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Balancing risks and opportunities in ex situ conservation: host-parasite dynamics of the European weatherfish

The Fish of Muddy Waters

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Tiziana Gobbin, **Nikol Kmentová**, Johan Auwerx,
An Martel, Alex Nelson, Naomi Terriere,
Jeroen Van Wichelen, Maarten Vanhove



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Let's talk about parasites

Global change & populations

- Distribution shifts
- Population declines and extinctions
- Few invasions
- in plants
- in animals

free-living



(metazoan) parasites?

Expected to be affected, but empirical data are lacking together with any conservation plans



Parasite extinction

Extinction of parasite species is not good news!

Parasites

- **Provide many ecosystem services**

linking food webs
regulating host populations
reducing impact of toxic pollutants
developing immunity
...



- **Have an intrinsic value**

part of genetic and species diversity
a (large) portion of evolutionary history



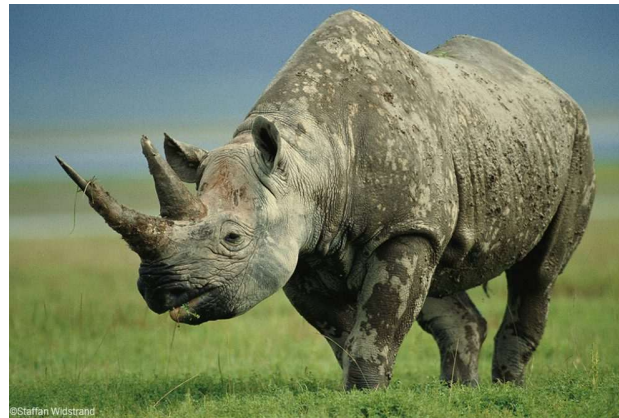
Conservation action

Among possible conservation action:

- **Breeding and reintroduction**
- **Relocation / Translocation**



Gopher tortoise
(*Gopherus polyphemus*)



Black rhinoceros
(*Diceros bicornis*)



California condor
(*Gymnogyps californianus*)



Conservation action

Commonly, (species-specific) parasites are intentionally removed during conservation actions targeting their hosts

Gophertortoise tick
(*Amblyomma tuberculatum*)



Gopher tortoise
(*Gopherus polyphemus*)

Amblyomma personatum
Dermacentor rhinoceros



Black rhinoceros
(*Diceros bicornis*)

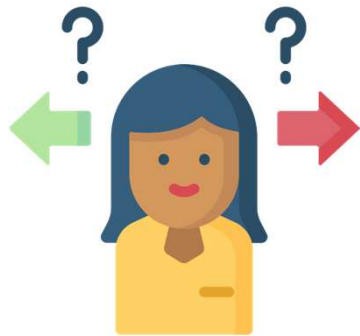
California condor louse
(*Colpocephalum californici*)



Californian condor
(*Gymnogyps californianus*)

→ increases the extinction risk of parasites
→ conservation-induced extinction

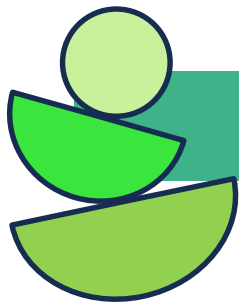
Does conserving parasites lead to a dilemma?



Protect endangered free-living species at the risk of causing parasite decline/extinction?

OR

Protect endangered parasite species at the risk of decreasing host fitness?



Conservation of one species should NOT hamper the conservation of other species!

→ a case study showcasing this

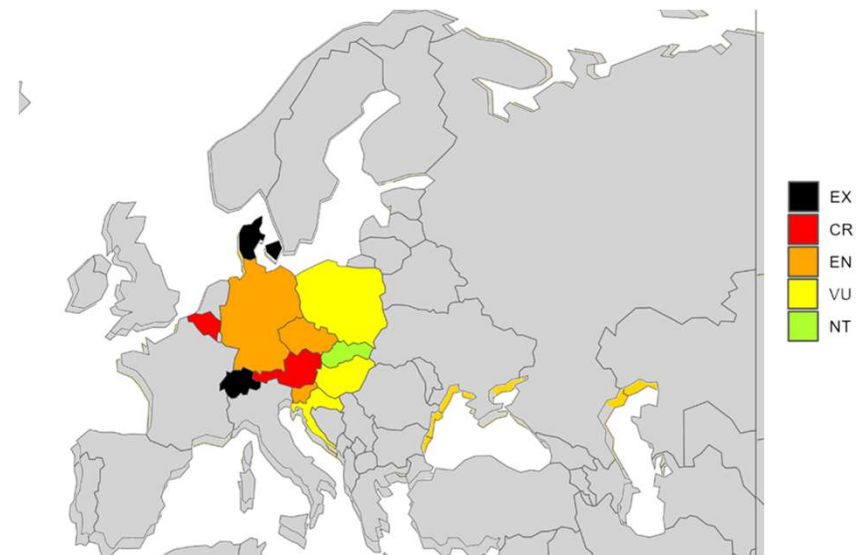


European weatherfish

European weatherfish (*Misgurnus fossilis*)

Decreased in large parts of its native range

(habitat loss, pollution, invasion of two Asian congeners)



European weatherfish

Flanders: critically endangered (few small populations left)
Since 2021: protection plan in Flanders



Ex-situ breeding

- to restock existing Flemish populations
- to establish new ones in suitable habitats



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Parasites of the European weatherfish: extinction risk in Czech Republic & Slovakia

HELMINTH CLASS/IUCN CATEGORY Helminth species	Host species	River basin ¹	Proposed IUCN category for Czech / Slovak Rep. ²
MONOGENEA/CRITICAL			
<i>Ancyrocephalus cruciatus</i> (Wedl, 1857)	<i>M. fossilis</i> 	E. O. D	EN / CR
<i>Dactylogyrus chondrostomi</i> Malevitskaja, 1941 ³	<i>C. nasus</i>	D	CR / SU
<i>Dactylogyrus dirigerus</i> Gusev, 1966	<i>C. nasus</i>	D	CR / SU
<i>Dactylogyrus ergensi</i> Molnár, 1964	<i>C. nasus</i>	D	CR / SU
<i>Dactylogyrus nybelini</i> Markevitch, 1933 ³	<i>C. nasus</i>	D	CR / SU
<i>Dactylogyrus simplicinalleata</i> Bychowsky, 1961 ³	<i>P. cultratus</i>	D	CR / VU
<i>Gyrodactylus fossilis</i> Lupu et Roman, 1956	<i>M. fossilis</i> 	E. O. D	EN / CR
<i>Gyrodactylus macrocornis</i> Ergens, 1963	<i>C. nasus</i>	D	CR / SU
<i>Gyrodactylus misgurni</i> , Ling Mo-en 1962	<i>M. fossilis</i> 	D	helminth not recorded / CR
<i>Gyrodactylus paraminimus</i> Ergens, 1966	<i>C. nasus</i>	D	CR / SU
<i>Paradiplozoon vojteki</i> (Pejčoch, 1968)	<i>P. cultratus</i>	D	CR / VU

CR

Critically
Endangered

EN

Endangered

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Parasites on European weatherfish! Now what?

18 fish from 2024 (9 adults + 9 juveniles)



Parasites on European weatherfish! Now what?

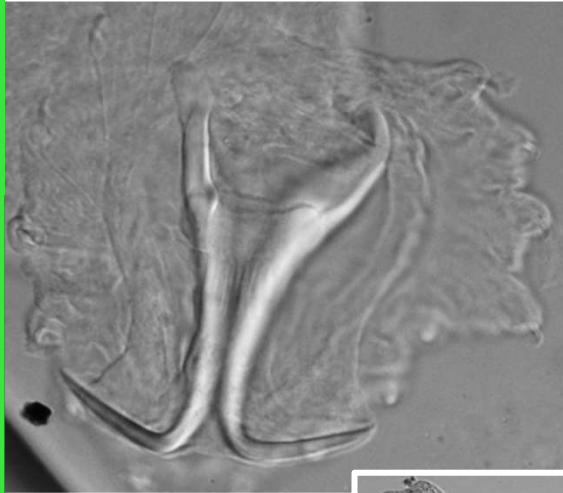
18 fish from 2024 (9 adults + 9 juveniles)
9 fish from 1881-1973 (9 adults)



1 host individual
=
1 parasite community

Parasites of the European weatherfish in Belgium

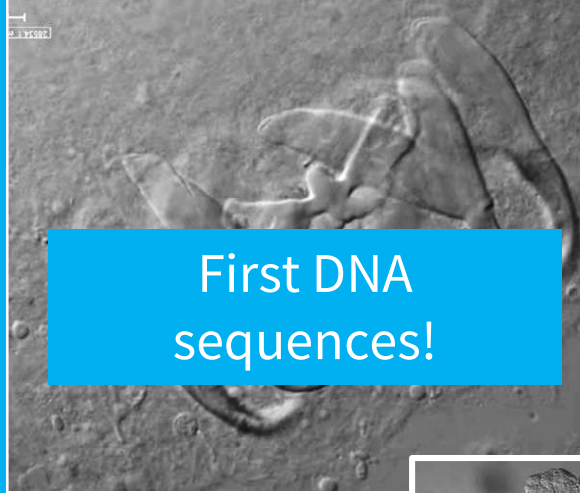
Gyrodactylus misgurni
(Gyrodactylidea)



Historical
collection
(& 1 recent
specimen)

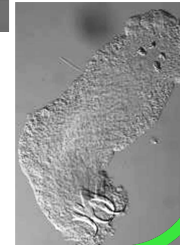


Actinocleidus cruciatus
(Dactylogyridea)

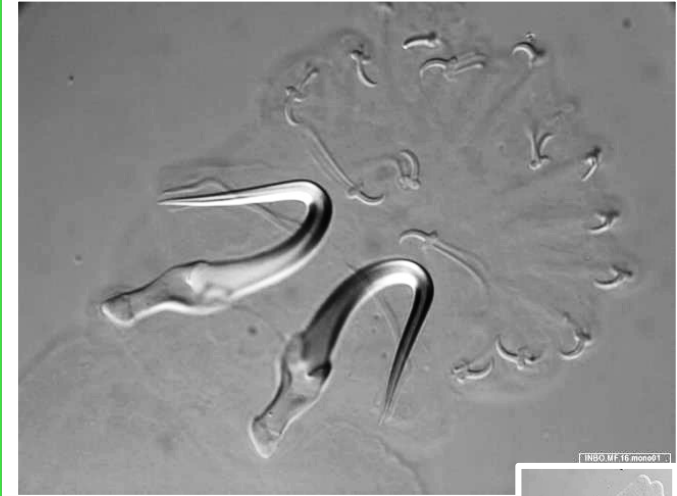


First DNA
sequences!

Historical
& recent
collection



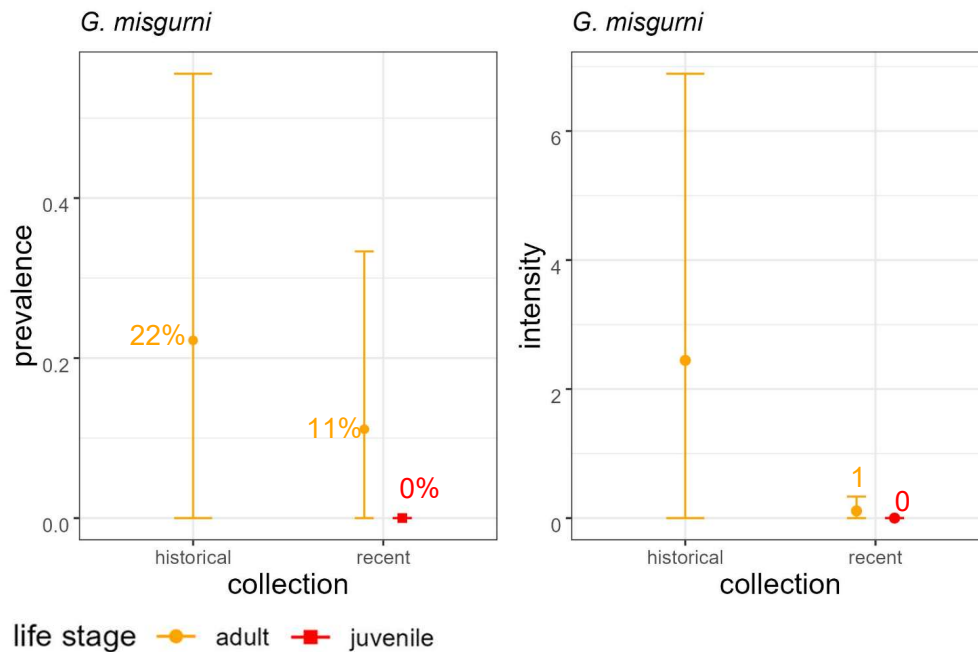
Gyrodactylus fossilis
(Gyrodactylidea)



Recent
collection

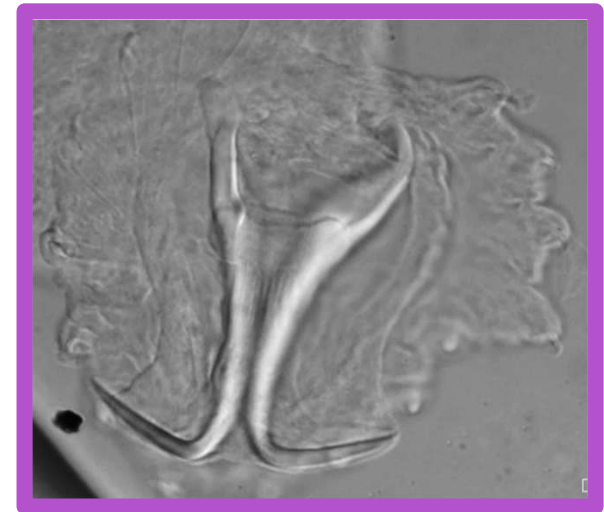


Parasites of the European weatherfish in Belgium

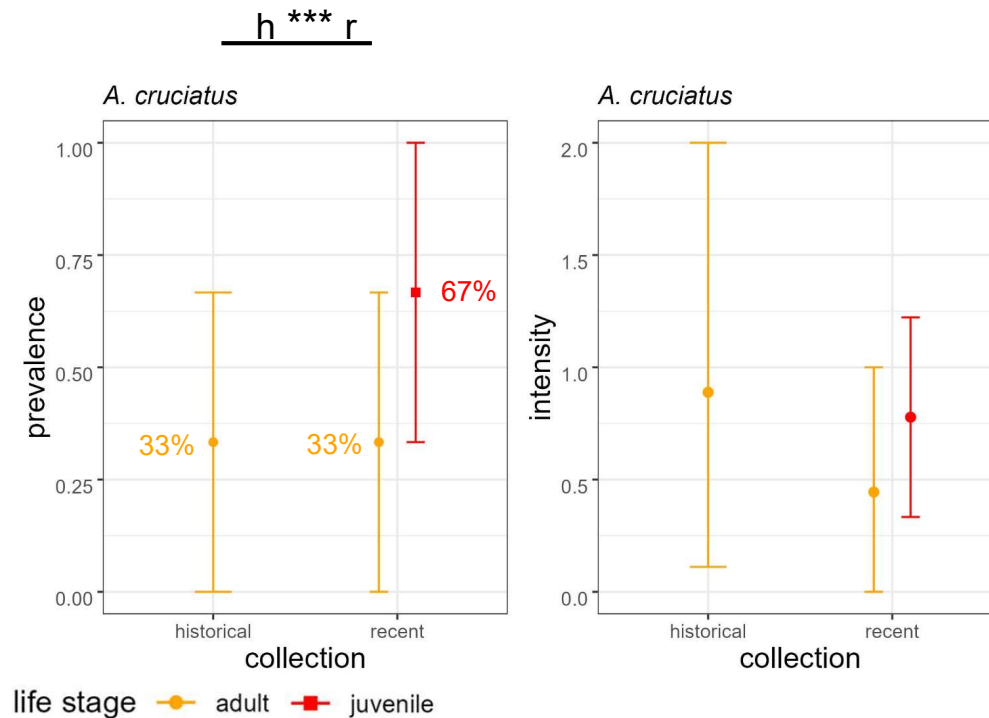


Gyrodactylus misgurni

On historical (adult) host specimens, except 1 individual on a recent fish (no stats)



Parasites of the European weatherfish in Belgium



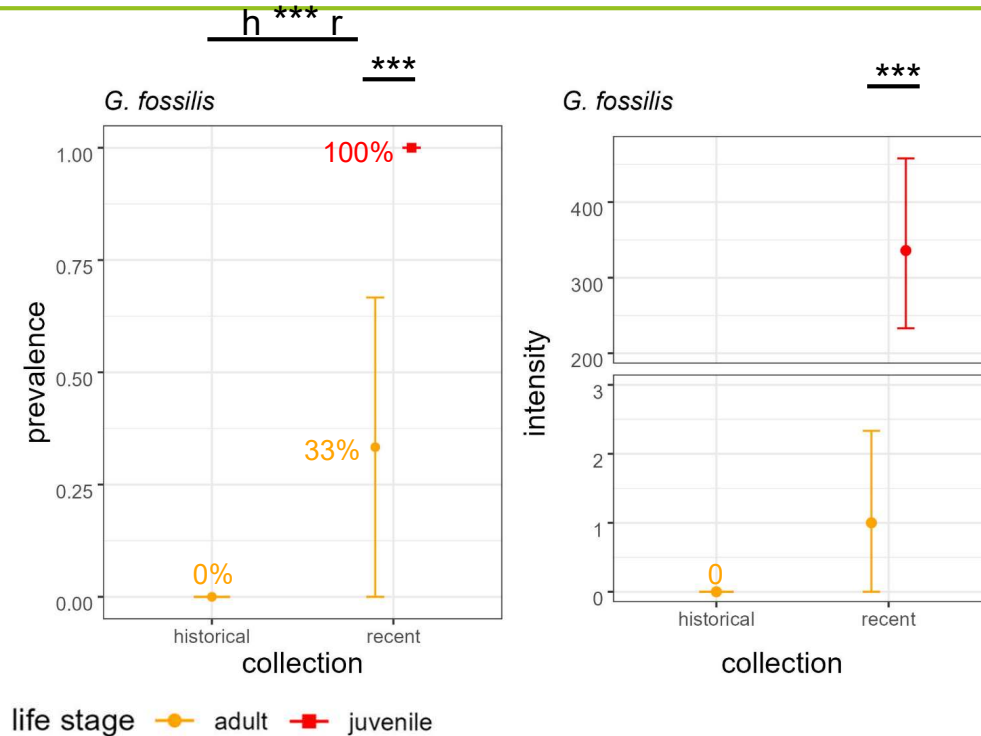
Actinocleidus cruciatus

Despite similar prevalence, recent specimens had higher numbers than historical ones.

→ it thrives in aquaculture



Parasites of the European weatherfish in Belgium



Gyrodactylus fossilis

Only on recent host specimens

All juveniles were infected and by much higher numbers than adults (mean 336 vs 1)

→ It may not have been present in Belgium in the past

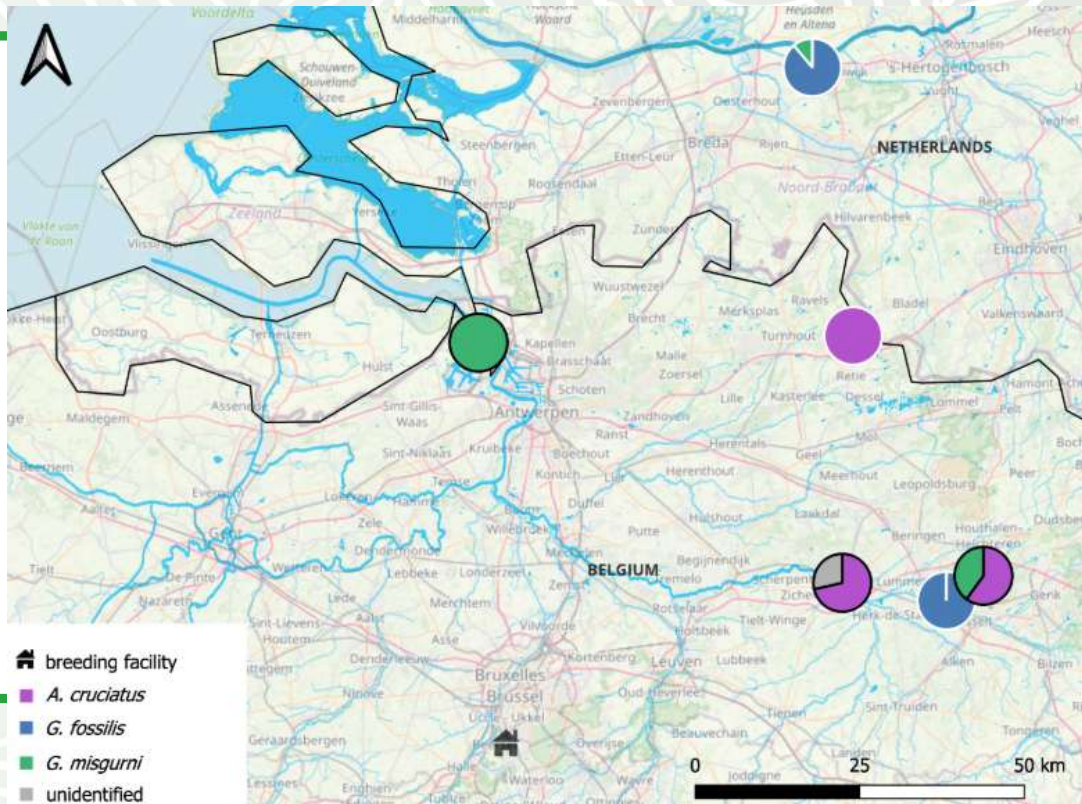
→ Juvenile/adult difference in infection may be explained by their different diet



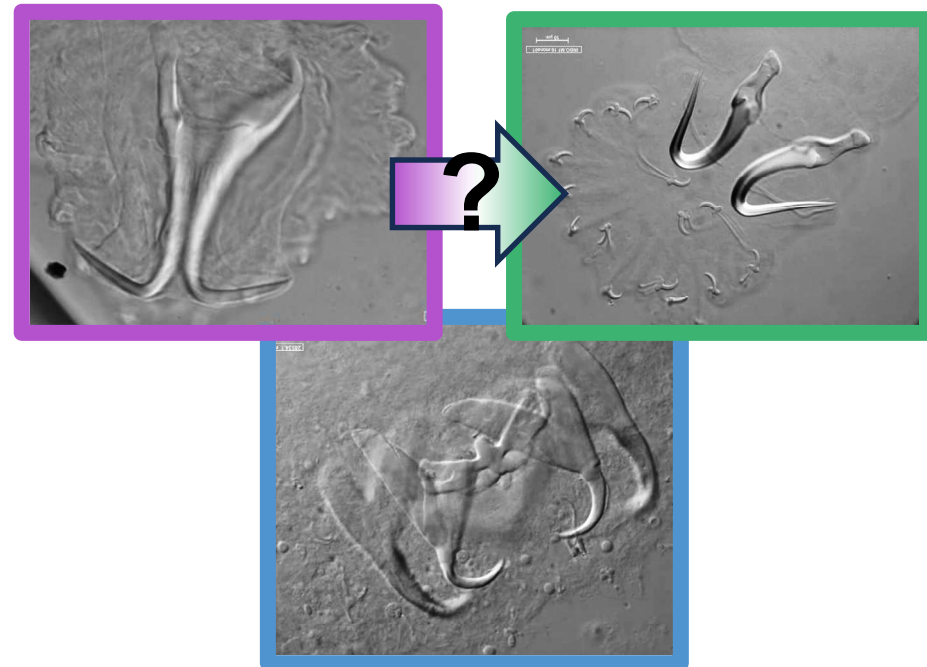
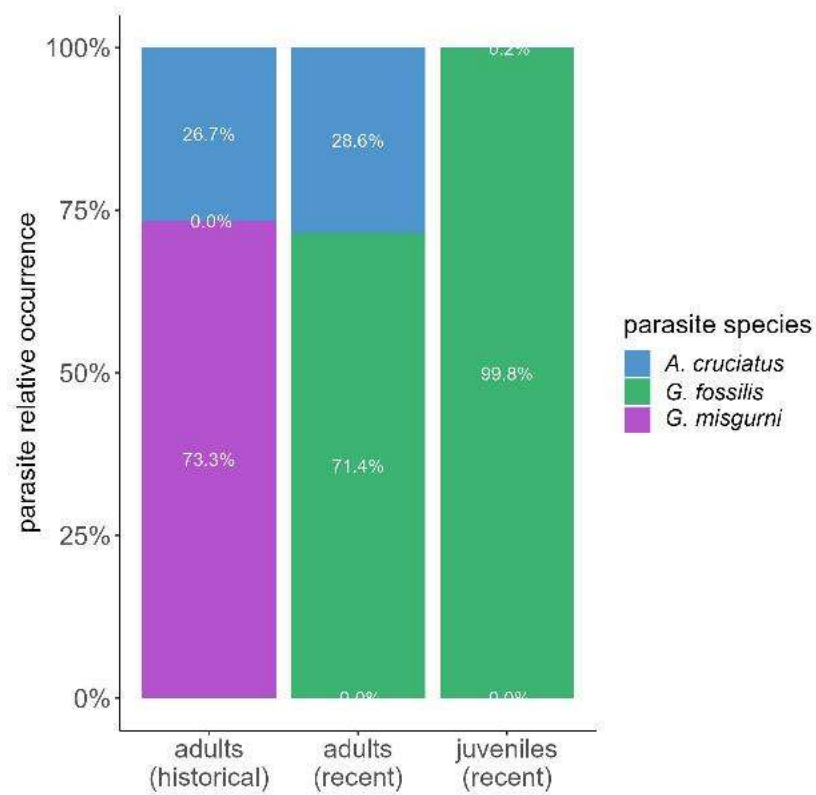
Parasites of the European weatherfish in Belgium

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Parasites of the European weatherfish in Belgium



A winning combination: saving more than one



under moderate abundance, monogeneans do not kill their hosts

- **not necessary to actively remove them during conservation actions**
- **conservation actions for hosts can benefit parasites, too!**
- **integrate parasitological assessments into conservation good practices and reintroduction**

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Perception of parasites

World Archives of Species Perception,
spin-off on parasites



WASP-P

Survey on
perception of
wildlife parasites



Stinking corpse lily (*Rafflesia arnoldii*), a plant parasite



How do you rate this species in terms of:

Ugly	☐	☐	☐	☐	☐	Beautiful
Disgusting	☐	☐	☐	☐	☐	Cute
Scary	☐	☐	☐	☐	☐	Benign
Boring	☐	☐	☐	☐	☐	Interesting
Harmful for ecosystem	☐	☐	☐	☐	☐	Important for ecosystem



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Thank you for your attention!

We warmly thank Olivier Pauwels (vertebrate curator, Royal Belgian Institute of Natural Sciences) for access to the fish collection!

nikol.kmentova@uhasselt.be

