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A Critical Analysis of Existing Fish Pass Structures at Small Hydropower Plants in Turkey

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INTRODUCTION

What is fish passage ?

- Fish passage is a bridge to upstream or downstream for migrating fish.
- Fish migrate in short and long range for food, reproduce, sheltering, escaping from predators to change in environmental conditions and water quality.
- Fish use fish passages like human accros the stream for the sustainability of food chain in stream.



Current status of freshwater fish fauna in Turkey

- Fish fauna of Turkish freshwater;
- 368 species, 31 families and 16 orders

- Dominant species in fish fauna of Turkish freshwater;
- Cypriniformes order with 247 species
- Cyprinidae (188 species), Nemacheliidae (39 species), Salmonidae (21 species), Cobitidae (20 species), Gobiidae (18 species)
(Çiçek et al., 2015)

- Endemism; 153 endemic species
- Non-native species: 28 species

Fish Passage Status of Dams, Reservoirs/Regulators, SHP

(Source: State Water Works of TR)



Type	Number	Fish passage status	Private or Governmental
Dam	592	No	G
Res/Reg	176	35	G
SHP	413	Most of them	P

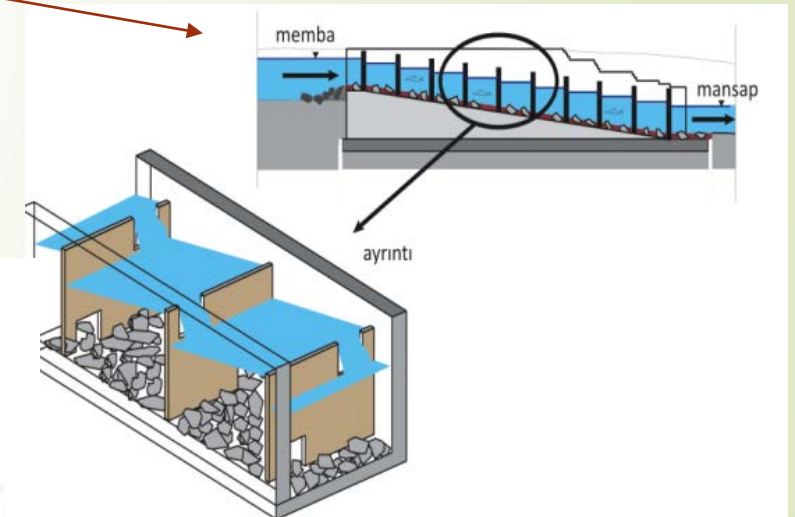
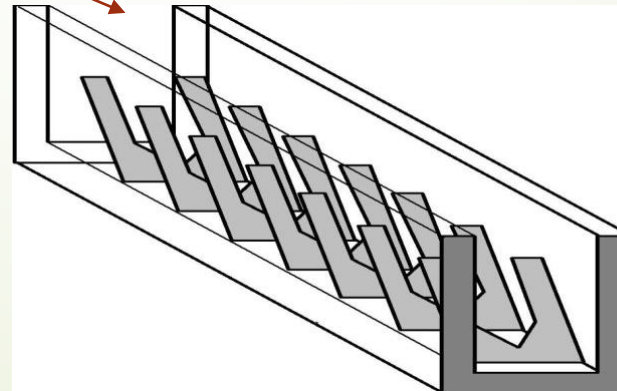
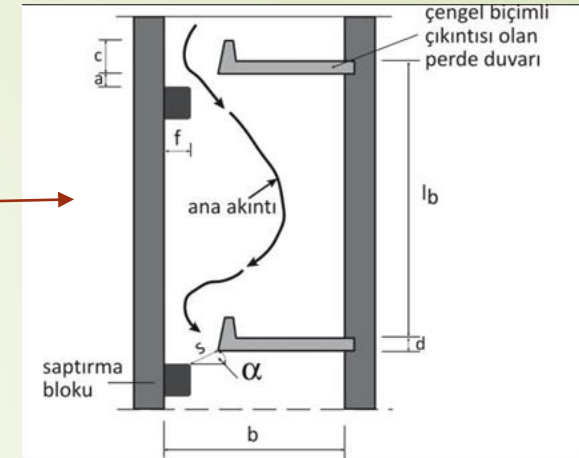


Fish passage types used by Hydro Power Plants

Vertical Slot

Pool and Weir with orifice

Denyl type



General Problems in Fish Passages of Turkey

► Functionality

- Incorrect target species selection
- Inadequate fishpass type choice
- Don't ignore downstream migration

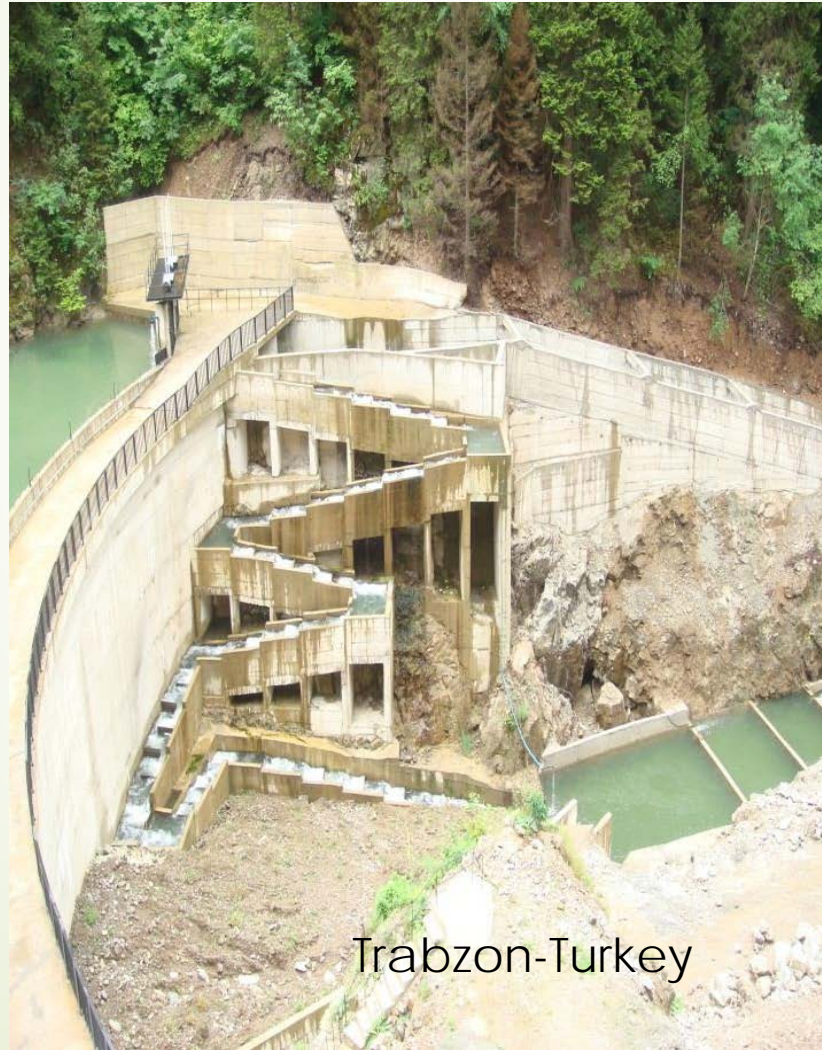


► Structural

- High slope in fishpass >1:20
- No enough water
- Unsuitable entrance



Fish passage examples from Turkey



Some fish passages examples from Turkey



Present status of fish passages of SHP in Turkey

- Most of the fish pass structures are pool-weir and they have high velocity ($V > 2$ m/s) in the orifice slots
- Passability of small and weak swimming capacities fish were not taken into account
- Inlet and outlet of the passes were not adequately designed for fish traceability
- Dynamic upstream water levels were ignored.

Nonfunctional Fish Pass in Supercritical Flow Regime



Inadequate Upstream Inlet for Fish Traceability



Case Study: Karakeçeli SHP, Yeşilirmak River Basin

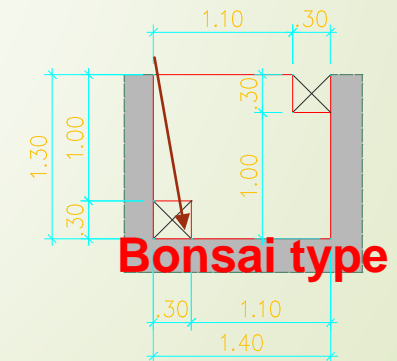
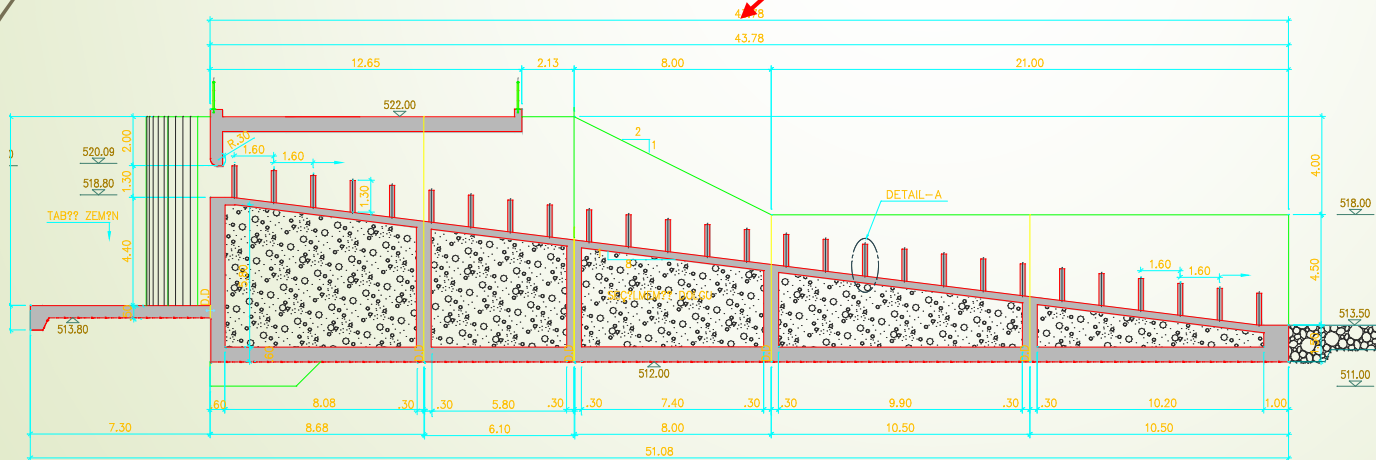
Caught fish in the project area



Atherina boyeri

Nemacheilus angorae

Do not Match



Bonsai type !

Fish Pass Type: Pool-Weir

Case Study: Ceyhan River Basin

Length distribution of fish in the trap in a Vertical Slot Fish Pass

Data Source: Alp et al. (2015)

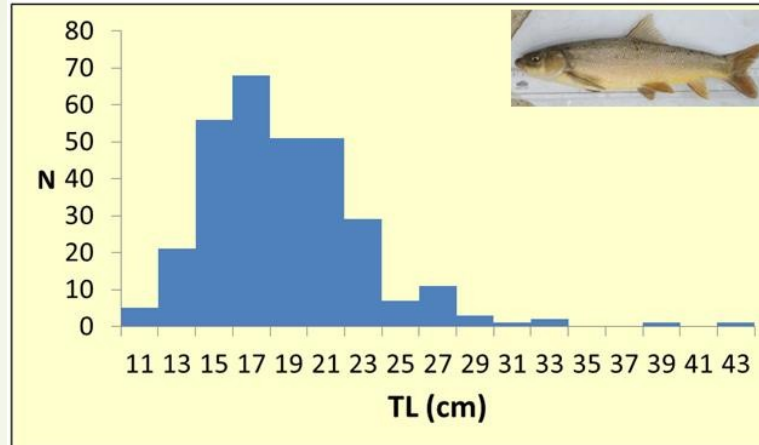


Figure 1. Length distribution of *Capoeta angorae* in the trap in a vertical slot fish passage

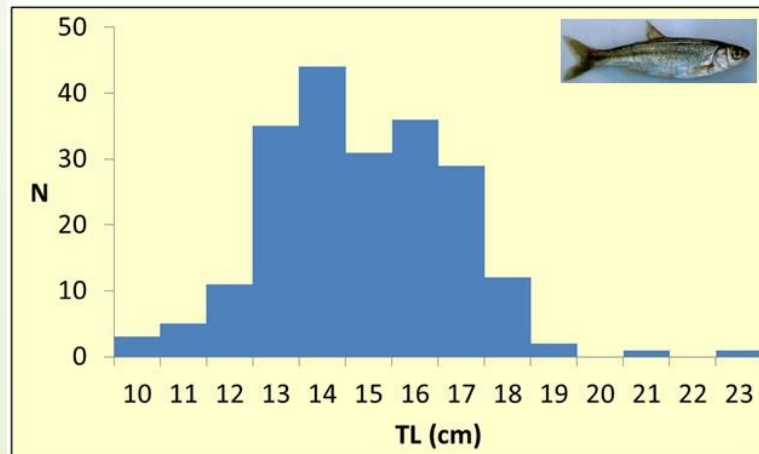
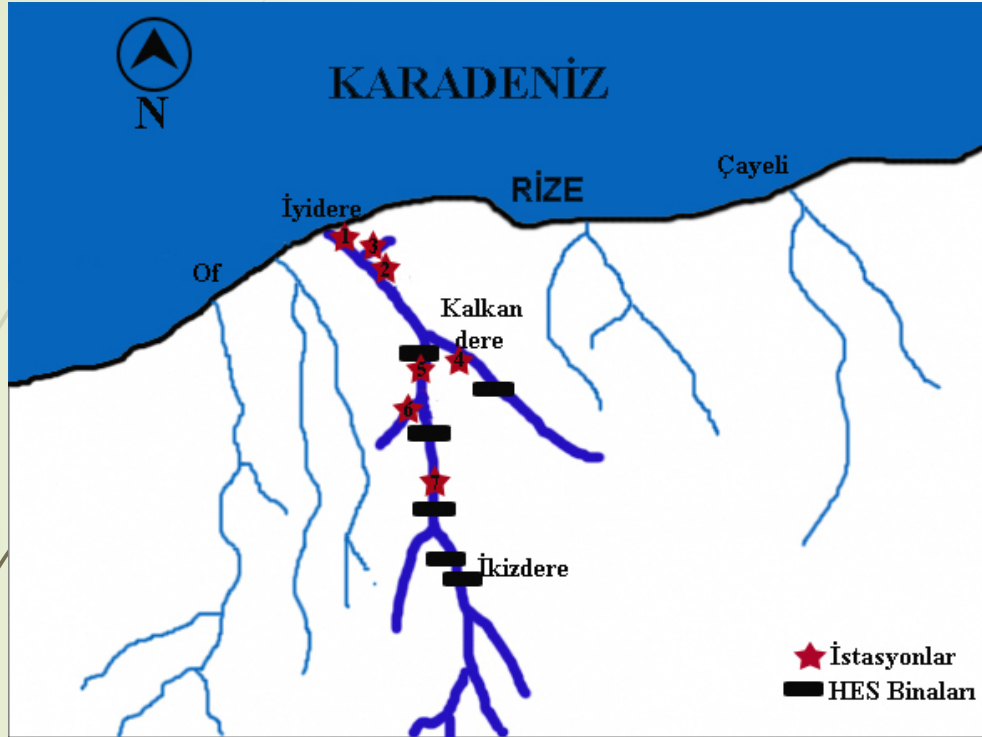


Figure 2. Length distribution of *Alburnus kotschy* in the trap in a vertical slot fish passage

A Research Project on the Eastern Black Sea Region of Turkey



An Investigation of The Hydrodynamic and Fish Behavior Characteristics of The Brush-Type Fish Passage: İyidere (Rize-Trabzon) Field Study*

*This work is supported by the Scientific and Technical Research Council of Turkey under Scientific and Technological Research Projects Funding Program (1001 TUBITAK) grant with agreement number 315M019

Fish Species of Project Area (iyidere River Basin)

All species

- ▶ *Salmo rizeensis*
- ▶ *Salmo coruhensis*
- ▶ *Lampetra lanceolata*
- ▶ *Squalius orientalis*
- ▶ *Alburnus derjugini*
- ▶ *Chondrostoma colchium*
- ▶ *Barbus tauricus*
- ▶ *Capoeta species*
- ▶ *Alburnoides fasciatus*
- ▶ *Rutilus frisii*
- ▶ *Ponticola rizeensis*
- ▶ *Cobitis splendens*

Target species

- *Salmo coruhensis*
- *Lampetra lanceolata*
- *Barbus tauricus*
- *Alburnoides fasciatus*
- *Rutilus frisii*
- *Ponticola rizeensis*
- *Cobitis splendens*

PROJECT AREA: İyidere- İkizdere river basin



Sea trout (*Salmo coruhensis*)



Barbel (*Barbus taurucus*)



Fish passage



Spirlin (*Alburnoides fasciatus*)



Lamprey





iyidere-ikizdere havzası-Anzer





İkizdere-Cimil



Thanks a lot..

