

# Are anthropogenic “barriers” important in river restoration actions in Greece?

| *Είναι οι φραγμοί σοβαρό θέμα στην αποκατάσταση ποτάμιων οικοσυστημάτων στην Ελλάδα;*

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## Presentation themes

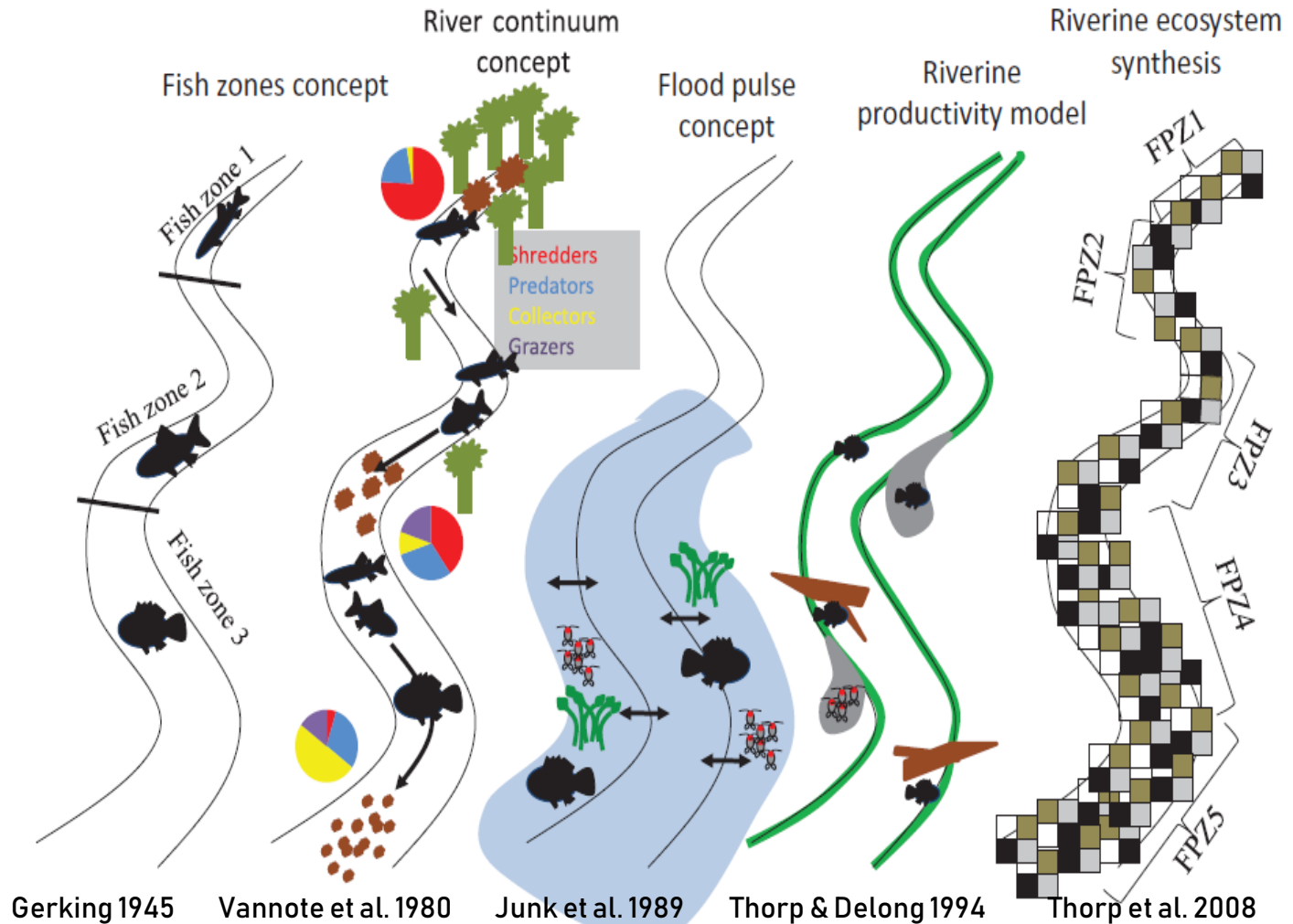
1. River connectivity issues
2. Fishes as indicators of ecosystem integrity and connectivity
3. Loss of connectivity
4. The dam and barrier situation in Greece
5. Restoration

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## River connectivity issues

Longitudinal connectivity is a dominant conceptual theme in the study of the structure and functioning of rivers

Η διαμήκης συνεκτικότητα είναι κυρίαρχη έννοια στην μελέτη της δομής και λειτουργίας των ποταμών

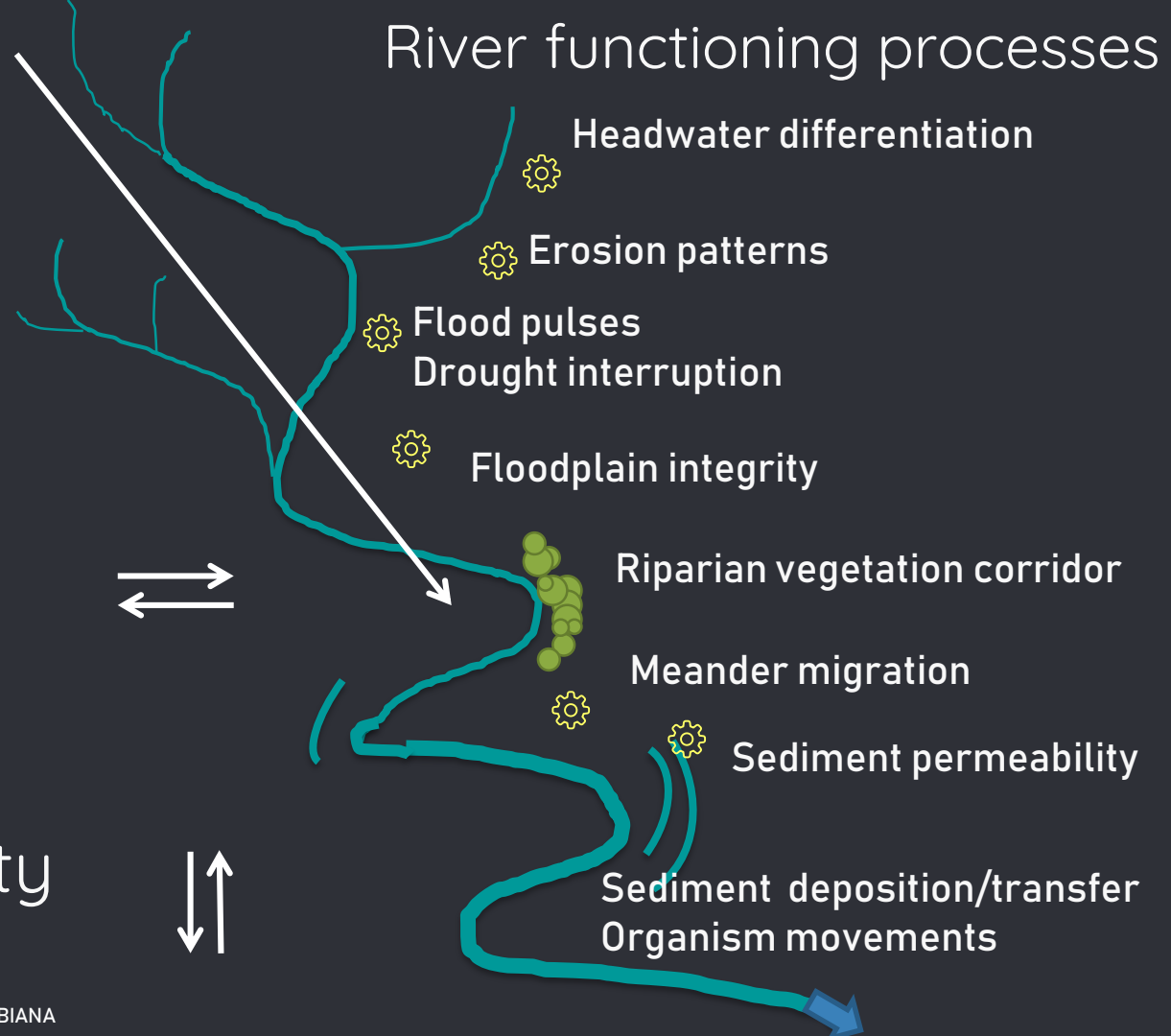


# River functioning processes

Longitudinal connectivity  
Διαμήκης συνεκτικότητα

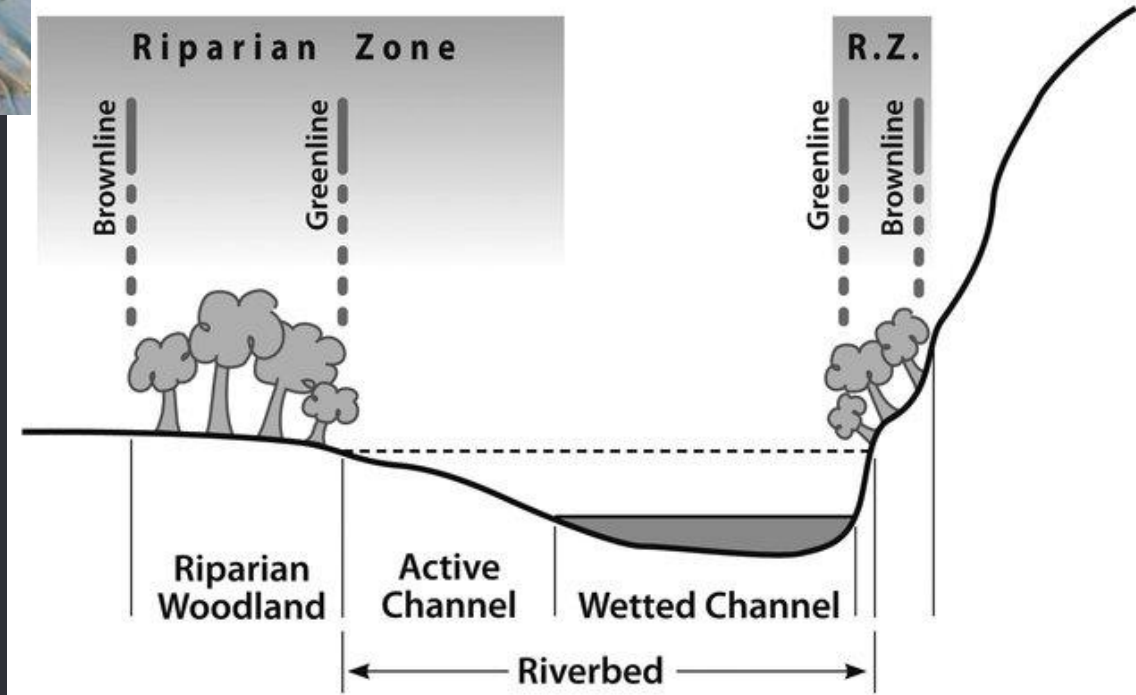
Lateral connectivity  
Οριζόντια συνεκτικότητα

Vertical connectivity  
Κάθετη συνεκτικότητα





Barriers  
have **multiple**  
**affects** on  
natural  
systems

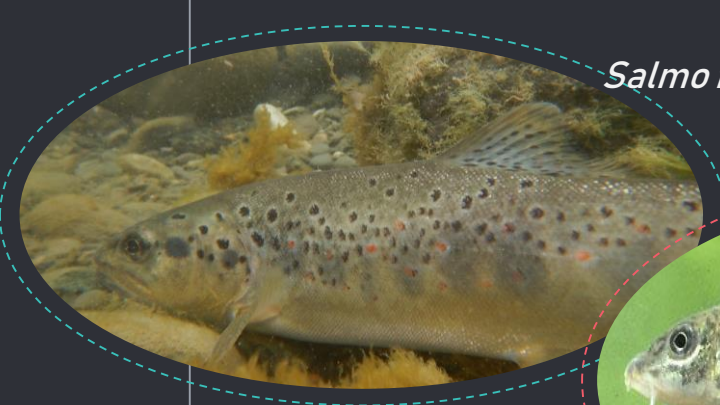


2

## Fish |

A WFD biological quality element (BQE) and living indicator of connectivity

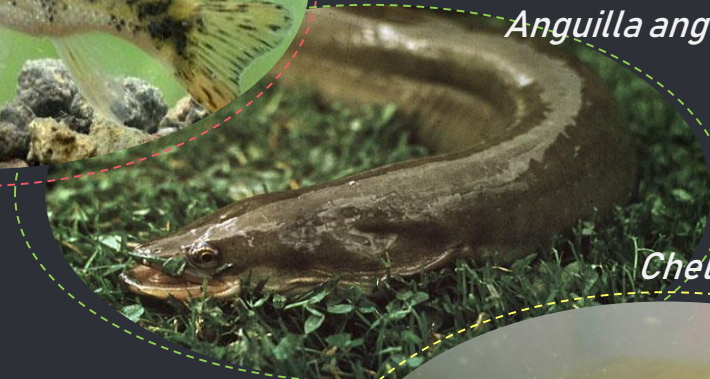
*Salmo fariodes*\*



*Barbus peloponnesius*\*



*Anguilla anguilla*\*\*



*Chelon labrosus*\*\*



## Species move through rivers in different ways

### \* Short distance movements

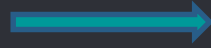
Ποταμόδρομα | τακτικές μετακινήσεις εντός ποταμού

### \*\* Long-distance and sea-river migrations

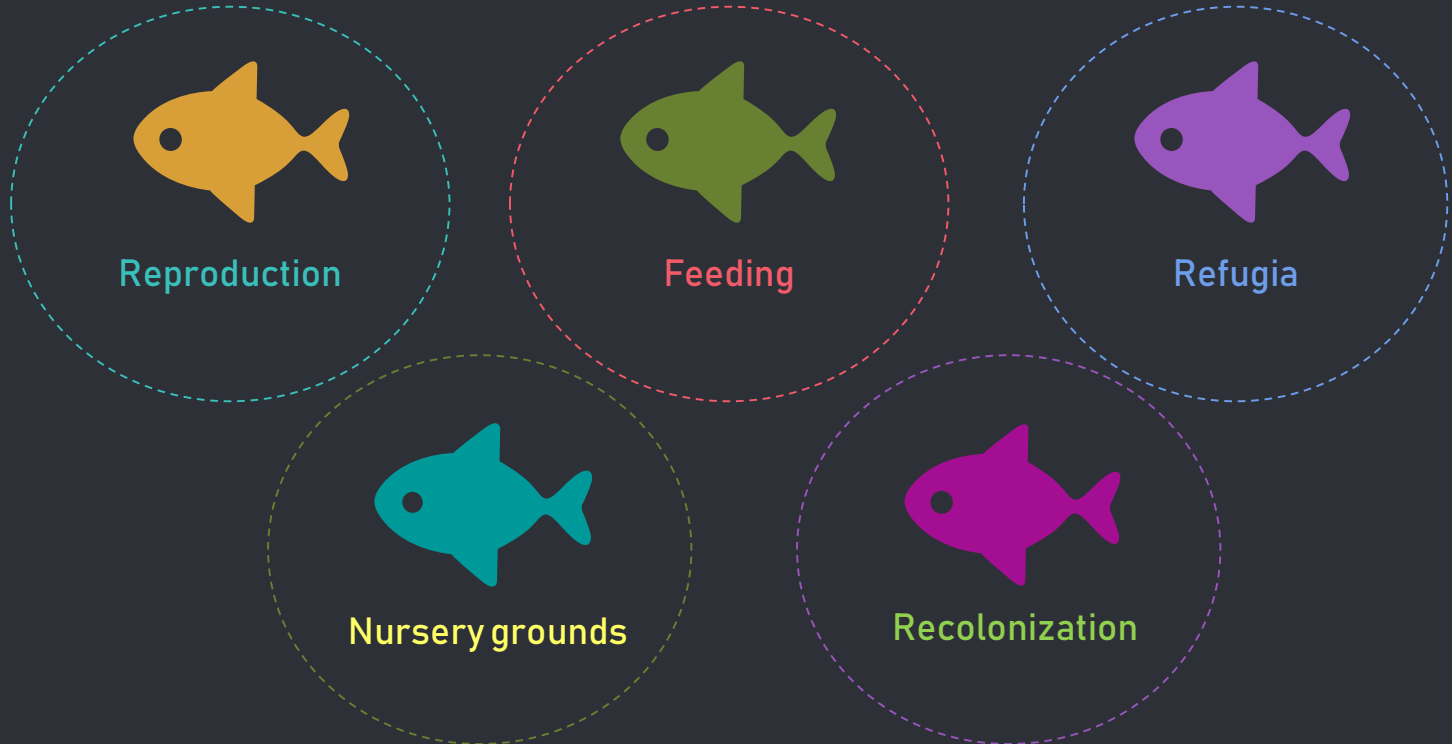
Διάδρομα: Μετακινήσεις μεγάλων αποστάσεων | μεταναστεύσεις (ανάδρομες, κατάδρομες, αμφίδρομες)



## Movements- Migrations



Fish assemblages influence and are influenced by important **ecological processes**



Achelooos Inter-basin river diversion – Mesochora Dam

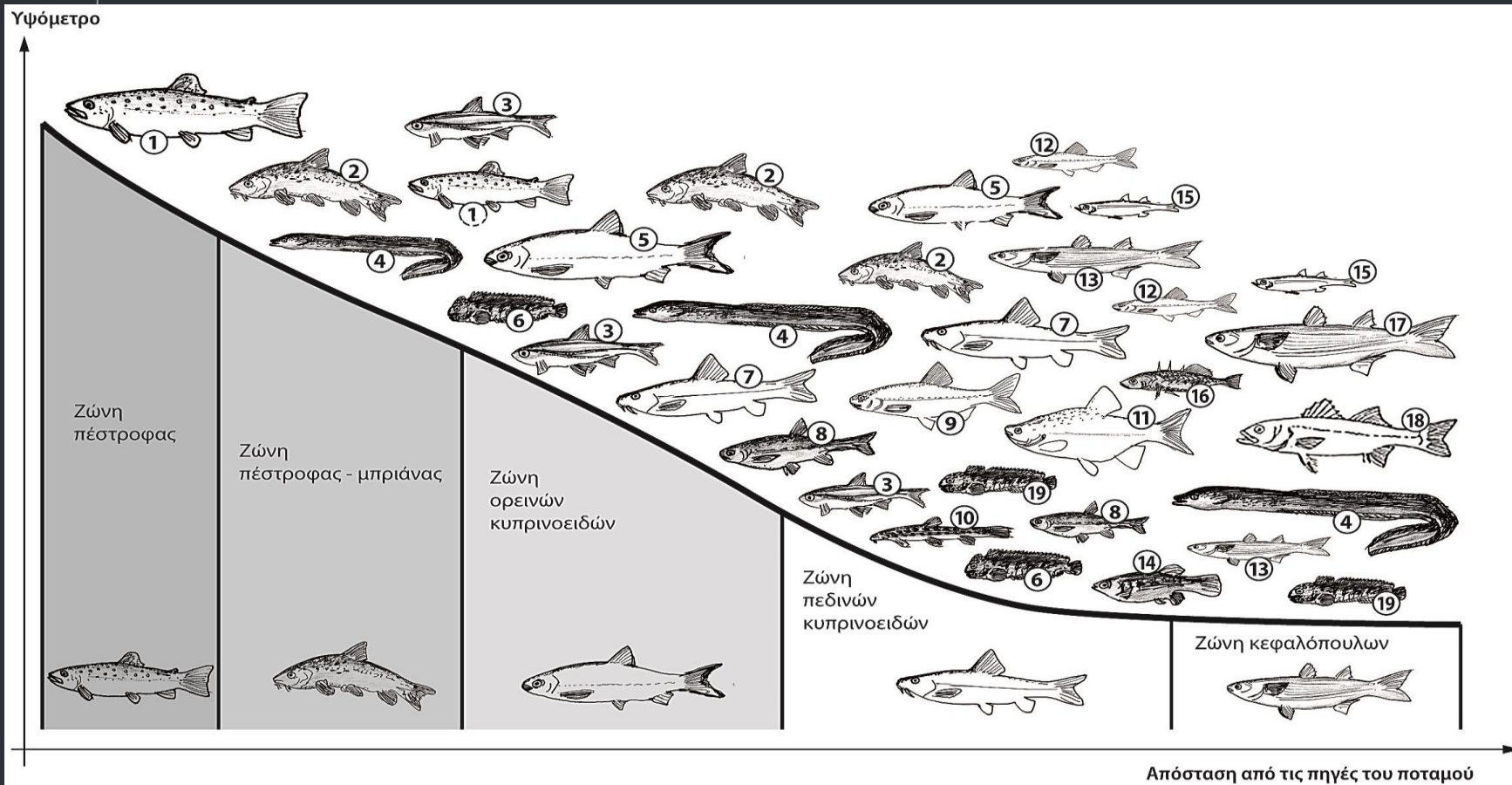


*Salaria fluviatilis*



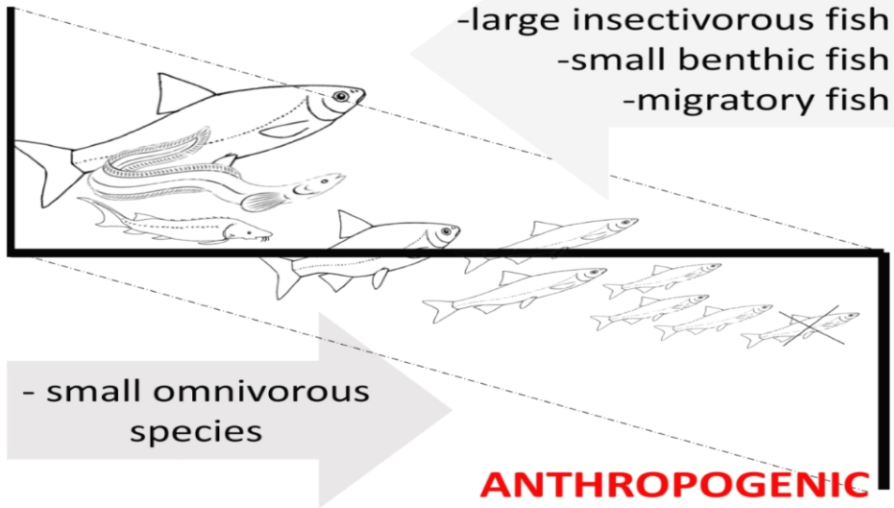
*Luciobarbus albanicus*



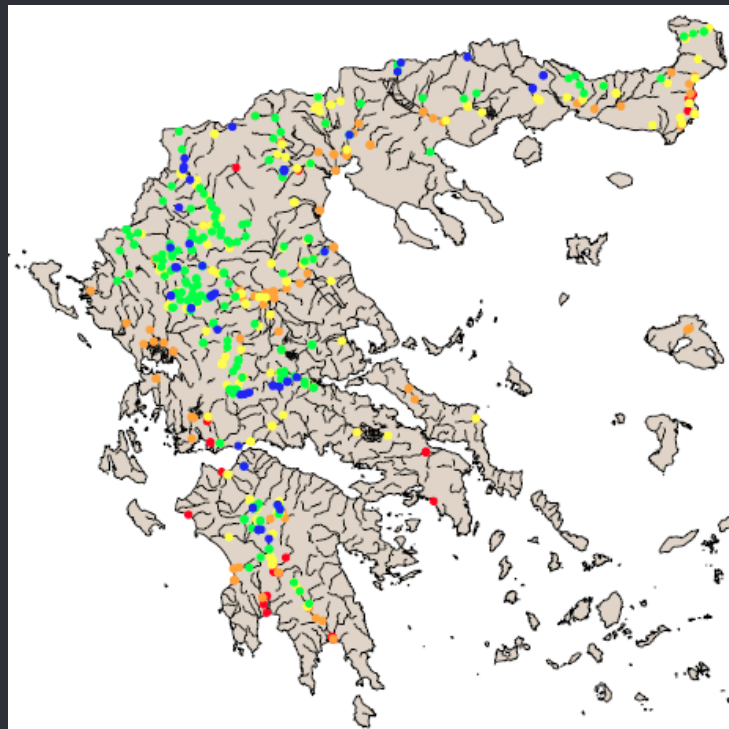


Longitudinal fish community patterns in Greece: fish can help define river typology (generalized bio-physical river zones and reference conditions in these zones)

## ECOLOGICAL INTEGRITY



**ANTHROPOGENIC  
DEGRADATION**



# Hellenic Fish Index | HeFI

3

Loss of connectivity

- Loss of connectivity\*

\*longitudinal

- Natural barriers



- Loss of connectivity

- Anthropogenic barriers



Από τα σοβαρότερα  
προβλήματα για τα  
ποτάμια και τη  
βιοποικιλότητά  
τους



# Τύποι φραγμών | Barriers

Φράγμα | Dam



Υδατοφράκτης | Weir



# Τύποι φραγμών | Barriers

Οχετός | Culvert

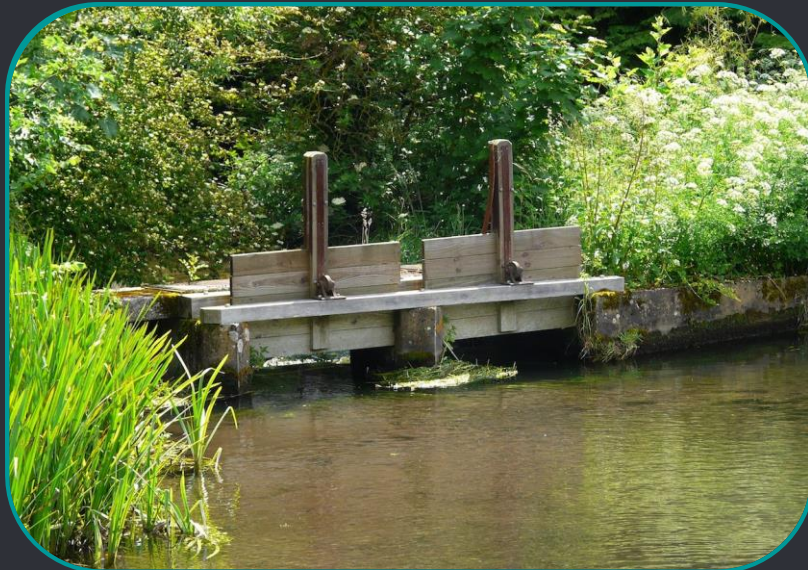
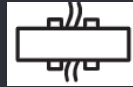


Ιρλανδική διάβαση | Ford



# Τύποι φραγμών | Barriers

Θυροφραγμός | Sluice



Αναβαθμίδα | Ramp



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The dam and barrier situation in Greece

## What about dams and other barriers in Greece?

For the present survey the registry of **Greek Large Dams** in operation conducted by Greek Committee on Large Dams (2013) was used, after validation and update, while also the large dams under construction were included. Additionally, the registry of small dams and artificial reservoirs (Ministry of Rural Development and Food of Greece, 2006) and the on-line registry of Land Reclamation Projects of Ministry of Rural Development and Food of Greece (2018; <http://www.minagric.gr/index.php/el/for-farmer-2/eggeiesbeltioseis/sxedismowee/963-sxediasmoskaiparakeggeron>) were used.

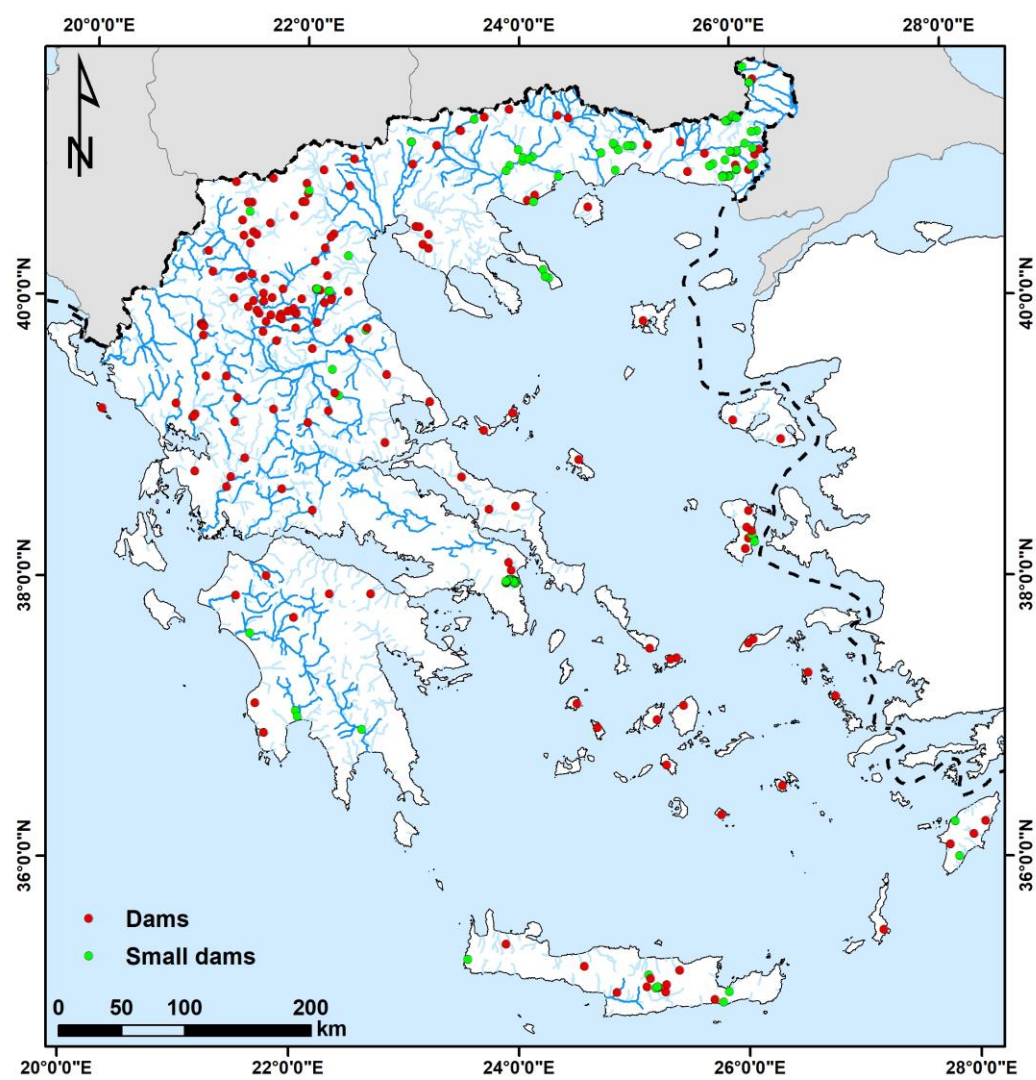
### Small hydropower plants (SHPs)

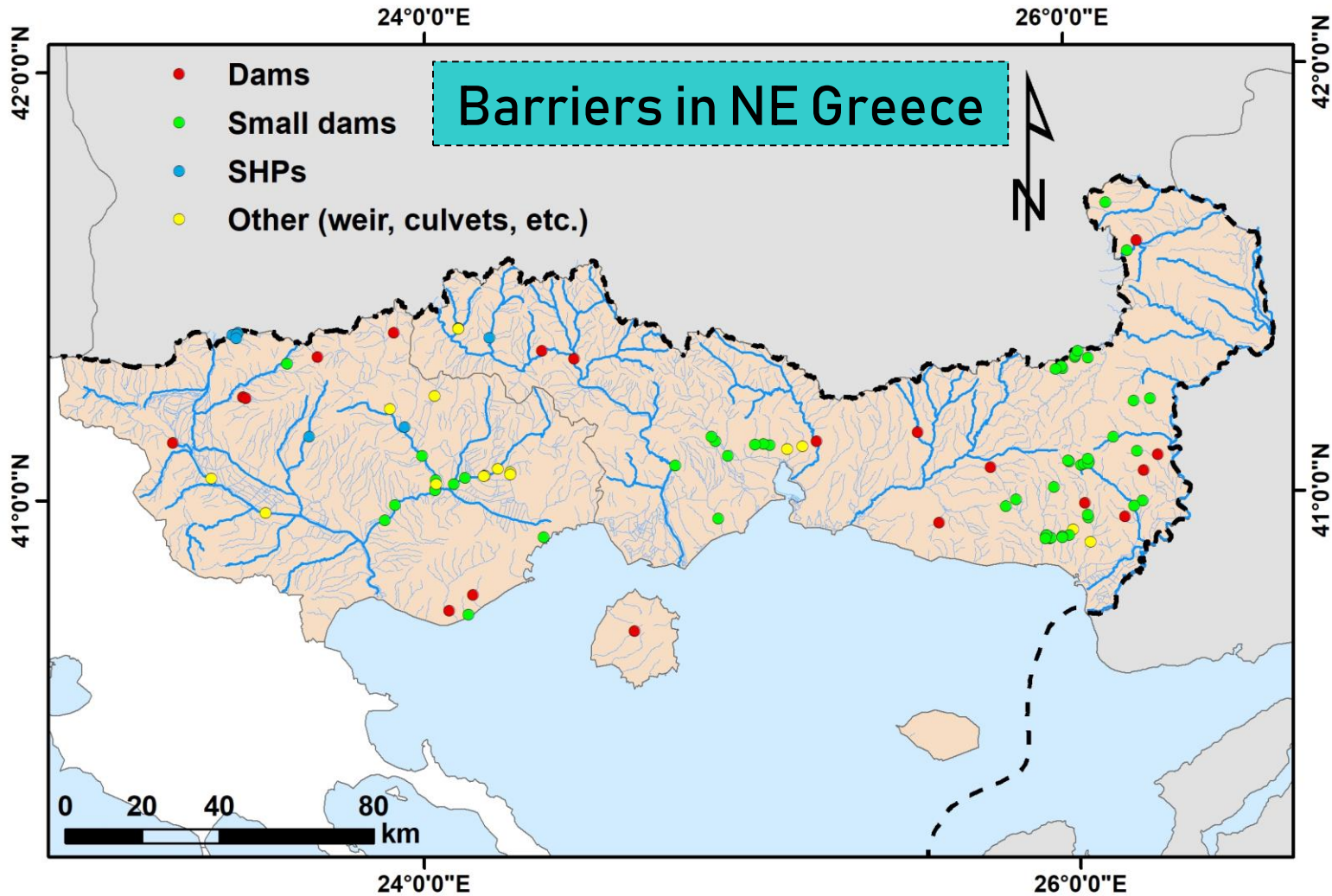
SHPs are defined as the hydropower plants with maximum install capacity 15 MWp (Law 3468/2006; Official Journal of the Hellenic Republic 129A/2006).

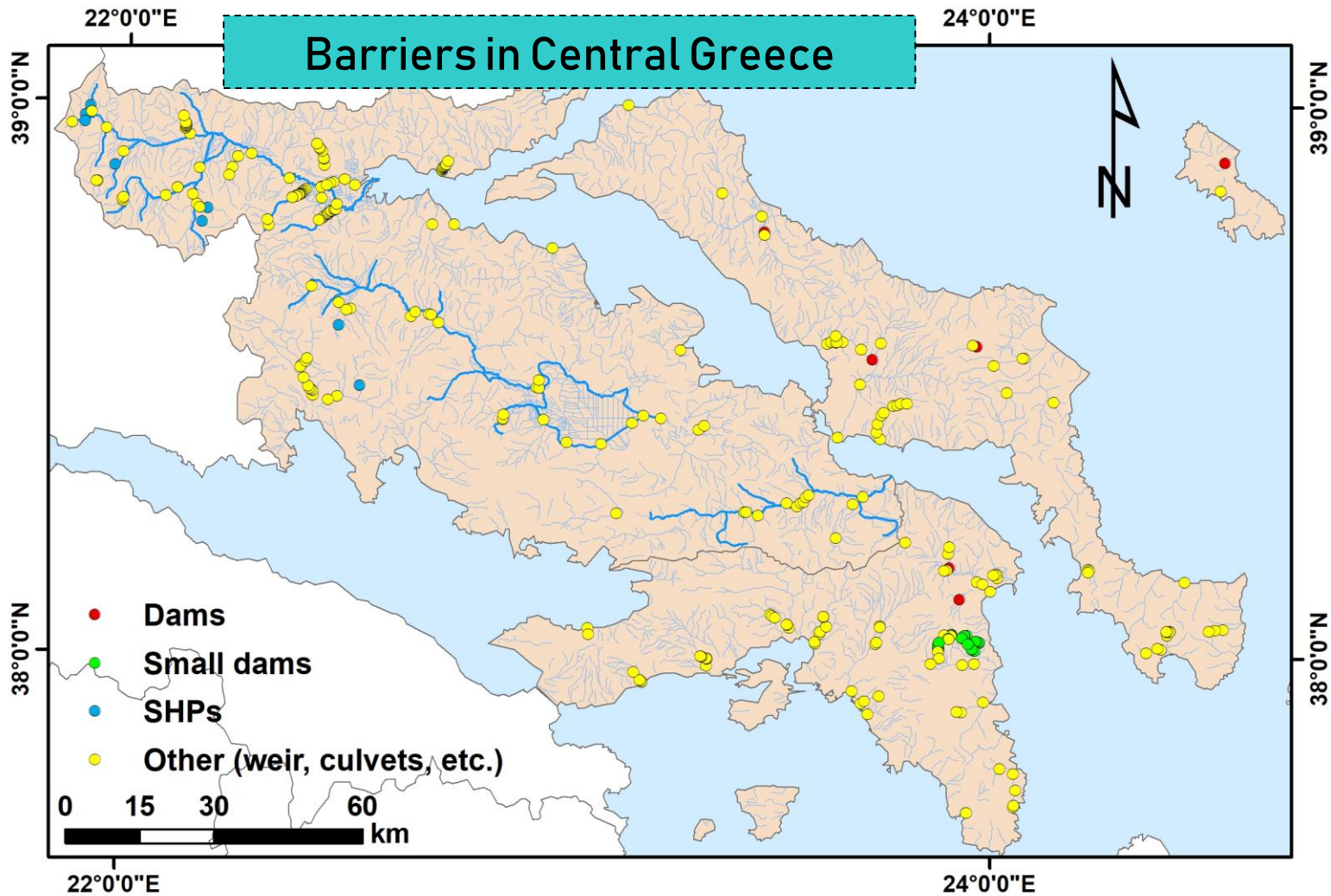
The data concerning the SHPs with operational license were retrieved from Regulatory Authority for Energy of Greece (RAE, 2018; <http://www.rae.gr/geo/>).

Initial surveys: work in progress

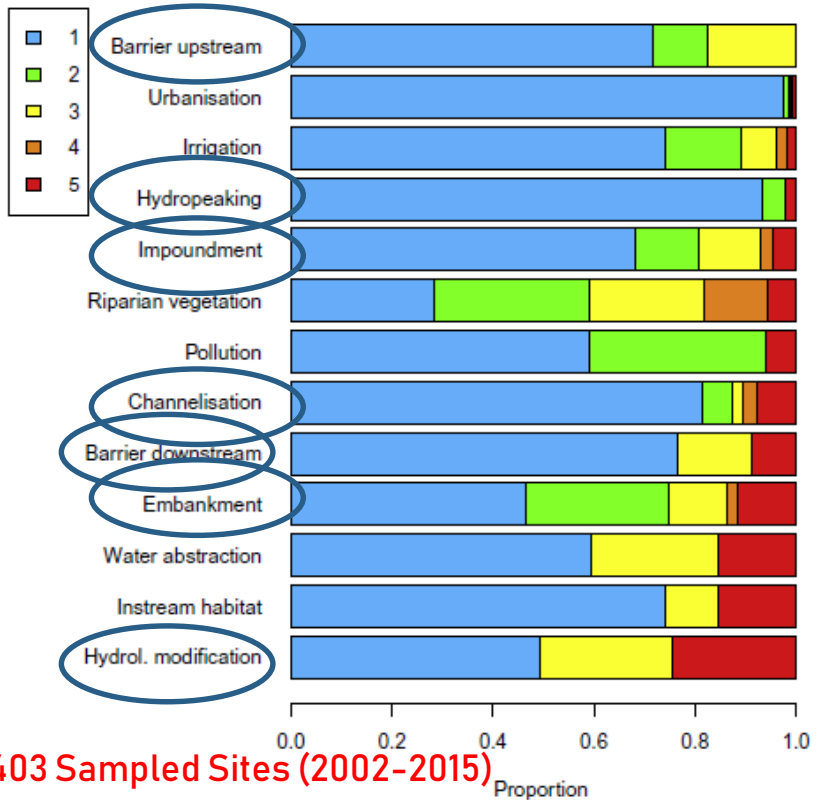
- Dams: 168
- Small dams: 115





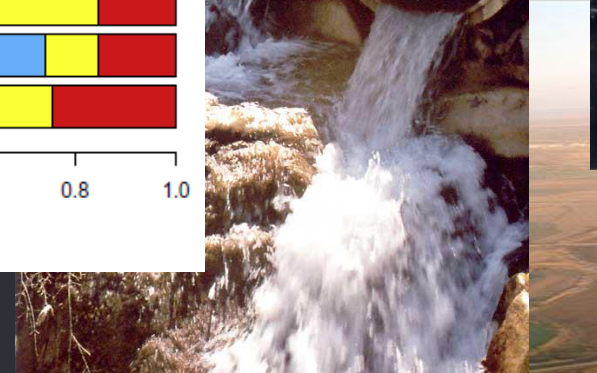
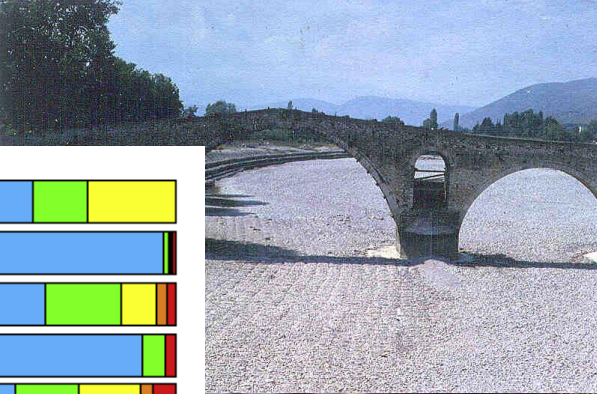




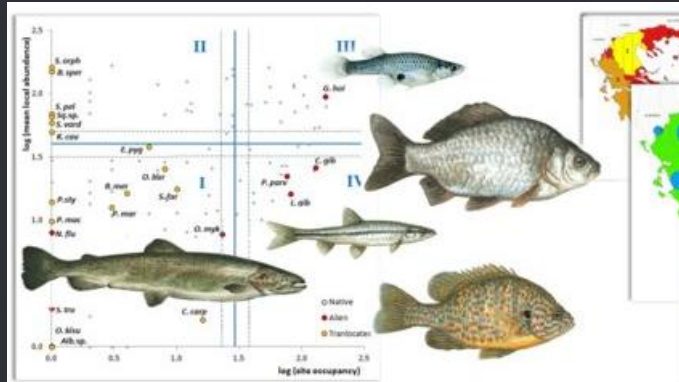


403 Sampled Sites (2002-2015)

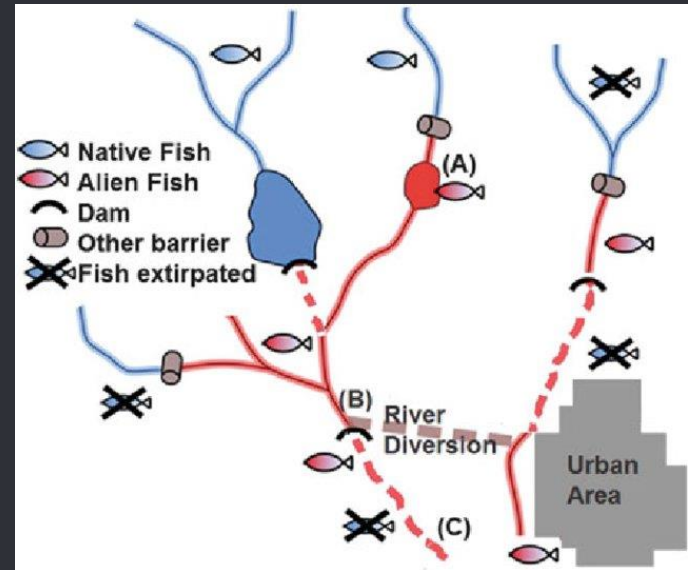
Proportion



# Dams effect natural ecosystems in multiple & synergistic ways: they help the spread of **alien species**



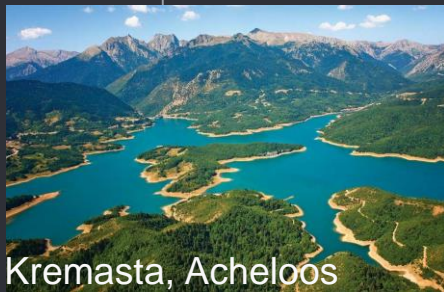
Koutsikos, Zogaris et al. 2019. Science of The Total Environment,



Zogaris et al. in Skoulikidis et al. (eds.), Hdb Env Chem

# Dam reservoirs: “good, bad and ugly”

Pournari, Arachthos



Kremasta, Acheloos

Kerkini (Semi-natural)  
Strymon



Sykia, Acheloos

Not so simple... but  
they change whole  
landscapes...



Ilarion, Aliakmon

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## Restoration

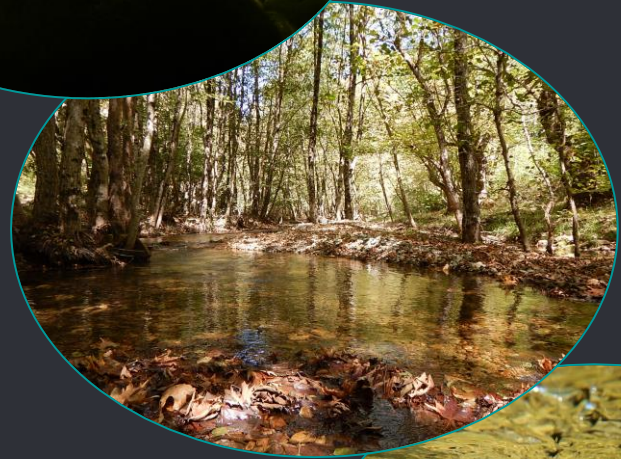
## Why?

### EU Directives

WFD, Nature Directives  
(Water Management &  
Biodiversity)

**Ecosystem services**  
(especially benefits to  
human well-being)

Management of “vulnerable waters”  
in the face of Mediterranean  
**climate variability** and adaptation to  
**climate change**



# Ecological restoration: largely missing in GREECE!!!

## Ecological flows

- Few recent studies
- Scarce/rare applications
- Poor monitoring

## Fish passes

- Several studies
- Few applications
- Many probably do not work
- No inventory or monitoring

## Barrier Removal

- No experience at all

## Urban river re-wilding/ NBS ('daylighting')

- Some planning
- Some studies
- Several poorly applied attempts (greenwashing really)
- Nearly no experience at all

Measures largely focus on monitoring not building a fully developed and adaptive program of measures for rivers

Restoration actions in rivers are localized even in terms of biodiversity conservation (Life Nature projects)



**Adaptive management approaches urgently required!**



# Thank you for your attention

## Please keep in touch with HCMR



## References

<https://portal.amber.international/barriers/>

2018; <http://www.minagric.gr/index.php/el/for-farmer-2/eggeiesbeltioseis/sxedismowee/963-sxediasmoskaiparakeggeron>  
RAE, 2018; <http://www.rae.gr/geo/>

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