



Conservation of Ayu in the “Nagara River System”

**Gifu Prefctural Research Institute for
Fisheries and Aquatic Environments**

Satokawa

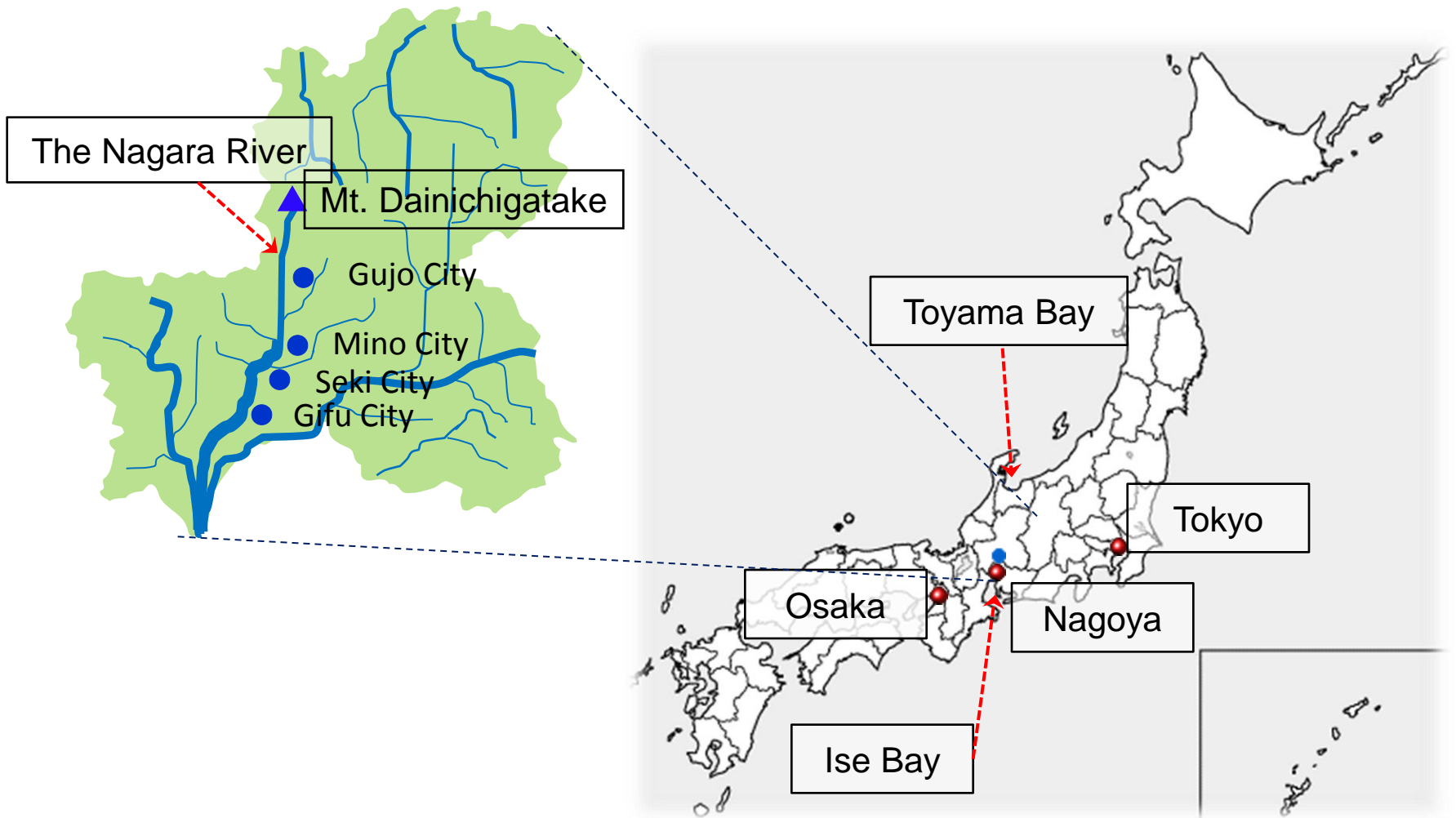


- “*Satokawa*” refers to river system integrated into rural settlements through wise use and proper management of surrounding areas and forests.
- “*Satokawa*” is a vital link connecting mountains of “*Satoyama*” with sea of “*Satoumi*”.

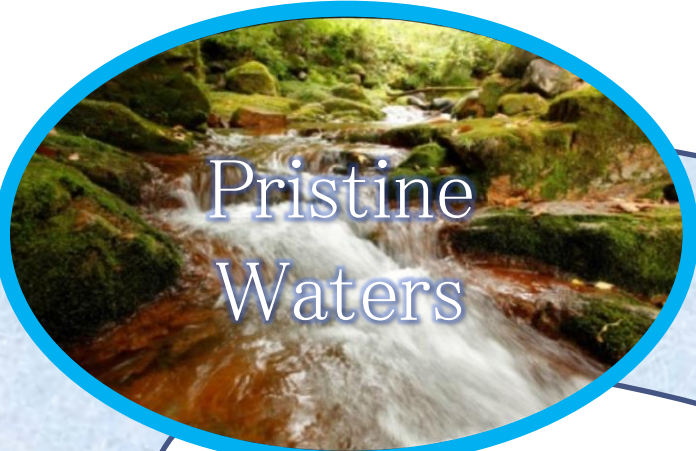


Overview of the Nagara River

The Nagara River is 166km in length and passes throughout some cities such as Gujo, Mino, Seki and Gifu. It originates from Mt. Dainichigatake and finally flows into Ise Bay.



The Nagara River System (*Satokawa*)



Landscape
Diversity

Fish Species in the Nagara River

Ayu



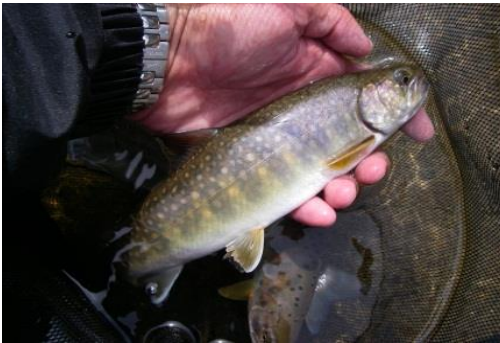
Red Spotted Masu Trout
(Landlocked Form)



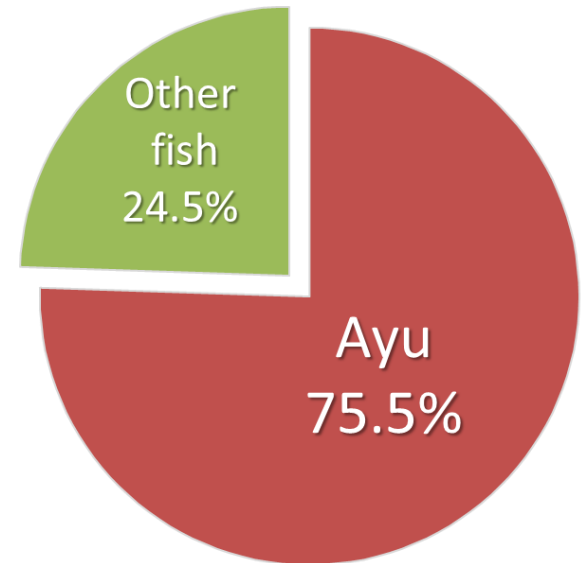
Red Spotted Masu Trout
(Catadromous form)



White Spotted Char



Japanese Eel



It is reported that we can see ~74 fish species in the Nagara River, with only the 17 species being targets for fishing.

Ayu accounts for the largest yield on the Nagara River and its annual catch is estimated about 253,000kg. It corresponds to 75% of the total fish catch on the Nagara River.

Annual Fish Catch on the
Nagara River in 2002

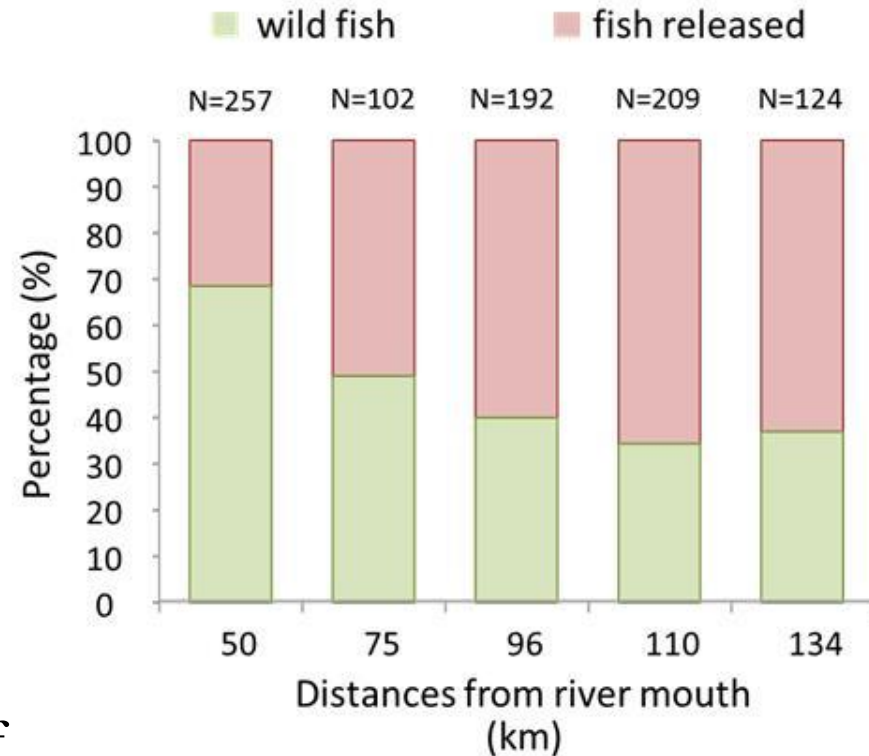
The Importance of Wild Ayu



Inland fisheries on the Nagara River are exploited for catching not only wild fish but also hatchery-released fish.

Wild ayu accounts for about 45 % of the total fish catch on average, and therefore wild fish are main targets for fishing around the lower basin.

The proportion of fish catch among wild and released ayu



Distance from the river mouth

Activities to Conserve Ayu Resources

Reproduction of wild fish can considerably contribute to a yield of fish on the Nagara River. Proper management for conserving wild ayu is important in order to use natural resources wisely and sustainably. Gifu Prefecture has conducted a variety of activities with fisheries cooperatives and politicians.

1. Conservation of spawning fish
2. Construction of spawning grounds
3. Release of fertilized eggs
4. Release of juvenile ayu stocks
(The Efforts to Preserve Genetic Variation)



Conservation of Spawning Grounds

[Establishment of Non-fishing Areas]

Point A: 43km upstream from Ise Bay

Closed period: Sep. 15 - Oct. 15

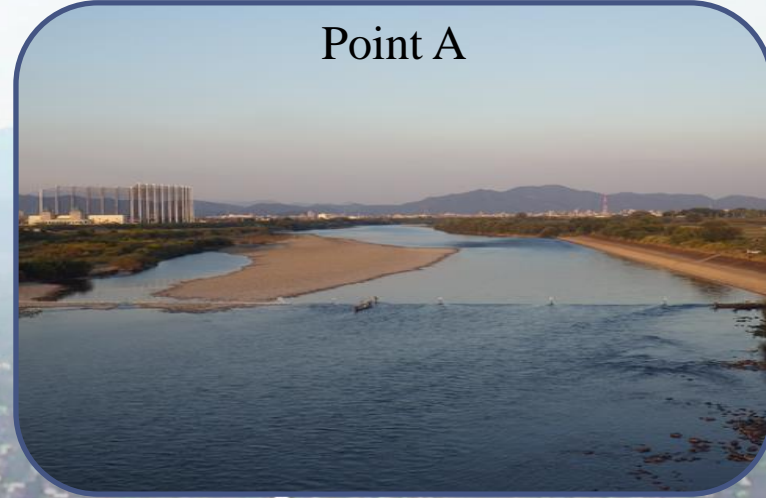
Non-fishing area: 250,000m²

Point B: 37km upstream from Ise bay

Closed period: Sep. 25 - Oct. 31

Non-fishing area: 450,000m²

Point A



Point B

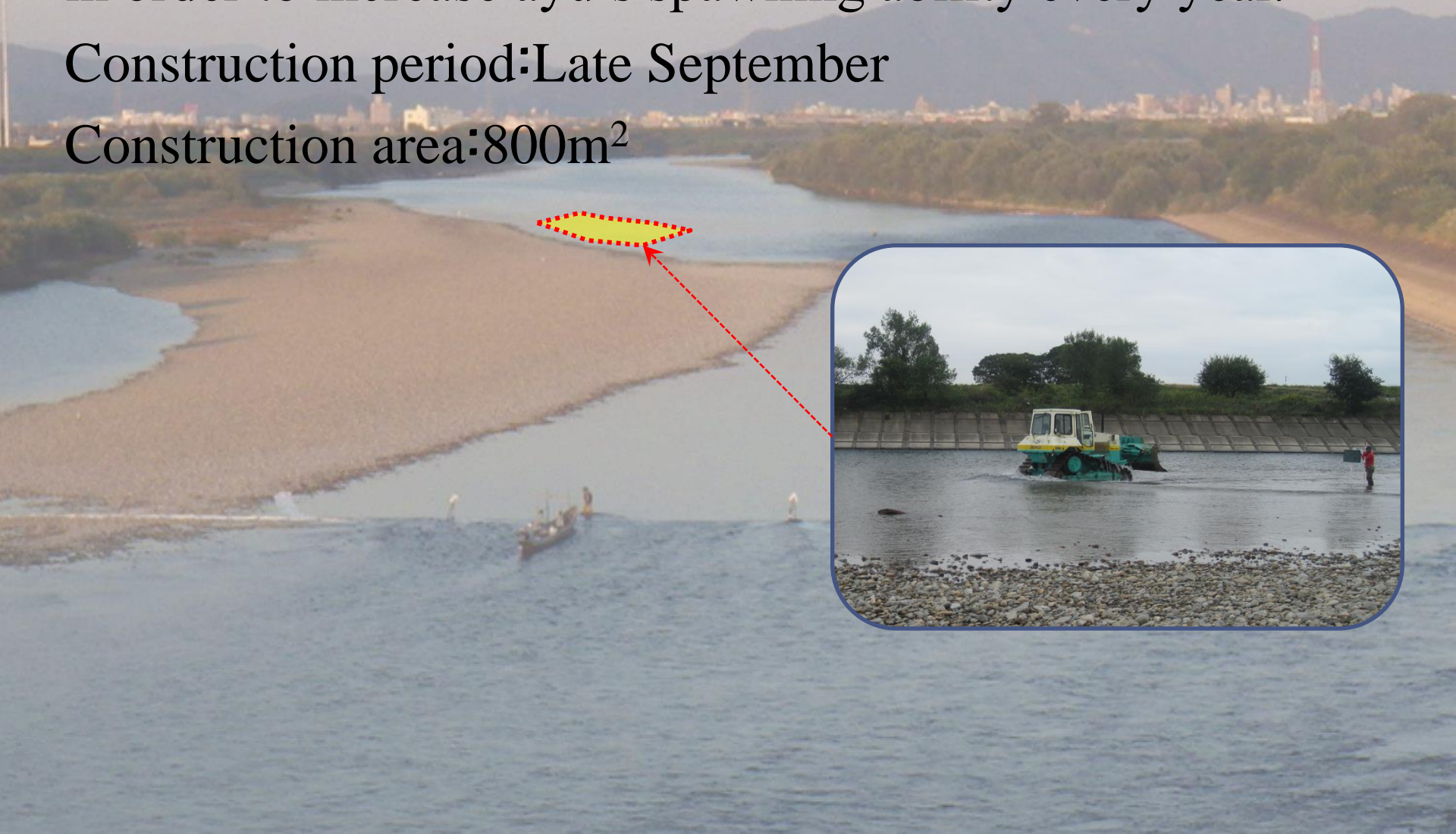


Construction of a Spawning Ground on the Nagara River

A spawning ground of ayu is constructed in the riverbed in order to increase ayu's spawning ability every year.

Construction period: Late September

Construction area: 800m²



Release of Fertilized Eggs [Activities by Fishermen]

Collection of Sperm and Eggs from Wild Ayu



Fertilization



Management of Fertilized Eggs



Release of Fertilized Eggs

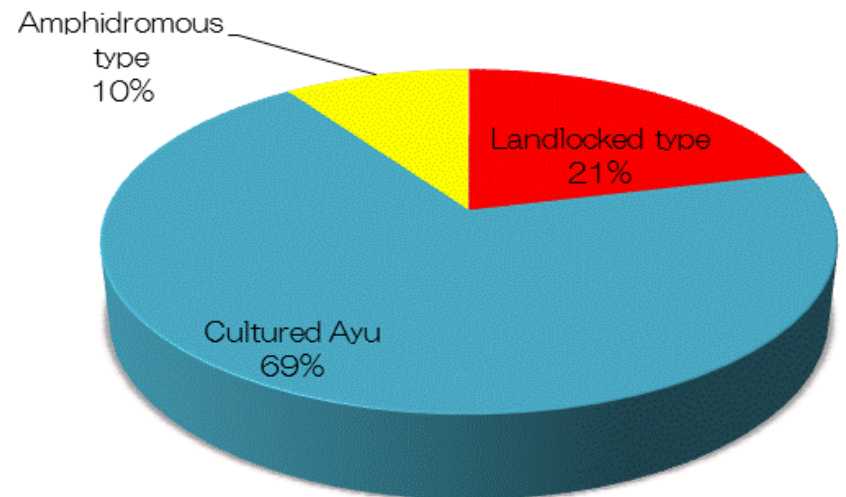


Release of Ayu Stocks [a variety of ayu stocks]

In order to compensate a shortage of natural resources, some institutes often release hatchery fish. Various stocks have been produced by hatchery, but consideration for genetic mixing between wild and hatchery ayu is not sufficient. Releasing genetically consistent fry of the river is important in order to prevent genetic mixing.



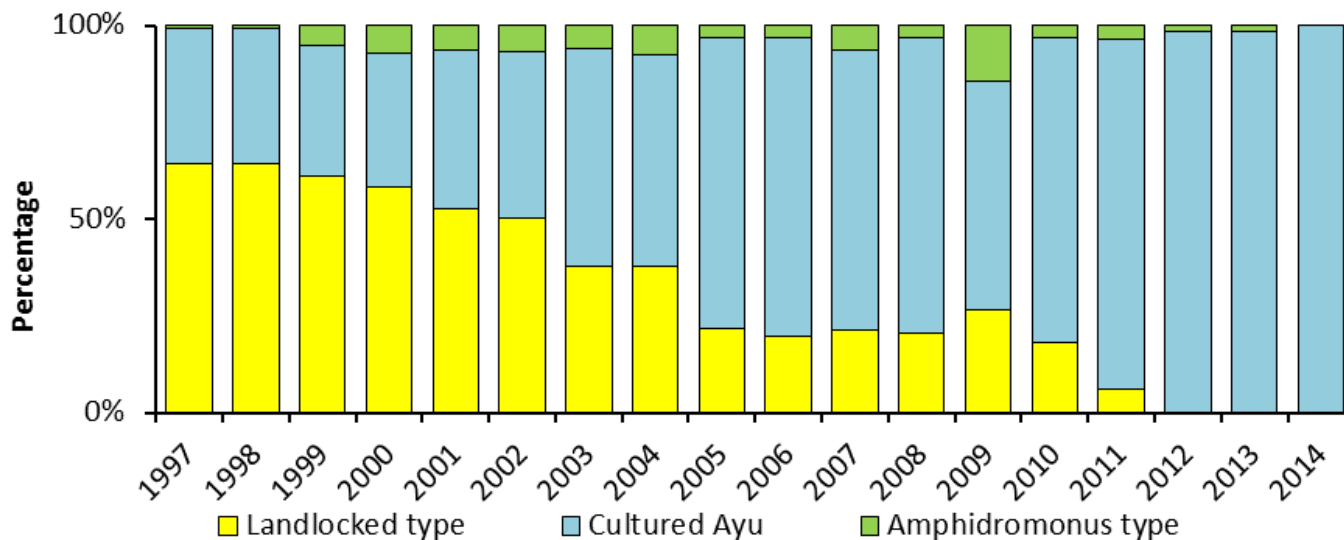
Types of released ayu stocks in Japan



Release of Ayu Stocks [Present state]

A life cycle of wild ayu on the Nagara River is an amphidromous. Gifu Pref. previously released genetically different type of landlocked ayu from Lake Biwa where is located 50km away from Gifu. Recently, this contribution has been decreasing in order to conserve genes of wild ayu population.

Types of released ayu stocks on the Nagara River

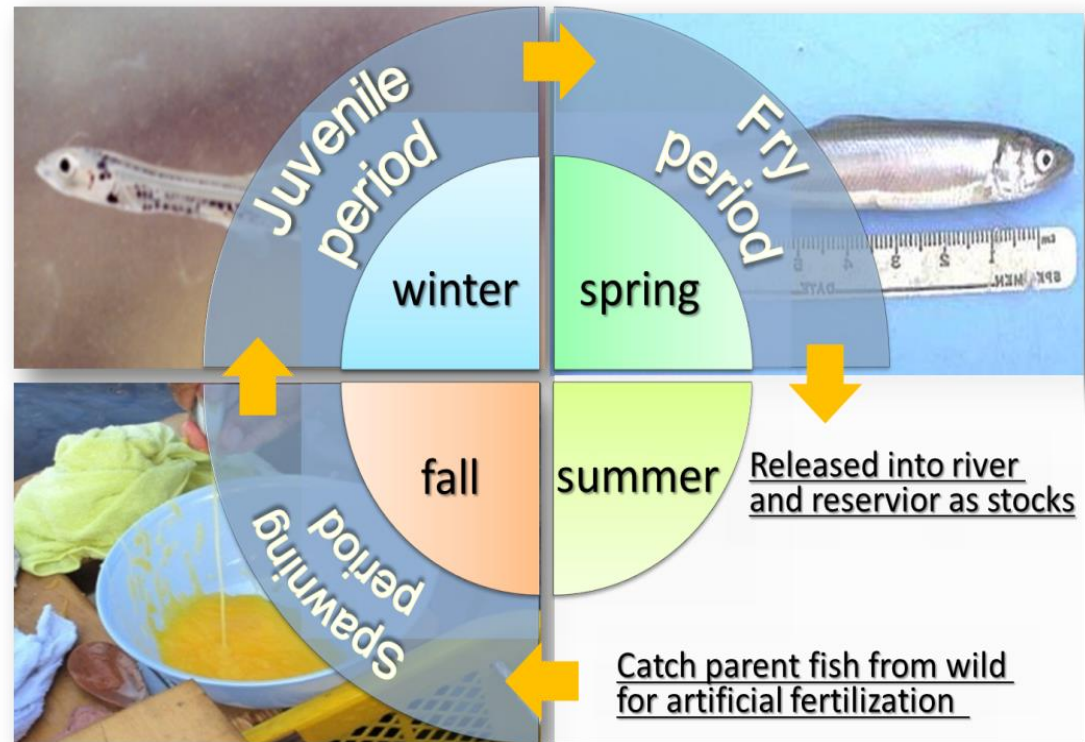


Release of Ayu Stocks

[The Efforts to Preserve Genetic Variation]

All of ayu stocks released into the Nagara River are supplied by the Gifu Prefectural Ayu Hatchery.

- Catching parent fish on the Nagara River and fertilizing them artificially.
- More than 1,500 males and 4,000 females are fertilized at the Hatchery.
- The hatchery is generally not allowed to keep passaged fish.

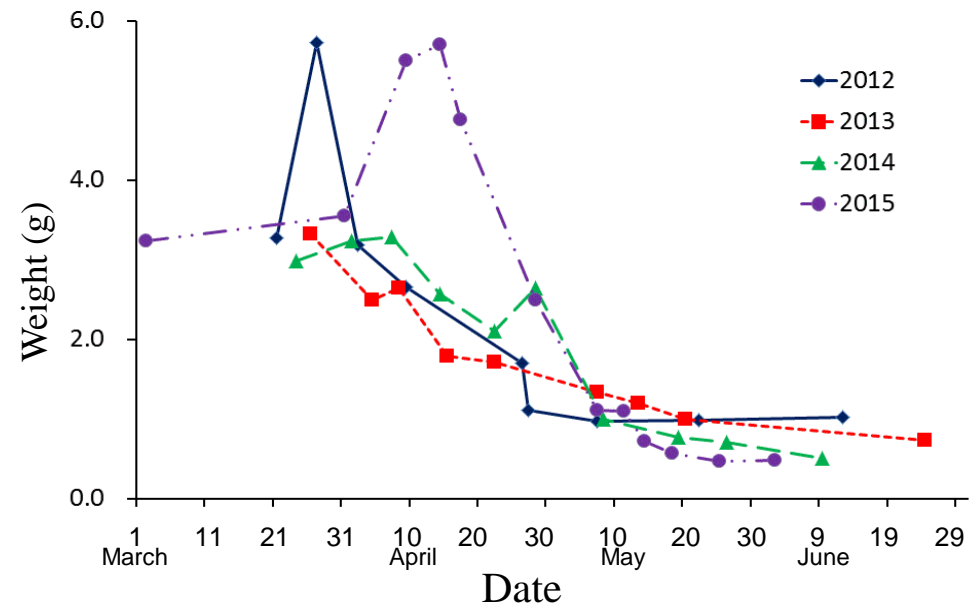


Challenges in the future

The clear relationship can be observed between the time of migration from the sea and the size of migratory fish. For example, later a fish migrates, smaller its size becomes. Recently, the data shows that migration time was delayed, the fish size was small. It may be supposed that overfishing of matured fish on the river especially in early spawning season mainly causes it.



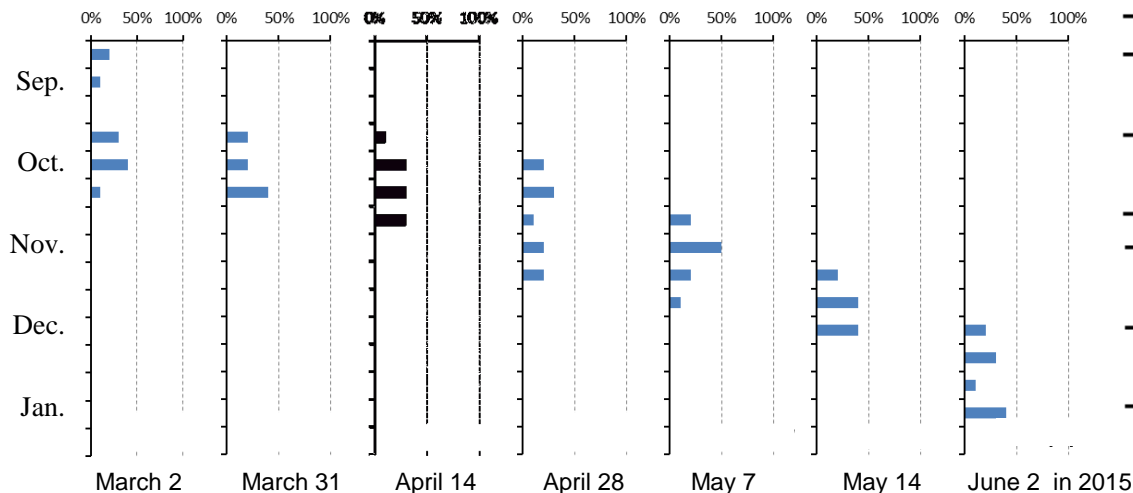
Weight of ayu caught on the Nagara River from 2012 to 2015



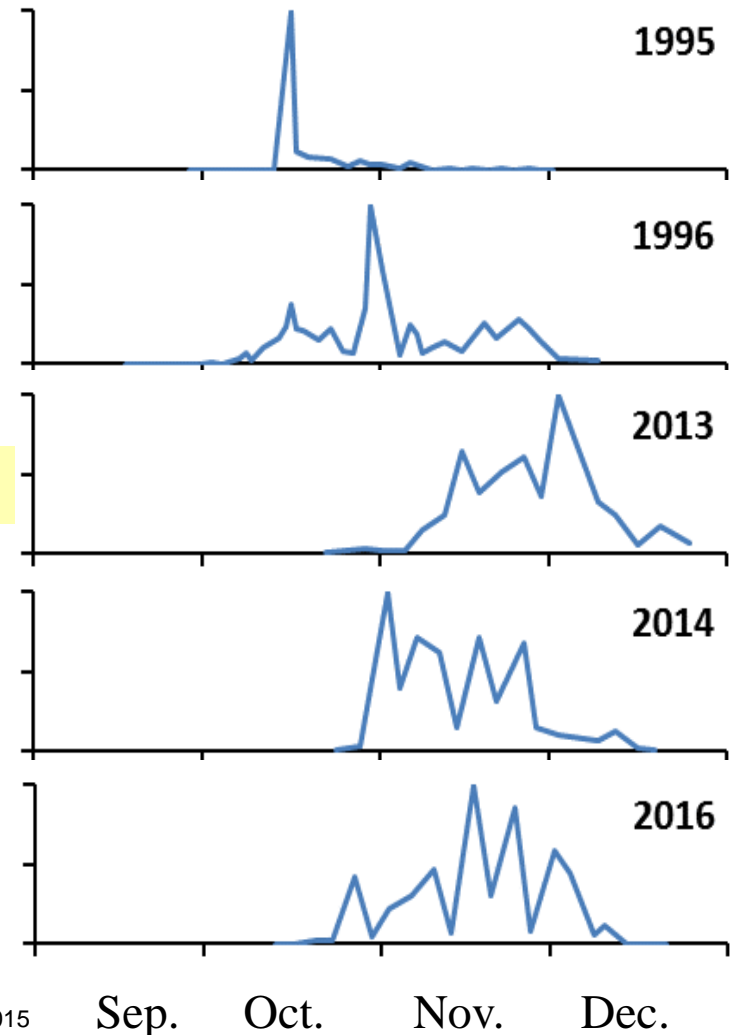
Ayu on the Nagara River

- The positive interrelation is observed between the birth date and the migration time.
- Scientific data shows the delayed migration time influenced the birth dates.
- Intensive fishing pressures may cause the delay of hatching.

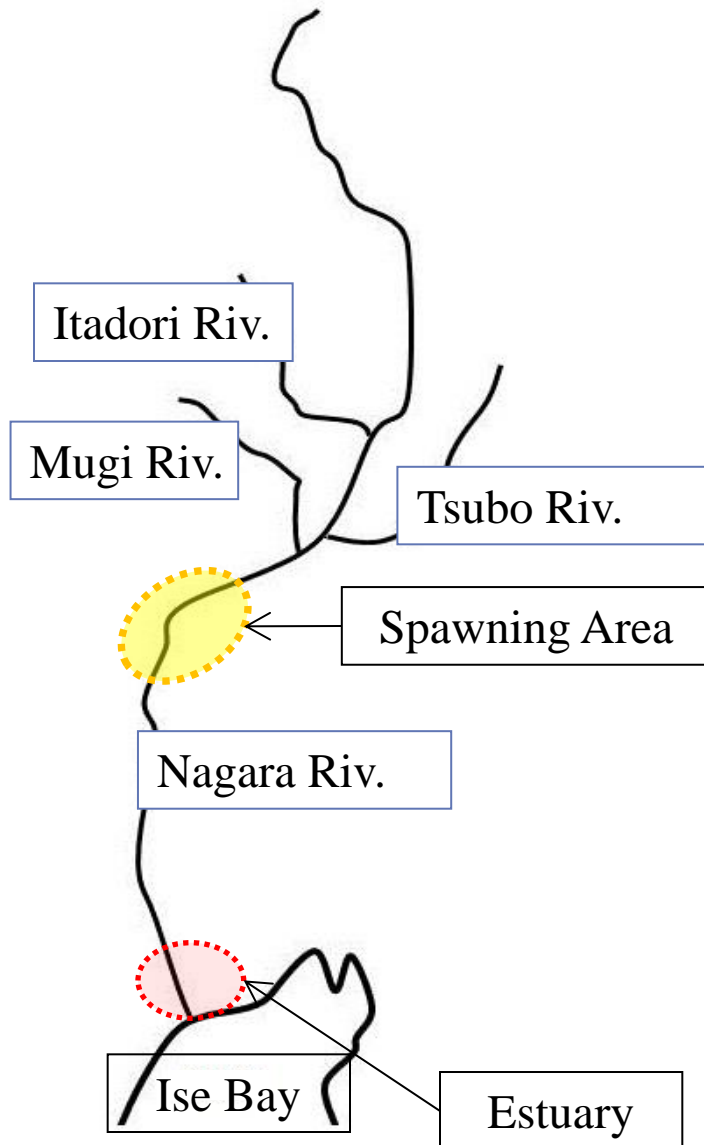
Interrelation between migration time and birth date



Changes of the estimated birth date



Perspectives (Conservation efforts in the future)



1. Catching early migrating fish at the estuary and using them as parents for the fish stocks.
2. Reconsidering the conservation efforts for preserving the genetic resources of early migrating fish (e.g., duration of fishing, spawning area etc.).
3. More data are needed to reconfirm the interrelation between the birth date and the migration time.

Thank you for your attention!

