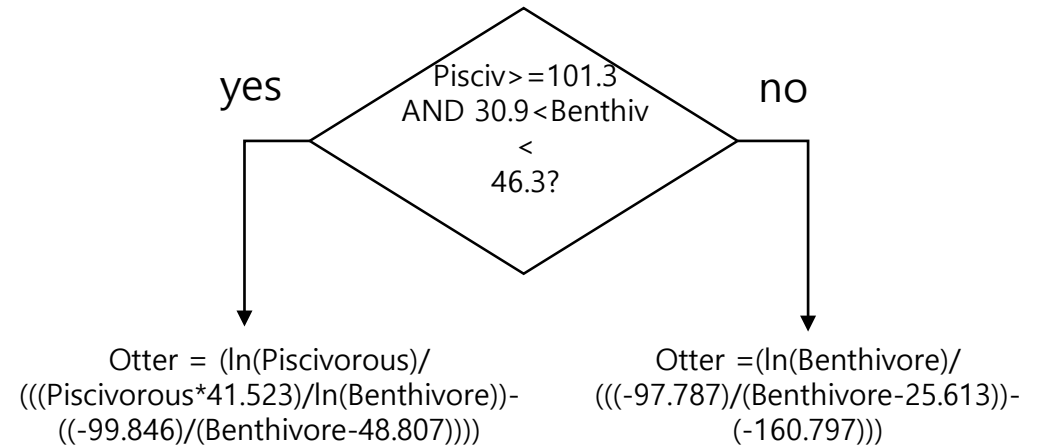


Testing the strengths of relationships between otter populations, fish and macroinvertebrate communities as well as habitat conditions across three Korean rivers by inferential modelling based on the hybrid evolutionary algorithm HEA



Sungwon Hong^{1*}, Friedrich Recknagel², Tae-Soo Chon^{1,3}, Gea-Jae Joo¹

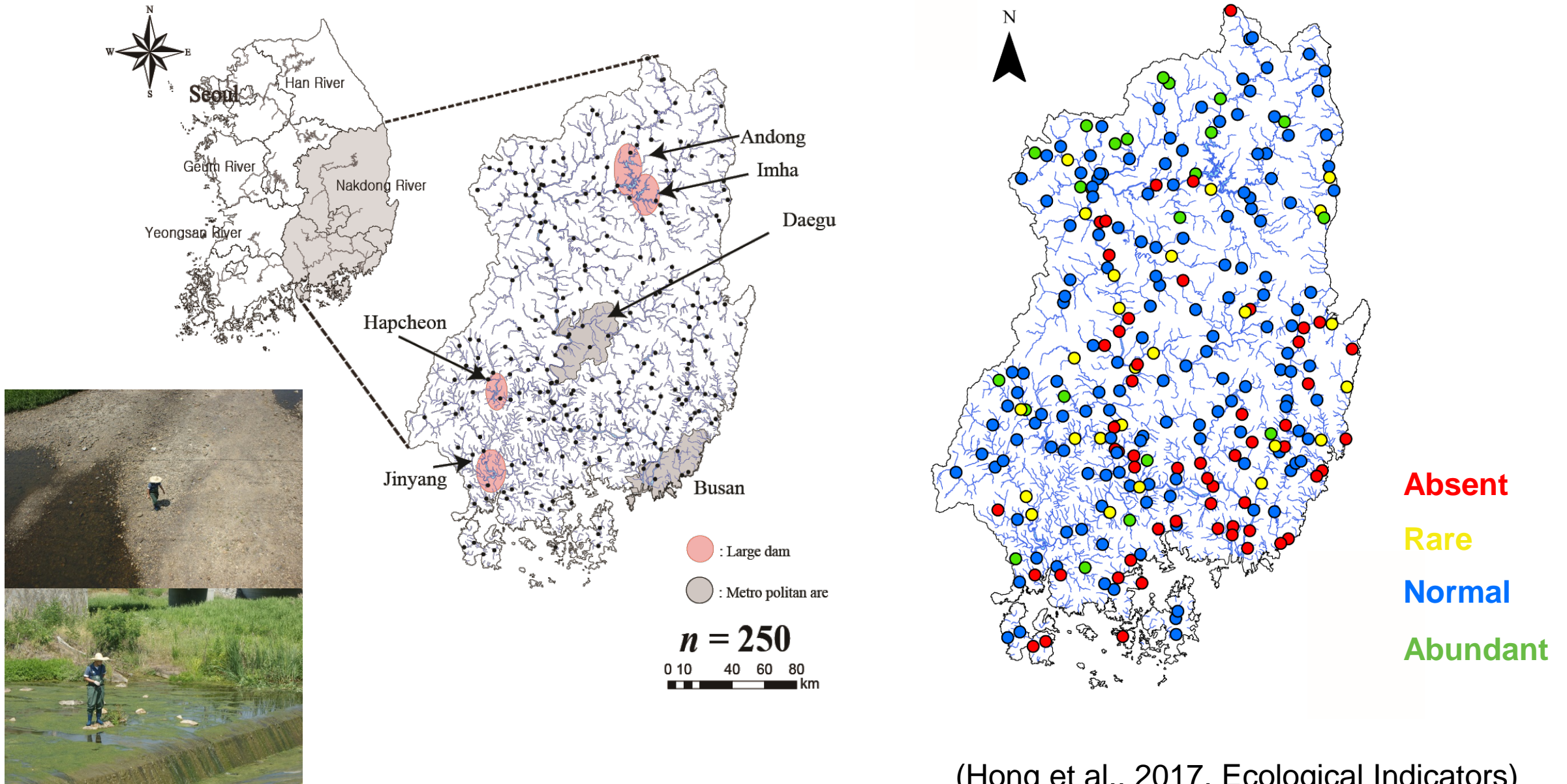
¹ Pusan National University, Busan, Republic of Korea

² University of Adelaide, Adelaide, Australia

³ Ecology and Future Research Association, Busan, Republic of Korea

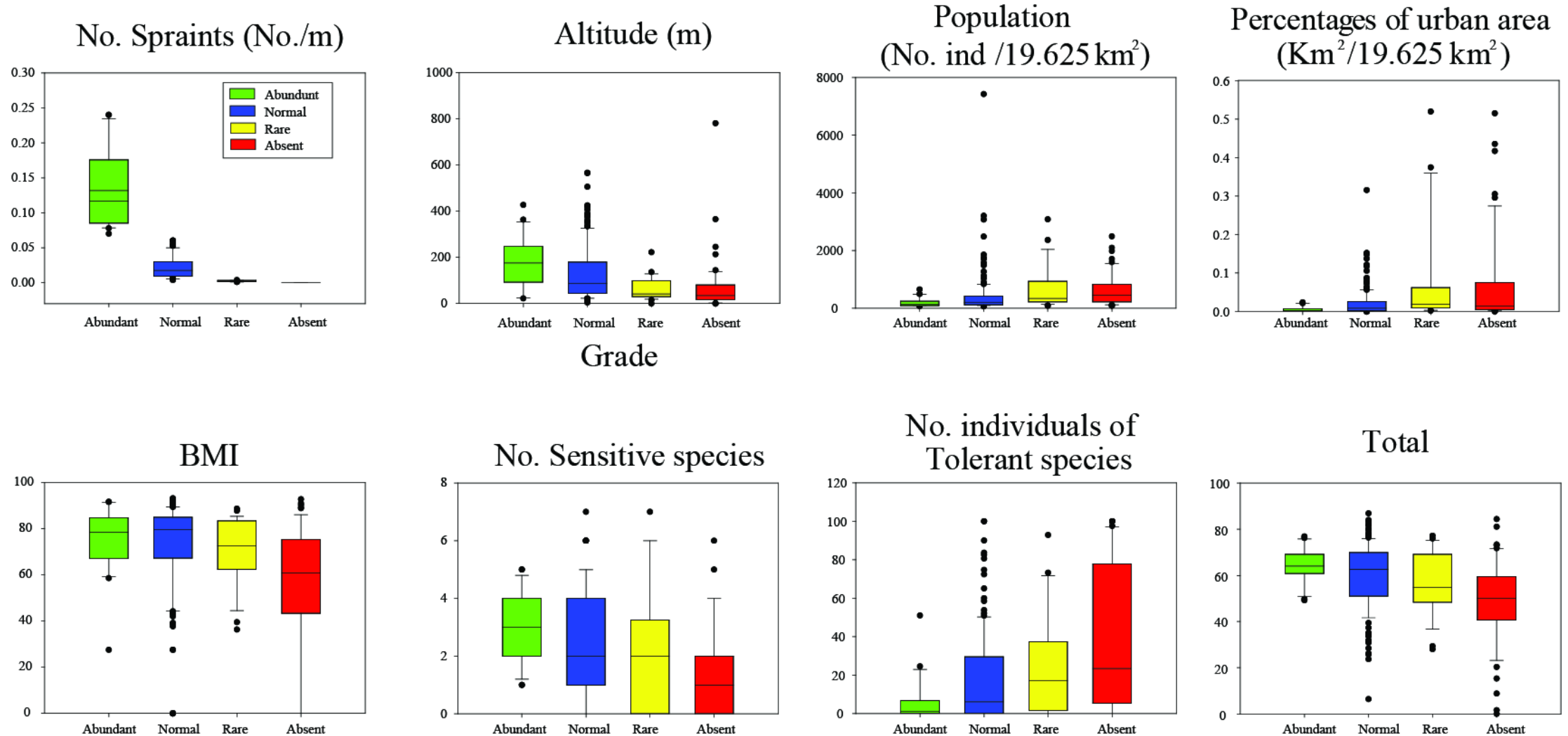


⋮ Otter population related with health of aquatic system



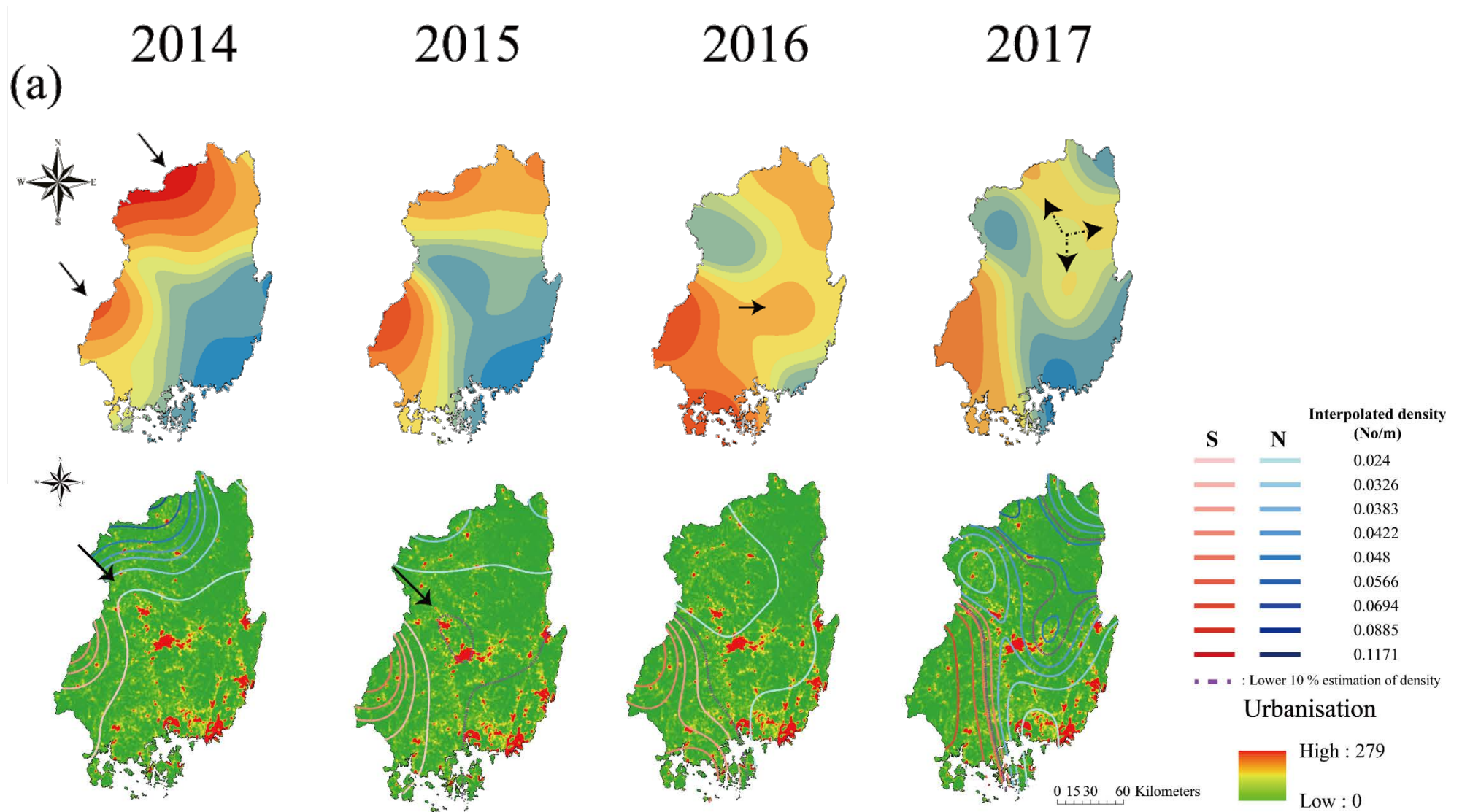
(Hong et al., 2017, Ecological Indicators)

⌘ Otter population highly related with health of aquatic system



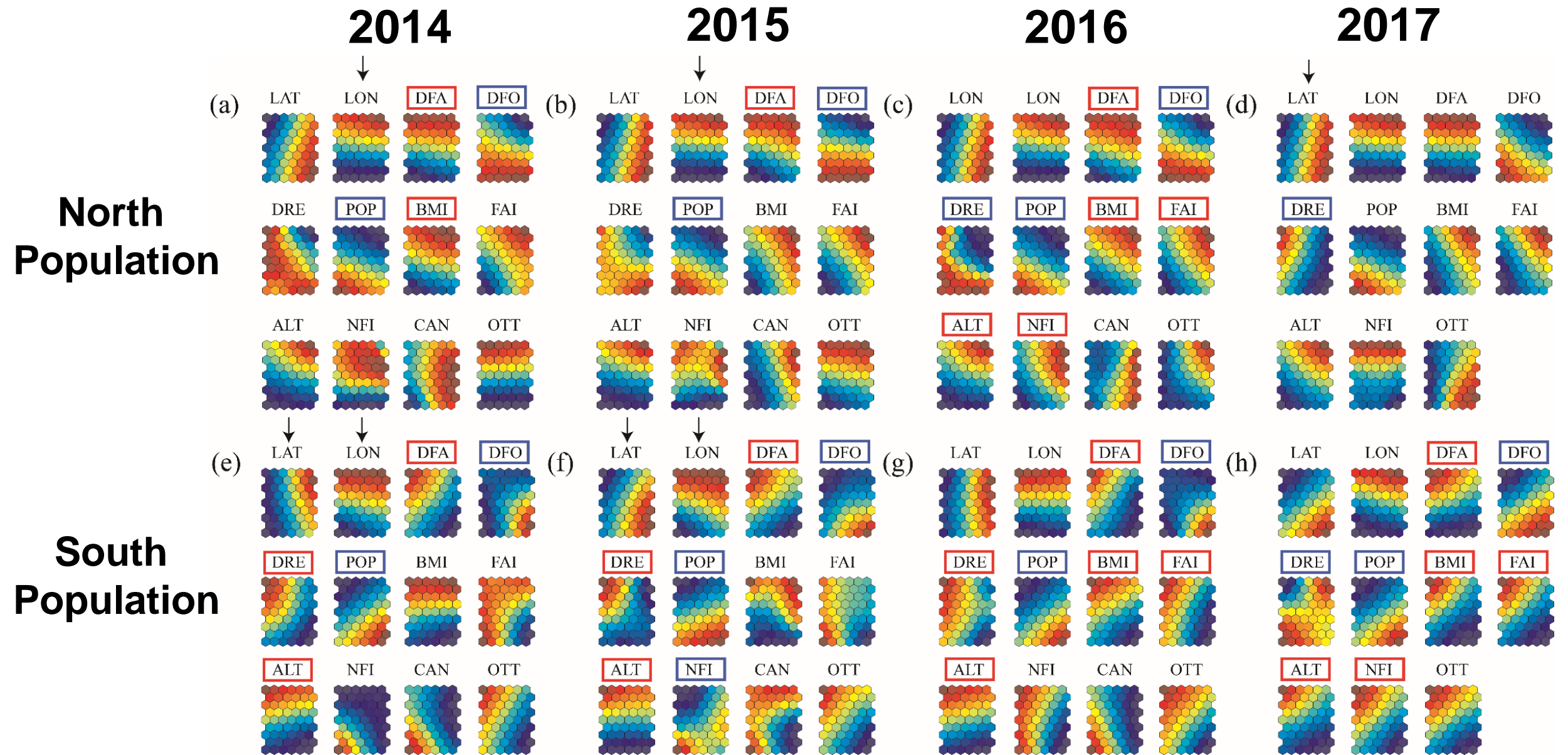
(Hong et al., 2017, Ecological Indicators)

Four yearly data showed fine scale of otter dispersal patterns



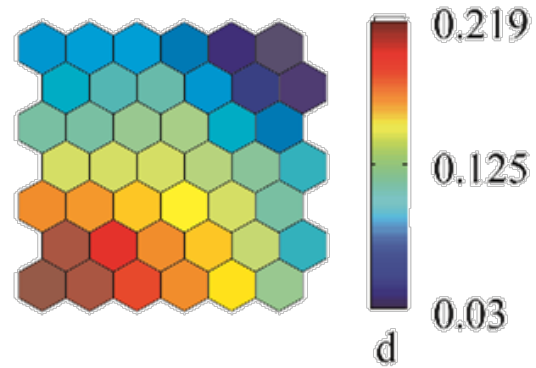
(Hong et al., unpublished)

⌘ Different patterns between two populations

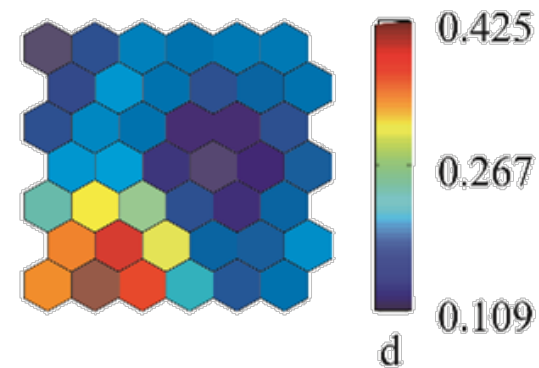


⌘ Otter dispersal patterns = food abundance

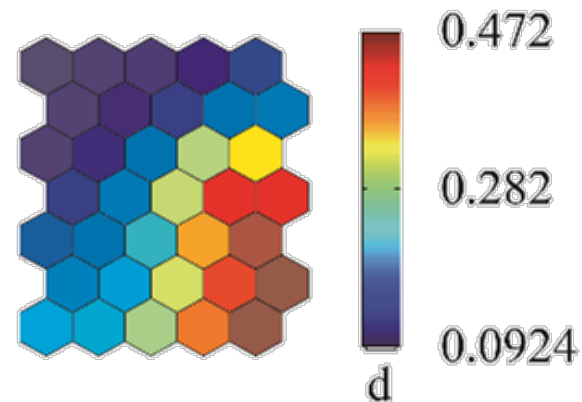
No. fish ind.



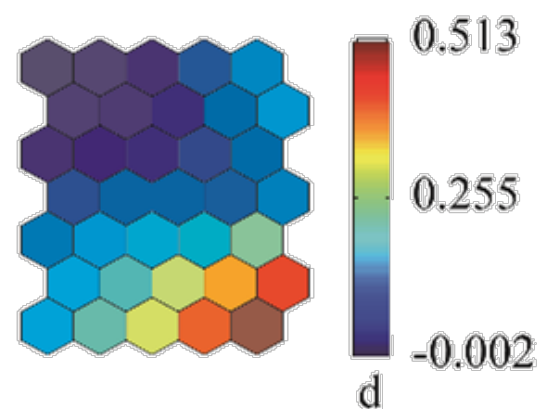
Otter



No. fish ind.



Otter



Objectives

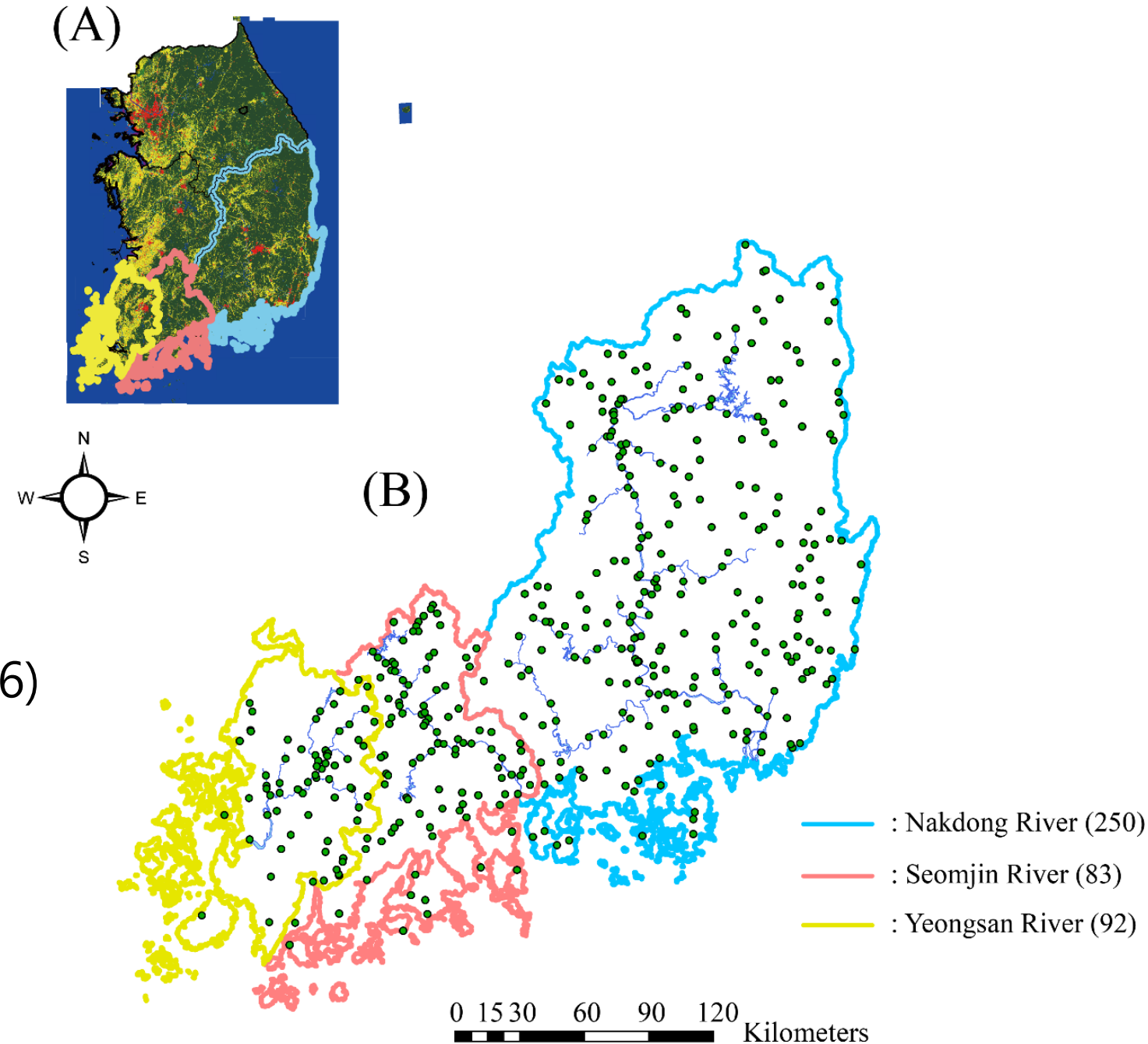
1. Are otter densities positively related with densities of four fish categories (piscivore, herbivore, plankivore, and benthivore) across three rivers?
2. How strong otter densities are related with food web cascade (benthos, and water qualities) across three rivers?

Study sites

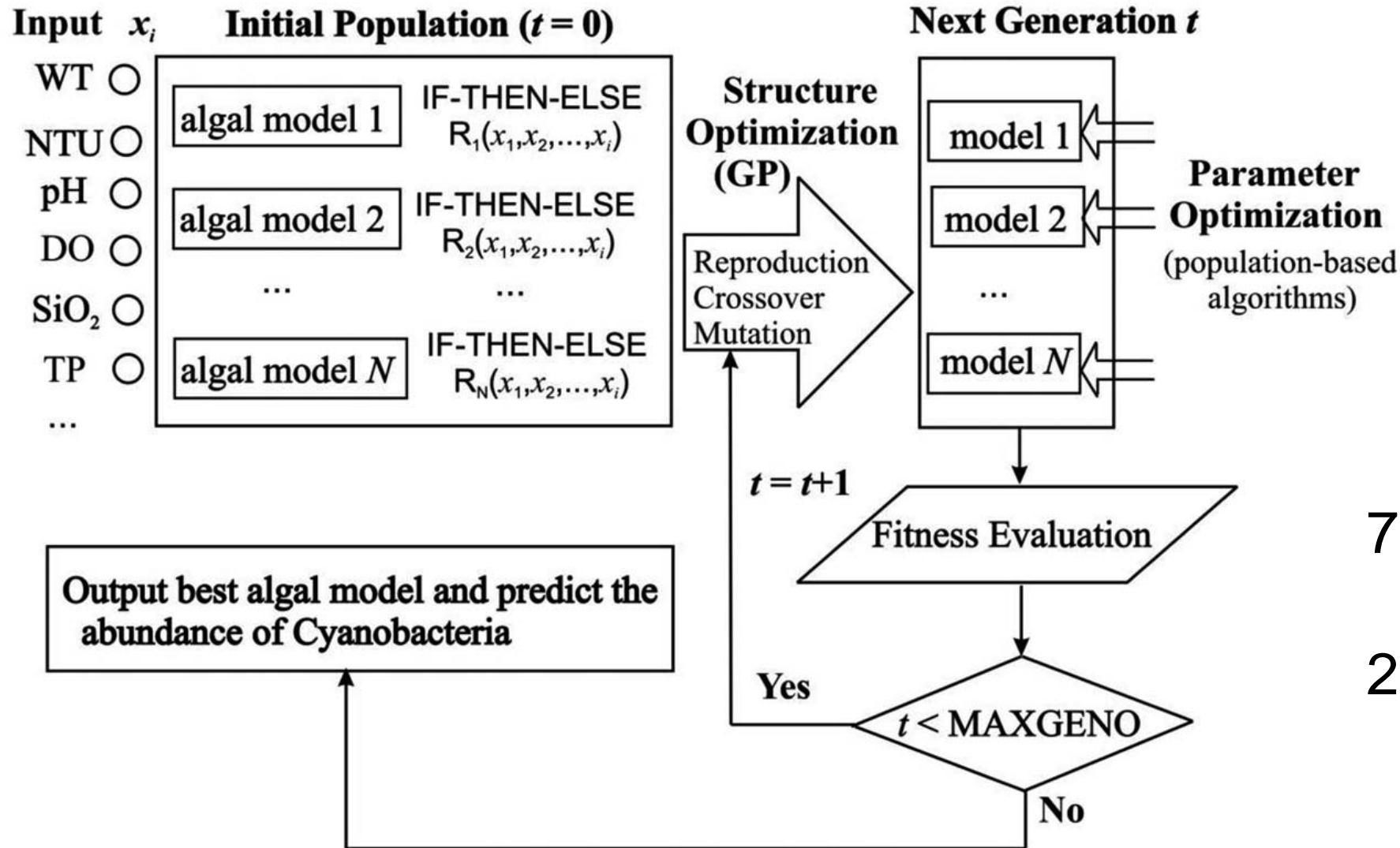
- **Period**

: March - June,
(2014 - 2016)

- Nakdong R. 250 sites (2014-2016)
- Seomjin R. 83 sites (2016)
- Yeongsan R. 92 sites (2016)



Hybrid Evolutionary Algorithm, HEA

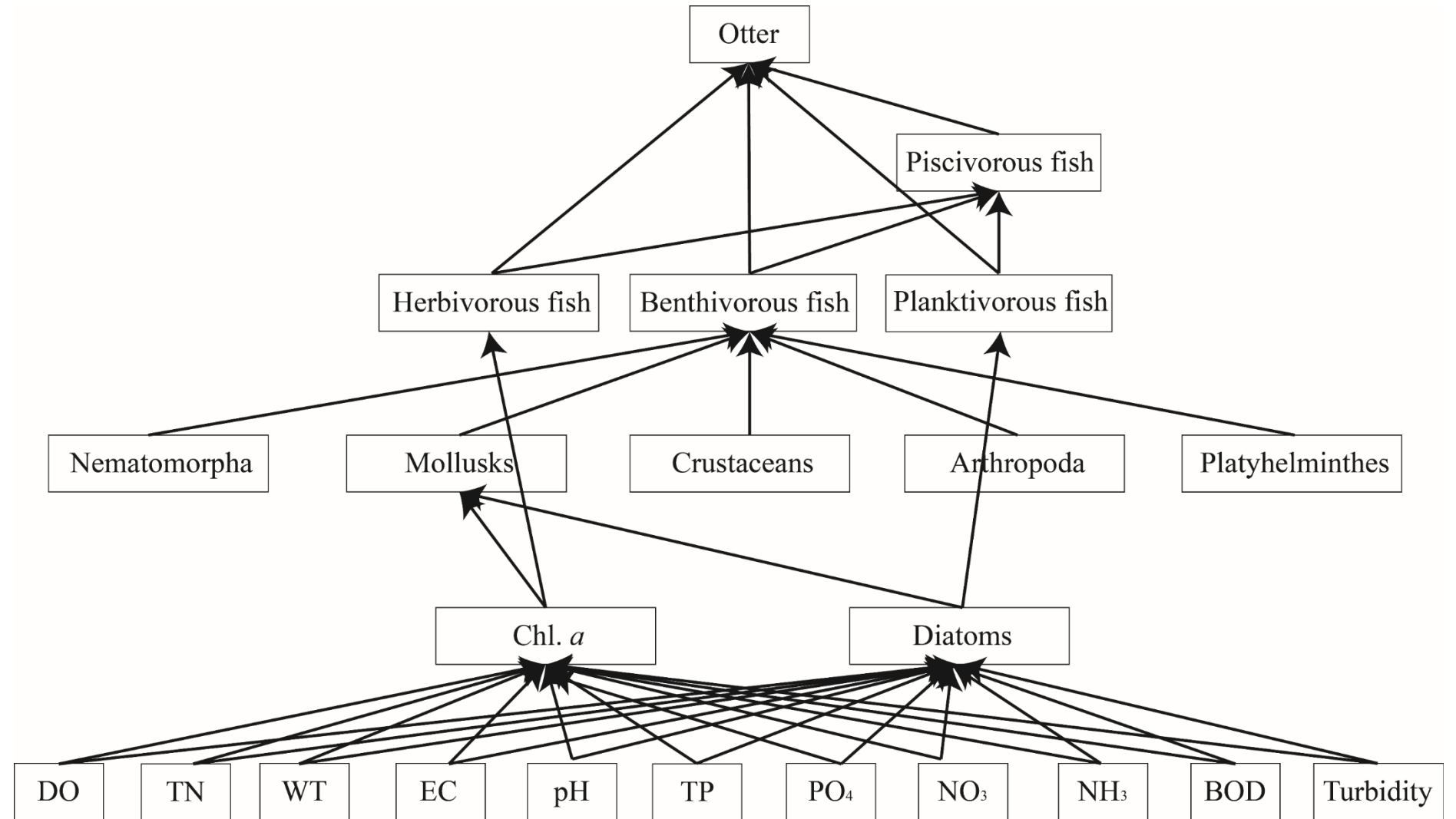
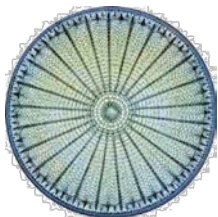


75 % validation data

25 % test data

Food web cascades

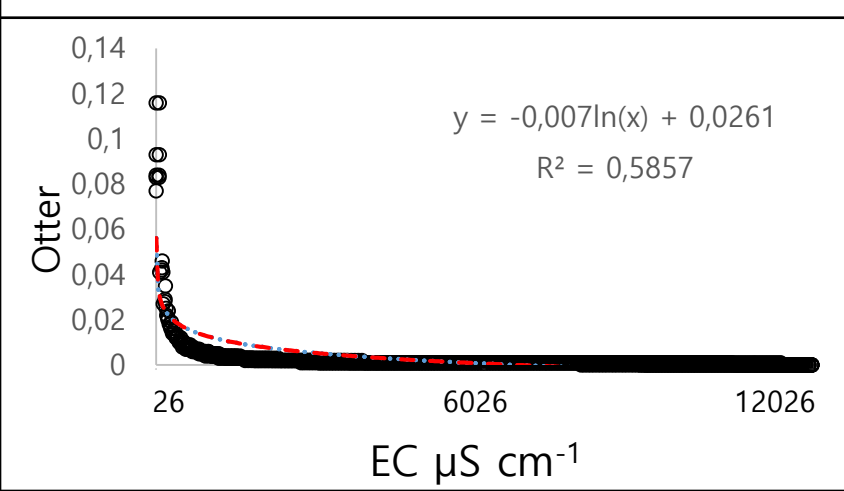
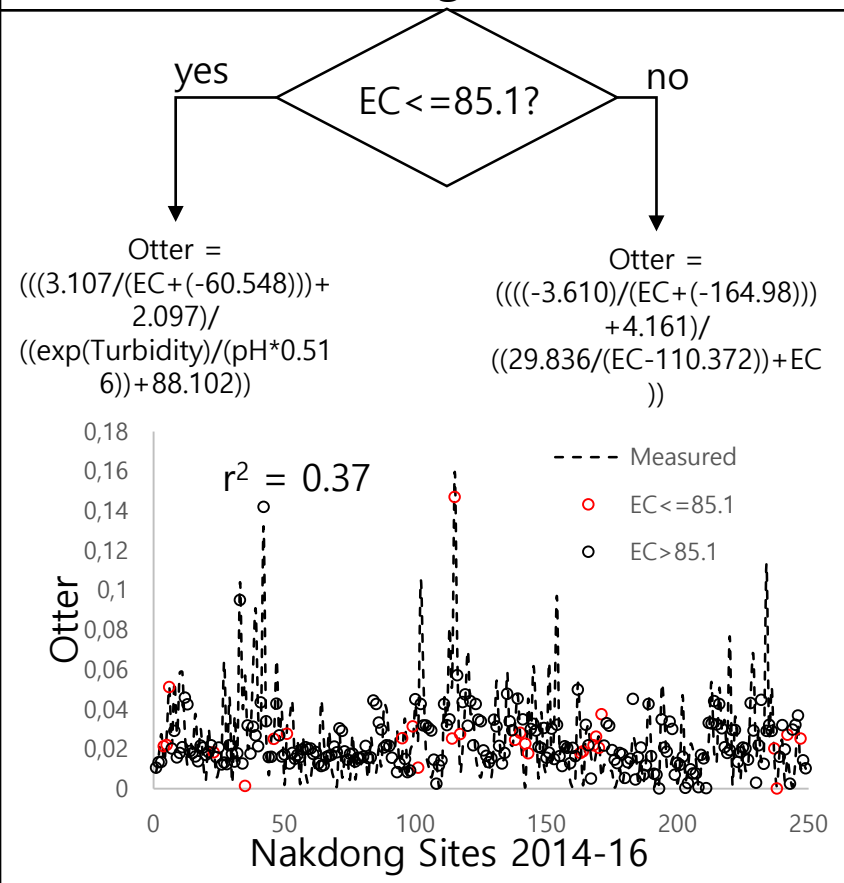
provided by the Ecological Stream Health Assessment (MOE/NIER)



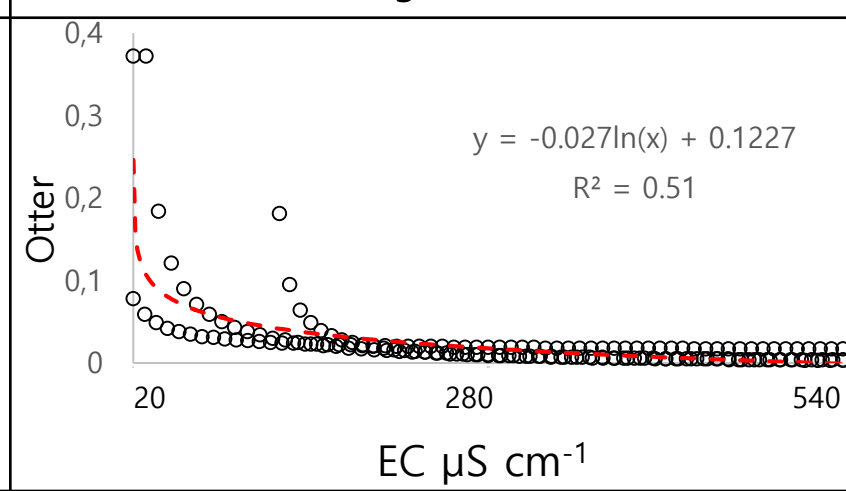
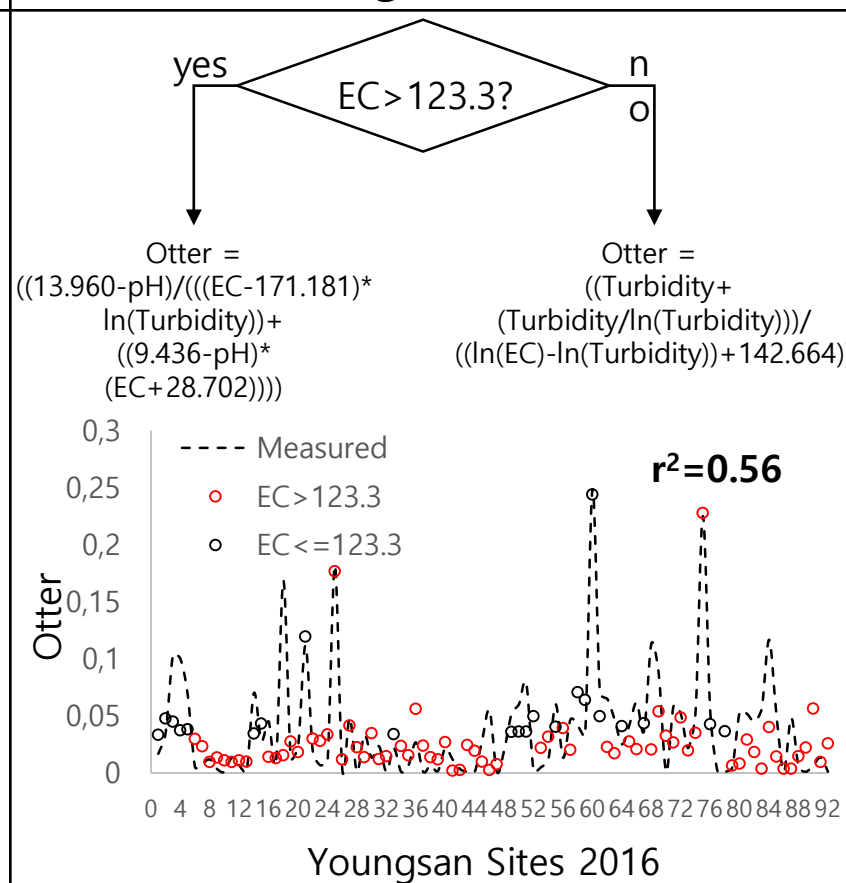
⌘ Data description

- Otter: Spraint densities (no. spraints per 600 m)
- Fish: Herbivore (3 species), Benthivore (134), Planktivore (63), Piscivore (40)
- Benthos: Nematomorpha (5), Mollusks (78), Crustaceans (29),
Anthropoda (726), Platyhelminthes (5)
- Diatom: Cell density of total 728 species
- Water qualities: 11 parameters

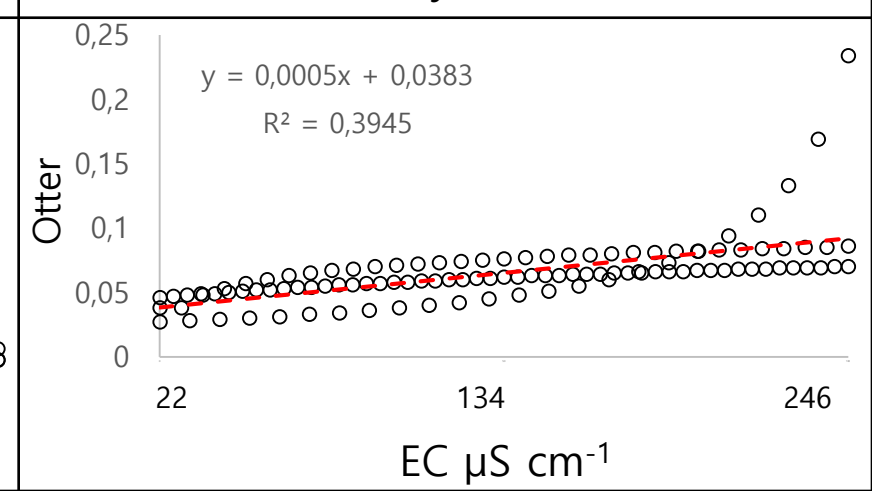
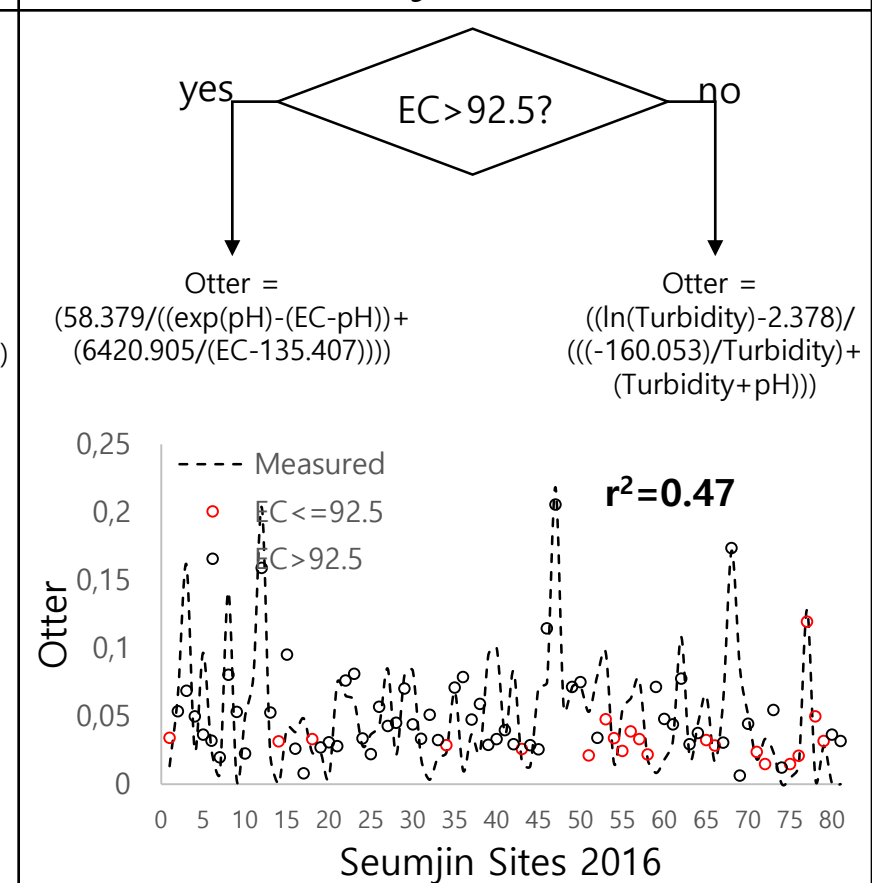
Nakdong River



Youngsan River



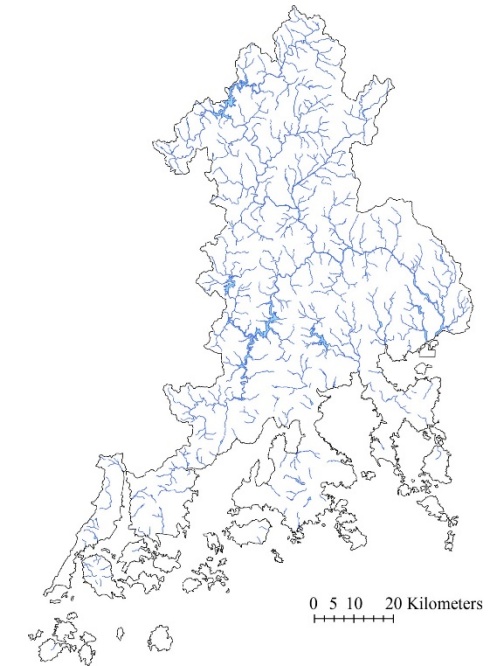
Seumjin River



Why Seumjin River is different?



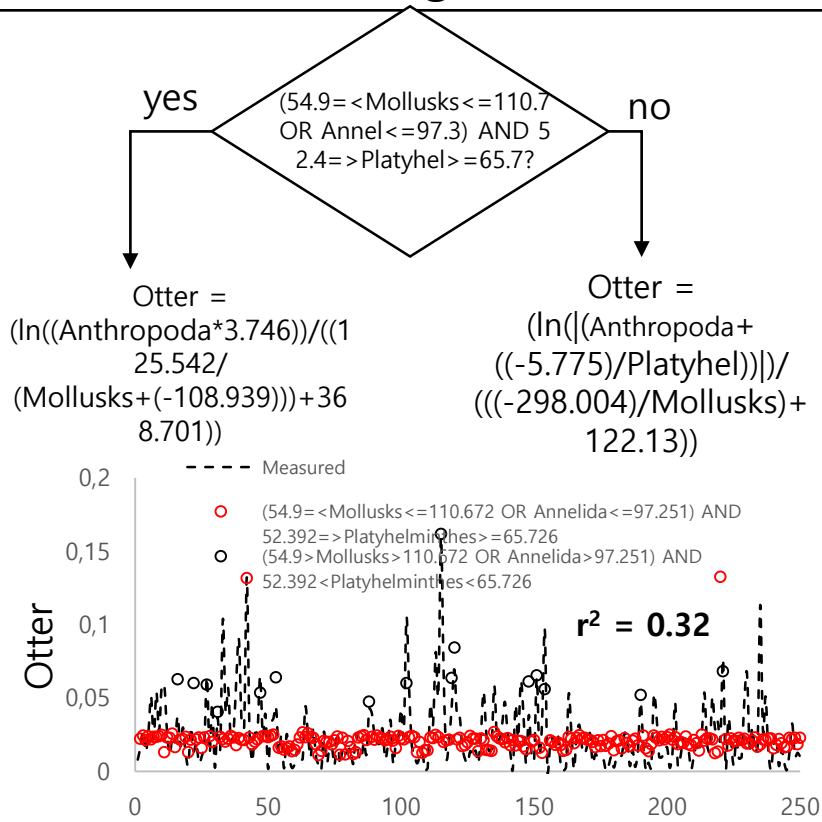
Seumjin R. basin



No large weir!!

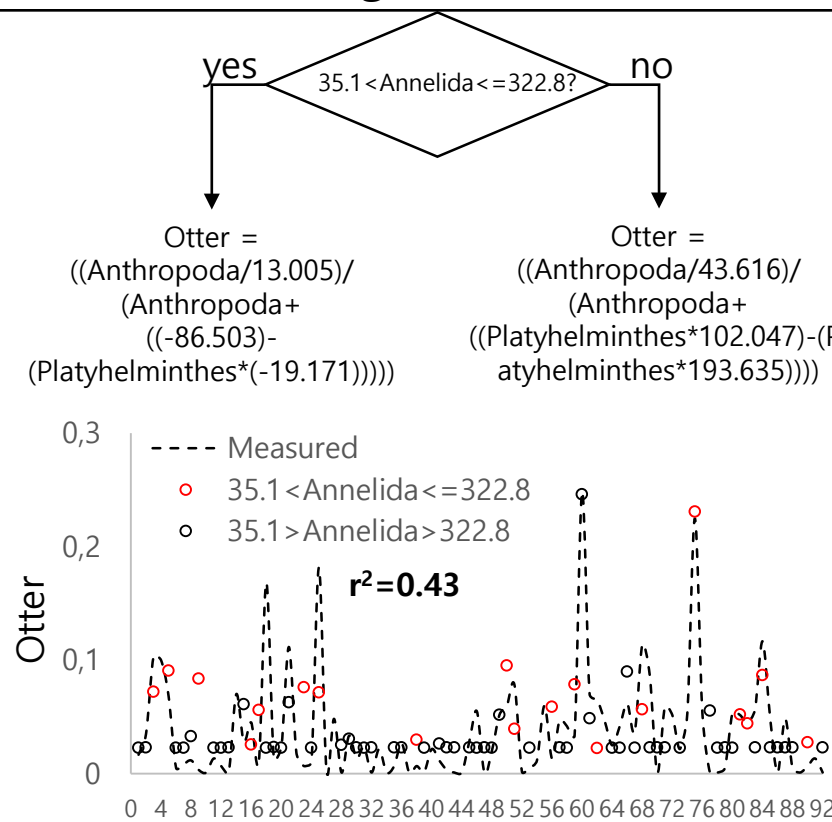
No Estuary barrage!!

Nakdong River



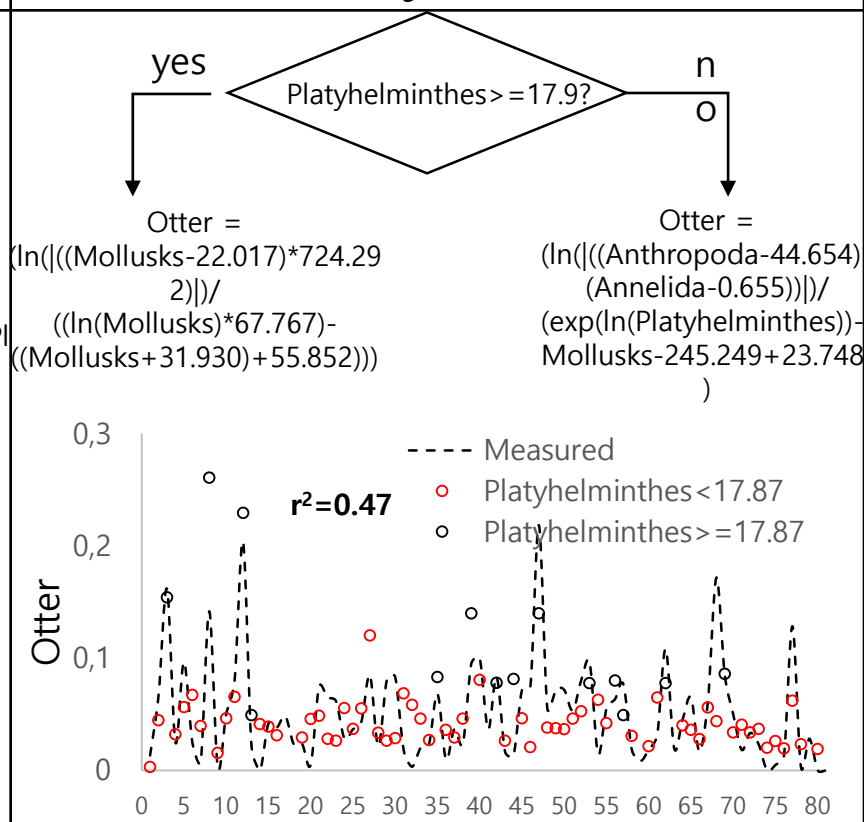
Nakdong Sites 2014-16

Youngsan River

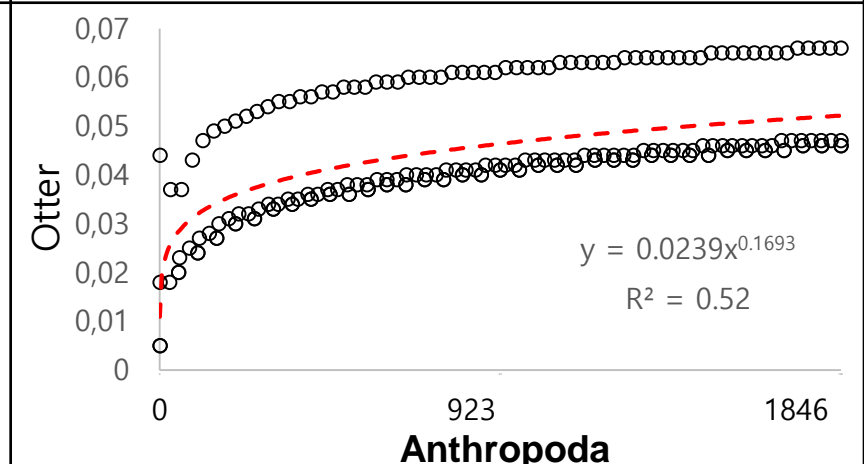
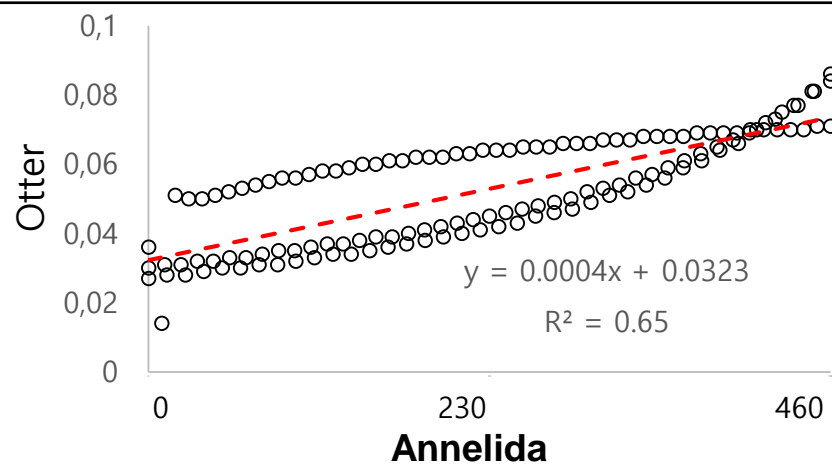
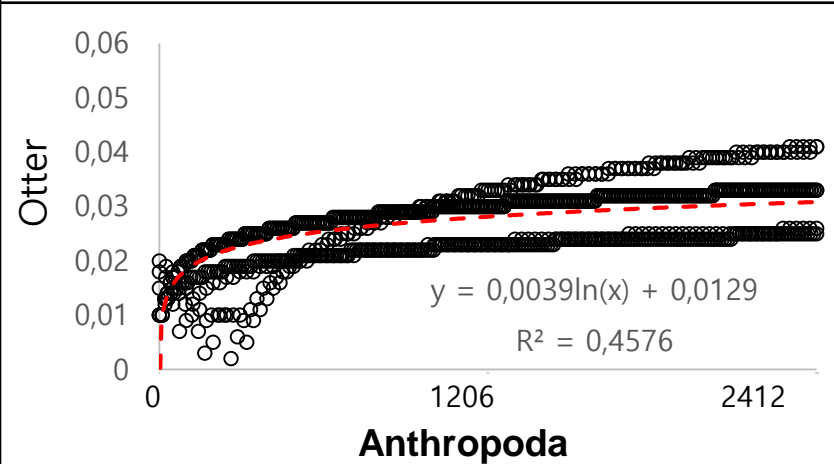


Youngsan Sites 2016

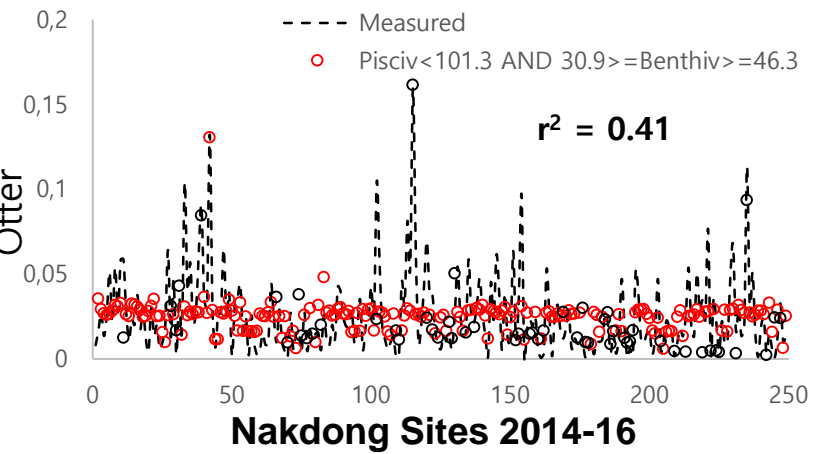
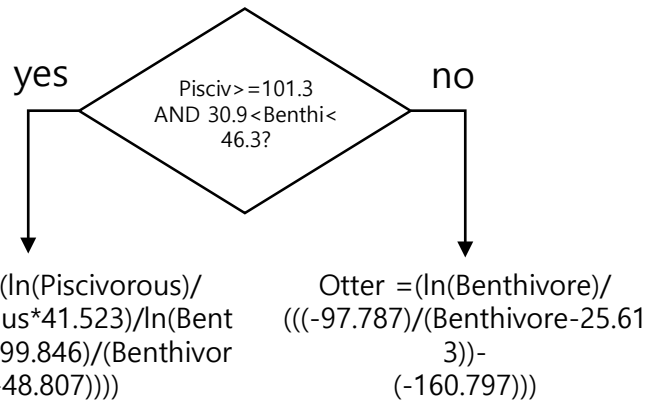
Seumjin River



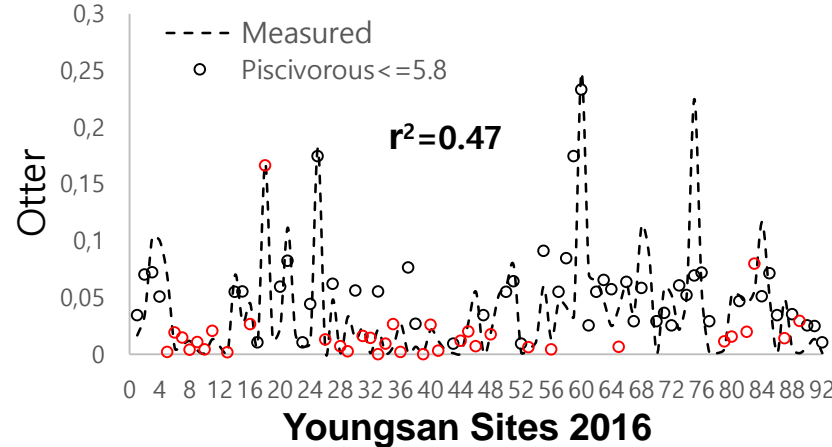
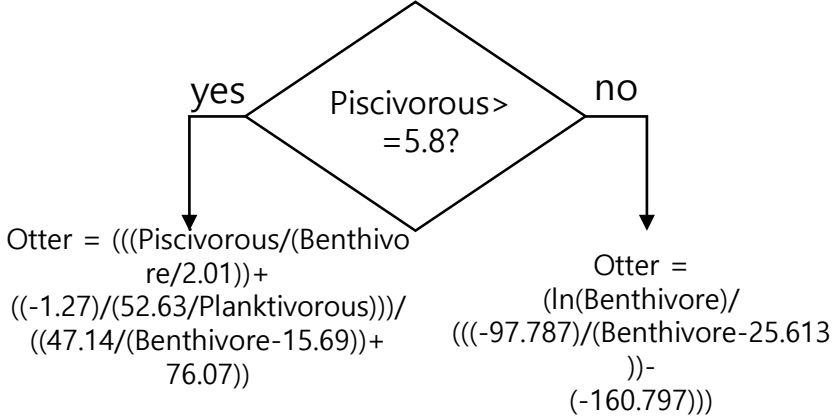
Seumjin Sites 2016



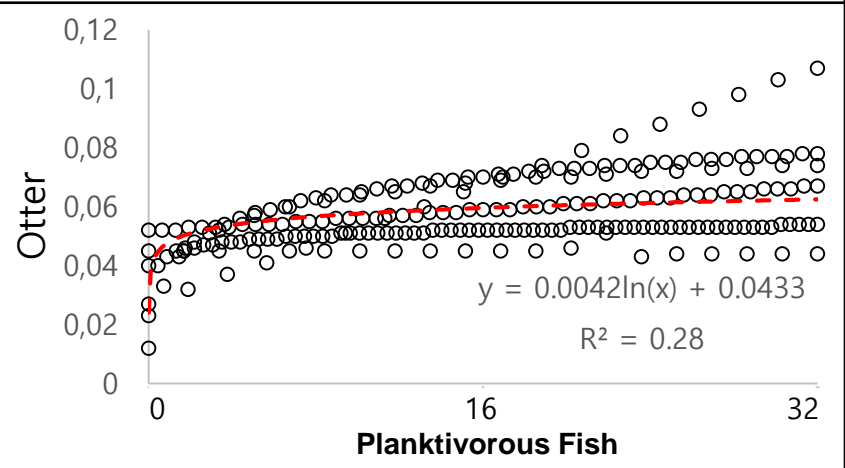
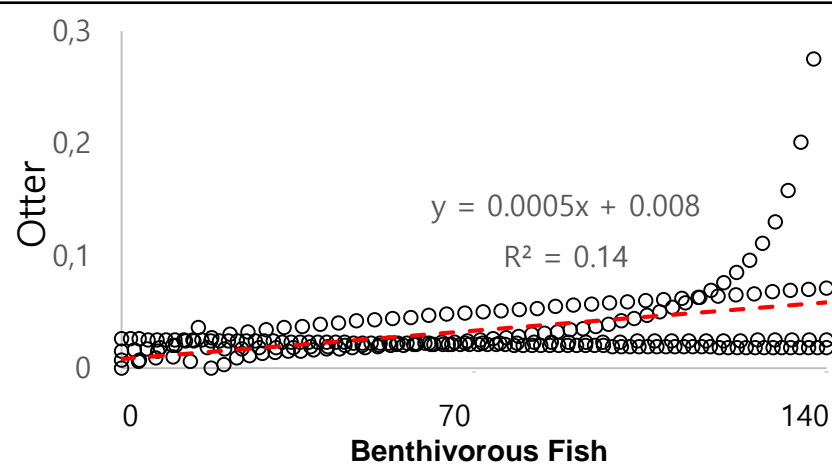
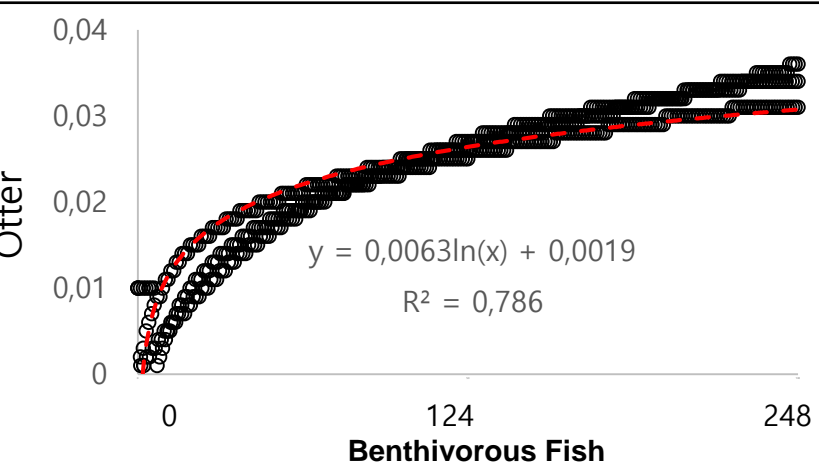
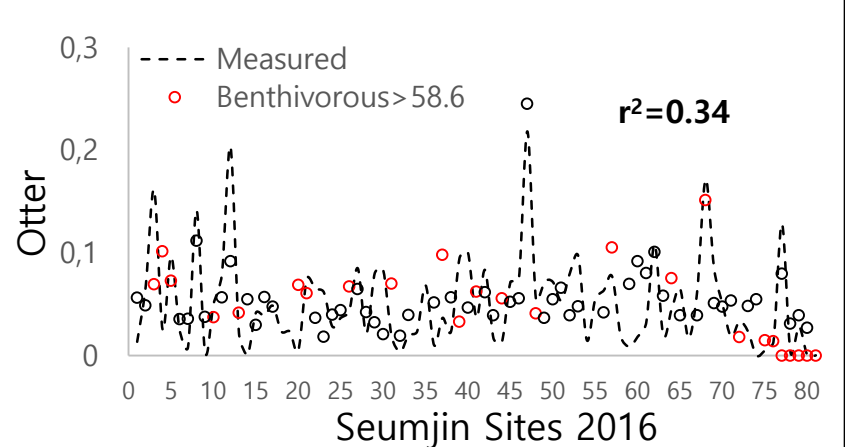
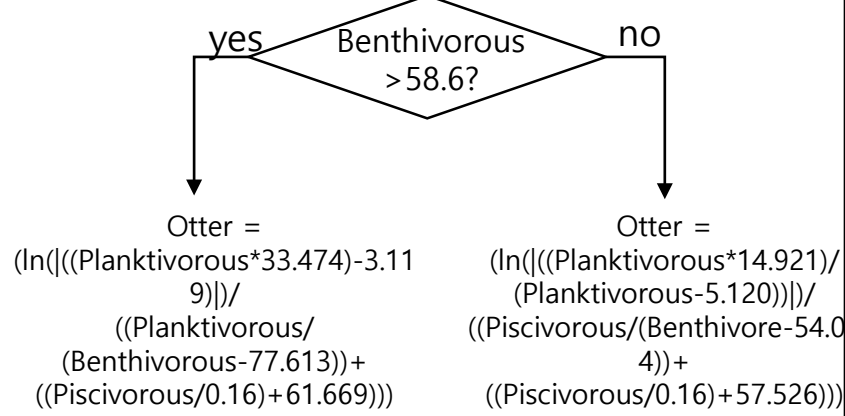
Nakdong River



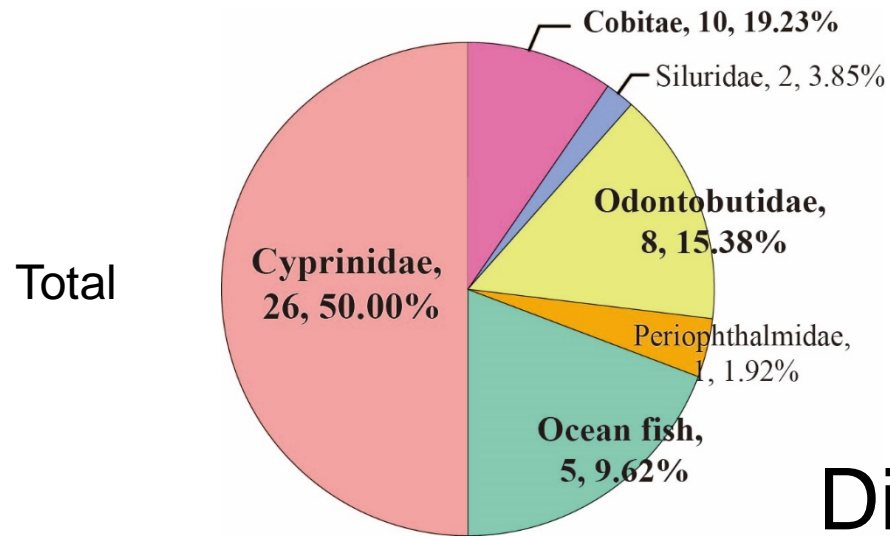
Youngsan River



Seumjin River



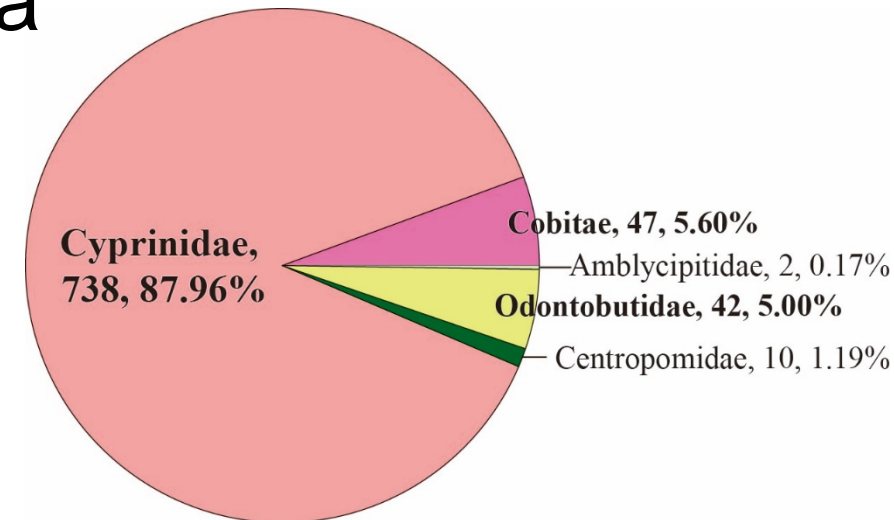
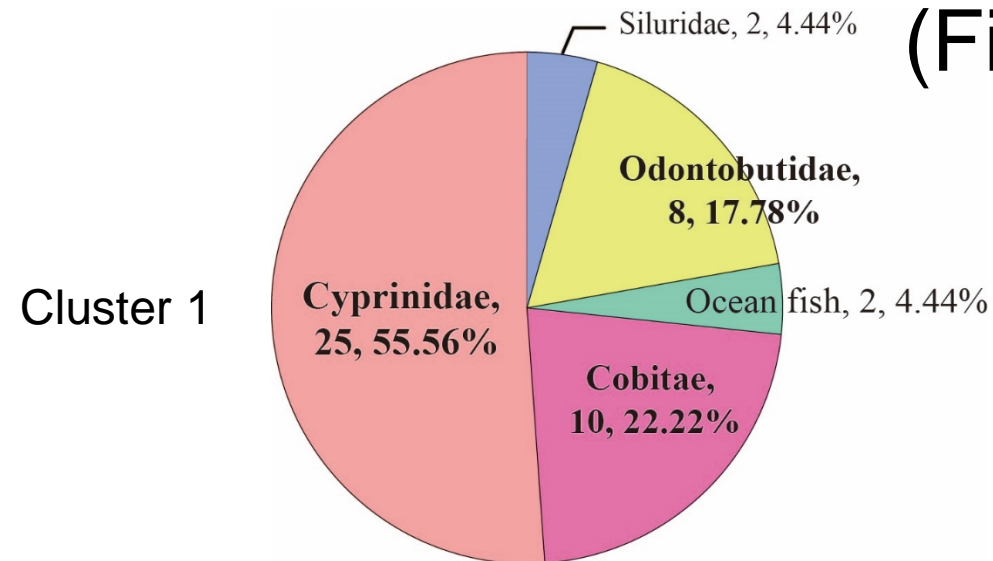
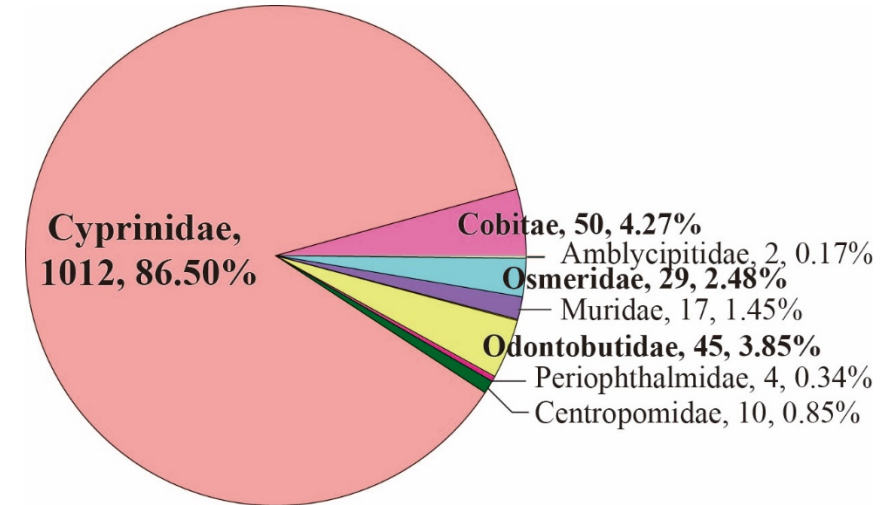
⌘ Otter preferred slow moving and benthic fishes



Diet items
(Fishes)

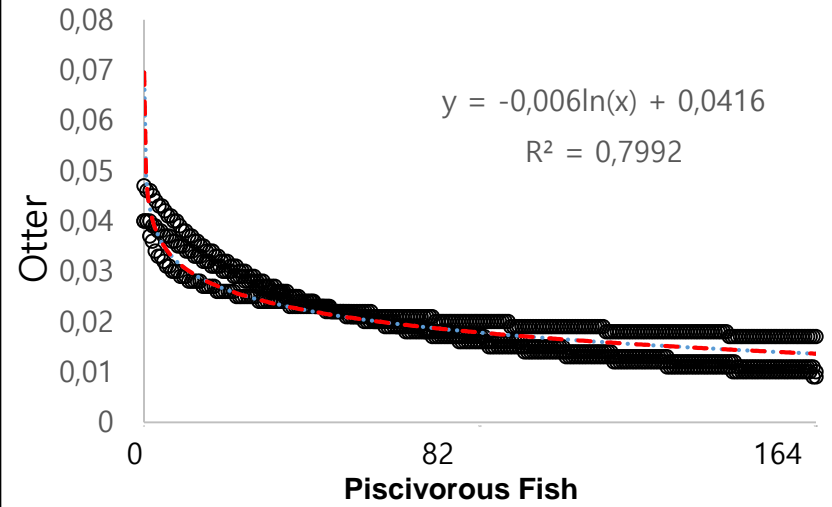
≠

Fish
Fauna

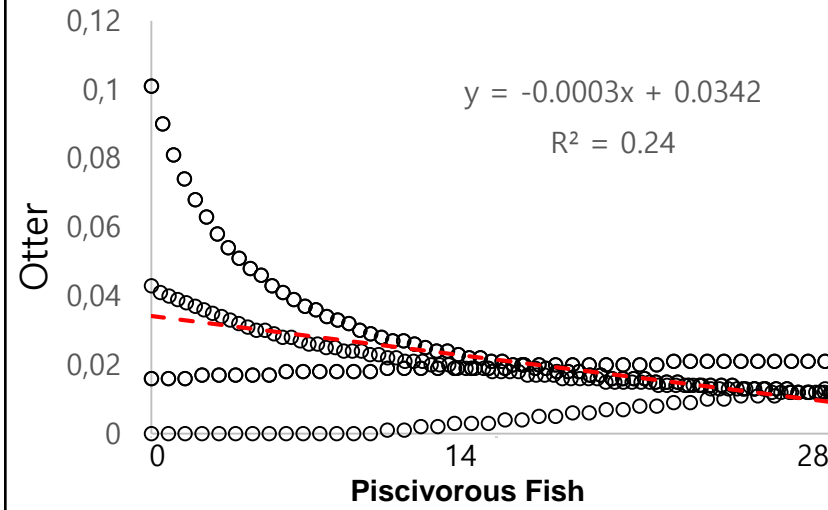


(Hong et al., unpublished)

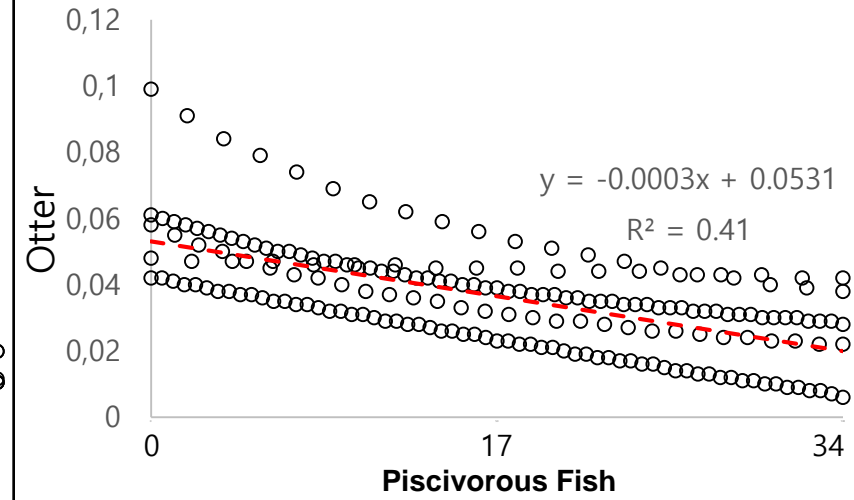
Nakdong River



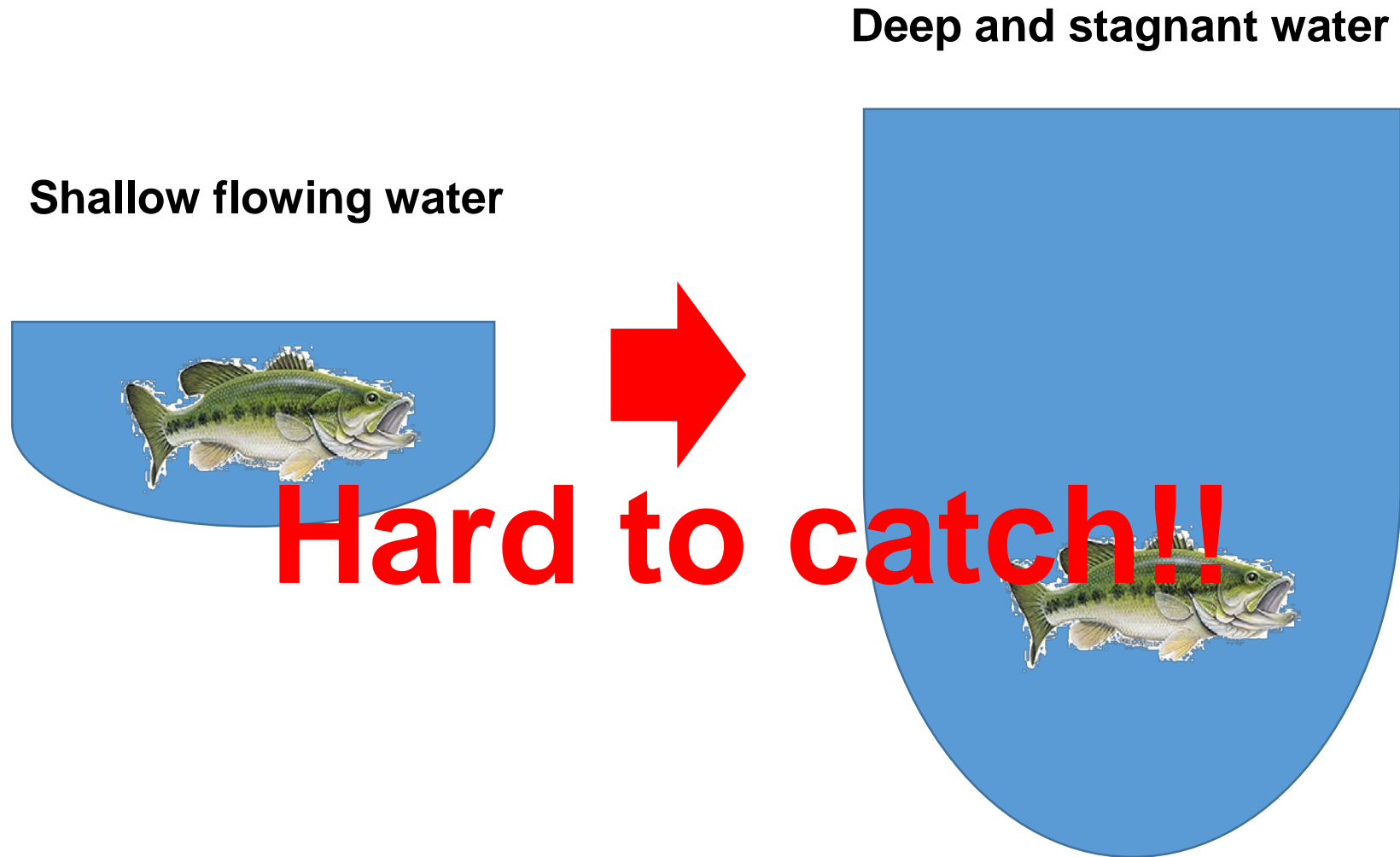
Youngsan River



Seumjin River



⋮ Why piscivores densities negatively related with spraints densities?



⌘ Otter do not like largemouth bass

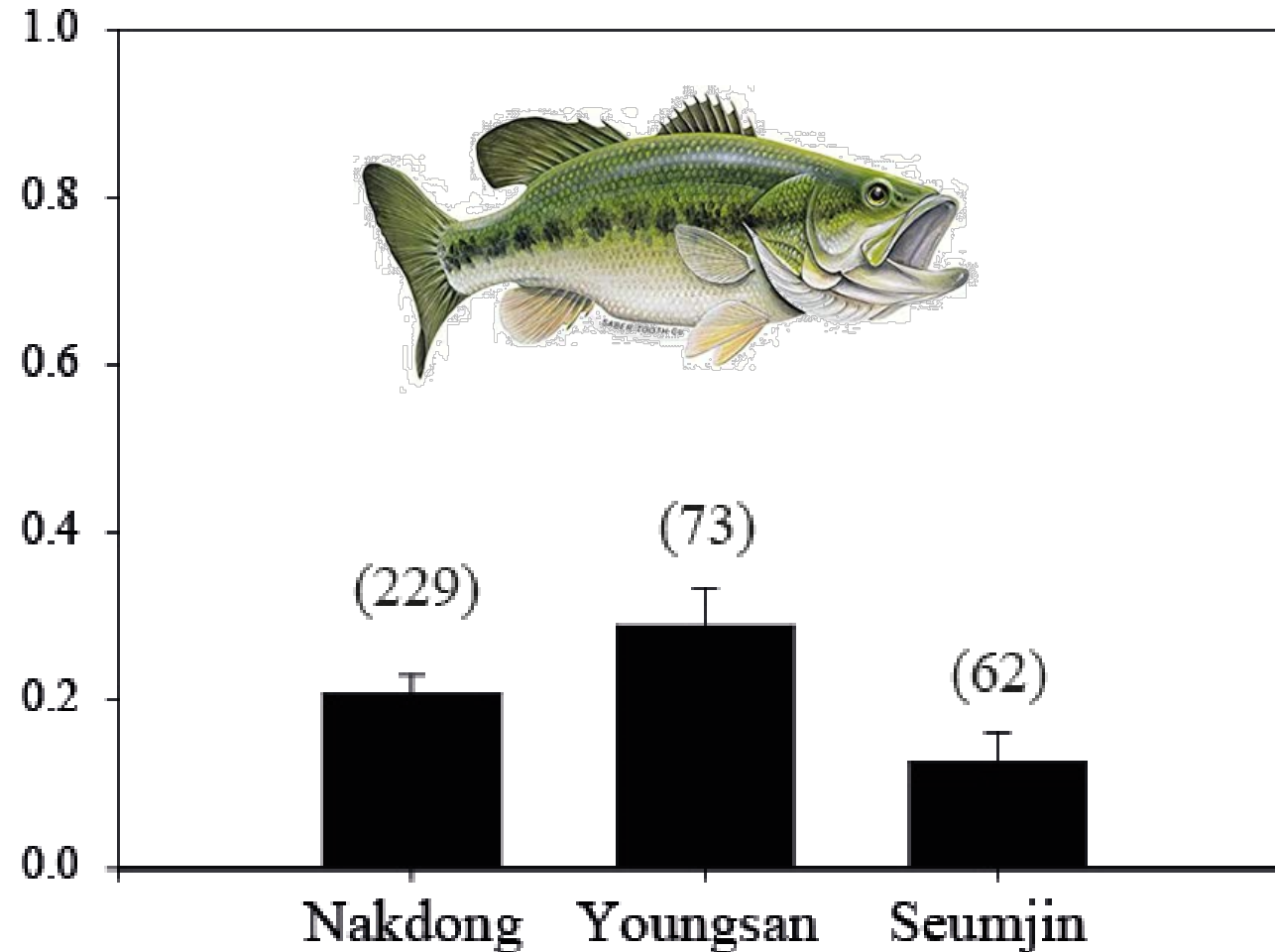
Percentage of Largemouth Bass of piscivores

Biol Invasions (C
DOI 10.1007/s10

ORIGINAL

Eurasian
in Medit

Francisco Bl
Marta Narva



ishes

❖ Conclusion

1. Interestingly, otter densities were negatively related with piscivorous fish densities.
2. Using HEA, we identified strength of relationship between otter populations and food web structure across three river basins.

⌘ Further study

1. Specific prey preference or relationship
2. Using HEA (Hybrid Evolutionary Algorithm), organizing cascade of food web structure

Thank you very much