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Two changes in gear regulation to improve yield of the Nile perch fishery

MultiTip Policy Brief #1

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Gear regulation has been a subject of discussion among Lake Victoria Nile perch stakeholders for a long time: How best to regulate gear to maintain abundant and healthy fish stocks while ensuring high fishery yields? A new study shows that two simple, but important changes to current gear regulation in the Nile perch fishery can help reach these goals and actually increase long-run yields: Gillnets below 7” should be phased out and the 85cm TL upper slot size end should be abandoned. These conclusions are based on a novel size-structured, ecology-based and empirically informed model of the Nile perch fishery.

Key Insights

1. **Preventing undersized gillnets increases yield, income and stock biomass**: A reduction in fishing pressure on juvenile Nile perch is key to stock health and fishery yield. Phasing out gillnets below 7” could increase the long-term (steady-state) yield by up to +21.8% and income by up to +33.4% (see figure on page 2). The increase comes from the combined effect of targeting larger fish and reduced overall fishing pressure, which makes the stock more abundant.

2. **Young fish are protected by 7” gillnets**: Young fish below 50cm TL, which ensure the future viability of the fish population, can be protected by large nets. 7” gillnets target fish at 66.8 cm TL mean length (±11.0 cm standard deviation), 6” gillnets at 57.2 cm TL (±9.5 cm), 5” gillnets at 47.7 cm TL (±7.9 cm). Therefore, 7” gillnets guarantee to strictly avoid undersized fish in the range of selectivity.

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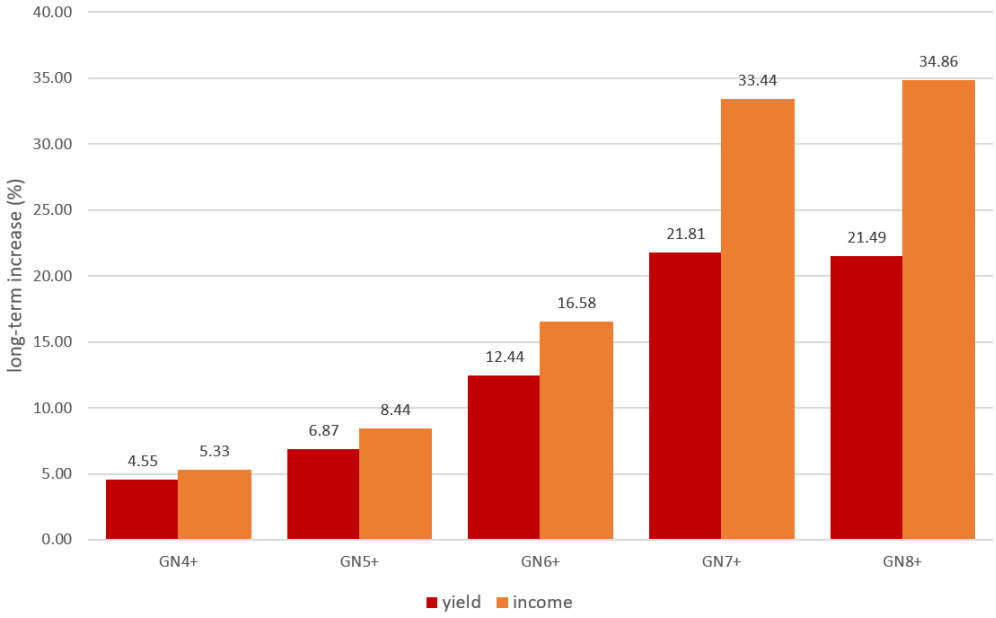

Figure: Long-term increase of yield and income (%), relative to the fishery in 2020, if the fishery would phase out all gillnets below 4" (GN4+), below 5" (GN5+), below 6" (GN6+), below 7" (GN7+), below 8" (GN8+). Simulations do not include the re-distribution of gears. Longline hooks are assumed to stay at 2020 level.

3. **The 85 cm TL upper slot size is unhelpful**: Foregoing the catch of highly valuable large fish hurts income and produces little system benefits: A 10% reduction in the catch of Nile perch above 85 cm (compared to 2020) decreases long-term yield by 1.81%. Protecting the stock and securing high long-term yield is better served by reducing fishing below 50 cm TL.

4. **Regulation of longline hooks merits close examination**: The study assumes that longline hooks remain at 2020 levels. Study evidence shows that hooks target fish with the highest selectivity around 71.0 cm TL, but their target range is broader and dependent on bait choice. Hook regulations and comparisons with gillnet selectivity need to reflect that.

Methodology

The study uses a size structured model of the Nile perch population. Growth and natural mortality rates are based on a novel ecology-based framework which has already been successfully applied to other fish stocks. Dynamics are based on a Beverton-Holt recruitment function, calibrated with biological measurements. The model is simulated in the long-term equilibrium with multiple selectivity scenarios. Current fleet selectivity comes from LVFO's 2020 CAS survey. The simulations do not include re-distribution of effort across gears. Longline hooks are assumed to stay at 2020 level.

References:

Kammerer, J., Gómez-Cardona, S., & Nyamweya, C. (2022). Size selective fishing: The effect of size selectivity on the equilibrium yield in the Nile perch fishery of Lake Victoria. *AWI Discussion Paper 720*, Heidelberg University. https://doi.org/10.11588/heidok.00032308

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