



AFRESH

AFRESH and its “genealogy”

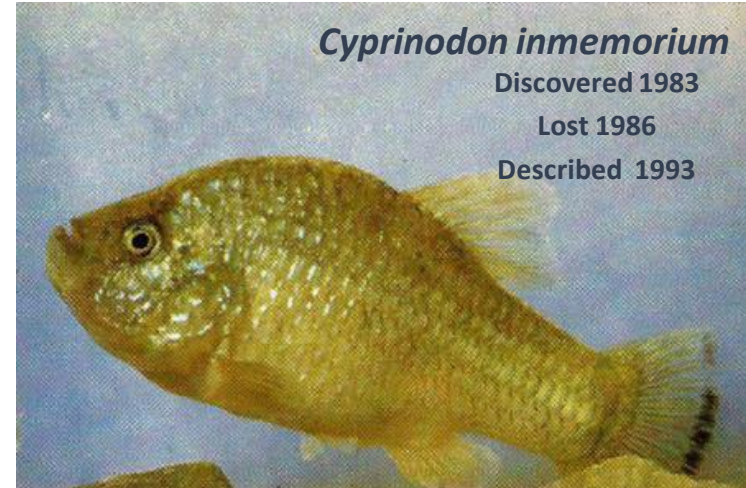
Brian Zimmerman & Eleni Kalogianni

Freshwater Fish

AFRESH

Freshwater fish comprise $\frac{1}{2}$ of all fish species. Freshwater habitats comprise only $\frac{1}{3}$ of 1% of aquatic habitats on the planet.

- More than 15,000 (of 32,500 total fish) species globally
- 10,867 assessed by IUCN
- 2564 threatened ($\frac{1}{4}$)
- 79 already extinct – 16 declared extinct in last two years
- 2189 data deficient



AFRESH

Corfu killifish



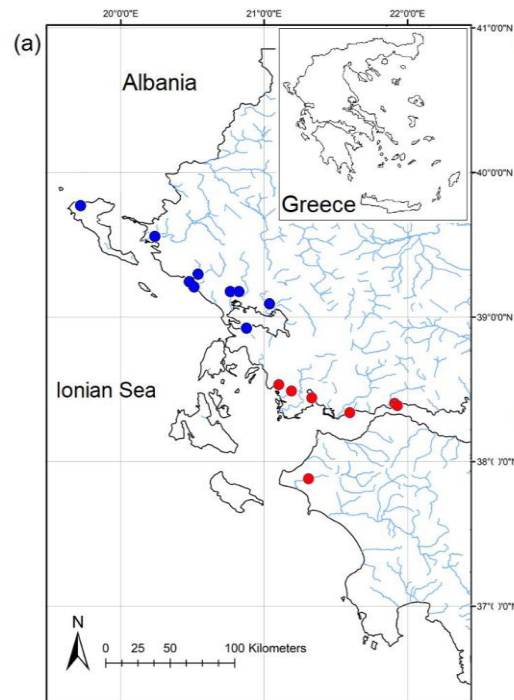
Valencia letourneuxi (male)



Valencia robertae (male)

Glacial relict

AFRESH





Female



Male

AFRESH

Micro-predator – larval terrestrial and aquatic





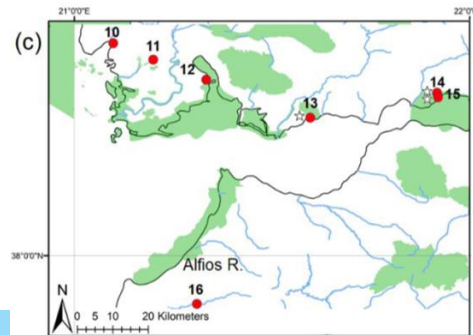
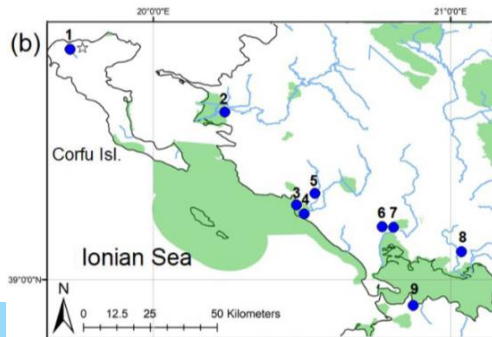
AFRESH

Habitat specialist – lowland, coastal



AFRESH

Habitat specialist – lowland, coastal springs



fresh

Bristol
Workshop

December 2nd, 2022

Agriculture

AFRESH



 fresh

Bristol
Workshop

December 2nd, 2022

Mosquitofish

Gambusia holbrooki

AFRESH





AFRESH

2004 Workshop at London Zoo

FRESHWATER FISH WORKSHOP TO IDENTIFY PRIORITY SPECIES FOR CONSERVATION

Review of European species that were threatened

Create a prioritised list of species that zoos/aquariums could support conservation for and identify partnerships

Valencia letourneuxi was considered a high priority and HCMR was the key authority in Greece.





AFRESH

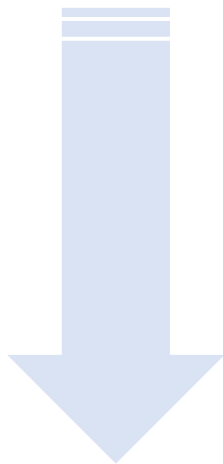
Valenciidae in zoos/aquariums

In 2020 the European Association of Zoos and Aquariums (EAZA) published its Regional Collection Plan and agreed to create a new Ex-situ programme (EEP) for the family Valenciidae.

The focus of the RCP and the EEP is to find conservation solutions for these threatened fishes through cooperative efforts between zoos and in-situ partnerships



WHAT LED TO AFRESH



2005	"GREEK KILLIFISH"
2012-	"FISH-NET GREECE"
2018-2019	"RESILIENT"
2018-2020	"DECAGON"
2019-2020	"PACIM"
2020-2022	"AFRESH"

THE FIRST STEPS

Nation-wide population survey of a threatened freshwater fish species (*Valencia letourneuxi*, later split to *V. letourneuxi* and *V. robertae*)

Fieldwork by joint HCMR-ZSL team in 14 basins (95 sampling locations)

The experience of ZSL & veteran HCMR colleagues was invaluable

Valencia robertae



WIDENING THE SCOPE OF CONSERVATION ACTIONS

Long-term monitoring of Corfu killifish populations

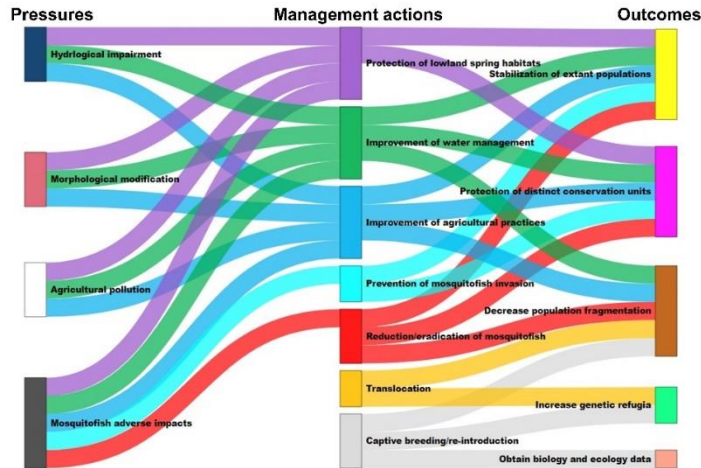
Pilot trial freshwater fish translocation in the wild

Basic research (ecology, diet, parasites, etc) & Public awareness activities

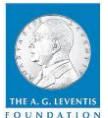
funding

WIDENING THE SCOPE OF CONSERVATION ACTIONS

Long-term monitoring of Corfu killifish populations permitted discerning long-term trends & Provided crucial information for proper conservation management



funding





FISH-NET GREECE

STEPS FORWARD

Pilot translocation in the wild in Louros river basin (2015-2017) offered significant **know-how on planning, implementation and monitoring**

Long-term and rigorous post-release monitoring with **multiple** monitoring methods is required





RESILIENT

2018-2019

PILOT E-DNA MONITORING IN GREEK FRESHWATERS

Pilot application of the environmental DNA method to monitor
native threatened freshwater fish species & alien invasive freshwater fish species



Bristol
Workshop



funding



December 2nd, 2022



RESILIENT

ACHIEVEMENTS AND SETBACKS

The high sensitivity of the eDNA method is confirmed

First encounter, however, with “pseudo-negatives”



DECAGON

2018-2020

FIRST ETHOLOGY EXPERIMENTS AND FISH REARING ATTEMPTS

Behavioural experiments using native and alien, invasive species

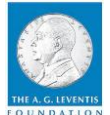


 fresh

Bristol
Workshop



funding



December 2nd, 2022



Breeding of *V. letourneuxi* and *V. robertae* in aquaria

Freshwater fish breeding in close circuit conditions requires continuous monitoring, a trial and error attitude and a lot of background experience and knowledge...



DECAGON

as collecting the fish, however hard, is just the beginning (mainly issues of transfer, disease and acclimatization)





2019-2020

EXPANDING THE SCOPE OF THE eDNA SURVEYS

Assessment of two other threatened, range restricted species

Nation-wide range assessment of two top fish invaders

 fresh

Bristol
Workshop



**UWE
Bristol**

University
of the
West of
England

funding



December 2nd, 2022



PACIM

CHALLENGES AND STEPS FORWARD

The eDNA is a useful tool for resolving geographic range issues, new questions may arise

The eDNA is a powerful tool for detecting *alien* species, though with limitations





AFRESH

2021-2022

WHERE ALL CONVERGE

Multi-species, nationwide eDNA survey targeting native threatened species

Multi-species, nation-wide eDNA survey of top alien invaders

Conservation translocation of threatened fishes (creating refugia population in situ)

Conservation behaviour experiments

Creation of safety stocks of two more threatened species

funding

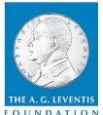


Bristol
Workshop



**UWE
Bristol**

University
of the
West of
England



December 2nd, 2022



AFRESH

CHALLENGES AND STEPS FORWARD

The eDNA survey **can resolve** threatened, native species range issues (e.g. *Alburnus vistonius*)

Alien invaders' detection through DNA can function an early warning for intervention (e.g. *Lepomis gibbosus*?)



CHALLENGES AND STEPS FORWARD

Conservation behaviour experiments is a purely laboratory endeavour, with significant implications however for species' conservation (e.g. turbidity exposure experiments)

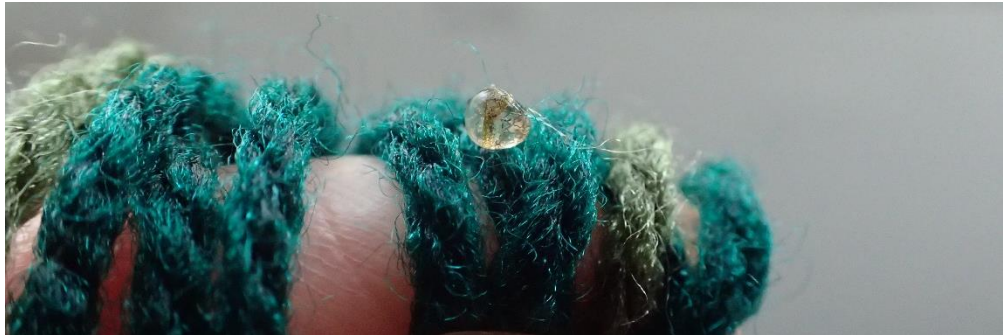




CHALLENGES AND STEPS FORWARD

Creation of safety stock populations of threatened species is a difficult path due to species' peculiarities (e.g. *E. trichonis* and *P. hellenicus*)

Should be conducted with caution and often requires protocol modifications





AFRESH

AND BEYOND

FUTURE PERSPECTIVES

Expanding freshwater fish research (including the eDNA method) in other species and systems

Standardization of tools and methodologies for fish fauna restoration through freshwater fish translocations

Freshwater ethology research (climate change fish behavioural research, fish swimming performance experiments. *In situ* and *ex situ* experimentation)

Targeted fish aquaria breeding for future conservation translocation actions



AFRESH

AND BEYOND

THANK YOU FOR YOUR ATTENTION



Bristol
Workshop

December 2nd, 2022