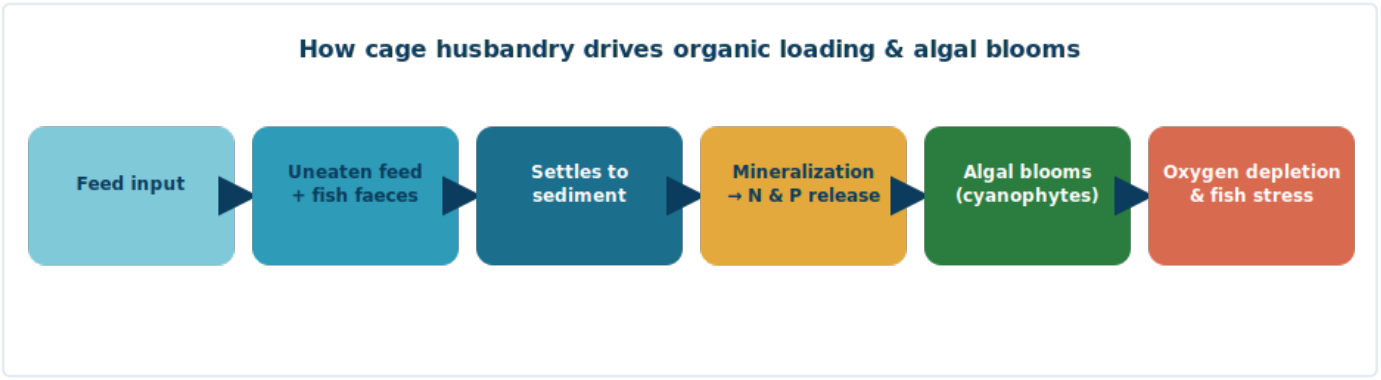


Figure 3. How cage husbandry drives organic loading: uneaten feed and faeces settle, mineralize and release nitrogen and phosphorus that fuel algal blooms and subsequent oxygen depletion.

Habitat characteristics by site

Mulukoba	Anyanga	Ogal
Restricted circulation	Strong currents	Restricted circulation
Moderate mixing	Intense mixing	Weak mixing
Optimal depth	Optimal depth, possible seepage	Shallow, disturbance-prone
Low DO nearshore	Optimal DO, stratified	Optimal DO

Conclusions and Recommendations

- Anyanga is at greatest risk from overcrowding-driven organic loading; the re-emergence of *Merismopedia punctata* needs urgent investigation.
- Mulukoba is suitable for cages but limited by restricted circulation and low nearshore oxygen, so the cause of the low oxygen should be established before any relocation of cages offshore.

- Ogal's shallow, poorly circulated bay is vulnerable to environmental collapse; the community's self-imposed limits on cage number and density should be supported and monitoring sustained at all three sites.

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Suggested citation: Guya, F. et al. (2026). Implications of Organic Matter Load on the Proliferation of Harmful Algal Blooms in Lake Victoria. KMFRI Factsheet C82_5(2).