ICPOW 2025

5th INTERNATIONAL CONGRESS ON PARASITES OF WILDLIFE

14-18 September 2025 | Kruger National Park, South Africa

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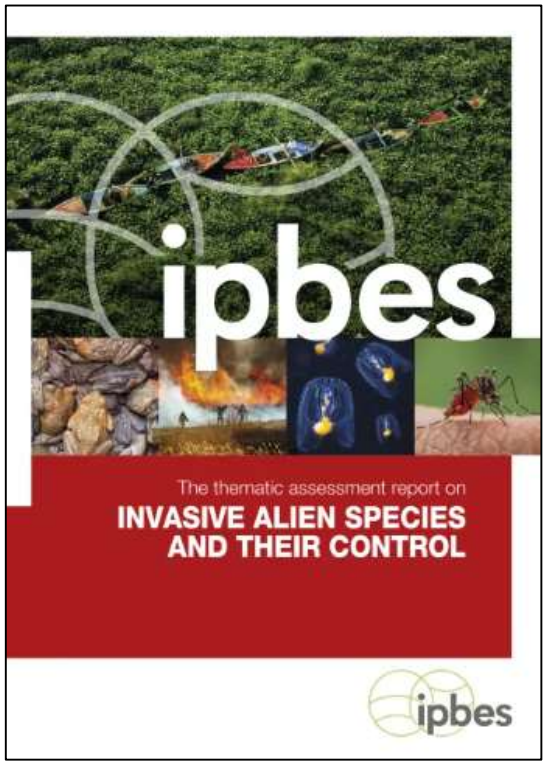
Old hosts as treasure troves of worms, worms as tags for new hosts:
the overlooked potential of helminthology in invasion biology

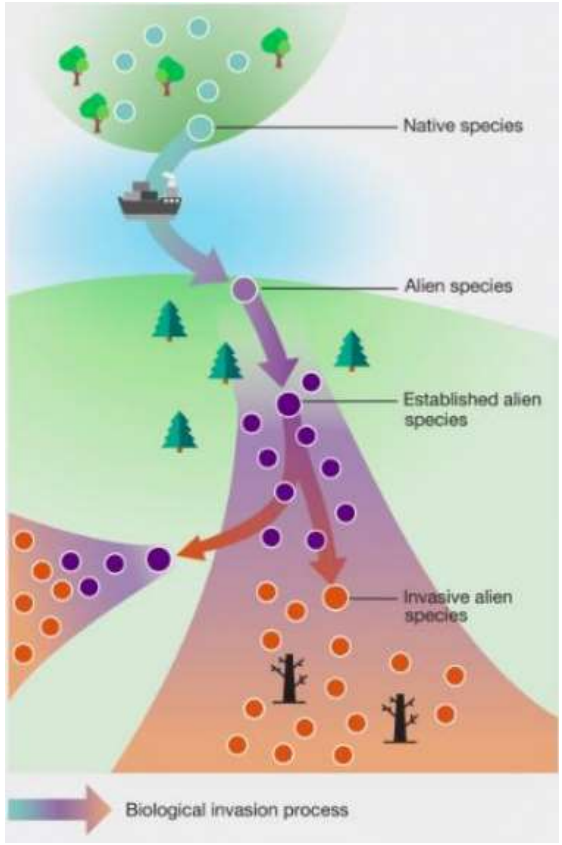
Maarten Vanhove

associate professor, Research Group Zoology

PARASITOLOGICAL SOCIETY OF SOUTHERN AFRICA · PARASITOLOGIESE VERENIGING VAN SUIDELIKE AFRIKA
PARSA

Invasive alien species





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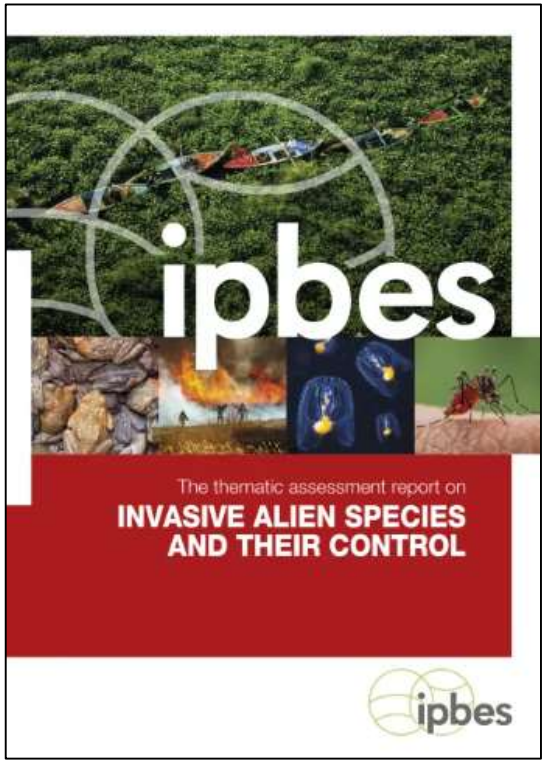
Invasive alien species as vectors/hosts



Box 4 16 **Invasive alien species as disease vectors or reservoir hosts.**

Beyond the health impacts discussed in **Box 4.15**, many invasive alien species can act as disease vectors (i.e., introducing parasites and pathogens to new regions along with their host, passing diseases directly to humans), reservoir hosts (where a disease can survive before a vector passes it onward), or facilitators (i.e., helping the occurrence of pathogen or vector).

Global trade in livestock, wildlife and plants is a key driver facilitating both intended and unintended introductions of pathogens, hosts, and vectors to new land areas, increasing the rate of disease emergence and health impacts on human populations (Bezerra-Santos *et al.*, 2021; Chinchio *et al.*, 2020; Fèvre *et al.*, 2006; Lounibos, 2002; Vilà *et al.*, 2021).

Diseases such as the bubonic plague, caused by the flea- and rat-borne bacterium *Yersinia pestis* (black death), have caused traumatic social and political upheavals (Athni *et al.*, 2021; Kosoy & Bai, 2019; Wells *et al.*, 2015). Mosquito species such as *Aedes aegypti* (yellow fever mosquito) and *Aedes albopictus* (Asian tiger mosquito) have spread since the fifteenth century, largely due to shipping, air and road transport and trade (Lounibos, 2002). These species have exacerbated the spread of the lethal yellow fever, dengue fever, chikungunya and Zika viruses, and other infectious diseases, throughout the Americas, Asia and, more recently Europe (Juliano & Lounibos, 2005; LaPointe, 2021; Romi *et al.*, 2018). *Culex quinquefasciatus* (southern house mosquito), a vector for lymphatic filariasis, St. Louis Encephalitis virus, and West Nile virus, has spread from West Africa, killing over a million people a year (LaPointe, 2021; Lounibos, 2002; Romi *et al.*, 2018). Invasive mammals and birds can alter the epidemiology of resident pathogens and become reservoir hosts, increasing disease risk for humans (Capizzi *et al.*, 2018). Most zoonotic human diseases are known to originate from mammals: rodents and bats are vectors for a high number of pathogens (Han *et al.*, 2016), and so are *Nyctereutes procyonoides* (raccoon dog), implicated in rabies and tapeworm transmission, and *Procyon lotor* (raccoon), implicated in roundworm transmission (Lojkić *et al.*, 2021; Page *et al.*, 2016). Introduced bird species, in particular psittaciform (parrots), columbiform (pigeons) and anseriform (duck) species, represent a hazard to good quality of life. Main zoonoses include psittacosis, cryptococcosis, listeriosis and salmonellosis, transmitted by direct contact or *via* insect vectors (fleas, lice, ticks and mites). Some galliform species, introduced for hunting, can cause salmonellosis and other gastroenteric diseases (Mori *et al.*, 2018).

The magnitude of risks and impacts arising from co-invasive pathogens is difficult to discern because few data exist on the links among invasive alien species, their parasites or pathogen load and zoonotic diseases (Hulme, 2014). Robust documentation of the prevalence and abundance of parasites, pathogens, and vectors of human diseases associated with high-risk alien hosts would be needed to initiate effective management.

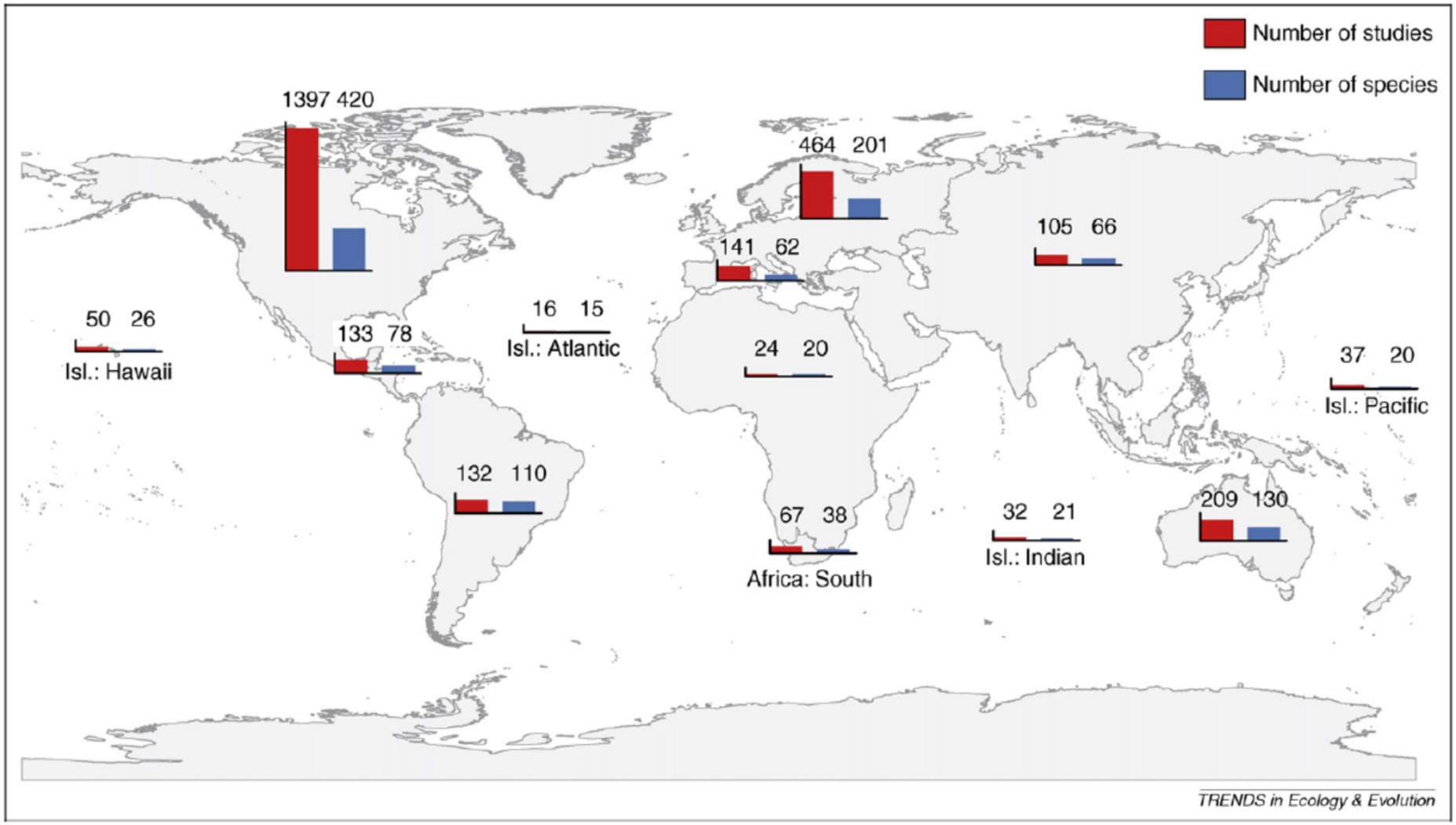
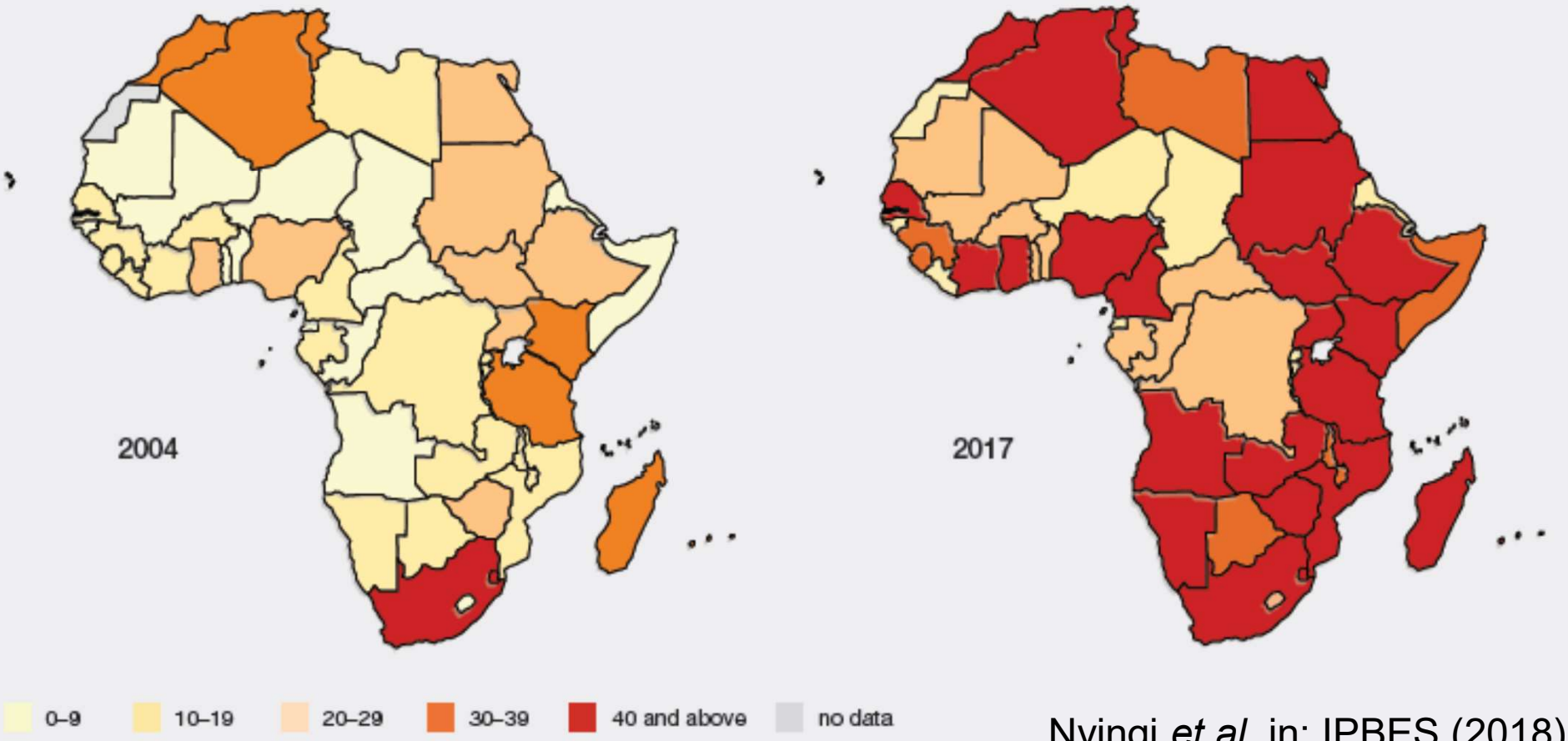


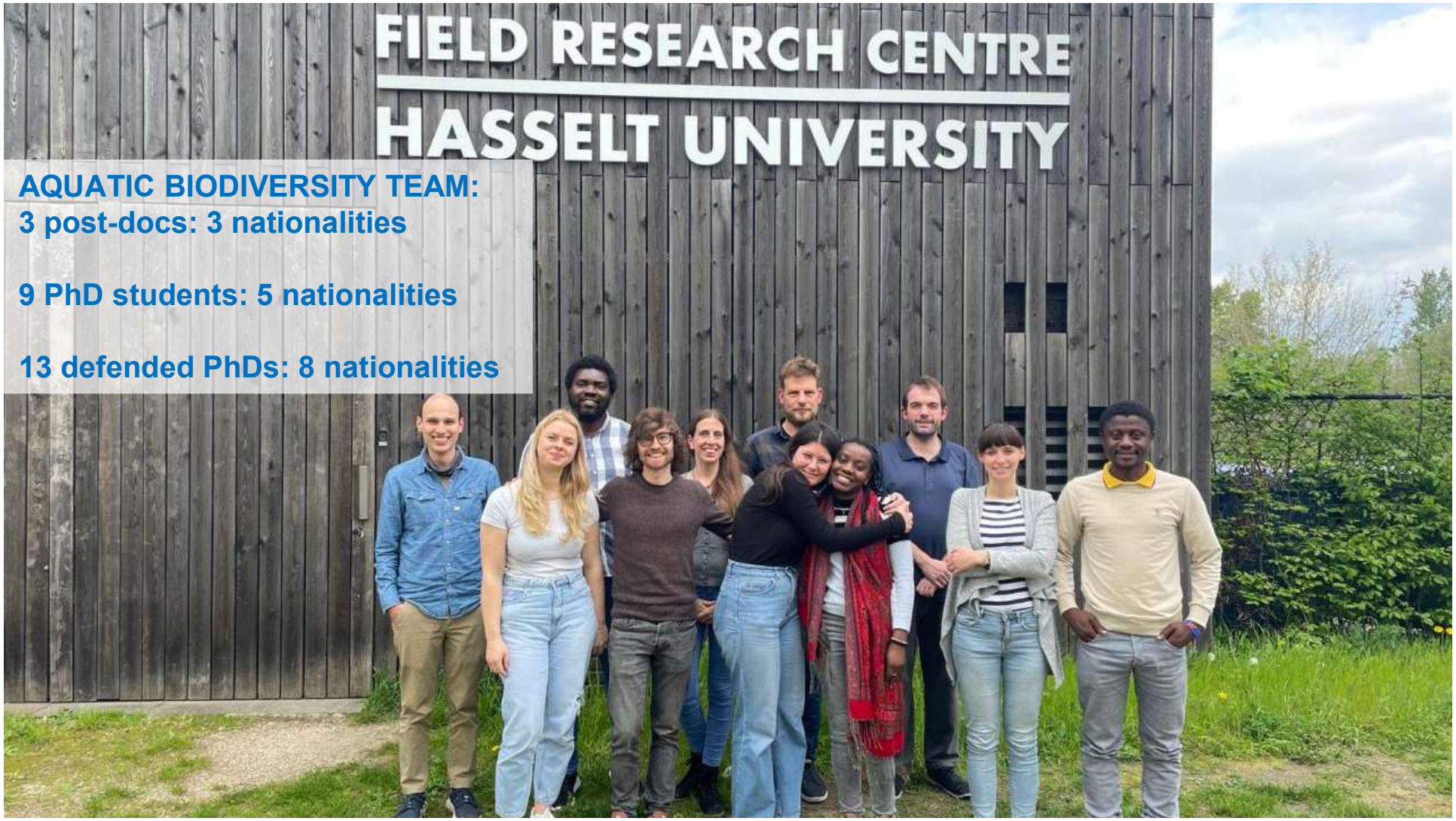
Figure 3. Geographical structure of the invasive biota studied. Sizes of bars indicate proportional contribution of world regions to the total number of invasive species studied (n = 892) and to the total number of studies (n = 2670). The numbers of species/studies are at the tops of the bars. The classification of regions follows Weber [14]. The concentration of research effort in North America and Europe is obvious.

Pyšek *et al.* (2008, *Trends in Ecology and Evolution*)

Figure 4 16 The incidence of invasive alien plants in Africa in 2004 and 2017. Data sources: For 2004, Chenje *et al.* (2006) and for 2017, http://www.iucngisd.org/gisd/.



Nyingi *et al.* in: IPBES (2018)


FIELD RESEARCH CENTRE
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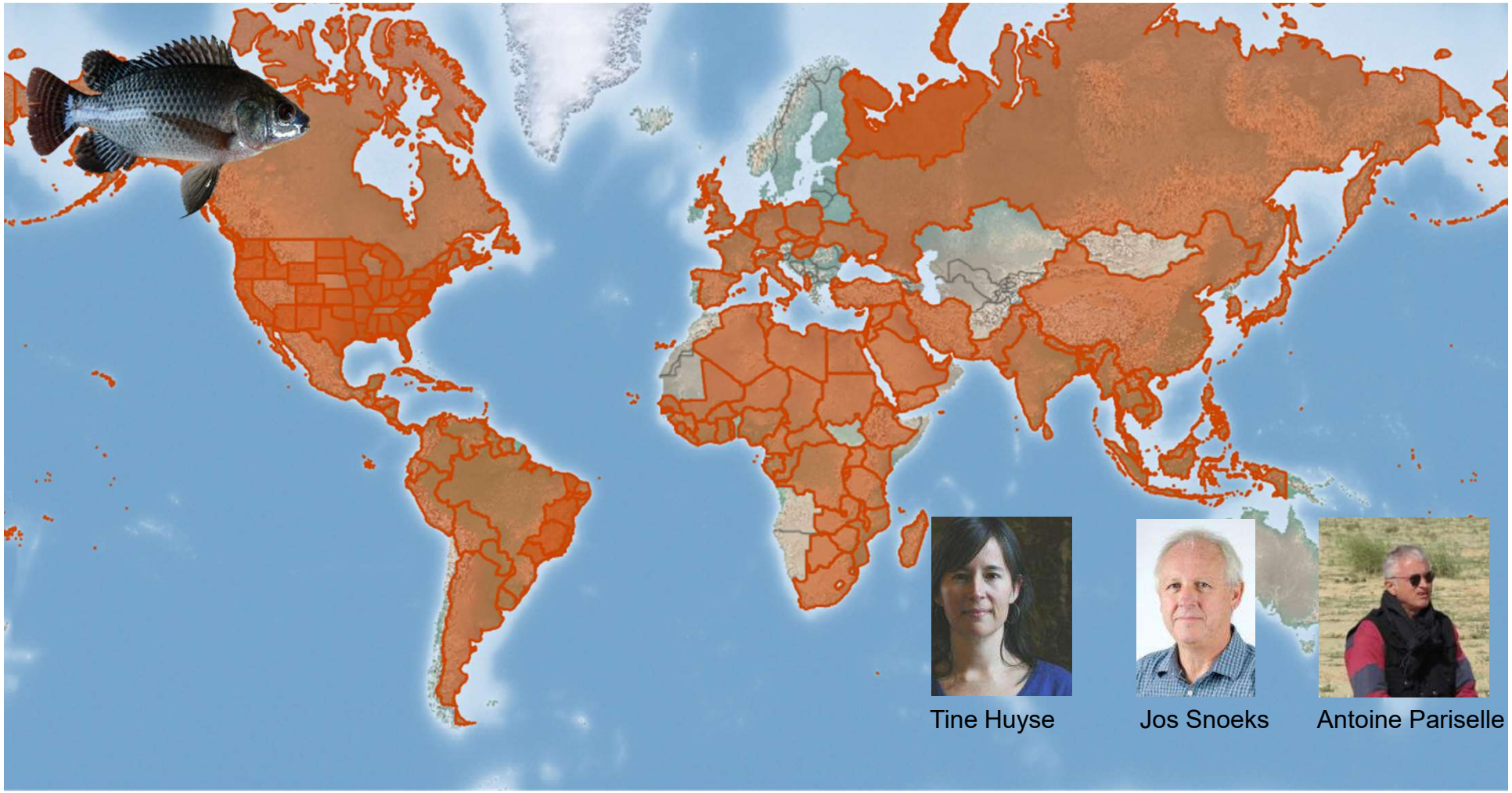
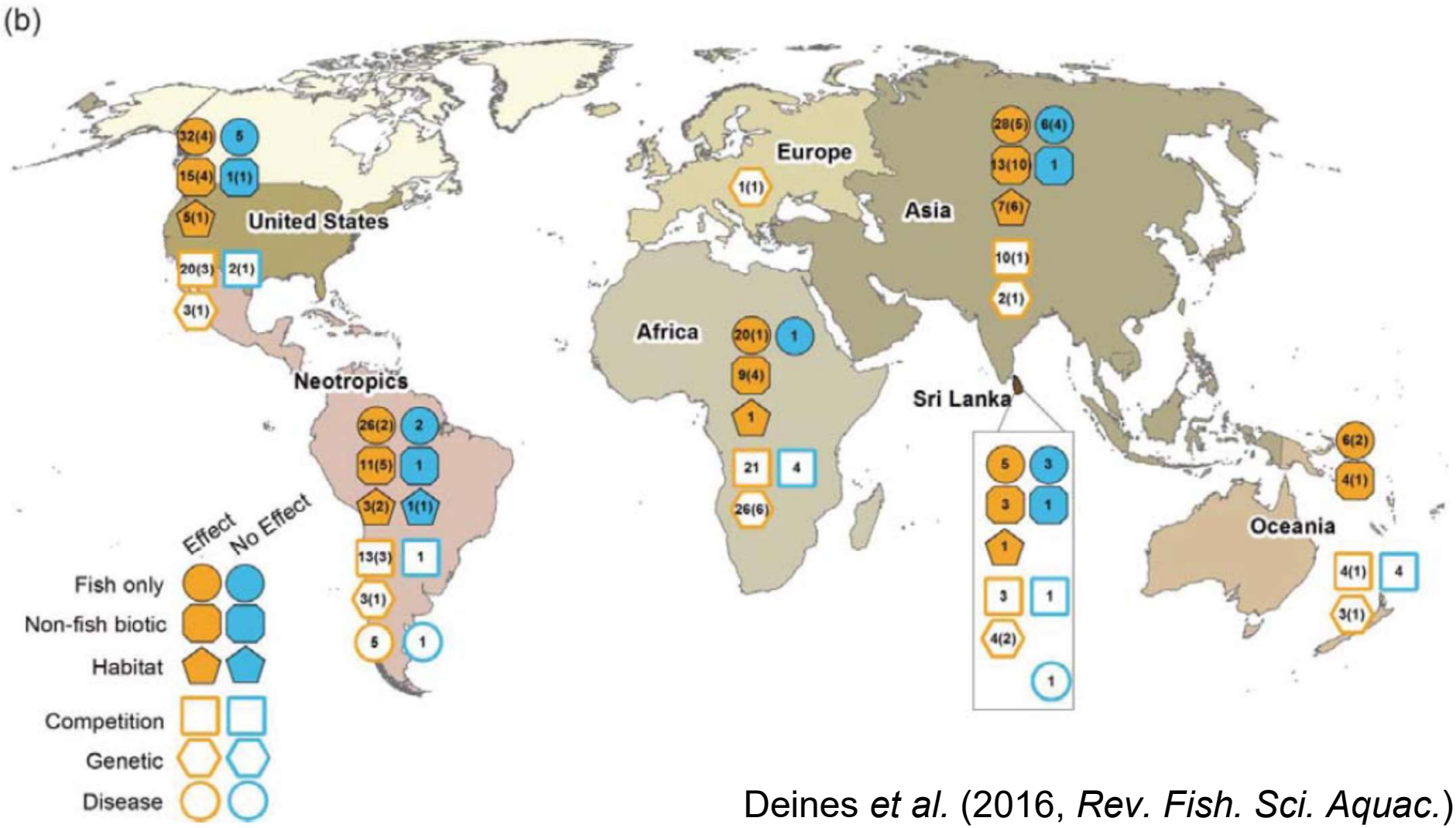
AQUATIC BIODIVERSITY TEAM:
3 post-docs: 3 nationalities
9 PhD students: 5 nationalities
13 defended PhDs: 8 nationalities



SOURCE: CABI 2022. *Oreochromis niloticus*. In: Invasive Species Compendium. Wallingford, UK: CAB International. https://www.cabi.org/isc



Deines *et al.* (2016, *Rev. Fish. Sci. Aquac.*)

Monogeneans as threats

Biol Invasions (2019) 21:803–819
https://doi.org/10.1007/s10530-018-1859-0

CrossMark

ORIGINAL PAPER

Transmission of parasites from introduced tilapias: a new threat to endemic Malagasy ichthyofauna

Andrea Šimková · Eva Řehulková · Jean Robertin Rasoloariniaina · Michiel W. P. Jorissen · Tomáš Scholz · Anna Faltýnková · Šárka Mašová · Maarten P. M. Vanhove

IZAY ADALA NO TOA AN-DRAINY

MASARYK UNIVERSITY

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Monogeneans?

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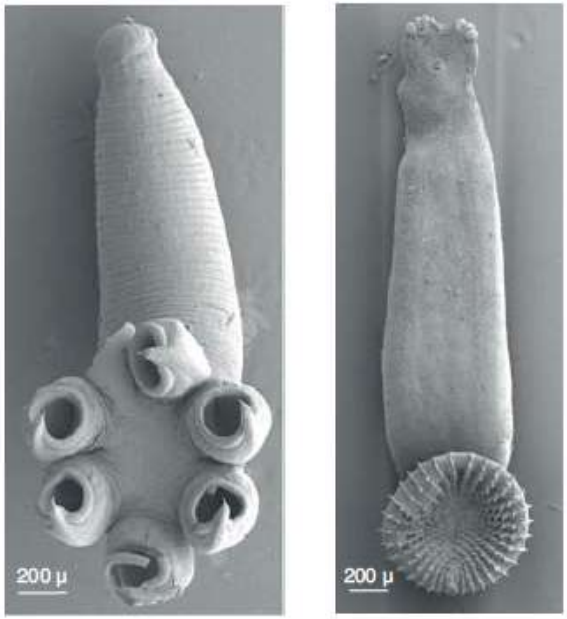
Monogeneans?



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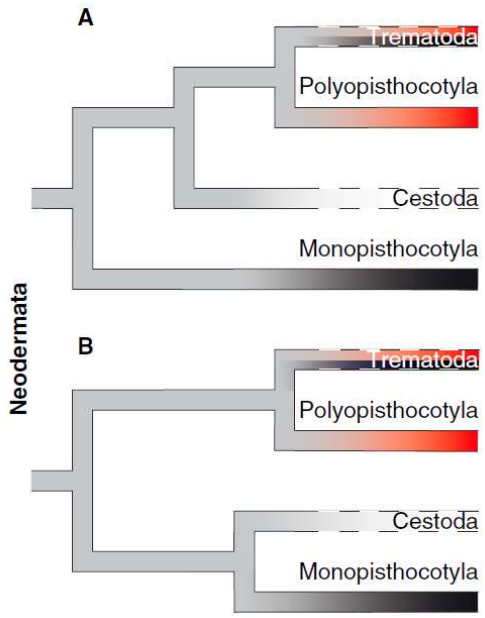
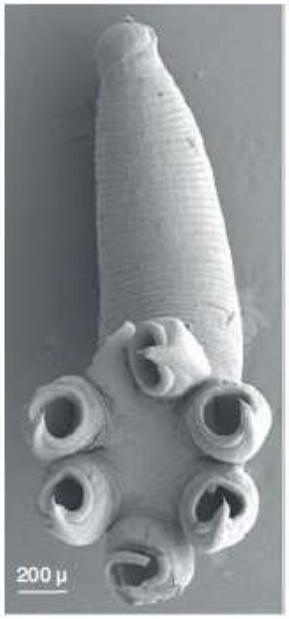
Vanhove *et al.* (2024, *Current Biology*)

Do monogeneans even exist?





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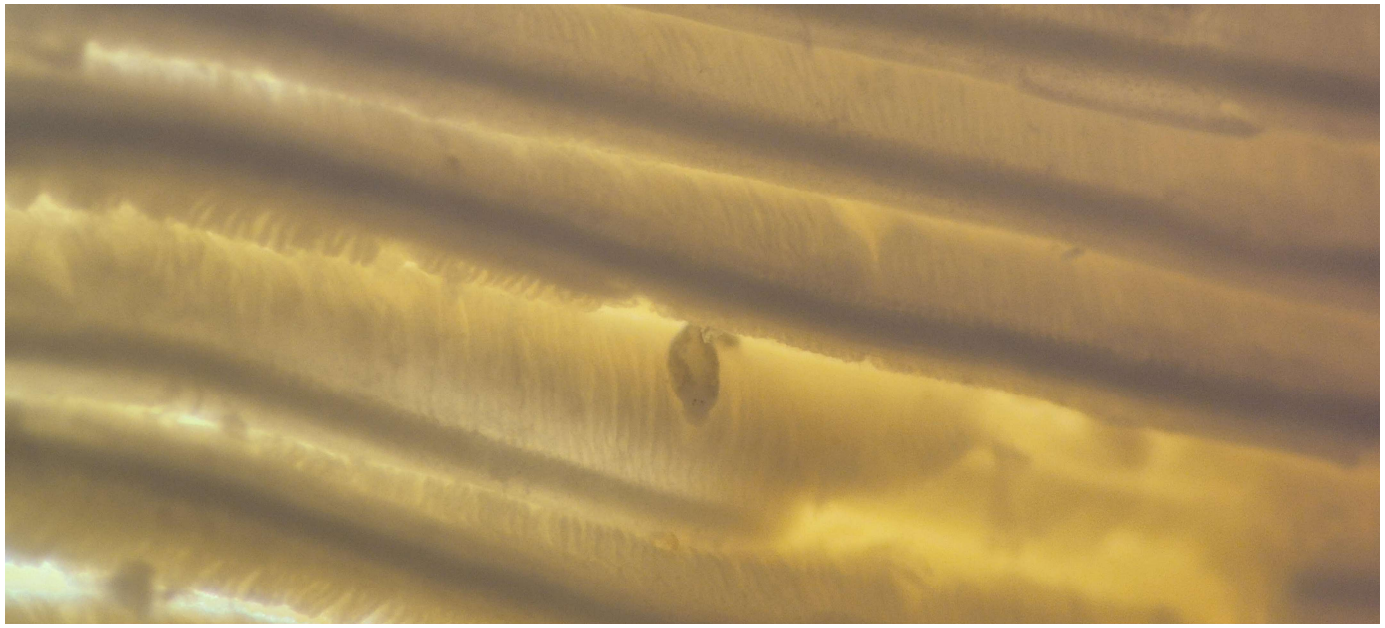
Vanhove *et al.* (2024, *Current Biology*)

Monogeneans?



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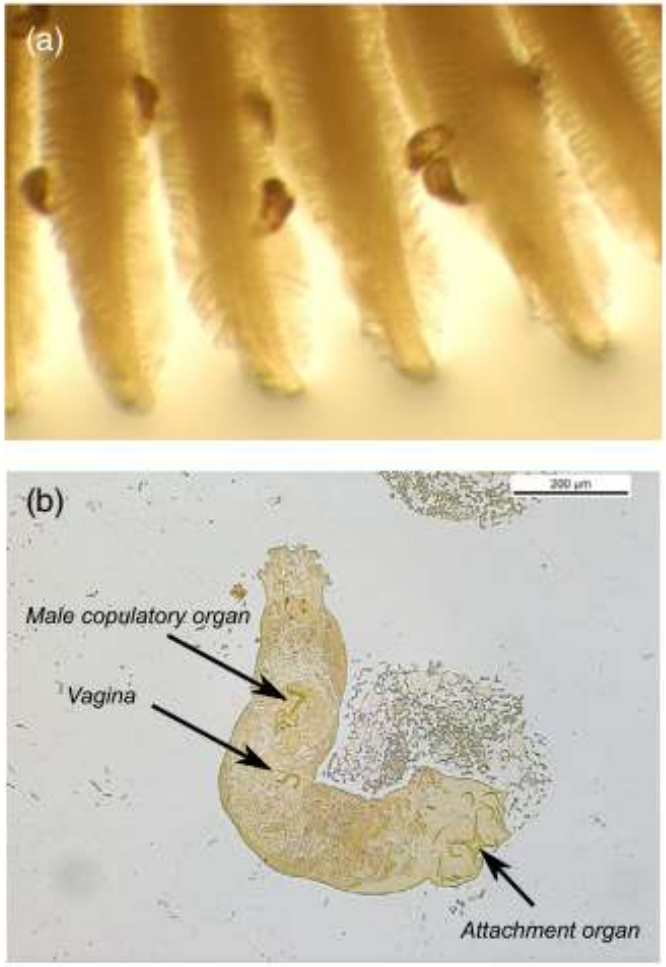
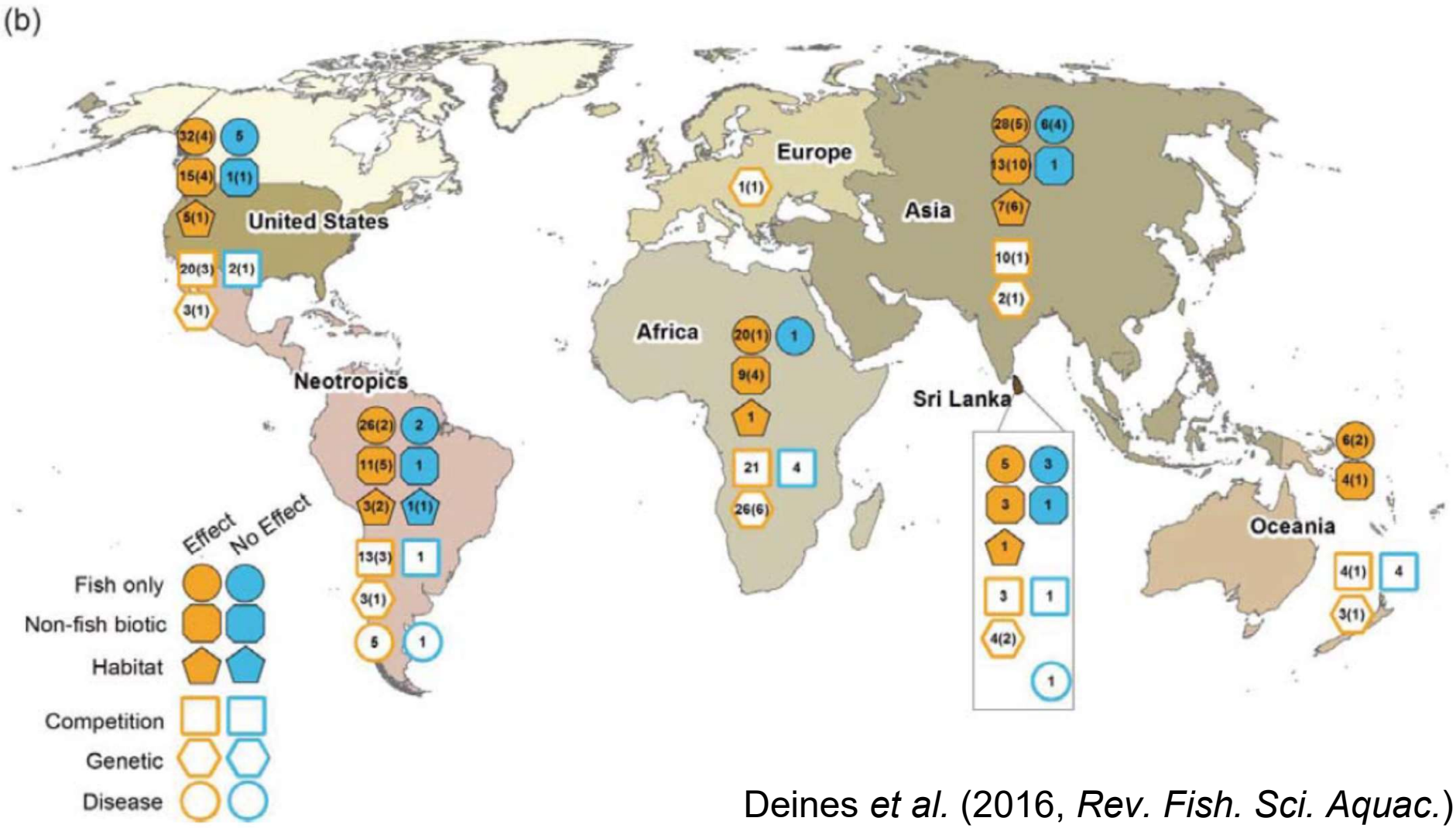
Vanhove *et al.* (2025, *Trends in Parasitology*)

The first day of the rest of your lives: meet *Cichlidogyrus* - the most species-rich monogenean flatworms of cichlids!



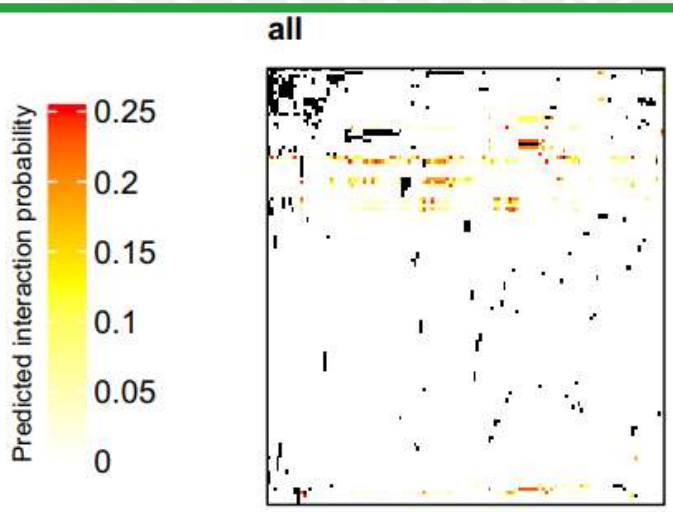
Cruz-Laufer *et al.* (2022, *Cladistics*)

Scholz *et al.* (eds.) (2018, *AbcTaxa*)

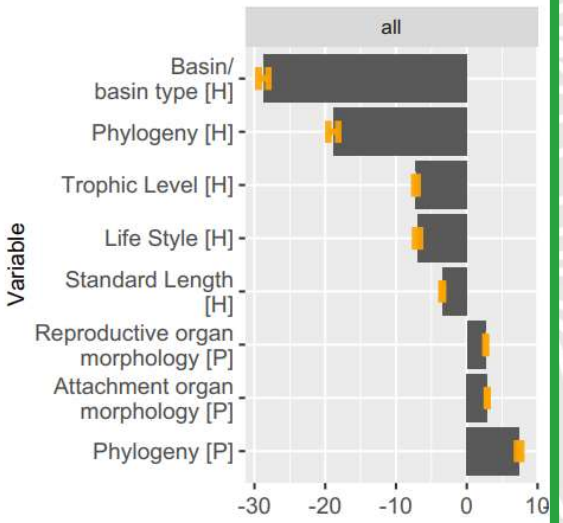


Deines *et al.* (2016, *Rev. Fish. Sci. Aquac.*)

What do we know, and what do we need to know?



network link prediction:
a large proportion of undetected cichlid-*Cichlidogyrus* interactions



variable importance:
most important predictor is ecological

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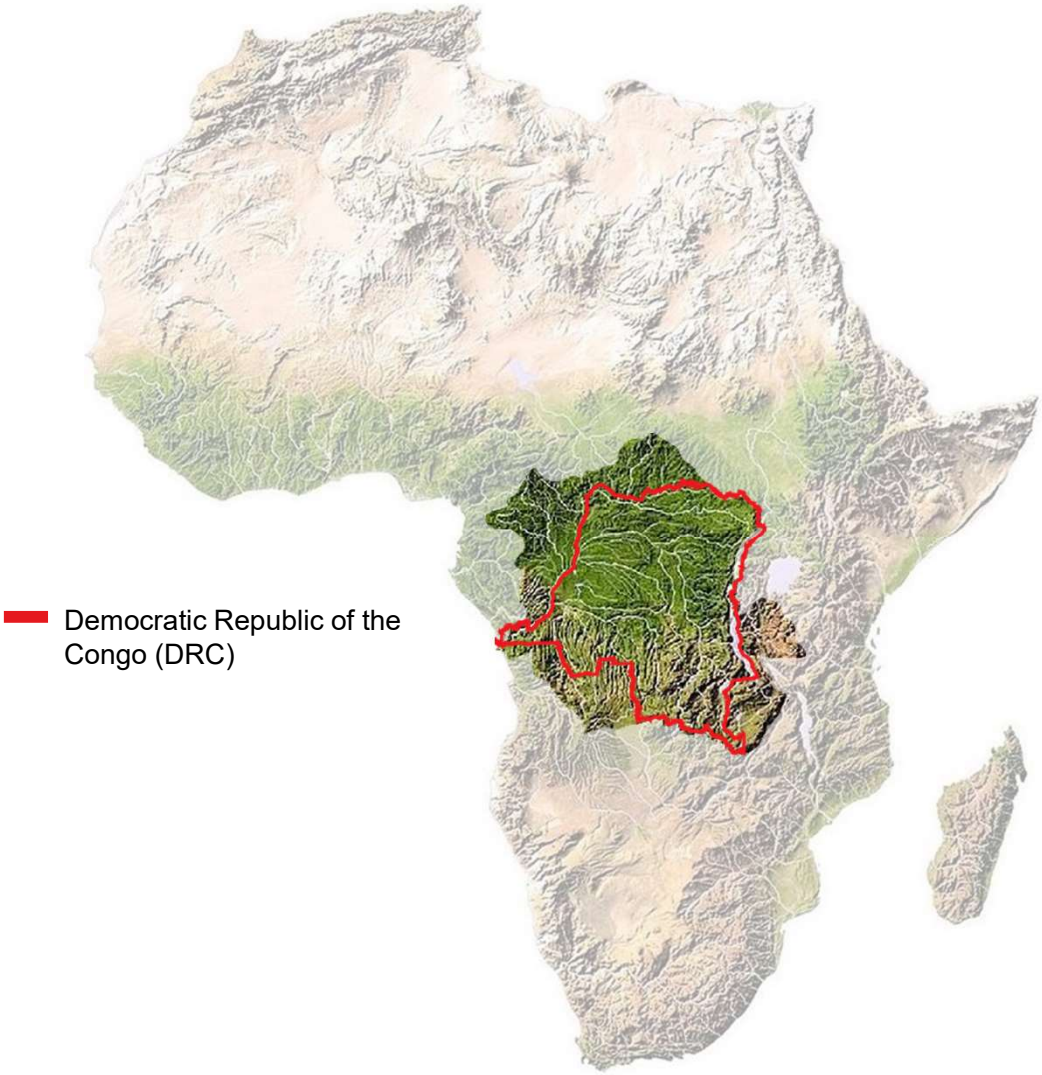
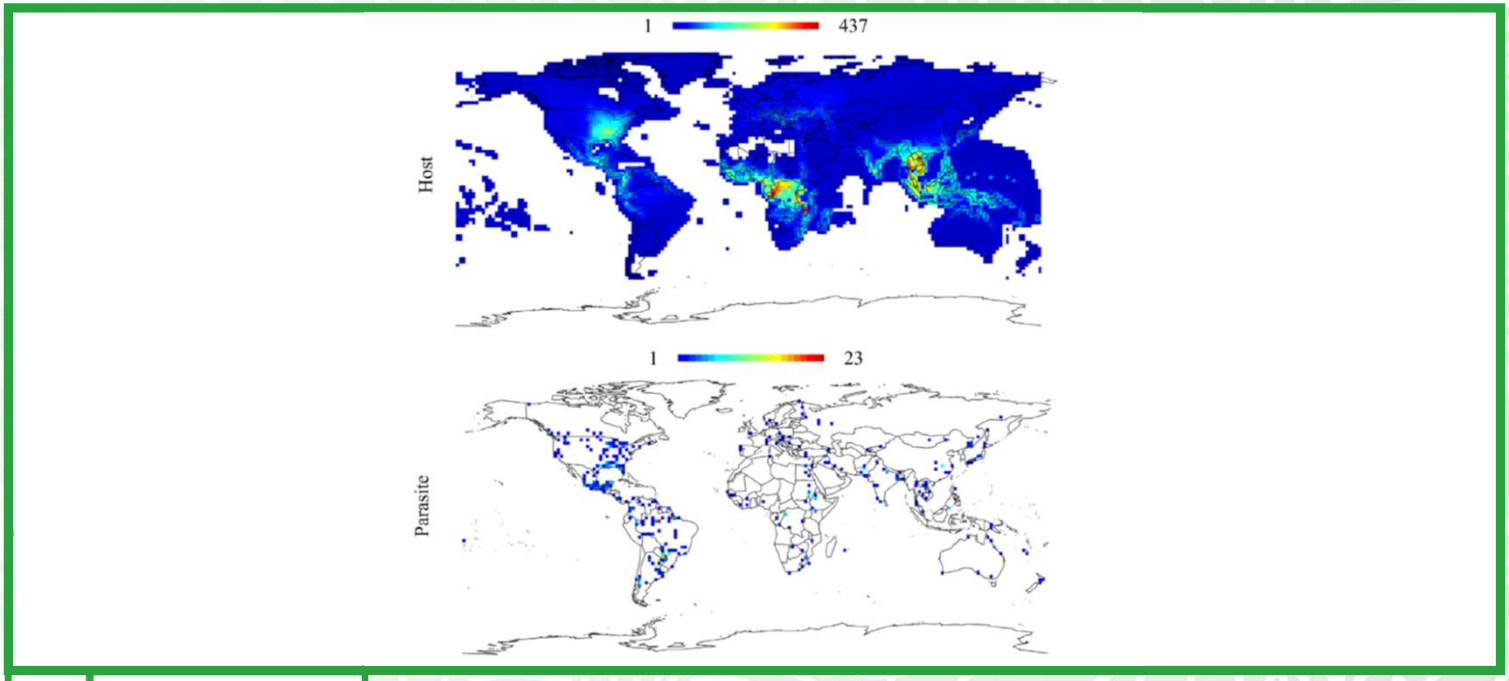
Cruz-Laufer *et al.* (2022, *Ecology Letters*)


Democratic Republic of the Congo (DRC)

Need for species discovery



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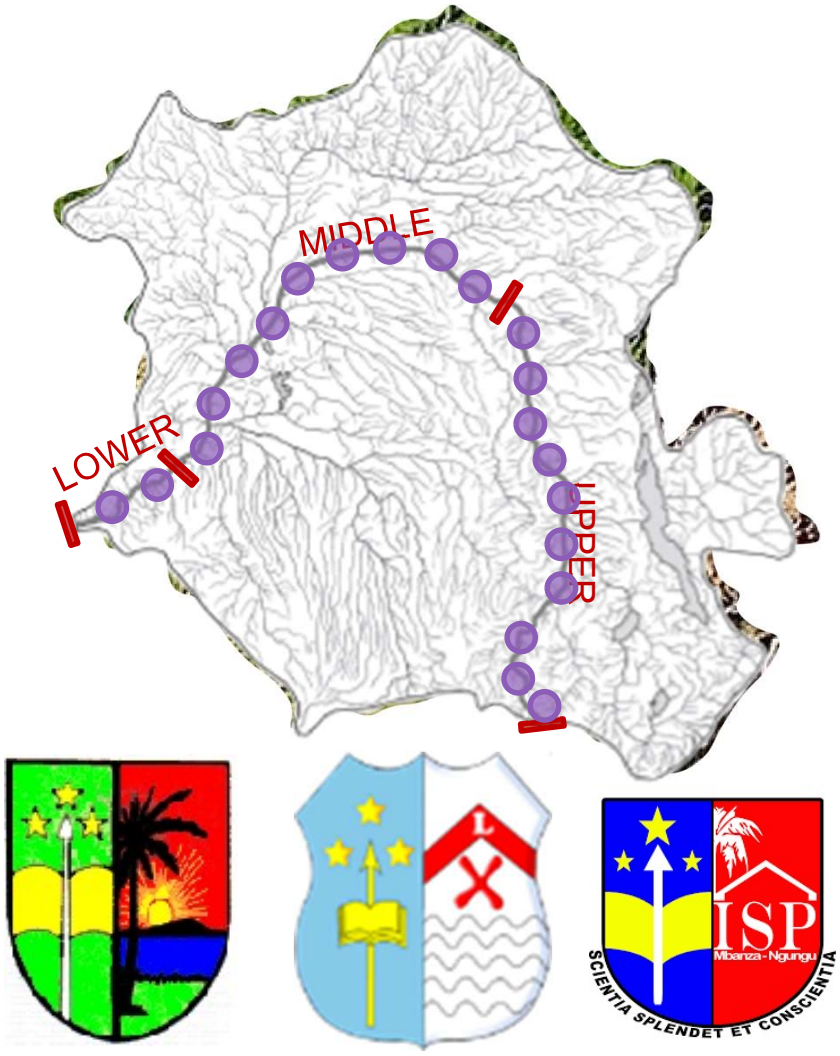
Poulin *et al.* (2020, *International Journal for Parasitology*)



Journal of Helminthology, Page 1 of 21
© Cambridge University Press 2017
doi:10.1017/S0022149X17000712

Diversity and host specificity of monogenean gill parasites (Platyhelminthes) of cichlid fishes in the Bangweulu-Mweru ecoregion

M.W.P. Jorissen[1,2*], A. Pariselle[3], T. Huyse[1,4], E.J. Vreven[1], J. Snoeks[1,4], F.A.M. Volckaert[4], A. Chocha Manda[5], G. Kapepula Kasembele[5], T. Artois[2] and M.P.M. Vanhove[1,2,4,6,7]

Parasite 25, 64 (2018)
© M.W.P. Jorissen et al., published by EDP Sciences, 2018
https://doi.org/10.1051/parasite/2018059
urn:lsid:zoobank.org:pub:EEFEB392-86FC-40ED-B8C3-01936A04C892

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RESEARCH ARTICLE
OPEN ACCESS

Six new dactylogyrid species (Platyhelminthes, Monogenea) from the gills of cichlids (Teleostei, Cichliformes) from the Lower Congo Basin

Michiel W.P. Jorissen[1,2,*], Antoine Pariselle[3], Tine Huyse[2,4], Emmanuel J. Vreven[2,4], Jos Snoeks[2,4], Eva Decru[2,4], Thomas Kusters[1], Soleil Wamuini Lunkayilakio[5], Fidel Muterezi Bukinga[6], Tom Artois[1], and Maarten P.M. Vanhove[1,4,7,8]

Geraerts *et al. Parasites Vectors* (2020) 13:187
https://doi.org/10.1186/s13071-020-3927-4

Parasites & Vectors

RESEARCH
Open Access

Six new species of *Cichlidogyrus* Paperna, 1960 (Platyhelminthes: Monogenea) from the gills of cichlids (Teleostei: Cichliformes) from the Lomami River Basin (DRC: Middle Congo)

Mare Geraerts[1†], Fidel Muterezi Bukinga[2*†], Maarten P. M. Vanhove[1,3,4,5], Antoine Pariselle[6,7], Auguste Chocha Manda[8], Emmanuel Vreven[5,9], Tine Huyse[10] and Tom Artois[1]

Monogeneans as threats

Oreochromis mweruensis
Upper Congo

Coptodon tholloni
Lower Congo

	Recent		Recent	
C. cirratus	**T?**		**NO**	
C. halli	**T?**		**NO**	
C. rognoni	**NO**		**NO**	
C. sclerosus	**T?**		**NO**	
C. thurstonae	**NO**		**NO**	
C. tilapiae	**T?**		**T?**	
S. longicornis	**NO**		**NO**	

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museum AFRICA museum

Jorissen *et al.* (2020, *Biological Invasions*)

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Monogeneans as threats

Oreochromis mweruensis
Upper Congo

Coptodon tholloni
Lower Congo

	Recent	Historical	Recent	Historical
C. cirratus	T?	YES	NO	NO
C. halli	T?	YES	NO	NO
C. rognoni	NO	NO	NO	NO
C. sclerosus	T?	YES	NO	NO
C. thurstonae	NO	NO	NO	NO
C. tilapiae	T?	YES	T?	
S. longicornis	NO	NO	NO	NO

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Monogeneans as threats

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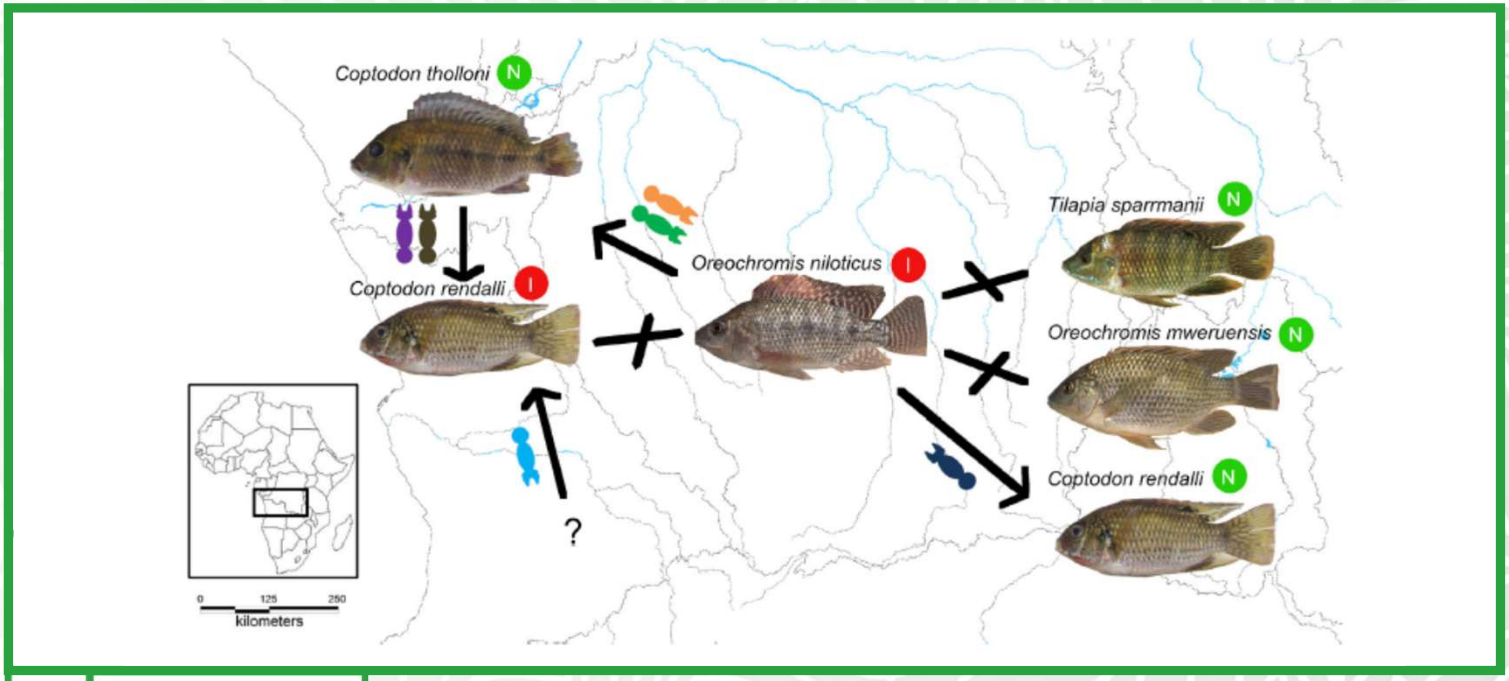
Co-introduction? Transmission?



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Jorissen *et al.* (2020, *Biological Invasions*)

The historical ecology of parasitism

Journal of Helminthology

cambridge.org/jhl

Centenary Review

Cite this article: Wood CL, Leslie KL, Claar D,

How to use natural history collections to resurrect information on historical parasite abundances

C. L. Wood[1], K. L. Leslie[1], D. Claar[2], N. Mastick[1], W. Preisser[3], M. P.M. Vanhove[4] and R. Welicky[5,6]

Received: 19 March 2022 | Accepted: 25 July 2022

DOI: 10.1111/1365-2656.13794

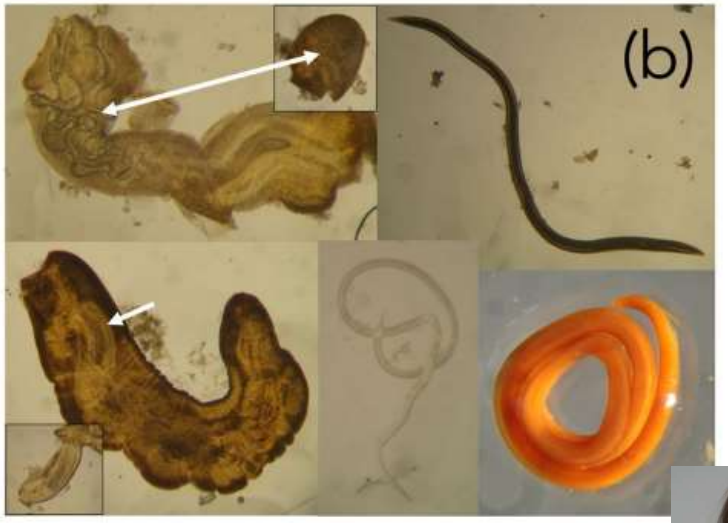
Journal of Animal Ecology

RESEARCH METHODS GUIDE

Leveraging Natural History Collections to Understand the Impacts of Global Change

Is the world wormier than it used to be? We'll never know without natural history collections

Chelsea L. Wood[1] | Maarten P. M. Vanhove[2]



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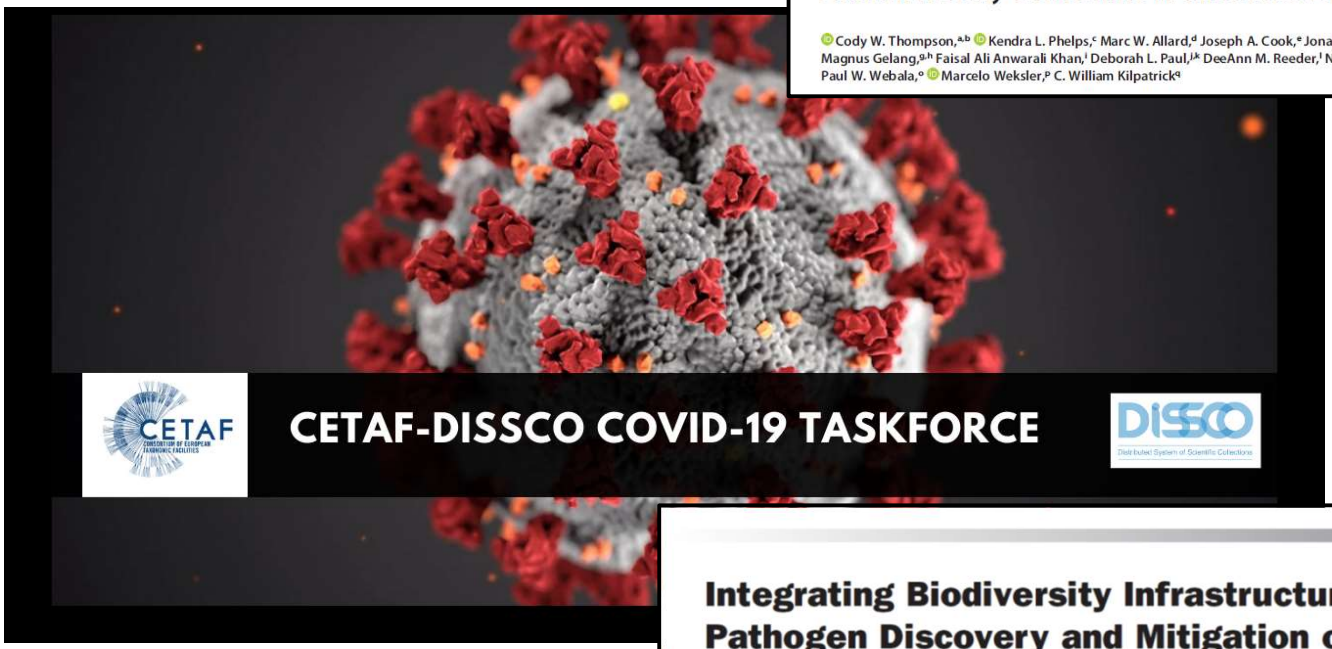
Integration of biodiversity infrastructure into pathobiology



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MINIREVIEW

Preserve a Voucher Specimen! The Critical Need for Integrating Natural History Collections in Infectious Disease Studies

Cody W. Thompson,[a,b] Kendra L. Phelps,[c] Marc W. Allard,[d] Joseph A. Cook,[e] Jonathan L. Dunnum,[e] Adam W. Ferguson,[f] Magnus Gelang,[g,h] Faisal Ali Anwarali Khan,[i] Deborah L. Paul,[j,k] DeeAnn M. Reeder,[l] Nancy B. Simmons,[m] Maarten P. M. Vanhove,[n] Paul W. Webala,[o] Marcelo Weksler,[p] C. William Kilpatrick[q]

Viewpoint

Integrating Biodiversity Infrastructure into Pathogen Discovery and Mitigation of Emerging Infectious Diseases

JOSEPH A. COOK, SATORU ARAI, BLAS ARMIÉN, JOHN BATES, CARLOS A. CARRION BONILLA, MARIA BEATRIZ DE SOUZA CORTEZ, JONATHAN L. DUNNUM, ADAM W. FERGUSON, KARL M. JOHNSON, FAISAL ALI ANWARALI KHAN, DEBORAH L. PAUL, DEEANN M. REEDER, MARCIA A. REVELEZ, NANCY B. SIMMONS, BARBARA M. THIERS, CODY W. THOMPSON, NATHAN S. UPHAM, MAARTEN P. M. VANHOVE, PAUL W. WEBALA, MARCELO WEKSLER, RICHARD YANAGIHARA, AND PAMELA S. SOLTIS

PANDEMIE

De collecties in natuurhistorische musea kunnen waardevol zijn om pandemieën te voorspellen. "Alleen worden ze daarvoor nu te weinig benut", zegt bioloog Maarten Vanhove van de Universiteit Hasselt, die deel uitmaakt van een daarvoor opgerichte taskforce.

Miranda Gijsen

De afgelopen twintig jaar kregen we wereldwijd te maken met grote uitbraken van infectieziekten als SARS, Ebola, Zika en nu Covid-19. Bijna al deze infectieziekten zijn afkomstig van micro-organismen die in het wild leven en vervolgens door (on)rechtstreeks contact - via een mug of teek - overspringen op de mens.
We weten dat het coronavirus ontstond in vleermuizen, maar vanuit welke soort precies, waar, wanneer en in welke omstandigheden de overdracht naar de mens plaatsvond, is voorlopig nog een raadsel. Toch zijn dat net factoren die belangrijk zijn om inzicht te krijgen in hoe een virus gedurende vele jaren evolueert in een dierlijke drager (gastheer).

Museumcollecties

Daarom hebben wetenschappers uit vijf continenten, onder wie bioloog Maarten Vanhove van de Universiteit Hasselt, zich verenigd in een taskforce. "Wij doen een oproep om meer middelen te investeren in onderzoek naar de verspreiding van ziekten en parasieten via de natuurhistorische collecties die in musea worden bewaard. Daarnaast pleiten we ook voor een betere samenwerking met wetenschappers die infectieziekten onderzoeken."
De wetenschappelijke waarde van deze museumcollecties wordt vandaag onderschat. "De musea herbergen niet alleen een fantastische, maar ook wetenschappers die zich dag in dag uit bezighouden met het inventariseren en beschrijven van verzamelingen planten, dieren, schimmels en andere organismen. Het zijn de rijkste informatiebronnen die beschikbaar zijn over het leven op aarde", stelt professor Vanhove.

Tijdreis

Concreet bevatten de natuurhistorische collecties wereldwijd naar schatting meer dan drie miljard exemplaren. "En daaronder zitten bewaarde exemplaren van mogelijke gastheren van de coronavirussen die tot SARS of Covid-19 hebben geleid", vertelt professor Vanhove. "Die exemplaren zijn decennia geleden verzameld met een ander doel, maar kunnen vandaag wel de sleutel zijn tot nieuwe wetenschappelijke inzichten in de verspreiding van ziekten en parasieten."
Dat blijkt ook uit een recent doctoraatsonderzoek waarvan de onderzoeksgroep Dierkunde van de UHasselt meewerkte. "Het onderzoeksteam ging na of de introductie van de Nijltilapia in het Congobekken nieuwe ziekten heeft meegebracht bij andere vissoorten. En wat blijkt? Maar liefst 3 parasietsoorten zijn meegelift en overgedragen. We zijn tot die conclusie gekomen door vissen van nu te vergelijken met vissen uit de collectie van het Afrikamuseum, die jaren geleden zijn verzameld nog voor de Nijltilapia werd uitgezet. Het is dan wel geen overdracht van dier naar mens, maar het concept is wel hetzelfde."

Boekhouding

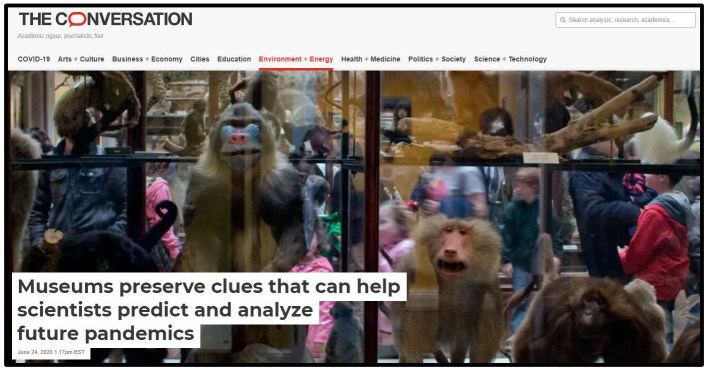
Door klimaatverandering en habitatwijzigingen verandert het ecosysteem. "Mensen komen zo vaker in contact met wild, waardoor het risico op overdracht ook groter wordt. Op een duurzame manier omspringen met de natuur is dus in ieders belang. Hadden we die virussen of andere ziekteverwekkers die in dieren leven, vooraf beter kunnen begrijpen en inventariseren, dan hadden we vandaag verder gestaan in het vermijden en managen van een pandemie", stelt professor Vanhove. De gastheer van het Covid-19-virus identificeren en conserveren kan dus levens redden in de toekomst. "Die informatie heeft niet alleen vandaag een waarde, maar ook over 100 jaar. Daarom dringen we er samen met de taskforce op aan om via de museumcollecties een betere boekhouding bij te houden van potentiële gastheren van ziekteverwekkers. Die onderzoekskosten verdwijnen in het niets als je die vergelijkt met de huidige maatschappelijke en economische kosten van de coronacrisis."

De collectie van het Afrikamuseum in Tervuren zou wel eens belangrijk kunnen zijn voor het onderzoek naar de oorsprong van het coronavirus. FOTO GUY PUTTEMANS

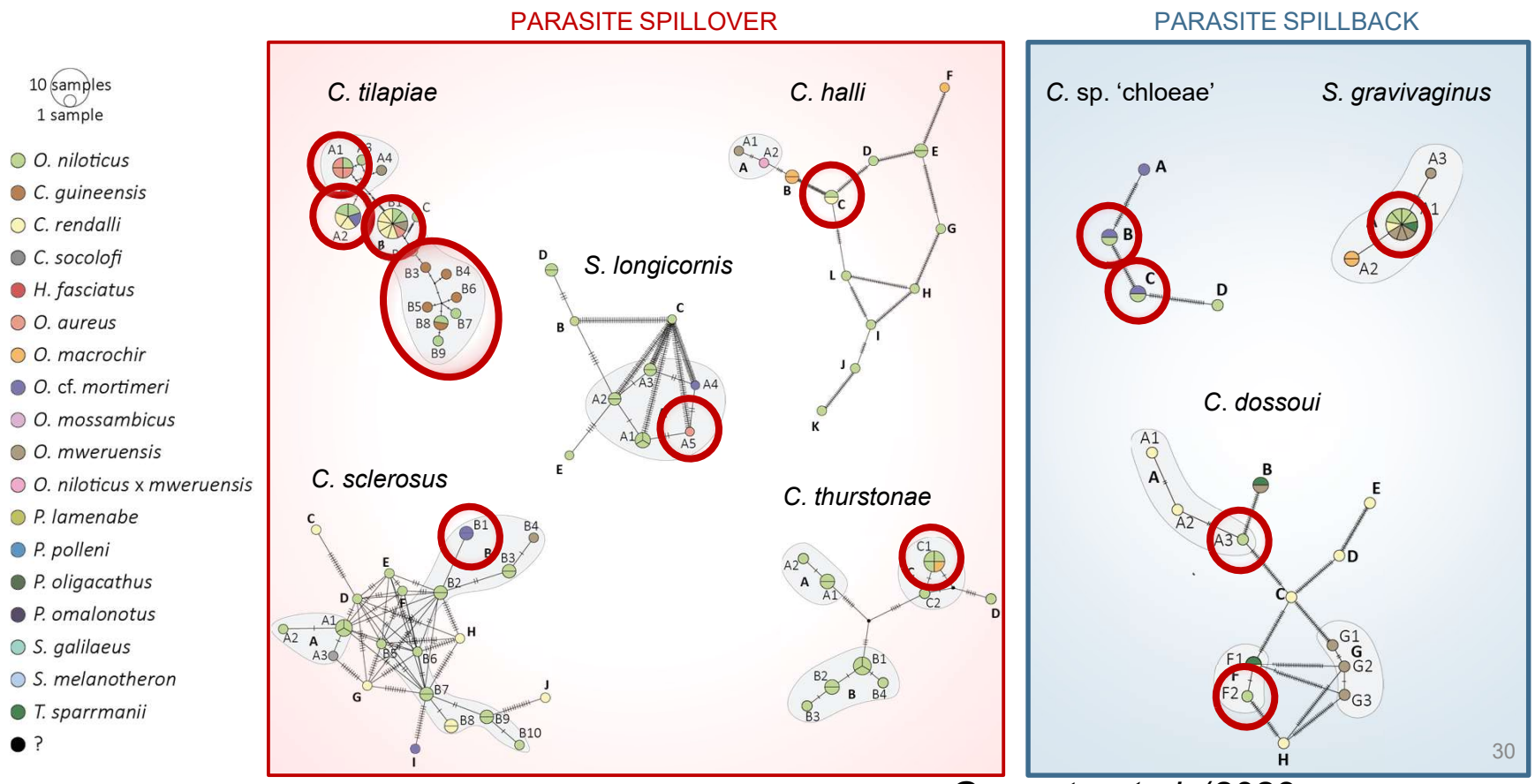
Bioloog UHasselt op zoek naar gastheer van corona in... musea

"Wij doen een oproep om meer middelen te investeren in onderzoek naar de verspreiding van ziekten en parasieten via de natuurhistorische collecties die in musea worden bewaard"
Maarten Vanhove
Bioloog UHasselt

HBvLPLUS ZATERDAG 11 EN ZONDAG 12 JULI 2020 hbvl.be 5

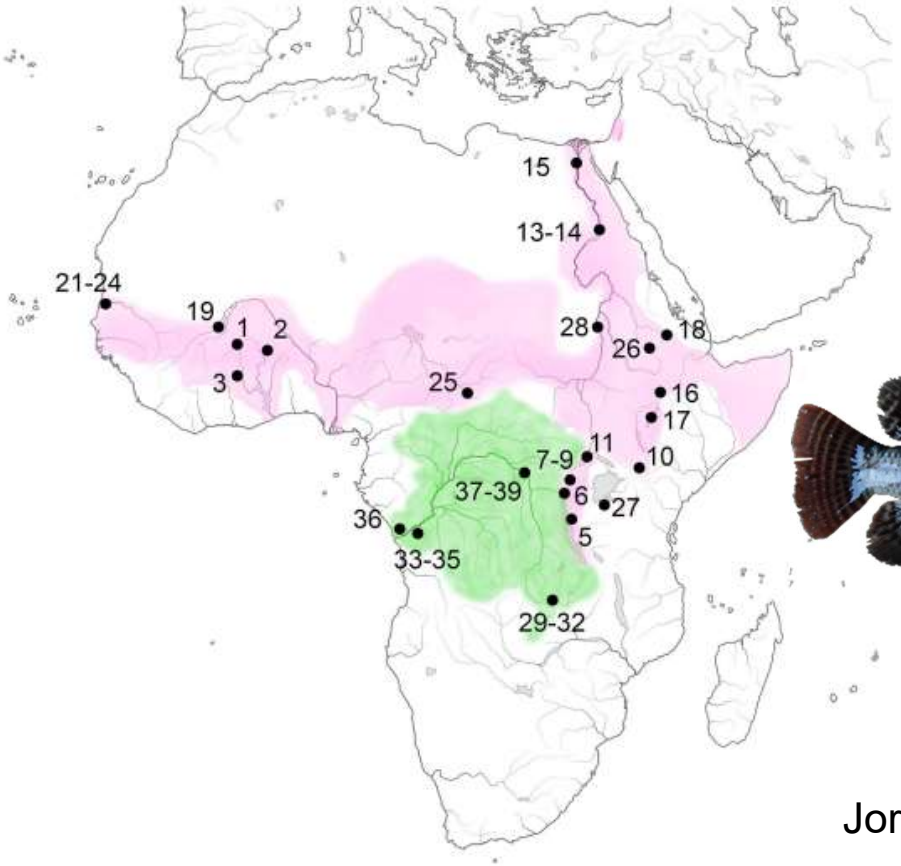


Barcoding to detect “hidden” transmission



Geraerts *et al.* (2023, *International Journal for Parasitology*)

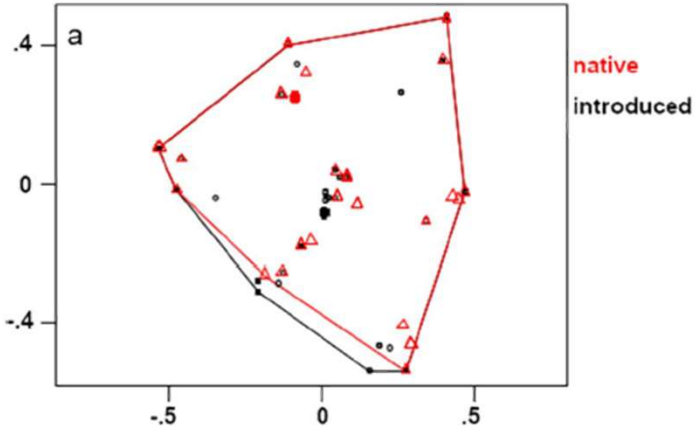
Monogeneans as tools

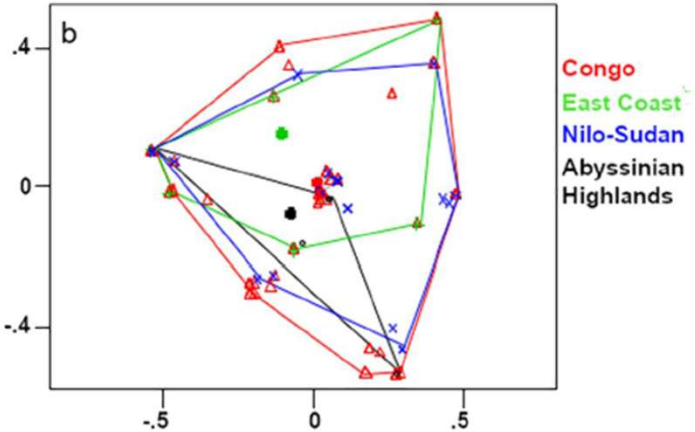


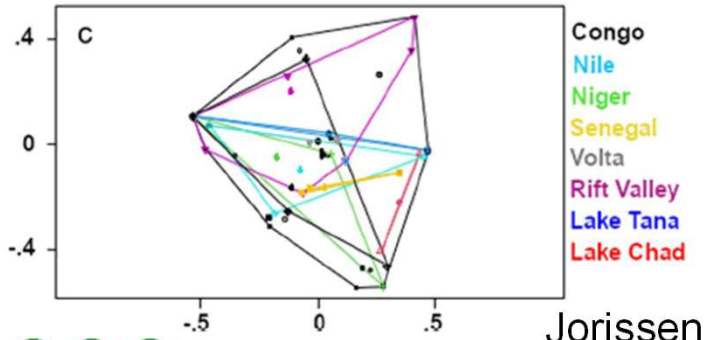
Oreochromis niloticus

Jorissen *et al.* (2025, *Hydrobiologia*)

Monogeneans as tools



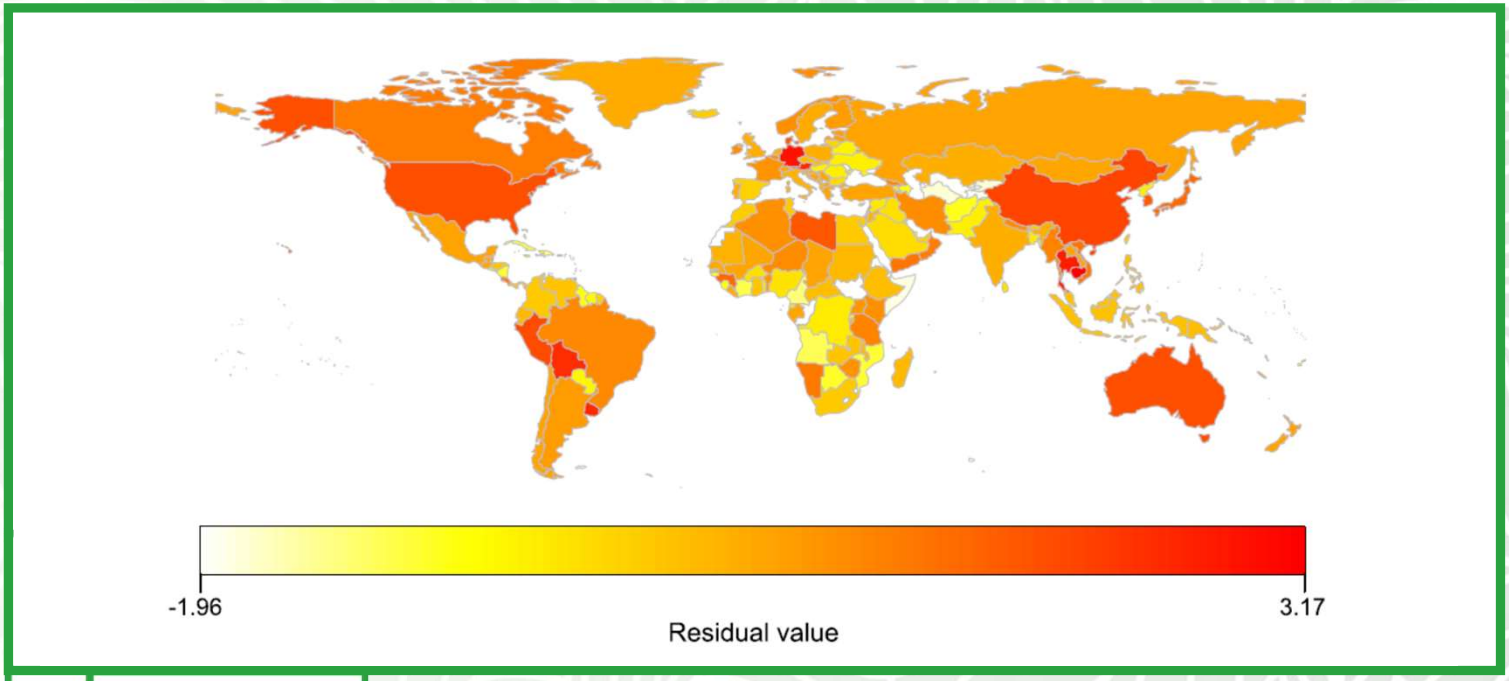




Introduction status		Indicator value	Probability
C. thurstonae	Introduced	0.4226	0.002
C. sclerosus	Introduced	0.2422	0.045
C. halli	Native	0.4159	0.034
C. tilapiae	Native	0.3966	0.011
S. longicornis	Native	0.1697	0.014
River Basin			
C. cirratus	Lake Chad	0.6199	0.006
C. sclerosus	Rift Valley	0.7164	0.007
G. nyanzae	Nile	0.6713	0.005
Province			
C. cirratus	Abyssinian Highlands	0.3944	0.002
C. sclerosus	East Coast	0.5440	0.006
S. longicornis	Nilo-Sudan	0.4972	0.001

Jorissen *et al.* (2025, *Hydrobiologia*)

Need for additional genomic resources



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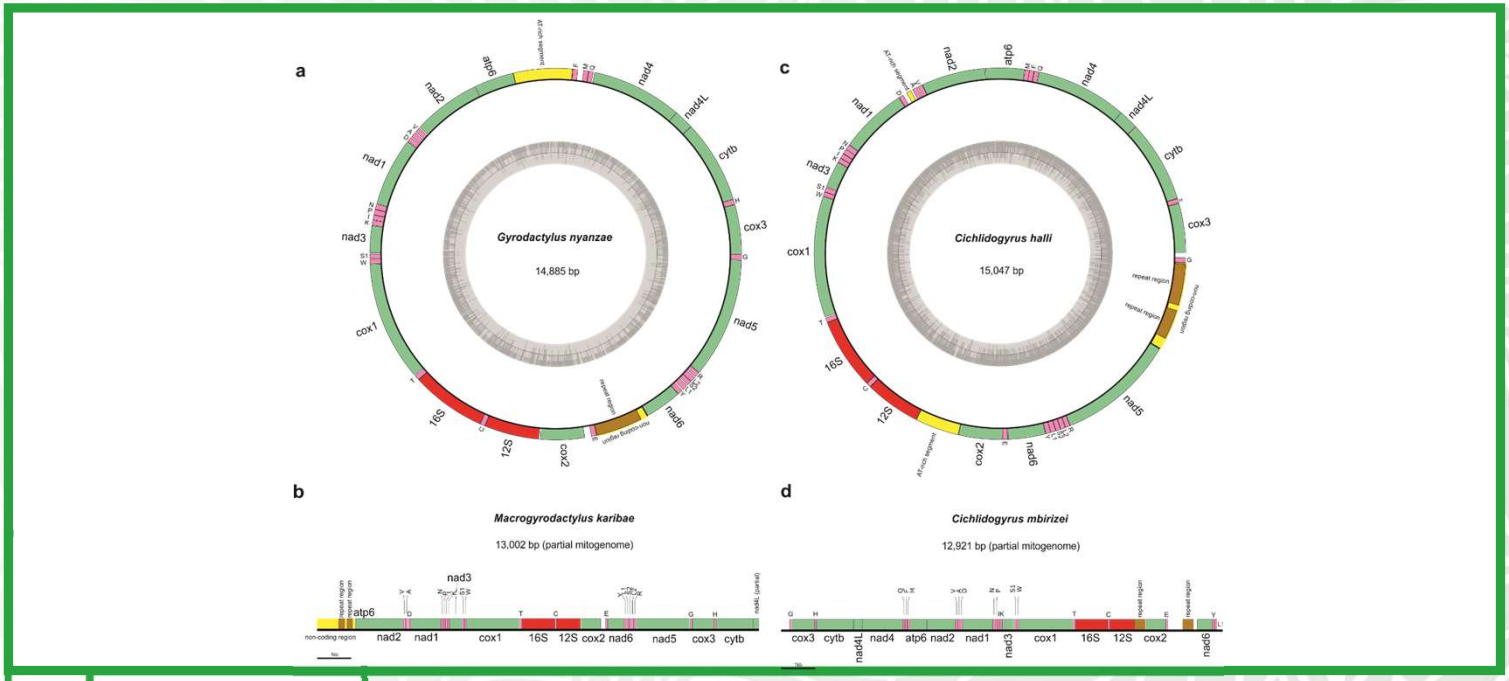
Poulin *et al.* (2019, *International Journal for Parasitology*)

Need for additional genomic resources



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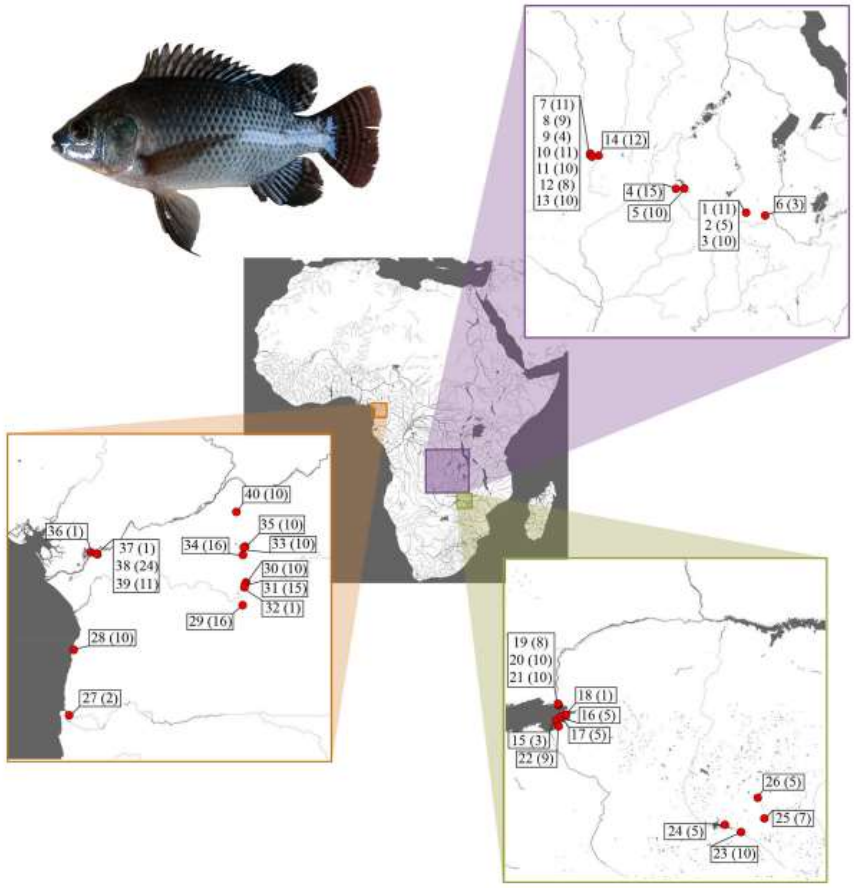
Vanhove *et al.* (2018, *BMC Genomics*)

Monogeneans as tools



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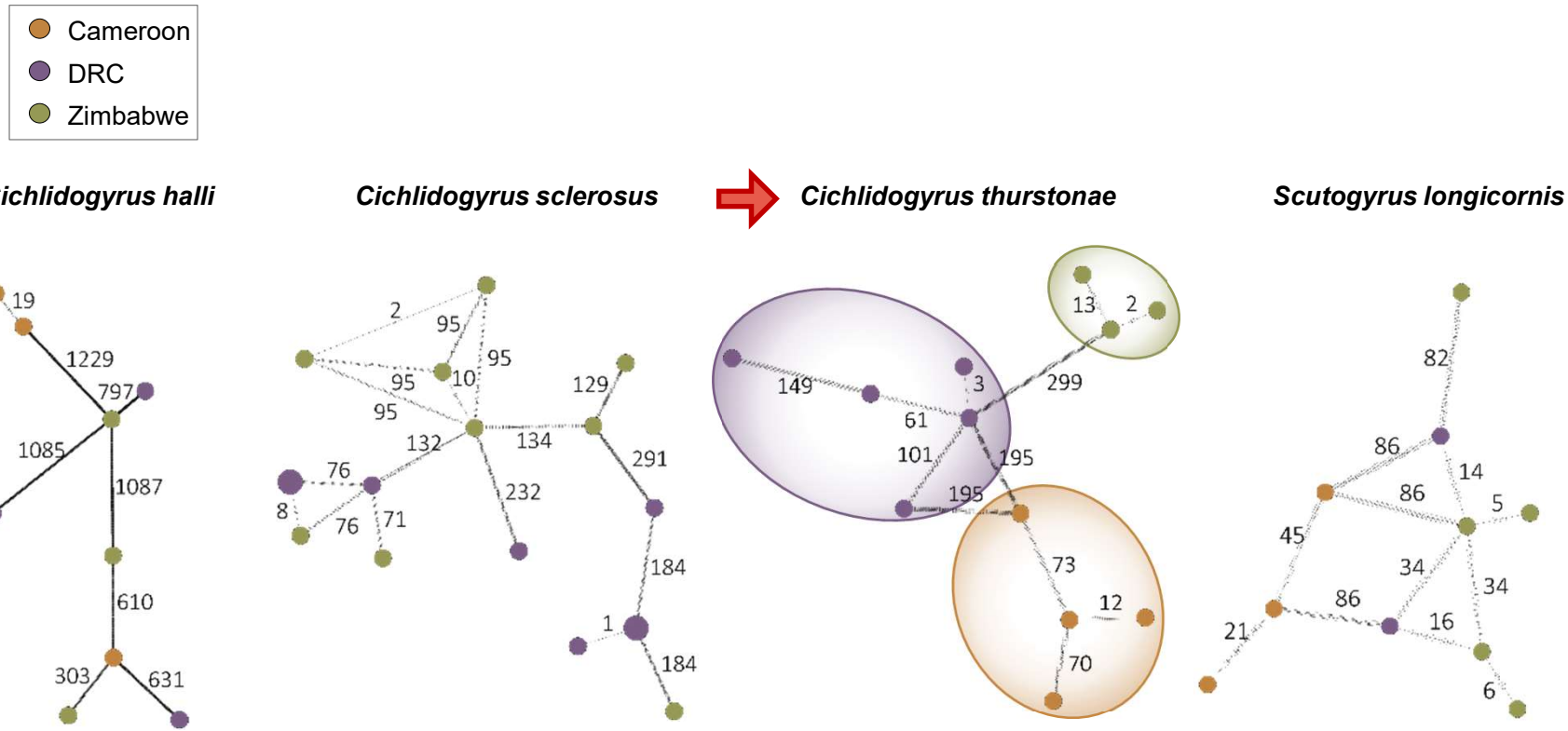
Monogeneans as tools

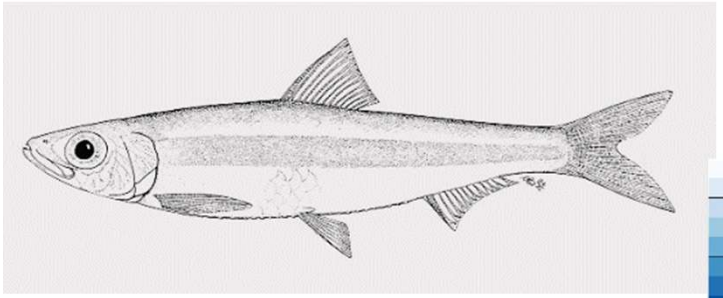


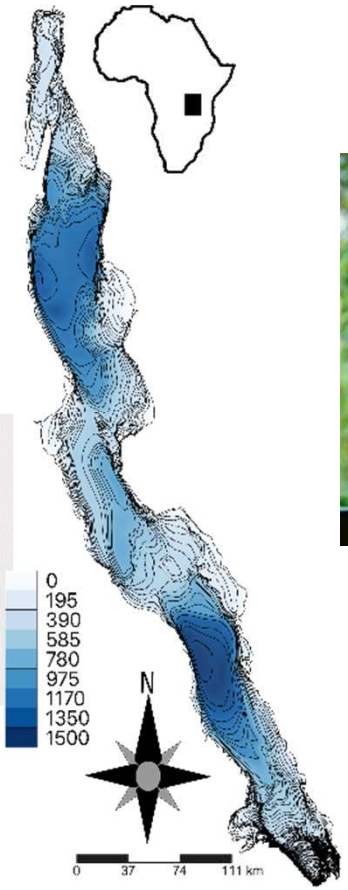
Geraerts *et al.* (2022, *Genomics*)

Monogeneans as tools

Monogenean parasite fauna of:

Limnothrissa miodon





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Kmentová *et al.* (2019, *Biological Invasions*)

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Monogeneans as tools

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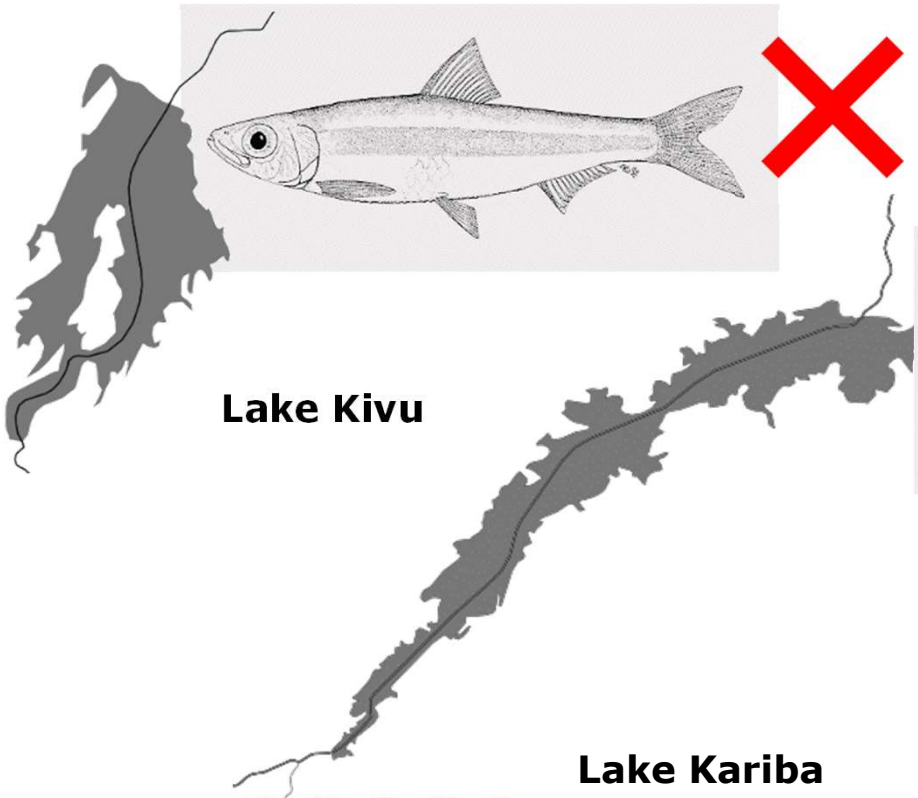
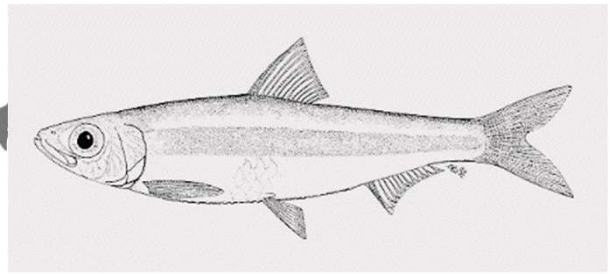
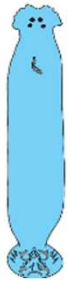




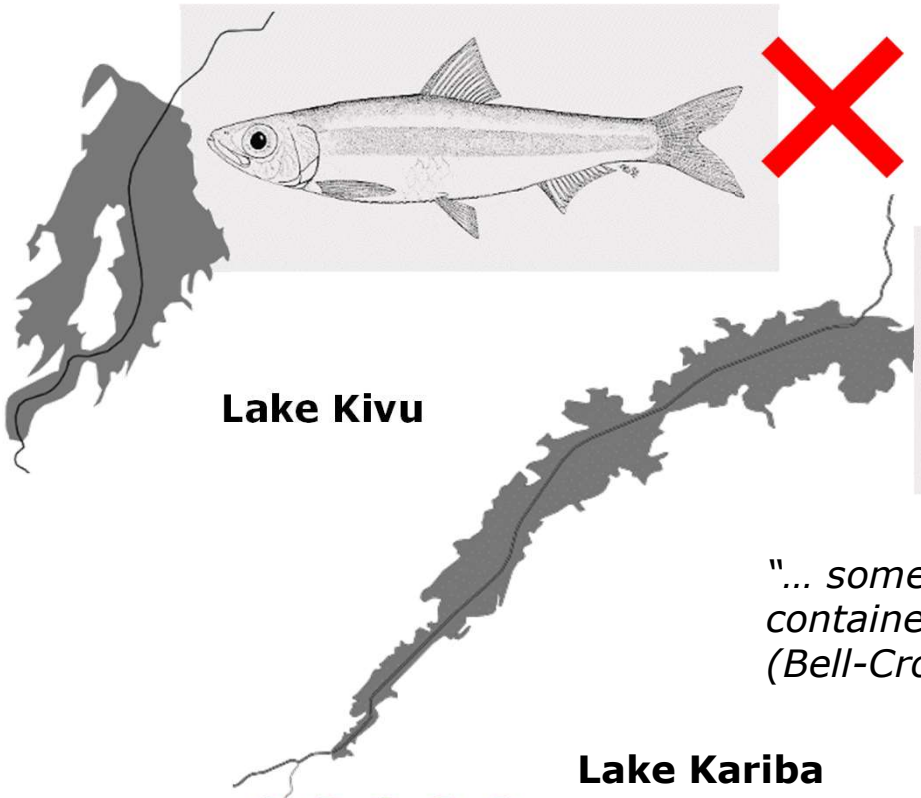


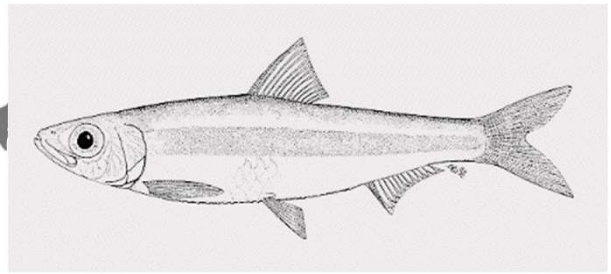
Kapentagyrus limnotrissae

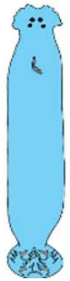
Kmentová *et al.* (2019, *Biological Invasions*)

Monogeneans as tools

Monogenean parasite fauna of:
Limnothrissa miodon





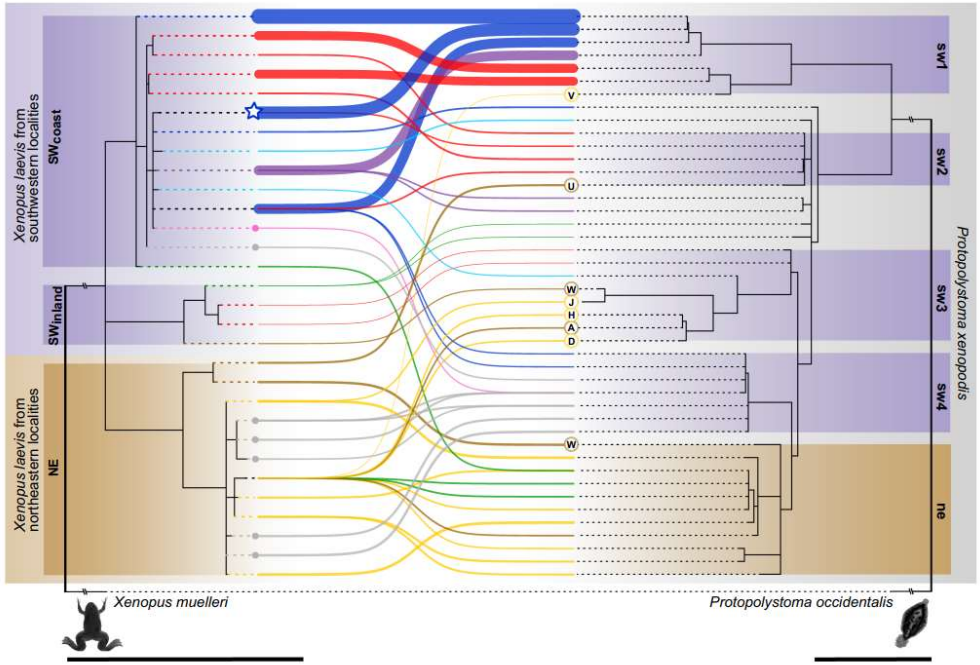


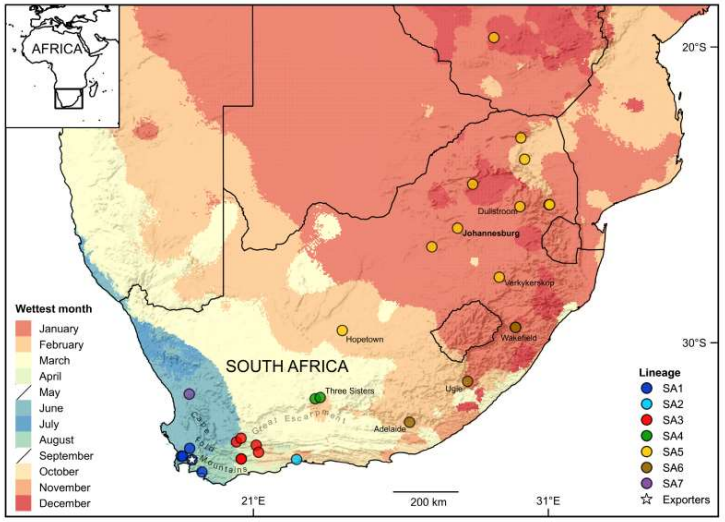
Kapentagyrus limnotrissae

"… some larger specimens did find their way into the containers."
(Bell-Cross & Bell-Cross, 1971, Fish. Res. Bull. Zambia)

Kmentová *et al.* (2019, *Biological Invasions*)

Monogeneans as tools





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NRF National Research Foundation | SAIAB South African Institute for Aquatic Biodiversity

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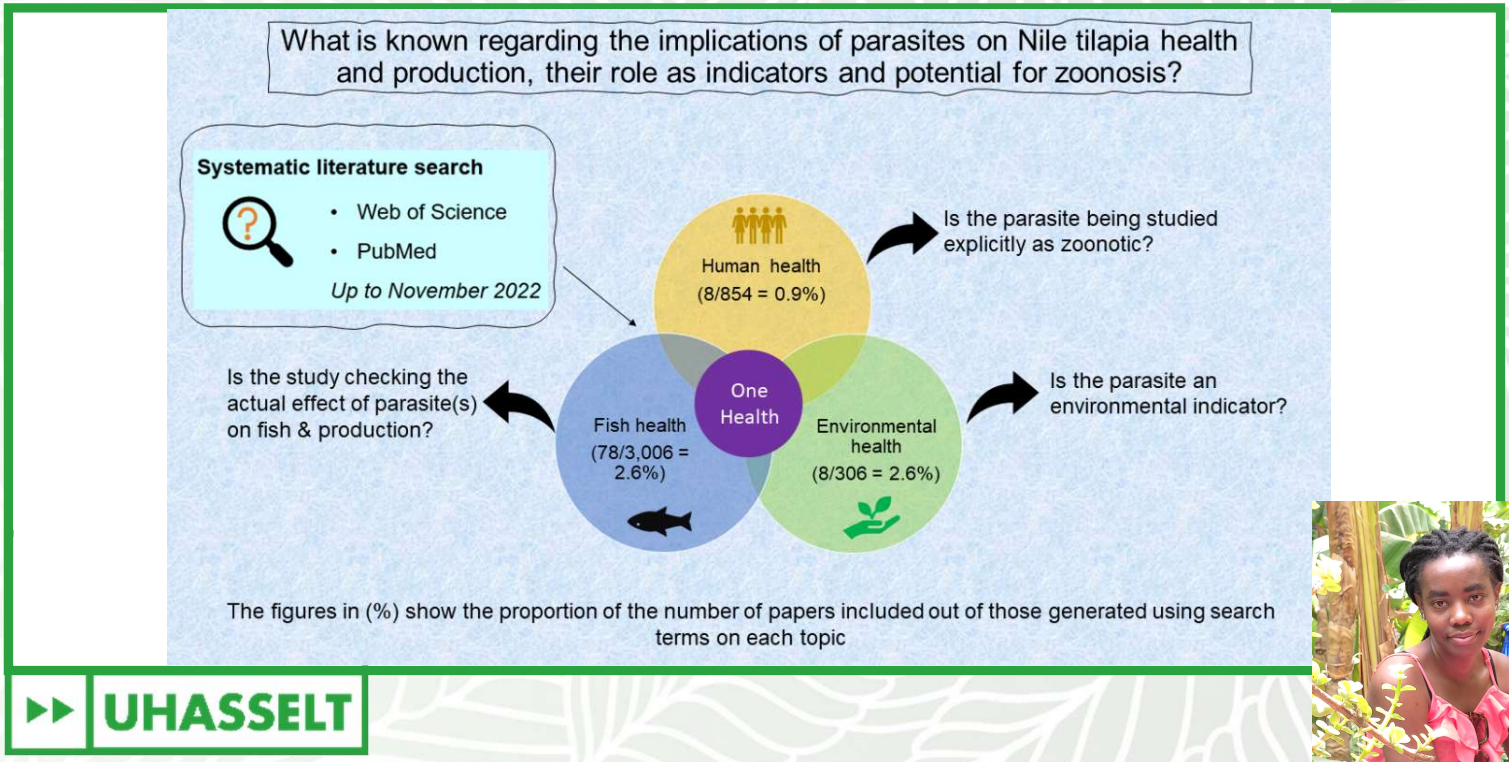
Schoeman *et al.* (2022, *Journal of Applied Ecology*)

One Health in Nile tilapia parasitology?



Shigoley *et al.* (2025, *Hydrobiologia*)

Conclusions and perspectives

- parasitology of major IAS requires a more integrative approach (overlooks co-introduction & (zoonotic) transmission, bio-indication…)
- potential of historical collections for baseline infection data
- potential of parasites as tags for IAS
- importance of morphology-based parasite taxonomy
- a way to promote biodiversity infrastructure in One Health?

Heartfelt thanks to co-supervisors & other co-authors!

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KNOWLEDGE IN ACTION

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WASP-P

Survey on perception of wildlife parasites

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Database, 2023, 1–18
DOI: https://doi.org/10.1093/database/baad003
Technical report

DATABASE

WASP: the World Archives of Species Perception

Tuan Nguyen[1,2,*], Robert Malina[1], Ilias Mokas[1], Antonis Papakonstantinou[3], Orestes Polyzos[3] and Maarten P.M. Vanhove[2]

http://www.wasp-project.net/