ONE HEALTH: LINKING VULTURES, ANTHRAX, PEOPLE & HEALERS

Introduction to One Health

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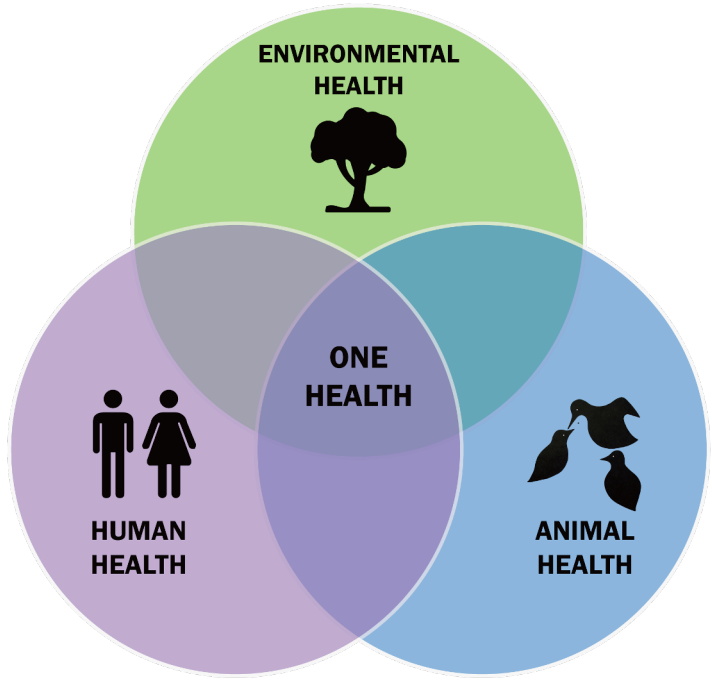
Colorado State University
Fort Collins, Colorado USA

TREPA | Threat Reduction for the Environment, People, and Animals



TREPA | Threat Reduction for the Environment, People, and Animals

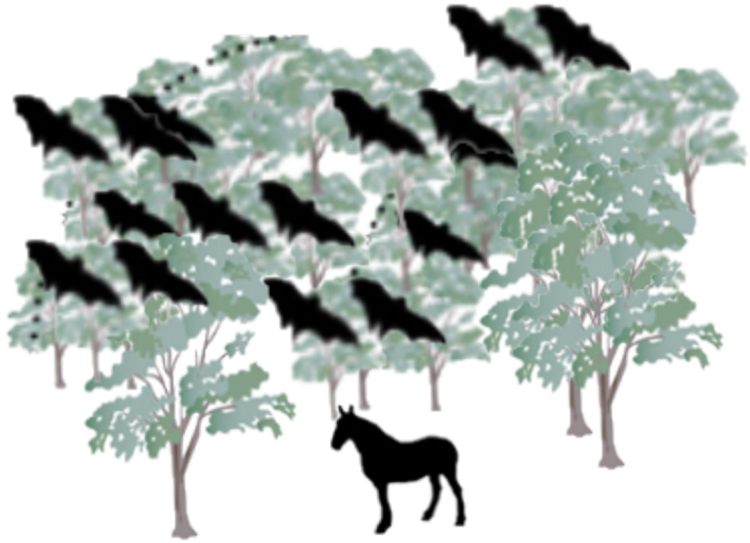
TREPA | Threat Reduction for the Environment, People, and Animals

EMERGING INFECTIOUS DISEASES

Most are not ‘new’ diseases

- Expanded in geographic range
- Moved from one host species to another
- Increased in impact or severity
- Undergone a change in pathogenesis
- Caused by a recently evolved virus

An example of a recently emerged disease



Hendra virus

Australia, 1994

Why are diseases emerging?

- Changing ecosystems
    - Biodiversity loss
    - Increased contact with wildlife
- Human overpopulation and behavior
- Climate and weather
- International travel and commerce
- Poverty and social inequity
- Microbial adaptation
- Breakdown in public health measures
- Susceptibility to infection
    - Ecotoxicology

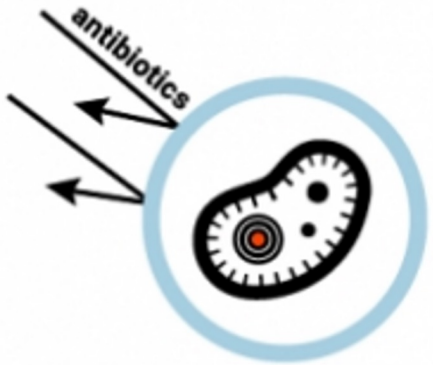
What factors are increasing zoonosis emergence?

(Diseases transmitted from animals to humans)

Deforestation and other land use changes

Intensified agriculture and livestock production

Illegal and poorly regulated wildlife trade



Antimicrobial resistance

Climate change

Source: *UNEP Frontiers 2016 Report*


OIE WILDLIFE HEALTH FRAMEWORK
OIE MANDATE
The World Organisation for Animal Health aims to improve animal health worldwide
OVERALL GOAL OF WILDLIFE HEALTH FRAMEWORK
Protect wildlife health worldwide to achieve One Health
OBJECTIVE 1
OIE Members improve their ability to manage the risk of pathogen emergence in wildlife and transmission at the human-animal-ecosystem interface, whilst taking into account the protection of wildlife
OBJECTIVE 2
OIE Members improve surveillance systems, early detection, notification and management of wildlife diseases
OUTCOME 1
One Health, multisectoral collaboration and capacity for wildlife health management, monitoring and surveillance systems Strengthened
OUTCOME 2
A political, policy and scientific environment that allows Veterinary Services to implement effective wildlife health monitoring and management promoted
OUTCOME 3
Awareness and knowledge of risks pathways and best practices in wildlife health and One Health management increased

TREPA

One Health involves everyone.

Veterinarians
Community members
COLLABORATING
Policymakers
Agricultural workers
Ecologists
Pet owners
COMMUNICATING
Healthcare workers
&
Scientists
COORDINATING
Epidemiologists
Laboratory workers

Working together is key to One Health.

ENDANGERED WILDLIFE TRUST

ENDANGERED WILDLIFE TRUST

VANISHING VULTURES

TREPA ONE HEALTH SESSION

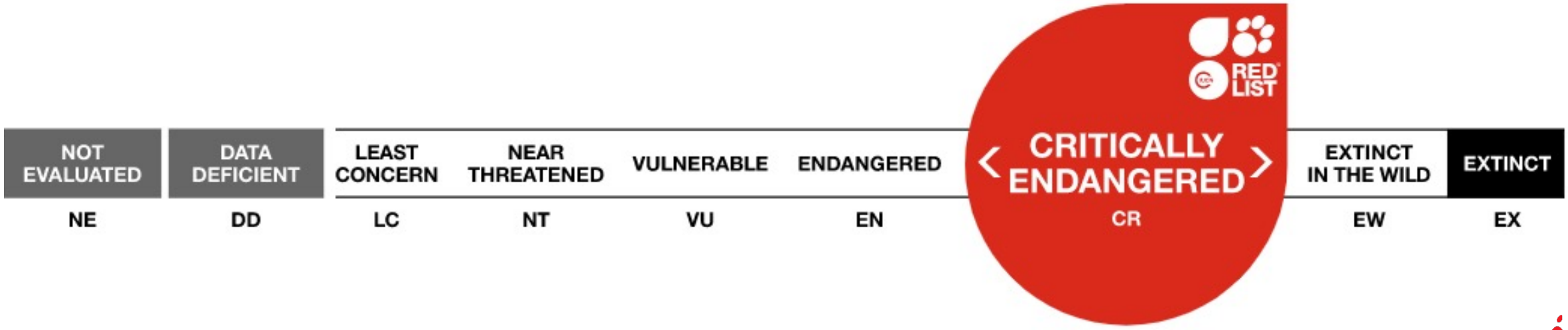
More than 28,000 species are threatened with extinction

That is 27% of all assessed species.

THE IUCN RED LIST OF THREATENED SPECIES™

AMPHIBIANS	MAMMALS	CONIFERS	BIRDS	SHARKS & RAYS	REEF CORALS	SELECTED CRUSTACEANS
40%	25%	34%	14%	30%	33%	27%

feedback



http://www.iucnredlist.org/

ENDANGERED WILDLIFE TRUST

NEAR THREATENED
NT

CRITICALLY ENDANGERED
CR

VULNERABLE
VU

VULNERABLE
VU

ENDANGERED
EN

VULNERABLE
VU

SOUTH AFRICA'S VULTURE CRISIS

ENDANGERED WILDLIFE TRUST

HOODED VULTURE

CRITICALLY ENDANGERED CR

WHITE-HEADED VULTURE

CRITICALLY ENDANGERED CR

WHITE-BACKED VULTURE

CRITICALLY ENDANGERED CR

CAPE VULTURE

VULNERABLE VU

LAPPET-FACED VULTURE

ENDANGERED EN

SOUTHERN AFRICA'S VULTURE CRISIS

ENDANGERED WILDLIFE TRUST

RED LIST
CRITICALLY ENDANGERED
CR

RED LIST
VULNERABLE
VU

BEARDED VULTURE

The decline of Africa’s vultures

Video – Cornell Lab of Ornithology

White-backed Vulture

Gyps africanus

OVERALL IT IS SUSPECTED TO HAVE UNDERGONE A **VERY RAPID DECLINE OF 63-89% OVER THREE GENERATIONS** OWING TO INTENTIONAL AND UNINTENTIONAL POISONING, HABITAT LOSS AND CONVERSION TO AGRO-PASTORAL SYSTEMS, DECLINES IN WILD UNGULATE POPULATIONS, HUNTING FOR TRADE AND COLLISIONS.

2004 2007 2012 2015

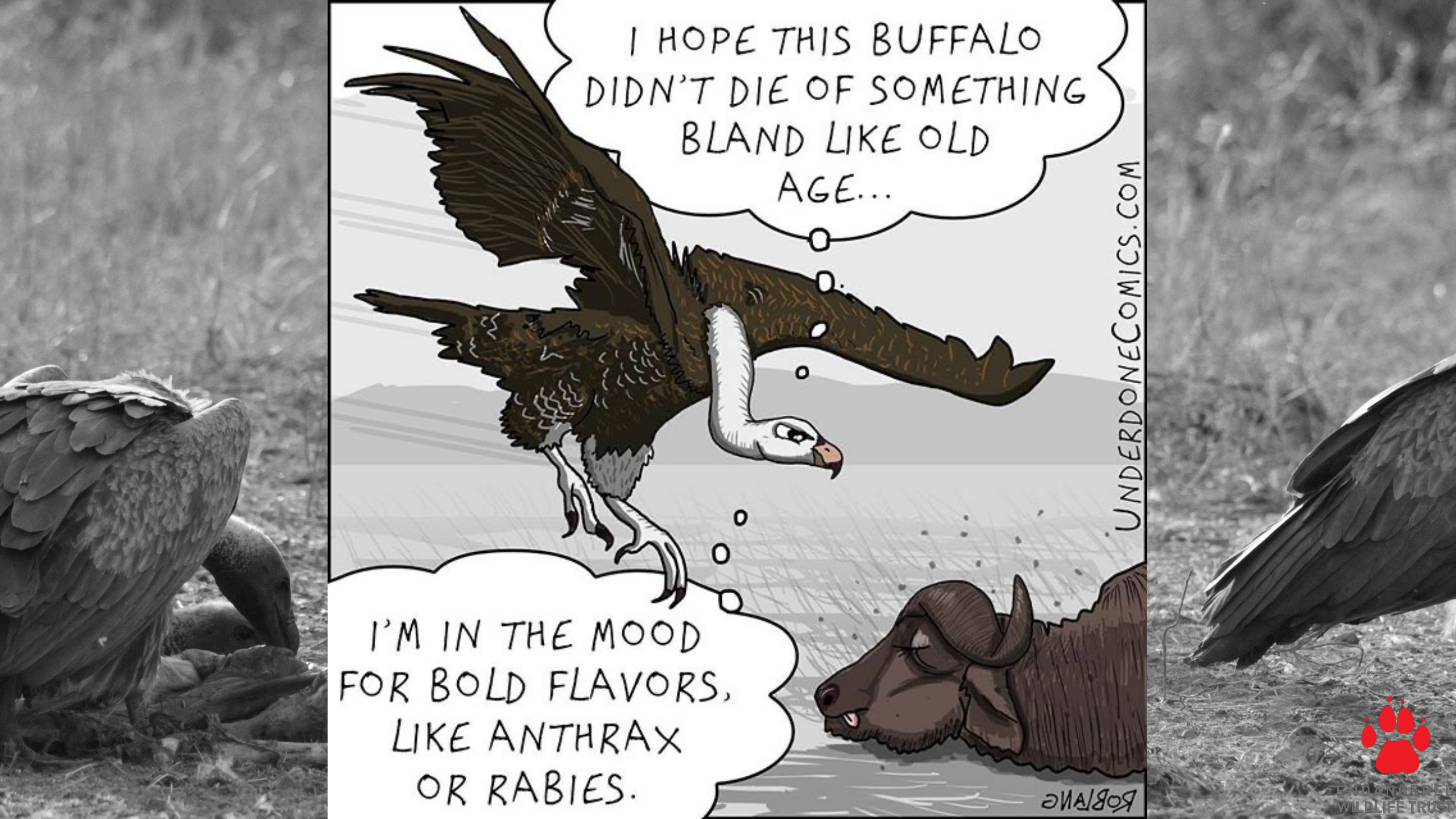

REGIONALLY
EXTINCT

Indian Vulture Crisis

The value of vultures

VIDEO– Andre Botha

ENDANGERED WILDLIFE TRUST

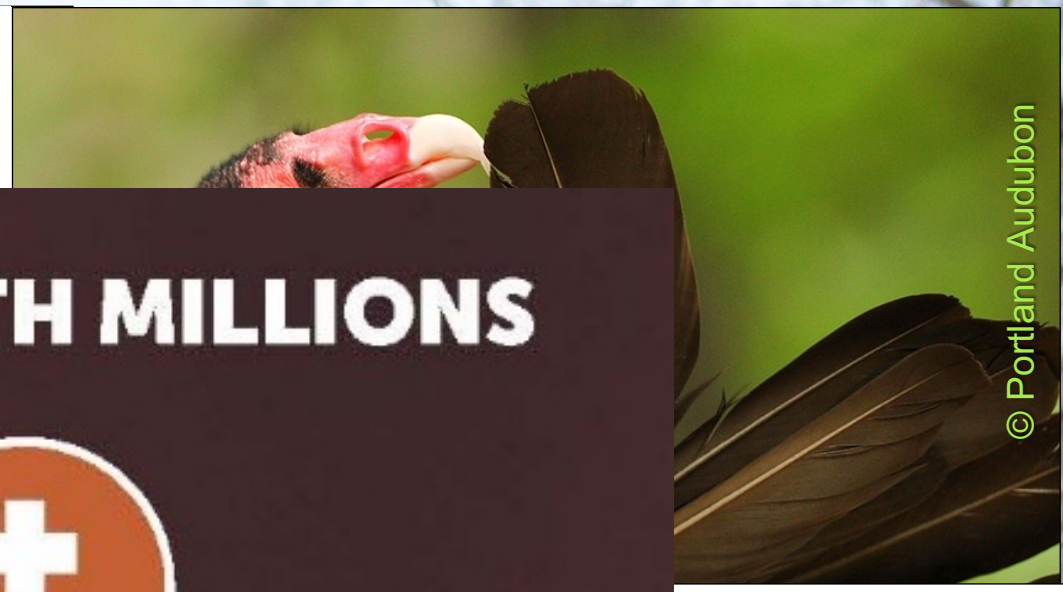

I HOPE THIS BUFFALO DIDN'T DIE OF SOMETHING BLAND LIKE OLD AGE...
I'M IN THE MOOD FOR BOLD FLAVORS, LIKE ANTHRAX OR RABIES.
UNDERONECOMICS.COM
ROBLANE

The value of vultures

ENDANGERED
WILDLIFE TRUST

US$34 billion over 14 years

Counting th
appraisal of
of vultures i



VULTURES ARE WORTH MILLIONS

A single vulture is worth over US **$ 11,000** dollars just for its cleaning services.
By halting the spread of disease, they are worth much, much more to governments in saved health service costs, not to mention tourism, etc.

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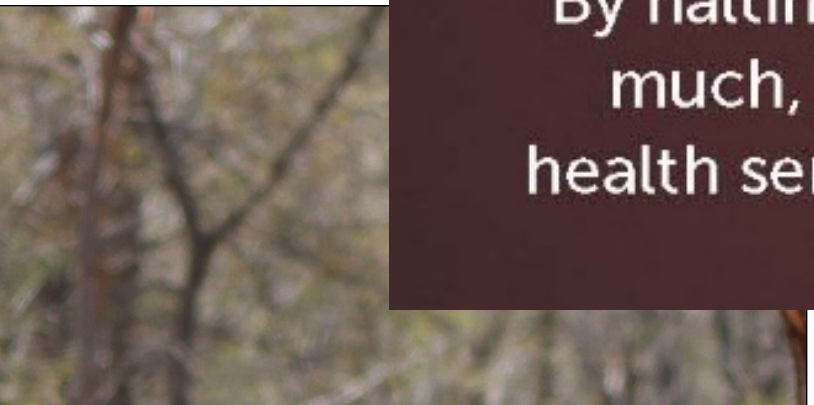


es offered by a

Maricel Graña Grilli[a,*], Keith L. Bildstein[b], Sergio A. Lambertucci[a]

POISONED CARCASSES

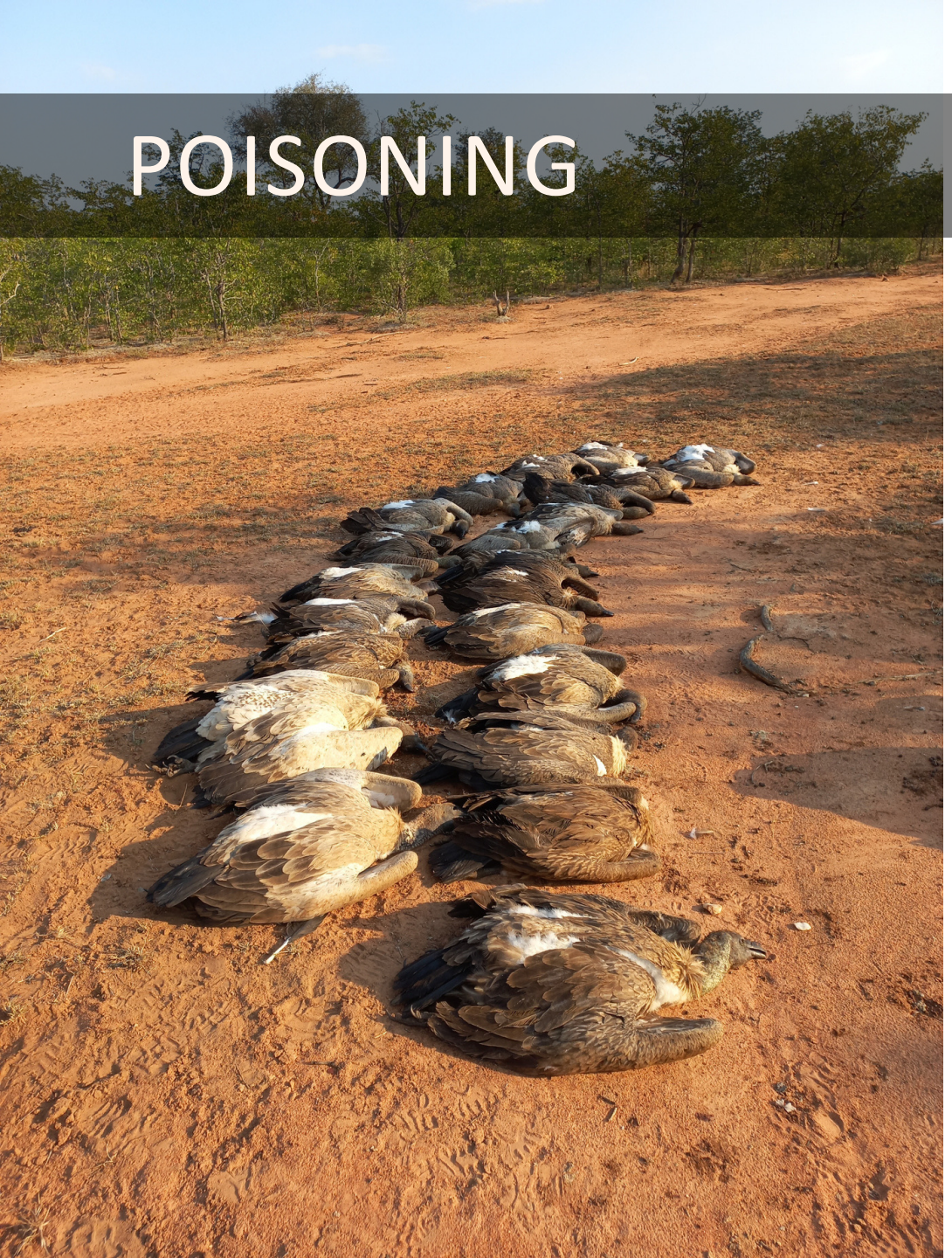
ENDANGERED
WILDLIFE TRUST

Image: Raptors Botswana

THREATS

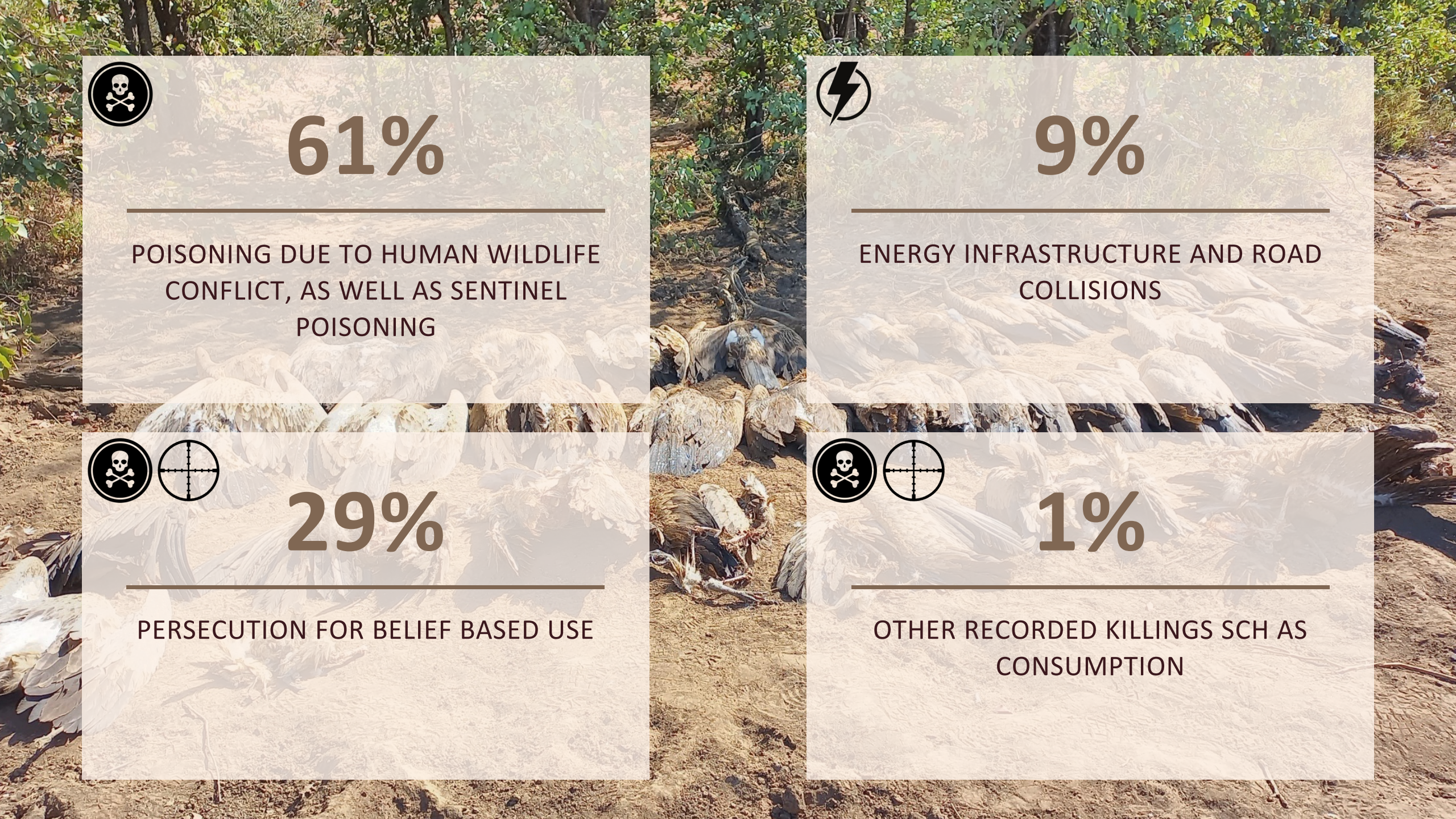
- Poisoning
- Energy infrastructure
- Persecution
- Habitat Loss
- Nest site disturbance
- Drowning

POISONING



AGRICULTURAL PESTICIDES, LEAD & WATER POLUTION

Avian scavengers are particularly succeptible to the misuse of wideespread agricultural pesticides, leading to large scale declines accross populations. Lead exposure affects breeding and mobility, negatively impacting the population. Water polution negatively affects prey base for certain species, as well as being harmful to the species.



61%

POISONING DUE TO HUMAN WILDLIFE CONFLICT, AS WELL AS SENTINEL POISONING

9%

ENERGY INFRASTRUCTURE AND ROAD COLLISIONS

29%

PERSECUTION FOR BELIEF BASED USE

1%

OTHER RECORDED KILLINGS SCH AS CONSUMPTION

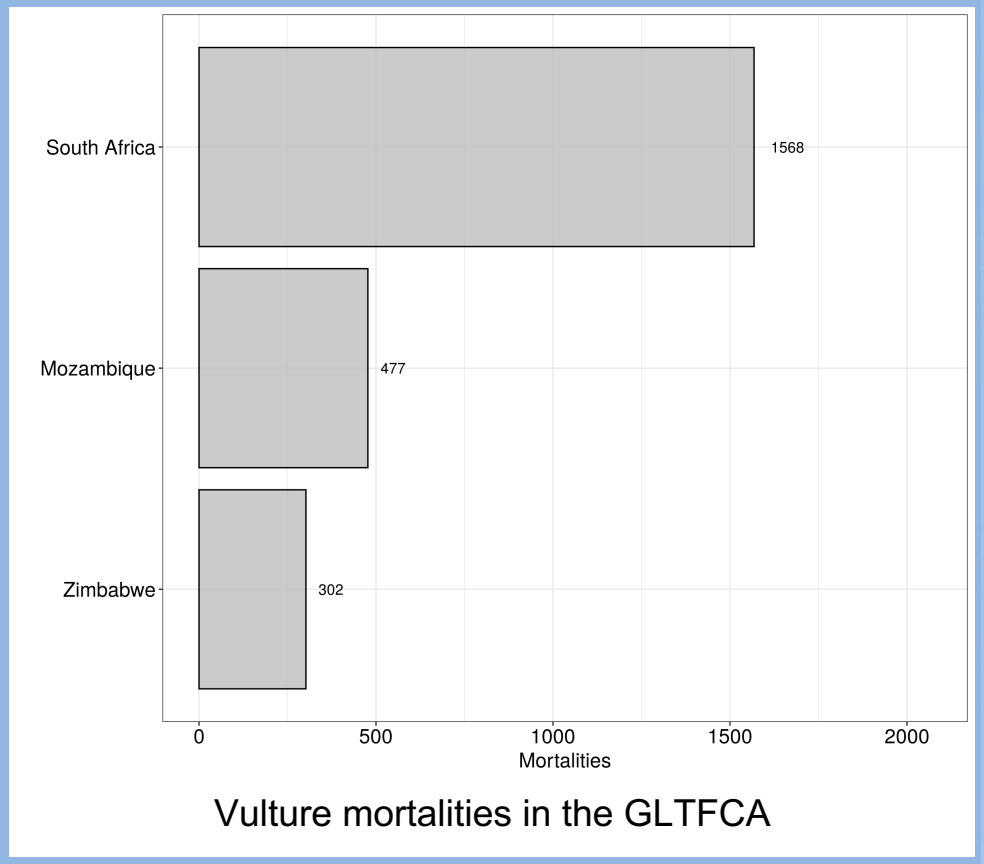
PROMINENT GLTFCA POISONINGS INCIDENTS

MOZAMBIQUE **– 76 BIRDS** (JUN 2011)
ZIMBABWE **– 174 BIRDS** (AUG 2012)
MOZAMBIQUE **– 84 BIRDS** (MAY 2013)
ZIMBABWE **– 219 BIRDS** (OCT 2013)
MOZAMBIQUE **– 42 BIRDS** (JUL 2015)
SOUTH AFRICA **– 44 BIRDS** (SEP 2015)
SOUTH AFRICA **– 110 BIRDS** (FEB 2016)
ZIMBABWE **– 94 BIRDS** (MAY 2017)
MOZAMBIQUE **– 103 BIRDS** (FEB 2018)
SOUTH AFRICA **– 200+ VULTURES** (MAY-JUN 2019)
SOUTH AFRICA **– 46 BIRDS** (JUNE 2023)
SOUTH AFRICA **– 109 BIRDS** (JULY 2023)

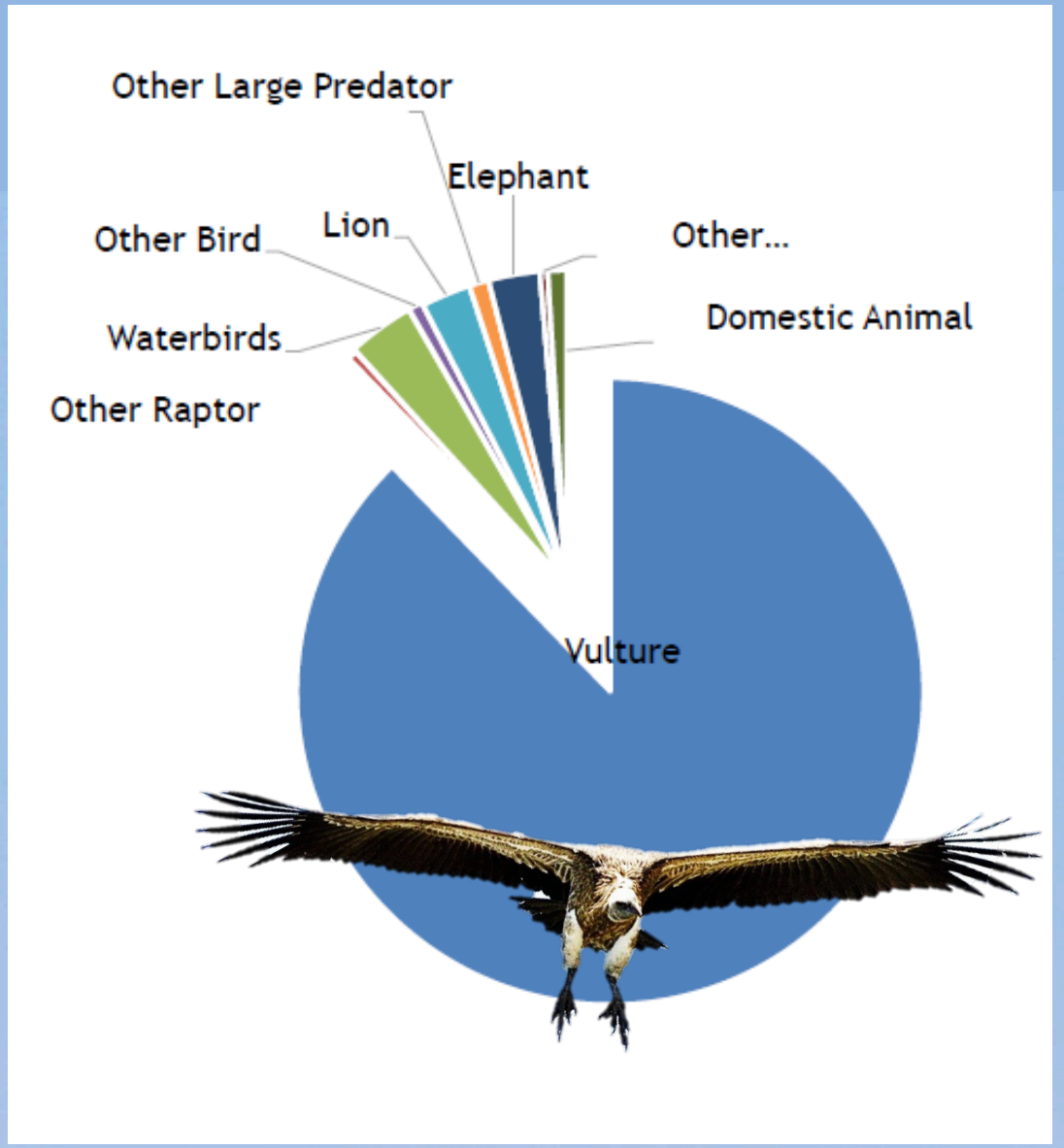
AFRICAN WILDLIFE POISONING DATABASE

www.africanwildlifepoisoning.org

45434	1574	16175
Total mortalities	Total poisoning incidents	Total vulture mortalities



Vulture mortalities in the GLTFCA



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WHY ARE VULTURES SO VULNERABLE TO POISONING?

- Highly mobile - obligate scavengers
- Generation length
- Slow reproductive rate
- Clutch size
- Social feeding behaviour

ENDANGERED WILDLIFE TRUST

Intentional vs. Unintentional Poisoning

INTENTIONAL POISONING

- When pesticides/chemicals are purposely used to kill animals

- Examples:
  - Human-Wildlife Conflict
  - Sentinel Poisoning
  - Poisoning for Traditional Medicine
  - Poisoning for other consumption

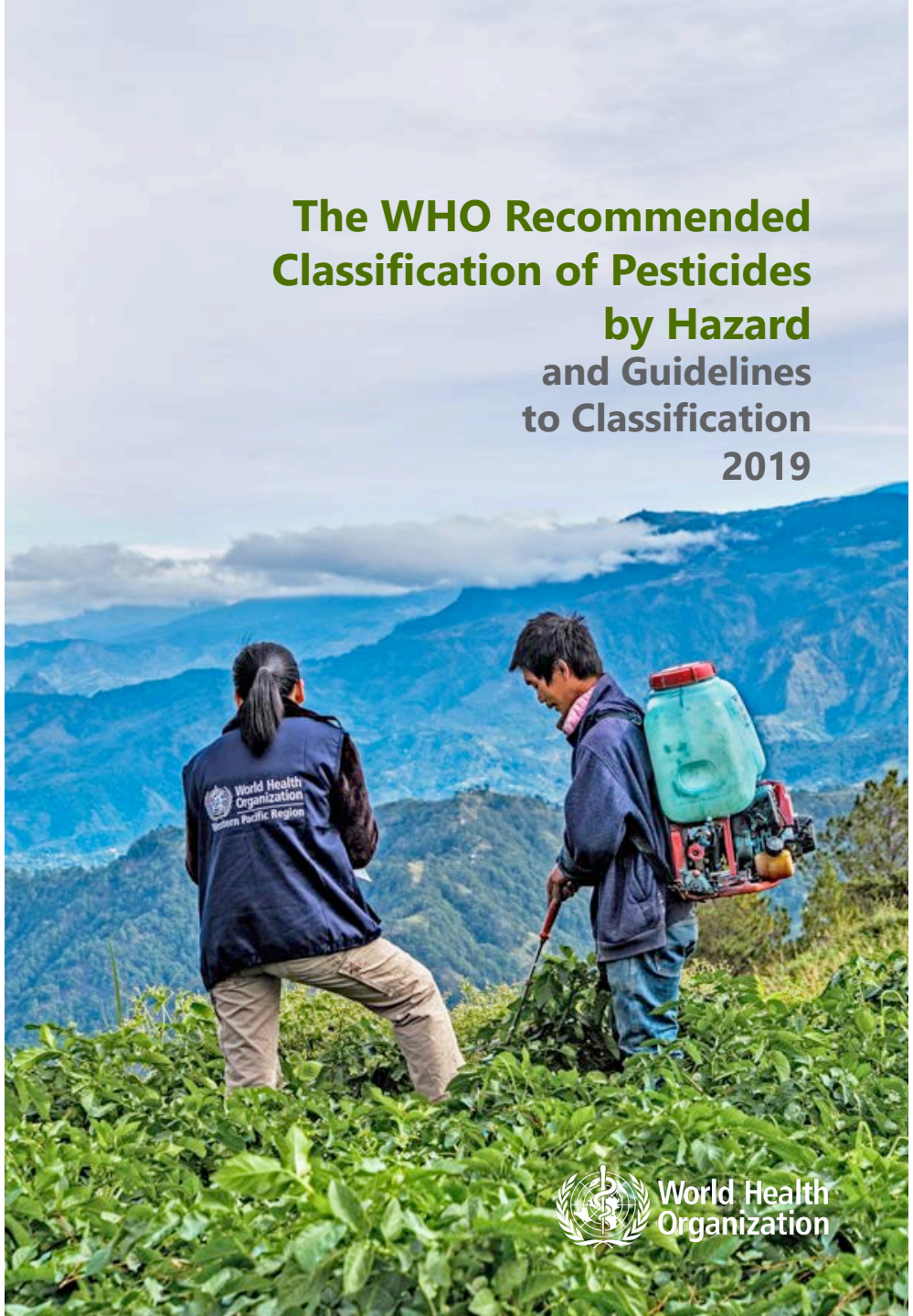
UNINTENTIONAL POISONING

- When pesticides/chemicals are released into the environment and kill animals without this being the intended outcome

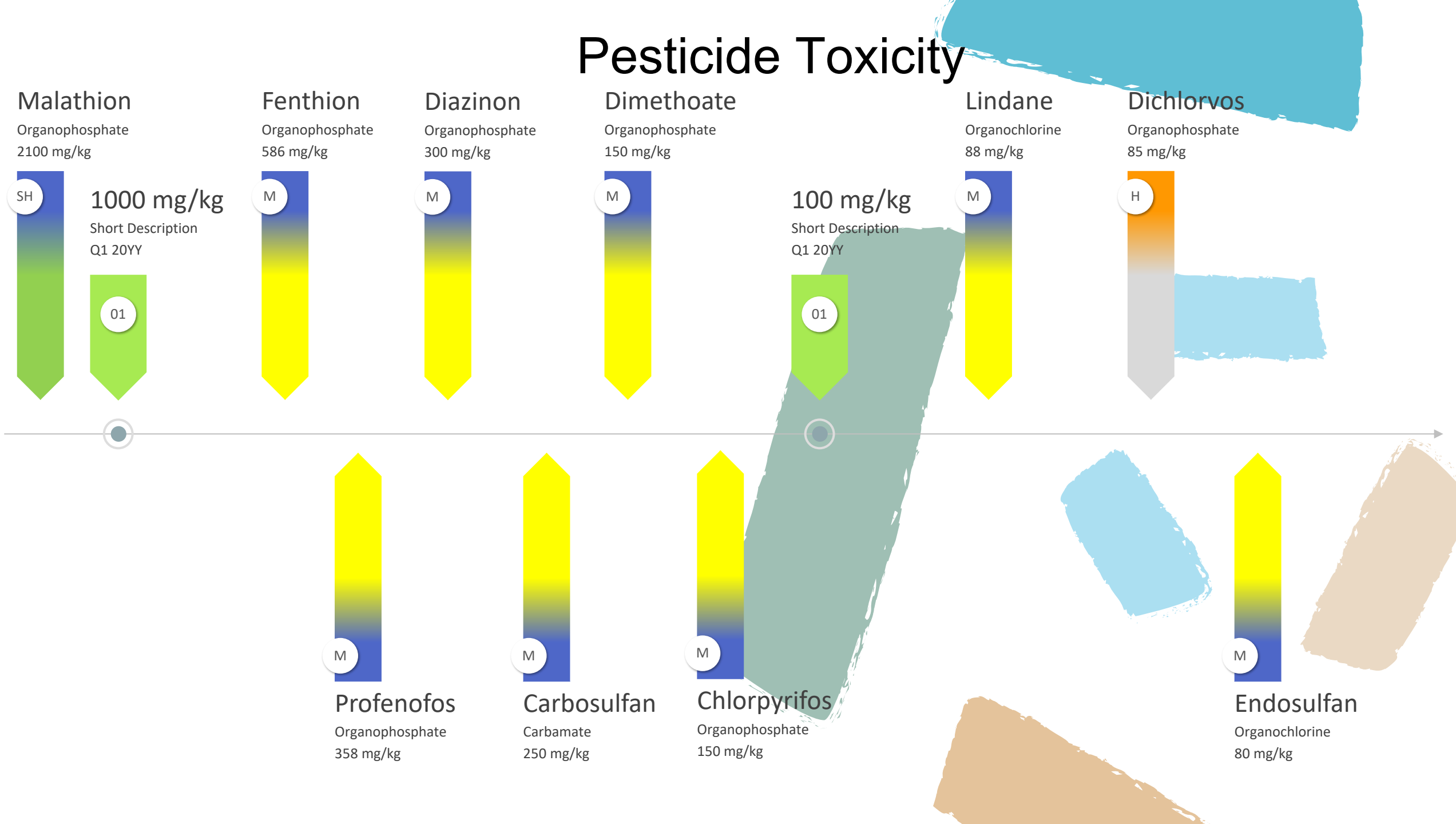
- Examples:
  - NSAIDS or other drugs
  - Lead poisoning
  - Pollution

Major Pesticide Groups

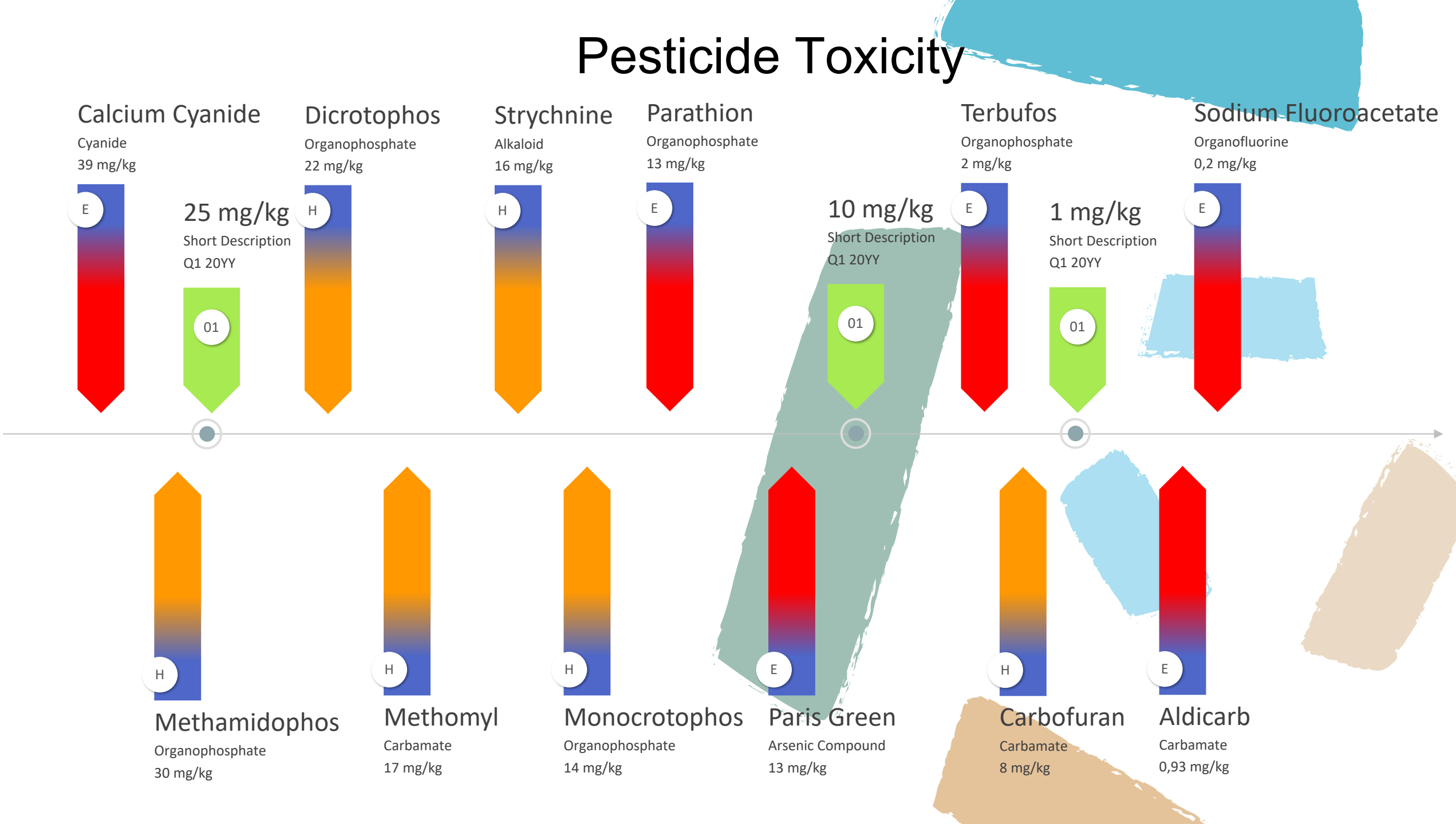
AK Alkaloid
AS Arsenic compound
BP Bipyridylium derivative
C Carbamate
CO Coumarin derivative
CU Copper compound
HG Mercury compound
NP Nitrophenol derivative
OC Organochlorine compound
OF Organofluorine compound
OP Organophosphorus compound
OT Organotin compound
PAA Phenoxyacetic acid derivative
PZ Pyrazole
PY Pyrethroid
T Triazine derivative
TC Thiocarbamate

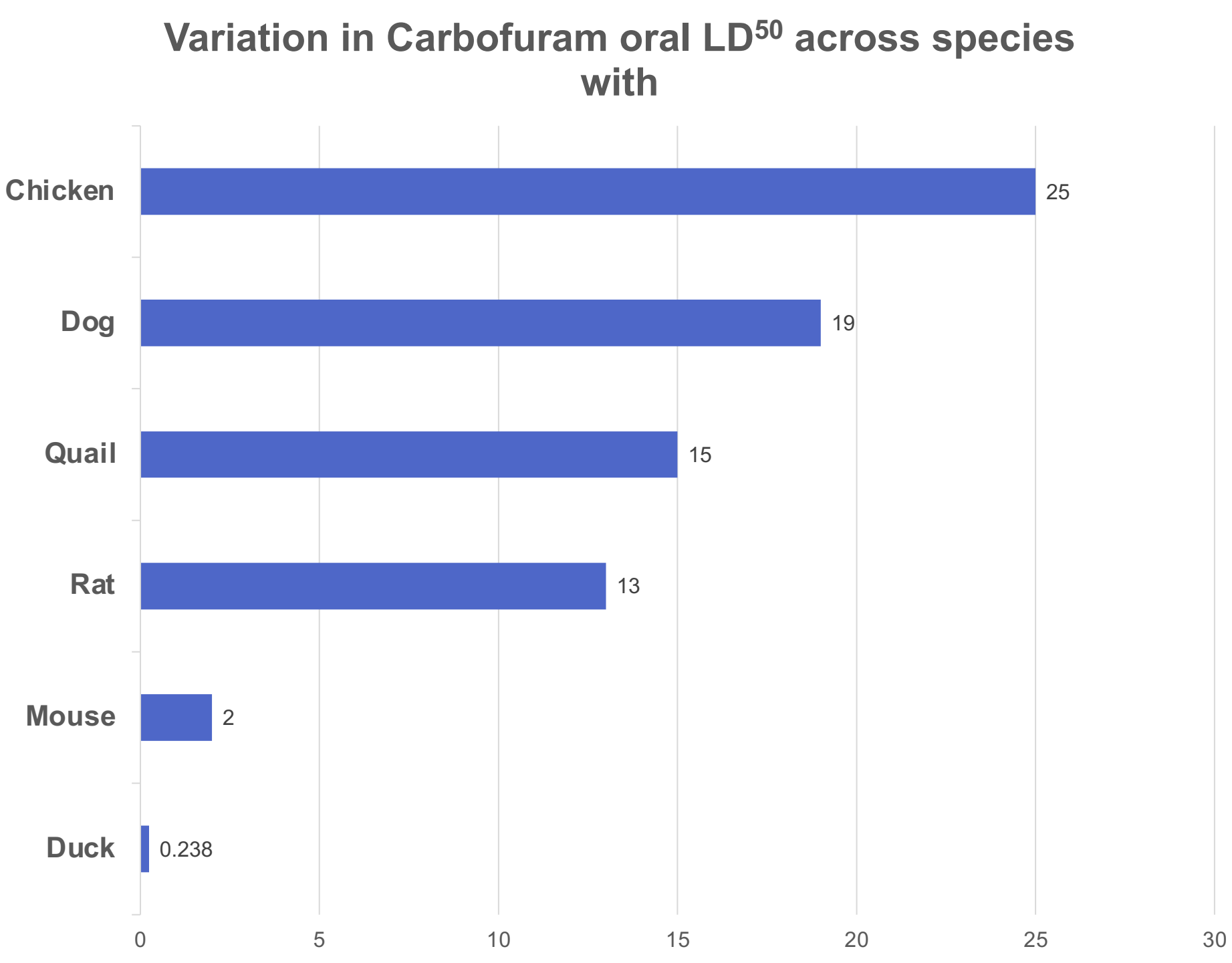


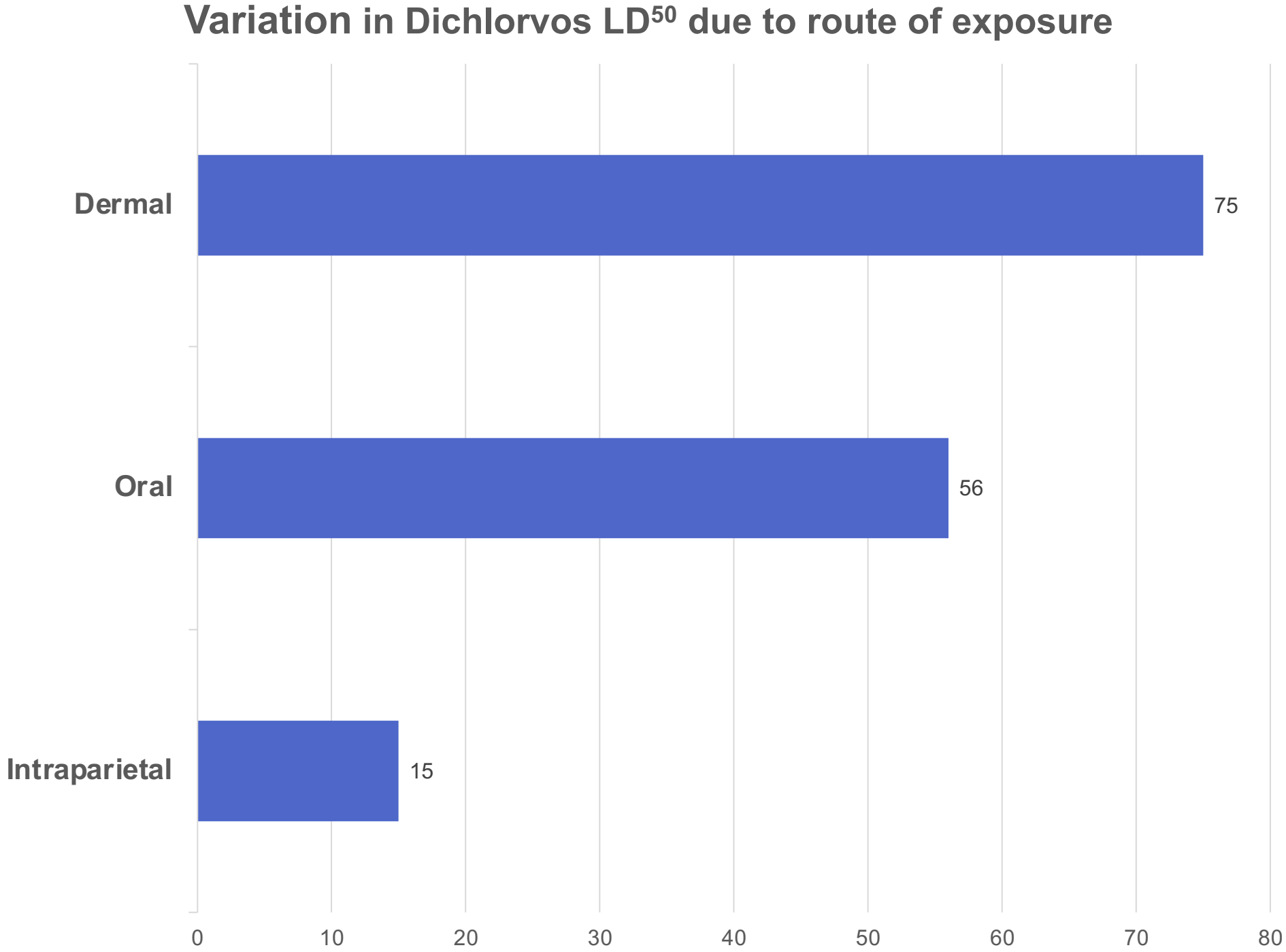
Pesticide Toxicity

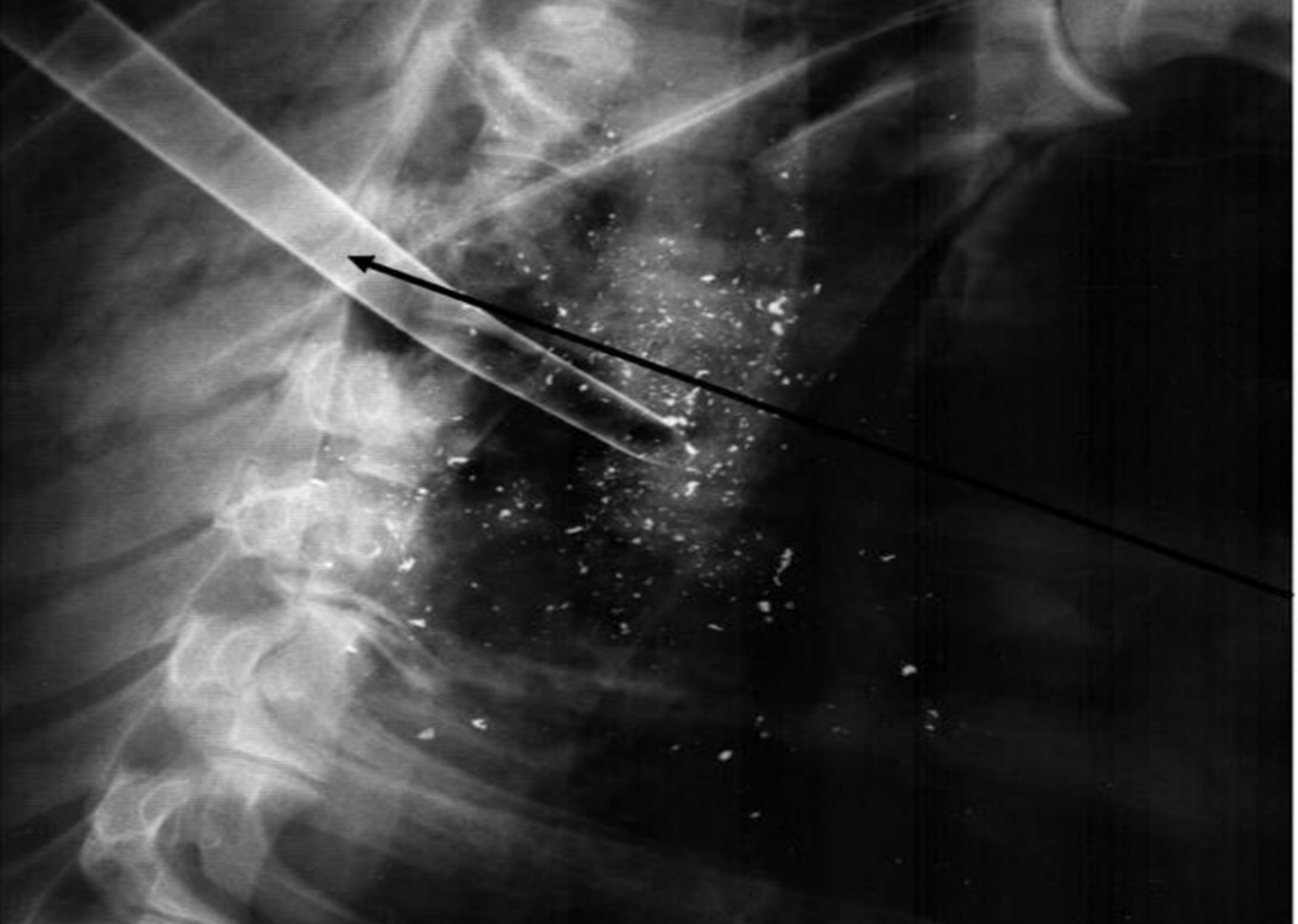


Pesticide Toxicity




Variation in Carbofuram oral LD50 across species with
Chicken
25
Dog
19
Quail
15
Rat
13
Mouse
2
Duck
0.238
0
5
10
15
20
25
30


Variation in Dichlorvos LD50 due to route of exposure
Dermal
Oral
Intraparietal
75
56
15
0
10
20
30
40
50
60
70
80



Deer #30

thorax, whole body

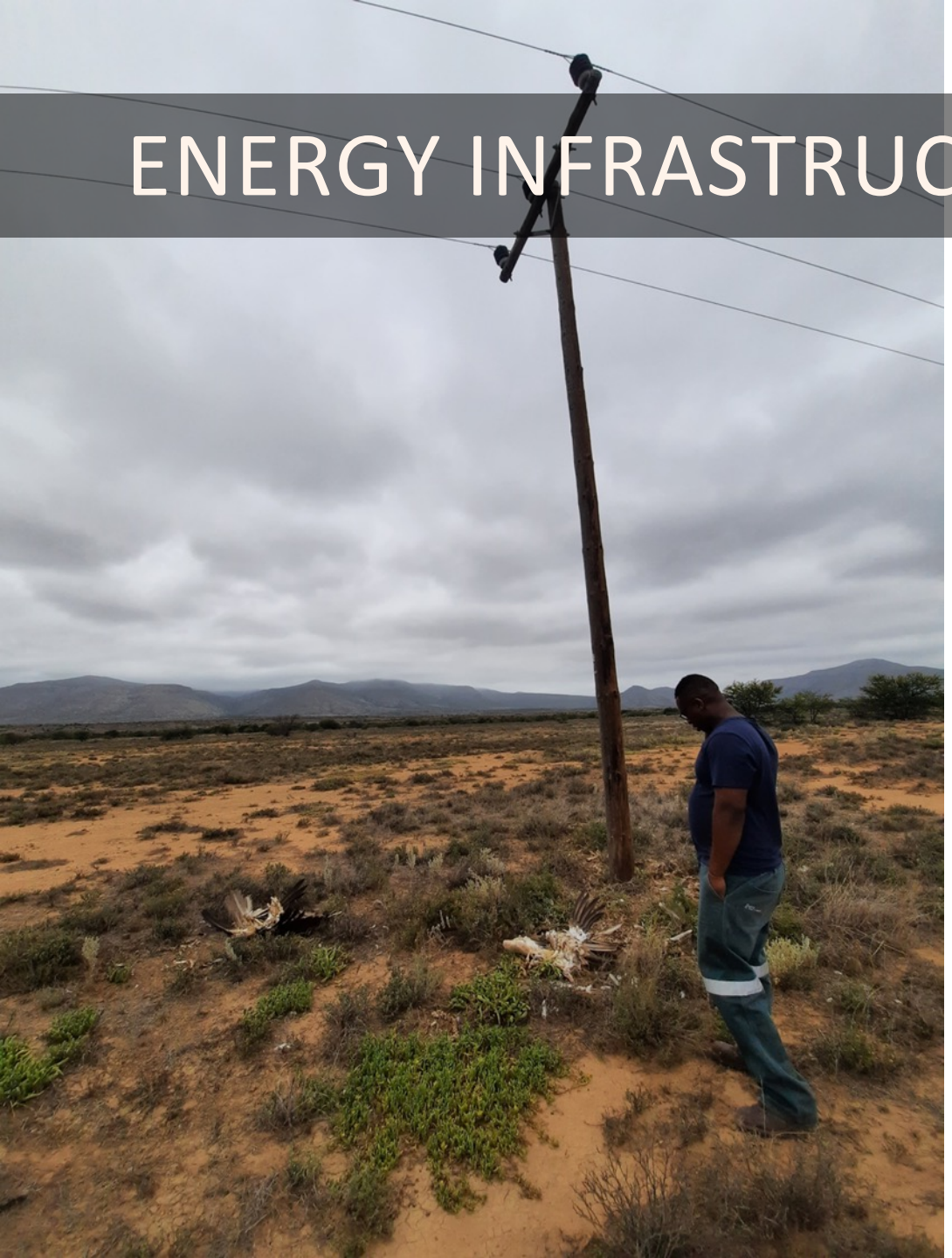
Rifle: 7-mm Rem Magnum

Bullet: lead-core, lead-tip, 175-grain

547 fragments counted

Note: 9-mm carbon fiber tube inserted through bullet path

ENERGY INFRASTRUCTURE



POWER LINES & WIND ENERGY DEVELOPMENTS

Energy infrastructure represents a very significant threat, leading to powerline collisions, as well as electrocutions, which negatively impact a wide range of species of birds of prey. Wind energy is a known concern, although it is a more species-specific threat.

ENDANGERED WILDLIFE TRUST
Protecting forever, together.

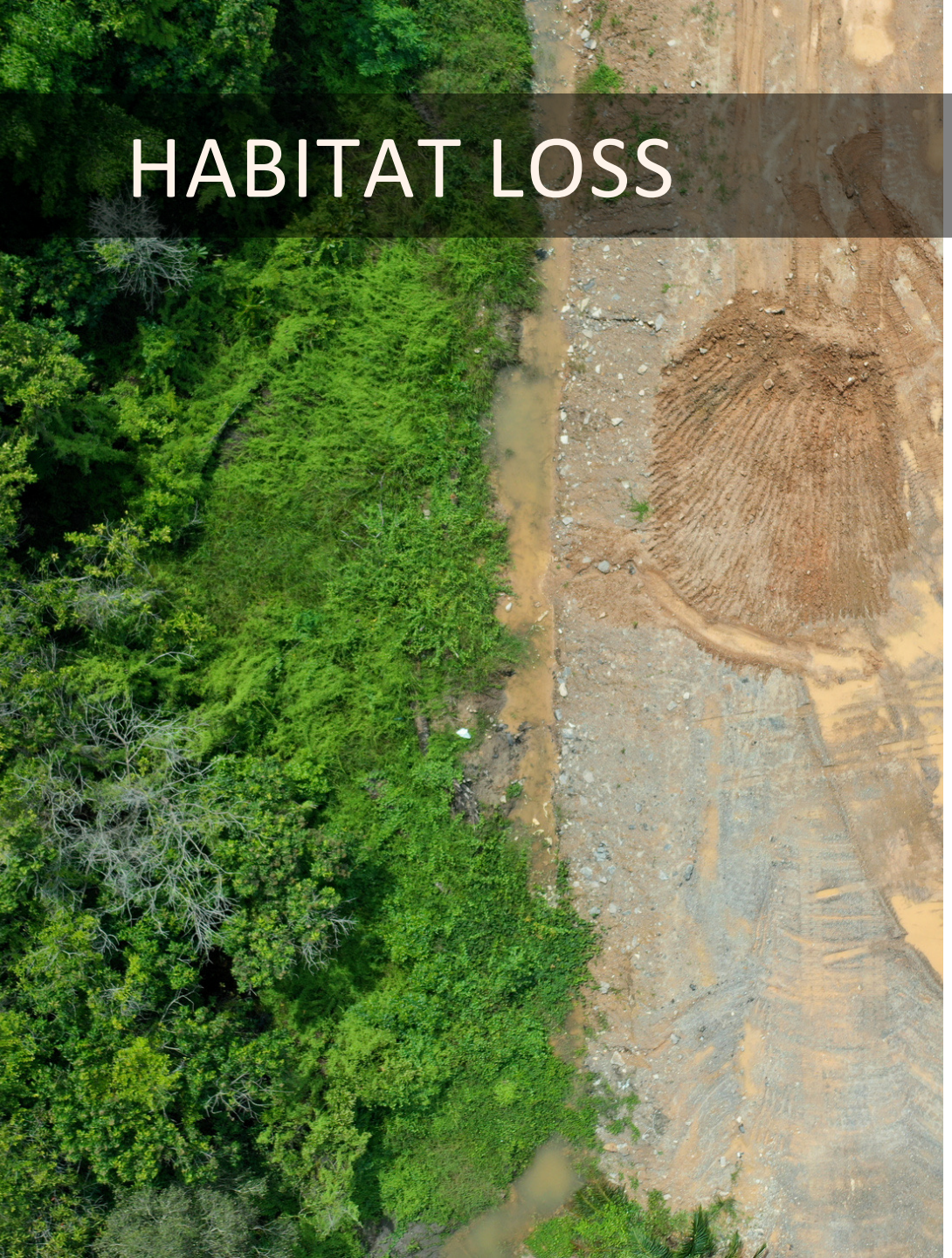
Eskom

STRATEGIC PARTNERSHIP

PERSECUTION

DIRECT PERSECUTION DUE TO HUMAN WILDLIFE CONFLICT

Direct persecution still exists, for example owls being killed as a result of negative traditional beliefs. In some area, large eagles may also be killed if it is believed that they kill livestock.



HABITAT LOSS

THE LOSS OF BREEEDING HABITAT

The loss of breeding range is a significant concern, and particularly for more specialist species, is often the most significant threat. In many area, illegal transformation of habitat is still a common practice that leads to the slow but continuous attrition of breeding habitat.

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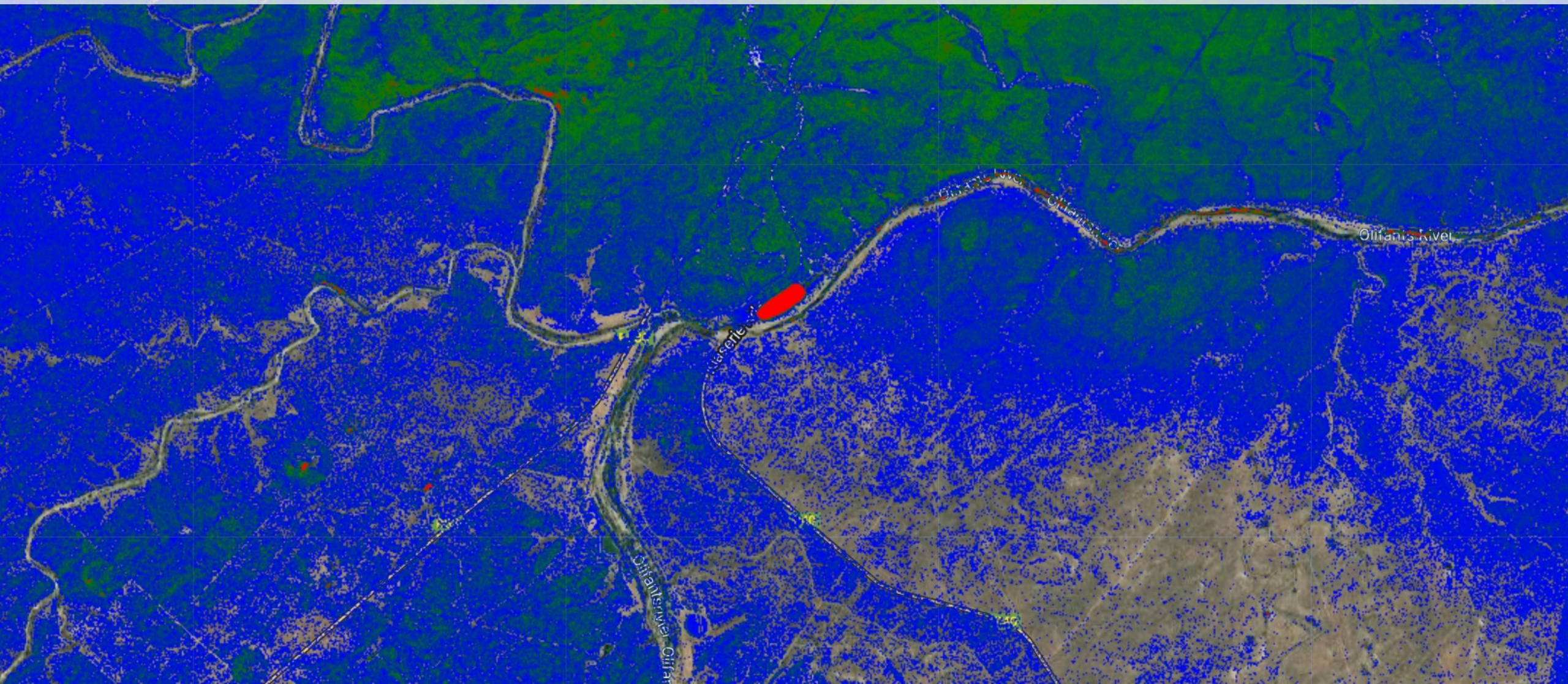
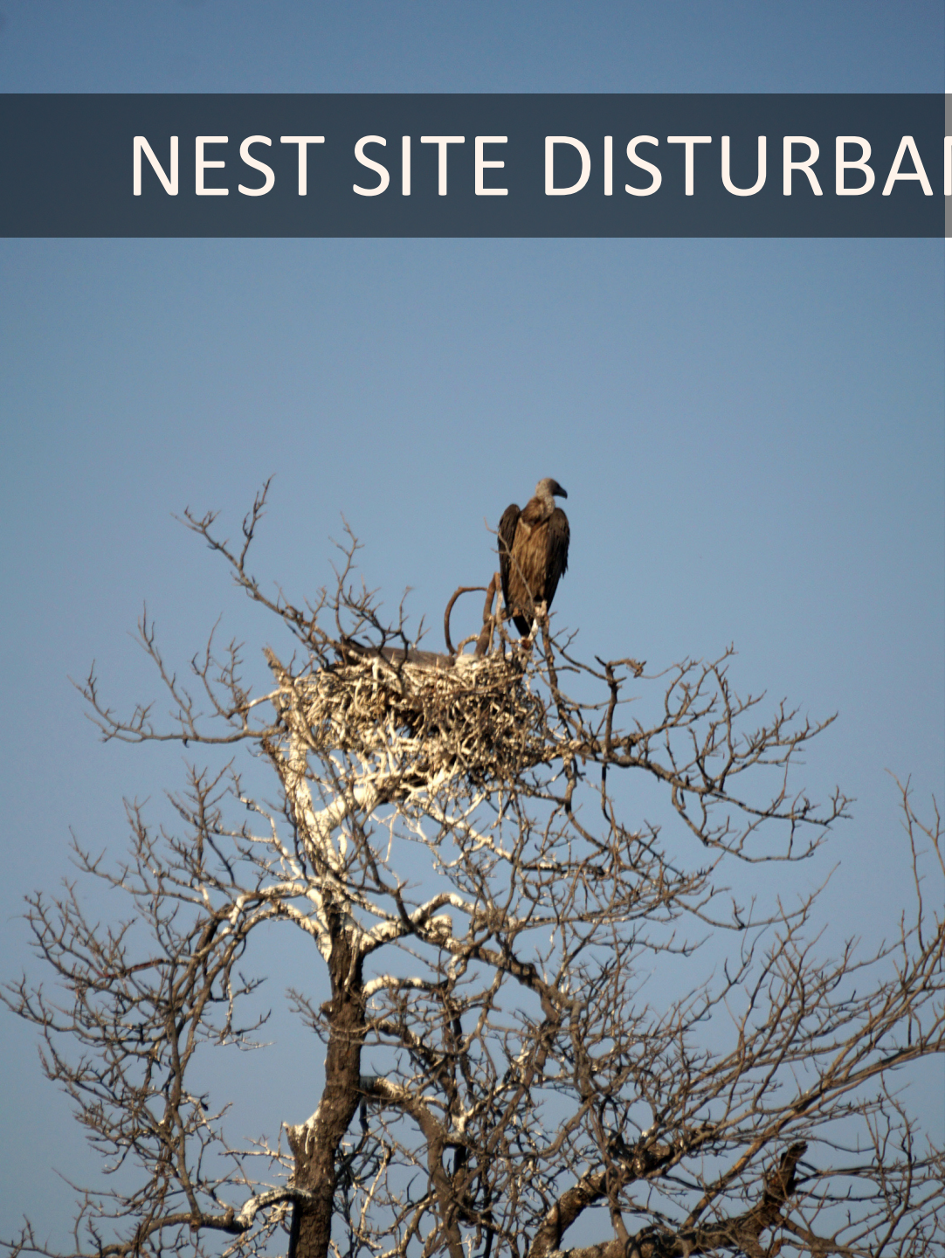
Remote Sensing for Habitat Loss

The use of satellite imagery to flag illegal developments



NEST SITE DISTURBANCE



DISTURBANCE AT NEST SITES

This can be because of several reasons, both intentional and unintentional. Common examples include road placement inn areas near nest sites resulting in the abandonment of nests, tourist activities disturbing nests, as well as deliberate accessing of nests, particularly for more specialist and rare species.

DROWNING

UNSAFE FARM DAMS, RESERVOIRS AND DRINKING TROUGHS

Although more common in arid areas of South Africa, unsafe farm dams, reservoirs and drinking troughs represent a threat to a wide range of species that can get trapped in these structures and eventually drown. By adding a structure that allows birds and other animals to get out of these structures safely, one can eliminate unnecessary mortalities.

Wildlife poisoning in the GLTFCA

Annette Hübschle

GLOBAL RISK GOVERNANCE PROGRAMME · GLOBAL RISK GOVERNANCE PROGRAMME ·

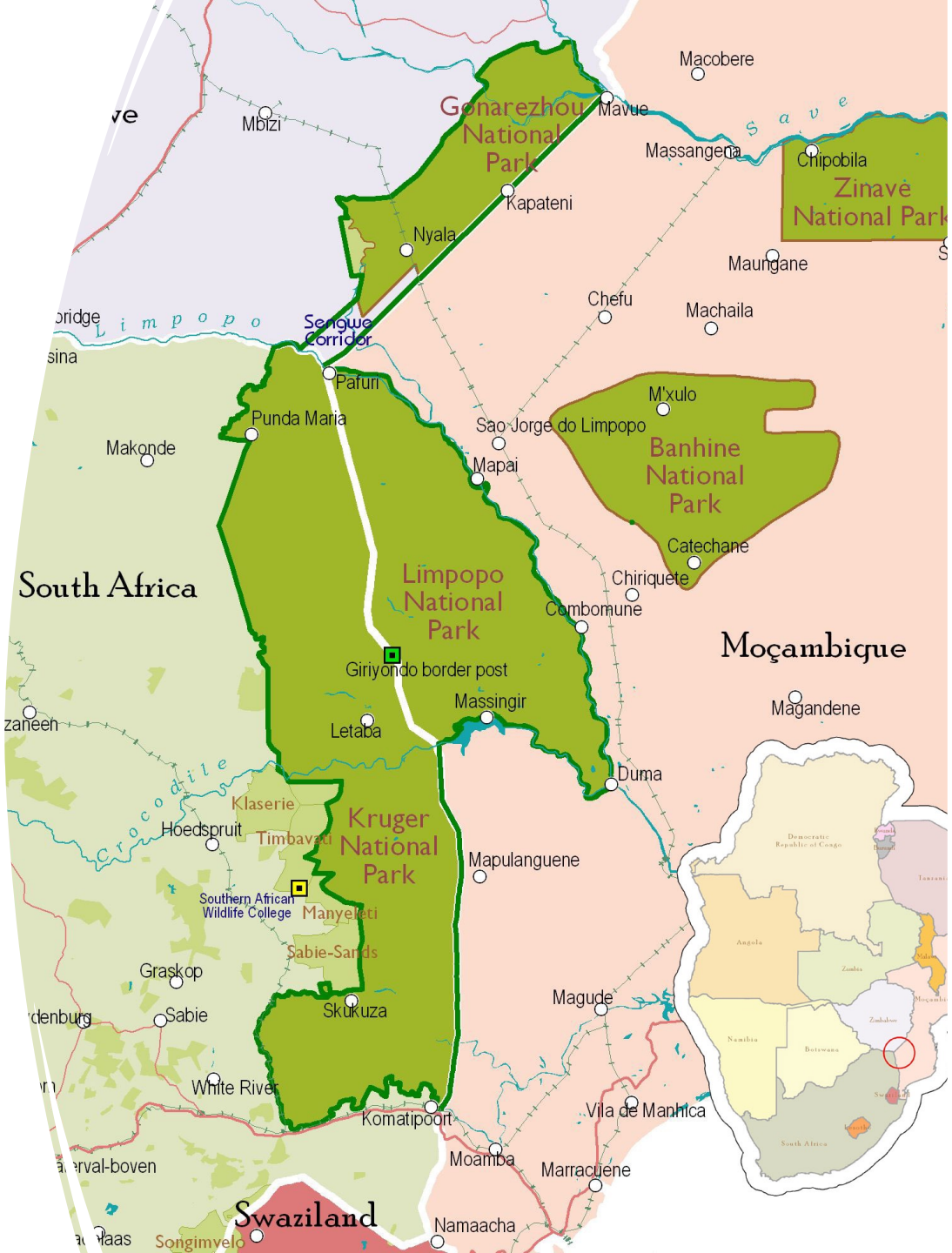
TREPA | Threat Reduction for the Environment, People, and Animals

Background to the study

- In 2016, conservation officials in the GLTFCA registered concerns that poison poaching was emerging as a major threat to conservation efforts
- Joint Management Board (JMB) of the GLTFCA set up a wildlife poisoning task team on 25 August 2016
- Researcher appointed in November 2017 to conduct baseline study on poisoning
- Scoping study completed in March 2018
- Fieldwork and data collection completed in July 2019

Research sites: Great Limpopo Transfrontier Park and surrounds

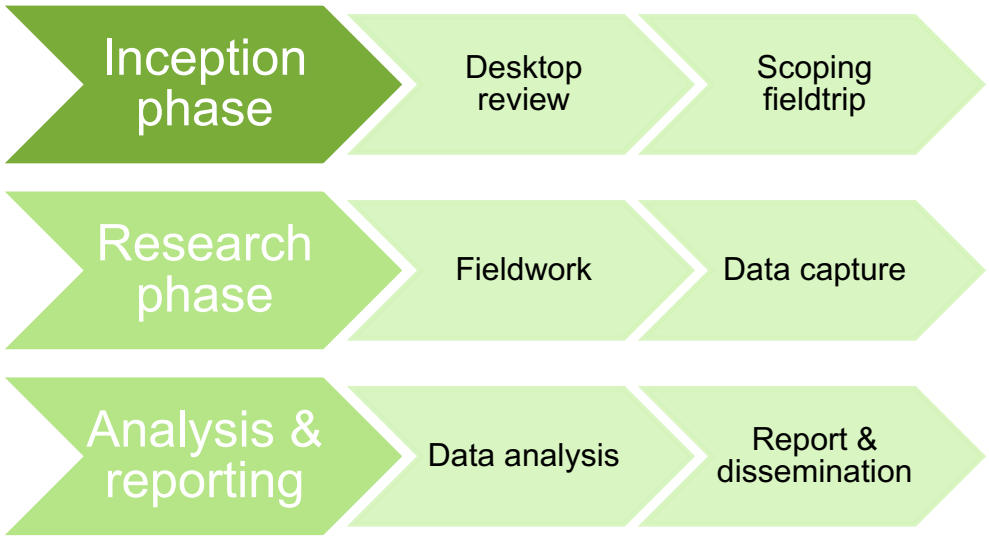
- Gonarezhou National Park
- Kruger National Park
- Limpopo National Park
  - Adjacent private game reserves & commercial farms
  - Communities in and adjacent to the parks
  - Markets and border posts close to the GLTP

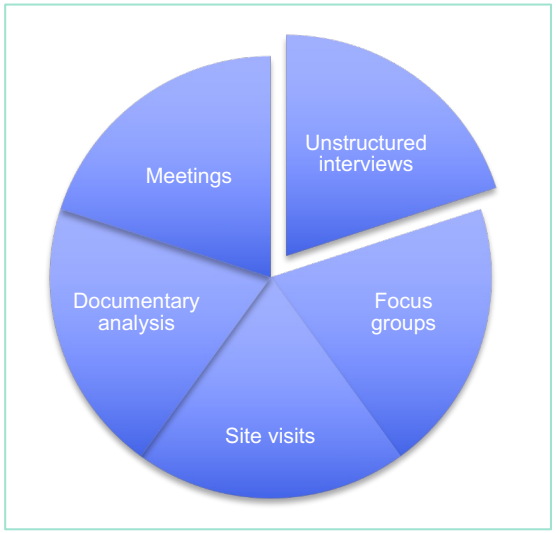


Objectives of the Study

- development of a comprehensive database of the current state of wildlife poisoning within the GLTFCA;
- documentation of current workable and appropriate methods to address wildlife poisoning;
- identification and investigation of potential sources of wildlife poison in the project area;
- identification and investigation of socio-economic benefits accrued as the result of wildlife poisoning;
- identification and investigation of negative socio-economic impacts of wildlife poisoning;
- identification and assessment of options for the development of a systems-based data capture and reporting tool

INTERNATIONAL BORDER NEAR CHICUALACULA AND SANGO BORDER POSTS


Inception phase
Desktop review
Scoping fieldtrip
Research phase
Fieldwork
Data capture
Analysis & reporting
Data analysis
Report & dissemination


Meetings
Unstructured interviews
Documentary analysis
Focus groups
Site visits

Sample size and geographic spread

Method	Number of participants
Individual and group interviews	172
Focus groups	51
Total	223

Region	Number of participants
Mozambique	57
South Africa	85
Zimbabwe	24
International	6

Research challenges and data limitations

LENGTHY RESEARCH AUTHORIZATION/PERMISSION PROCESS

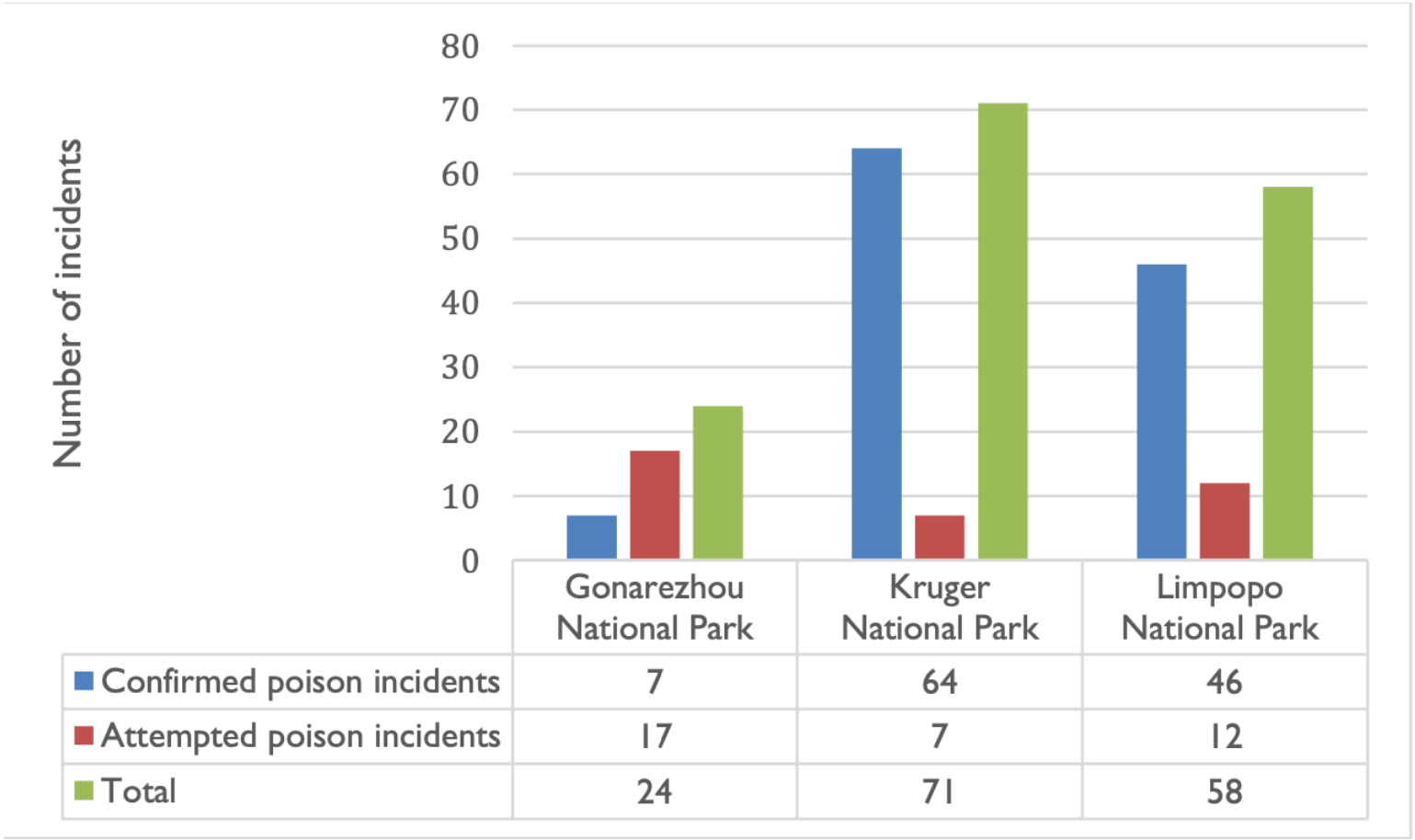
PROBLEMS WITH DATA VALIDITY, ACCESS AND SHARING

TIMING OF FIELDWORK

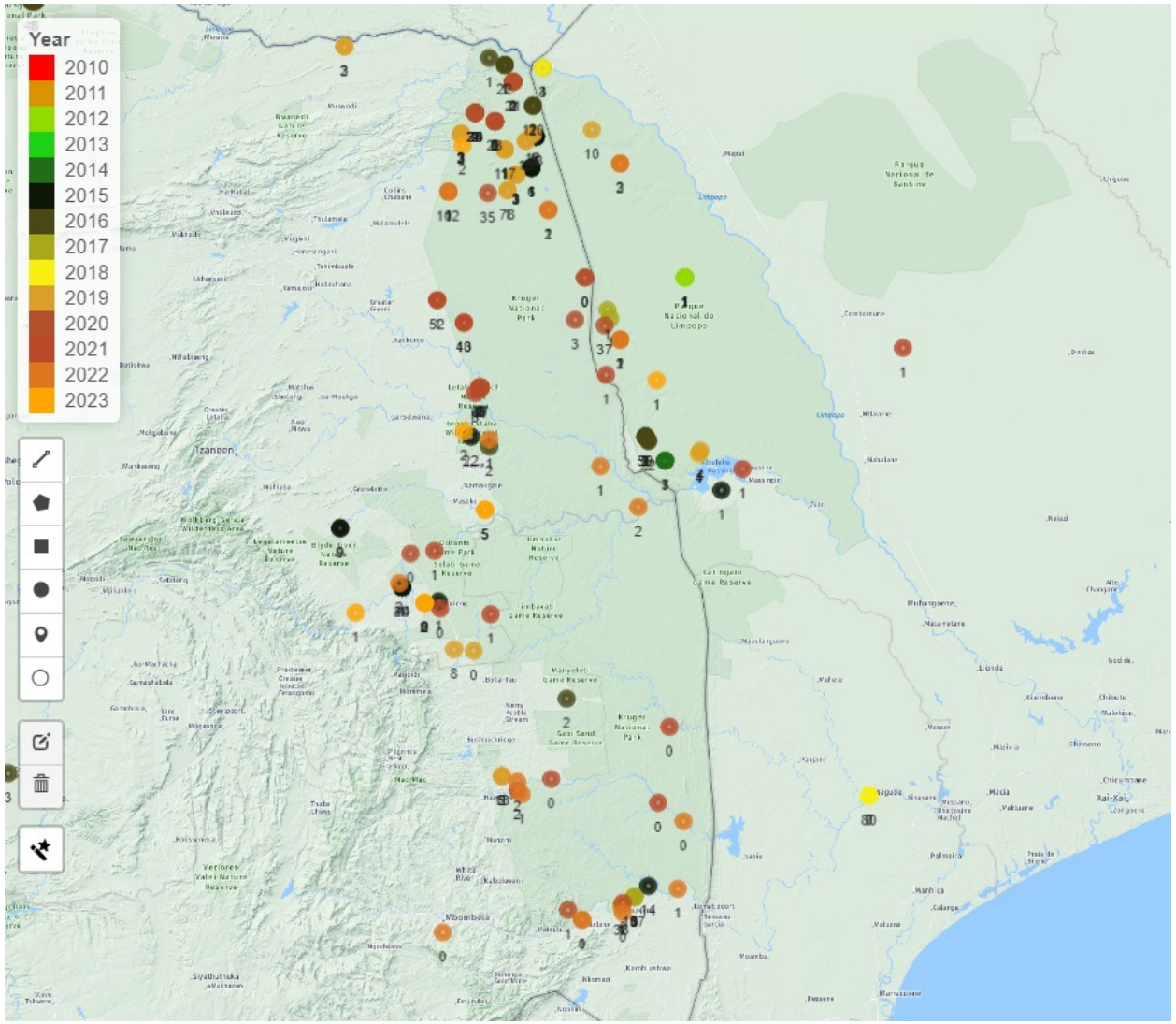
COMMUNITY ACCESS AND RESEARCH FATIGUE

COMMUNITY-PARK RELATIONS

Magnitude of wildlife poisoning in the GLTFCA (1 January 2008 to 18 July 2019)

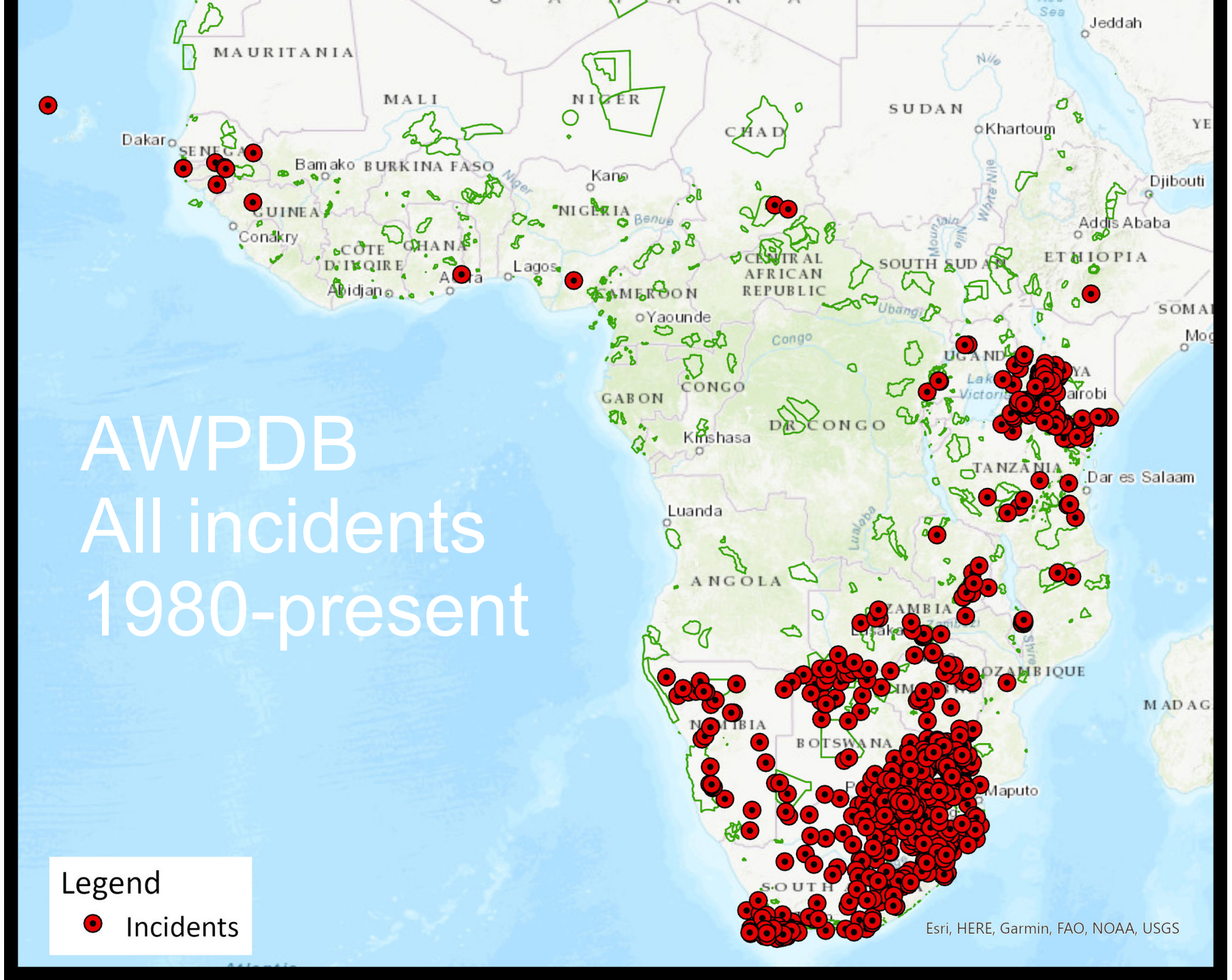


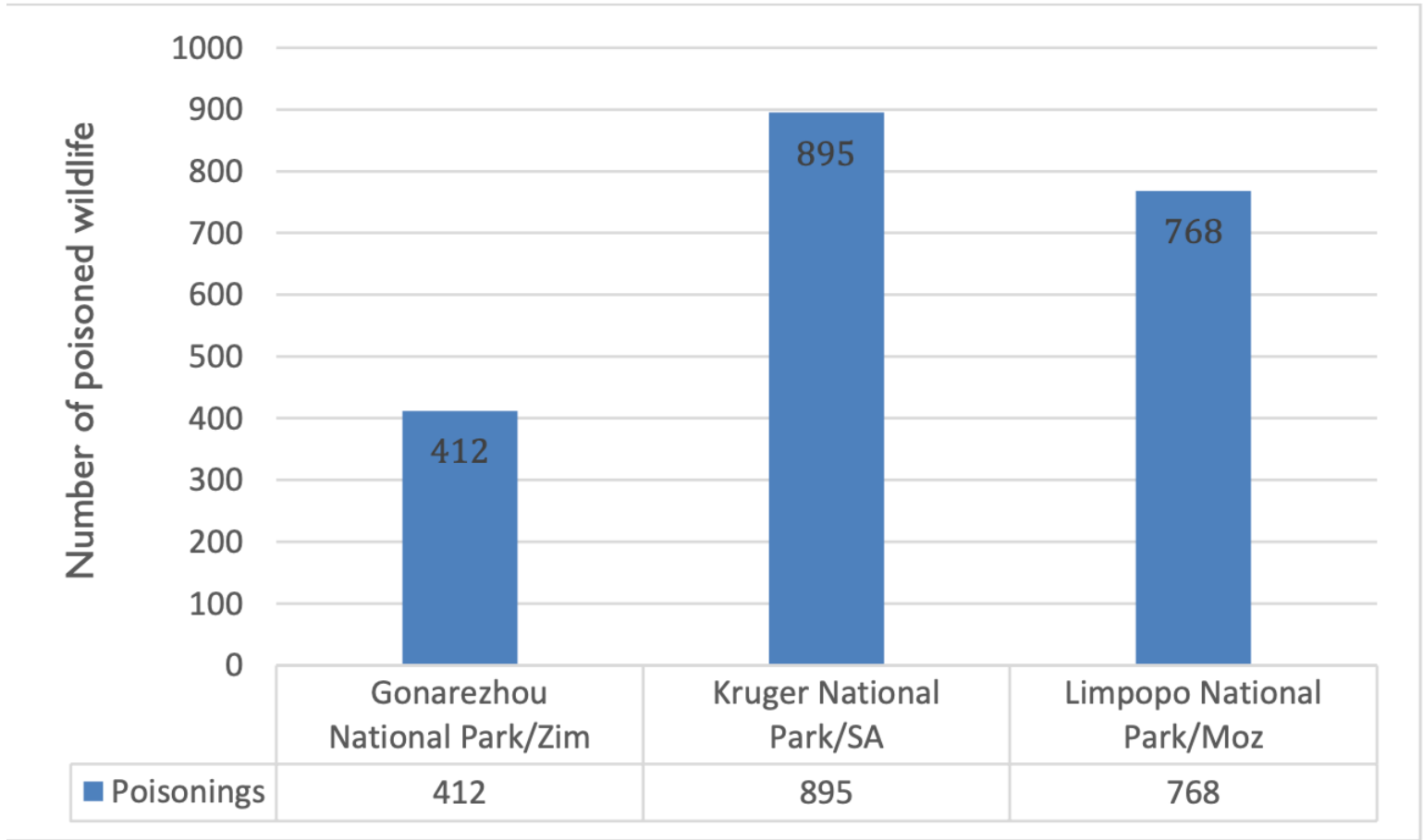
	Gonarezhou National Park	Kruger National Park	Limpopo National Park
Confirmed poison incidents	7	64	46
Attempted poison incidents	17	7	12
Total	24	71	58



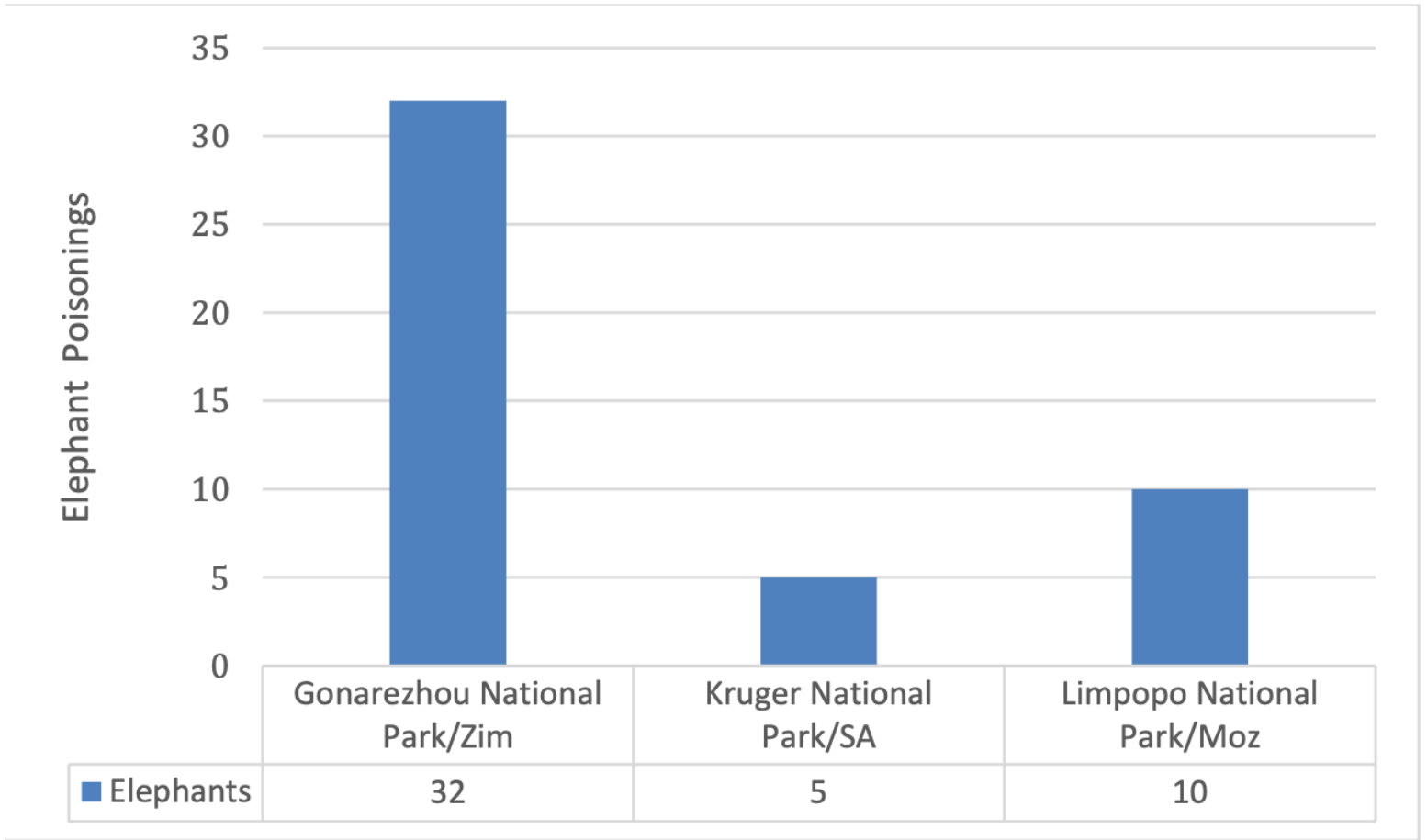
GLTFCA Poisoning Incidents 2010-2023

Source: African Wildlife Poisoning Database


AWPDB
All incidents
1980-present
Legend
Incidents
MAURITANIA
MALI
NIGER
CHAD
SUDAN
Khartoum
Jeddah
Dakar
SENEGAL
Bamako
BURKINA FASO
Kano
NIGERIA
GUINEA
Conakry
COTE D'IVOIRE
GHANA
Lagos
Abidjan
CENTRAL AFRICAN REPUBLIC
SOUTH SUDAN
ETHIOPIA
Addis Ababa
Djibouti
CAMEROON
Yaounde
GABON
CONGO
DR CONGO
Kinshasa
UGANDA
Nairobi
TANZANIA
Dar es Salaam
Luanda
ANGOLA
ZAMBIA
MOZAMBIQUE
NAMIBIA
BOTSWANA
Maputo
SOUTH
Esri, HERE, Garmin, FAO, NOAA, USGS

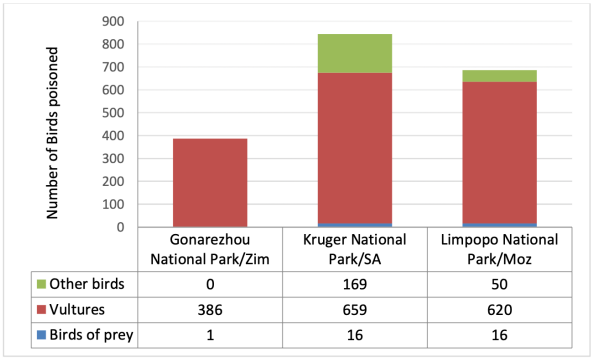

Number of poisoned wildlife
1000
900
800
700
600
500
400
300
200
100
0
412
895
768
Gonarezhou National Park/Zim
Kruger National Park/SA
Limpopo National Park/Moz
Poisonings
412
895
768

Species	Gonarezhou National Park/ Zimbabwe	Kruger National Park/ South Africa	Limpopo National Park/ Mozambique
Elephants	32	5	10
Rhinos	0	2	0
Predators	0	18	55
Vultures	386	660	620
Birds of prey	1	17	16
Other birds	0	169	50
Small animals	1	6	5
Buffalos	0	4	0
Antelopes	1	5	8
Domestic animals	0	0	4
Totals	421	884	768

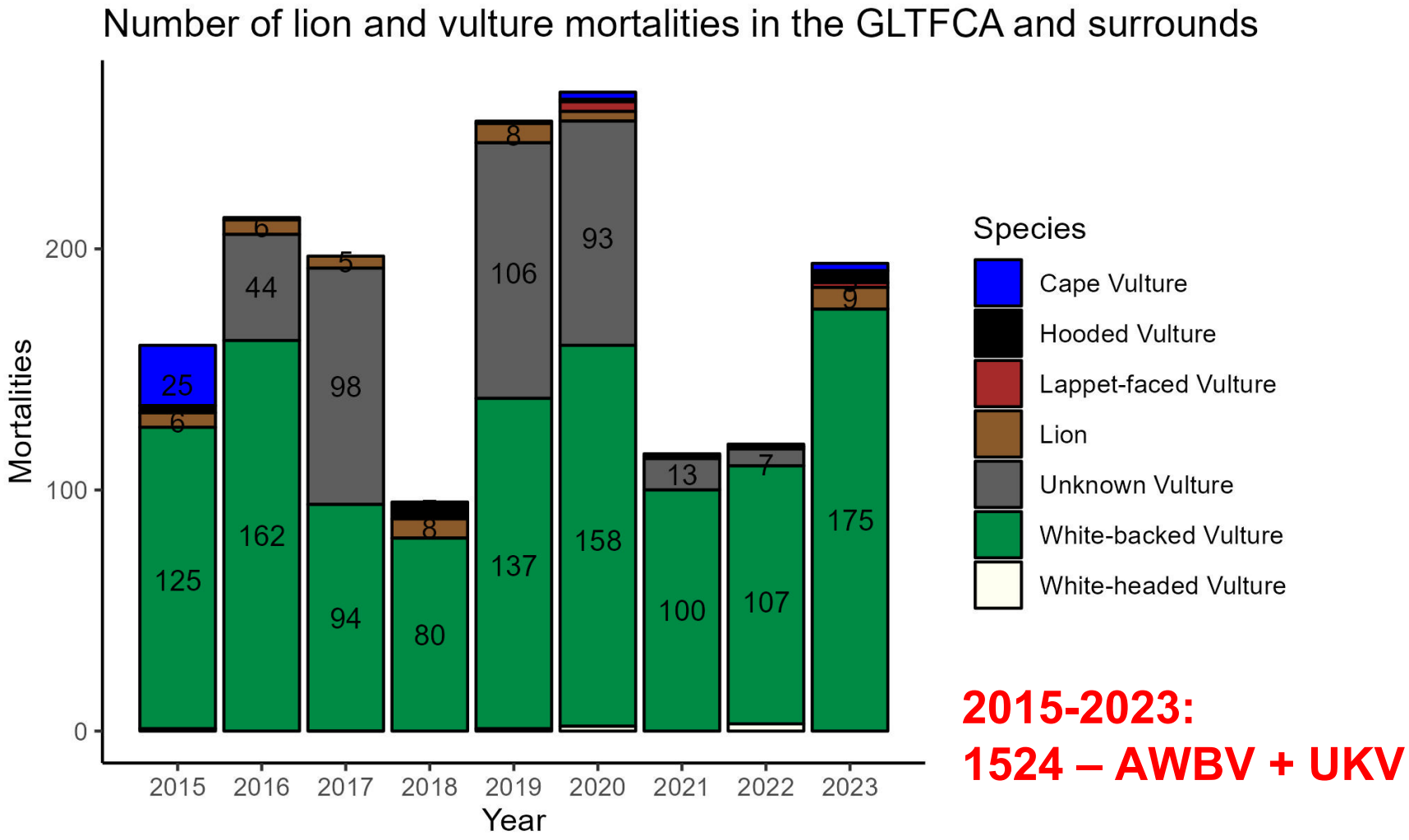

Elephant Poisonings
35
30
25
20
15
10
5
0
Gonarezhou National Park/Zim
Kruger National Park/SA
Limpopo National Park/Moz
Elephants
32
5
10

Date	Region	Country	Vultures	Elephants
2010	Mbabala	Mozambique	63	1
17/07/2012	GNP	Zimbabwe	191	1
28/09/2015	Vlakteplaas	South Africa	44	1
27/02/2016	Vlakteplaas	South Africa	110	1
2017	GNP	Zimbabwe	100	5
20/05/2017	GNP	Zimbabwe	94	1
25/02/2018	Mbashene	Mozambique	87	1
20/03/2019	Vlakteplaas	South Africa	18	1
29/05/2019	Vlakteplaas	South Africa	78	1
01/06/2019	Vlakteplaas	South Africa	12	1
			797	14

Number of birds poisoned in the GLTFCA between January 1, 2008 and July 18, 2019



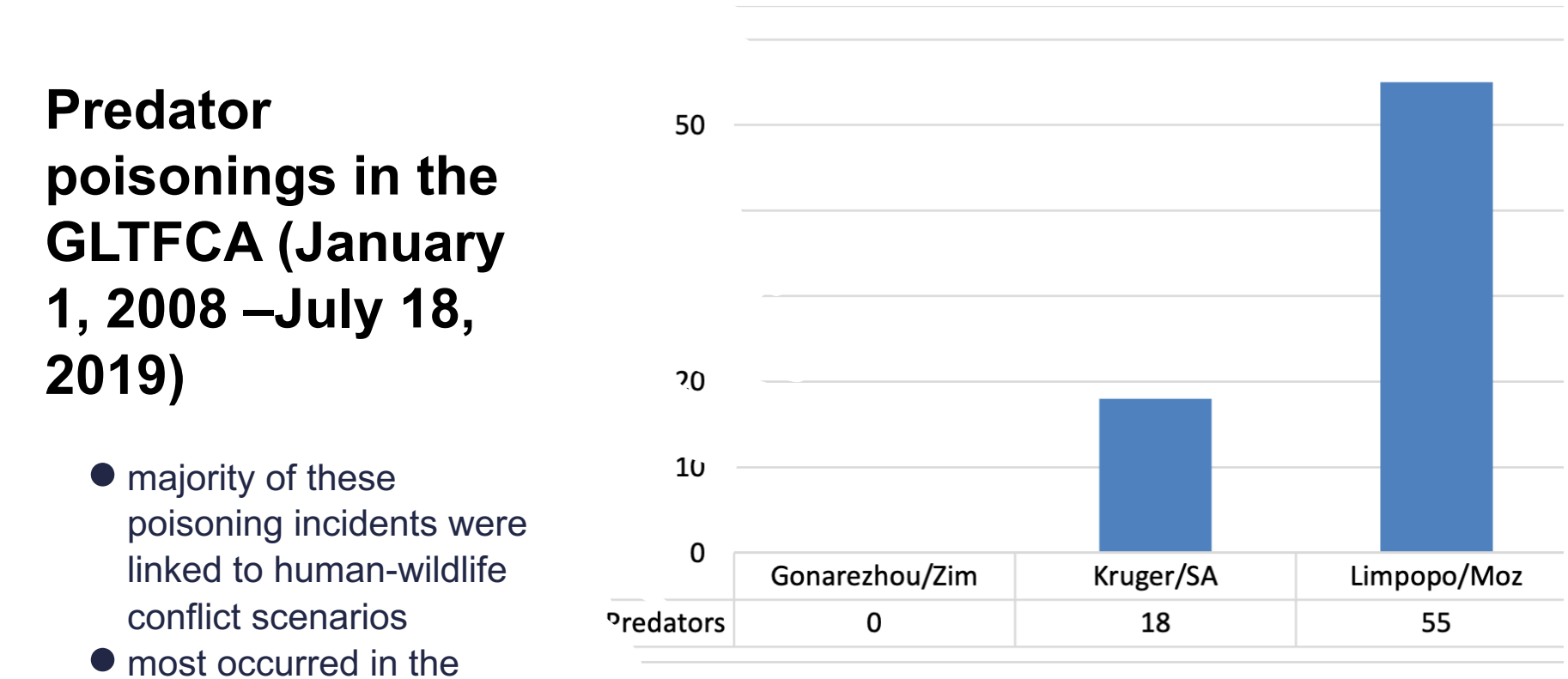
	Gonarezhou National Park/Zim	Kruger National Park/SA	Limpopo National Park/Moz
Other birds	0	169	50
Vultures	386	659	620
Birds of prey	1	16	16



2015-2023:
1524 – AWBV + UKV

Predator poisonings in the GLTFCA (January 1, 2008 –July 18, 2019)

- majority of these poisoning incidents were linked to human-wildlife conflict scenarios
- most occurred in the Mozambican part of the GLTFCA
- Lion bones, faces and paws were removed in one case and lion faces, heads and paws were removed in three other cases

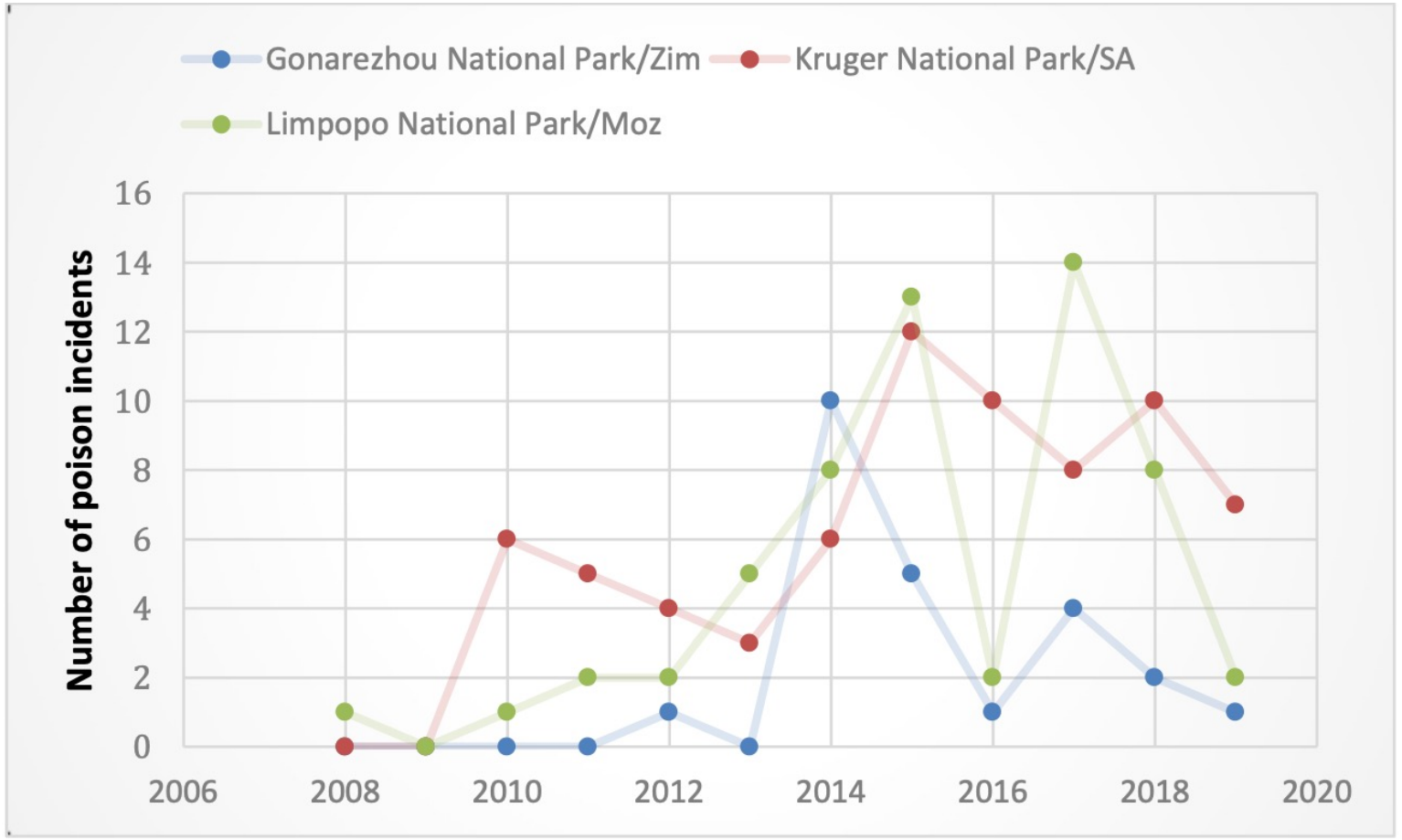


Impact on ecosystems

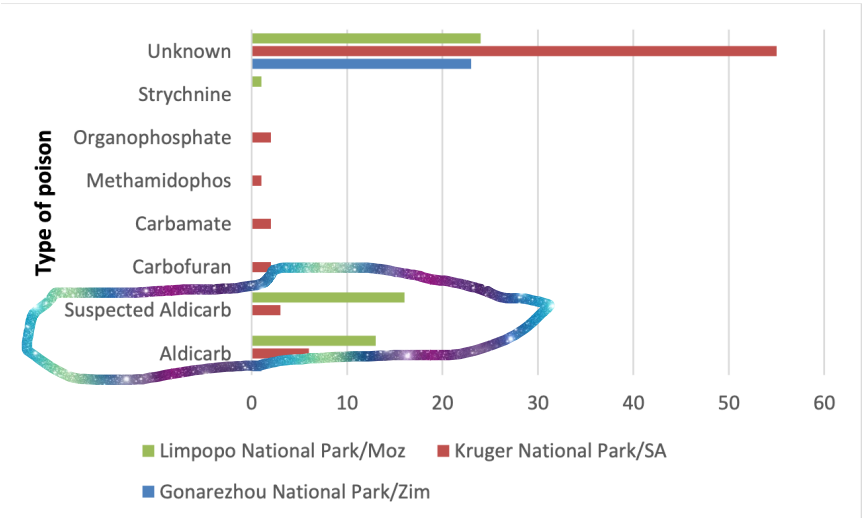
The datasets considered in this study found little evidence as regards the impacts of wildlife poisoning on the broader ecosystem, including water bodies and vegetation. One data entry recorded the dead vegetation around a poisoned elephant. None of the records mentioned insects while small animals were cited in a few incident records only.

Photo credit: Kruger Ranger Services

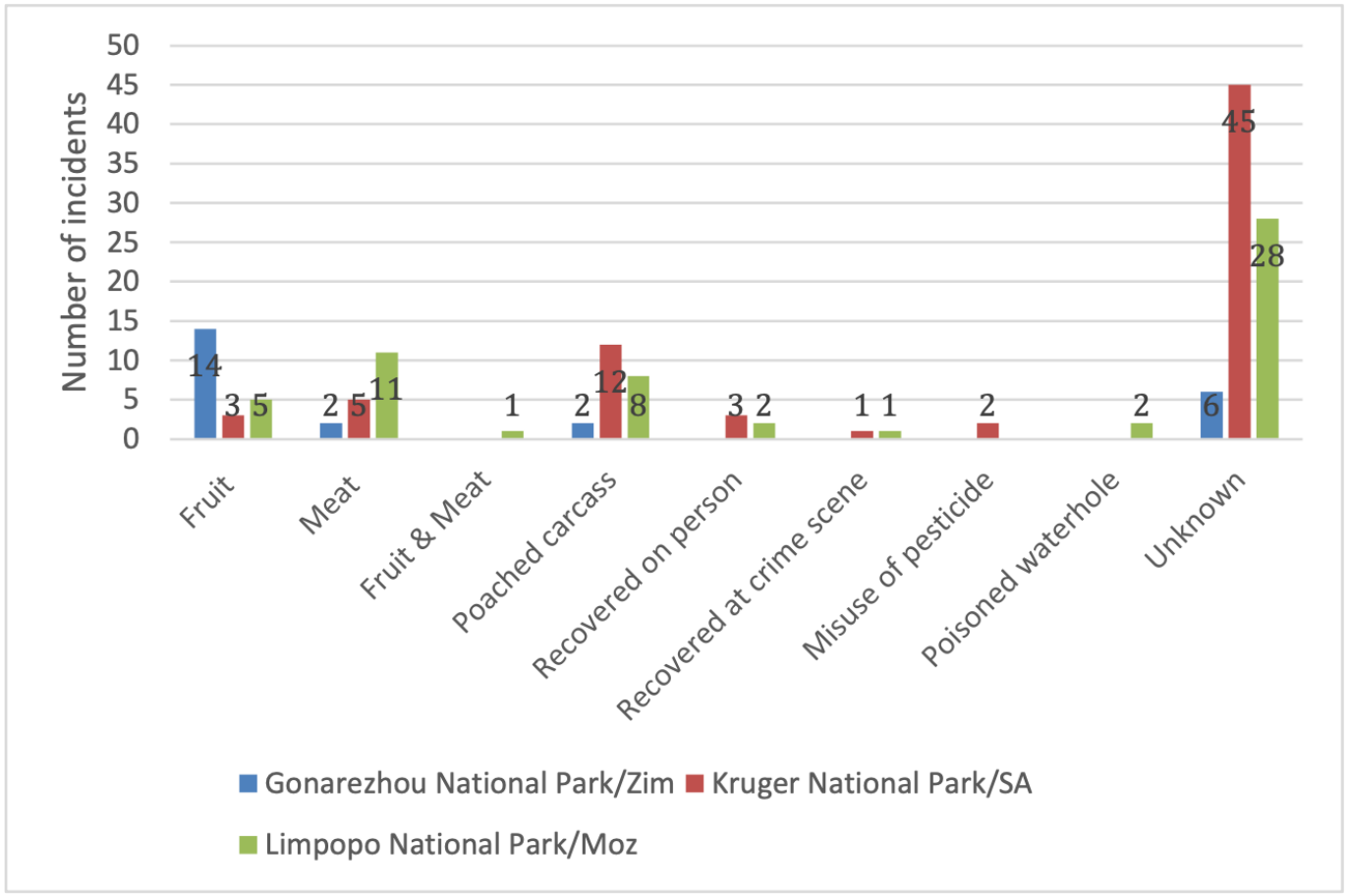
Frequency of poisoning incidents in the GLTFCA (January 1, 2008 – July 18, 2019)



Types of poison used



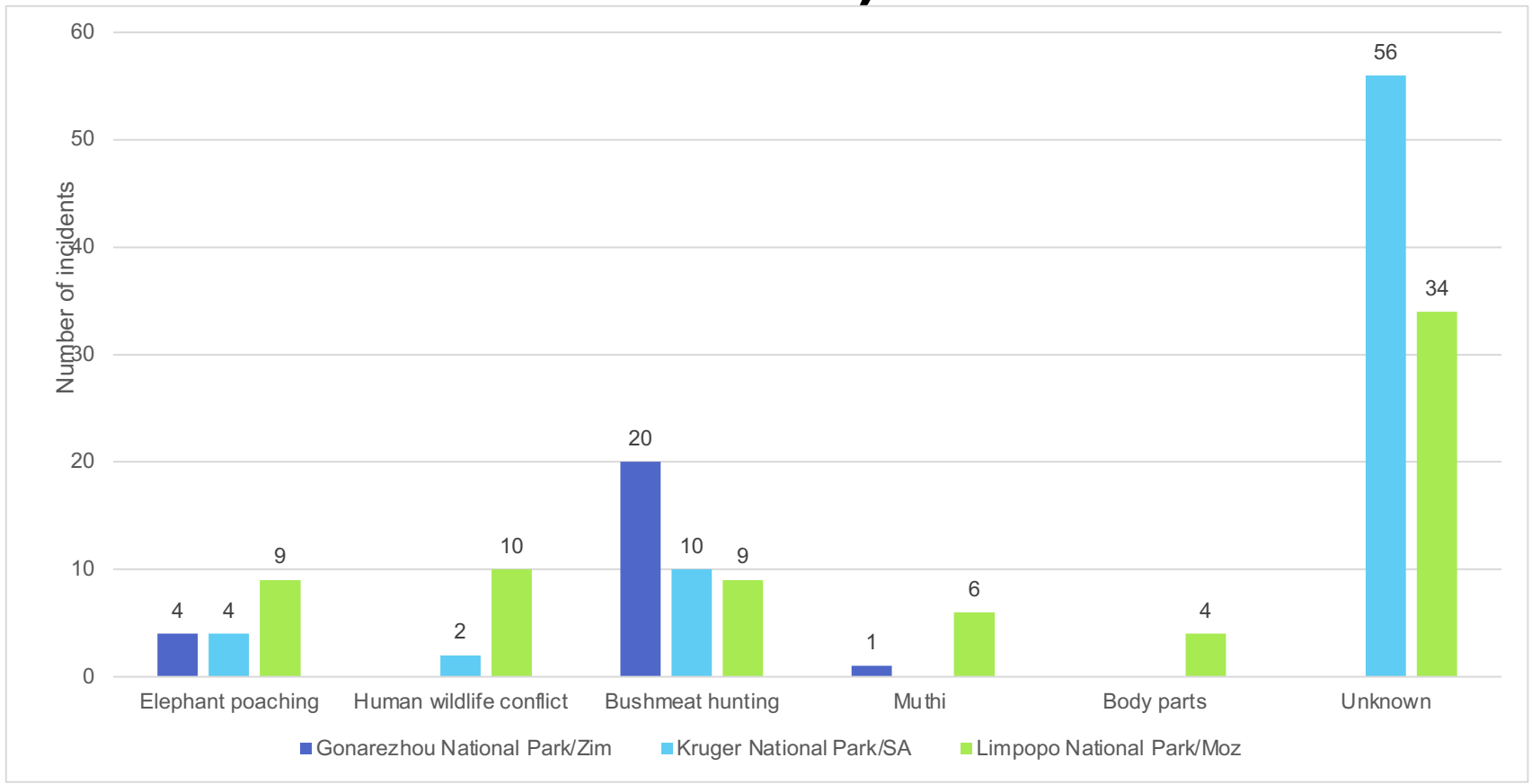
Method of poison administration in the GLTFCA (January 1, 2008 –July 18, 2019)



Motivations for wildlife poisoning

- Misuse & accidental use
  - Ignorance
  - Ubiquity of banned, generic and fake pesticides and toxins
- Deliberate poisoning
  - Poison poaching (elephants and lions)
  - Retaliatory poisoning (vendetta killings)
  - Means of wildlife capture & hunting
  - Eliminating the bush police (vultures)
- Secondary poisoning
  - Means of killing/capturing wildlife sentinels and scavengers

Drivers of wildlife poisoning in the GLTFCA (January 1, 2008 –July 18, 2019)



Insights from research in local communities

Highly hazardous pesticides are widely available and traded in market-places, taxi ranks and bus stops in the three countries

Prices for aldicarb ranged from 1- 2 USD for four straws

One confirmed human death from poison exposure in Sengwe Corridor, several more deaths in SA and Mozambique which were not verified

Livestock deaths, dog poisonings

Poisoned game meat sold to local people

Poisons used to deal with dangerous or damage-causing animals

Toxic pesticides used to spray fields causing respiratory problems for people

The way forward?

- Ranger training re poisoning sites as emergency crime scenes
- Impact of secondary and tertiary poisoning – people, livestock & ecosystems
- How to deal with the pervasive legitimacy of the use of highly toxic pesticides and chemicals?
- Cross-border responses needed
- Center local communities (including commercial farmers) in responses
- Open-access national/regional database?
- Regulate/ban/return illegally stored poisons and fake variants – operationalize local/indigenous knowledge to deal with pests/problem animals

Wildlife Poisoning Sniffer Dogs?

JUNTA DE ANDALUCIA

SOUTHERN AFRICAN
WILDLIFE COLLEGE
TRAINING BEYOND BOUNDARIES

ENDANGERED
WILDLIFE TRUST

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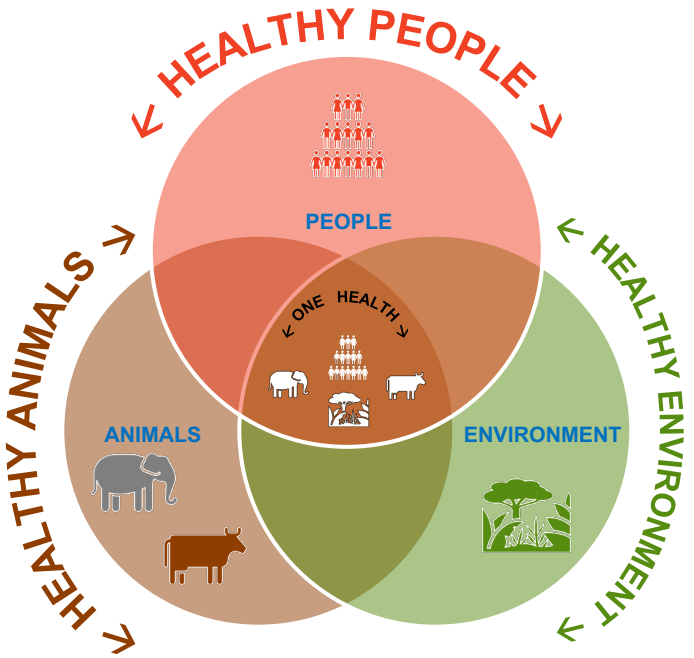
Traditional Healers in the System



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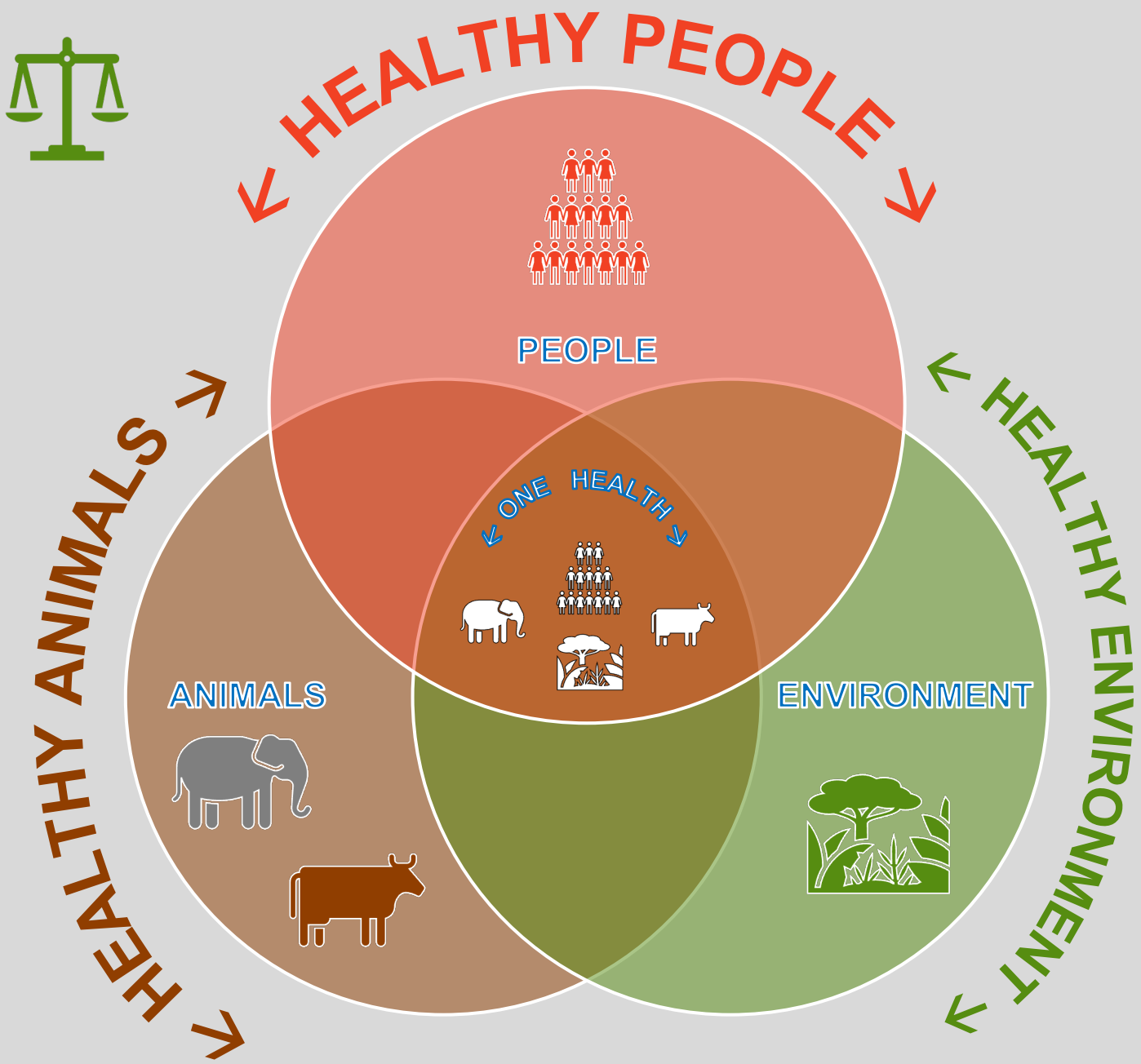
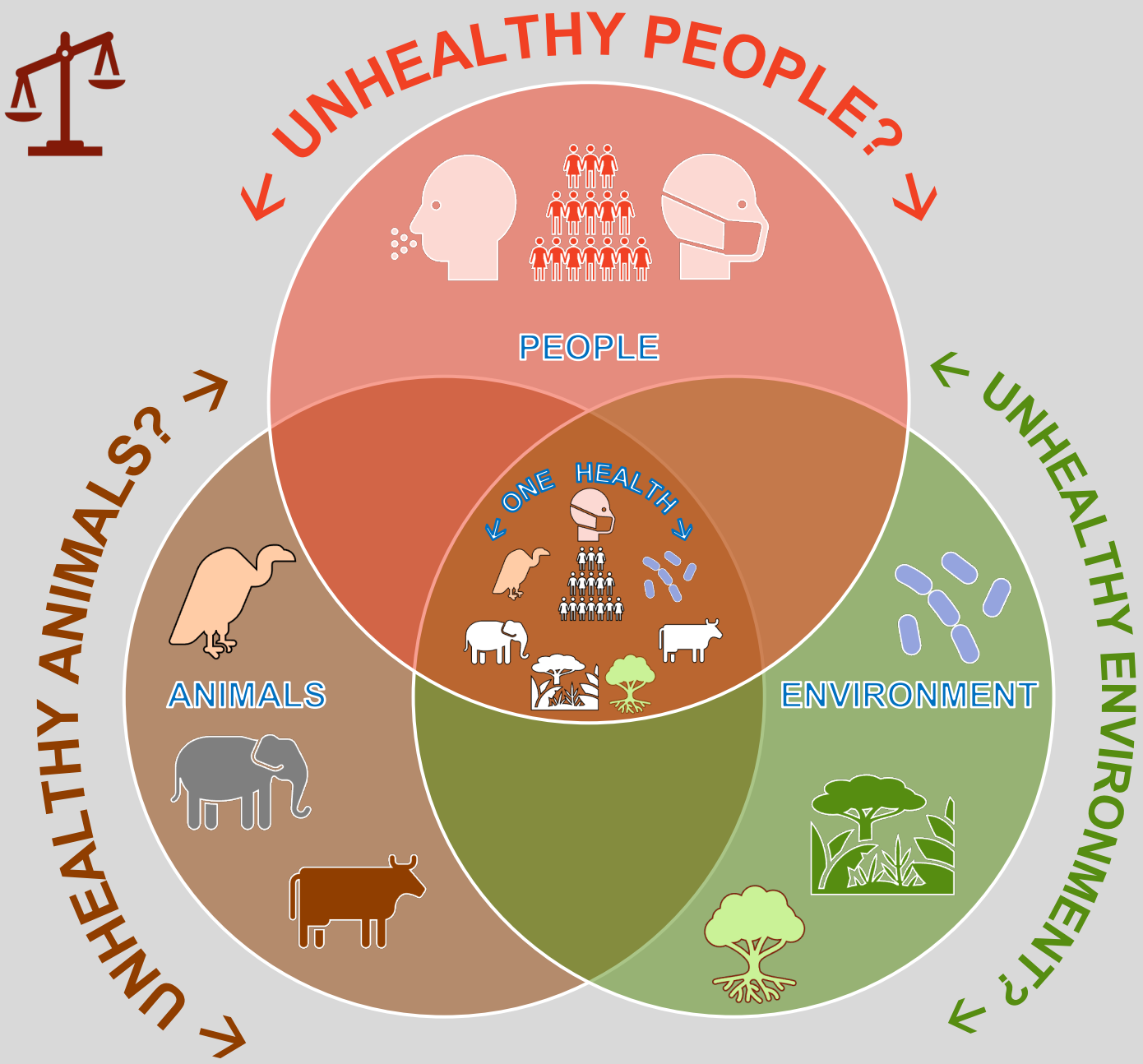
Dr Vivienne Williams
School of Animal, Plant & Environmental Sciences

TREPA | Threat Reduction for the Environment, People, and Animals

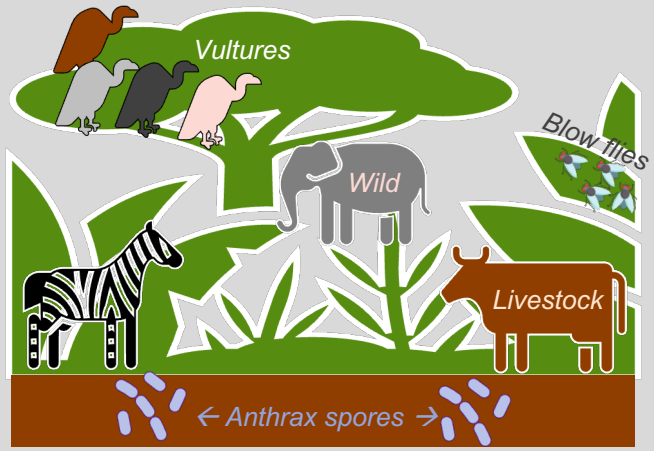


One Health (for all) recognizes that the **health** of **people** is interconnected with the **health** of **animals** in our shared **environment**, and that **health challenges** require an holistic approached.

Where do traditional healers fit into the One Health system?



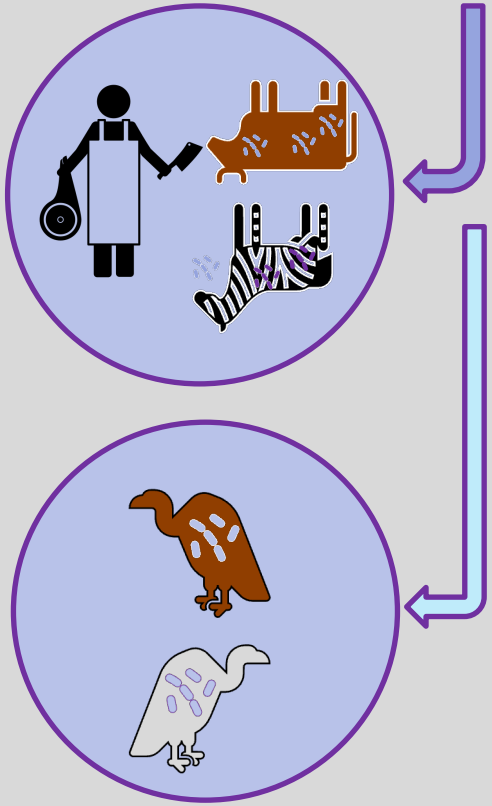
Specifically….
Where do traditional healers fit into a One Health system where **anthrax** (and other zoonotic diseases) in the **environment** has the potential to be transmitted and spread to **traditional medicines**, **livestock**, **wild animals**, **vultures**, **food**, and **people**??



Traditional healers in the One Health system

QUESTIONS TO BE ASKED:

- What is the likelihood of anthrax exposure via these transmission routes?
- What is the likelihood that a vulture exposed to anthrax in the region will transmit it to humans following a hunting/poisoning event, after which their body parts were removed and traded in to the traditional medicine system with a stakeholder (e.g. traditional healer) and/or given to a person seeking a zootherapeutic remedy?
- Are there other zoonotic diseases, that are more transmissible, that are more harmful to people, livestock and other wild animals?



CULTURAL ROLE

Must acknowledge the cultural significance, and historical use, of vultures in traditional healing practices when discussing public health and conservation concerns.

These practices may include the risk of using parts of an animal that carried anthrax.

CONSERVATION CHALLENGES

Vultures have a role in disease/anthrax prevention through their scavenging behaviour.

Important to conserve them for ecological and public health reasons

– but habitat loss, hunting and cultural use are causing population declines and increasing the risks for disease spread.

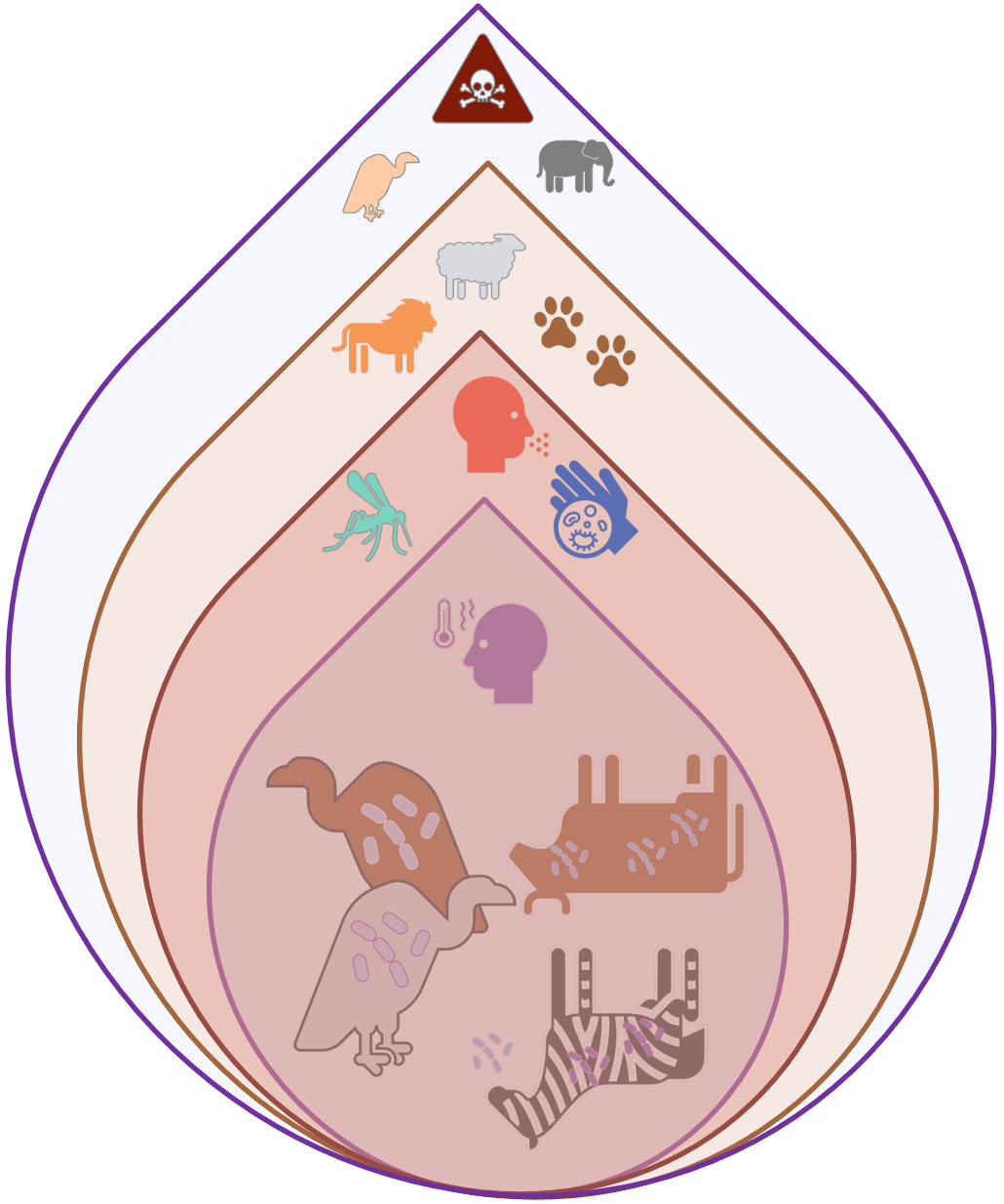
DIFFERING PERSPECTIVES & COMMON GOALS

While there are different views on vulture use, culture and conservation – there are shared concerns about community health and the future availability of bio-cultural resources.

Hence, must explore shared perspectives on cultural preservation, bio-cultural resource sustainability, conservation, and disease control.

Culture and Conservation – Clash or Common Ground?

Core issues and other layers



Traditional Healer Engagement…

CULTURAL KNOWLEDGE & COLLABORATION

Engage in discussions with healers about zoonotic diseases (anthrax) and transmission risks.

Their local knowledge could help identify knowledge gaps and disease-prone areas, and behaviours that might contribute to the spread of pathogens.

INFORMATION & AWARENESS

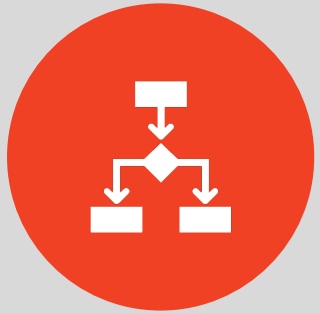
Share information about the ecological and cultural roles of vultures, and the risks associated with handling animals that might carry pathogens.

Promote practices to minimize disease transmission during rituals or remedies involving unsafe animal products

EARLY DETECTION & REPORTING

Encourage healers to look for any signs of disease or unusual animal death and report such incidents to the proper authority.

This can aid in early detection and response to potential outbreaks.



ALTERNATIVE PRACTICES

Collaborate to explore alternatives that do not involve high-risk products and practices...

This aligns with One Health's goal of reducing disease transmission between humans and animals.

TREPA

In summary: it's not just about the anthrax..

Traditional knowledge, environmental health, and disease dynamics in animals are interconnected

Integrating traditional healers and understanding the role of wildlife (e.g., vultures) in carrying pathogens (e.g., anthrax) into the One Health framework involves information sharing, collaboration, early detection, and promoting practices that mitigate disease transmission risks while respecting cultural heritage and ecological balance.

It is also important to find common ground between different stakeholders to foster understanding of differing world views, respectful dialogue, and a collective effort to address health challenges (people, animal, environment), conservation and disease control.

What actions can I take in my community to improve health at the interface of humans, animals ,and the environment?

What actions can national parks take to improve health at the interface of humans, animals ,and the environment?