

アフリカと日本の架け橋となる次世代の人材を育成する 国際獣医学・保全医学教育プログラム [IVCMEP]

～ザンビア - 北大の頭脳循環成果を基盤として～

International Veterinary and Conservation Medicine Education Program



保全医学に資する人材育成

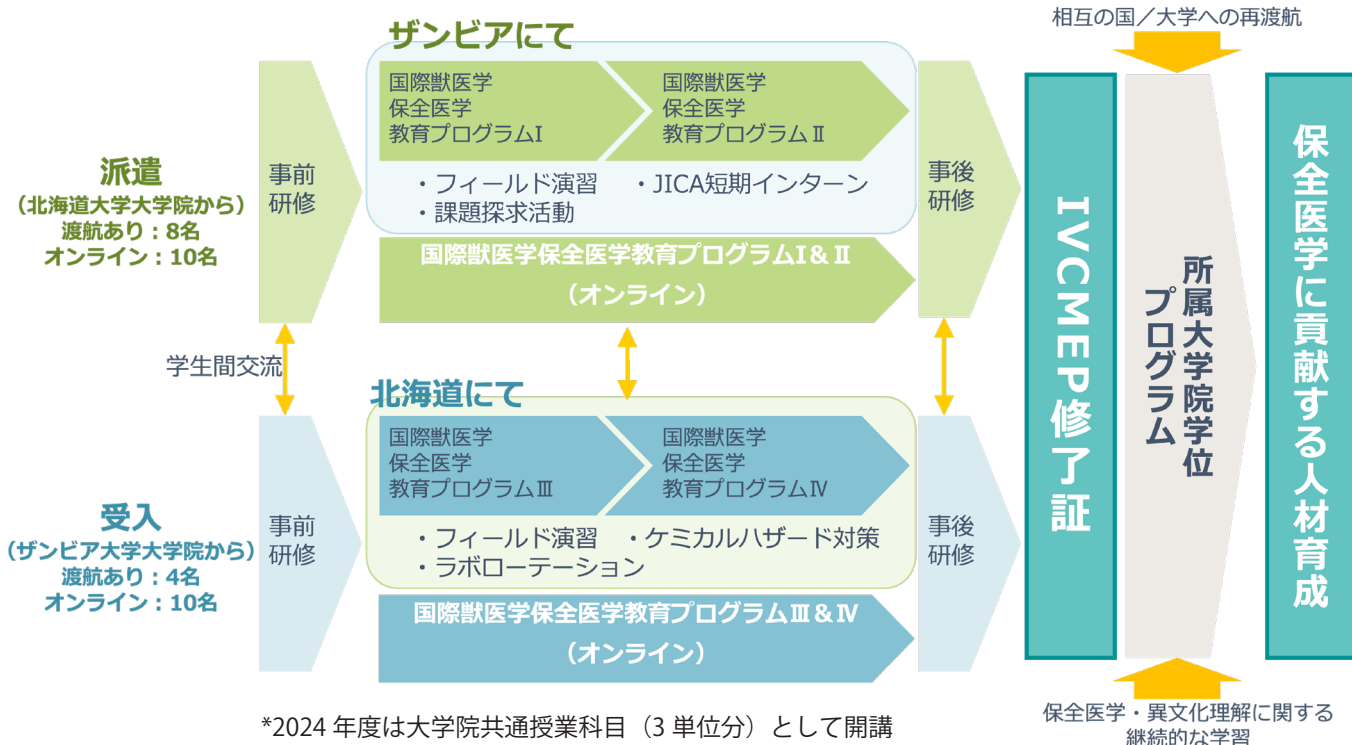
保全医学（conservation medicine）の概念は2000年に入り急速に世界に広まった新しい学問分野です。人間の活動に伴う環境の変化とそれに付随する感染症や汚染物質による健康問題は世界的に解決しなければならない課題です。保全医学は、「健康」について、人間だけではなく、動物や生態系、社会、そして広くは地球全体の健康問題として捉えるOne Healthの概念の下で進められます。保全医学の推進のためには医学、生態学、獣医学、工学、農学、経済学、地球科学、情報学、文学、人類学など、文系理系の枠を超えた多分野間の連携が必要です。IVCMEPでは多分野の学生が参加できるようカリキュラムを構築し、北海道大学のどの学院／研究院からでも応募できます。

ザンビア大学との「知の循環」

IVCMEPはアフリカの中でもこれまで約40年間にわたって交流を続けてきたザンビア大学と連携したプログラムです。ザンビア大学には北海道大学で学位を取得したザンビア人教員が多く在籍しており、感染症や環境・資源分野など、保全医学に関して大学間で組織だった教育交流が可能となっています。本事業では、日本で育ったザンビア人教員や在学生、過年度の参加者が日本の大学院生を教育する頭脳循環のグッドプラクティスとなる取り組みを実施しています。



コースの構成



コンピテンシー評価

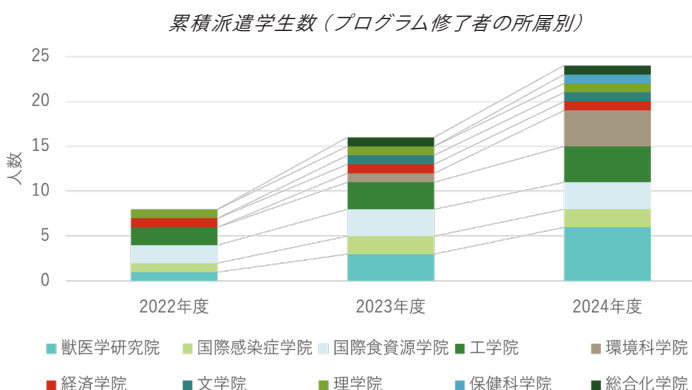
コンピテンシー評価とは、学習における到達目標の内容を詳細に定義した上で学習効果を評価するものです。コンピテンシーは日本語で行動特性と訳されることも多く、学生が各目標を達成した場合に表に現すことができる知識、技能、行動を具体的に示した到達度の評価指標として利用されます。従来の評価と比べ評価者の主観ではなく、具体的な行動とベースとした評価手法のため客観的で公正な評価に結びつきやすいことで近年注目を集めています。評価される学生側も「どのような行動特性を評価されたのか」「どの行動特性については、不十分だったのか」が理解できるため、結果としてモチベーションの向上にもつながります。今年度は① One Health に関する知識 ② 異分野融合 ③ 異文化理解 ④ 課題解決能力 ⑤ 語学力の5つの観点ごとに5段階でコンピテンシーを設定した表(ルーブリック)を作成・運用しました。

2024年度ルーブリック

Rubric (performance description of each criteria)

Level	S : Advanced	A : Sophisticated	B : Competent	C : Fair	D : Incompetent
Description	実務に保全医学に関する課題解決を行う能力を持っている	保全医学に関する知識を体系的に習得し、課題解決の方法を説明できる	保全医学に関する社会課題について複数の分野/ステークホルダーについて自分の専門分野を統合して説明できる	保全医学に関する特定の課題に、保全医学の概念や知識をほとんど活用しない	保全医学の概念や知識をほとんど活用しない
1. One Healthに関する知識	One Healthの概念と知識を専門領域と密接に関連させ、かつ保全医学に関する社会課題を導き出すことができる	One Healthの概念と知識を自分の専門分野の知識と結びつけることができる	One Healthの概念を認識し、自分の専門分野の知識と結びつけることができる	One Healthの概念を認識している	One Healthの概念や知識をほとんど活用しない
2. 異分野融合	自分の専門と異なる分野の専門知識やネットワークを積極的に活用できる	自分の専門と異なる分野の専門知識やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門と異なる分野の専門知識やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門と異なる分野の専門知識やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門と異なる分野の専門知識やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している
3. 異文化理解	異なる文化を持つ多様な立場の人々やネットワークを積極的に活用できる	異なる文化を持つ多様な立場の人々やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	異なる文化を持つ多様な立場の人々やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	異なる文化を持つ多様な立場の人々やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している	異なる文化を持つ多様な立場の人々やネットワークを積極的に活用し、自分の専門分野の課題の多面的な理解につながるよう努力している
4. 課題解決能力	自分の専門分野に関する社会課題を解決することができる	自分の専門分野に関する社会課題を解決し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門分野に関する社会課題を解決し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門分野に関する社会課題を解決し、自分の専門分野の課題の多面的な理解につながるよう努力している	自分の専門分野に関する社会課題を解決し、自分の専門分野の課題の多面的な理解につながるよう努力している
5. 語学力	英語でOne Healthに関する社会課題の解決法について立案し、その解決法を他の場で知識として伝えることができる	英語でOne Healthに関する社会課題の解決法について立案し、その解決法を他の場で知識として伝えることができる	英語でOne Healthに関する社会課題の解決法について立案し、その解決法を他の場で知識として伝えることができる	英語でOne Healthに関する社会課題の解決法について立案し、その解決法を他の場で知識として伝えることができる	英語でOne Healthに関する社会課題の解決法について立案し、その解決法を他の場で知識として伝えることができる

これまでの参加学生



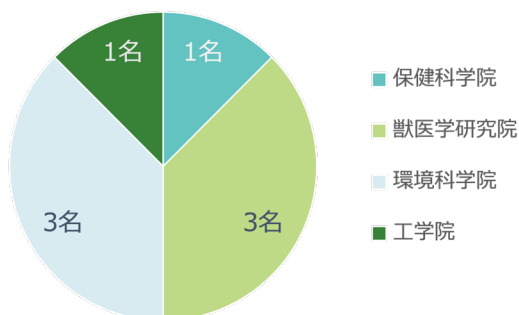
本プログラムには文理を問わず全研究院から学生が参加してきました。参加の動機は専攻に関する興味関心のほか、ザンビアでの人的ネットワークの拡充やサンプリング活動により自信の研究内容の幅を広げたり、国際的なキャリア形成や国際協力の現場について見聞を深めたり様々です。本プログラムでは保全医学をキーワードとした多岐に渡るフィールド演習のほか、面談に基づくセミオーダーメイドプログラムによりバックグラウンドや発想が異なる学生が集い、参加者の間でも学び合う環境を重視しています。

2024 年度実施概要

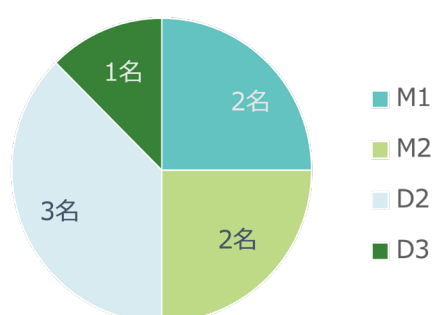
学生派遣

北海道大学参加学生人数：8 名

派遣学生所属別内訳



派遣学生学年別内訳



活動内容

事前学習

[7～8月]

- ・ アカデミックイングリッシュ
- ・ 海外リスクマネジメントセミナー
- ・ JICA ザンビア事務所オンラインセミナー
- ・ 課題探求活動企画／調整



ザンビア渡航

[9月7～9月24日]

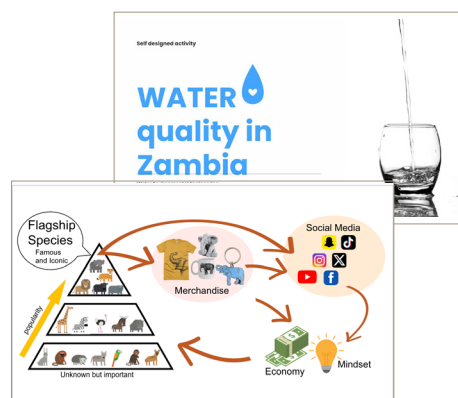
- ・ JICA ザンビア事務所
- ・ 重金属汚染環境修復サイト
- ・ 農業技術開発センター
- ・ Mosi-Oa-Tunya 国立公園
- ・ 課題探求活動 (SDA)



事後学習

[9～10月]

- ・ 活動報告会
(ザンビア大学とオンライン接続)
- ・ レポート作成



「課題探求活動 (Self-Designed Activity; SDA)」とは？

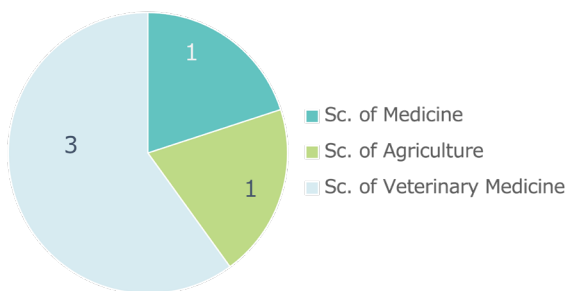
保全医学の実現には今まさに起きている**社会課題の抽出 / 解決能力と専門分野や文化を超えたコミュニケーション能力**が必須となります。そこで、滞在中の原則3日間はフリーデザインとし、学生が主体的に活動する期間としました。参加学生はまず、事前学習の一環として**各自の関心に沿って One Health/ 保全医学に関するテーマを設定**します。テーマは大学院の専攻内容に準じたものである必要はなく、卒業後のキャリアまで見据えた上でザンビア特有の課題を抽出し一人一人企画書を作成します。IVCMEP 事務局の仲介によりザンビア大学の研究者や JICA 職員、およびその関係団体にカウンターパートを依頼し、そのあとは学生が直接カウンターパートと活動内容や詳細なスケジュールの調整を行いました。実際にザンビアに渡航してからは、フリーデザインの日程でフィールド計測やインタビューなどをカウンターパートとともに実施し、帰国後にはプレゼンテーション形式の報告会の開催とレポートの作成を行いました。最終成果物となったレポートは本冊子にも掲載しています。



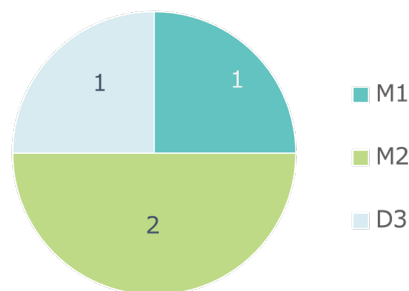
学生受入

ザンビア大学参加学生人数：4名

Students' affiliation



Academic year

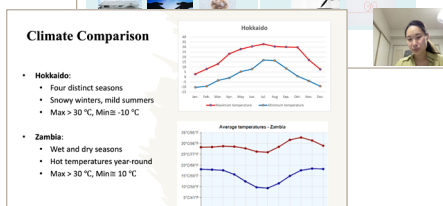


活動内容

事前学習

[6～7月]

- ・ 日本文化と言語のオンライン学習
- ・ ラボローテーション企画



北海道渡航

[7月8～7月26日]

- ・ ケミカルハザード専門家講習
- ・ 豊羽鉱山フィールド演習
- ・ 知床生態系フィールド演習
- ・ ラボローテーション



事後学習

[9～10月]

- ・ 活動報告 / 交流会
- ・ レポート作成
- ・ ラボローテーション
フォローアップ



オンライン受講

参加学生人数：13名

開講内容

ケミカルハザード対策、感染症対策、環境修復など幅広いラインナップから3授業分（1コースあたり8科目相当）を学生自ら選択しオンデマンド形式にて受講しました。

【 Example of the classes 】

- Chemical Hazard Control
 - ・ Field Toxicology & Risk Analysis
 - ・ Chemical Analyses
 - ・ Comprehensive Studies on Chemical Hazard Control
 - ・ Environmental Remediation and Diagnostic Techniques
 - ・ GIS and satellite remote sensing
 - ・ Informatics
- Mechanism, Assessment and Remediation of Environmental Pollution
- Advanced and Comprehensive Studies on Zoonosis Control
- Advanced Seminar on Conservation Medicine

次のページより派遣学生の訪問先及び課題探求活動のレポートを掲載しています
受入学生のレポートは逆開きの英語版をご覧ください

参加者による訪問先レポート

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在ザンビア日本国大使館 および JICA ザンビア事務所 Embassy of Japan and JICA office

環境科学院 M2 石田隆悟

Graduate School of Environmental Science M2

Ryugo Ishida

Embassy of Japan

Our first visit was to the Embassy of Japan in Lusaka, where we met with Ambassador Takeuchi. We outlined the objectives of the IVCMEP mission, and each member introduced themselves. Ambassador Takeuchi expressed his appreciation, emphasizing the long-standing relationship between Japan and Zambia, which has persisted since Zambia's independence. He particularly acknowledged Hokkaido University's contributions,



Fig.1 With Ambassador Takeuchi

notably its partnership with the University of Zambia. The ambassador also provided an update on Zambia's current situation, highlighting severe drought. Despite being early in the dry season, the country is already experiencing water shortages. Zambia's electricity comes from hydropower, the water crisis has led to significant power cuts. The government has enforced 21-hour blackouts, leaving just 3 hours of electricity daily.

JICA Office

Our next visit was to the JICA office, where we received a presentation from a member who has been working there since this March. The talk was about JICA's activities in Zambia and the country's development challenges, with a particular focus on infrastructure, the economy, and public health. One key theme in tackling Zambia's challenges is "distance." With a population density much lower than Japan's (about 1/13), Zambia faces significant difficulties in extending infrastructure such as power lines and water supply across its vast landscape.

Zambia's heavy reliance on copper exports, which account for 60% of its total exports, was another major focus. This dependence leaves the country vulnerable to global price fluctuations. Since the decline in copper prices in the 1970s, Zambia's economy has struggled with debt and poverty. The presentation emphasized the importance of diversifying the economy, particularly through agriculture and manufacturing, to reduce this dependency. JICA is actively promoting rice production, which has strong potential, as well as supporting small and medium enterprises to stimulate economic diversification.

Healthcare remains another priority, with JICA supporting the construction and upgrade of hospitals in Lusaka to ease the burden on major referral hospitals and enhance access to essential services, including cesarean sections.

The final point of discussion was China's increasing influence, particularly through infrastructure loans. While Chinese financial assistance has enabled important projects, such as road construction, concerns remain about Zambia's growing debt burden. He emphasized the need for continued international cooperation, including



Fig.2 JICA office in Lusaka

from Japan, to ensure sustainable development. JICA's role in capacity-building, through training programs and technical cooperation, remains vital in helping Zambia develop self-sufficient healthcare, agriculture, and manufacturing sectors.

The second presentation focused on strengthening healthcare systems in developing countries. The talk emphasized the need for robust healthcare infrastructure, staff training, and medical equipment to improve access to quality care. JICA has been instrumental in upgrading hospitals, providing essential equipment, and improving healthcare services, particularly in Zambia. The speaker discussed how JICA-funded projects have enabled hospitals to tackle significant public health challenges, including COVID-19.

The discussion moved to the decentralization of healthcare management, which allows for more localized service. The presentation also covered the challenges that arise after project completion, such as maintaining infrastructure and managing advanced equipment. While Japanese contractors often provide equipment, local teams sometimes face difficulties due to a lack of training. To address this, JICA offers training programs in Japan for local healthcare workers.

The presentation concluded by recognizing the crucial role international partnerships play in achieving universal healthcare coverage. However, local governments must also eventually take full ownership of these systems to ensure they can manage the infrastructure and continue providing essential services once external support has ended.

My impression

During our stay, I frequently saw the Japanese flags across Zambia, particularly at hospitals and research facilities. It was heartening to see the respect Zambians have for Japan and how the strong ties from Zambia's early independence are reflected in their daily interactions. I

also noticed the importance they place on relationships and communication, which I believe is vital for a landlocked country where diplomacy and neighborly relations are key to stability.



Fig.3 Lecture of strengthen healthcare

国交 60 周年記念イベント 60th Anniversary of Zambia-Japan Cooperation event

獣医学研究院

Graduate School of Veterinary Medicine D2

Jeremiah Buumba Chijikwa

BACKGROUND

Zambia and Japan have enjoyed cordial international relations since October 1964, the year in which Japan acknowledged Zambia as a nation. A few years later, Japan opened its embassy in Zambia and since then, the relationship between the two countries has only grown stronger.

The year 2024 marks not only 60 years of Zambia's post-independence sovereignty but also 60 years of relations with Japan. To celebrate this milestone, the two countries have reflected on the many projects and programs that have been facilitated through this cooperation. Japan has been involved in several areas of Zambia's development including but not limited to healthcare, infrastructure, education, agriculture, water and sanitation, Japan overseas cooperation volunteers and others.

60TH ANNIVERSARY EVENT AT UNZA

The event held at the University of Zambia (UNZA) was organized and coordinated by the Hokkaido University (HU) IVCMEP program students, with support from the HU international office. The event was publicized around UNZA through flyers to increase awareness and motivate people to participate in the event (Figure 1). It was attended by mostly students from UNZA and coincidentally, there were some visiting students from

Hiroshima university who attended.

The actual event program was as follows;

14:00 Opening remarks

Ms Patricia Sakala from International Link office.

14:05 Introduction to One Health and Conservation Medicine Rio Doya, Researcher from School of Veterinary Medicine.

14:10 Short presentation – Hokkaido University students

- 1) Graduate School of Environmental Science.
- 2) Graduate School of Health Science.
- 3) Graduate School of Engineering.
- 4) Graduate School of Veterinary Medicine.

15:10 Short presentation - UNZA students.

15:40 Interactive session including auditory students.

15:55 Closing remark Mr. Goto from Japanese Embassy.



Fig.1 Flyer advertising the event

The event was opened by Ms. Sakala, who read a speech on behalf of the Deputy Vice Chancellor of the University of Zambia, who commended the initiative and highlighted the many collaborations between the two universities, especially through the school of veterinary medicine. She also indicated the need to spread such collaboration to other fields such as the humanities and social science faculties.

The IVCMEP is primarily a one-health program that exposes participants to various related topics that cut across human, animal and environmental health as well as other interconnected fields. The one-health presentation highlighted the basic principles and concepts relating to it.

Alumni of the IVCMEP program from the University of Zambia made presentations on their experiences

through the program both in Japan and Zambia and how this had impacted their studies, careers as well as personal lives. They spoke about the unique opportunity they got to see and make comparisons of the challenges and solutions to similar issues that the two countries experience.

The Hokkaido University students also presented on the faculties they belonged to and the programs offered. They further went on to enlighten their counterparts on some of their research projects (Figure 2).

To foster further discourse, an interactive session was undertaken (Figure 3).



Fig.2 Hokkaido University students presenting



Fig.3 Interactive session

This was in the form of a game where individuals asked their colleagues general questions to see what things they had in common. Those with the most answers would be considered the most sociable and eventual winners.

The event was closed off by a speech and vote of thanks by Mr. Goto, First Secretary at the embassy of Japan in Zambia. He reiterated the importance of the relationship between Zambia and Japan and how it was beneficial for both countries. He commended both organizers and participants for a wonderful interaction and wished everyone the best as this relationship continues further into the future.

A group picture was taken with some of the participants to wrap up the event.



Fig.4 Group picture with invited guests

Natural Resources Development College [JICA ボランティア活動 サイト]

Visit to Natural Resources Development College (NRDC)

環境科学院

Graduate School of Environmental Science, D3

Anushilan Acharya

General information

The National Resources Development College (NRDC) is a public institution established in 1965 and operates under the Ministry of Agriculture. Affiliated with the University of Zambia (UNZA), NRDC offers 3-year diploma-level training in eight distinct agricultural disciplines. The available programs include Agricultural Business Management (ABM), Animal Science Major (ASM), Agricultural Education and Extension (ED), Agricultural Engineering (AE), Fisheries and Aquaculture, Crop Science (CS), Food and Nutrition (FN), and Water Engineering (WE).

The college places a strong emphasis on practical training, allowing students to gain hands-on experience in laboratories, engineering workshops, and on the college farm, as well as through industrial attachments.



Fig.1 NRDC

Site Visit

On September 10, 2024, we visited NRDC, where we were assisted by JICA volunteer Nariai-San as we explored the college's various farm facilities. For the visit, we wore boots provided on-site, and Nariai-San briefed us on the current conditions and operations of each farm area.

Pig Farm: The pig farm featured several units, including a pig shed, drainage unit, and sanitization unit. Unfortunately, the sanitization unit was present but not in use, potentially increasing the risk of disease



Fig.2A Sanitization Unit



Fig.2B. Drainage system

vtransmission.

Chicken Farm: The chicken farm housed a variety of chickens, primarily broilers and layers, ranging in age from two days to over a month. The layout also included numerous cages designated for egg-laying.

Goat Farm: The goat farm consisted mainly of a few female goats. While the area was relatively clean and equipped with basic shelters, there is room for improvement in facilities.

Cow Farm: This farm was home to many cows of various breeds, including Jersey and Tonga. The cows were tagged for identification, and most were allowed to graze in a controlled open area. Some milking cows were tethered, providing one of our participants, Shinji San, with the enjoyable opportunity to milk a cow.

Hay Stacking: JICA volunteers, alongside NRDC students, collaborated to create a unit for stacking hay and producing hay rolls. This innovative basket-like equipment allows for efficient stacking and rolling of hay, facilitating easy storage, transportation, and nutrient preservation for future use.

While the farms at NRDC have functional components such as sanitization and drainage systems, they are not operating at their full potential. However, the implementation of the hay-rolling method stands out as a commendable innovation that can be easily adopted for improved agricultural practices.



Fig.3 Hay stacking unit



Fig.4 Hay rolls produced using hay stacking unit

Mwapula マザーシェルター

[NPO 法人ロシナンテス]

Mwapula Mothers Shelter

保健科学院 M1 久野智海
Graduate School of Health Science M1
Tomomi Kuno

Background

The average lifespan in Zambia is 62.5 years. It is younger than that in Japan, which reaches 84 years old, meaning there are some health issues in Africa. The maternal mortality rate in Japan is 2.8/100,000, and it in Zambia is 213/100,000. This rate is much higher than that of other regions. In the world, this rate is lower than 100/100,000 except Africa. In some villages, there are still some mothers who give birth at home. Home delivery is much more dangerous than delivery in hospital, but some mothers don't know its risk. The neonatal mortality rate in Zambia is 25 times higher than that in Japan, this rate shows the importance of establishing safe childbirth facilities. One of these facilities is Rocinantes, which is NPO is focusing on mortality rate in Zambia

Mwapula Mothers Shelter gives mothers opportunities to learn the importance of safe delivery and facilities of safe birth.



Fig.1 Mothers Shelter

Facilities at mothers shelter

At mothers shelter, mothers can not only deliver their baby but also they can take prenatal checkups with ultrasound, and they can stay longer until their delivery. At the beds of mothers, each bed has a mosquito net, because malaria is one of the most dangerous risks for pregnant mothers.

Mothers can be inspected with their baby and can be checked TB and HIV because these two diseases are sometimes overlapping and expanding in Africa. Staff at



Fig.2 Bed for mothers

the shelter uses ultrasound probe which can be directly connected to smartphone.

Challenges and problems

There is no hospital near the mothers coming to shelter. Even though this shelter is the nearest place for safe delivery, it takes mothers 1~3 hours by foot from their home. Their husbands are busy with their agricultural work, so coming to shelter is not easy for mothers. The shelter told mothers to come for inspection at least 4 times before giving birth, but this may not be enough from a Japanese perspective. In Japan, mothers take inspections 14 times or more before the delivery. To ease this problem, the shelter tells mothers that they can stay longer for months until birth, but most mothers go back home the same day because they must work as housekeeping. Still there are some mothers who deliver at home and don't know the risk of delivery. For this problem, shelter gives mothers opportunities to know the importance of safety delivery. I think shelter plays an important role, since young mother said they know the risk of home delivery. Shelter is working to increase the ratio of safety delivery.

Mothers at the shelter

Not only for safety delivery, but mothers can also communicate with other mothers at the shelter. When we visited there, they cooked us nshima, which is soul food in Zambia. Mothers come with their children, and everyone ate Nshima together. At the shelter, they can receive simple treatment, and there was a doctor and he gives treatment for slightly injured kids or gives medicine. Although it was simple compared to Japanese hospital, the Mwapula Mothers Shelter plays an important role in the community.

Nsansa 孤児院 [NPO 法人 Nsansa] Nsansa Village Community Development Mission: Supporting Zambia's Street Children

工学研究院 M1 進士絢香

Graduate school of Engineering M1

Ayaka Shinji

Introduction

The Nsansa Village Community Development Mission (hereafter, Nsansa) is a non-profit organization in Zambia dedicated to supporting street children by providing education, shelter, healthcare, detoxification support, and skills training. Founded ten years ago, Nsansa currently houses around 30 boys. This report explores Nsansa's mission, its ongoing operations, the types of support provided, challenges encountered, and its future prospects.

Activities and Current Situation at Nsansa

Nsansa was founded by Mr. Jasper Mutale. Nsansa's main activities focus on aiding street children by offering education, healthcare, and safe accommodation. The children live in modified containers to ensure a secure environment, receiving daily meals that meet their nutritional needs. Regular psychological counseling is also provided as part of Nsansa's comprehensive health support program.

Experience Visiting Nsansa Village

Upon arrival, we were welcomed with songs, creating a joyful atmosphere. The children eagerly engaged in learning math, Japanese characters, and playing games. Many were familiar with Japanese culture due to JICA staff visits. The children were excited to receive Japanese names, and I connected with a boy named Shota, who dreams of becoming a businessman in Japan. He gifted me a handmade bracelet, symbolizing our bond.



Fig 1. Learning Kanji



Fig.2 Welcoming us with song



Fig.3 Played together

Story of a Specific Boy

One story particularly illustrates the importance of Nsansa's support. A young boy, left parentless, struggled with hunger and eventually resorted to using drugs, which were more affordable than food, leading him into street life. Due to political unrest, he was frequently targeted by the police, experiencing violent assaults and fleeing repeatedly. Upon hearing his story, Mr. Mutale welcomed him into Nsansa, providing him with shelter and the chance to begin a new life.

Living Conditions at Nsansa

Through field research, I observed the children's living conditions at Nsansa. The boys reside in shared spaces, with two children per mattress or four per bunk bed within the containers. In contrast to Japanese orphanages, which are generally well-funded and provide private rooms, Nsansa faces significant financial limitations, impacting the space and resources available. Despite these constraints, the children expressed feelings of safety and security, relieved to be away from the dangers they previously faced on the streets.

Types of Support Provided

Nsansa provides a variety of essential and practical educational programs. In addition to fundamental subjects such as math and language, the children learn cooking and other vocational skills to help them achieve self-sufficiency. Health support includes psychological counseling to address past trauma and support mental well-being. Nsansa also extends its care to street children who have not yet joined the facility, offering weekly meals and monitoring their welfare.

Differences from Japanese Orphanages

A primary reason for children entering orphanages in both Japan and Zambia is domestic abuse. However, in Zambia, children also face significant risks of abuse on the streets, where they are exposed to violence and exploitation. Furthermore, the easy availability of cheap drugs leads some children into drug dependency, which can result in criminal activity and subsequent admission to orphanages. These unique challenges emphasize the distinct issues faced by Zambian orphanages in

comparison to those in Japan.

Challenges and Constraints

Nsansa relies on donations, which limits its capacity to expand and admit more children. Although it prioritizes vulnerable children, current funding situation restricts the number of new entry.

Future Prospects

Nsansa aims for financial self-sufficiency through sustainable revenue sources. Mr. Mutale is exploring a mining operation to secure funds, enabling the organization to expand its support for street children without relying solely on donations.

Conclusion

Nsansa Village plays a critical role in supporting Zambia's street children, helping them to build safe and healthy lives. However, to continue providing sustainable support, addressing financial challenges and securing long-term stability are essential. Nsansa would benefit from additional resources to broaden its reach and continue this valuable work in the years ahead.

Maambo 村

Maambo Village

Veterinary Medicine D2

Joshaniel Tan Yong Yin

Background – the effects of climate change on subsistence farms

Maambo village is a small coalition of multi-generational families that are based outside of Mazabuka, Zambia. Their livelihood relies on subsistence farming of crops and livestock, and they mainly practice traditional methods and crop types. As the main staple food in Zambia is nshima, it is extremely common to grow maize and a variety of vegetables as a means to supplement their diet throughout the year. In terms of animal husbandry, keeping some cattle, goats, and chickens for meat is also common.

Many of the practices have been passed down through generations, so these populations have been using certain techniques for extremely long periods of time and are not the best equipped to deal with change. As a result, many farms are attempting to learn how to deal with climate change and the differences in conditions that are becoming more prevalent.

The most startling example is the changes in rainfall and the length of the rainy season. When talking to the

successor to the head of Maambo village, I was told that the rainy season is generally from November to April, and they can expect around 600 -1000 mm of rain. However, the past few years have had less rainfall than usual, and 2023 was especially bad – only about 200 mm of rain fell. Not only was the rainfall significantly lesser, the rainy season ended extremely early. This led to substantially dry top soil, which was subsequently blown away during the dry season. Dry topsoil also results in the difficulty of planting crops, which has in turn affected the harvest along with the poor rainfall levels.

Another aspect of traditional farming that has resulted in poor adaptability to volatile conditions is the reliance on rainfed agriculture in these smaller farms. Many of these farms have access to groundwater through boreholes, which are mainly used for household purposes like drinking and washing and not for irrigation. While irrigation exists, I did not observe it being used outside of the larger sugarcane plantations in the area, and it does not seem likely that these small scale farms would be able to afford such an expensive aspect of infrastructure.

Finally, even though maize is the most common crop to plant due to it being made into nshima, it can be vulnerable to drought. Some researchers have suggested investing into researching and developing alternatives that are adapted to the local conditions and are also more drought-tolerant. Nshima is also made from other staple crops, such as cassava, millet, or sorghum, in other regions. Cassava and sorghum are both known to be more climate-resistant, and could be prime candidates for substitutes.



Fig.1 Extremely dry conditions on the farm

Documenting disappearing species

As the farm has been operating for generations, they are intimately familiar with the species of animals and insects that are commonly found on their land. However, they have noticed in recent years that many

insect species are no longer appearing, and so they have started an effort to collect and preserve as many of these insect species as possible.

Unfortunately, they have not been able to comprehensively identify all species, but the main purpose of this effort is to create a preliminary database to keep track of species that used to be found in this area. In addition to insects, there were a few bones from a hippopotamus and a crocodile that apparently have become much more rare in the nearby river.



Fig.2 Disappearing insects being preserved for future reference

Adapting to changing conditions

As a response to the changing conditions, especially the lack of rainfall, the farm is in the process of exploring alternative methods to be more resilient. One project they have embarked on is creating a fish pond that is stocked with tilapia, another staple protein in Zambia. The fish are quite low-maintenance and are able to feed on byproducts from the farm and vegetation that grows nearby. The water needed to stock the pond is able to be drawn from the groundwater relatively easily as well. Another avenue is expanding the types of livestock that they are keeping for consumption past just chickens, goats, and cattle. They have started to raise turkeys, guinea fowl, and ducks to see if they can thrive in these conditions. These birds are known to be quite easy to



Fig.3 Small plot with experimental crops being grown

raise and can be kept as free-roaming around the farm, and so require little maintenance.

Finally, they also keep a small plot of land where they test out new and alternative crops to the regular staples. The goal is to identify which types of vegetables can last through a drought without withering, and so far they have tested plants like kale, chard, and a type of spinach. According to them, the kale can stay planted for up to five years, and the chard can be harvested throughout the year as it has multiple harvests. Along with new types of crops, they are also testing alternatives to traditional pesticides to protect these crops. One such strategy is to cover the leaves of the plants in ash, which prevents insects from feeding on them.

資源産業と生物多様性 [Quantum Mineral Ltd.] Mining and Biodiversity Stewardship

School of Environmental Science M2

Joyce Defigueirefo

On September 13th, our visit to the KCM Mining site in Nampundwe was unfortunately not authorized, but as a testament to the development of our problem-solving skills and dedication to fulfilling all the different facets of one health, we were able to attend the Mining and Biodiversity Stewardship held at the university of Zambia (UNZA), as a way to incorporate the Mining and Natural resources component of the program.

This stewardship had keynote speakers Jackson Katampi and David Squarre, who are UNZA Veterinary Medicine alumni, and representatives of First Quantum Minerals. The aim was to have an open discussion and explanation on the topic: Can mining and conservation co-exist? It also had the goal of showcasing First Quantum's efforts in bridging the gap between mining and biodiversity.

First Quantum Minerals is a corporation that has multiple mining sites conducting open cast mining to explore copper, nickel and other energy transition related minerals and metals. An in-depth explanation was given on their efforts towards sustainable practices including employment of a trolley system to reduce the use of diesel, their no plastic on the mine policy and their rigorous speed limit and monitoring systems. They later

ties in with their biodiversity and rehabilitation efforts specifically turning the surrounding area of the mine into a wildlife sanctuary which boasts a variety of key African wildlife, with key notes on sightings of the white bellied tree pangolin which is an endangered species. Other efforts such as conducting the first assessment of carbon sequestration of the surrounding national forests and the assistance in the creation of the Ntambu Community Game Reserve were also mentioned. These activities are conducted by the mining company in an effort to lessen the destructive nature of mining in terms of biodiversity and topography and to promote the co-existence of mining and sustainability.

A question-and-answer session was opened where the audience were able to ask questions and multiple topics were debated including other forms of community involvement, sound frequency from blasting and its effects on the animals, monitoring of microplastics and the mining effects on the river tributaries it cuts through amongst others.

After the stewardship we had the privilege of having a private roundtable discussion session with the two keynote speakers and other members of the First Quantum team who were present. This was an opportunity to go more in depth into the topics discussed. Questions about microplastics, acid mine drainage, the mining project category and other environmental management related questions were asked by the IVC-MEP students and a discussion was had about the reality of mining and how the efforts of First Quantum towards conservation vary from the average mining companies and the members perspective on these efforts with respect to the cost benefit comparison to the environment and Zambian communities.

Overall, this gave us an opportunity to be more



Fig.1 The Discussion session

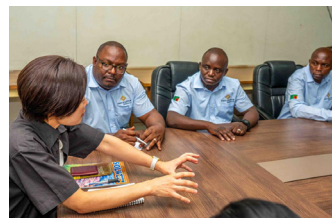


Fig.2 IVCMEP & FQM Round Table



Fig.3 Stewardship Group Picture

open about the questions we ask and gain a better understanding of mining operations in Zambia.

Mosi-oa-Tunya 国立公園 Mosi-Oa-Tunya National Park

Graduate School of Veterinary Medicine D2

Paul Dela Cruz Valcorza

Introduction

The Mosi-Oa-Tunya National Park adventure began at the Department of National Parks and Wildlife (DNPW) in Livingstone. We met their head, Mr. Chikanya, where he provided us with an overview of the office's functions and shared insights into the current state of the National Park and Livingstone. The trip to the park was split into two parts: a morning safari tour, followed by an afternoon visit to Njovu African Wildlife Conservation. Some had the chance to explore Sukulu, a private game reserve, and Mukuni Big 5 Safaris, a facility dedicated to big cat conservation and tourism.

Mosi-Oa-Tunya National Park

Mosi-Oa-Tunya is derived from the local Lozi language translates to The Smoke that Thunders. This national park is Zambia's smallest, situated in Southern Province (17.870 ° S,25.810 ° E), bordered by Livingstone to the north, and spanning about 23 km² along the majestic Zambezi River to the south. Positioned north of its twin, the iconic Victoria Falls where it shares border with Zimbabwe. These two NPs were declared as UNESCO



Fig.1 A foraging hippo with a red-billed oxpecker perched on its back



Fig.2 A calf pair of Southern White Rhino

World Heritage Site in 1972 and are jointly managed by both countries to date.

Mosi-Oa-Tunya NP is teeming with life. With no predators, it hosts three of the big 5: elephants, buffaloes and rhinos. We even stayed in a nearby resort frequented by baboons and vervet monkeys. Roaming around the park are several other species of mammals such as hippos, giraffes, zebras, warthogs, antelopes like sables, bushbuck, waterbuck, impala, wildebeest and the likes. The park is also considered as an Important Birding Area (IBA) of Zambia where some of the endangered, migratory and endemic birds can be seen. Even from the places we stayed at, everyone was always in for a treat with songs of wild birds. Our groupmate was even able to spot and identify more than 30 birds from the park alone (about 55 in the whole trip).

This NP is so small that it lacks game management areas to serve as buffer zones from the community. Instead, the park directly shares its fine borders with Livingstone resident. This has led to steadily increasing HWC. In fact, we arrived to find a herd of massive African elephants browsing along roadsides, where people pass by despite dangers.

Mosi-Oa-Tunya NP plays a pivotal role in Africa's wildlife conservation, especially for the dwindling rhino population. It stands out as the only park in the country with wild southern white rhinos. Their presence in the park is a product of a collaborative effort to bolster the species: two batches were imported from South Africa, a pair in 2007, then a herd of four in 2009. Unfortunately, the first pair was poached within months, prompting heightened security. On our safari walk, we were guided by armed park rangers, guarding the Rhinos and other wildlife around the clock – a vivid example of HWC's impact on wildlife and conservation efforts.

■ Njovu African Wildlife Conservation

Njovu means Elephant in the local language of Nyanja. Why elephants? As an umbrella species, elephants cover large areas within an ecosystem, thus, to protect them means protecting many other species in the process. This non-profit organization plays a vital role in wildlife conservation of the park and neighboring villages – as significant as the African elephant it's named after.

Run by Spanish and Zambian volunteers, they are dedicated to a holistic approach in resolving or at least, alleviate problems between communities and African biodiversity. They carry out conservation activities addressing both society and wildlife. They work in concert with DNPW especially in deterring poachers and in clean-up drives. They also visit schools to promote conservation awareness and provide veterinary care for animals harmed by HWCs

Njovu's most crucial activity is sweeping the entire park for wire snare traps. Wire snares are used by poachers to trap unsuspecting animals which locks automatically and cut deeper as the animal struggles. They showed us snare of various sizes and materials, each designed to target different animals in the park. There isn't a day without snares—in fact, that very day, they collected 15. This highlights the severity of HWC in the area.



Fig.3 Njovu staff showing how a snare trap works

■ Sukulu Game Reserve

Sukulu, rhinoceros in Nyanja, is a private game ranch legally owning wildlife. Here, we were able to view wildlife conservation from another angle. Game ranches are legal sources of products like bush meat, hide, and ornaments. Sukulu also provides livelihood to surrounding communities, even funding a village school. They reintroduce animals to boost the ecosystem. When populations reach sustainable levels, animals may be relocated to support other parks.

課題探求活動 (SDA) レポート

参加学生が事前学習で作成した initial proposal (企画書) と事後学習で作成した実施報告書を合わせて掲載しています (一部抜粋)

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Public Health Risk Associated With Use Of Estradiol Based Hormones In Zambian Livestock

獣医学研究院 博 2
Graduate School of Veterinary Medicine D2
Chijikwa Jeremiah Buumba

Initial Proposal / 企画書

1) Activities theme/title

ASSESSMENT OF PUBLIC HEALTH RISK ASSOCIATED WITH USE OF ESTRADIOL BASED HORMONES FOR ESTROUS SYNCHRONIZATION IN DAIRY ANIMALS.

2) Background

Global food security, fueled by a continuously rising global population, is increasingly becoming an issue of global concern. The human population recently crossed the 8 billion mark and with this comes the need for provision of nutrition in the form of meat, milk and eggs. Declining yields and fertility in dairy cattle, for example, has made this task more challenging. This therefore calls for increased production and reproduction efficiency for many on our planet to afford sustainable livelihoods.

My current research theme investigates the mechanisms of action of a protein-based therapy (osteopontin), which helps improve fertility without the use of potentially harmful reproductive hormones. The therapy allows for increased dairy yields in a sustainable manner without the harmful effects of global warming arising from the need to rear more animals per liter of milk produced. It also safeguards public health through the avoidance of potentially harmful hormones.

The International Veterinary Medicine and Conservation Medicine Education Program (IVCMEP) piqued my interest because it aims to train scholars who can play an active role on an international stage and to strengthen international capabilities in the field of conservation medicine. I come from Africa and I am very passionate about conserving the rapidly depleting natural resources that our countries are endowed with through mismanagement and lack of technical skill. I believe that this program will give me an opportunity to learn how to create collaborations and create solutions that are tailored to my home country. After my training in Japan, I plan on returning to my country and play an integral role, especially in the dairy sector, to promote sustainable and efficient production with

minimal risk of harm to humans, animals and the environment.

Prudent use of hormones requires the concerted efforts of regulatory authorities, practitioners, pharmaceutical traders farmers and animal owners alike.

3) Specific targets and goals of the research

- To determine the scale of use of hormones for estrous synchronization.
- Review legislation related to regulation of hormone use.
- Assess on farm compliance to prudent use of hormones.
- Assess monitoring of hormone residues from milk processors.

4) Means to achieve the goals above

Goals will be achieved via the following;

- Site visit to one of the largest dairy farms in Zambia (Kalundu dairy)
- Engagement with some veterinary practitioners to understand what synchronization protocols are commonly used.
- Visit to importers of pharmaceutical products to assess volumes imported and consumed.
- Engagement with regulators from the Ministry of Fisheries and Livestock as well as the Zambia Medicines regulatory Authority to understand what legislations are in place to ensure prudent use of these hormones.

5) Necessary resources, facilities and preparation

Most of the materials required will be personal protective equipment relating to biosecurity requirements for on-farm visits.

Others will be related to transport logistics and airtime for communication with focal point persons.

実施後報告書

INTRODUCTION

Livestock have always been a go-to source of nutrition in most communities globally due to the high density and quality of nutrients they possess. The fact that they utilize 'non-food materials' such as grass or pastures has also made them an advantageous option for human nutrition requirements without competing with humans. In 2022, the global human population crossed 8 billion and it is projected that by the year 2050, the global food demand will double.

What this entails is that there must be proactive strategies to tackle the increasing hunger risk (Figure1).

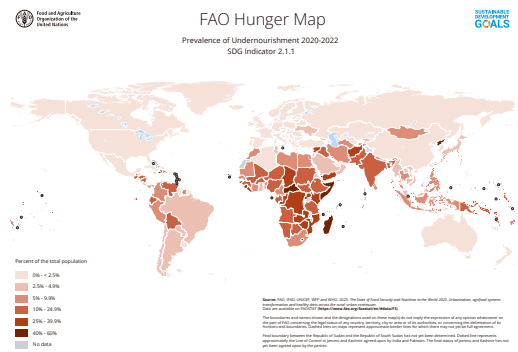


Fig.1 Hunger Map [Source FAO]

This demand for nutrition has resulted in the birth and advancement of intensive rearing strategies that generate more produce in a relatively shorter amount of time and with less resources required. One of these strategies that has long been in use is hormones. Estradiol-based hormones specifically are utilized for various reasons in livestock rearing including treatment of some uterine conditions, estrous synchronization and growth promotion among others. Unfortunately, researchers are concerned that some of them might have tumor-initiating and tumor-promoting effects. The European Union has issued several directives prohibiting the use of substances having a hormonal action for growth promotion in farm animals. In Zambia however, these hormones are still being utilized. Therefore, coming from a background of having worked in the pharmaceutical industry in Zambia and now studying in the animal reproduction laboratory at Hokkaido University, I am interested in assessing just how widespread use of these hormones is and whether there exists a risk of hormone residues being taken up through livestock products such as milk.

RESEARCH ACTIVITY

I endeavored to review the medicines (hormone) distribution chain up to the point at which there is risk of uptake into the food chain (Figure 2).

This would be done through collection of quantitative data on use at different levels as well as gathering of

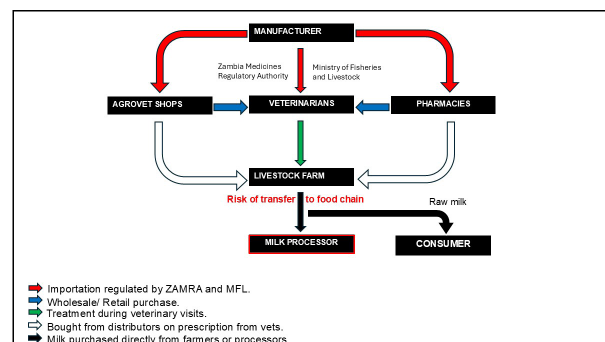


Fig.2 Medicine distribution chain in Zambia



Fig.3 Zambia Medicines Regulatory Authority



Fig.4 Largest distributor

information relating to importation, distribution, use, food residues and general concerns or awareness through a questionnaire.

To do this, I visited the two main government agencies responsible for regulation of medicines and allied substances to get information on importation and regulation. These were the Zambia Medicines Regulatory Authority (Figure 3) and the Ministry of Fisheries and Livestock.

I then visited Livestock Services Cooperative Society, one of the largest agro-veterinary outlets (Figure 4) responsible for distribution of these hormones within the country. They retail to veterinarians, registered pharmacies and directly to farmers on prescription.

To partially assess consumption, I also visited Paw Veterinary Services (Figure 5) which is a major dairy veterinary practice and Zambeef Kalundu dairy (Figure 6) which is one of the largest commercial dairy farms, both located in Chisamba, north of Zambia's capital Lusaka.

Lastly, I engaged Lactalis, a milk processor responsible for processing a large amount of milk from most parts of the country and supplying into majority of the retail outlets around Zambia.



Fig.5 Veterinary practice

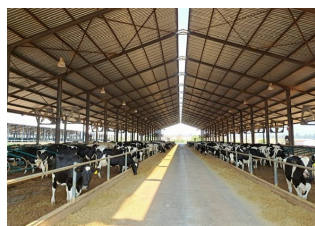


Fig.6 Commercial dairy farm.

QUANTITATIVE DATA SUMMARY

Information to assess usage of estradiol-based hormones was collected from the largest distributor, dairy farm and veterinary practice in the form of quantities imported or used.

Data from the distributor indicated that there had been a steady annual increase in usage up until 2021 when it became more difficult to import the product due to lack of stock from manufacturers.

A decline was seen in 2022 and 2023, but importation has gone up again in 2024 indicating that the product is

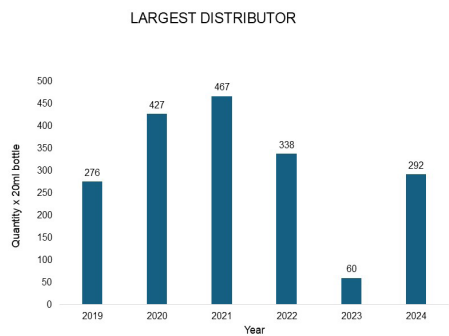


Fig.7 Estradiol hormones imported and sold still widely used (Figure 7).

The commercial farm had a similar annual increase in usage up to 2023 when they abolished use of estradiol-based hormones due to requirements from their parent company that complies with EU regulations (Figure 8).

The veterinary practice saw a steady decline in usage from 2021 mainly due to problems in acquiring the estradiol-based hormones and as of 2024, they had switched to protocols that do not incorporate use of estradiol.

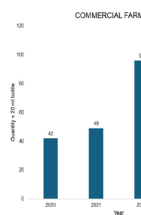


Fig.8 Amount of estradiol-based hormone used for reproductive management

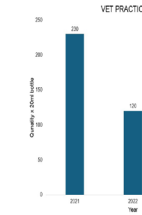


Fig.9 Amount of estradiol-based hormone used for reproductive management

QUESTIONNAIRE DATA SUMMARY

Information obtained from the questionnaires that were administered is summarized in table 1 below.

Table 1 Questionnaire Summary

HORMONE	No specific legislation.
IMPORTATION	Mainly government regulated.
	Hormones sourced mainly from Belgium, Argentina and South Africa.
DISTRIBUTION	Both licensed and unlicensed distribution.
	Partial monitoring but not effective.
PRUDENT USE	Hormones used mostly in dairy.
	Low awareness on prudent use.
	Poor or no records on usage.
MONITORING	
OF RESIDUES	No monitoring being done
IN MILK	Very low consumer awareness
GENERAL PERCEPTION	Most interviewed expressed concern over poor regulation and lack of residue monitoring.

CONCLUSION

Estradiol based hormones are still relatively widely used in Zambia. However, accessibility is reducing due to less production from manufacturers.

Regulation in Zambia is not very effective except at importation, but use is unregulated once they enter the country and date is still not monitored.

No monitoring by processors and therefore risk of residues in food products from livestock. Consumer awareness is also very poor.

We can conclude that risk of these hormones getting into the food chain potentially exists and needs to be investigated further.

Challenges

I did not experience too many challenges as I had made several contacts well before traveling. However, I could not access quantitative importation information from the two main government regulatory agencies due to the sensitivity of the information and requirement for higher-level clearance. Despite this, officers from both agencies filled out the questionnaires which provided sufficient insight.

I could also not physically get onto the dairy farm due to the requirement for a 14-day quarantine period before visiting the premises which is part of routine biosecurity protocol. I did, however, manage to get all the required information.

ACKNOWLEDGEMENTS

Firstly, I want to thank the IVCMEP program and staff for the support and giving me an opportunity to be part of this highly practical one health program that exposes students to real world issues and how they are solved, giving them a chance to use the skills they have acquired through their study. I would also like to thank the many collaborators I had in Zambia that went out of their way to provide me with the information I needed. Lastly, I would like to encourage my fellow students to sign up to programs such as these because they are a once in a lifetime opportunity to not only be exposed to one health in the real world but to also experience different cultures and their approaches to problem resolution.

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Assessing the water pollution situation in Zambia

工学研究院 修1 進士絢香

Graduate school of Engineering M1

Ayaka Shinji

Initial Proposal / 企画書

1) Activities theme/title

Assessing the water pollution situation in Zambia and proposing remedial measures

2) Background

In Zambia, the advancement of sludge from poorly constructed pits and overflowing during the rainy season have affected water sources such as shallow wells, resulting in frequent outbreaks of diseases such as cholera. In addition, many other diseases related to environmental sanitation, such as malaria, diarrhea, blood-sucking worms, and other water-borne diseases, have occurred, making the improvement of sanitation an issue. Currently, the research is focusing on E. coli, which is considered an indicator bacterium of fecal contamination in river water in Sapporo. Therefore, the project will measure E. coli in drinking water sources such as wells in urban areas in Zambia, and in rivers and lakes that are also sewage discharge sites, to understand the status of water environmental pollution in Zambia.

3) Specific targets and goals of the research

Target sites: Urban wells, shallow wells, groundwater, stored water, public supply facilities, rivers and lakes.

Targeted items: E. coli (groups), T-CI, F-CI, DO, pH, temperature, electrical conductivity (EC), turbidity

Goal: Analyze results of E. coli concentrations and other water quality parameters to determine contamination status and trends. Based on the identification of contamination sources, propose appropriate sanitation improvement measures.

4) Means to achieve the goals above

1. sampling collection: 100 mL of water is collected at each site

2. on-site measurement: Each of the following items will be measured on-site.

- Temperature

- pH value (portable pH meter)
 - Electrical conductivity (EC meter)
 - T-Cl, F-Cl (spectrophotometer)
 - DO (DO meter)
 - Turbidity (turbidimeter)
3. The following measurements are made on the collected samples.
- E. coli concentration (membrane filter method or MPN method)
4. analysis of data
5. propose sanitation improvement measures
- 5) Necessary resources, facilities and preparation
- If not available locally, what to prepare and bring in Japan :
- Portable pH meter, EC meter, spectrophotometer, DPD reagents, test tubes, DO meter, sodium thiosulfate, agar powder, petri dishes, parafilm
- Preparation on site if possible:
- bucket, rope, sample bottle (about 100 mL) x 15, incubator (35 ± 0.5 ° C), autoclave, clean bench, pipettes

実施後報告書

Background

Water is essential for life, yet ensuring access to safe drinking water and maintaining environmental conservation remain global challenges. In Zambia, comprehensive water quality assessments are scarce, and contaminated water sources contribute to the frequent outbreaks of cholera and diarrhea, posing significant public health concerns.¹ These issues are thought to be caused by open defecation and inadequate water infrastructure.² Zambia's water supply system mainly relies on groundwater pumped into reservoirs and treated river water for drinking purposes. This study aims to evaluate the water quality of drinking water in Zambia. Additionally, microbial source tracking was conducted to identify the origins of fecal contamination in river water.

Methodology

This research was conducted with the cooperation of Mr. Tembo from the University of Zambia. During the field survey, pH, dissolved oxygen (DO), and water temperature were measured on-site. Water samples were filtered using a portable filtration device, filter paper, and pipettes brought from Japan, along

with locally sourced sampling bottles and buckets. The filtered samples were preserved in DNA Shield and transported back to Japan. Subsequent analysis was conducted in the laboratory at Hokkaido University, utilizing qPCR and electrophoresis to measure 16S rDNA (total bacteria), uidA (found in the E. coli genome, encodes the enzyme β -glucuronidase), and antibiotic-resistant genes (Bla_{FOX}, Bla_{IMP}, mph (E), msr (E)). Additionally, microbial source tracking (MST) markers were used to identify sources of microbial contamination.

Sampling point

As shown in Figure 1, the sampling sites were primarily located in the Livingstone area. Water samples were collected from four tap water locations, two well water locations, and five river locations, including three sites in the Zambezi River and two in the Maramba River. The Zambezi River is the fourth-largest river in Zambia, while the Maramba River flows through Livingstone. The Maramba River had minimal flow, and at point J, stagnant and turbid water was observed (Photo 2). During the dry season, water shortages occurred, and many households relied on wells. Figure 2 illustrates an example of Zambia's water supply system, where groundwater is pumped and stored in tanks before being supplied to households and public water sources.³

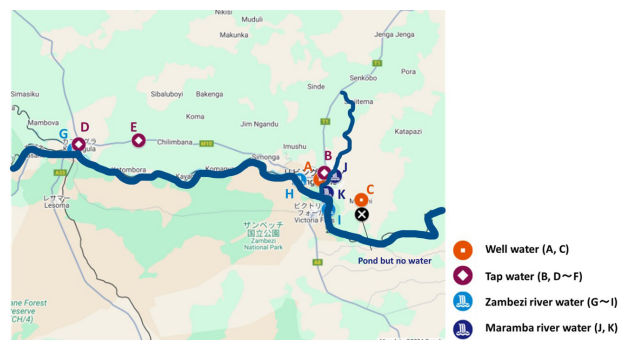


Fig.1 Sampling Map

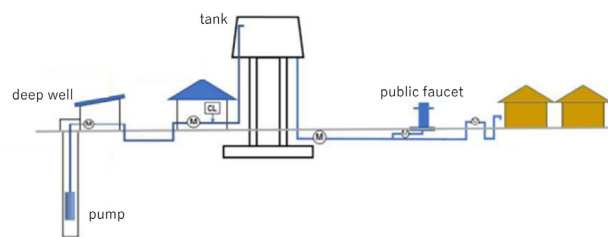


Fig.2 Exsample of a waer supply system in zambia.jpg

Results

• Drinking Water (Well / Tap) Results

The water temperature results are presented in Figure 3. Some Zambian drinking water sources had higher

maximum temperatures than Tokyo's tap water⁴, suggesting conditions conducive to bacterial growth. The results of 16S rDNA and uidA gene detection are shown in Figure 4. While 16S rDNA was detected in both Zambia and the U.S., uidA was found in all Zambian drinking water samples. The detection of the uidA gene suggests the presence of E. coli. E. coli is a bacterium commonly found in the intestines of humans and animals, and its detection is considered an indicator of fecal contamination. If the uidA gene is detected in drinking water, it indicates the possible presence of fecal-derived pathogens, posing an increased health risk.

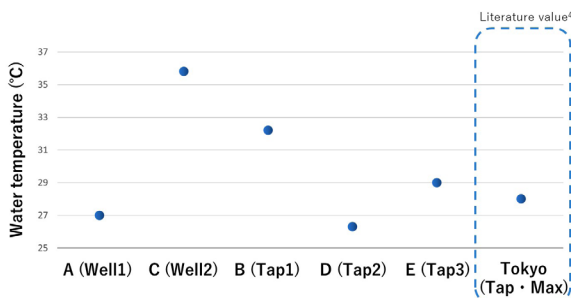


Fig.3 Water Temperature of Drinking Water (Comparison with Tokyo Tap Water⁴)

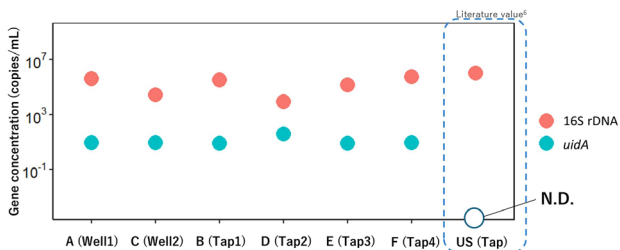


Fig.4 qPCR Results of 16S rDNA and uidA Gene (Comparison with the U.S.⁶)

• River Water Results

The results of 16S rDNA and uidA gene detection in river water are shown in Figure 5. In the evaluation of river water quality, there is no clearly defined standard value for uidA gene concentration. However, it was found that the concentrations of 16S rDNA (total bacterial count) and uidA gene (E. coli count) in Zambian river water are



Photo1 Water Sampling in the Zambezi River (point H)

comparable to those in Japanese rivers (Yasuharu River). Figure 6 shows the results of microbial source tracking (MST) markers. While no human-derived contamination was detected, all rivers showed contamination from birds. These findings, combined with Figure 5, suggest that fecal contamination sources may not be from open defecation but rather from birds or other animals. This is likely due to the dry season, which reduces surface water inflow from human waste sources.

Finally, Figure 7 presents the qPCR results for antibiotic-resistant genes (ARG). In the upstream Maramba River (point J), the ARG concentration was comparable to that in Japanese rivers. This is possibly influenced by the stagnation of water at this point. However, the concentrations of bla_{IMP} and bla_{FOX} in Zambian river water were lower than in Japan, possibly reflecting higher usage of β-lactam antibiotics in Japan.

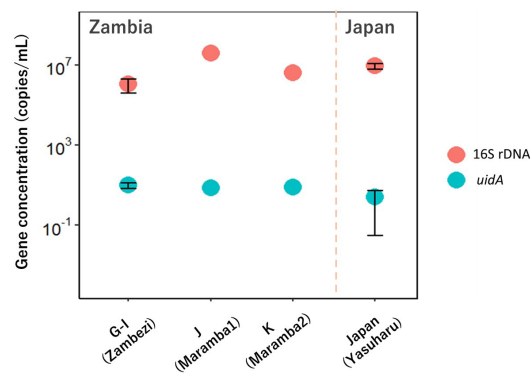


Fig.5 qPCR Results of 16S rDNA and uidA Gene (Comparison with Japanese river)

		Zambia			Japan	
		G-I (Zambezi)	J (Maramba1)	K (Maramba2)	Japan (Yasuharu)	Japan (Toyohira)
MST Marker	BacUni (all Bacteroides)				N.D.	N.D.
	BacH (Human)					
	HS (Human)	N.D.	N.D.	N.D.	N.D.	N.D.
	Pig					
	Ruminant				N.D.	N.D.
	Avian					

Fig.6 Microbial Source Tracking (MST) Marker results (Comparison with Japanese river)

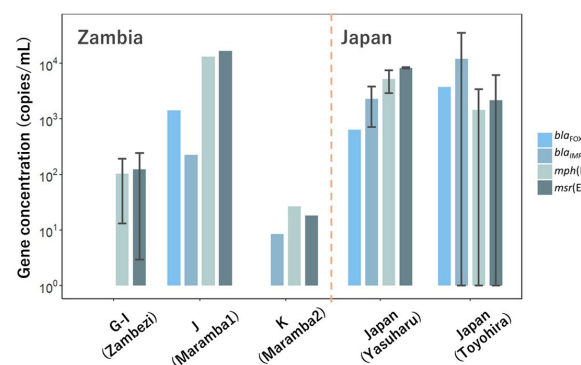


Fig.7 qPCR Results of ARG (Comparison with Japanese river)

Conclusion

Regarding drinking water, the high-water temperature suggests favorable conditions for bacterial growth. The detection of 16S rDNA and uidA genes indicates that Zambia's drinking water, sourced from groundwater and rivers, may be contaminated. Open defecation is a likely contributing factor.

For river water, the results from 16S rDNA, uidA genes, and MST markers suggest that fecal contamination sources may stem from birds and other animals rather than open defecation. This is possibly influenced by the limited surface water inflow from human waste. Additionally, pollutant accumulation was observed in the Maramba River, which flows through urban areas. These findings highlight the need to consider groundwater contamination in drinking water and pollutant accumulation in urban areas in Zambia.

Challenges

Several challenges arose during this survey, particularly with the first-time use of a portable filtration device. Despite prior training in Japan, the filter paper did not function properly on the first day, causing a failed attempt in the morning and preventing sample collection near Victoria Falls. As a result, a revisit was necessary.

The high temperatures in Livingstone were another challenge, reaching nearly 40 °C in the afternoon. Filtration work under intense sunlight was more physically demanding than expected.

During the first two days, Mr. Tembo assisted with site arrangements and filtration work. However, on the third day, he was unavailable due to other duties, and the bus driver, Mr. Raphael, provided support. Explaining the destinations and filtration methods to Mr. Raphael was necessary, but he was highly cooperative and a great



Photo2 Carrying water

help.

Acknowledgments

The water quality survey in Zambia was an invaluable experience.

I would like to express my deepest gratitude to Professor Sato for his guidance and to Mr. Taniuchi and Ms. Hirano for their support. I am also sincerely grateful to Mr. Tembo from the University of Zambia for his cooperation in this research and to Mr. Raphael, our driver, for assisting with water sampling and filtration work.

Additionally, I would like to thank my fellow IVCMEP members for creating a warm and enjoyable environment.

Finally, I extend my appreciation to Ms. Ogishima for providing this opportunity and to Ms. Doya for his support.

Thank you very much.

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The Relationship Between Obesity and What People Eat in Zambia

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Tomomi Kuno

Initial Proposal / 企画書

1) Activities theme/title

The relationship between health conditions and food in Africa

2) Background

My research in master is discovering the relationship between obesity and spices. While my work in lab, I am interested in the influence of food on our health. African food has big difference from our Japanese food. I have thought that difference should have influence

on the human health. I am researching about obesity, so I want to know about relationship between obesity and what they eat in Africa.

3) Specific targets and goals of the research

- Know about what people eat in Zambia by interview.
- Research BMI of Zambian people using their height and weight.

4) Means to achieve the goals above

- Interview and measurement with Zambian people.

If it possible, I want to collect information from 10-20 persons who are young and old.

5) Necessary resources, facilities and preparation

- To research BMI, I will use tape measure and scale.

Tape measure: I can bring from Japan

Scale: I want to borrow or get in Zambia.

実施後報告書

Background

My master's research is discovering the relationship between obesity and spices. By screening test, paprika powder and coriander are effective for preventing obesity. While working in the lab, I learned what people eat makes people's health better or worse, and I am interested in the influence of food on our health. African food has big difference from Japanese food. I thought that difference should have an influence on human health. I am researching obesity, so I want to know about the relationship between obesity and what they eat in Africa.

Not only in Japan, but also in the world, obesity is one of the biggest problems of lifestyle related diseases1. Obesity is caused by some factors, especially diet and the lack of exercise. In Japan, there are the least obese, ranked 160th in the global ranking of obesity rate. Japanese food is one of the reasons of this ranking2.2. This means that what people eat has a big effect on people's health, so I thought that people who eat different foods had different health situations. I thought that African people were underweight because they don't have enough food to live by other countries like in Japan because there are a lot of news about the drought or hunger. However, the ratio of obese people is increasing also in African urban city now4. Still some people are suffering from having a shortage of food, but people living in urban cities have enough food now, but most of them are working while sitting. The ranking of obesity people ratio shows that countries in Africa are

in higher place than Japan. In this activity, I wanted to know how food differences affect human health.

Method

Specific targets and goals of the research

- To know about what people eat in Zambia by interview
- Research BMI of Zambian people using their height and weight

Means to achieve the goals above

- Interview and measurement with Zambian people

I wanted to collect information from 10-20 people who are young and old.

Necessary resources, facilities and preparation

- To decide the class of BMI, I will use tape measure for people who do not know their weight and height
- Tape measure: bring from Japan

For this activity, I needed to know what people eat and how fat they are. To know these, I conducted surveys using sketchbook and stickers of three colors.

First, I asked people to answer their weight and height. Then I asked to check their BMI (Body Mass Index) using graph.

I decided the color of the overweight group ($BMI > 25$), normal weight group ($25 \geq BMI \geq 18$), and underweight ($18 > BMI$) group. If they did not know their weight and height, I measured their waist. More than 85 cm (man) or 90 cm (woman), they use red color. Each group uses red, yellow, and blue stickers. After people checked their sticker color, I asked what they ate

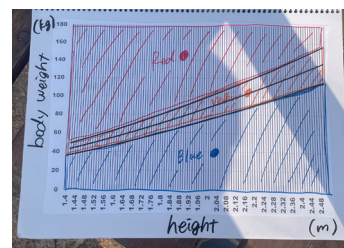


Fig.1 Graph of BMI

Fig.2 The questionnaire



Fig.3 Survey at the museum



Fig.4 Students near the museum

in the past 3 days by putting stickers on area of food. I interviewed what they ate for breakfast, lunch, supper, and if they ate snacks in 3 days.

The options for each question are below.

• Breakfast:

Bread, rice, samp (maize), oats, fritters, eggs, sausages, porridge, potato cereal, Nshima

• Lunch / Supper

Nshima, rice, potato, pasta, meats, vegetables, sausage, fish, insects, beans, mushrooms

• Snacks

Biscuit, noodles, fruits, porridge, cereal, cassava, drinks (Mahew)

*Nshima: staple food in Zambia, made from maize

*Porridge: made from maze, waterier than Nshima

*Mahew: drink made from water and maize, looks like milk, tastes like maize.

I conducted this survey for 2 and half days in Livingstone Zambia. For the first day, I asked people at the Living Stone Museum. And I could hear something about Zambian food.

At the museum, I could ask 19 people.

In after 2 days, I visited Mukuni village to conduct survey for village people. At the village, I collected 19 people's

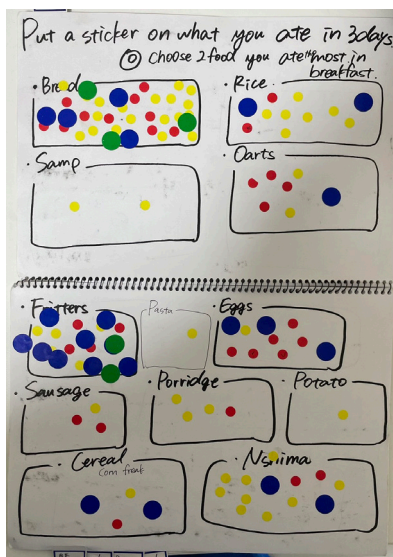


Fig.5 Completed questionnaire

answers.

Result of the survey

Totally, I asked 38 people at museum and village. From this result, there is no bias in people's BMI.

Table1 BMI group

	number of people
overweight	11
normal	17
underweight	10
total	38

Result of breakfast

For breakfast, most people eat bread. At village, more people eat fritters, and they tend to eat same food and eat together.

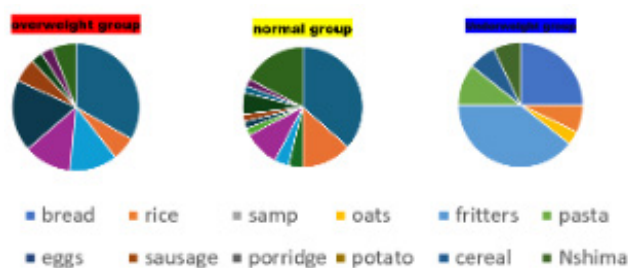


Fig.6 Graphs of results for breakfast

Result of lunch

Almost all people eat Nshima for lunch every day. There was no difference of other foods, because Nshima is eaten with side dishes such as meats, fish, or vegetables.

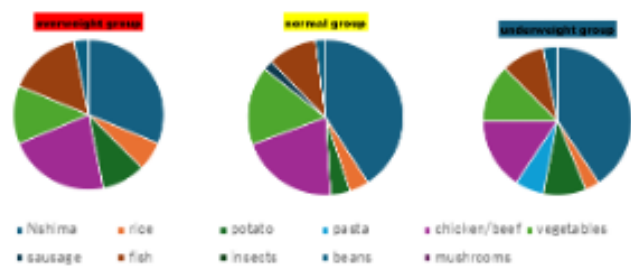


Fig.7 Graphs of results for lunch

Result of supper

Almost all people eat Nshima for supper. In the overweight group and normal group eat meat with Nshima, but underweight group, they eat potato rather than meat.

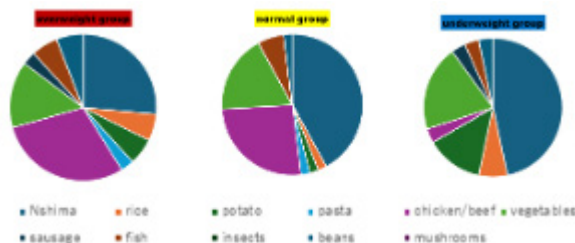


Fig.8 Graphs of results for supper

Result of snacks

This is not expected results, most of all people eat snacks in 3 days. At villages, less people eat snacks. More people have drinks (Mahew) and fruits for snacks.

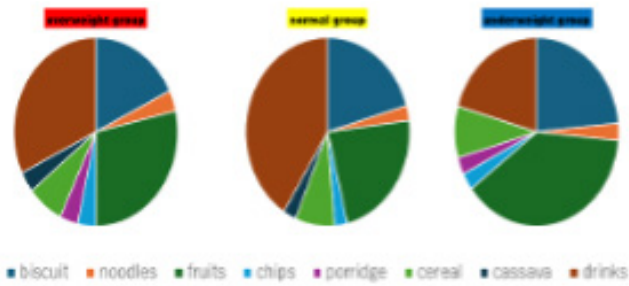


Fig.9 Graphs of results for snacks

Conclusion

Through these results, there is no correlation between people’s BMI and what they eat. From the result, the difference of BMI is the difference of how they are doing daily activity.

At Livingstone Museum, people eat the same as village people, but they are working at the desk. Some people said they were trying to eat less Nshima because Nshima makes them gain weight. Village people also eat Nshima, but more people were underweight. The reason why they are not overweight may be due to their work. Most village people work outside, and they tend to eat only breakfast and supper for a day.

I think these differences in lifestyle make differences in their health. For Zambian people, Nshima is important.

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The Roll of Flagship species Merchandise -Social Trends for Enhancing Conservation Awareness-

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Ryugo Ishida

Initial Proposal / 企画書

1) Activities theme/title

The Roll of Animal Merchandise: Social Trends for Enhancing Conservation Awareness.

2) Background

Background 1: Role of Flagship Species

Animals that create significant popularity domestically and globally, such as pandas and penguins, often draw substantial attention. A recent example is long tailed tits, Shima-enaga in Japanese, which gained immense popularity on social media, resulting in a surge of related merchandise and books. Flagship species, known for their iconic appeal, can contribute to conservation from two perspectives;

1. Engaging Public Interest

These species often capture public attention due to their appearance, such as being perceived as “cute (Kawaii)” This initial interest can expand to include knowledge about their ecology, habitat, and broader environmental issues. For many, conservation and research are seen as the only domain of biologists. However, if even one beloved species can engage people, it can bring the public closer to environmental issues. Flagship species can serve as icons to foster learning and shift attitudes towards conservation. Emotional motivation, driven by the desire to protect these beloved species, can sometimes be more powerful than scientific arguments.

2. Funding Acquisition

Conservation requires substantial funding. The economic impact of tourism centered around species like the Oriental stork in Japan, estimated to bring about 1 billion yen (600 million US \$), highlights how wildlife conservation can also benefit local economies. To secure necessary funding, showcasing wildlife through activities like safaris and birdwatching is essential. These activities generally have a lower impact compared to consumptive uses like agriculture and hunting. However, excessive ecotourism can negatively affect species through increased disturbance. Alternatively, merchandise and media can motivate conservation efforts and generate funds without directly impacting wildlife.

Background 2: Personal Activities (About my Research and Museum Shop)

My research focuses on familiar bird species, such as the Japanese tit. The prominence of the target species is crucial in attracting public interest. Iconic species with visual appeal and catchiness are highly effective in engaging people, as seen in the recent birdwatching and long tailed tit (Shima-enaga) trends. While birds are particularly relatable and popular, using flagship

species strategically can draw in a broader audience.

I work at the Hokkaido University Museum shop, developing museum merchandise. The impact of such merchandise is significant. Even though these items are not essential for life, they attract both adults and children, fostering an emotional connection to the species. This connection can lead to increased awareness and occasional reminders of the conservation message learned at the museum.

Background 3: Career

Aspiring to contribute to conservation as a science communicator, I aim to work in public relations or media for research institutions. Only research itself cannot protect wildlife. In the age of social media, creating content and merchandise plays a vital role in mobilizing funds and raising public awareness. I am deeply interested in how to convey scientific information and represent animals to inspire conservation efforts.

3) Specific targets and goals of the research

Target Species:

The flagship species for this study will be the “Big Five” of African safaris (lion, leopard, elephant, rhinoceros, buffalo). Additionally, five other iconic mammals often represented in merchandise (e.g., hippo, giraffe, cheetah, zebra, hyena) will be selected for comparison.

Goals:

Understanding the trends and promotional methods that resonate with the public will enable strategic conservation efforts that involve a wider audience. By creating strategic popularity and gathering funds, more citizens will consider environmental issues personally and contribute to bottom-up conservation efforts.

4) Means to achieve the goals above

1. Popularity Polls and Awareness Surveys

Conduct easy and short surveys using a “sticker poll format” to increase sample size.

Show the Big Five + 5 other species on a board and have participants choose one species and place a sticker on it.

Q1: What is your favorite animal?

Q2: Which animal do you feel is “valuable” from a conservation perspective?

Differentiate by using different colored stickers for locals and tourists (or use separate boards) to compare attributes.

- Compare with social media trends and merchandise trends.

- Compare with the Red List and population numbers to determine if “valuable species” are rare or simply more noticeable due to larger body size.

2. Merchandise Trend Analysis

Visit shops to find and record products featuring the target species (Big Five + 5 other species). Only handle products where the packaging or motif features a single species.

Record items:

Product name, species name, category (described below), price, shop name, popularity (described below)

Categories: Keychains, plush toys/figures, food, dishes/cutlery, apparel (clothing, accessories), magnets, artwork/posters, postcards, stationery

Interview shop staff:

Q1: What are the top 3 popular products?

Q2: Do you have a system in place to donate sales to conservation efforts?

In the shops, continuously take photos of product names, prices, and actual items. If there are shops that can be recorded outside of SDA time, such as at the airport, proceed with those.

Determine which species are more likely to be made into merchandise, what types of merchandise they become, and their popularity.

- Consider how to analyze duplicate products across shops (consult with CP).

- If all animals not only big 5 are handled, the data could become overwhelming (consult with CP).

- Calculating a diversity index of animals in the shop may be interesting (requires number of occurrences and species count).

For comparison, I would like to conduct a preliminary survey at Japanese shops (Maruyama Zoo, Asahiyama Zoo) handling the Big Five items. It is anticipated that the diversity and quantity of merchandise will be higher in Japan. Since merchandise is highly popular in Japan, there seems to be a wide variety of products available in many shops.

3. Social Media Trend Analysis

Use Google Trends to obtain regional (Zambia and Japan) and chronological search data. Use the search frequency of species names.

Additionally, analysis may be possible using external

tools on Instagram and X, but the extent of this is unknown (consult with CP). Aim to obtain data on hashtags and number of posts.

- Utilize this data to compare with popularity polls and merchandise trends.

4. Donation Willingness Survey (+ α)

Investigate how the amount and motivation to donate change when asked how much they would pay to protect an area versus how much to protect a specific flagship species.

Encourage responses via Google Forms after the sticker survey. There is concern about how to gather respondents and the need to consider the analysis method (consult with CP).

5) Necessary resources, facilities and preparation

1. Popularity Polls:

Locations: Tourist spots, Zambia University, etc.

Materials: Boards or sheets with animal images and names, stickers (2 colors or more).

2. Merchandise Trend Analysis:

Locations: Local shops, airports, etc. (consult with CP)

Materials: Camera and note book for documentation.

3. Social Media Trends:

Tools: Google Trends, social media analytics tools.

4. Donation Willingness Survey:

Platform: Google Forms or similar for online responses.

実施後報告書

Introduction

Charismatic and iconic animals often symbolize companies and organizations. In Zambia, for example, the Fish Eagle is on the national flag, and the buffalo appears on the 100-kwacha bill, these are called flagship species. While ecosystems contain countless species, many crucial for conservation are unknown to the public. Flagship species, due to their appearance or ecological role, gain visibility through merchandise and social media, raising funds and conservation awareness. This also helps support unknown species and entire ecosystems.

Target species

The Big Five (Lion, Leopard, Elephant, Rhinoceros, and Buffalo) are iconic African flagship species, originally chosen for their difficulty to hunt but now symbolizing Safali through tourism and souvenirs. This study focuses on the Big Five to explore their role in raising public

awareness. To compare their impact, I also selected five non-Big Five mammals that symbolize Africa (Giraffe, Zebra, Cheetah, Hippo, and Hyena).

Aim of this activity

In this study, I focused on public awareness regarding animal merchandise and social media interest to examine how flagship species and other animals influence conservation awareness. For example,

- >Popularity and interest in animals among people in Zambia.

Are popular animals valued for conservation?

- >Which animals are likely to be merchandise?

- >What aspects make animals symbolic and popular?

- >Does the number of merchandise products match the interest of street surveys and social media?

Method

- Sticker questionnaire

I conducted a public survey using a sticker questionnaire. Participants chose from the 10 animals. This simple and pop format attracted a large and diverse group of respondents. A total of 102 people participated: 74 Zambians, 19 tourists from 14 other countries, and 9 IVCMEP team members.

- Record merchandised products

I visited 11 shops and recorded products that featured the 10 animals.

- Public interest in Internet

I also collected data from the internet to understand public interest. On Google, I recorded the number of search hits, and on Instagram, I recorded the number of hashtags.



Fig.1 Sticker questionnaire

Result

First, I identified 328 products featuring the 10 selected animals as standalone motifs. When categorized into 7 category (① Keychains, ② toys/figures ③ dishes/cutlery, ④ apparel/accessories, ⑤ magnets, ⑥ artwork/posters/postcards, ⑦ stationery), figurines and

sculptures were the most common, followed by cutlery items such as plates and spoons.

Animal products were found in every shop. Traditional items like Chitenges (Zambian garment) also often featured animals, showing that wide variety of animals appeared across a wide range of products.

This figure shows the number of products for each species. Elephants had the most merchandise, followed by giraffes, hippos, and zebras—all non-Big Five animals. Buffalo products were notably few, despite being one of the Big Five and featured on the 100-kwacha bill. The results suggest that Big Five animals are not especially likely to be merchandised. So, what kinds of animals are more likely to be merchandised?

For example, there was a strong correlation between

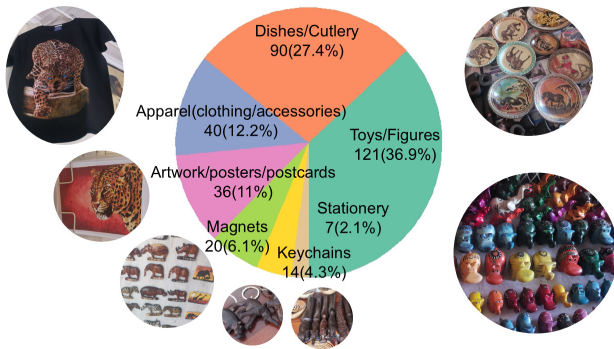


Fig.2 Ratio of product categories

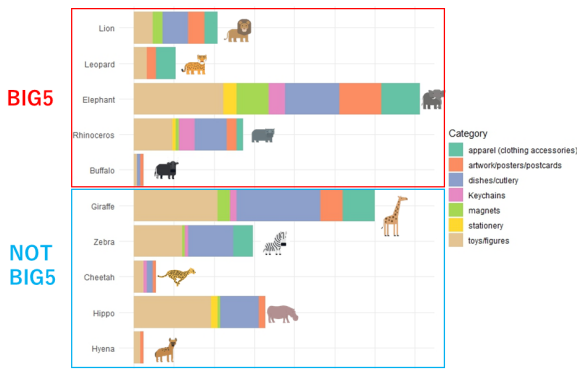


Fig.3 Number of products

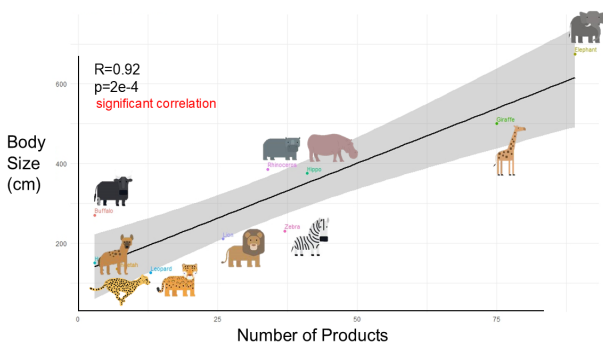


Fig.4 Relationship between Number of products and Body size

body size and the number of products. Symbolic species tend to be large and physically noticeable, a general trend also seen in this study, suggesting larger animals are more likely to be merchandised.

According to the survey results for the question, “Which is your favorite animal?” elephants were the most popular, both domestically and internationally, followed by lions. Zebras are also popular in Zambia.

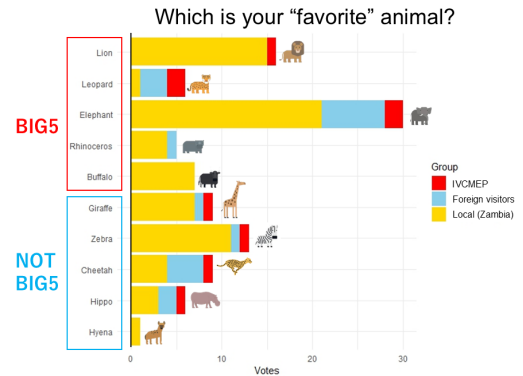


Fig.5 Which is your “favorite” animal?

In the area around Livingstone National Park, wildlife is close to humans, elephants causing agricultural damage and accidents. Similarly, hippos are often known as dangerous animals in Africa, which made me to believe that elephant and hippo would not get many votes. But they did.

Since this survey was conducted in urban areas, it’s possible that fewer people directly affected by such issues.

When seeing the relationship between the popularity votes and the number of products, significant correlation was found.

This suggests that the animals available in stores show the popularity in public. At the same time, having these animals displayed in stores make them popular.

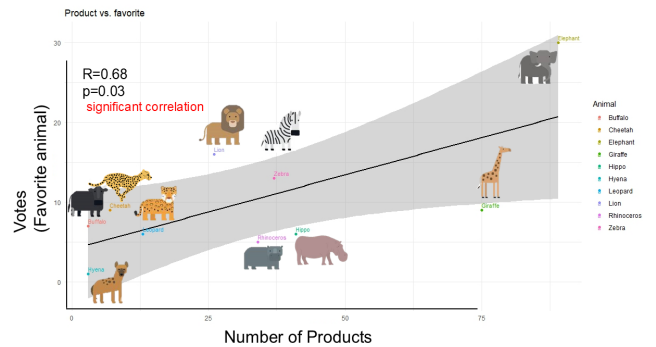


Fig.6 Relationship between Number of products and popularity

Next, when I asked, “Which animal has the highest conservation priority?” rhinos, despite ranking 9th in popularity, received the most votes. This was consistent

among both domestic and international respondents, many of whom cited the impact of poaching and population decline.

Finally, I tried to reveal what criteria did people use to choose animals in these questions? I focused on 4 perspectives:

- ① Appearance, such as color and shape, beauty
- ② Rarity, based on population numbers
- ③ Familiarity, focusing on relationships with people
- ④ Ecology, considering lifestyle, behavior, and roles in the ecosystem.

When I asked, “Which factor do you think determine the popularity and value of animals?” The order is Familiarity, appearance, rarity, and ecology. Zambian people explained how people can utilize an animal make animal popular, especially its monetary value. In contrast, many international respondents voted for rarity. This indicates Zambians characteristic, which have a closer relationship with animals in their daily lives and culture.

On the other hand, when asked, “When promoting conservation efforts or fundraising, which aspect of the animal should be highlighted?” Many people felt that rarity and ecological aspects should be highlighted.

There was no strong correlation between online interest

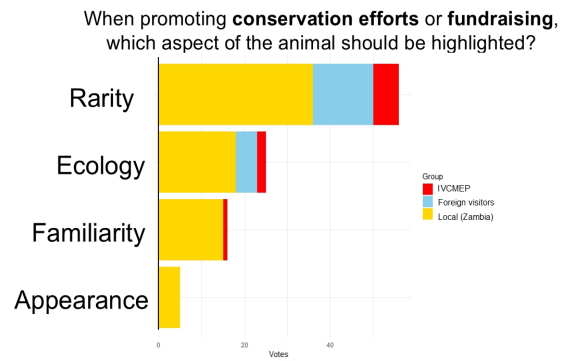


Fig.9 When promoting conservation efforts or fundraising, which aspect of the animal should be highlighted?

Interest on the Internet was **not** correlated with other questions or the number of products.

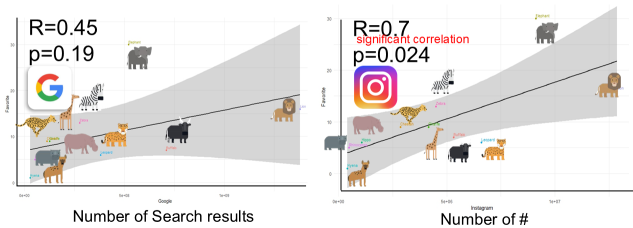


Fig.10 Public interest in social media and popularity

and the responses to the questions, nor the number of products. The only correlation was the number of hashtags on Instagram and “favorite animals”. This also suggests that, even online, the animals in the Big Five are not always popular.

Discussion

Elephants show high interest, as seen in the number of products, reinforcing their role as a true flagship species that boosts conservation awareness. In contrast, other animals are viewed differently. For example, rhinos show a weak connection between popularity and conservation priority, and buffalo, though symbolic, lack widespread appeal. What distinguishes elephants from others? This survey revealed that popularity and value are often driven by appearance and familiarity, while conservation priorities focus on rarity and ecological importance. The disconnect may arise from the public not fully linking these factors.

Conclusion

- ① The BIG 5 are not particularly merchandisable or popular.
- ② Conservation awareness for popular animals was not always high.
- ③ Also, animals with high conservation priorities are not always popular.
- ④ There were differences in their attitudes toward animals within and outside of Zambia.

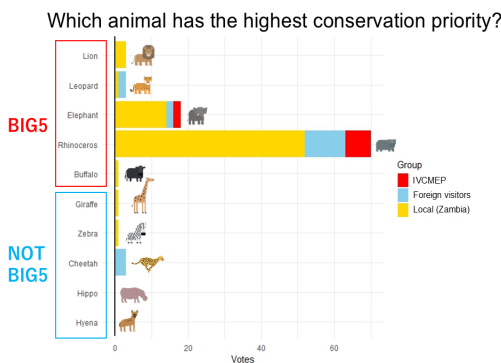


Fig.7 Which animal has the highest conservation priority?

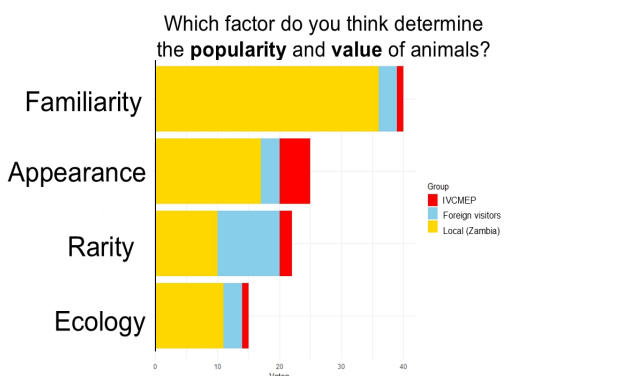


Fig.8 Which factor do you think determine the popularity and value of animals?

⑤ Merchandising and communication is needed to link Popularity to conservation awareness.

Changes in activities from the initial plan and limitations I skipped the survey about donation amounts due to concerns about economic disparities in Zambia and the survey complexity. And when I visited many souvenir shops, shop staff often required a purchase before survey participation. In addition, I couldn't collect pricing data because prices were not fixed. I also tried to compare online interest in animals, but X, Facebook, and YouTube don't provide post counts, and tracking trends required paid services.

Identifying challenges of wildlife management in Mosi-Oa-Tunya National Park and Livingstone area

獣医学研究院 博2

Graduate School of Veterinary Medicine D2

Joshaniel Tan Yong Yin

Initial Proposal / 企画書

1) Activities theme/title

Integrating Traditional Management Techniques into Wildlife Parks

2) Background

My personal research has a focus on wildlife management and the potential impacts that human activity has on wildlife populations. I am greatly interested in facilitating conservation and human-wildlife conflicts, and wildlife parks can sometimes create these points of tension as traditional people groups might be forced out of areas that they historically harvested from. On the other hand, these people groups often are intimately in touch with the land and have managed it sustainably for generations, so their techniques and insights can be used to better manage wild spaces. Integrating traditional people groups into management has been historically beneficial to both the park and the human population, as a compromise can be set up allowing for monitored harvesting within the park while simultaneously bettering management techniques.

3) Specific targets and goals of the research

The main goal would be to contact traditional people groups who have lived in or around the Mosi-Oa-Tunya National Park and conduct interviews on how the park has impacted their livelihood, and how management

can be improved to better serve traditional ways of life as well as wildlife populations. Sub goals could be:

- To explore recruiting these people groups into wildlife management positions with the aim of using applicable traditional knowledge to better understand wildlife populations
- To create enrichment opportunities for park visitors to come and visit villages to see how people groups lived and harvested the land, allowing for additional points of income for people groups who are involved

4) Means to achieve the goals above

A survey with appropriate questions would have to be created. However, given that the research I am proposing is highly contextual, it would have to be created with much input from people who are familiar with the people groups who might live nearby the park. While on the ground, I would travel around to the different groups and, if possible, talk to tribe leaders and explain my intentions and request for an interview.

5) Necessary resources, facilities and preparation

Transportation, translation, and means for recording down responses would all be required. Additionally, I would need to request for inputs from people who are familiar with the area beforehand, so possibly videocalls or emails would need to be exchanged.

実施後報告書

Background

Management of wildlife populations often faces multifaceted and complex challenges, with one of the most foremost being conflicts between humans and wildlife. This is also the case at Mosi-oa-Tunya National Park in southern Zambia. Mosi-oa-Tunya is the second smallest national park in Zambia.



Fig.1 Map of Mosi-oa-Tunya National Park and the two areas where surveys were conducted, Nakatindi (near Livingstone) and Mukuni village

Most wildlife parks and sanctuaries have a form of buffer zone around the perimeter, as it helps reduce the chances of human populations encountering wildlife that is leaving or entering the park. Usually buffer zones in Zambia are formed into a Game Management Area (GMA) or Wildlife Management Area (MGA), where organizations or private property owners are allowed to use the land for recreational purposes, like wildlife tours, safaris, wildlife sanctuaries, or hunting. These activities help to cultivate areas for wildlife to move around outside the park while also severely limiting the public access. Many of these activities include an aspect of public education, around the kind of wildlife that live in the area and how to behave around them to stay safe. They also generate income that directly contributes to maintaining the park area by attracting visitors, especially international ones, that pay premiums to see wildlife and the accompanying landscapes.

However, Mosi-oa-Tunya does not have the benefit of having a GMA to act as a buffer zone around this park. The closest town, Livingstone, has its outskirts bordering the park, and as it continues to expand it increasingly shares more area. As a result, it is becoming more common for people living here to encounter wildlife from the park, which leads to more human-wildlife interaction and, consequently, conflict. To better identify what challenges the local human populations face when it comes to wildlife, I conducted interviews of locals around the park in the village of Mukuni and a compound in the outskirts of Livingstone called Nakatindi.

Mukuni Village

Mukuni village lies to the east of Mosi-oa-Tunya National Park and has a population of about 8,000. The main industry revolves around the national park and the village has become a tourist destination, with many people in the craft trade selling souvenirs to tourists,



Fig.2 A wild elephant that had fallen into a soakaway pit in a village



Fig.3 Broken fence due to elephant activity at night working in the park, or one of the organizations around it like the Mukuni Big Five, a private safari.

Mukuni village and Livingstone both lie near to the border to Zimbabwe, and the elephants that exist in Mosi-oa-Tunya transit between both countries through the Zambezi River. Mukuni is also situated within one of the wildlife corridors that the elephants use to access historic feeding grounds. Crossing through the village represents high percentage conflict points as the elephants often come across humans. In addition to elephants, it is not uncommon to see buffaloes from November to March and hippopotamuses during the night throughout the year. However, these two animals do not come into contact with these populations as often as elephants do, and neither are they as dangerous.

Nakatindi Compound

Nakatindi is a small neighborhood to the southwest of the main area of Livingstone, the largest city near the national park. As this area lies immediately to the east of the park, it is extremely common for wildlife to come into the village and can lead to many cases of conflict. Depending on the season, it is not uncommon for elephants, buffaloes, and baboons to be seen inside the village. Elephants and buffaloes are more frequently sighted during the dry season when there is less food available in the park, so they wander out in search of food and can be found in crop fields and home gardens. Baboons are common year-round however, even entering homes in search of food if given the opportunity.

Because this area is not as heavily dependent on agriculture, buffaloes and elephants are not as common. In the cases of their appearance, the only food that is available for them are small home gardens, so they do not stay for long and do not pose as much of a danger to the humans around them. As opposed to Mukuni village, there have not been any fatalities due to elephants in the compound, but just outside

the compound there was a recent fatality. Part of the difference is because when the wildlife does come, it often is very early in the morning or after dusk; during these hours the children are sleeping and the adults are usually aware enough to stay away from the wildlife.

Given the proximity of this compound to the national park, and the propensity for wildlife to enter, a fence was built in 2012 by the national park in an effort to reduce the number of animals who could leave the park in that direction. However, sections of the fence have fallen into disrepair from normal wear and tear, and elephants are powerful enough to knock down the fence posts if they desire to. Additionally, monkeys and apes are able to climb over the fence, so the effectiveness of this method has been greatly reduced in its current state.

Conflict with elephants

Throughout all the interviews I conducted, the recurring theme that surfaced was the threat that elephants represent to both industry (namely, agriculture), and more worryingly, human life. While other animals also represent threats to human life and wellbeing, no other animal was as consistently addressed as being dangerous, or to the degree of the danger that they represent. One farmer who had experience with dealing with elephants noted that even a single adult elephant could eat through an entire year's worth of crops in a single day if there is no intervention. As elephants often travel in herds, it is even more likely that when elephants do come to a field almost nothing will be left when they are finished foraging.

Another factor that compounds these issues is the effect that climate change has on food availability in both the bush in the national park and for human populations. Rainfall has been extremely inconsistent in recent years, and overall levels are much lower than expected. For example, a farm to the north of Mukuni in the area of



Fig.4 Broken and foraged crops



Fig.5 A hedge that was broken to access a vegetable plot

Mazabuka noted that expected rainfall is between 600 - 1200 mm, but this past year they only received around 200 mm. Average rainfall in Mukuni is around 800 mm, but they also received much less rain in the previous year. This greatly affects both the amount of crops that are successfully planted and the quality and quantity of the harvest. Additionally, it also affects the amount of food that is available in the bush, so in years of drought the risk that entering crop fields represents for elephants becomes increasingly more unavoidable.

The aspect of conflict with elephants that has more emotional impact is the threat that they represent to human lives. I had conducted three separate interviews in the village of Mukuni, two amongst farmers and one with someone who worked in the health clinic in town. Despite different occupations and living in separate areas of the village, they all had the same concerns and experiences with elephants. Two of these parties also had direct relatives who had been attacked and killed in the village by elephants. To build some background around why attacks are happening, there are differences in law between Zambia and Zimbabwe. Elephants are chased away and attacked when they approach villages and crop fields in Zimbabwe, so they have learned that any humans are threats. As a result, they have a tendency to attack any human they encounter, regardless of whether or not any aggressive action was directed towards them.

The two incidents that happened to my interviewees had similar factors that would suggest that there are specific times with a higher risk of elephant attacks. Both attacks happened at night and while traveling between the main area of the village and the outskirts. While elephants are known to be large, they actually move throughout the landscape relatively silently to their size. Additionally, there are no public light sources in these areas, so it can be extremely difficult to spot these animals as they roam. As a result, by the time people can spot them, it is often too late and the elephants would have begun to attack. While it is known that attacks are more common at night, some villagers have no choice but to travel between their place of residence in the outskirts and their workplace in the village, as is the case with one interviewee who lost his wife in the previous year.

Conflicts with other animals

Besides elephants, other animals were also mentioned

as threats to humans in these areas. Hippopotamuses can be extremely dangerous if encountered at night, and buffaloes can be threats as well. However, both of these animals were not as dangerous as elephants and the local populations know how to behave when near them to avoid triggering an attack. The only other significant threat mentioned was the baboon presence in the Nakatindi compound. While they are not the largest, they do represent a significant threat to children in this area. It was noted that the smaller and younger baboons can be chased away by children with sticks, but fully grown baboons can and will attack children. These attacks can inflict serious harm to the children, and some have even resulted in fatalities. The other impact that baboons have on households in this area is that they have the intelligence to open doors and enter houses in search of food. Encountering a baboon at home can be a high stress point for both the occupant and the animal, and can result in injuries for both parties.

Possible solutions to elephant conflict

When talking to the farmers, a few techniques to either chase off elephants or deter them from entering fields had been tried to varying rates of success. At this point in time, because of laws in Zambia, farmers do not have many options available to them once the elephants have entered their fields. Their main option at the moment is to contact the village chief, who will then escalate the issue to the park wildlife rangers, who will come and chase the elephants away by firing rifles into the air to scare them with the sound. There are a few flaws with this method, unfortunately. Firstly, every aspect of this method takes time. Because the communication is not direct, it takes time to get in touch with the rangers, for the rangers to gather their equipment, and for them to make their way to the corresponding farm. All the while, the elephants are spending time in the crop fields and eating what they can. Even with the rangers there, chasing them away is not exactly effective as the elephants now know that while guns are fired into the air, they are never physically harmed and are thus no longer alarmed. In fact, they often will just retreat into the nearby bush and wait for the rangers to leave, at which point they simply resume eating the crops in the field. In terms of protecting crops from being eaten, this is not particularly effective or sustainable for farmers. Another solution that has had some limited

effectiveness is the burning of chilies at field perimeters to prevent elephants from entering them. While it has shown some efficacy, it is an extremely fickle method that depends mostly on the direction of the wind at any given moment. If the winds are still or blow the smoke towards the elephants it can be quite effective at keeping them away, but if the winds shift, the smoke will not reach its intended effect.

Conclusion

Given the struggles that these local populations face with wildlife, it would seem reasonable to think that they would hold resentment towards the animals for the impacts they have on their livelihoods. However, that was largely not the case as most of the community I spoke to acknowledged that they were living on land that used to belong to these animals and they were just trying to survive, like any other living organism. They did mention their hope for park staff to bolster their efforts in keeping the wildlife away, although no clear method was discussed.

One common theme amongst the interviewees was that electric fences were seen as the best interim solution. Opinions on this topic ranged from individual farmers saving up to buy enough fencing to protect their crops, to suggesting that the national park has a responsibility to build one around the entire village. Electric fences have shown to be effective deterrents against most wildlife, but they are prohibitively expensive for most private individuals to purchase.

Wildlife Pathology and Human Wildlife Conflict (HWC) through the Lens of Field Veterinarians

獣医学研究院 博2

Graduate School of Veterinary Medicine D2

Paul de la Cruz Valcorza

Initial Proposal / 企画書

1) Activities theme/title

Postmortem findings of wildlife mortalities in Zambia National Parks.

2) Background

I am a doctoral student in the Laboratory of Comparative Pathology, School of Veterinary Medicine. Comparative pathology is a broad field covering both domestic and wildlife vertebrates, invertebrates, and human pathology. Our laboratory usually receives

necropsy cases from captive wildlife in zoos, aquariums, and rescue centers from different parts of Japan. Determining the gross lesions and histopathology of deceased animals, wherever possible and necessary, are fundamental in understanding how these animals have lived and provides us with insights into the current conditions of their respective ecosystems. To that, I have always wondered about the pathologies wildlife animals face in their natural habitat and what we can learn from them.

The postmortem protocol in our laboratory is well-defined and carried out in a specialized facility, which may not be feasible in the field. Therefore, if an opportunity arises during this immersive activity, I would also like to be involved in an actual postmortem examination.

3) Specific targets and goals of the research

In this self-designed activity, I plan to conduct a retrospective study on wildlife mortalities in protected areas of Zambia. Through this activity, I want to achieve the following objectives:

- Determine the demographics (species, age class, sex) of animal mortalities in protected areas.
- Identify the common post-mortem findings and diagnoses of major wildlife species.
- Describe the probable causes of wildlife mortalities subjected to necropsy such as predation, diseases, human-related injuries.
- Learn the differences between indoor and field necropsies, and identify the key challenges in conducting necropsies and making gross diagnoses in wildlife animals.
- Participate or observe a field necropsy performed by wildlife veterinarians.

4) Means to achieve the goals above

To achieve these objectives, I plan to:

- Access, collect, and consolidate data on common gross pathological findings and diagnoses from post-mortem examinations of animals in protected areas in Zambia.
- Conduct interviews with wildlife veterinarians to learn about field necropsies, including their differences, advantages, and disadvantages compared to indoor setups, as well as the tools and equipment used in the field.
- If the opportunity arises and the situation permits, participate or observe a field necropsy on animals in

wildlife preserves.

実施後報告書

Changes from the initial proposal

Before heading to Zambia, I reached out to several veterinarians to act as counterpart for my activity. I initially connected with vets from the University of Zambia, but I was advised to find someone who works in the field. I eventually found Dr. Jaime Galan, a Spanish veterinarian of Njovu African Wildlife Conservation. Unfortunately, our arrival coincided with his return to Spain. He informed me that access to the secondary data, the core of my SDA, would only be possible through the DNPW.

Thence, I contacted DNPW's veterinary division. However, aside from not having such data, due to a tight schedule, their veterinarian could not commit to being my counterpart; in fact, during our stay, he was in another park handling cases of lions that had strayed. By this point, most of the objectives were eliminated due to the unavailability of veterinarians to follow and necessary data. Consequently, my SDA shifted focus to exploring the differences between indoor and field wildlife necropsies and HWC. I was to join the routine activities of Njovu during my stay. Unfortunately, none aligned with our itinerary, and schools were busy with current academic activities.

Student-Designed Activity

I connected with two veterinarians in Zambia, whom I interviewed via email after personal communication. Dr. Galan also gave continued support online throughout my activities. I also visited local villages to conduct in-person interviews with residents directly impacted by HWC. Although this was not originally part of my SDA, it awarded me a broader perspective on the landscapes



Fig.1 Staffs of Mukuni Big 5 Safaris

of HWC and wildlife pathology. I also visited Sukulu Game Reserve, a private game ranch to meet their wildlife veterinarian; and Mukuni Big 5 safari, where conservation efforts focus on big cats, intended for breeding and rehabilitation. Ultimately, my SDA evolved into two main areas: (1) Wildlife Pathology and (2) HWC from the perspective of field veterinarians.

Wildlife Pathology

From actual experiences of wildlife vets, I aimed to capture the differences between indoor and field necropsies and to identify the challenges in conducting necropsies and making gross diagnoses in wildlife. For this activity, I met two wildlife veterinarians in person and contacted another via email, asking them to complete an interview questionnaire. The questions were prepared in an open-ended manner and are summarized as follows:

(a) General Experience:

Overall, the veterinarians faced more challenges during outdoor necropsies, which not only affected their performance but also impacted diagnostic accuracy. One emphasized that they often perform necropsies with very limited information, as background knowledge on the animals is scarce, and the health conditions of deceased wildlife are generally worse than those of domestic animals.

(b) Equipment and Tools:

They highlighted the lack of resources in the field, often having to work with only basic tools, like knives alone. They stressed the importance of being resourceful, adaptable, and innovative under these conditions. Say, when other disposal methods are unavailable, burning the carcass in the field may be opted to minimize biosecurity risks.

(c) Sample Collection and Preservation:

"... something is better than nothing." In the field, they noted that sample integrity and collection are highly constrained. When preservatives are unavailable, they rely on ice packs and coolers as alternatives, while minimizing transit time as much as possible.

(d) Safety and Hygiene:

Exposure to zoonotic diseases and the challenges of maintaining hygiene brought about the precautionary principle, "everything should be treated as high risk." One pointed out that risks also include the physical dangers posed by other animals in the area. One such vet recounted experiences of being attacked by an



Fig.2 A month-old carcass of elephant in the park. Isolated deaths without evidence of HWC does not warrant a necropsy

elephant and a lion during field necropsies. Although rangers were able to assist, the situation remained perilous.

(e) Environmental Factors:

"... a factor that cannot be controlled." They noted how high humidity, and temperature can quickly degrade carcasses and samples in the field. They also described the challenges of working on difficult terrain and in harsh weather conditions. One vet shared an experience of performing a necropsy atop an elephant in a muddy pond, while another recounted doing a necropsy in heavy rain on rugged ground. They highlighted the difficulty of maintaining clean conditions, avoiding personal injury, and making accurate diagnoses.

(f) Documentation and Record Keeping:

This aspect of necropsy shows the least variability with respect to indoor necropsies. Challenges could easily be compensated by support personnel, like rangers, or by using waterproof materials (notebooks, digital devices, and voice recordings) to capture real-time observations.

(g) Team and Workflow:

One noted that it is crucial that all personnel receive prior training to ensure that everyone understands the various steps and associated risks. One added that field necropsies require more experienced staff and the importance of flexibility in field settings compared to indoor settings – noting that members must be more communicative and multitaskers.

Human-wildlife conflict through the lens of field veterinarians

Dr. Galan generously shared his experiences and perspectives on HWC. He highlighted the constant need for wildlife veterinarians to be vigilant whether a carcass is safe for necropsy, on top of determining if it is worth examining for. He also pointed out that the most concerning cases are often those where the cause of death shows no obvious signs. He listed diseases of particular concern, such as anthrax, rabies, herpes



Fig.3 A wire snare trap collected by NJOVU African Wildlife Conservation

of primates, tuberculosis, and brucellosis. Generally, natural deaths in the wild do not require necropsy, as they are part of the ecosystem. However, he does examine carcasses with signs of human-related injuries like bullet wounds, snares, traps, spears, and arrows. Poisoning cases – often retaliatory – pose challenges, as affected animals may appear healthy. Pathological signs in HWC cases include hepato-renal and gastrointestinal damage from poisoning, and external lesions from snares, the most common HWC-related injury. Dr. Galan also shared that their work frequently involves treating animals injured by wire snares, with occasional gunshot wounds found in living elephants. Abscesses, though common, don't always need intervention. On wildlife species commonly affected by HWC, "Elephants are undoubtedly the main species both affected by and causing HWC." Baboons and vervet monkeys also frequently appear in HWC cases, and based on his broader experience, juvenile and elderly male lions, along with hyenas of any age or sex, are significant contributors.

Summary

I faced great hurdles in conducting my SDA prompting a shift in focus to wildlife pathology and HWC. Despite setbacks, I conducted interviews with veterinarians, ultimately exploring the perspectives of field vets on these critical issues. The study explored challenges faced by vets during field necropsies compared to indoor setups. Key issues included limited resources, compromised samples, safety concerns, and environmental factors, with effective teamwork, experience and ingenuity highlighted as essential for success in the field. Dr. Galan discussed the complexities of HWC, emphasizing the need for wildlife vets to carefully assess carcasses for signs of human-related injuries, such as gunshots and snares. He noted that

elephants are the primary species affected by and contributing to HWC. Indeed, HWC is a major threat to biodiversity, necessitating a holistic approach that includes veterinarians' critical role in wildlife pathology, particularly in conducting necropsies to assess human-related injuries and diseases that impact both wildlife health and local communities.

Acknowledgements

I would like to convey me deepest gratitude to all the staffs behind IVCMEP, especially Ms. Doya who greatly contributed to this SDA. I am also very thankful to Dr. Jaime Galan for guiding me throughout my activities despite the remote communication. To everyone who contributed to the success of this endeavor, Zikomo!

Analyzing public perspectives on climate change: A comparative study between Nepal and Zambia

環境科学院 博3

Graduate School of Environmental Science, D3

Anushilan Acharya

Initial Proposal / 企画書

1) Activities theme/title

Analyzing Student Perspectives on Climate Change: A Comparative Study Between Nepal and Zambia

2) Background

As a glaciologist with over seven years of experience studying glaciers, glacial lakes, and mountain hazards, I have actively engaged in international discussions on these topics and maintained close interactions with mountain populations through various social and scientific research projects. Currently, as a doctoral student, I am focusing on avalanche hazard analysis in the Nepal Himalayas, incorporating both scientific and social-based methods. This work has developed my skills in interacting with locals, acknowledging their perspectives, and respecting the indigenous knowledge that has been applied repeatedly to address problems in mountainous regions.

While my expertise lies in mountain studies, I am eager to broaden my exposure to different environments through this inclusive program, which welcomes people from diverse fields and helps them become well-rounded global professionals. I appreciate the program's commitment to fostering interdisciplinary collaboration and finding common ground among

participants from various backgrounds.

Climate change is a pressing global issue, and as someone who works in mountain regions— areas alarmingly affected by even the slightest climatic shifts—I developed an interest in comparing climate change perspectives in two different geographical settings. I aim to understand whether the perspectives and challenges associated with climate change are similar or different in Nepal and Zambia. Therefore, I intend to conduct research on climate change perceptions of students in Zambia, aligning with my goal of contributing internationally while maintaining a focus on my area of expertise.

This study offers a valuable opportunity for me, particularly as someone who has primarily studied mountainous regions, to gain insights into students' perspectives on climate change and its impacts in a new context. It will be my first-time conducting research in Zambia, and I am eager to understand how students there perceive and comprehend climate change, especially in comparison to my previous studies in Nepal.

I anticipate uncovering diverse environmental concerns arising from climate change and hope to identify common approaches students believe can address these challenges. This experience will provide me with a comprehensive understanding of climate change impacts across different geographical settings, enriching my knowledge and contributing to my development as a globally-minded researcher.

3) Specific targets and goals of the research

1. Understand Students' Perceptions of Climate Change in Nepal and Zambia

2. Identify and Compare Environmental Concerns in Nepal and Zambia

3. Discover Common and Unique Approaches to Address Climate Change

4) Means to achieve the goals above

1. Understand Students' Perceptions of Climate Change in Nepal and Zambia:

- Formulate at least 20 questions to explore students' understanding and perceptions of climate change and the associated challenges in both countries.
- Distribute questionnaires to students at Kathmandu University (online) and the University of Zambia (onsite/online) to gather comprehensive insights.

2. Identify and Compare Environmental Concerns in

Nepal and Zambia:

- Analyze the data to identify the primary climate change concerns specific to each geographical setting, such as water scarcity and cryospheric hazards in Nepal and drought in Zambia.

- Test the hypothesis that the concerns will vary significantly between the two countries.

3. Discover Common and Unique Approaches to Address Climate Change:

- Investigate the common strategies and unique approaches students believe can be employed to tackle the challenges posed by climate change in their respective regions.

- Gain valuable insights into students' perspectives, contributing to a broader understanding of global climate change impacts and potential solutions.

実施後報告書

Introduction

This study explored public perceptions of climate change. While both Zambia and Nepal are impacted by climate change, their environmental, geographical, and geological contexts give rise to distinct challenges. Nepal, located in the Northern Hemisphere at high altitudes, is particularly susceptible to mountain-related hazards like avalanches, which are absent in Zambia, situated in the Southern Hemisphere. As a result, the impacts of climate change differ significantly between the two countries: Nepal confronts various cryospheric hazards, while Zambia deals primarily with challenges such as drought.

The questionnaire survey was initially designed to target undergraduate students from the University of Zambia, Zambia and Kathmandu University, Nepal. However, after careful discussions with the program coordinator, we decided to broaden our focus and shift the respondent group from students to the general public while maintaining the overall framework of the study.

Methodology

A questionnaire survey was conducted both online and on paper, comprising 27 questions related to climate change. In Nepal, all surveys were conducted online, while in Zambia, 17 surveys were completed online, with the majority being paper-based. The paper questionnaires in Zambia were distributed in locations such as Kasisi Village, the Livingstone Museum and



Fig.1 conducting questionnaire survey in Livingstone and Souvenir shop

nearby areas, and the Victoria Falls Souvenir shops.

Results and discussion

A total of 50 responses were obtained from each country. In Zambia, 17 responses were collected online, while all 50 responses from Nepal were gathered online. To maintain consistency and minimize any potential bias between online and paper-based responses, I provided paper questionnaires to Zambian respondents without interference, allowing them to complete the survey independently.

In Zambia, 46% of respondents were female, compared to 40% in Nepal. The majority of respondents in both countries were between the ages of 30 and 40, representing 54% of participants in each country. Respondents in Nepal represented four age groups, while in Zambia, six different age groups were represented.

Regarding familiarity with the term “climate change,” 80% of respondents in Zambia reported being very familiar, followed by 14% who were somewhat familiar and 6% who were not very familiar. In Nepal, 64% were very familiar with the term, while 34% were somewhat familiar, and 2% were not familiar at all.

Major causes of climate change

The responses indicate that deforestation is seen as the primary driver of climate change in Zambia, with 84% of respondents identifying it as the most significant factor. In Nepal, however, 74% of the public attributed climate change mainly to greenhouse gas emissions, with deforestation also cited by 64% of respondents. In Zambia, industrial activities were the next most frequently cited cause after deforestation. Specifically, Zambian responses identified greenhouse gas emissions (38%), industrial activities (44%), agricultural practices (28%), natural processes (24%), and other factors (2%) as contributing to climate change. In Nepal,

the breakdown was as follows: industrial activities (37%), agricultural practices (56%), natural processes (18%), and other factors (8%).

Pressing impacts of climate change

In both Zambia and Nepal, changes in weather patterns were identified as the most pressing issue caused by climate change, with 92% of respondents in Zambia and 94% in Nepal highlighting this concern. In Zambia, other significant impacts included droughts (58%), floods (46%), impacts on agriculture (48%), health issues (14%), and biodiversity loss (34%). In Nepal, respondents reported droughts (68%), floods (76%), impacts on agriculture (68%), health issues (34%), and biodiversity loss (58%) as major consequences of climate change.

Cryosphere hazards, which are significant in Nepal’s mountainous regions, were identified by 30% of respondents there as an important impact of climate change. Surprisingly, four respondents in Zambia also indicated cryosphere hazards as a concern. This may be due to unfamiliarity with the term or a misunderstanding, as Zambia does not typically experience such hazards. It’s possible they selected it as a general impact of climate change rather than one specific to their country.

Barriers in addressing Climate change

Both Zambia and Nepal reported similar barriers to addressing climate change, though respondents in Nepal expressed much higher dissatisfaction with government support. In Zambia, 86% of respondents identified lack of education as the biggest barrier, followed by lack of financial resources (46%), lack of government support (34%), and lack of community support (34%). In Nepal, the top concern was lack of government support, cited by 72% of respondents, followed closely by lack of education (70%), lack of financial resources (64%), lack of community support (34%), and other factors (12%).

Effective climate change mitigation strategies

In Zambia, reforestation was identified as the most important mitigation strategy to combat climate change, with education and awareness cited by 30% of respondents, followed by sustainable agriculture (14%), renewable energy adoption (14%), and policy and regulations (10%). In contrast, respondents from Nepal did not select reforestation as a viable mitigation strategy. Instead, education and awareness ranked highest in Nepal, comprising 28% of responses, followed

by renewable energy adoption (26%), policy and regulations (24%), and sustainable agriculture (22%).

In Zambia, respondents perceive that government agencies are primarily addressing climate change issues, with 30% supporting this view. Other organizations working on climate change include local NGOs (28%), the United Nations (26%), and private companies and other agencies (8%). In Nepal, however, the public believes that local NGOs are the leading entities tackling climate change, receiving 38% of responses, while government agencies rank third and the United Nations comes second. Notably, there were no responses indicating the involvement of private companies in addressing climate change in Nepal.

In Zambia, many international and private companies, particularly in the mining sector, are actively engaged in efforts to mitigate their environmental impacts. One notable example is First Quantum Minerals, which has made significant strides in addressing environmental concerns. During our time in Zambia, we learned about their initiatives aimed at promoting conservation and enhancing the welfare of local communities. Their dedicated team works to ensure that both environmental sustainability and community benefits are prioritized. In contrast, Nepal's less industrially developed landscape has resulted in limited investment from private companies for environmental improvements.

Correlation between public perception on climate change in Zambia and Nepal

A chi-square test was conducted to analyze the main causes of climate change, revealing that all options were correlated with each other except for greenhouse gas emissions. Respondents in Nepal regarded emissions as a major cause of climate change, while in Zambia, this factor received comparatively less emphasis.

Similarly, responses regarding the most pressing impacts of climate change showed correlation across both countries, indicating that respondents perceive these issues in a similar manner.

In terms of the most effective climate change mitigation strategies, public perceptions were also largely aligned in both countries, with the exception of reforestation. This suggests that while Zambian respondents considered reforestation to be one of the most important mitigation strategies, respondents in Nepal did not view it as a significant option.

The perceptions of organizational involvement in addressing climate change differ significantly between Zambia and Nepal. The presence of private companies in Zambia contrasts sharply with Nepal's limited industrial investment, indicating a lack of correlation in how climate change mitigation is approached in the two countries.

Conclusions

In conclusion, this study reveals that public perceptions of climate change in Zambia and Nepal share notable similarities despite the distinct geographical and environmental contexts of each country. Both populations recognize changes in weather patterns as a pressing concern, and they identify common barriers to addressing climate change. However, key differences emerge regarding the perceived causes and effective mitigation strategies. While Zambians prioritize reforestation as a crucial strategy, Nepalese respondents focus more on education and renewable energy adoption. To effectively combat climate change, it is essential for both nations to develop targeted educational programs that address specific local challenges and enhance government support for climate initiatives tailored to their unique circumstances.

The Effects of Climate Change in Zambia in the Context of One Health

環境科学院 修2

Graduate School of Environmental Science M2

Joyce Defigueiredo

Initial Proposal / 企画書

1) Activities theme/title

Ambient radiation Dose Measurement in Mining Tailings.

2) Background

I have an undergraduate degree in Geology from Texas Tech University and currently my course is Global Environmental Management which my research topic being Radiation Propagation from Heavy Mineral Sand Mining and its effects in surrounding local communities. The program already includes field exercises observing operational mines and industrial activities to study the impact of mining on the conservation situation. I would like to spend my self-study time expanding on this aspect of the field research, taking ambient radiation

measurements, and exploring the aspects and type of mining from a geological and environmental impact perspective. The Lower Zambezi National Park has been subject to open pit copper mining which contains naturally occurring radioactive materials (NORM) including uranium, thorium, and radium.

Consequently, the same NORM are found within my study area in Mozambique, thus I would like to measure the ambient radiation dose of the mines surrounding area and map out proximity to communities and possibility measure the indoor radon activity and conduct the same community questionnaires to test a broader applicability of my thesis questionnaire. In essence, I would be conducting a miniature scale of my master's research thesis concept using the Copper mining in the Lower Zambezi National Park as my study area.

I selected this topic as a form of extension and continuation of my research to determine whether the Naturally Radioactive Occurring Minerals are concentrated during the mining process and thus the tailings have higher radiation levels.

I aim to make field measurements using an ambient radiation survey meter and use these as a comparative analysis point to Heavy Mineral Sand Mining within my research.

- Activities will mainly include;
 - GPS tracking
 - meter measurements as we walk around the tailing areas.
 - Community questionnaires should the tailings be near any communities.

To achieve this I will be bringing along with me the same measuring devices I used during my thesis field work and applying the same questionnaire. I will be asking the assistance of one of my former lab mates who currently resides in Zambia.

The necessary equipment will include:

- Radiation survey meter
- GPS
- Questionnaires
- Guide to local communities.

Given the short time of the self-study my focus would be on visiting the copper mining site and using a radiation survey meter and GPS to make measurements of the ambient radiation dose rate of the surrounding area. Should the copper mine be within proximity

to any communities or living facilities then the short questionnaire could also be implemented.

実施後報告書

Introduction

My Initial Proposal for the self-designated activity was on what environmental measures and procedures are being conducted to ensure the safeguarding of the surrounding soil and water to minimize pollution especially Acid Mine Drainage in the KMC Mining Site in Nampundwe. The activity would've included talking to the staff at the mining site, taking pH measurements of water and recording indoor radon concentration in the mine. Unfortunately, once we were already in Zambia the mining counterpart informed us that they had not gotten the authorization for our visit. This forced me to pivot and find alternative ideas for the SDA. One of the alternatives was to visit the Victoria Falls Hydropower Station in Livingstone. The hydropower visit was also contingent on visitation acceptance, which was facilitated by my IVCMEP colleague Jeremiah. Before the visit was approved and as we continued to visit various places and sectors in Zambia, a pattern began emerging from the conversations during our visits.

Zambia is experiencing one of the worst droughts it has ever faced, and its severity is being felt across various sectors. Thus, my self-designated activity emerged, an overview analysis on how drought and climate change are affecting the different components of one health in Zambia and how these components are interconnected.

Agriculture

During our visit to Mambo village where we were welcomed and spoke to the farmers and other members of the community, we were informed of the hardships of their current situation. This year only one third of the expected rainfall occurred. This caused



Fig.1 Baren Lands in Mambo Village



Fig.2 Discussion with the farmers of Mambo Village

most farmers to have no yield, especially the small-scale farmers who depend on rain fed farming. Maize is a water intensive crop. With it being the staple food of Zambia, these farmers who every season invest in seeds, weed killers and other inputs not only experienced a lackluster harvest, but also a monetary loss. This maize yield outcome also affected animal farming as beyond consumption maize is also one of the main ingredients in most animal feeds. Another component that was affected because of the drought is the topsoil, which will affect future crops.

The drought has also increased human wildlife conflicts as the farmers send their livestock 25 Km away from the village during the dry season to the river for water due to the tributaries nearby drying up. It has caused the safer and shallower regions of the river to dry up as well, forcing animals to move closer to the riverbank and often encounter being stuck in the muddy deltaic areas and predators such as crocodiles.

The drought not only affects farmers but even students. The National Resources Development College, a 3-year degree predominantly agricultural institution is also being affected by the drought as the fields used for class practical are producing no crops and the animals that the school has, mainly poultry, chickens and cattle are being fed less often and a more diverse diet including scraps due to lack of hay and corn for the feed.

Mosi Oa Tunya National Park

One of the major components of our program visit was Mosi Oa Tunya National Park. The park, located within and around the city of Livingstone boasts a variety of herbivores including three of the big five. During the safari tour, we were informed that the park has been providing supplementary feeding for the animals in the form of hay due to the lack of grazing vegetation caused by the drought.

The human wildlife interaction index has also increased during this time as animals have been travelling further to find grazing land and drinking water. Because the park is open there is no fencing to inhibit the movement of the animals around the area. It was said that the Zambezi River has gotten so shallow that animals like lions and other Carnivores which are not present in the national park will sometimes cross over from Zimbabwe. When visiting one of the non-profits Njovu, which is an organization that in partnership with the park rangers help locate and disarm poaching traps, they noted the increase of the number of traps put out due to the drought and lack of agricultural yield this year.

In terms of Victoria Falls the amount of water on the falls was significantly less and many locals also marveled at the fact that although it is the dry season there is significantly less water than there has been in the past.



Fig.3 Animals eating supplementary feed

Victoria Falls Hydropower Plant

I was fortunate to be able to visit the Victoria Falls Hydropower Plant in Livingstone, as one of my alternative activities. This visit was integral in helping to shed light on the load shedding due to the energy shortage that the entire country is experiencing. The Victoria Falls Hydropower Plant owned by ZESCO has existed since 1938. It is currently a 108-Megawatt station and consists of 3 main sections.

After being passed through transformers which output kilovolts to the plant's switchyard, the power generated is transported to a variety of locations including Livingstone town, Choma, Kazungula, Botswana, Namibia, Mucuni Substation, Muzak substation, Kaufman and the rest to the grid. Due to the drought and thus less electricity being generated some energy exports like Namibia and Botswana had been reduced or cut off.

The flow of the powerplant is as follows:



Fig.4 The Discharge Point into the Zambezi

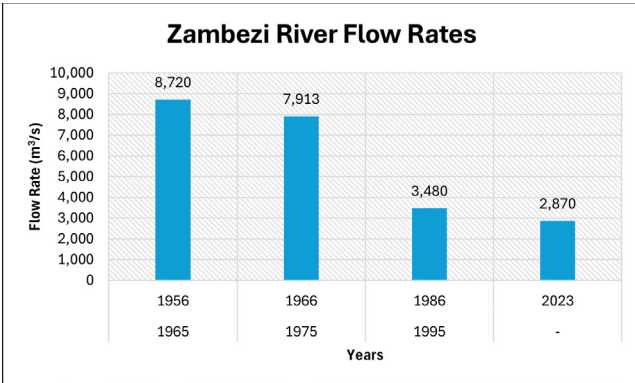


Fig.5 Zambezi River Flow rates throughout the years

Intakes > Settling basins > Penstocks > units > tail rest > Zambezi River

The Hydropower has two intakes 1 intake for sections A and C and one intake for section B. The two intakes have different flow rates and due to the topography of the river on the Zambia side the riverbed had to undergo blasting to stabilize the flow. The critical parameters that determine the efficiency of the hydropower plant are head and flow rate. When fully operational the flow rate of the whole operation is 117.2 m³/s. The fall head is 105 m for section A and 112 m for sections B and C. Currently the plant is working at approximately 85% efficiency. Section A is currently off as some maintenance is done. Water testing is done monthly.

I had the pleasure of being shown around the facility by Mr. Paul Mwanza, the project electrical engineer at ZESCO. Some of the questions I asked included: In your opinion what mitigation strategies could be implemented to help maintain the Zambezi River as the threat of drought continues to increase due to climate change? Mr. Mwanza suggested that an interdisciplinary approach should be considered including conservation education to the local communities because not only the drought puts the river at risk but also events that occur such as waste dumping, indiscriminate non

regulated abstraction of water from the river, the blocking of tributaries coming into the main Zambezi, and infrastructure along the banks should be stopped and this would be a joint effort with all the relevant stakeholders.

I asked about the animal interactions given the open nature of Mosi o Tunya and he mentioned that they mainly see the monkeys and they usually do not cause any trouble and should interactions with elephants occur they are not allowed to interfere and must contact park rangers.

At the time of visitation, the current intake was 65/108 MW and Mr. Mwanza predicted that by October the intake would ramp down to 50/108 MW to match the lack of water in the river and the current flow conditions. A discouraging note he made was that the river has been telling us for many years what is happening in terms of flow rate, and we need to pay attention to it to ensure its longevity.

As the world begins to feel the effects of climate change, Zambia is currently experiencing one of the longest and biggest droughts in its history. This has led to major issues including food insecurity, elevated human wildlife conflicts and energy shortage.

The intersectionality's of the different sectors within Zambia affected by climate change are a testament to how we should continue to view the world moving forward from a one health perspective.

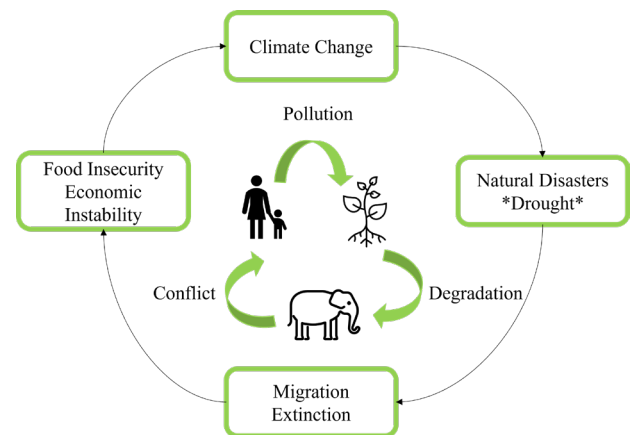


Fig.6 The Interconnectivity of the effects of climate change in the context of one health

