

A large group of rainbow trout swimming in clear water over rocks. The fish are seen from above, swimming in various directions. The water is clear, and the rocks at the bottom are visible. The lighting creates a shimmering effect on the water's surface.

# Global swimways: developing a framework for conserving migratory freshwater fishes

Thomas Worthington, Arnout van Soesbergen, Kerry Brink, Joshua Royte, Michele Thieme, Herman Wanningsen, William Darwall and Catherine Sayer

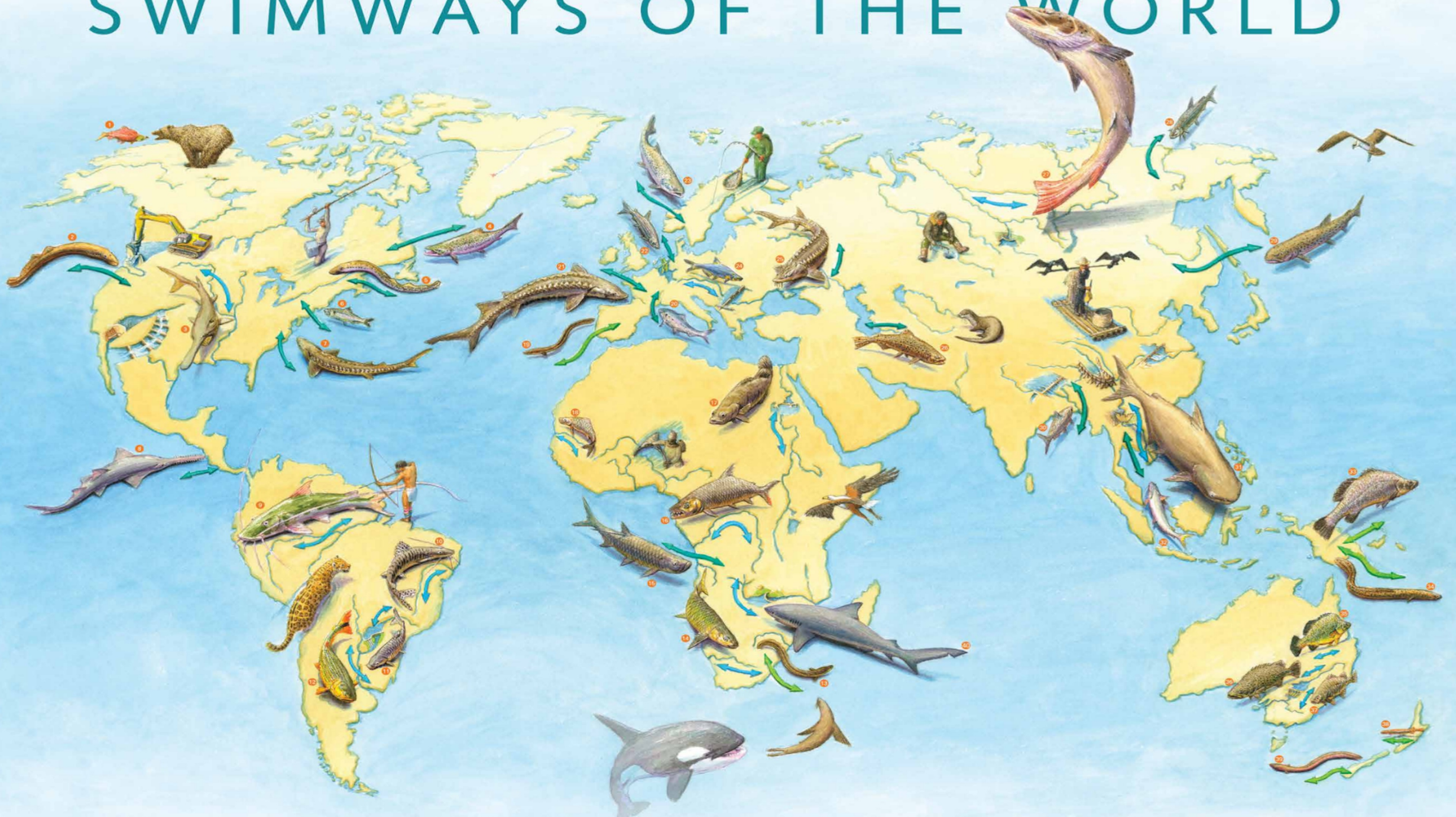
Owned by everyone?  
University of Cambridge, 30<sup>th</sup> March 2023

# Cambridge Conservation Initiative

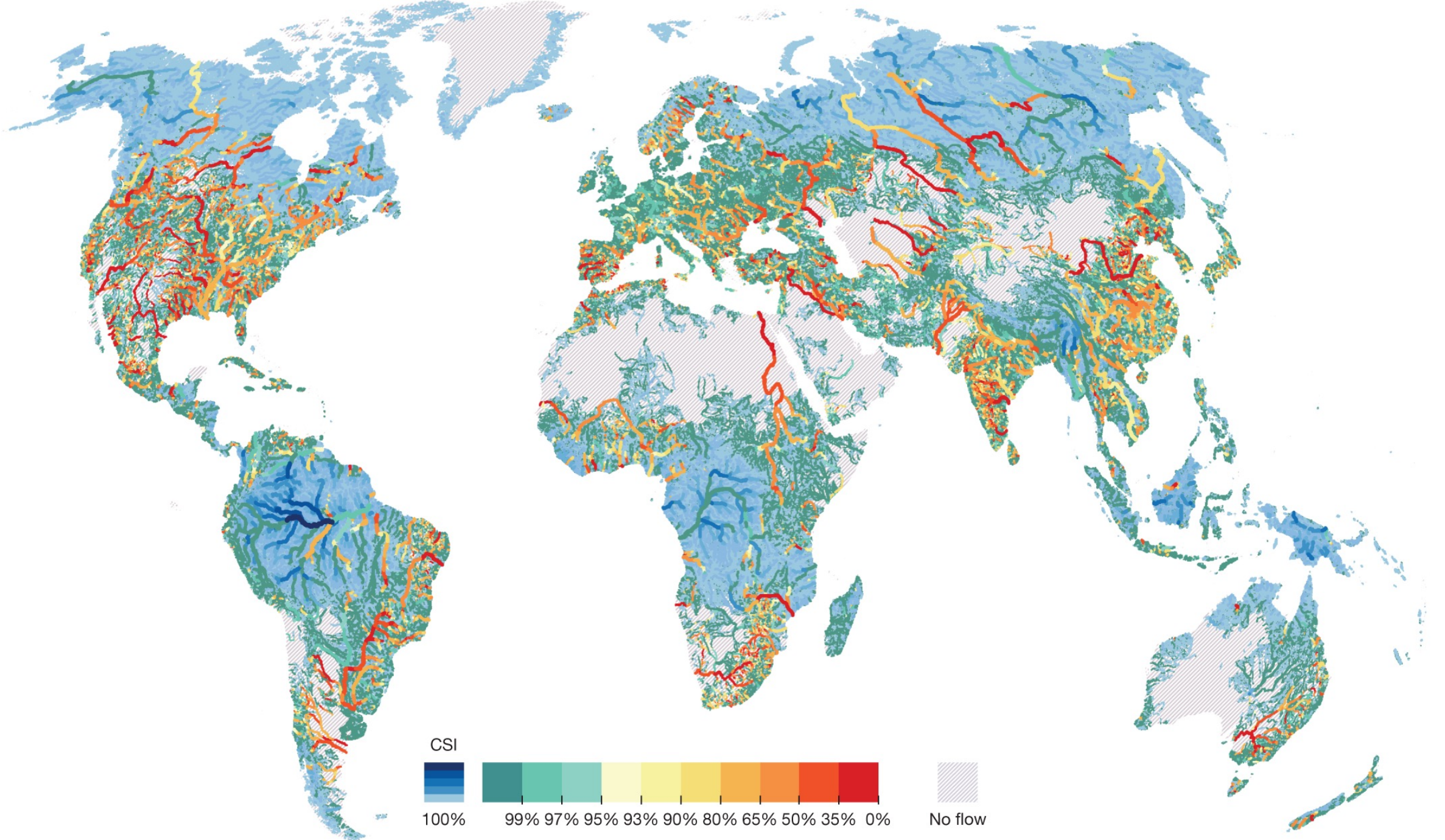


UNIVERSITY OF  
CAMBRIDGE

# SWIMWAYS OF THE WORLD







**b**

Field-estimated barrier density  
(barriers per kilometre)

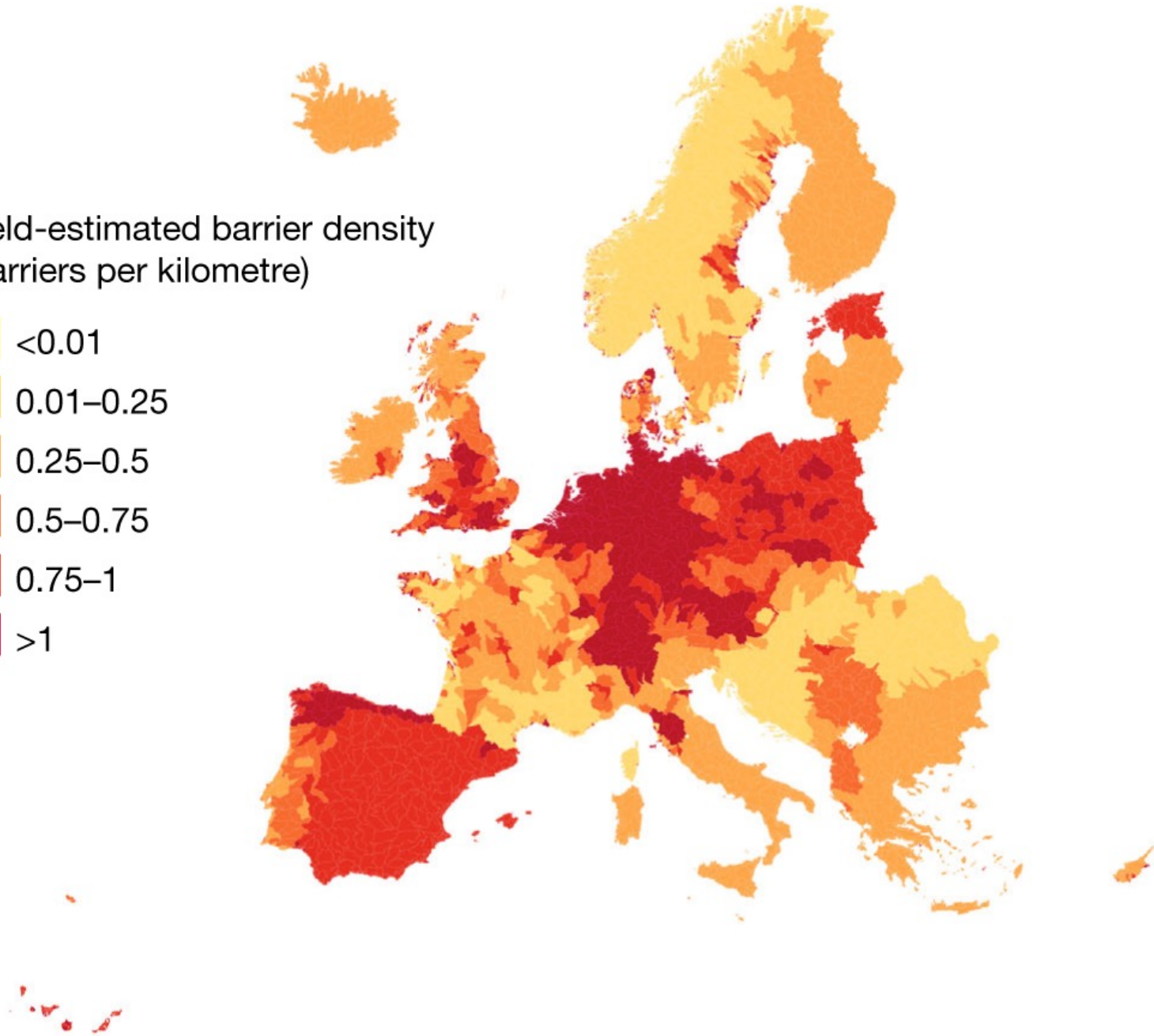
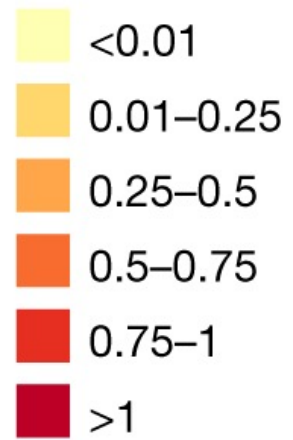
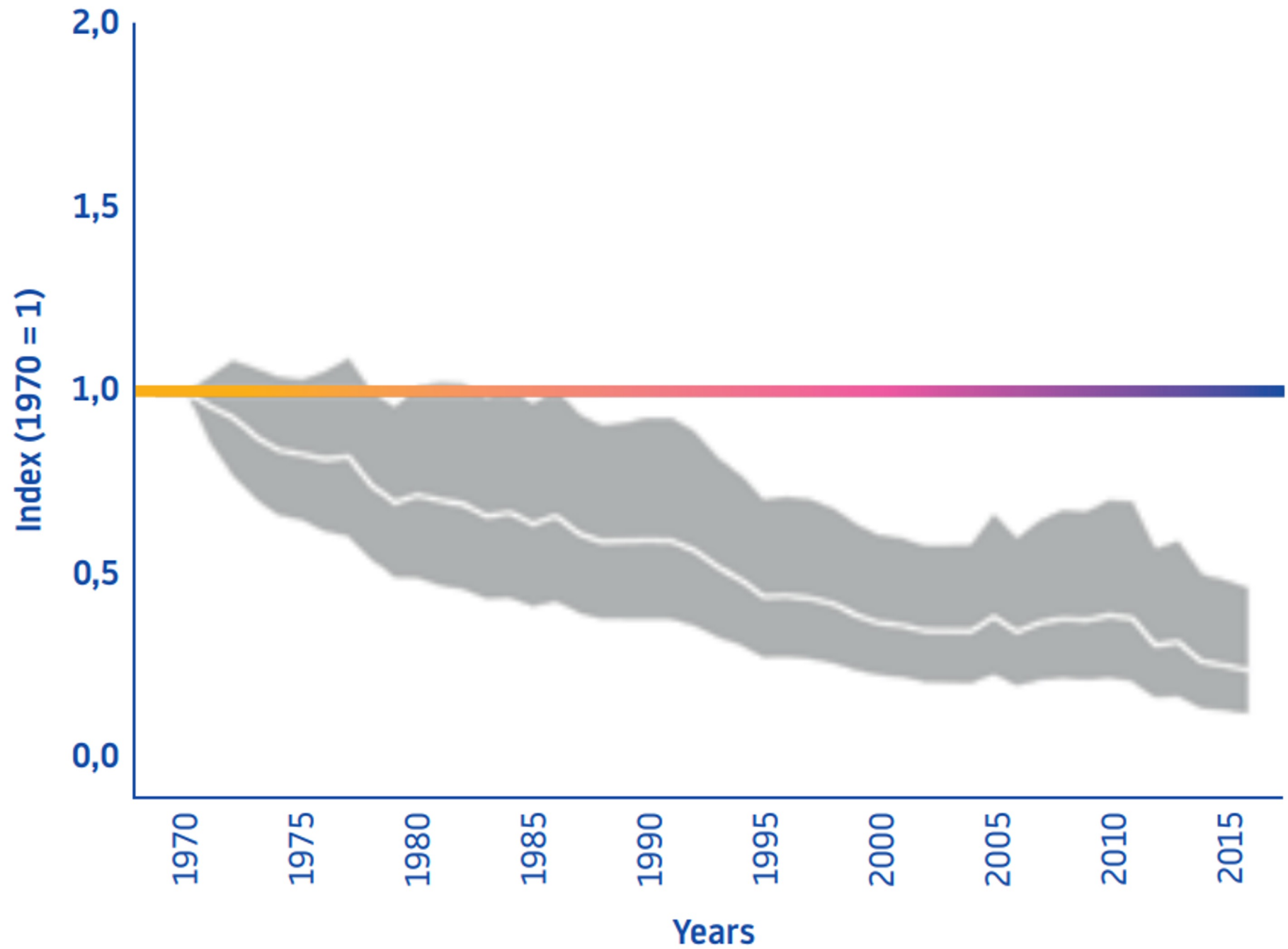




Image by jacopo cavalca from Pixabay





# Global Swimways for the conservation of migratory freshwater fishes

Thomas A Worthington<sup>1\*†</sup>, Arnout van Soesbergen<sup>2,3†</sup>, Arjan Berkhuisen<sup>4</sup>, Kerry Brink<sup>5</sup>, Joshua Royte<sup>6</sup>, Michele Thieme<sup>7</sup>, Herman Wanningsen<sup>5</sup>, and William Darwall<sup>8</sup>

Anthropogenic activities have severely degraded the ecological integrity of global freshwater systems. Migratory freshwater fishes are especially threatened by the cumulative effects of multiple stressors and fragmentation, particularly those that impede access to critical habitats. To stimulate the conservation and protection of these species, we propose a “Global Swimways” program to identify rivers that support the migration routes of biologically and/or socioeconomically important freshwater fishes. We test the utility of the International Union for Conservation of Nature Red List data to support the identification of Global Swimways and present case study regions containing rivers with either high species richness (west-central Africa and Southeast Asia), high numbers of threatened species (Eastern Europe and Central Asia), or multiple endemic species (the Rift Valley lakes in East Africa). We hope the Global Swimways program will provide metrics that can be used to identify rivers requiring increased protection or restoration, track trends, and stimulate the greater inclusion of migratory freshwater fishes in global policy mechanisms.

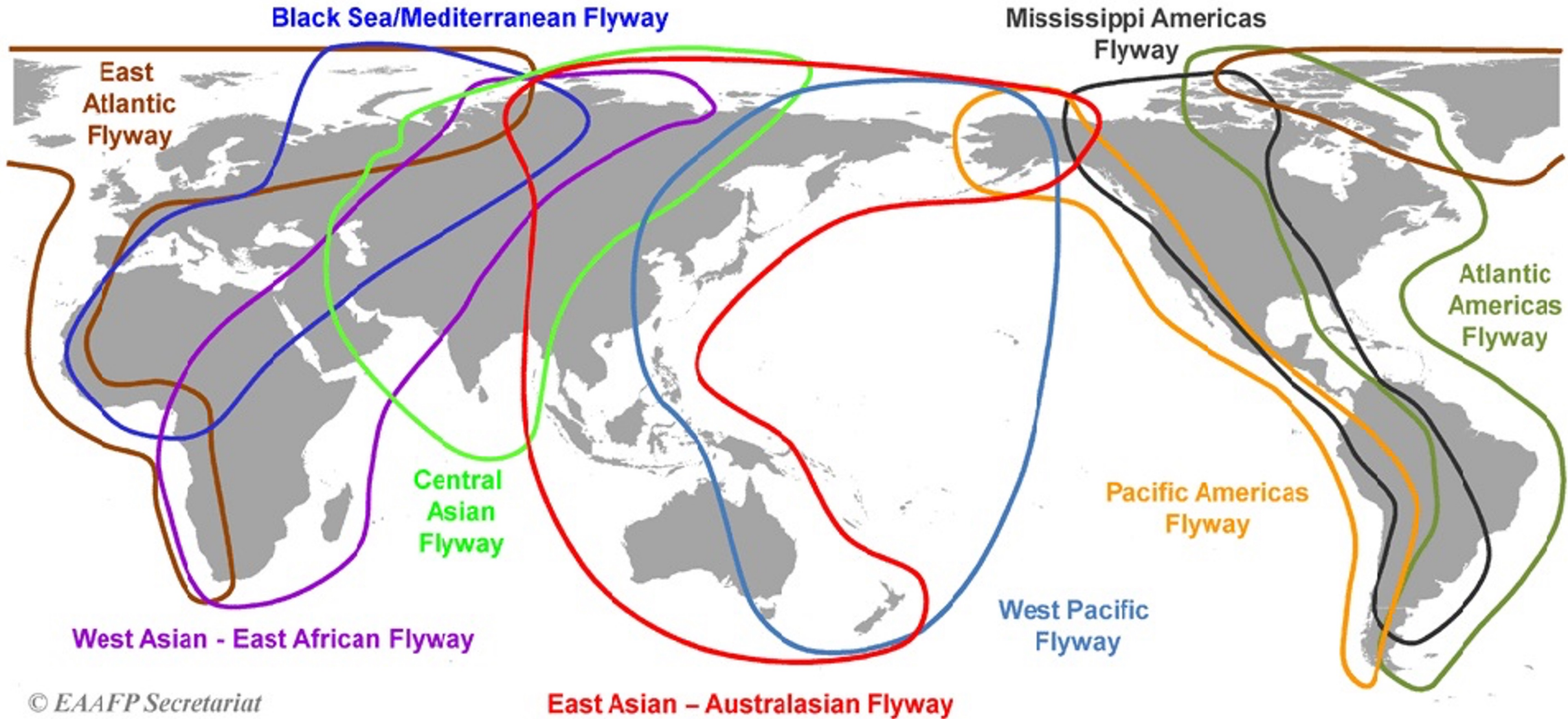
# Global Swimways

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- We define Global swimways as:

“rivers and their associated ecosystems that support the entire migration routes of biologically and/or socioeconomically important freshwater fishes”

# Global Swimways



# Biological criteria

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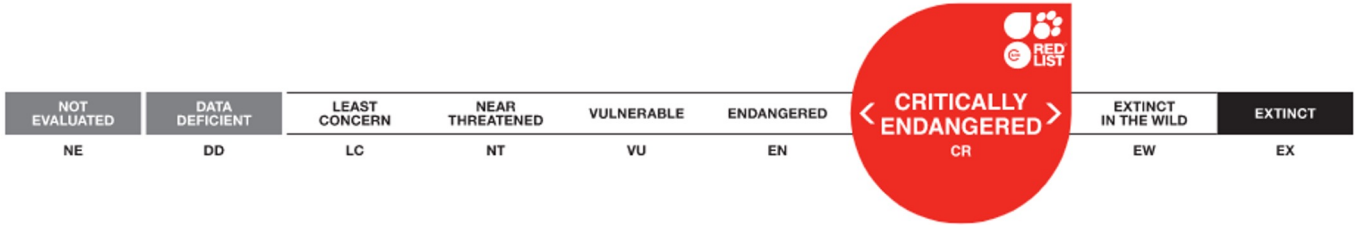
- IUCN Red List database
- Biological criteria
  - Species richness
  - Threatened status
  - Endemism

# Biological criteria

14 September 2019

SCOPE OF ASSESSMENT  
**Global**

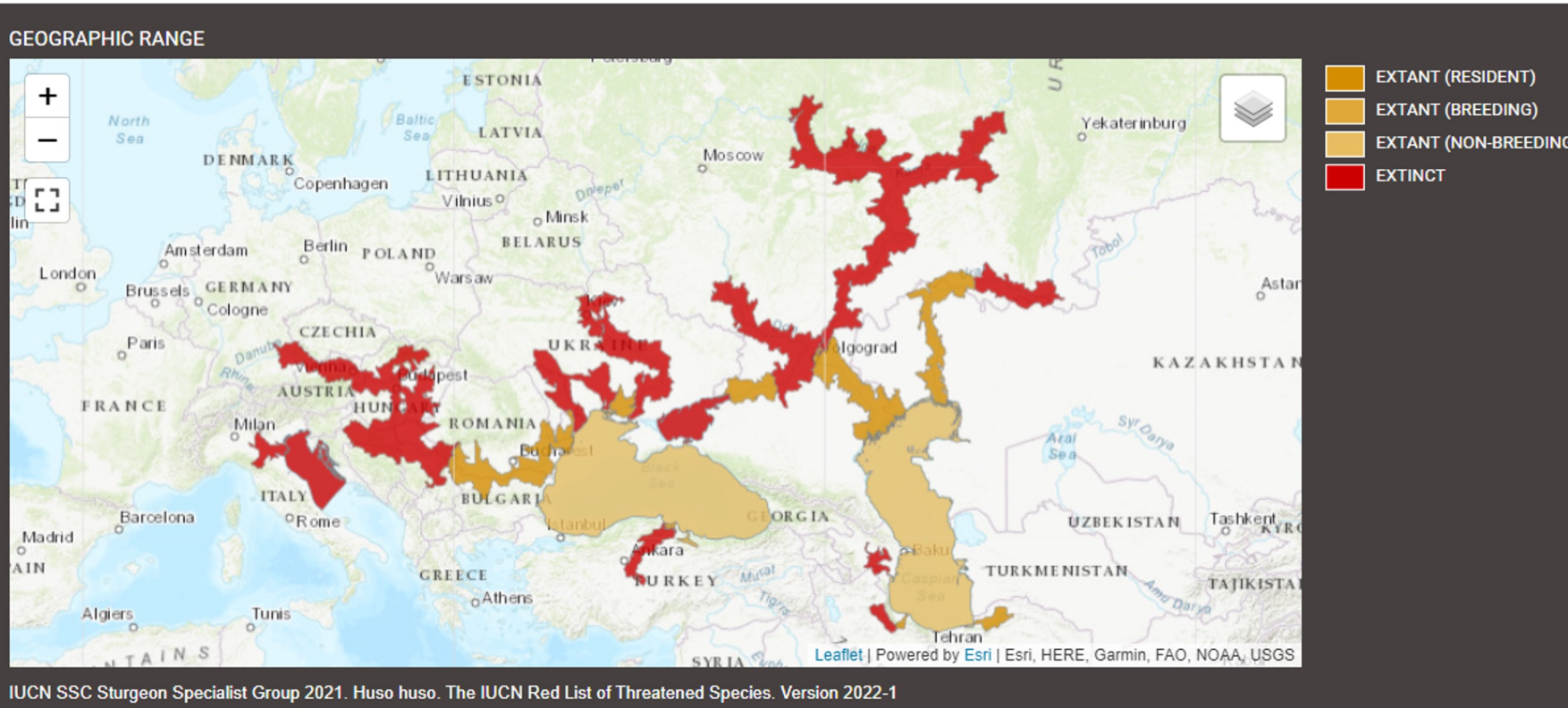
[Assessment in detail](#)



POPULATION TREND  
↓ Decreasing

NUMBER OF MATURE INDIVIDUALS  
[Population in detail](#)

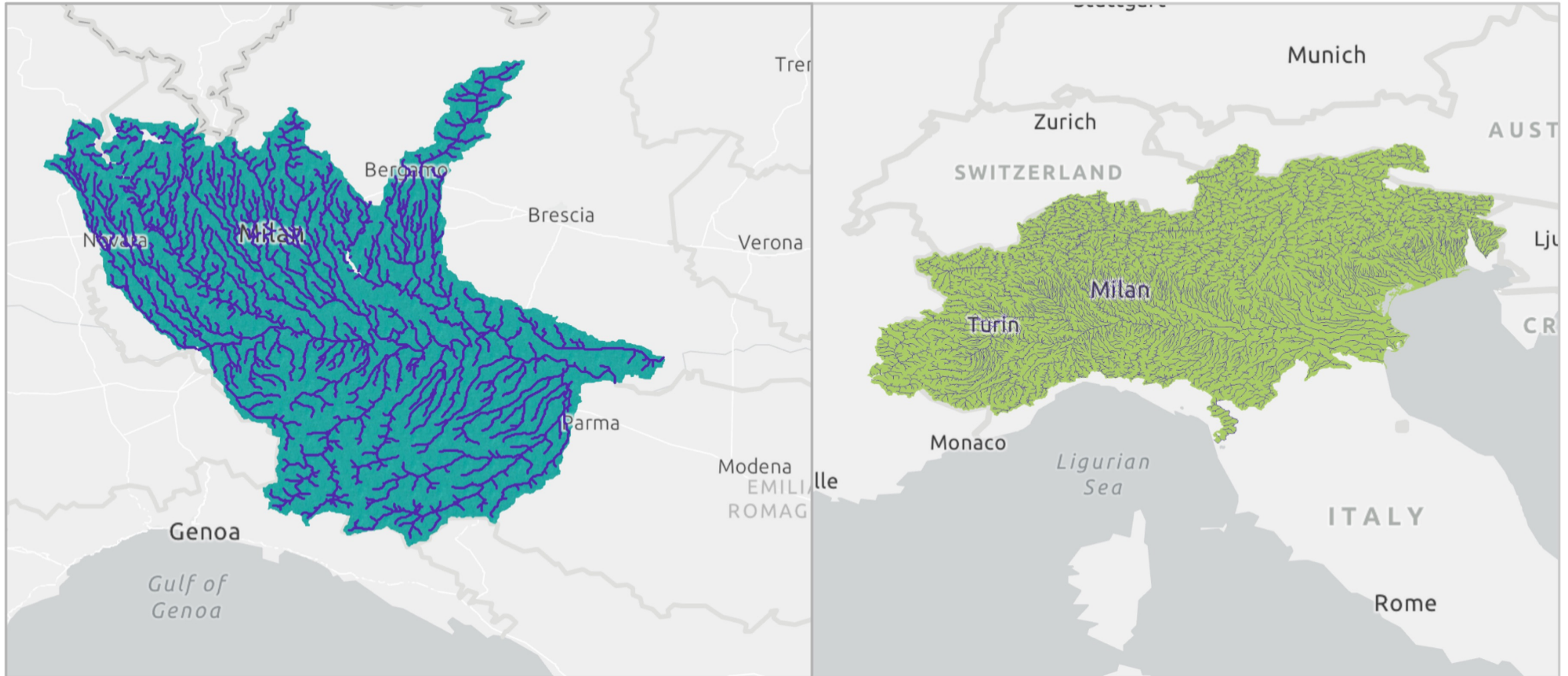
HABITAT AND ECOLOGY  
**Wetlands (inland), Marine Neritic**



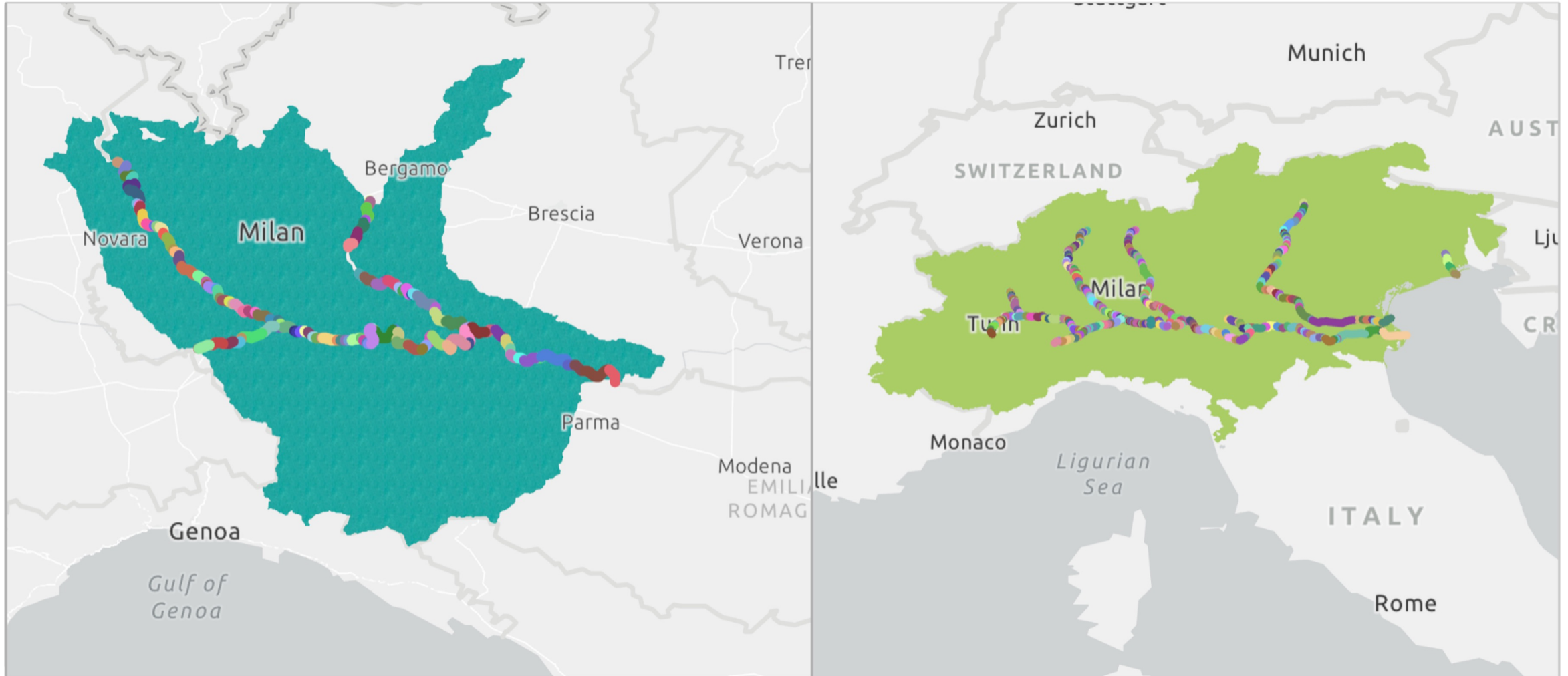
# Biological criteria



# Biological criteria



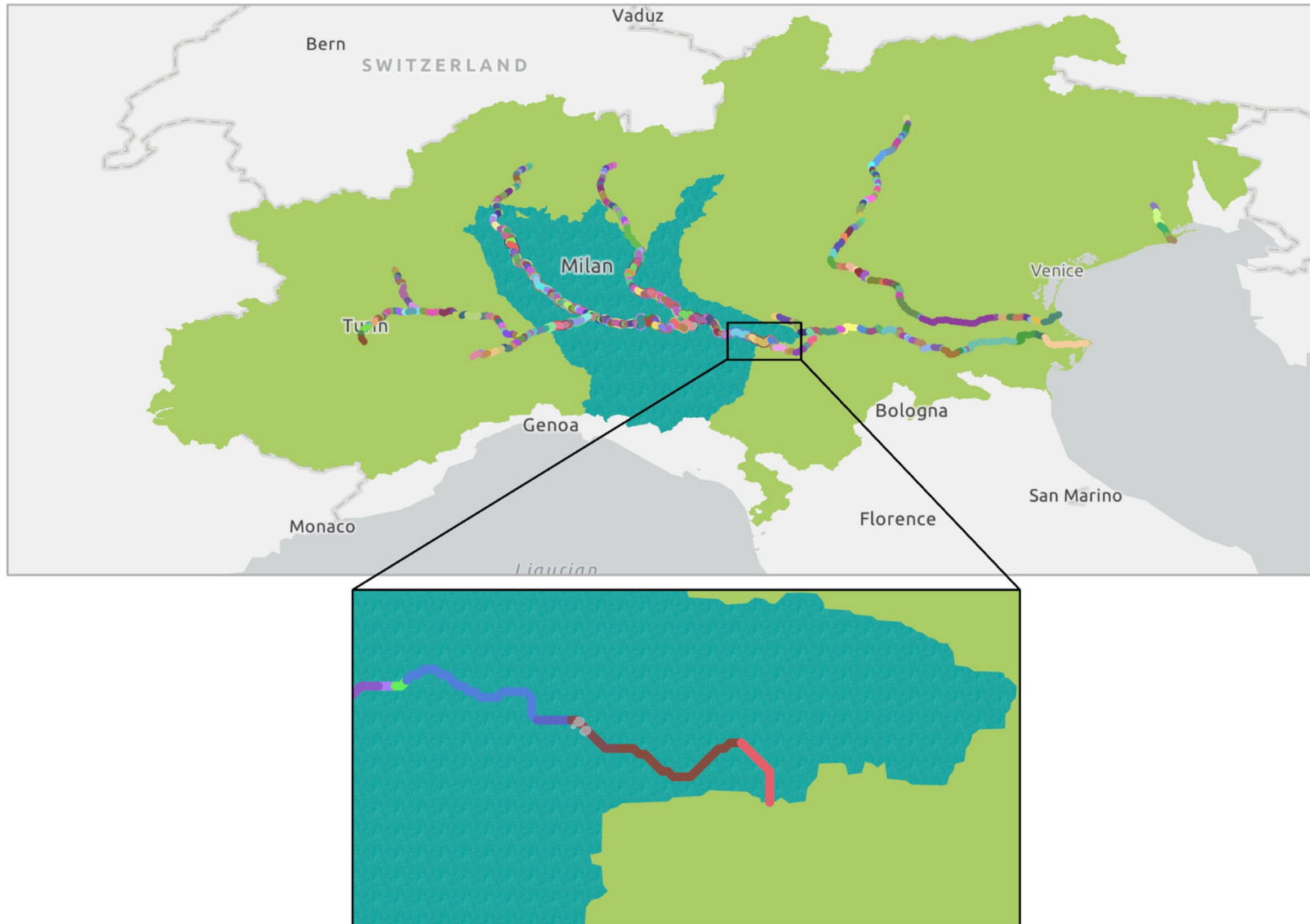
# Biological criteria



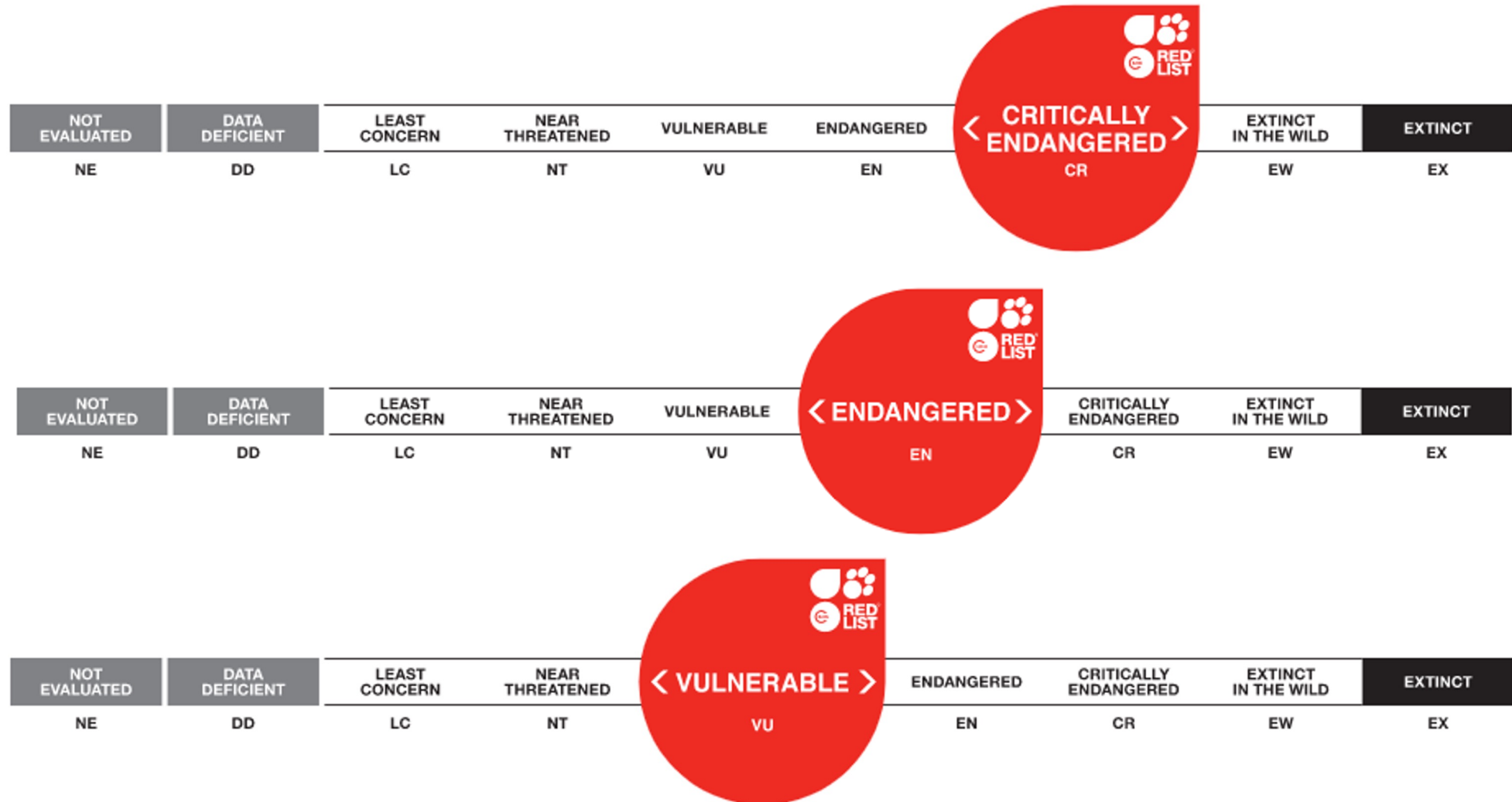


# Biological criteria

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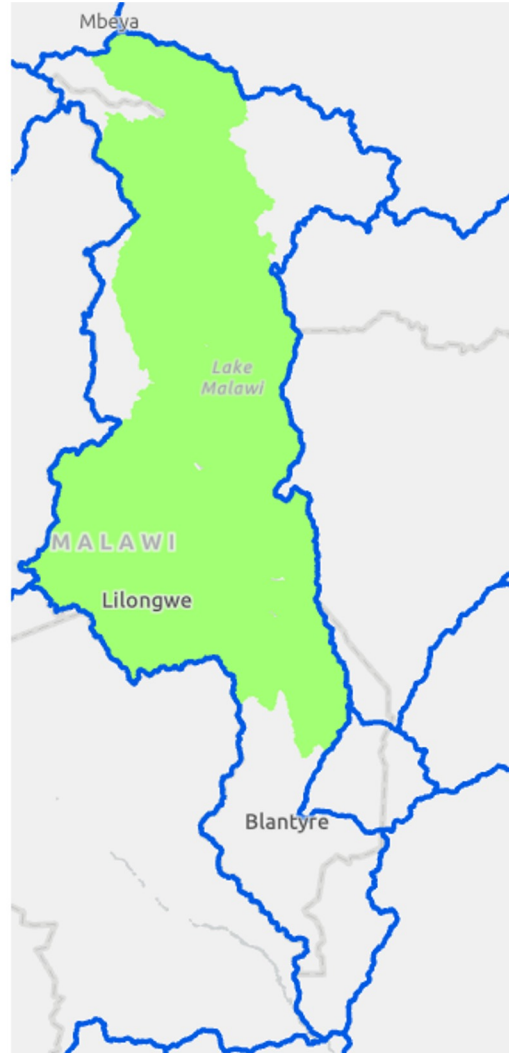
# Biological criteria



# Biological criteria



Hydrobasin

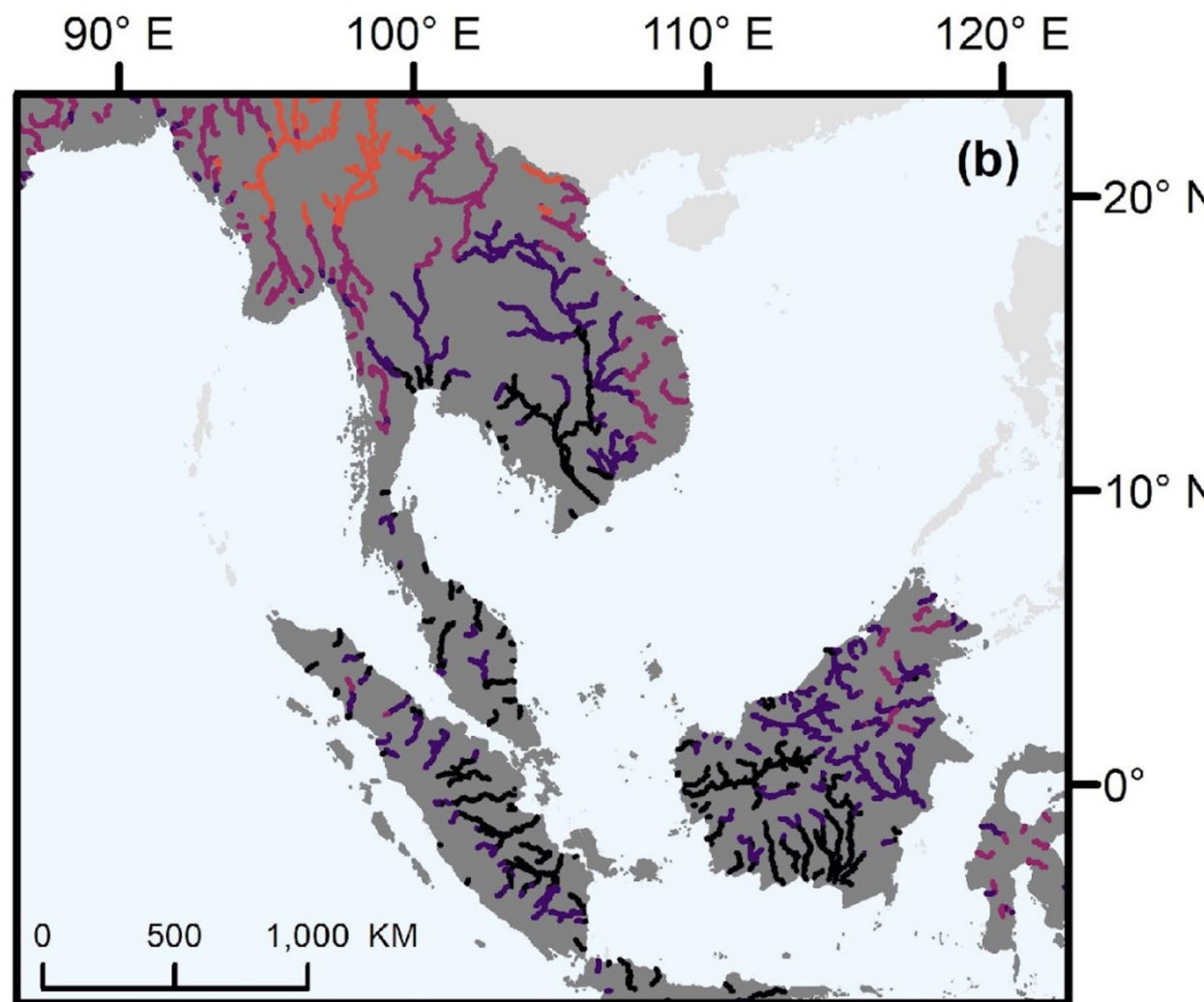
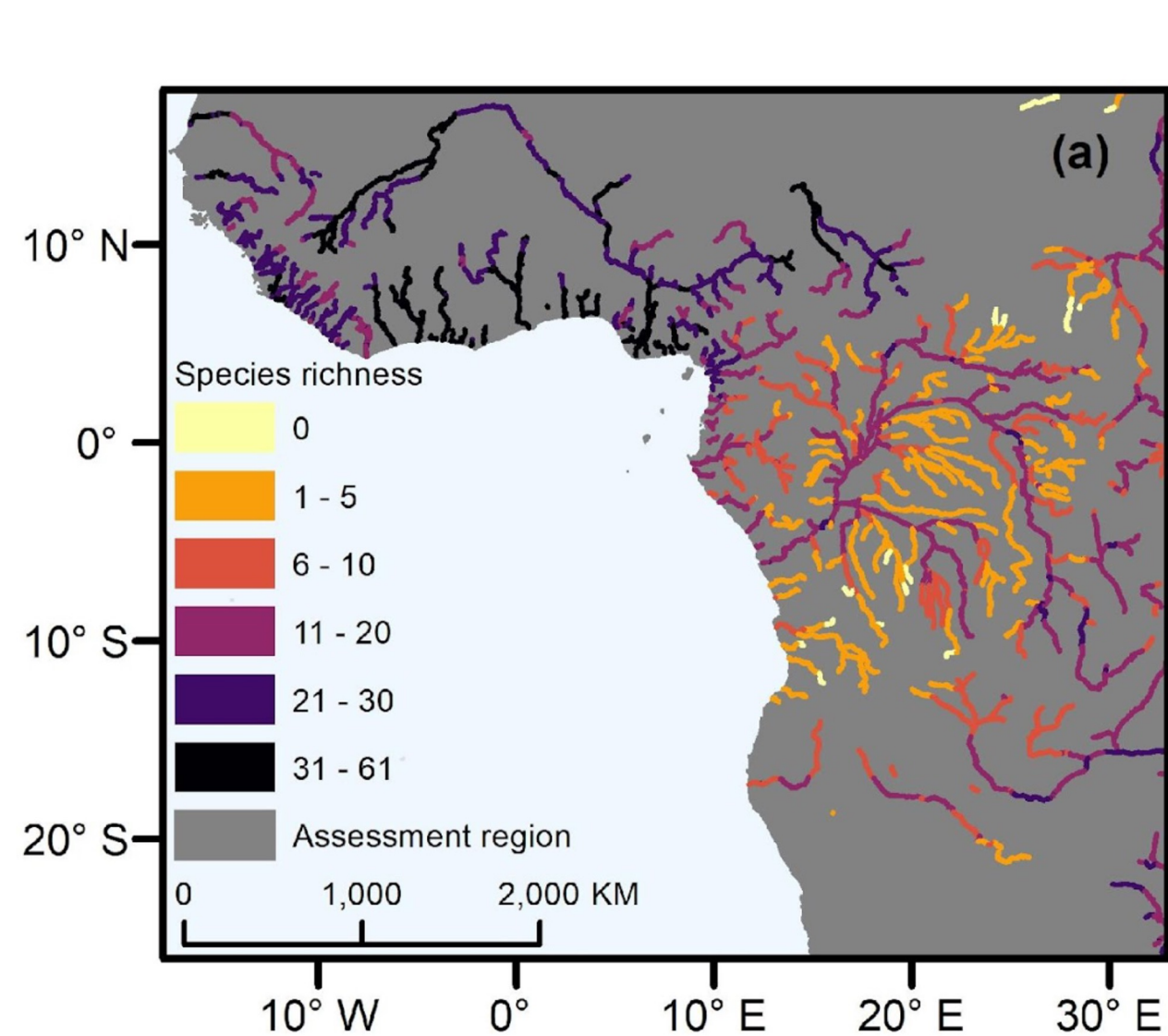


Species range

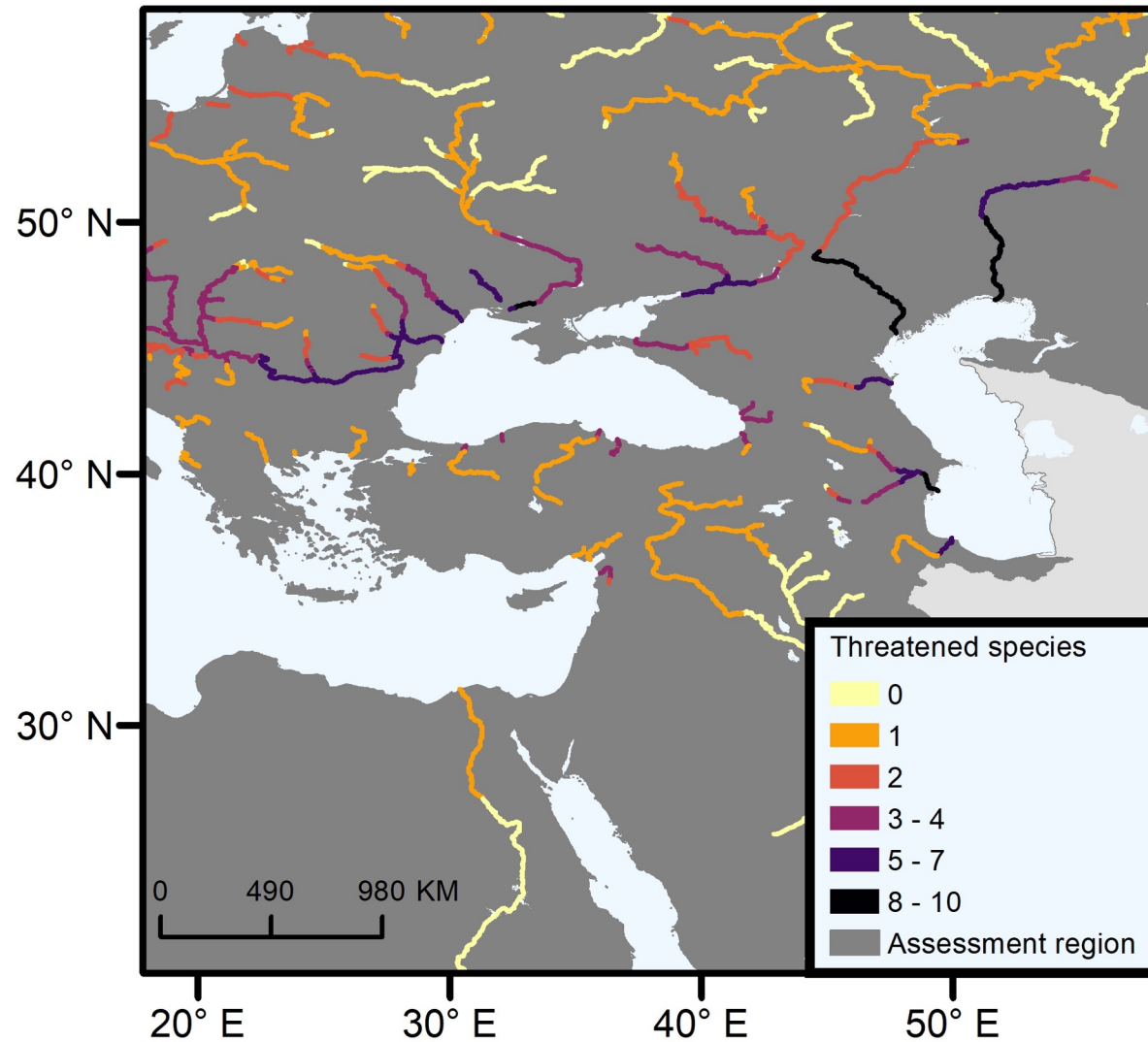
## *Opsaridium microlepis*



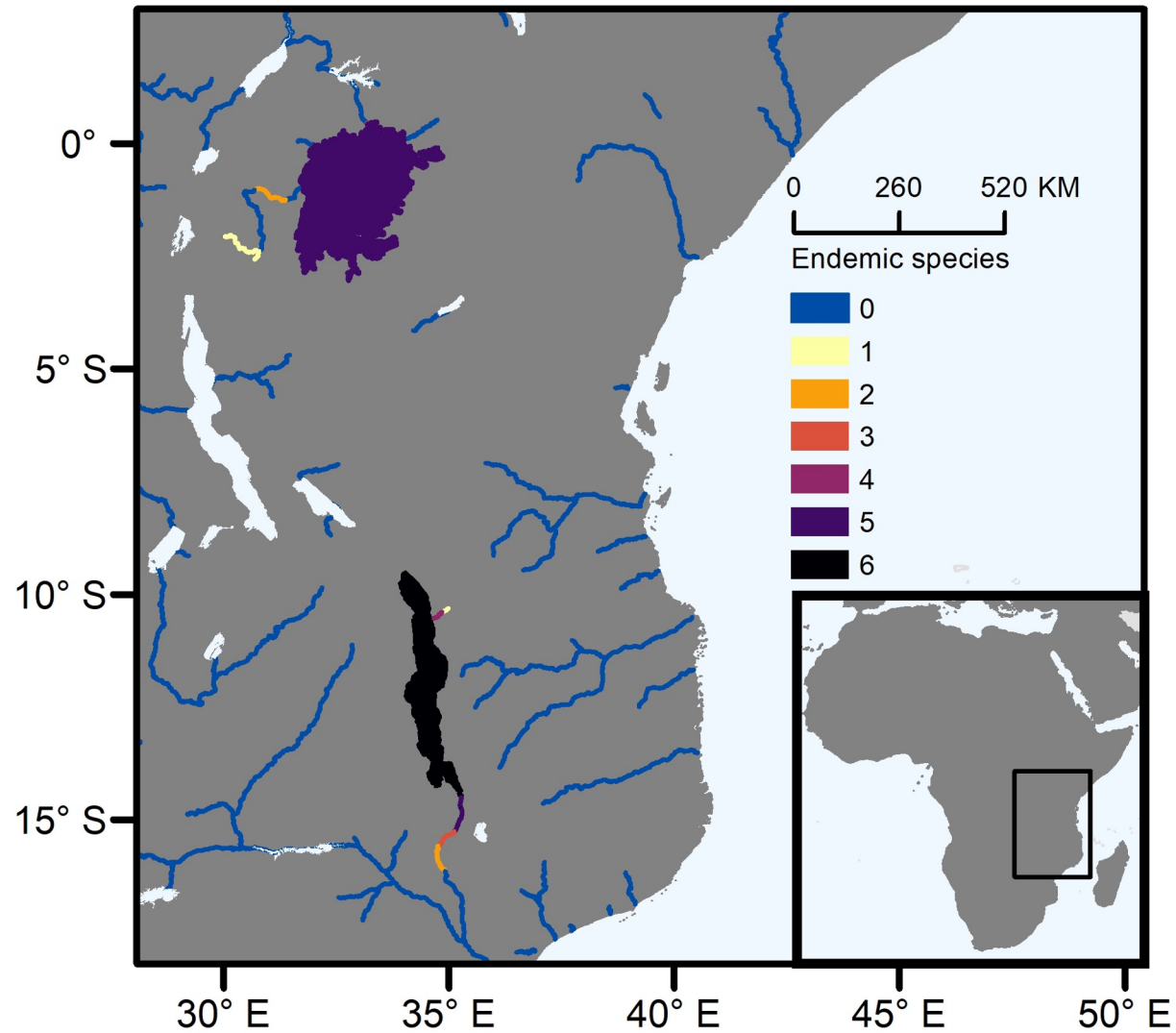
# Biological criteria



# Biological criteria



# Biological criteria



# Biological criteria

**Global Swimways** About Global map

**Swimway**  
River name: Niger  
Id of river segment: 10866118  
Number of migratory freshwater species in river segment: 60

Species name	Potential length of swimway in Niger river (km)	Show/hide distribution	
<a href="#">Parachanna obscura</a>	4038	<a href="#">Show</a>	<a href="#">Hide</a>
<a href="#">Pantodon buchholzi</a>	942	<a href="#">Show</a>	<a href="#">Hide</a>
<a href="#">Hemichromis fasciatus</a>	1584	<a href="#">Show</a>	<a href="#">Hide</a>
<a href="#">Petrocephalus bovei</a>	2946	<a href="#">Show</a>	<a href="#">Hide</a>

**Baselayers**  
Map basic  
Satellite

**Basin layers**

**Threat layers**  
GOODD dams   
GRAND dams

**Species layers**  
All species richness   
Endemic species   
Threatened species

Total number of freshwater migratory species  
0  
1 - 5  
6 - 10  
11 - 20  
21 - 30  
31 - 61

Leaflet | Tiles © UNEP-WCMC  
The boundaries and names shown and the designations used on maps do not imply official endorsement or acceptance by the UN Environment Programme or contributory organisations. © www.globalswimways.org





# Economic criteria

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Photo by John Cameron on Unsplash

# Social criteria



Photo by John Cameron on Unsplash

# Social criteria



# Habitat criteria

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# Future directions

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- Quantifying and refining migration routes

# Future directions

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- Quantifying and refining migration routes
- Global engagement to address data gaps

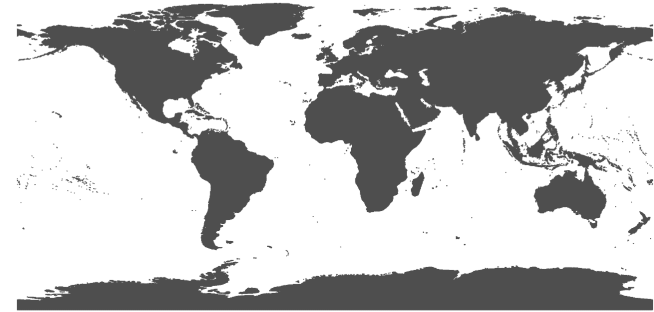
# Future directions

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- Quantifying and refining migration routes
- Global engagement to address data gaps
- Identification of a Global Swimway

# Future directions

- Quantifying and refining migration routes
- Global engagement to address data gaps
- Identification of a Global Swimway
- Developing a hierarchical approach

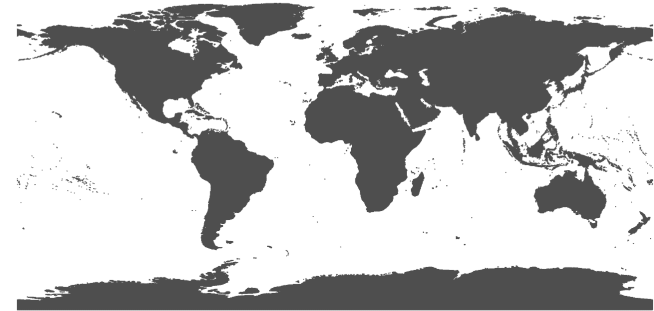




# Future directions

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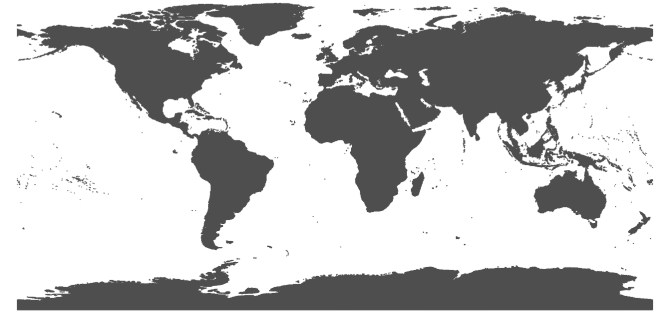
- Quantifying and refining migration routes
- Global engagement to address data gaps
- Identification of a Global Swimway
- Developing a hierarchical approach
- Creating a global standard



# Future directions

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- Quantifying and refining migration routes
- Global engagement to address data gaps
- Identification of a Global Swimway
- Developing a hierarchical approach
- Creating a global standard
- Embedding Global Swimways within conservation policy



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- This research was funded by the Cambridge Conservation Initiative Collaborative Fund (CCI-05- 19- 003).
  - Arnout van Soesbergen
  - Kerry Brink
  - Joshua Royte
  - Michele Thieme
  - Herman Wanningen
  - William Darwall
  - Catherine Sayer