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KAPENTA RIG SURVEY OF THE ZAMBIAN WATERS OF LAKE KARIBA

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EXECUTIVE SUMMARY

This survey revealed the huge extent of overfishing of kapenta that is occurring on the Zambian side of Lake Kariba and the rate at which this problem is expanding. It can be confidently reported that there are at least 950 boats but more likely over 1000 on the Zambian side of Lake Kariba. This is four times the number of vessels estimated to keep fishing at the original maximum sustainable yield. Rapid action is required to prevent further collapse of the kapenta fishing industry and it is therefore important to highlight the lack of enforcement and the lack of resources within Local Government and DOF to police these waters. This lack of enforcement is identified to be one of the leading problems. The DOF do not appear to have any record of the number of rigs registered legally on the lake. The following recommendations are submitted:

1. Determine how many kapenta fishing licenses have actually been issued;
2. Halt the issuing of any additional kapenta fishing licenses and renew existing licenses for operators who comply with all existing regulations (such as catch return submission, certificates of seaworthiness etc);
3. Remove unlicensed/unregistered/duplicated vessels immediately from the water;
4. Clearly mark all legal vessels with unique codes and use a coded microchip to prevent vessel duplication
5. Remove/ prosecute illegal fishers from Little Kariba
6. Remove illegal kapenta fish drying camps;
7. Conduct enforcement patrols regularly with police support;
8. Revive and develop a functional Association of kapenta fishers and allocate them power to self-regulate and police the waters;
9. Improve collaboration with Zimbabwean authorities;
10. Conduct an aerial survey of the Zimbabwean waters of Lake Kariba ASAP in order to determine the total fishing effort on the lake;
11. Conduct a hydro acoustic survey of the lake again in order to set the total allowable catches and effort limits (apparently plans are underway);

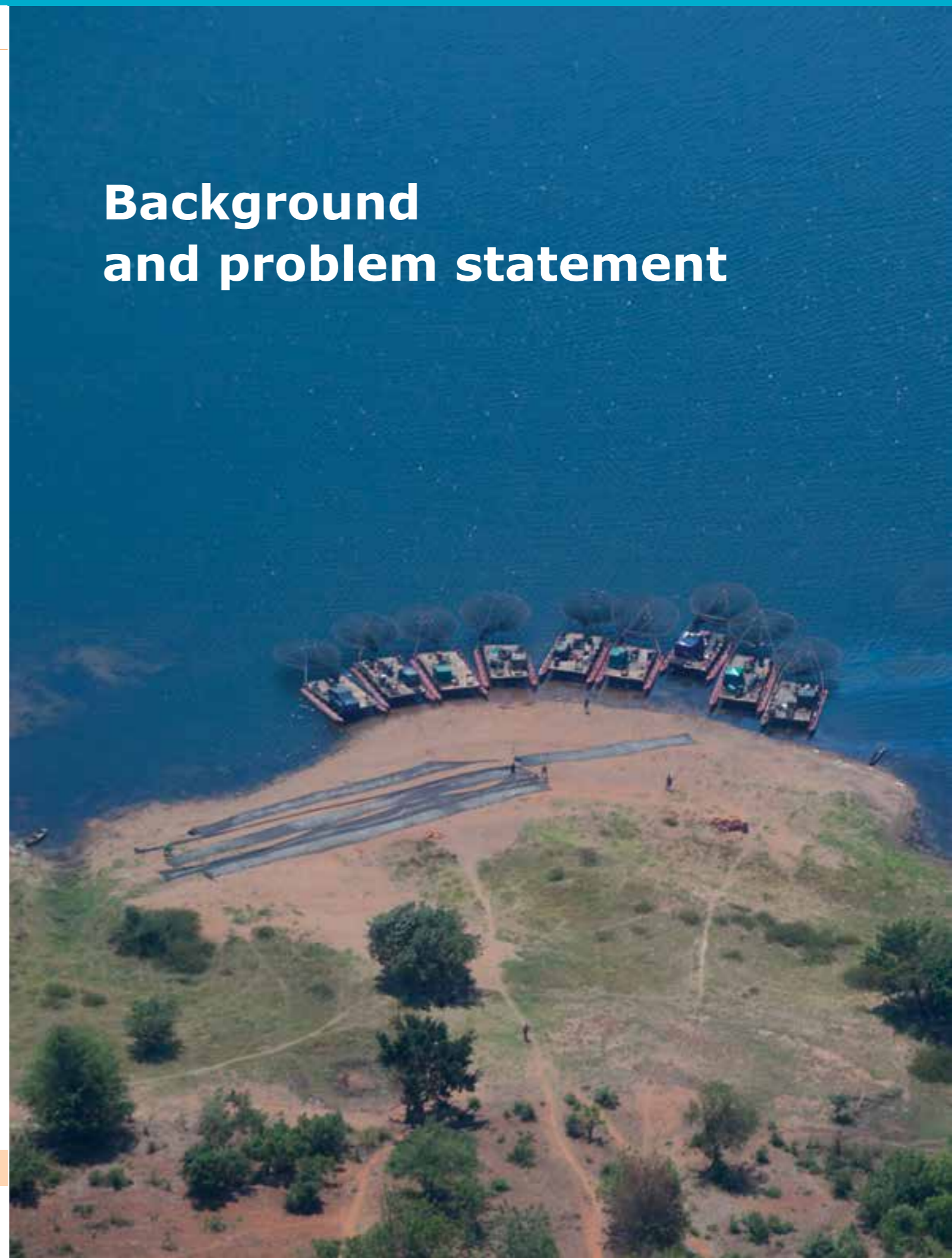
DOF's recommendations: taken from their report which was received on 05/02/2014 (Appendix 2)

1. there is need for the Ministry of Commerce and Industry to meet with Department of Maritime and Inland Waterways and Department of Fisheries to explore possibilities of harmonizing the Act in an effort to halt the registration of new Kapenta Companies as well as construction of new rigs.
2. There is need to strengthen law enforcement on the lake in order to ensure adherence to this provision. This could be done through increased random patrols jointly between DOF, Maritime and Marine Security.
3. There is need for DOF in conjunction with Maritime Department to conduct regular rigs inspection programme in order to remove all illegally constructed and unlicensed rigs.
4. Rig construction should be considered as separate industry by companies at their permanent designated places for easy inspection (and not constructed all over the lake shore).
5. Improve law enforcement on the entire lake

Since the survey was undertaken, some of the recommendations have already been initiated which is a very positive sign. On 21st January a meeting was held in Sinazongwe and among others, it was resolved that there will be a 10 day lunar closure every month, thus 120 nights per annum of no fishing. It was also resolved that the formation of a single Association for Lake Kariba representing all fishers (including gillnetting etc) will occur. In addition, it was resolved that all illegal rigs be removed and forfeited to the State, but it is not clear how this will happen. The DOF recommends the use of water-based surveys over aerial surveys but it is the SmartFish expert's opinion that once all costs and time frames are considered, there is no better method than aerial surveillance for this purpose.

SmartFish would be in a good position to facilitate a number of the proposed recommendations. Further dialogue between the DOF and SmartFish will identify possible areas for collaboration in the future. Enforcing existing legislation and promoting the re-establishment of a single and functional Management Association amongst the fishers is seen as a priority.

Background and problem statement



BACKGROUND AND PROBLEM STATEMENT

The pelagic kapenta, *Limnothrissa miodon*, was introduced into Lake Kariba in 1967 from Lake Tanganyika. It is managed by Zambia and Zimbabwe as a single stock using a collaborative fisheries resource management initiative with meetings previously funded by the FAO. It was previously agreed, during the Zambia/Zimbabwe SADC Fisheries Project, that management of the Kapenta fishery be conducted jointly with agreed harvest levels. A 1997 study concluded that the maximum sustainable yield of the kapenta stood at 25,000t and that the stock was 30,000t. The Zambia/Zimbabwe SADC Fisheries Project set a maximal limit of 500 Kapenta fishing rigs for the Lake in order to allow fishing to continue at a sustainable level, with this number divided into 230 for Zambia and 270 for Zimbabwe. However, due to a lack of monitoring, policing and joint meetings between the two countries, the number stood at 632 rigs for the Zambian side alone in 2011 and the current survey indicates a massive increase in the number of Kapenta rigs since then. Another hydro acoustic survey is planned for the near future which will review the kapenta stock status and allow for a revision of the total allowable catch (TAC).

The establishment of a Kapenta Fishermen’s Association (KFA) was meant to ensure and guide sustainable utilisation of fisheries resources but as reported in the last Frame Survey (2011), KFA has become ineffective due to a lack of support and a lack of policing of their policies by the Department of Fisheries (DOF). According to role players in the industry and DOF, the volunteer KFA no longer has the ability to influence the industry. In addition it appears as though there is no complete record of the actual number of vessels licensed on the Zambian side of the Lake. This survey will provide an audit of the total number of Kapenta fishing vessels within Zambian waters.



Figure 2 Lake Kariba

SURVEY METHODS

AERIAL SURVEY

An Islander aircraft was hired from ProCharter to fly two four-hour surveys on the Zambian side of Kariba. Two SmartFish consultants sat side by side at the back of the aircraft with an unobstructed view and counted vessels out of their respective windows. The aircraft flew along the shoreline from the dam wall up to the top of the lake, and returned down the lake over open water and any islands that may have been missed on the first leg. The first survey flight missed out the islands in the vicinity of Zebra Island and the Little Kariba area but these areas were overflowed in the second survey. Boats counted in these two areas during the second survey were added to the counts from the first survey. The lake was divided into 5 areas based on flying time in order to give some idea of the distribution of vessels (Figure 2; Appendix 3).

VESSEL SURVEY



Figure 3: Areas (A-F) as used for the aerial surveys

The water-based survey of kapenta vessels was initiated in three areas, Siavonga, Chipepo and Sinazongwe. The main fisheries vessel, the Namazambwe, is based in Sinazongwe and was commissioned for an 8 day period from the 6th of December until the 13th of December. Initially, it sailed for the Little Kariba region of the Zambezi River which is beyond Devil’s Gorge, which demarcates the start of Lake Kariba. The Namazambwe and its tender boat worked their way back past Sinazongwe surveying vessels and marking them with paint for identification purposes. Their survey pattern involved following the shoreline of the mainland and around islands which was confirmed by the aerial survey to be where the vast majority of boats are. During the same period, a smaller boat from Siavonga and one from Chipepo performed the same task in those areas. The data sheet used for this component of the survey is included in Appendix 5 and the information collected by the DOF will be compiled into a report by Mr. Chijoka.

LAND SURVEY

The land based component of this survey was cancelled due to delays in payment to the aircraft charter company. In hindsight, this method for surveying kapenta rigs would have very little value and would have added significantly to the cost of the operation. It is not considered to be a loss as far as the results are concerned.

SURVEY RESULTS

The aerial surveys counted between 852 and 950 boats due to the different flight paths taken. It must be noted that examination of the flight path of the second aerial survey revealed that some sections of the lake were still missed out. This is supported by the fact that the water-based survey team did not see the survey aircraft and vice-versa. Results from water based survey were found to be very similar to the aerial survey and their count was 962 boats.

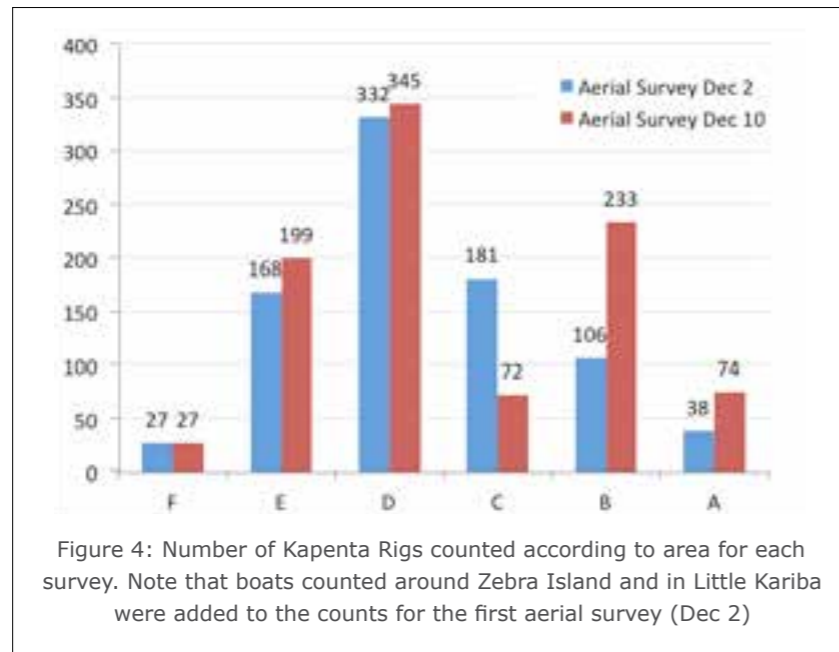


Figure 4: Number of Kapenta Rigs counted according to area for each survey. Note that boats counted around Zebra Island and in Little Kariba were added to the counts for the first aerial survey (Dec 2)

Table 2: Total number of Kapenta boats counted in Zambian waters of Lake Kariba for each aerial survey

Survey Method	Kapenta boats counted
Aerial Survey 1*	852
Aerial Survey 2	950
Boat Survey	962

* including boats added from areas initially missed.

DISCUSSION

The second aerial survey counted significantly more boats than the first survey which does indicate that it is possible to miss boats from the air. Small harbours in the lee of taller islands can be missed from the air but this can be solved by flying directly over such islands in future surveys. The aircraft used for this survey had a maximum flying time of four hours and so it would be beneficial in the future to use an aircraft with a greater flying capacity or alternatively land and refuel more frequently. Results did however show that boats move significant distances over an 8-day period and in order to get a "snapshot" of vessel numbers it is imperative to use an aircraft for the survey. The water-based survey counted 962 vessels which was very similar to the aerial survey which supports the use of aerial surveys. The DOF recommends the use of water-based surveys over aerial surveys but it is the SmartFish expert's opinion that once all costs and time frames are considered, there is no better method than aerial surveillance.

According to the 2011 Frame Survey, it was deemed not necessary to repeat that exercise more frequently than once every five years because it was thought that no significant differences would be found between more regular surveys. The findings of this survey indicate that this is not the case and that there has been an increase of over 150% in the Kapenta boat numbers in the past 2 years. From 1998 to 2013 there has been over 425% increase in the number of kapenta boats counted (Figure 4). It appears that the Zambian DOF does not have a breakdown of the number of kapenta fishing licenses currently issued as numerous requests have been made for this information with no response to date.

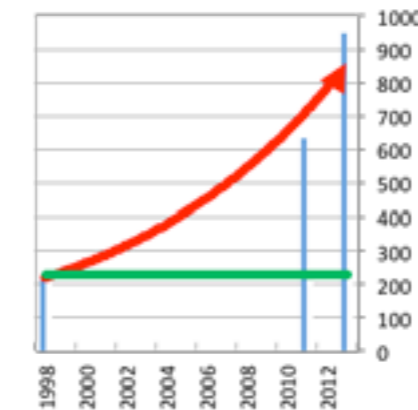


Figure 5: Graph showing increase in Kapenta boat numbers from 1998 to 2013. The green line represents the agreed number of boats for Zambian waters and the red line indicates the exponential trend in the increase in boat numbers.

Overflying the islands revealed another problem that has serious implications for the reported catch rates on commercial boats. Large-scale drying of kapenta is occurring on makeshift racks on many of the islands and numerous banana boats are present at these sites. According to commercial operators, one of the biggest threats to their livelihoods is the practice of illegally buying kapenta from the rigs at night and drying them at these sites. This not only results in significant loss of income, but these catches are not reported and do not form part of any catch statistics. In the past the KFA has proposed many ideas on self-policing of the industry but due to the current state of affairs, there is no effective plan in place. There was never formal agreement between the KFA and DOF concerning policing, though DOF has recognised the KFA's efforts in the past. One of the agreements that did exist between the two Parties, was that the Chairman for the KFA would sit on the Fish Licensing Committee Board when licenses were considered, but this was agreement was apparently not honoured. It is interesting to note that the Zimbabwean waters of Lake Kariba are monitored and patrolled fairly regularly (not without problems), and that Zambian vessels entering Zimbabwean waters are impounded. Most people accept that the biggest problems with illegal fishing emanate from the Zambian side of the lake. Other issues identified by this survey showed more than 27 kapenta fishing vessels fishing illegally in the Little Kariba area of the Zambezi River. In addition, multiple boats with the same registration number have been identified around on the lake by the water survey team. This information already gives the DOF some actionable data to work with.

A report detailing the findings of the water based survey team is attached as Appendix 2 in this report.

SUMMARY AND RECOMMENDATIONS

This survey revealed the huge extent of overfishing of kapenta that is occurring on the Zambian side of Lake Kariba and the rate at which this problem is expanding. It can be confidently reported that there are at least 950 boats but more likely over 1000 on the Zambian side of Lake Kariba. This is four times the number of vessels estimated to keep fishing at the original maximum sustainable yield. Rapid action is required to prevent further collapse of the kapenta fishing industry and it is therefore important to highlight the lack of enforcement and the lack of resources within Local Government and DOF to police these waters. The following recommendations are submitted:

12. Determine how many kapenta fishing licenses have actually been issued;
13. Halt the issuing of any additional kapenta fishing licenses and renew existing licenses for operators who comply with all existing regulations (such as catch return submission, certificates of seaworthiness etc);
14. Remove unlicensed/unregistered/duplicated vessels immediately from the water;
15. Clearly mark all legal vessels with unique codes and use a coded microchip to prevent vessel duplication
16. Remove/ prosecute illegal fishers from Little Kariba
17. Remove illegal kapenta fish drying camps;
18. Enforce submission of catch returns
19. Conduct enforcement patrols regularly
20. Revive and develop a functional Association of kapenta fishers and allocate them some power to self-regulate and police the waters;
21. Conduct an aerial survey of the Zimbabwean waters of Lake Kariba ASAP in order to determine the total fishing effort on the lake;

22. Conduct a hydro acoustic survey of the lake again in order to set the total allowable catches and effort limits (apparently plans are underway);

DOF's recommendations: taken from their report which was received on 05/02/2014 (Appendix 2)

1. there is need for the Ministry of Commerce and Industry to meet with Department of Maritime and Inland Waterways and Department of Fisheries to explore possibilities of harmonizing the Act in an effort to halt the registration of new Kapenta Companies as well as construction of new rigs.
2. There is need to strengthen law enforcement on the lake in order to ensure adherence to this provision. This could be done through increased random patrols jointly between DOF, Maritime and Marine Security.
3. There is need for DOF in conjunction with Maritime Department to conduct regular rigs inspection programme in order to remove all illegally constructed and unlicensed rigs.
4. Rig construction should be considered as separate industry by companies at their permanent designated places for easy inspection (and not constructed all over the lake shore).
5. Improve law enforcement on the entire lake

Since the survey was undertaken, some of the recommendations have already been initiated which is a very positive sign. On 21st January a meeting was held in Sinazongwe and among others, it was resolved that there will be a 10 day lunar closure every month, thus 120 nights per annum of no fishing. It was also resolved that the formation of a single Association for Lake Kariba representing all fishers (including gillnetting etc) will occur. In addition, it was resolved that all illegal rigs be removed and forfeited to the State, but it is not clear how this will happen.

SMARTFISH FUTURE INVOLVEMENT

SmartFish would be in a good position to facilitate a number of the proposed recommendations. Further dialogue between the DOF and SmartFish will identify possible areas for collaboration in the future. Enforcing existing legislation and promoting the re-establishment of a functional Management Association amongst the fishers is seen as a priority.

ADDITIONAL RECOMMENDATIONS/PROPOSAL FROM THE KAPENTA INDUSTRY

Comment was requested from one of the largest commercial kapenta rig operators to determine how they foresee ways for the industry to be resuscitated. The text is unedited and is the opinion of J. Jordaan but what this highlights is the huge willingness to sort the issues out with the assistance of the DOF and the community. Here are the recommendations they put forward:

- All unlicensed fishing vessels operating on the Lake MUST be removed immediately and be impounded and held under Court order, to be disposed of as per Court ruling. There is provision within the Act / Law to prosecute those involved in illegal & unlicensed fishing;
- No further issuing of any licenses for kapenta fishing, other than the renewal of legitimate licenses and only where there has been compliance with all regulations;

- Renewal of licenses must only be issued upon the issuance of a valid 'Certificate of Seaworthiness' issued by the Surveyor of Vessels;
- Both, Fishing License and Certificate of Seaworthiness must be issued in the form of a license disc that must be displayed on the vessel, displaying vessel registration number and all other relevant information;
- No kapenta fishing in water less than 15m in depth calculated from 'Lake Full Supply Level' or closer than 500m from any shoreline, whether mainland or an Island;
- No kapenta fishing closer than 1000m of any Lodge or built up residential areas, shoreline towns etc;
- Fishing to be limited to a maximum of 22 nights per calendar month, 4 nights before full moon, full moon and 4 nights after full moon;
- Little Kariba to be out of bounds for all Zambian kapenta operators and gill netting, 12 months of the year;
- No fishing for four months of the year, October through to January, even if it means on the Zambian side only;
- An Association be registered ' Kariba Fishers Management Association' and only Members be recognised by DOF. All kapenta license applicants to first submit their applications to the Association and only upon recommendation by the Association, will a license be issued. The Association must be authorised to police and manage the resource under the guidance of DOF. DOF's main role should be prosecuting offenders, as per recommendation and evidence provided by the Association. This Association will manage all the fishers, not only kapenta;
- The Act allows for Community Based Resource Management and this is what needs to be promoted, through the Association and the Zones that are already in place, though currently ineffective. Both the Zones and the Association must have provision to generate sufficient revenue to manage the resource. DOF must facilitate and prosecute, that's it for them. No licenses should be renewed unless recommended by the Association;
- No fishing within 500m of any tributary or recognised fish breeding area, defined with buoys;
- Gill netting must be controlled by enforcing licensing with a limited number of nets & mesh size. All detail and conditions must be stated on the license, particularly with reference to breeding areas and all restrictions. Again, the Association must be mandated to enforce and recommend based on past history/offences etc.
- The Association may further make recommendations to designated breeding areas and restrictions, this in conjunction with the Zones and DOF, upon which District Councils should pass Bylaws to ensure enforcement.
- Heavy penalties be introduced for would be offenders and that 50% of such revenue accrue to the Association;
- That 50% of license fees accrue to the Association to be used for enforcing and prosecuting offenders;
- That the Association receive 50% of all Council Levies and any other revenue based income that the Councils or DOF may impose on any of the fishers;
- Staff employed by DOF and the Councils should not be allowed to fish, unless enforcement is handed over to the Association;

- Any licenses that are to be revoked, should be done through a Court of Law through the prosecution of repeat offenders, thus ensuring and enforcing discipline and compliance;

The role of policing and enforcement needs to be handed over to the Communities/ Fishers through their Association and that DOF & Councils provide for legislation and prosecution.



Figure 6: drying racks on an island



Figure 7: Fishing village

Appendix



APPENDIX 1 - COMMENTS

The main cause of delay with the progress of this survey was due to the way in which the survey aircraft payment was made and an initial lack of communication from the DOF. The EFT made to Procharter was delayed by a couple of weeks and this necessitated the cancellation of the land-based survey component and created some initial budgeting issues. The survey success was not compromised by this setback but it did delay the process. In addition, the DOF was not initially willing to use its own vehicles for the survey if only the fuel cost was to be covered. They had reservations that they would break down and there would be no money to fix them. As such, a vehicle was hired from a private company. A report on the water based component of the survey was received on the 4th of February 2014 and is attached as appendix 2 in this document. Thanks go to everyone involved, but in particular Mr Mweemba Chijoka (Statistician), who was important to the success of the survey from the DOF side and without his input and participation, the survey not have proceeded.

VIDEO AND STILL PHOTOGRAPHY:

One of the outcomes was listed as a video record of the counts but this was not successful. The battery life of the video recorder did not last long enough and there was nowhere in Lusaka to purchase additional batteries for that camera. Photos taken from the aircraft will be supplied on a CD if requested.



Figure 8: 22 boats lying idle

APPENDIX 2 - DOF REPORT

2013 KAPENTA RIG FRAME SURVEY ON LAKE KARIBA FISHERY

1.0 INTRODUCTION

Lake Kariba fishery, situated in southern province of Zambia and shared with Zimbabwe is a creation through damming of the Zambezi River for the purpose of hydro-electricity power generation. It is one of the largest man-made lakes in the world and is located between latitudes 16.5 and 18 degrees South, and longitudes 27 and 29 degrees East. It stretches for 320km with an average width of 19.4km although the widest portion is 40km. The shoreline is approximately 2,164km. At maximum height, the lake holds 157million cubic metres of water with an average depth of 29m. The lake is 486m above sea level (Chipungu, 1993).

The general features of the topography and hydro biography of the lake can be summarized as follows:

Altitude:	665m at average high water level
Length:	280 kilometers (total)
Width at greatest:	19.4 km
Total area of Lake:	5,364 km ²
Depth at greatest:	93 m
Water temperatures at surface:	22 – 35 ° C
Air temperatures:	22.5° C to 28 ° C at the surface
Rainfall:	16 to 24 inches on the Southern side and 24 to 32 inches on the Northern side of the Lake



Table 1.0 Divisions of Lake Kariba into Strata

Due to the ecosystem change, it was estimated that up to 20,000t of fish per annum would be reached and easily benefit those displaced with the belief that Lake Kariba's productivity would follow that of Lake Malawi. The pelagic zone, thought to have been "empty" was later to be filled by *Limnothrissa miodon* introduced from Rift Valley Lake up north, Tanganyika in 1967. Overall fish production potential for the Lake Kariba fishery has further increased to 30,000t per annum. This is a single stock that is shared between Zambia and Zimbabwe as it prefers the limnetic or pelagic zone. While management of the in-shore fishery (breams, characids, cat fish etc) is per country-basis, because the mixing of fish species in this category is very minimal, management of the pelagic species (*Limnothrissa miodon*) has to be jointly done because fishing units catch the same stock as it moves to any or all parts of the lake.

In 2011, a lake wide frame survey of Lake Kariba jointly with the Zimbabwe Parks and Wild life Management Authority (ZPWMA) with the support of Food and Agriculture Organization (FAO) The survey revealed that number of fishing rigs has increased by 185% from 222 in 1998 to 632 in 2011 while number of Kapenta companies had increased from 50 to 151 over the same period

The catches of Kapenta (*Limnothrissa miodon*) per rig-night has over six years ranged from 0.302 to 0.124 tonnes and continue to decline as the number of players and actual rigs continue to increase year by year

1.1 PROBLEM STATEMENT

Frame survey refers to a complete census of fishers and their fishing crafts. It is an inventory of fish production factors and is conducted in every five years depending on availability of funds. The information collected during frame survey include number of fishing villages by status, fishers, fishing crafts and gears by type and size, infrastructure, facilities and services available at the fishing villages or established fishing companies. This data is collected through total enumeration of; all fishing crafts and gears which could potentially be used in the fisheries need to be captured.

Although the frame survey revealed that there were 632 fishing vessels on the Zambian, it was observed at the Fifth Technical Consultation on the Management and Development of Fisheries of Lake Kariba that there could be more fishing vessels on the Lake than what was actually encountered. The methodology employed during the Frame survey was therefore questioned. It was against this background that the technical committee that sat for a technical meeting in Siavonga Zambia suggested that a complete enumeration of the fishing vessels (Rig survey) was required which employ a completely different methodology from the Frame survey.

1.2 OBJECTIVES

The Key objective of the Rig survey was to conduct a comprehensive enumeration of all the Kapenta fishing vessels (Rigs) on the Zambian side of Lake Kariba

1.3 KEY OUTPUT

Baseline data on the number of Kapenta fishing vessels (rigs) on the Zambian side of Lake Kariba

2.0 MATERIALS AND METHODS

2.1 MATERIALS

The materials to be used during the survey include the following

- Light Aircraft
- Land Transport
- Water transport
- Human Resource
- Questionnaire
- Stationary
- Fuels and Lubricants

2.2 METHODS

Aerial Survey:

- The light plane will fly for approximately 4 hours and will comprise offshore and in-shore transects.
- Survey will utilize both video and still photography to provide a permanent record of rig counts.
- A second comparative aerial survey was undertaken after one week.
- Aerial survey comprised of three persons (two SmartFish consultants and one Zambian official).

Water Survey:

- Involved the use of the Use of the 8-person sleeper vessel (NAMAZAMBWE) and other small boats for a period of eight days to count the number of rigs that are actively engaged in fishing and those that are packed for un known reasons (on land under repair or construction etc)
- Three groups were involved; the first group was based in stratum 1 and 2, the second group was in stratum 3 and the third group was in stratum 4.
- During the survey, Rigs were marked to avoid double counting.

The base data obtained was entered in excel spread sheets for further analysis

Finding 1: Mushrooming of kapenta companies is a direct business of the Ministry of Commerce and Industry since they are regarded as Small Medium Enterprises (SMEs).

Recommendation: there is need for the Ministry of Commerce and Industry to meet with Department of Maritime and Inland Waterways and Department of Fisheries to explore possibilities of harmonizing the Act in an effort to halt the registration of new Kapenta Companies as well as construction of new rigs.

Finding 2: the restriction all the boats without navigation lights from moving between 6pm and 6am is already provided for under the Transport Act of the Laws of Zambia.

Recommendation: There is need to strengthen law enforcement on the lake in order to ensure adherence to this provision. This could be done through increased random patrols jointly between DOF, Maritime and Marine Security.

Finding 3: counting of rigs on the Zambian side is more accurate using water transport as opposed to aerial and land.

Recommendation: water transport should be used during the future rig count survey because of the way rigs are distributed as well as fishing practices implored; a good number of the rigs would not be accessed by land since they pack on the islands while certain landing sites are located behind high hills that obstruct their visibility from the plane.

Finding 4: great number of rigs on Lake Kariba do not have Vessel numbers and fishing licenses while some with vessel numbers are still labelled.

Recommendation: there is need for DOF in conjunction with Maritime Department to conduct regular rigs inspection programme in order to remove all illegally constructed and unlicensed rigs.

Finding 5: there are few rig construction companies with permanent abode but instead company proprietors simply purchase the material and thereafter bring the construction their premises. Consequently, construction of rigs takes place almost everywhere along the shore of the lake. This makes it difficult for the responsible institutions to ensure that correct standards are followed during construction of the rigs; minimum length of the rig and right thickness of pontoon sheets (3mm).

Recommendation: rig construction should be considered as separate industry by companies at their permanent designated places for easy inspection.

Finding 6: Ten Kapenta fishing companies with the total of 38 rigs were found conducting their fishing operations in the riverine system (between the 'gate' and Makunka fishing village) contrary to the Fisheries Act. A good number of rigs were also noticed to be fishing on-shore and fish breeding grounds.

Recommendation: improve law enforcement on the entire lake.

Finding 7: Fifty five (55) kapenta fishing companies with 239 rigs were encountered in Stratum 1 and 343 rigs were found in Stratum 2 owned by 97 companies. The highest concentration of the rigs was in Stratum 2, Zebra Island to be specific with over hundred rigs.

Description	Stratum1	Stratum 2	Stratum 3	Stratum 4	TOTAL
No. of companies	55	97	50	52	254
Total rigs	239	343	228	153	962
Licensed rigs	210	287	174	*	671
Unlicensed rigs	9	56	54	*	119
Rigs with engines	234	307	*	*	541

Comment: kapenta fishers are mobile throughout the lake who follow the highest concentration of kapenta fish species.

Finding 8: most captains interviewed in the survey who did not submit kapenta catch returns expressed ignorance on the matter and lack of knowledge on how to complete the catch return forms.

Recommendation: sensitization of Kapenta fishers on how to complete the catch return forms and its importance to the department towards the planning and management of the fishery.

Finding 9: Year of Kapenta company formation and rigs construction trends

Description		Before 2007	2007	2008	2009	2010	2011	2012	2013
Str 1	% companies	12.2	0.0	7.3	12.2	22.0	7.3	17.1	22.0
	% rigs	28.8	0.5	9.4	4.7	6.8	23.0	8.9	17.8
Str 2	% companies	11.9	3.0	11.9	17.9	16.4	6.0	14.9	17.9
	% rigs	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Str 3	% companies								
	% rigs								
Str4	% companies								
	% rigs								



Fig 1: Percentage distribution of Kapenta companies formation and rigs construction by year in Stratum 1 and 2 on Lake Kariba

Comment: the survey results indicate that an escalation in both the number of companies and rigs on Lake Kariba started in the 2008. This could be attributed to improved accessibility of loans through government facilities such CEEC through which government seeks to promote formation of SMEs. Most rigs that were constructed before 2003 are owned by Maaze Holdings Limited, W.M Enterprises and Lakar Kapenta Fishing which are one of the oldest companies in Sinazongwe area.

4.0 CHALLENGES ENCOUNTERED

During the survey, the water team would encounter bad weather due to lake turbulences and this made the survey to be difficult at times

The outboard engines on the Research vessel would go off especially when in Low Revolution per Minute (LRPM) and this made work difficult

Because fishers were fishing, a lot of time was consumed as a result of following each and every rig.

Due to lack of proper harbours, the water team faced a lot of difficulties to dock the Research vessel.

Most rigs captains who were interviewed did not have key information such as year of company formation, year of rig construction or confirm licensing status of their rigs because they were either newly employed or were not just availed the information by company owners.

APPENDIX 3 - ATTENDANCE LISTS

Kapenta Rig Survey - Zambian Waters of Lake Kariba					
1st December- 14th December 2013 Lake Kariba, Zambia					
ATTENDANCE SHEET					
Participant List					
No.	Name of Participants	Function	Email Address/Phone number	01.12.2013	02.12.2013
1	Mwamba Chijoka	FISHERIES STATISTICIAN	chijokam@yahoo.com -260 977 388061		
2	Emmanuel Silwimba	SENIOR FISHERIES RESEARCH OFFICER	emmasils@yahoo.com +260 977 596540		
3	Simon Banda	SENIOR FISHERIES TECHNICAL OFFICER	bandacs@yahoo.co.uk 0977393312		
4	Simon Humbande	Driver	0960444106		
5					
6					
7					
8					
9					

No.	Participant List		
	Name of Participants	Function	Email Address/Phone number
1	NWEDIBA CHIZOKA	FISHERIES STATISTICIAN	chizokane@yaho.com +260 977388061
2	EMMANUEL SILWIMBA	SENIOR FISHERY RESEARCH OFFICER	emmanuel@yaho.com +260 977596540
3	SIMON BANDA	SENIOR FISHERIES TECH NICAL OFFICER	bandsias@yaho.com 097739312
4	Paul Handwale	Driver	0960444106
5			
6			
7			
8			
9			

APPENDIX 4 - SAMPLE AREA COORDINATES

Area	starting coordinates		End Coordinates	
A	16°31'23.06"S	28°45'27.75"E	16°28'9.78"S	28°39'16.50"E
B	16°28'9.78"S	28°39'16.50"E	16°45'23.48"S	28° 5'7.08"E
C	16°45'23.48"S	28° 5'7.08"E	16°56'9.82"S	27°43'49.07"E
D	16°56'9.82"S	27°43'49.07"E	17°16'8.18"S	27°27'30.78"E
E	17°16'8.18"S	27°27'30.78"E	17°48'57.02"S	27° 8'20.99"E
F	17°48'57.02"S	27° 8'20.99"E	17°57'12.66"S	27° 1'57.59"E

APPENDIX 5 - FINANCIAL BREAKDOWN

BUDGET FOR LAKE KARIBA KAPENTA RIG SURVEY					
Cash received	€	16 490.00			
EFT for ProCharter		ZMW 32456.44			
ASSETS	Unit cost Euro	Number	Duration	Units	Total expected costs
3 Fisheries officers per diems + 1 driver	€	60.00	4	10 DAYS	€ 2 400.00
Vehicle hire	€	144.00	1	10 DAYS	€ 1 440.00
Airport taxes	€	90.00	8	1 trip	€ 90.00
Vessel hire, all inclusive	€	8 169.00	1	8 DAYS	€ 8 169.00
TOTAL UTILISED FOR SURVEY					€ 12 099.00
Cash Return to SmartFish					€ 4 391.00

Due long delay in the aircraft payment, the land based component of the survey was cancelled resulting in the cash return to SmartFish

LAKE KARIBA, RIG SURVEY - 2013

Objective and Purpose of the survey: The Rig Survey is meant to have a complete count and identify location of kapenta fishing rigs on the Zambian side of Lake Kariba whether they are licensed or not; it is further desired to take stock of all kapenta fishing rigs construction/ fabrication facilities.

PART ONE: GENERAL INFORMATION (To be collected by both land and water teams)

Date: ____/____/____ (dd/mm/yyyy) Name of Recorder: _____ Stratum: _____ Name of Respondent (or Captain): _____
 Mobile No. of Respondent: _____ Company Name: _____ Year Company established: _____ Total Rigs Owned: _____

PART TWO: RIG CHARACTERISTICS

Rig Number	Rig Type	Year Fabricated	Name of Rig Maker	Where Rig Maker located?	Engine Propulsion?	Is Rig Licensed?	How many months has rig fished in 2013	Does Rig Overly look seaworth?
	1. Portoon 2. Monofund			1. Stratum 1 2. Stratum 2 3. Stratum 3 4. Stratum 4	1. Yes 2. No	1. Yes 2. No		1. Yes 2. No

LIST OF PUBLICATIONS – LISTE DES PUBLICATIONS

1. *Report of the Inception / Focal Point Meeting of the SmartFish Programme – Flic en Flac, Mauritius, 15th-16th June 2011.* REPORT/RAPPORT: SF/2011/01. August/Août 2011. SmartFish Programme. Indian Ocean Commission. (55 pages)
2. *Report of the First Steering Committee Meeting of the SmartFish Programme – Flic en Flac, Mauritius, 17th June 2011.* REPORT/RAPPORT: SF/2011/02. August/Août 2011. SmartFish Programme Indian Ocean Commission. (51 pages)
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5. *Regional Market Assessment (Supply and Demand).* REPORT/RAPPORT: SF/2012/05. March/Mars 2012. SmartFish Programme. Indian Ocean Commission. (264 pages)
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13. *Review Of The Legal Framework for the ESA-IO Region.* REPORT/RAPPORT: SF/2012/13. June/Juin 2012 SmartFish Programme. Indian Ocean Commission. (149 pages)

14. *Comprehensive capacity review to implement effective MCS in the ESA-IO Region.* REPORT/ RAPPORT: SF/2012/14. June/Juin 2012 SmartFish Programme. Indian Ocean Commission. (101 pages)
15. *Assessment of IUU Fishing in Lake Tanganyika.* REPORT/RAPPORT: SF/2012/15. June/Juin 2012 SmartFish Programme. Indian Ocean Commission. (58 pages)
16. *Spirulina – A Livelihood and a Business Venture.* REPORT/RAPPORT: SF/2012/16. SmartFish Programme. June/Juin 2012 Indian Ocean Commission. (45 pages)
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18. *Value Chain Analysis of Fisheries Sector for Rodrigues.* REPORT/RAPPORT: SF/2012/18. June/Juin 2012 SmartFish Programme. Indian Ocean Commission. (85 pages)
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21. *Options to Reduce IUU Fishing in Kenya, Tanzania, Uganda and Zanzibar:* REPORT/RAPPORT: SF/2012/21. August/Août 2012 SmartFish Programme. Indian Ocean Commission. (99 pages)
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24. *Une Analyse Globale de la Chaîne D'approvisionnement de la Pêcherie du Crabe de Mangrove (Scylla serrate) à Madagascar.* REPORT/RAPPORT: SF/2012/24. August/Août 2012 SmartFish Programme. Indian Ocean Commission. (81 pages)
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27. *Report of the Second Steering Committee Meeting of the SmartFish Programme.* REPORT/RAPPORT: SF/2011/27. August/Août 2012. SmartFish Programme Indian Ocean

Commission. (29 pages)

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33. *The Feasibility of Aquaponics in Mauritius*. REPORT/RAPPORT: SF/2013/33. August/Août 2012 SmartFish Programme. Indian Ocean Commission. (63 pages)

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37. *Gestion des Ressources en Eau pour l'Industrie du Thon*. REPORT/RAPPORT: SF/2013/37. Octobre/ October 2011 SmartFish Programme. Indian Ocean Commission. (95 pages)

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43. *Third national focal point meeting*. REPORT/RAPPORT : SF/2013/43. April/Avril 2012 SmartFish Programme. Indian Ocean Commission. (25 pages)

44. *Inventaire et évaluation des capacités des organisations des organisations professionnelles de pêcheurs des pays de la COI*. REPORT/RAPPORT : SF/2013/44. April/Avril 2012 SmartFish Programme. Indian Ocean Commission. (77 pages)

SmartFish is a regional fisheries programme managed by the Indian Ocean Commission, funded by the European Union and co-implemented by the Food and Agriculture Organization of the United Nations. SmartFish, which operates in twenty countries throughout the Indian Ocean Region, Southern and Eastern Africa, focuses on fisheries governance, management, monitoring control and surveillance, trade, and food security.

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