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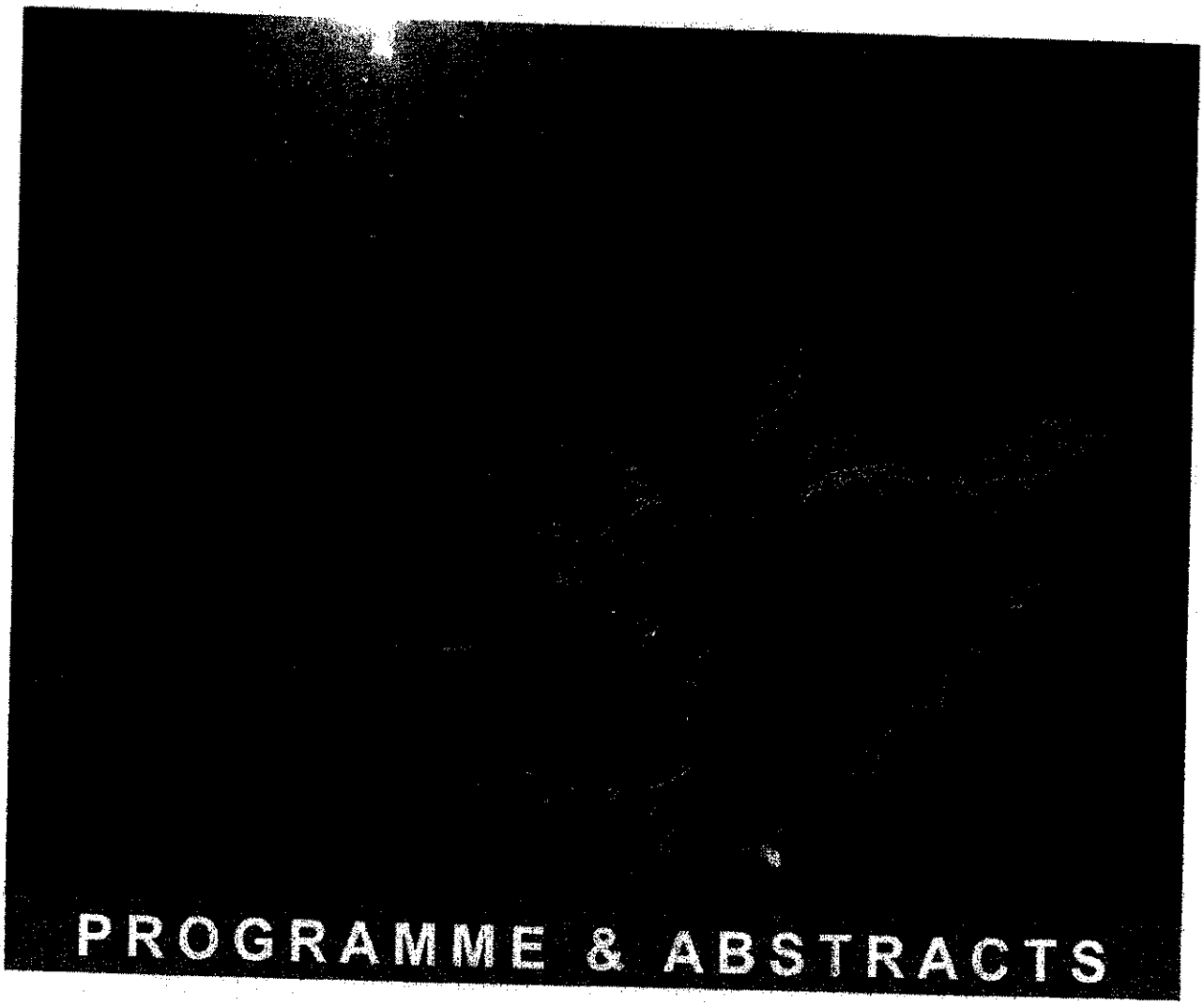
Southern African Society of Aquatic Scientists Congress 2018

24-28 June 2018

Aquatic ecology in the Anthropocene



PROGRAMME & ABSTRACTS

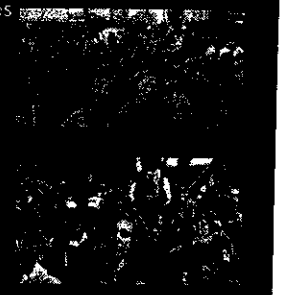
2	15:45	Courtney Cook – Something's 'fishy': African fish haemogregarine blood parasites – the past, present and future	Helene Coetzee – Histopathological effects in the liver and kidney of the freshwater Sharptooth catfish (*Clarias gariepinus*) exposed to the organochlorine pesticides aldrin and [illegible]	Discussion on Functional Traits, Functional Morphology and Functional Response CLOSED SESSION
3	16:00	Katlego Mogprosi – Parasitic crustaceans *Lernaea cyprinacea* and *Argulus japonicus* and the possible role they play in the development of aquaculture in the Free State Province	Nico Wolmarans – *Xenopus laevis*, the ideal African model frog?	
4	16:15	Rachel Welicky – Understanding the associations between cymothoid parasite and host size using museum and field collected data	Beatrice Opeolu – Ecological risk assessment of veterinary pharmaceuticals in effluents from agricultural sources using toxicity classification	
5	16:30	Edward Netherlands – The blood is the life: Host-parasite-vector interactions through the elucidation of the life history of an amphibian filarial nematode	Marie Clementine Nibamureke – Biometric indices and liver histology of the Mozambique tilapia (*Oreochromis mossambicus*) after a chronic exposure to the HIV drug nevirapine	
6	16:45	Coret Hoogendoorn – Discovering diplostomid trematodes (Digenea: Diplostomoidea) in *Tilapia sparrmanii* in the North-West Province, South Africa	Olatekan Fatoki – Survey of Endocrine Disrupting Chemicals in Water Systems – Veterinary Pharmaceuticals and their health Risk Effects	
7	17:00	Roman Svitin – Phylogenetic relationships of Camallanidae (Nematoda) parasitising freshwater vertebrates from South Africa	Refilwe Lukhwareni – Histology and ultrastructure of hepatic [illegible] alterations in *Clarias gariepinus* from Roodeplaat Dam	
	17:15	Student workshop		
	19:00	Supper		

[illegible]			
		Breakfast	
Session	Time	Room A	
		Key Note Session	
	08:30	Housekeeping	
1	08:40	Key Note: Ian Cowx – Can inland fisheries in Africa contribute to achieving the UN Sustainable Development Goals?	
2	09:20	Key Note: Nicholas Mandrak – Reconciling freshwater fisheries development with species at risk conservation	
3	10:00	Plenary: Denis Tweddle – Zambezi fisheries in crisis	
4	10:15	Plenary: [illegible] – Navigating the value chain from ecosystem processes to marketing: The case of Green economy	
5	10:30	Plenary: [illegible] Botha – The state of [illegible] ecotoxicology in South Africa	
	10:45	Morning Tea	
		Room A	Room B
		Fisheries	Freshwater Ecology
1	11:15	Olaf Weyl – Appropriate development goals for inland fisheries in South Africa	[illegible] – Fish community study of [illegible] River, a tributary of lower Nun River, Niger Delta, Nigeria

Parasitic crustaceans, *Lernaea cyprinacea* and *Argulus japonicus* and the possible role they play in the development of aquaculture in the Free State Province

Introduction

- South Africa's utilisation of freshwater fish products as a dietary supplement lags behind
- As compared to some of the more densely populated cities
- Eg China
- About 1.3 billion people
- About 47 mill tonnes (2015)
- In contrast to South
- About 57 million people
- In SA 5418 tons (2015) aquaculture products
- (DAFF yearbook 2016)



introduction

- Reasons for low utilisation of aquaculture products
- Long shore line of South Africa
- Rich but declining supply of marine fish

introduction

- South African rural and inland communities have not really developed a taste for freshwater fish
- Possibly most important reason
- Well developed meat agriculture sector
- As a result livestock farming is by far the largest agricultural sector in South Africa
- Therefore meat easily available and relatively affordable

Introduction

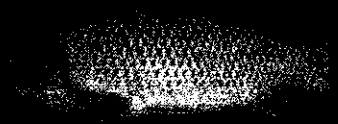
- However, there is evidence to show trend moving away from marine fisheries products
- (FAO 2013)
- More towards aquaculture products
- And specifically for the Free State Province, freshwater aquaculture products
- The following have been identified as commercially viable/important species in the Free State
- African sharptooth catfish *Clarias gariepinus*
- Alien invasive species common carp *Cyprinus carpio*
- Rainbow trout *Oncorhynchus mykiss*
- (Skelton 2001)

Introduction

- Sharptooth catfish

Introduction

- Common carp



Introduction

- Rainbow trout

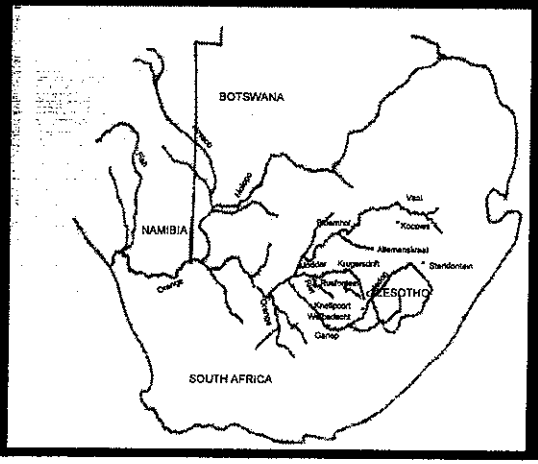
Introduction

- Under aquaculture conditions
- Susceptible hosts are in close proximity for intensive aquaculture
- Therefore facilitating the transmission and establishment of fish parasites in aquaculture systems
- Therefore fish parasites and diseases are regarded as significant constraints to aquaculture development in the Free State Province
- This change towards freshwater aquaculture therefore necessitates a better approach with regard to fish health management on aquaculture farms

Introduction

- The present study is a disease and parasite survey of commercially important fishes of the Free State
- Where we assess the risk to the sustainable development of a freshwater fish aquaculture industry based on parasitic data collected from field surveys in the Free State Province carried out over two years at 9 dams.

Introduction

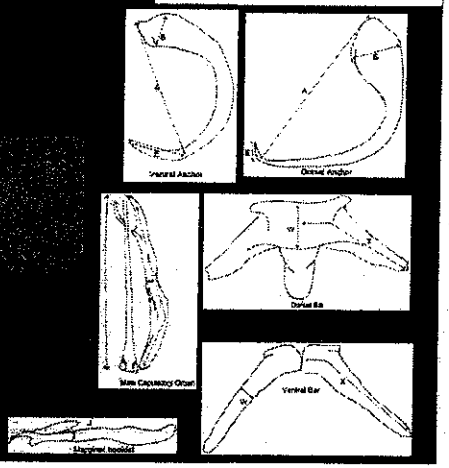


Introduction

- Parasite data was collected from wild fish stocks
- However this data can be applied to fish under aquaculture conditions
- This allows for proactive measures to be employed, as compared to resorting to reactive measures when there is a parasite breakout on the aquaculture farm
- The parasite taxa collected during the current study included the following

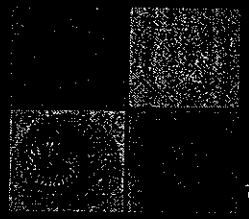
Introduction

- Monogeneans



Introduction

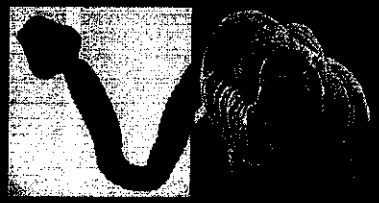
- Peritrich ciliophorans

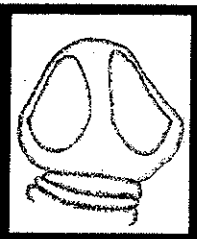


Trichodinella epizootica (Alien species)

Introduction

- Alien Asian tapeworm *Schyzocotyle acheilognathi*



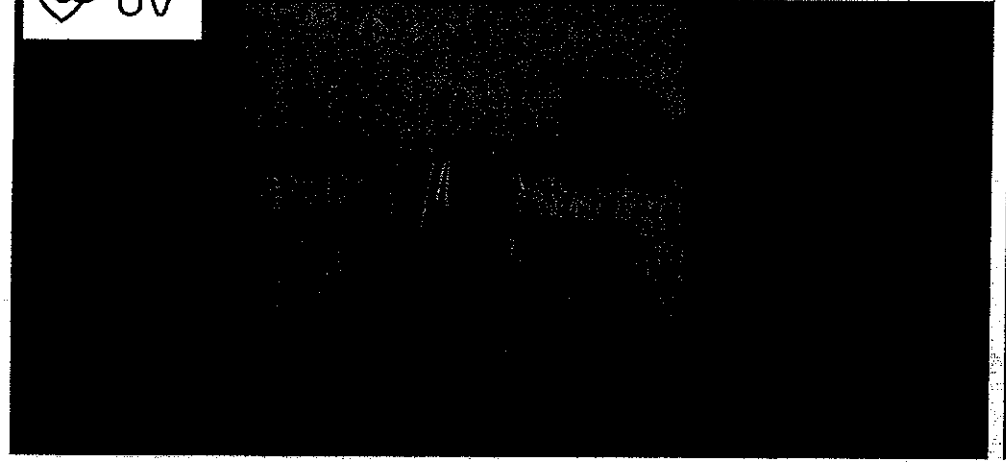


Introduction

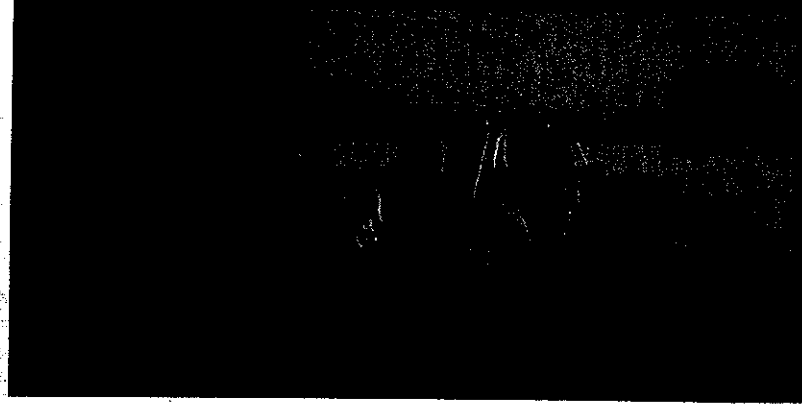
- For the purposes of this presentation, the focus will be on the parasitic crustaceans *Argulus japonicus* and *Lernaea cyprinacea*

- *L. cyprinacea* (195 specimens)
- *A. japonicus* (155 specimens)
- Four different host species
- *Lernaea cyprinacea* and *Argulus japonicus* have been shown to cause clinical disease under aquaculture conditions as well as in natural conditions
- Both species are of economic significance as they can cause epidemic levels due to attachment and feeding, thereby affecting survival of the host
- Both are alien species believed to have been introduced with common carp from the Asian

Materials and methods



Materials and methods



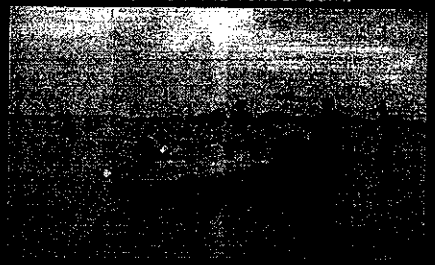
Materials and methods

Materials and methods

- Fish collections were done at 9 dams in the Free State Province over a period of two years, taking into account the different host habitats
- Motorised boats were used to access the dams
- Seine (75 mm) and gill (24-144mm) nets of varying mesh size were used
- The gill nets were set and left out in the dams for periods ranging from a few hours to overnight

Materials and methods

- The use of motorised boats
- The use of seine and gill nets to collect fish from the various dams



Materials and methods

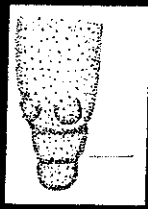
- The fish were kept in aerated containers at the respective dams
- And later transferred to aerated containers at the Department of Zoology and Entomology University of the Free State
- In cases where the dams were further away from the University
- Temporary labs were set up at the dams and fish examinations were done shortly after being caught
- The larger fish were anaesthetised using benzocaine, prior to being euthanized
- The smaller fish were euthanized by severing the spine just behind the head

Materials and methods

- Host examination, fixation and preservation of parasites
- Parasitic crustaceans removed in such a way that the whole body remained intact
- Individual specimens fixed in 70% ethanol
- Material recorded and labelled
- Specimens examined under dissecting microscopes
- Identified using laboratory reference material collected over the years by the Aquatic Parasitology Research Team UFS
- As well as available literature (i.e. Rushton-Mellor 2004, Harding 1950)

Results

- *L. cyprinacea* (anchor worms)
- All horns, long and slender
- Dorsal horns culminate into "T" shape
- Progenital prominence distinctly bi-lobed



Results

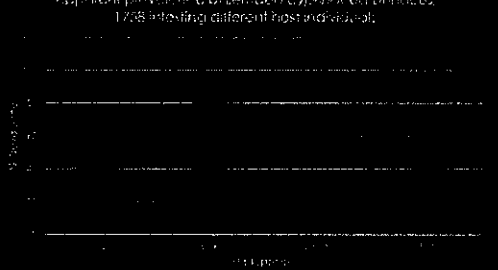
- *L. cyprinacea*
- Found associated with
- *Labeobarbus aeneus*
- *Labeo capensis*
- *Cyprinus carpio*
- *Ctenopharyngodon idella*

Results

- Apparent prevalence was calculated
- By dividing the number of hosts infected with one or more individuals of a particular parasite species, by the number of hosts examined for that particular parasite species
- Expressed as percentage
- *L. aeneus* 31%
- *L. capensis* 40%
- *C. carpio* 71%
- *C. idella* 100%

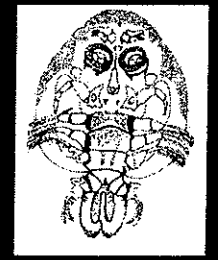
Results

Apparent prevalence of *L. cyprinacea* infesting different host individuals



Results

- *A. japonicus*
- Found associated with
- *Labeo umbratus*
- *L. aeneus*
- *L. capensis*
- *C. carpio*

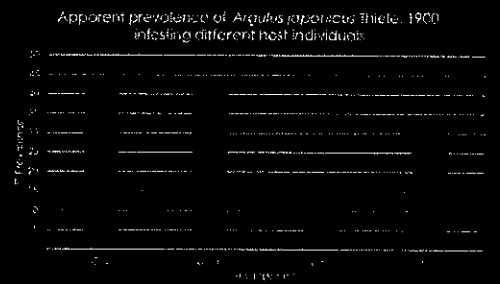


Results

- Apparent prevalence was also calculated
- *L. umbratus* 33%
- *L. aeneus* 41%
- *C. carpio* 43%
- *L. capensis* 16%

Results

- Apparent prevalence of *A. japonicus* infesting different host individuals

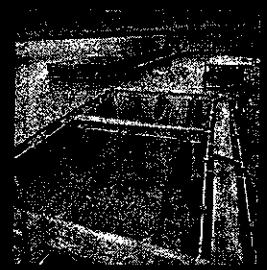


Discussion

- As mentioned parasite data collected from the wild can be applied to aquaculture conditions
- The Free State Province, through the Free State Dept Agriculture and Rural Development (FSDARD)
- And support from Dept Agriculture, Forestry and Fisheries (DAFF)
- In the process of developing the inland aquaculture industry
- As a means for food security and poverty alleviation
- As a result: the Gariep Dam Fish Hatchery (ATDC)

Discussion

- ATDC
- Located in Xhariep District
- Currently breeds sharptooth catfish, common carp, koi carp, goldfish



Discussion

- The ATDC
- Sources water directly from the Gariep Dam
- Series of outside ponds (36) for grow out
- And 86 tanks in the overwintering facility
- There is potential of introducing parasitic crustaceans from the Gariep Dam via the water
- As these were found associated with fish hosts from the dam itself
- In 2017 we found a few specimens of *A. japonicus* in 1 tank
- Not yet infested any fish (drained tank)

Conclusion

- Parasites including parasitic crustaceans are regarded as significant constraints to the development of aquaculture in the Free State Province
- They have been known to be the cause mass mortalities of cultured common carp, grass carp.
- However in the three years based at the ATDC, we have not had a serious outbreak of parasitic crustaceans

Conclusion

- Though parasitic crustaceans can potentially be really problematic at the ATDC
- It boils down to good farm practices
- Regular fish health checks
- The situation can be prevented and avoided

Thank you

Parasitic crustaceans *Lernaea cyprinacea* and *Argulus japonicus* and the possible role they play in the development of aquaculture in the Free State Province

Katlego Mogorosi[1,2], Liesl van As[2], Kevin Christison[3]
[1]Free State Department of Agriculture and Rural Development, Bloemfontein, South Africa.[2]University of the Free State, Bloemfontein, South Africa.[3]Department of Agriculture Forestry and Fisheries, Cape Town, South Africa

Inland aquaculture is receiving increased interest in the Free State, as a means of contributing to food security, creating jobs and diversifying agriculture production. Sharptooth catfish/baber *Clarias gariepinus*, common carp *Cyprinus carpio*, rainbow trout *Oncorhyncus mykiss* and Mozambique tilapia *Oreochromis mossambicus* have been identified as economically viable species. Under aquaculture conditions, susceptible hosts are in close proximity, thereby facilitating the transmission and establishment of diseases and parasites in aquaculture systems. Therefore diseases and parasites of fish are regarded as significant constraints to the development of aquaculture in this region. The present study is a disease and parasite survey of commercially important fishes of the Free State, wherein we qualitatively assess the risk to sustainable development of a freshwater fish aquaculture industry based on parasitic data collected from field surveys in the Free State Province carried out over two years. The taxa collected included monogeneans and peritrich ciliophorans, the cestode *Schyzocotyle acheilognathi* and alien parasite species such as *Trichodinella epizootica*, *Argulus japonicus* and *Lernaea cyprinacea*. For the purposes of this presentation the focus will be on *A. japonicus* and *L. cyprinacea*, where 195 specimens of *L. cyprinacea* and 155 specimens of *A. japonicus* were found infesting four different fish host species. *Lernaea cyprinacea* and*A. japonicus* have been shown to cause clinical disease under aquaculture conditions as well as in natural conditions.

Understanding the associations between cymothoid parasite and host size using museum and field-collected data

Rachel Welicky, Wynand Malherbe, Kerry Hadfield, Nico Smit
North-West University, Potchefstroom, South Africa

Cymothoid isopods are among the most conspicuous and diverse groups of ectoparasites of fish species. Yet, detailed studies on their life cycles are sparse, as even baseline morphometric data on their life stages remain limited. In fact, only two cymothoid species have been examined for correlations between their size and host size, and positive correlations were reported between hosts and both male and female parasites. Cymothoids attach to the body surface, mouth, and gill chamber of fish hosts, and these areas vary greatly in shape and size across host species. Accordingly, it is plausible that associations between cymothoid and host size cannot be extrapolated among genera or species. Moreover, associations between host and parasite size may change as parasites transition from juvenile to male to female. To test these predictions, we used field-collected data combined with data collected from fishes stored in the South African Institute for Aquatic Biodiversity fish collections. We examined the associations between host and parasite length for three mouth and one gill chamber-infesting genera (*Ceratothoa*, *Cinusa*, *Cymothoa*, and *Mothocya*, respectively). For two of the three mouth-infesting parasites, size was significantly and positively correlated for males and females, but not juveniles. For gill chamber-infesting parasites, female and male parasite size was weakly and not significantly correlated with host size. On-going research will include a second gill-infesting genus, and statistically examine parasite size in relation to attachment site. Perhaps most importantly, we provide the first morphometric data for juveniles, males, and females of four cymothoid genera.

The blood is the life: Host-parasite-vector interactions through the elucidation of the life history of an amphibian filarial nematode

Edward C Netherlands[1,2,3], Roma Svitin[2], Louis H Du Preez[2,4], Nico J Smit[1]
[1]Water Research Group, Unit for Environmental Sciences and Management, North-West University, Potchefstroom, South Africa. [2]African Amphibian Conservation Research Group, Unit for Environmental Sciences and Management, North-West University, Potchefstroom, South Africa. [3]Laboratory of Aquatic Ecology, Evolution and Conservation, University of Leuven, Leuven, Belgium.[4]South African Institute for Aquatic Biodiversity, Grahamstown, South Africa

Filarial nematodes are important microscopic, thread-like roundworms known as agents of medical and veterinary disease. That includes lymphatic, subcutaneous and dirofilariosis, e.g. elephantiosis, river blindness, and heartworm, respectively. These predominantly tissue-dwelling nematodes are characterised by a broad-host-range including amphibians, reptiles, mammals, and birds, infecting up to 170 million people worldwide. They have an evolved life-cycle, comprising a vertebrate host in which adult worms release microfilariae into the bloodstream. Microfilariae are then ingested with the blood meal of a haematophagous arthropod. Following complete development, the parasite can be transmitted to a new host. In the present study we were able to elucidate this cycle in the guttural toad host *Sclerophrys gutturalis* and the mosquito vectors *Uranotaenia* (*Pseudoficalbia*) *mashonaensis* and *U.* (*Pseudoficalbia*) *montana*. Mosquitos enticed to feed on infected toads were progressively dissected, and nematodes extracted and fixed according to the stages of their development. Light and scanning electron microscopy were used to study morphology, and PCR amplification to molecularly characterise and link each of these developmental stages. Additionally, we report