

# An Analysis of the Economic Value of the Endangered Species *Ayumodoki* — A Case Study of Kameoka City, Kyoto Prefecture in Japan

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# The Picture of *Ayumodoki*



## About *Ayumodoki*

- *Ayumodoki* is a freshwater fish that is endemic to Japan and that has been designated as a protected species in Japan in 1977.
- In the past, it was inhabiting over a wide area in Japan. However, in recent years, it has only been seen in some rivers in both Kameoka, Kyoto Prefecture and Okayama Prefecture.

## About *Ayumodoki*

- The *Ayumodoki* is recently categorized as a “critically endangered species” by the Japanese Ministry of the Environment’s Red Data Book,
- and also “critically endangered” in Kyoto Prefecture’s Red Data Book.

# About Kameoka

- Kameoka is a city of approximately 90,000 people, located in a semi-rural region, 20 kilometers west of Kyoto city (1.5 million people).
- There are 37,852 households in Kameoka.

# The Location of Kameoka



# What is the reason of population decline of the *Ayumodoki*?

- A direct reason of population decline is plausibly land use development, corresponding water pollution, poaching, and the invasion of foreign fish species.
- In addition, people's unawareness of the value of *Ayumodoki* and its habitat plays a critical role.

# Objective

- To measure the economic value of the endangered species *Ayumodoki*, river water quality, conservation activities, and conservation of paddy rice fields.
- To confirm the validity of pursuing to conserve the *Ayumodoki* with Kameoka financial support.

# Research Method

- Choice-type conjoint analysis was used.
- It has the advantage of being highly consistent with the theoretical model of consumers in economics.
- It has less bias compared to CVM method.

# Research Method

- Hence, it is widely used in the field of environmental economic value assessment.

Adamowicz *et al.*, 1998;

Holmes *et al.*, 1998;

Rolfe *et al.*, 2000;

Kuriyama, 2002;

Sakagami and Kuriyama, 2009), etc.

# Five Attributes and Four Levels

- ① Ayumodoki population (no. of fish)  
(levels: 250, 500, 750, 1,000 fish)
- ② River water quality (BOD value, mg/ℓ)  
(levels: 1.6, 1.4, 1.2, 1.0 mg/ℓ)
- ③ Number of people participating in  
conservation activities (total people)  
(levels: 75, 150, 200, 300 people)

# Five Attributes and Four Levels

- ④ Conservation of paddy rice fields  
(nature-reserve ratio, %)  
(levels: 0%, 5%, 10%, 20% conserved)
  
- ⑤ Additional tax burden (US\$).  
(levels: \$0, \$5, \$15, \$30)

# Data collection

- A questionnaire survey was conducted among residents in Kameoka.
- Respondents were 1,000 people chosen randomly from digital telephone book. (including around 14,000 people).

# Data collection

- Responses were 212, but the valid responses were 163.  
(the valid response rate was 16.3%)
- Collected data were analyzed statistically and estimates were conducted.

# Estimation Results

Attribute variable	Coefficient	z score	p value
Ayumodoki population	0.003	10.20***	0.000***
River water quality	-2.124	- 9.00***	0.000***
Number of people participating in conservation activities	0.007	10.39***	0.000***
Conservation of paddy rice fields	-7.294	-11.29***	0.000***
Additional tax burden amount	-0.001	-11.23***	0.000***

Number of samples = 3912

$LR\chi^2 = 358.56$

$p \text{ value } (>\chi^2) = 0.0000$

LL = -2284.6528

## Marginal Willingness-to-pay for each household

Attribute	Marginal Willingness-to-pay (US\$)
Ayumodoki (one fish)	0.04
River water quality (reducing BOD value 1mg/ℓ to improve water quality)	28.09
Number of people participating in conservation activities (one person)	0.10
Conservation of paddy rice fields (converting 1% to nature reserve)	-0.96

# Aggregate Economic Value for all residents of Kameoka

Attribute	Aggregate economic value (US\$ million)
Ayumodoki (500 fish for all residents (37,852) )	0.78
River water quality (reducing BOD value 1mg/ℓ to improve water quality for all residents)	1.06
Number of people participating in conservation activities (150 people for all residents)	0.55
Conservation of paddy rice fields (converting 1% to nature reserve for all residents)	0

# Conclusion

- The economic value of the Ayumodoki was calculated to be 4 cents per fish.
- This means that the economic value of 500 fish for all 37,852 residents in Kameoka was \$0.78 million.
- This economic value could be used as evidence for the validity of spending a certain amount of public funds on their conservation.

Thank you

