Twenty years of fish passage policies establishment in Brazil: a review of the current status of fish passage science

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Silva, Luiz, "Twenty years of fish passage policies establishment in Brazil: a review of the current status of fish passage science" (2018). International Conference on Engineering and Ecohydrology for Fish Passage. 1.
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Twenty years of the establishment of fish passage policies in Brazil: a review of the current status of fish passage science

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FISH PASSAGE POLICY IN BRAZIL

- Law 2250/SP – 28 Dec 1927 (Decree 4390 – 14 March 1928) – construction of fishways become a legal requirement for dams;

- Decree 794 – 19 Oct 1938 – construction of fishways or hatcheries to mitigate the impacts of dams;

- Decree 221 – 28 Feb 1967 – former SUDEPE;

- Decree 88351/83 e 99274/90 – IBAMA – decision should be based on EIA/EIS results.
FISH PASSAGE POLICY IN BRAZIL

- Law 12.488, 9 Apr 1997 – Minas Gerais State
- Law 4.630, 1998 – Federal level (not approved)

Fish passage mandatory

UNLESS

Unless if not recommended by the EIA/EIS reports
Decision-Making Process

Should be grounded on sound results and key objectives

Well Designed Previous Studies (prior to dam construction)

Environmental Impact Assessment
1) Fish migration
2) Spawning habitats
3) Rearing habitats
4) Feeding habitats

Critical habitats

Lopes & Silva (2012)

How many?
0

1) Fish migration
2) Spawning habitats
3) Rearing habitats
4) Feeding habitats
FISHWAYS IN BRAZIL

VERTICAL SLOT FISH PASSAGE
Silva (2012);
Godinho et al. (2012)

FISH LADDER
Alves (2012)
TRAP AND TRUCK SYSTEM
Santa Clara Dam; Pompeu & Martinez (2005)

Source: http://www.peyrani.org/sistema-de-transposicao-de-peixes-uhe-de-funil/
FISHWAYS IN BRAZIL

Itaipu Dam; Hahn *et al.* (2007)

Santo Antônio Dam

WHY BUILD FISHWAYS?
Clay (1995)
Larinier (2008)
Roscoe & Hinch (2010)
Bunt et al. (2012)
Noonan et al. (2012)
Nyqvist et al. (2017)
Allow access to critical habitats!

Contributed Paper

Fish-Passage Facilities as Ecological Traps in Large Neotropical Rivers

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Conservation of the fish fauna

Artificial stocking

RIVER RESEARCH AND APPLICATIONS
Published online 21 August 2008 in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/rra.1180

MIGRATORY FISHES OF BRAZIL: LIFE HISTORY AND FISH PASSAGE NEEDS

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HOW TO MEASURE SUCCESS?

Fish passage experience at small-scale hydro-electric power plants in France

Michel Larinier

- Difficult concept to determine – may differ for fish facilities or dependent of species considered;

- Effectiveness – qualitative concept – capable to let target species pass

- Efficiency – quantitative concept – proportion of the stock downstream moving upstream
HOW TO MEASURE SUCCESS?

Allow access to critical habitats!
WHAT HAS BEEN DONE?

Neotropical Ichthyology

Peer-reviewed manuscripts

Year

Manuscripts (N)
WHAT HAS BEEN DONE?

South America

Fig. 4. Number of studies published over the years (1987-2014) that investigated fish passage facilities in South America.

Lira et al. (2017)
Overall passage efficiency = 41.7%

- Higher for salmonids

Discuss that upstream passage should allow 90-100% of passage efficiency.

Fishways are not achieving their primary conservation goal — RESTORE CONNECTIVITY.

Salmonids more successful than non-salmonids

**POTAMODROUMOUS?**

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**Figure 2** Mean (±SE) passage efficiencies for up- and downstream migration at fish passage facilities for salmonid and non-salmonid fishes in North America, Europe and South America/Australia.

*Noonan et al. (2012)*
"Over recent years, the often held view that fish passes provide an effective mechanism to mitigate the impacts of impoundments on fish populations has been CHALLENGED."

Species moving upstream were unable to complete reproductive cycle.
Passage efficiency = 10%

Fish passage to allow gene flow?

Passage efficiency = 30%

Fish passage to allow gene flow?

Passage efficiency = 50%

Population not stabilized

Passage efficiency = 100%

Population "boom" in the reservoir

Modelled scenario

Silva et al. (In review)
CONCLUSIONS

• Analyses of fish passage efficiency have been focused on the passage itself;

• There is a pressing need to incorporate a holistic approach to monitor and understand the contribution of fish passages in Brazil to maintain viable populations of migratory fish;

• Also, there is a need for continuous monitoring of fish passages, as well as a greater geographical spread of studies;

• Advancement in the development of conceptual and hypothetical models have been published to discuss fish passage role;

• Nevertheless, the models have not triggered the development of holistic studies yet;