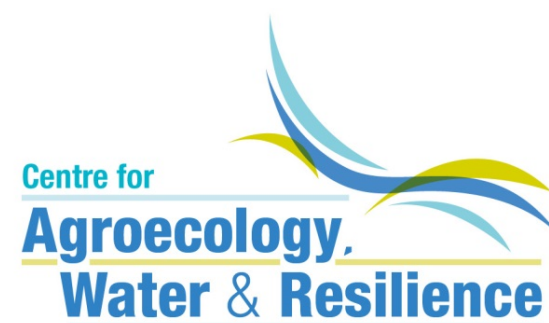


*Martin Wilkes is a Research Fellow at the Centre for Agroecology, Water & Resilience at Coventry University. Martin's research centres on responses of aquatic biota to anthropogenic stressors. His work is fundamentally ecological, although he works with a variety of colleagues from biology, engineering and social sciences.*



## **FISH-Net: Prior probabilities to support sustainable hydropower planning, design and monitoring**

*IEA Fish & Hydropower Annex, Brussels May 2017*

**Martin Wilkes** (Coventry U.)

Evelyn Habit & Oscar Link (U. Concepción); Luiz Silva (UFSJ)

Angus Webb (U. Melbourne); Lee Baumgartner (Charles Sturt U.)

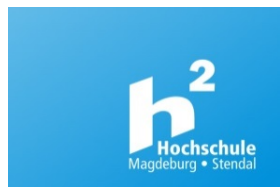
Brett Pflugrath (U. New South Wales/NSW Dept. Primary Industries)

Craig Boys (NSW Dept. Primary Industries/Charles Sturt U.);

Justin O'Connor, Matthew Jones & Ivor Stuart (Arthur Rylah Institute)

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# Knowledge Exchange for Efficient Passage of Fish in the Southern Hemisphere (KEEPFISH)

**Martin Wilkes** (Coventry U.); Kim Aarestrup & Niels Jepsen (DTU-Aqua); Bernd Ettmer (HSM); Paul Franklin & Cindy Baker (NIWA); Evelyn Habit & Oscar Link (U. Concepción); Paul Kemp (U. Southampton); Paulo Pompeu (UFLA); Luiz Silva (UFSJ); Angus Webb (U. Melbourne)

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 690857.*

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# Fish passage in the Southern Hemisphere Network (FISH-Net)

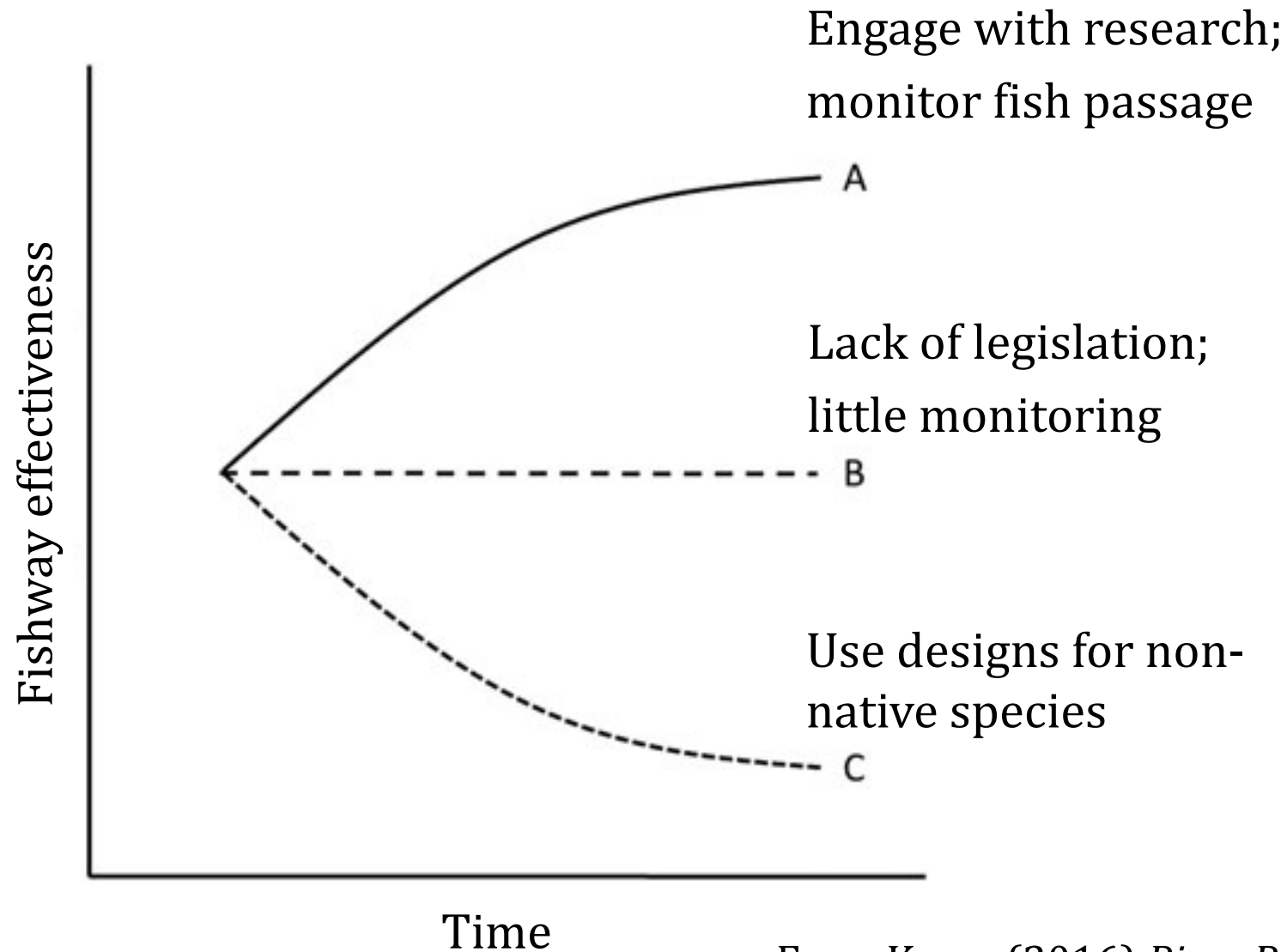
## Outline

- Global trends in fishway effectiveness
- The (neglected) temperate Southern Hemisphere
- A new approach to fishway design criteria:
  - Upstream fishway design for “migratory” species
  - Mortality during downstream passage
- Applications to hydropower planning, design and monitoring

# **Global trends in fishway effectiveness**



# Global trends in fishway effectiveness



From Kemp (2016) *River Res. Appl.*

# Global trends in fishway effectiveness

RIVER RESEARCH AND APPLICATIONS

*River Res. Applic.* (2016)

Published online in Wiley Online Library

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## The development of fish passage research in a historical context

Christos Katopodis<sup>a,\*</sup>, John G. Williams<sup>b,1</sup>

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### ARTICLE INFO

### ABSTRACT

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FA

Title: Structures assisting the migrations of non-salmonid fish: Latin America...

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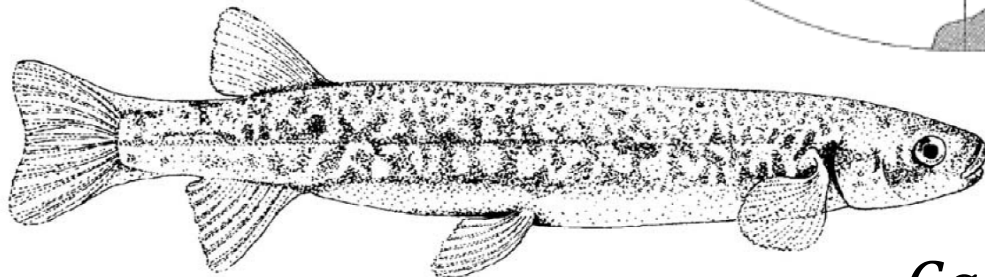
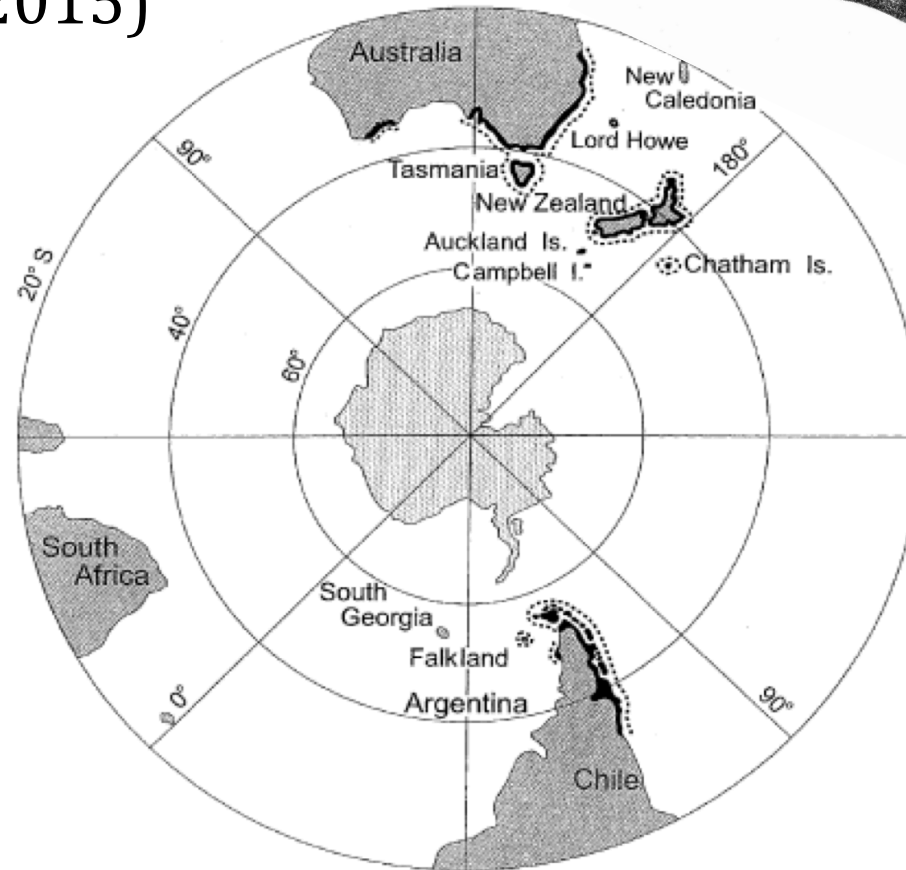
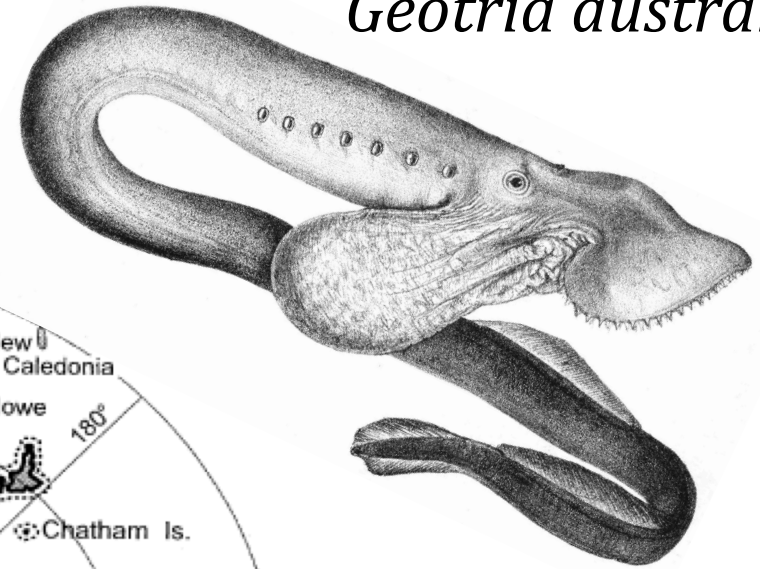
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# **The temperate Southern Hemisphere**

# Fish fauna

“Non-sport” fish <150 mm  
(Link & Habit, 2015)

*Geotria australis*



*Galaxias maculatus*

# Chilean freshwater species

Wilkes et al. (in prep.)

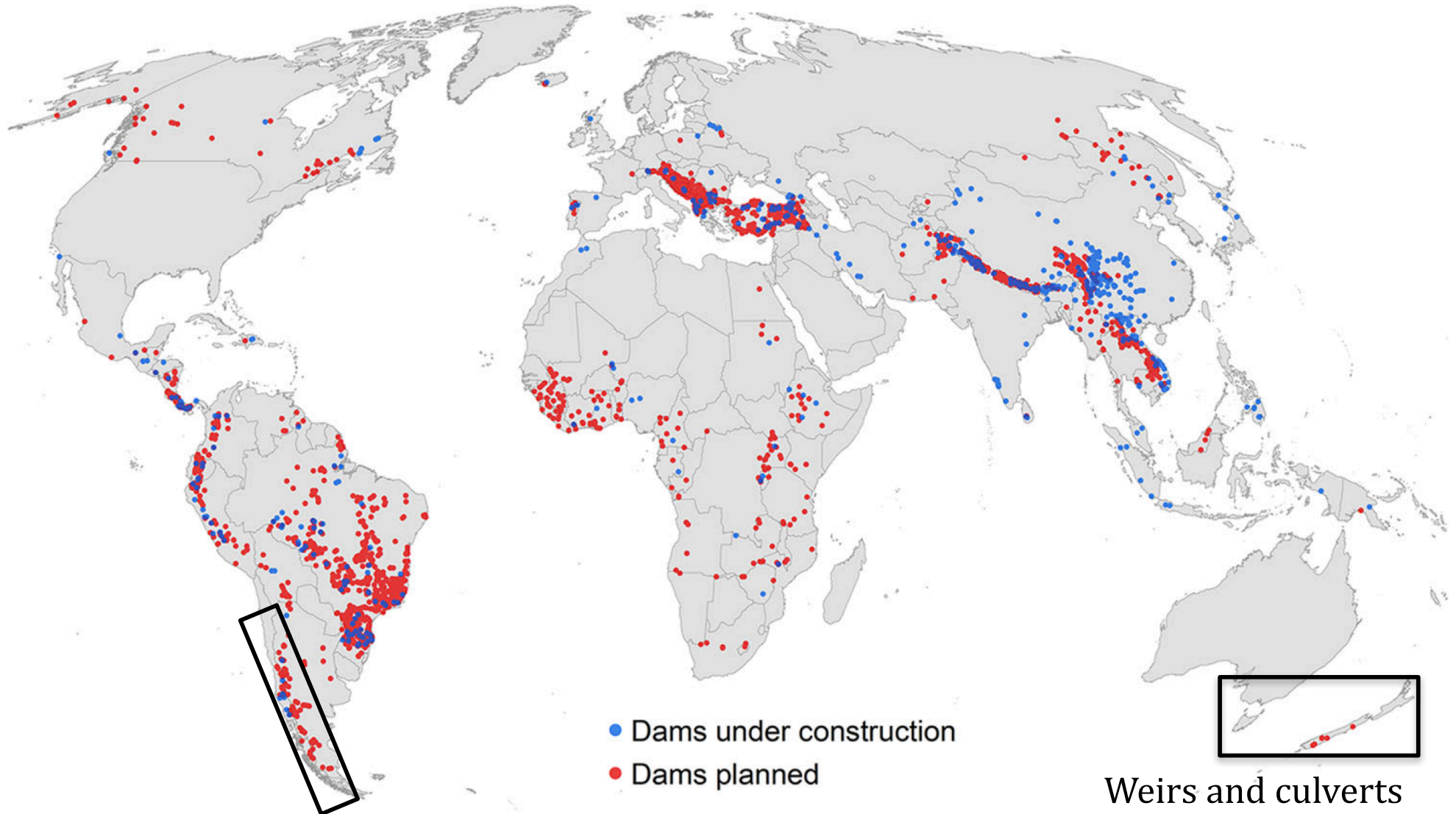
Order	Family	Species	Conservation status	Life-history
Petromyzontiforms	Geotridae	<i>Geotria australis</i>	Vulnerable	Anadromous
	Mordaciidae	<i>Mordacia lapicida</i>	Endangered	Anadromous
Characiforms	Characidae	<i>Cheirodon pisciculus</i>	Vulnerable	Resident
		<i>Cheirodon galusdae</i>	Vulnerable	Resident
		<i>Cheirodon kiliani</i>	Endangered	Resident
		<i>Cheirodon australe</i>	Vulnerable	Resident
Siluriforms	Nematogenyidae	<i>Nematogenys inermis</i>	Endangered	Resident
	Trichomycteridae	<i>Bullockia maldonadoi</i>	Endangered	Resident
		<i>Trichomycterus areolatus</i>	Vulnerable	Resident
		<i>Trichomycterus chiltoni</i>	Endangered	Resident
		<i>Diplomystes chilensis</i>	Endangered	Resident
		<i>Diplomystes nahuelbutaensis</i>	Endangered	Resident
		<i>Diplomystes camposensis</i>	Endangered	Resident
		<i>Diplomystes incognitus</i>	Not classified	Resident
Galaxiiforms	Galaxiidae	<i>Galaxias maculatus</i>	Vulnerable	Catadromous*
		<i>Galaxias globiceps</i>	Endangered	Resident
		<i>Galaxias platei</i>	Least concern	Resident
		<i>Brachygalaxias bullocki</i>	Vulnerable	Resident
		<i>Aplochiton zebra</i>	Endangered	Resident
		<i>Aplochiton marinus</i>	Endangered	Marine-estuarine
		<i>Aplochiton taeniatus</i>	Endangered	Catadromous**
Artheriniforms	Artherinopsidae	<i>Basilichthys microlepidotus</i>	Vulnerable	Resident
		<i>Odontesthes mauleanum</i>	Vulnerable	Resident
		<i>Odontesthes brevianalis</i>	Vulnerable	Resident - Estuarine
Perciforms	Percichthyidae	<i>Percichthys trucha</i>	Near threatened	Resident
	Perciliidae	<i>Percichthys melanops</i>	Vulnerable	Resident
		<i>Percilia irwini</i>	Endangered	Resident
		<i>Percilia gillissi</i>	Endangered	Resident
Mugiliforms	Mugilidae	<i>Mugil cephalus</i>	Least concern	Catadromous

Adapted from Link & Habit (2015) *Rev. Environ. Sci. Biotechnol.* 14 (1) 9-21.

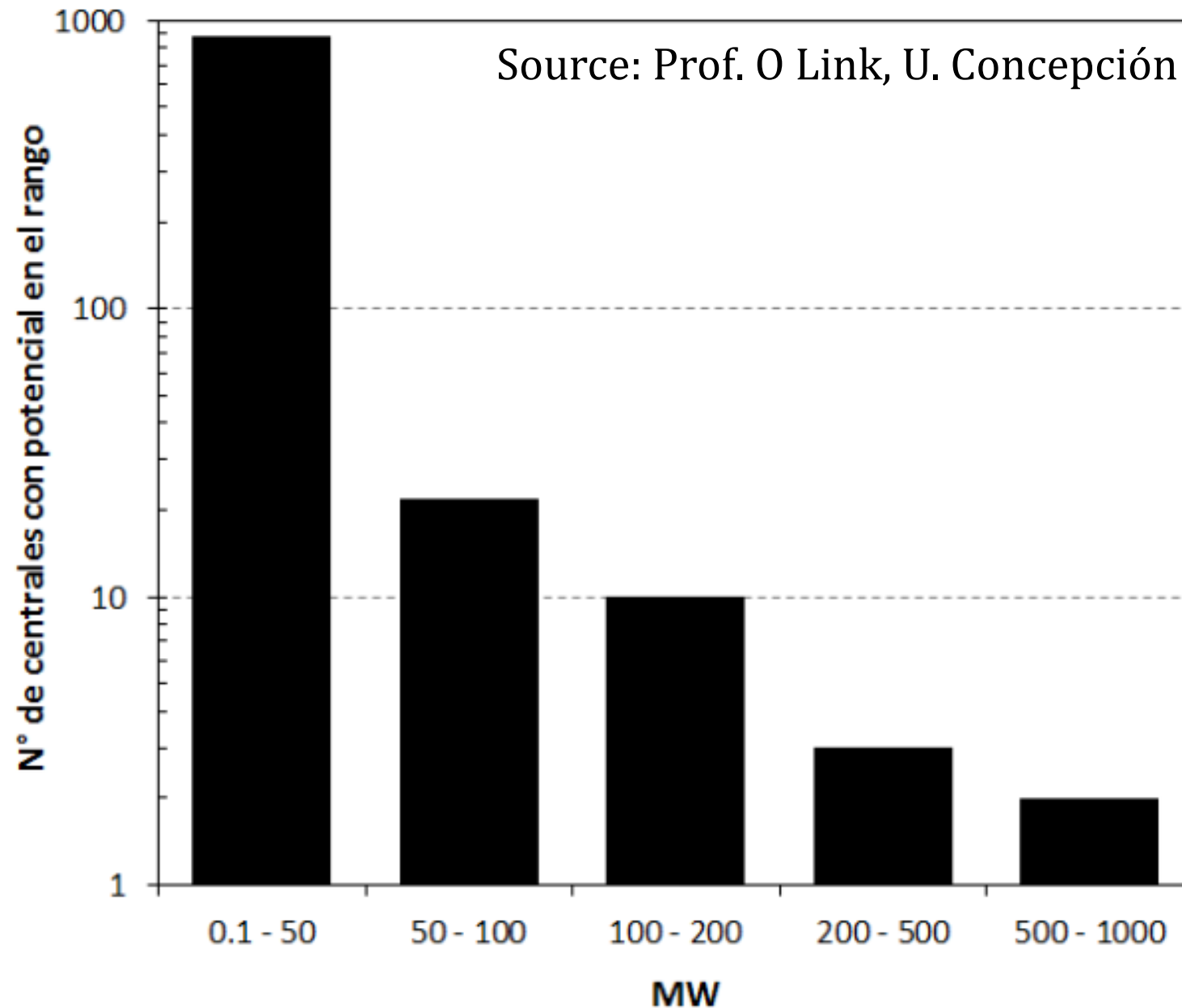


# Hydropower pressure

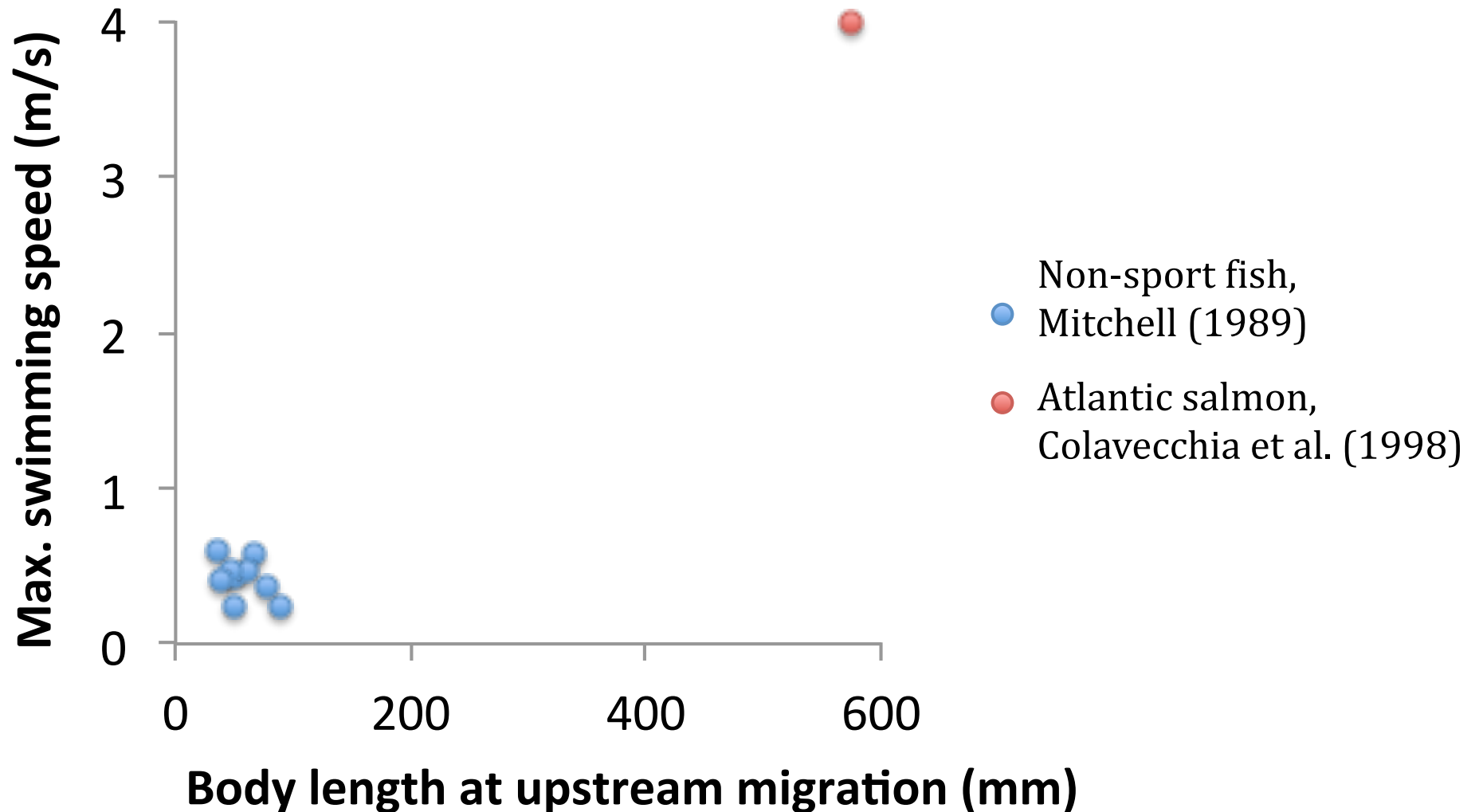
Zarfl et al. (2015) *Aquat. Sci.* 77 (1) 161-170.



# Rapid hydropower development in Chile



## "Non-sport" fish





# **A new approach to fishway design criteria**

# Design criteria



- Approach:
  - Systematic evidence review (Eco Evidence)

# Design criteria



- Approach:
  - Systematic evidence review (Eco Evidence)
  - Expert elicitation workshops



# Design criteria



- Approach:
  - Systematic evidence review (Eco Evidence)
  - Expert elicitation workshops
  - Bayesian Networks

## Expert Elicitation Workshop

## Scenario guide

Fishway design criteria for non-sport species  
26 September 2016, University of Melbourne

