

Fishways in Japan and Case study of small scale improvements on fishways

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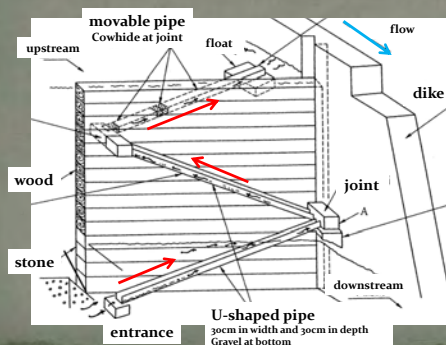
Today's Contents

- ✓ History of fishway in Japan
- ✓ Types of fishways in Japan
- ✓ Data of fishways in Japan
- ✓ Small scale improvement
---- case study

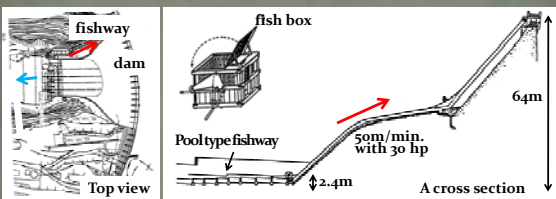
History of fishway in Japan(1)

- ✓ Around 1870, a small fishway installed on a fall at Lake Towada
- ✓ 1888, a 55m long fishway installed at Kinu River
- ✓ 1912, a fishway installed for eel at Seta River
- ✓ 1929, the first pool type fishway installed at Agano River
- ✓ 1931, a elevator type fishway installed at Sho River

The fishway for eel at Seta River



The elevator type fishway at Sho River



History of fishway in Japan(2)

- ✓ 1966, the first vertical slot type fishway installed at Agano River
- ✓ 1976, the first denil type (sectional) fishway installed at Yoshida River
- ✓ 1990, the 1st International Symposium on Fishways held in Gifu
- ✓ 1995, the 2nd International Symposium on Fishways held in Gifu

History of fishway in Japan(3)

- ✓ 1990, “project for creation of rivers richly endowed with nature” started
- ✓ 1991, “Model projects for the promotion of river works to facilitate fish migration” started and 19 rivers selected for this project

魚がのぼりやすい川づくりの
手引書
The guideline of
river works to
facilitate the ascent
of fish
国土交通省河川局
The Ministry of Land,
Infrastructure, Transport
and Tourism

Types of fishway in Japan

Pool and weir fishway



Iwakumai Dam, Gokase River

Pool type fishway with a trapezoidal section



Sashirui River (<http://gyodo.jp/contents/activity-log/2008/3.html>)

Ice harbor fishway



Sagami Dam, Sagami River

Pool type fishway
with horizontally slant weir



Oukouzu dam, Shinano River (出典：魚道事例集)

Half cone fishway



Hamura Dam, Tama River

Vertical slot fishway



Isobe Headworks, Sagami River

Sector type fishway



Kubota Ground Sill, Mogami River (出典：魚道事例集)

Slope type fishway with cobbles



Yomogisawa Sabo Dam #2, Uono River (出典：魚道事例集)

Slope type fishway with curved surface



Itachi River and Kshiwao River Merge Drop Structure, Itachi River
(出典：魚道事例集)

Gentle slope type fishway



Aono Dam, Aono River (出典：魚道事例集)

Ship way type denil fishway



Ashidagawa Tidal Weir, Ashida River (出典：国土交通省)

Full face type fishway with cobbles



Nabeta Ground Sill, Iwano River (出典：国土交通省)

Full face type fishway with concrete blocks



Iwatomi Drop Structure, Fushino River (出典：魚道事例集)

Other types of fishway



Setback type fishway
Nikaryo shukugawara Dam, Tama River
(出典：魚道事例集)



Zigzag type fishway
Arase Dam, Kuma River
(出典：魚道事例集)



Removable fishway
Chinai River
(<http://www.tonuma.com/index4.html>)

Other types of fishway



Operation type fishway
Kema Water Gate, Yodo River
(出典：国土交通省)



Combined fishway
Ice harbor + vertical slot
Arai dam, Shinano River
(出典：国土交通省)



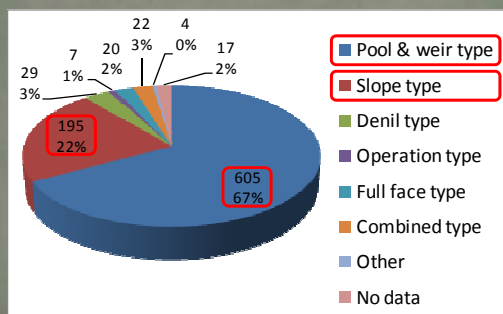
A couple of types of fishways on a weir
Arai dam, Shinano River
(出典：国土交通省)

A Numbers of Fishway

- ✓ How many fishways all over Japan?
> One book says 10,000 - 20,000
Nobody Knows.
- ✓ 899 fishways in governmentally controlled sections of rivers
(by the fishway research by MLIT)

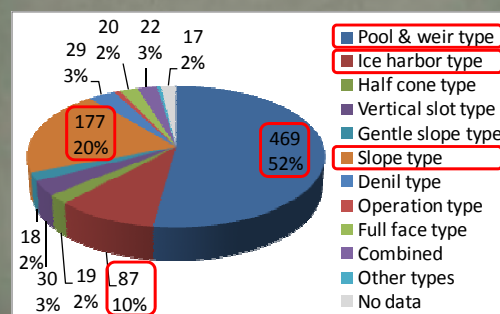
Data of Fishways in Japan(1)

Portions of fishway types



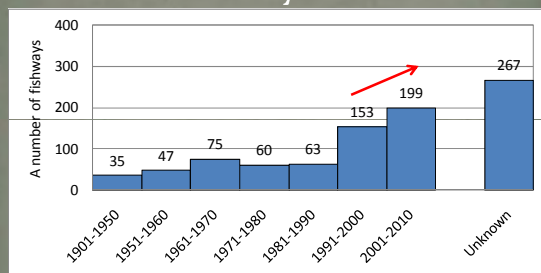
Data of Fishways in Japan(2)

Portions of fishway types (more details)



Data of Fishways in Japan(3)

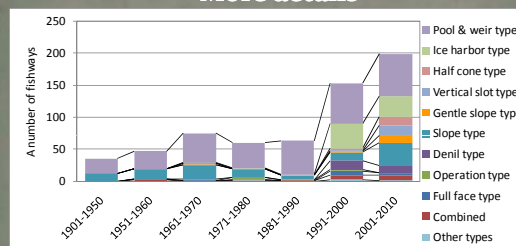
When fishways installed?



Rapid increase since 1991.

Data of Fishways in Japan(4)

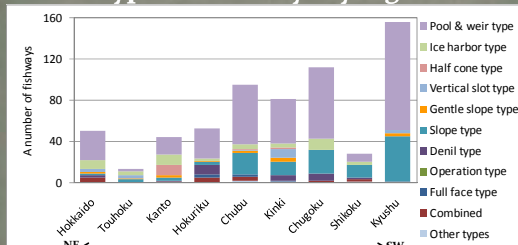
More details



since 1991, a rapid increase and more diverse.
 >>>> "Model projects for the promotion of river works to facilitate fish migration"

Data of Fishways in Japan(5)

Types of fishways by regions



A certain pattern on a certain region

>>> More half cone fishways in Kanto,
 >>> No ice harbor fishways in Kyushu, etc.....

Fishway problems and factors

In the questionnaire for offices of MLIT (2009 & 2010)

Problems	Factors
Impossible to reach fishway	No continuity to the lower end of fishway
Impossible to enter fishway	Large drop at the entrance of fishway
	Sediment at the entrance of fishway
	Entrance sticking out to downstream
	Another strong flow outside of fishway
Impossible to go up thru fishway	Too steep
Only large size fishes can go up	Too much air bubbles
A certain kind of fishes can go up	Turbulent flow
	Air pocket between water flow and weir
	High velocity
	Seiche
	Low flow
	Damaged
Impossible to go out of fishway	Sediment at the exit of fishway
Impossible to migrate down	No water depth at front apron

Examples (1)

Impossible to reach fishway



出典：魚道のはなし。技術者のための魚道ガイドライン及び国土交通省

Examples (2)

Impossible to enter fishway



出典：魚道のはなし。技術者のための魚道ガイドライン及び国土交通省

Examples (3)

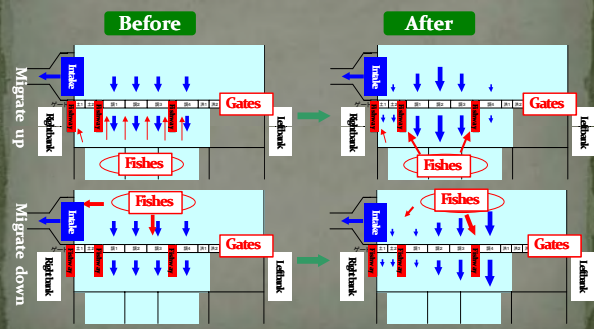
Impossible to go up thru fishway or to exit



出典：魚道のはなし。技術者のための魚道ガイドライン及び国土交通省

Fishway improvement (1)

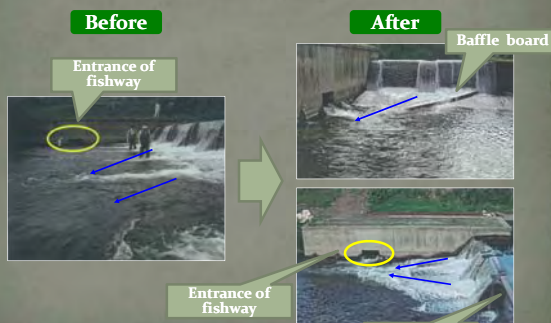
Impossible to enter fishway => Adjustment of water flow



(資料提供：水資源機構)

Fishway improvement (2)

Impossible to enter => Adjustment of water flow



(出典：技術者のための魚道ガイドライン)

Fishway improvement (3)

Impossible to enter => Alteration of the entrance



(資料提供：岐阜県)

Fishway improvement (4)

Impossible to enter => Installation of small slope fishway

Before



After



(資料提供：国土交通省)

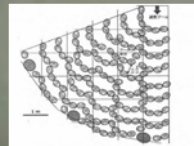
Fishway improvement (5)

Impossible to enter => Installation of sector type fishway

Before



After



(資料提供：山口県)

Fishway improvement (6)

Impossible to enter => Installation of setback type fishway

Before



After



(資料提供：国土交通省)

Fishway improvement (7)

Impossible to enter => Installation of sandbags (afflux)

Before



Gap gets smaller

After



Installation of sandbags to get water level up

(資料提供：大阪府)

Fishway improvement (8)

Impossible to go up => Alteration to ice harbor fishway

Before



After



Concrete block for rest space

Addition of weirs to shorten the drop

Wood panel for less cost

(資料提供：水資源機構)

Fishway improvement (9)

Impossible to go up => Installation of partition panel

Before



Divide width into halves

After



Installation of partition panel

(資料提供：岐阜県)

Fishway improvement (10)

Impossible to go up => Alteration of weir

Before



Horizontal weir

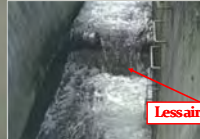


Air pocket between water flow and weir

After



Trapezoidal weir with cobbles



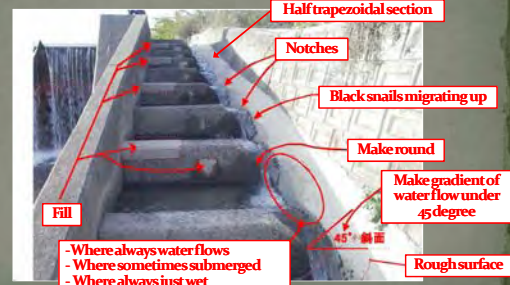
Less air pocket

(出典：技術者のための魚道ガイドライン)

Fishway improvement (11)

Impossible to go up => Half trapezoidal section and notches

After



Half trapezoidal section

Notches

Black snails migrating up

Make round

Make gradient of water flow under 45 degree

Rough surface

Fill

- Where always water flows
- Where sometimes submerged
- Where always just wet
- Where always dry

(資料提供：山口県)

Fishway improvement (12)

Impossible to go up => Reduction of drops

Before



Drops on this weir is too large to go over

After



Using cobbles dug up at the other construction in this watershed



Smaller drops

(資料提供：国土交通省)

Fishway improvement (13)

Impossible to go up => Alteration to Trapezoidal section

Before



Uniform flow

Air pocket between water flow and weir

After



Less air pocket

(出典：技術者のための魚道ガイドライン)

Fishway improvement (14)

Impossible to go up => Installation of removable fishway

After



Removable fishway made with stainless

Net to avoid to be eaten by birds

(資料提供：鳥取県)

Fishway improvement (15)

Impossible to go up => Secure fish route on construction

After



Notches on steel sheet piles for water flow toward the entrance of fish route

Secure the route for migrating fish by steel sheet piles used for channel excavation

(資料提供：福井県)

