DAGAA FISHERY OF LAKE VICTORIA

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BACKGROUND

- Sustainable economic growth
- Resource use
- Development
- Fisheries management measures
- Lake Victoria Fisheries Management Plan (FMP)
- LVFO
MAJOR OBSERVATION
a) **Economic Importance of “dagaa”**

The economic importance of “dagaa” is reflected in several macro and micro-economic activities in Kenya, Tanzania and Uganda that include:

- Employment opportunities to local people
- Protein source to poor/middle class consumers
- Protein source for animal feed industry
- Supports local, national and regional trade
Tanzania
• Involves traditional boat seining by local fishermen
• Use of catamarans (lift netting) by fishermen who have migrated from Lake Tanganyika.
• Mosquito net for boat seining is used by the local fishermen
• The official mesh size in Tanzania is 10 mm but nets as low as 5 mm are still in use for “dagaa” fishing
• Always using light for about 15 days fishing period during dark phases of the moon
• Some women own fishing boats (<2%)
Uganda:
• Boat seining is the main method of fishing.
• Some women own fishing crafts and gears (less than 2%)
• Men carry out actual fishing
• Fishing with light during dark phases of the moon for about 15 days.
Kenya:
• Boat seining is the main method of fishing
• Some women own fishing crafts and gears (less than 2%)
• Men carry out actual fishing
• Fishing within areas less than 6 m depth takes place throughout the month
• Light attraction is not used in many areas within the Nyanza Gulf.
• Light is always used in the deeper waters around the islands where fishing also takes place during dark phases of the lunar cycle
Economic significance:

• “Dagaa” can be rated first in terms of employment opportunities and second in terms of economic gains to Nile perch (*Lates niloticus*).

• The scope and magnitude for employment in dagaa fishery were identified to include a spectrum of stakeholders.
Dagaa Landings and Value

Contribution (%) = 0.631x - 3.9292
R² = 0.8455
Kenya

• The national trade is more pronounced while there is limited regional trade in “dagaa” apart from occasional demand by relief agencies to supplement or add nutritive value to relief food.
b) Fishing, processing and marketing

- Processing is done almost entirely by women
- The fishing grounds in Tanzania are mainly offshore
- In Kenya and Uganda, fishing areas are concentrated on the inshore areas and uses the boat seine method.
- The main “dagaa” collection points are Kirumba Market in Mwanza and Musoma.
• Marketing of the fish is at 3 tiers namely:
  i) Local consumption
  ii) Regional consumption and
  iii) For fishmeal industry:

**Tanzania:**
• is sold to traders from Shinyanga, Mtwara, Dodoma among many other regions
• “Dagaa” for human consumption marketed in various countries in the region including
  i) Zambia, DRC, Burundi, Rwanda, Kenya and Malawi
• “Dagaa” for fishmeal in Dar-es-Salaam
• “Dagaa” for fishmeal is also exported to market in various countries in the region including Zambia, DRC, Burundi, Rwanda, Kenya and Malawi.
Kenya

- Nationally found in almost every small market, urban centres and major towns
- Unconfirmed reports indicate that some “dagaa” that come to Kenya finds its way to Sudan (Dafur)
- “Dagaa” for fishmeal in Eldoret, Nakuru, Nairobi, Thika and Kwale District at the coast.
Uganda:
• Sold in Gulu, Kitgum, Arua, Iganga, Mbale for human food
• Exported to DRC, Burundi, Rwanda, Kenya “Dagaa” for fishmeal in Dar-es-Salaam
• “Dagaa” for fishmeal to Nuvita (Engaano), Grainmill, Bico, Spire Road etc and several small scale millers
c) Biology and behaviour
d) *Infection by Ligula intestinalis*

- About 6% of adults infected by *Ligula intestinalis*
- Highest infestation in Uganda
- Second infestation in Kenya and Tanzania
- Consumers for dry fish do not see the infestation as a serious problem since they do not even see the worm
- Consumers of fresh fish would however like to have the fish dried and handled in a more hygienic manner and with less of the tape worm
f) Impact of “dagaa” fishing on juvenile of other fish species

Tanzania
• Seems to have very little impact on the juveniles of other fish species. The by-catch consists mainly of haplochromines.

Kenya and Uganda
• Negligible by-catch of juveniles in offshore areas but high by-catch in bays
g) Economics of “dagaa” fishing

- Boat: TShs. 200,000.00
- Fishing nets: TShs. 220,000.00
- Lamp: TShs. 25,000.00 X 4
- Fishing operations: 2.5 litres of kerosene per lamp per fishing night that costs TShs. 850.00 per litre
- Depreciation on equipment
g) *Economics of “dagaa” fishing*

- Mean catch: 240 Kg/Boat/Day
- Bucket weight: 20 Kg
- Fresh weight value: TShs. 7,000.00 per bucket
- Dry fish value: TShs. 5,000.00 per bucket

- Based on these value: Cost benefit analysis done that factorizes in the fixed annul and daily costs
## Estimated Returns from Fishery

<table>
<thead>
<tr>
<th>Returns from the fishery</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kenya</td>
<td></td>
</tr>
<tr>
<td>Exchange Rates:</td>
<td>US $/Day Equivalent</td>
<td>19.02</td>
</tr>
<tr>
<td>US $ = KShs. 75.00</td>
<td>US $/Month Equivalent</td>
<td>228.18</td>
</tr>
<tr>
<td></td>
<td>Uganda</td>
<td></td>
</tr>
<tr>
<td>US $ = UShs. 1650.00</td>
<td>US $/Day Equivalent</td>
<td>20.94</td>
</tr>
<tr>
<td></td>
<td>US $/Month Equivalent</td>
<td>251.27</td>
</tr>
<tr>
<td></td>
<td>Tanzania</td>
<td></td>
</tr>
<tr>
<td>US &amp; = TShs. 1125.00</td>
<td>US $/Day Equivalent</td>
<td>27.82</td>
</tr>
<tr>
<td></td>
<td>US $/Month Equivalent</td>
<td>333.87</td>
</tr>
<tr>
<td></td>
<td>Catamarans</td>
<td></td>
</tr>
<tr>
<td>US &amp; = TShs. 1125.00</td>
<td>US $/Day Equivalent</td>
<td>42.93</td>
</tr>
<tr>
<td></td>
<td>US $/Month Equivalent</td>
<td>515.20</td>
</tr>
</tbody>
</table>
Those fishers who use outboard engines to go further offshore spend an additional TShs. 1,500,000.00 to buy an engine of 25 HP.
h) **Utilization and value addition**

- Process by sun drying for human food
- Processing and preservation and packaging for human food in Tanzania and Kenya
- Use in animal feed industry
- Use in child nutrition in hospitals (Uganda and Kenya)
h) Utilization and value addition

- Salted and 0.5% ww of pepper added
- Sealed in polythene bags in weights of 200g, 400g, 800g and 1,000g.
- The selling price is TShs 500.00, 1,000.00, 2,000.00 and 2,500.00 for the respective weights
- These products are packaged at Nyagezi and a label added to show the contents.
Animal Feeds:

- Tanzania: Based in Dar-es-salaam and traders have to transport the fish all the way from collection points in Lake Victoria.
- An animal feed industry started at Igombe is no longer operational (Dutch assistance)
- Uganda: Main animal feed processor (Novita in Jinja) uses “dagaa” as one of the main sources of protein to manufacture animal feeds and fish feeds (30 tonnes every 20 days).
- Other minor factories include Ugachic and Bugereee in Kampala. Within Jinja, there are many
Animal Feeds:

- Kenya: Unga Feeds, United Millers are the main animal feed producers
- Both utilizes dagaa for feed production
- Data on quantities and products are not easy to get
- The factories operate under the Ministries concerned with industrial development and not fisheries institutions
i) Food security, nutrition, production and prices

Contribution:
- Food availability
- Affordability
- Divisibility
- Shelf life

Risks:
- Competition with animal feed industries
- Changes in pricing due to market liberalization
- Weak policies on use of dagaa in animal feed industries
FISHERY, BIOLOGY AND ECOLOGY OF “DAGAA” IN LAKE VICTORIA
Little scientific information is available:

- Okedi (1973)
- Wanink (1989)
- Wandera (1990)
- Manyala (1991)
- Chitamwebwa (1992)
- Wandera (1992)
- Katunzi (1992)
- Manyala et al. (1992)
- Manyala (1994)
- Manyala (1995b)
- Manyala (1995b)
- Mannini (1992)
Table 1: Fecundity and breeding seasons of *R. argentea* in lake Victoria and annual breeding patterns based on relative condition.

<table>
<thead>
<tr>
<th>Fecundity</th>
<th>Region</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ova = 2292 (582 - 4771)</td>
<td>Winam Gulf, Mwanza Gulfs, Musoma, Bukoba</td>
<td>Okedi, 1973</td>
</tr>
<tr>
<td>$F = 0.005875 \times TL^{2.95}$</td>
<td>Mwanza Gulf</td>
<td>Wanink, 1989</td>
</tr>
<tr>
<td>$F = 0.00000033 \times TL^{5.376}$</td>
<td>Winam Gulf</td>
<td>Manyala <em>et al.</em>, 1992</td>
</tr>
</tbody>
</table>
Table 2: Size at massive maturity of *R. argentea* in Lake Victoria

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
<th>Region</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-41 mm SL</td>
<td>43-44 mm SL</td>
<td>Pilkington Bay</td>
<td>Wandera, 1992</td>
</tr>
<tr>
<td>63.0 mm TL</td>
<td>54.0 mm TL</td>
<td>Winam/Mwanza Gulfs, Musoma, Bukoba</td>
<td>Okedi, 1973</td>
</tr>
<tr>
<td>34 mm SL</td>
<td>36 mm SL</td>
<td>Winam Gulf</td>
<td>Manyala <em>et al.</em>, 1992</td>
</tr>
</tbody>
</table>
Table 3: Growth parameters and mortality rates of estimated by different authors in Lake Victoria

<table>
<thead>
<tr>
<th>$L_\infty$</th>
<th>K</th>
<th>M</th>
<th>F</th>
<th>Z</th>
<th>Region</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.8</td>
<td>0.58</td>
<td>0.88</td>
<td>1.98</td>
<td>2.86</td>
<td>Winam Gulf</td>
<td>Manyala, 1991</td>
</tr>
<tr>
<td>64.5</td>
<td>0.92</td>
<td>2.37</td>
<td>1.22</td>
<td>3.59</td>
<td>Uganda waters</td>
<td>Wandera, 1992</td>
</tr>
<tr>
<td>63.4</td>
<td>0.94</td>
<td>-</td>
<td>-</td>
<td>3.23</td>
<td>Winam Gulf</td>
<td>Manyala, 1992</td>
</tr>
<tr>
<td>52.0</td>
<td>1.14</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Mwanza Gulf</td>
<td>Wanink, 1989</td>
</tr>
<tr>
<td>59.0</td>
<td>0.74</td>
<td>1.12</td>
<td>1.89</td>
<td>3.47</td>
<td>Inner Winam Gulf</td>
<td>Manyala, 1995</td>
</tr>
<tr>
<td>62.0</td>
<td>0.74</td>
<td>1.12</td>
<td>1.39</td>
<td>2.97</td>
<td>Mid Winam Gulf</td>
<td>Manyala, 1995</td>
</tr>
<tr>
<td>58.0</td>
<td>0.68</td>
<td>1.07</td>
<td>1.80</td>
<td>3.38</td>
<td>Outer Winam Gulf</td>
<td>Manyala, 1995</td>
</tr>
<tr>
<td>62.0</td>
<td>0.66</td>
<td>1.04</td>
<td>1.45</td>
<td>3.03</td>
<td>Mbita Area</td>
<td>Manyala, 1995</td>
</tr>
<tr>
<td>58.0</td>
<td>0.63</td>
<td>0.99</td>
<td>1.77</td>
<td>3.35</td>
<td>Open lake</td>
<td>Manyala, 1995</td>
</tr>
</tbody>
</table>
Dagaa Effort Distribution (>50% Composition)
Number of Fishing Crafts by District
Number of Fishers by District
Conclusions

• High potential of offshore exploitation
• Catamaran offer better returns
• Mesh size below 5mm catch high proportions of immature fish
• Quantities utilized for animal feed are not easily available but it is estimated that 60-80% goes to animal feed
• Value addition for human consumption is done on small scale but technology exits in Tanzania, Kenya and the region
Immature Dagaa (Lakewide)
Recommendations_1

• Fishing grounds
  – Bays (<4km width) and shallow near-shore waters (<2km) are breeding & nursery grounds of Dagaa and other fishes. Fishing should therefore not be carried out in these waters
  – Open offshore waters contain mainly mature Dagaa. Fishing for “Dagaa” should be done offshore (>2.0 km)
Recommendations_2

• Mesh size
  – All meshes catch immature Dagaa when operated in waters containing juvenile fish.
  – Large mesh nets (8 & 10mm) catch higher proportion of mature Dagaa than small meshes (3, 5 & 6 mm) especially in waters where juveniles occur (K & U)
  – (T) Catches do not differ significantly between mesh sizes
• The 8 mm mesh net was found appropriate for Dagaa exploitation on Lake Victoria on the basis of harmonization
Recommendations

- The most popular products to be developed include:
  - Sun dried “dagaa” for general nutrition
  - Sun dried and salted products general nutrition
  - Enriched flours for adults nutrition
  - Enriched flours for children nutrition
  - Protein concentrates as food additives

- Develop quality standards for dried “dagaa” based on sensory assessment and biochemical analysis.
Photo Gallery
Tanzania – Kirumba Market
Tanzania: Nyagezi-Kijiweni
Women drying and selling dagaa by the lakeshore

Tanzania: Nyagezi-Kijiweni
Women patiently waiting for dagaa landings
Mases Fish Landing: Uganda
Dagaa packaging and storage before sale

Mases Fish Landing: Uganda
Dagaa landings from island collection points
Mainuga Beach: Kenya
Dagaa nets

Mainuga Beach: Kenya
Dagaa fish drying on
fishing nets
Sirare Border Post

Dagaa transportation across Tanzania-Kenya Border
Thank You