

**A preliminary comparison of the biology  
character among *Hucho bleekeri*, *Hucho taimen*  
and *Hucho ishikawai* Mori**

WANG Feng, ZHANG Yong-quan, YIN Jiashen

Heilongjiang River Fisheries Research Institute, Chinese Academy of Fishery Sciences  
Harbin150070 China  
DaLian Fisheries University, DaLian 116023 China

*Abstract* : A total of five species of *Hucho* genus distributed in the world and three species are in china, *Hucho bleekeri*, *Hucho taimen*, *Hucho ishikawai* Mori. A preliminary comparison of research done among the three species by widely collecting domestic and foreign materials and the analysis are mainly from aspects of the feature of configuration, character of biology and the distribution region.

There are 5 species of *Hucho* in the world, namely, *Hucho taimen*, *Hucho hucho*, *Hucho perryi*, *Hucho bleekeri* and *Hucho ishikawai*. They are all large-scale cold-water carnivorous and precious fishes, with extremely high nutritional value and economic value, distributed in northern Asia and the Danube river basin in Europe. Among them, there are three in China: Sichuan taimen (also known as: Belgian Salmon, Tiger Jiayu, Sichuan Jelly Salmon, Brandt Salmon; local names: tiger fish, cat fish, bark Grass carp, Sichuan tiger fish, large-mouth fish, flounder, catfish), Siberian taimen (local name: squid, squid, sage green fish, redfish) and Korean taimen (Aka: Changbai Zheluo). Due to changes in the environment in recent decades, it has destroyed the rule of life of the taimens. The number of resources has decreased significantly, the distribution area has been shrinking, and the population has decreased sharply. It is in an endangered state and it has been included in the National Red List of Second-class Protected Animals and China 's Endangered Animals.

Sichuan taimen is endemic to China. It is a large indigenous salmon fish in China, and it is also the only salmonid fish in the mountainous area on the edge of the Qinghai-Tibet Plateau. It is the Quaternary glacial period that diffused from the north. After the glacial period, it stayed in rivers with higher elevations and lower water temperatures to survive and became an independent species. It is a strong physical evidence of climate change in history. Research on animal geography, fish system development and climate change has high scientific value. So far, there have been few studies at home and abroad.

## **Biogeographic research**

Through a comprehensive collection of domestic and foreign data, we conducted a preliminary comparative study of the three species of *Hucho* distributed in China from morphological characteristics, biological characteristics, distribution areas and other indicators.

### **1 Main morphological characteristics**

#### 1.1 Common features

Body is elongated, flat side, large mouth, end position, the maxilla extends backward beyond the margin, with fat fins, pear bone teeth and palatal bone teeth are continuously arranged in a row, curved, The scale is small, the lateral line is complete, the lateral line phosphorus is 100-242, the gill rake is 10-16, and the pyloric blind sac is 65-250. The specific differences are shown in Table II

#### 1.2 Identification features

1.2.1 Sichuan taimen has a dark brown back, silver-white abdomen, dark gray on the side, darker upper part, and 7-10 vertical pale red large patches. There are small irregular gray-black spots on the body and sides of the head behind the eyes, dark gray fins, and grayish-white bands of anal fins with light yellow.

1.2.2 The body of Siberian Taimen is dark brown, and the body is purple-brown. There are many dark spots that are densely shaped like millet-like dark black and have a "ten" shape. There are black round spots on the back and sides, silvery white on the abdomen, and 6-10 wide dark bands on the body side.

1.2.3 The dorsal fin of Korean taimen is greenish brown, the body and abdomen are silvery white, and the head and body are densely covered with small black spots. There are 8-9 dark stripes on the lateral side of the juvenile body [17].

Sichuan taimen body and anal fin fork light dark brown silver white gray black. The bleekeri has a relatively small spot and a light purple-brown silver-white dark horizontal band in the body of the Siberian taimen fish and the anal fin fork. The taimen is relatively front to the ishikawai. Korean taimen middle and anal fin fork deep back relatively greenish brown silver white black small spots

### **2. Biological characteristics**

1 Life habits Sichuan taimen, Siberian taimen and Korean taimen are all cold-water fish, all resting on low water temperature, turbulent water flow, clear water quality, high dissolved oxygen, no

Upstream rivers or tributaries of ecological environments such as pollution and lush vegetation on both banks. The shoaling habits of the Sichuan taimen are the backwaters before spawning, the migratory habit of the Siberian taimen are the spring reproductive migration and the autumn and winter overwintering snorkeling, and the migratory habit of the Korean taimen are the backwaters before the spawn.

It can be seen from Table 2 that the ability to adapt to the water temperature is better for the Siberian taimen and Korean taimen. Therefore, compared to Sichuan taimen, Siberian and Korean taimens are more suitable for intensive farming.

2.2 The three species are extremely fierce carnivorous fish, swimming faster, agile, good at hunting predatory fish.

2.2.1 Food Composition at the juvenile stage for Sichuan taimen is dominated by aquatic insects, followed by small fish and small animals. Adult fish are dominated by split-bellied fish, plateau loach, and ichthyidae. They also eat aquatic insects, shrimp, and water worms III-1.

In the juvenile period Siberian taimen preyed on fish in the juvenile stage, while the adult fish completely prey on fish. The fishes ingested are mainly *A. variegata*, red-fin tentacles, anchovy, whitefish, oyster, yellow catfish, dogfish, gill and so on. (Stone) The gigantic fish has a large food intake, and has preyed on wide fins,

The diet of Siberian taimen is relatively wide (only some of the species that are ingested are listed in the table), and there is no significant difference in the dietary habit between the three species. They all have high feeding intensity, and they are all perennial fish. Among them, Siberian taimen had the highest intake in autumn, followed by spring, and worse in summer. They still ingested under ice in winter, and only stopped for a short time during the reproductive period. According to fishermen observations, Siberian taimen swim from deep water to shallow water to prey on fish or terrestrial animals such as rodents and snakes falling into the water. The dietary intake of Korean taimen began to increase after spawning in spring. The dietary intake decreased in July with the increase of water temperature, and the dietary intake began to increase in September.

## **2.3 Breeding habits**

2.3.1 The age of first sexual maturity

The age of the first sexual maturity of the three species is different. Males are 2 years old, females are 3 years old, and Siberian taimen are sexually mature to 4 or 5 years old, ishikawai are 5 years old sexually mature, the basic trend is from small to large, see Table 4.

### 2.3.2 Breeding season

The reproductive seasons of bleekeri, taimen and ishikawai, are respectively from March to May, May to June and May and June, See Table 4.

### 2.3.3 Fish egg characteristics

Sichuan fertilized yellow eggs, non-sticky, heavy eggs, egg diameter of 3-4mm Driving 1. The fertilized eggs of the salmon Light yellow, round, non-sticky, sinking egg, egg diameter is 3.5-4.5mm. The fertilized egg of ishikawai is light yellow, sinking egg, egg diameter is 5.3.7mm. Egg size. The basic trend is from small to large, see Table 4. 2.3.4 Spawning ground conditions (water quality, water temperature, water depth, water Speed, bottom quality) is not much different for the three species, see Table 4.

The breeding of the three species methods belong to the bottom spawning type. They lay their eggs at the bottom of the water, and the fertilized eggs are hidden in the gravel or developed under the gravel. During the breeding season, all choose the gravel river bed as the spawning ground before spawning. The specific performance is as follows: fish swim back to the river after the river opens in the middle of April every year, both upstream and downstream have rapid and deep water in the central nearshore slow flow area, choose dense vegetation on both sides of the bank, and spawn in sand or gravel. At this time, the male and female dig a shallow nest of net-shaped or oval in the suitable river bed to lay eggs, and after the eggs are laid, they sink into the nest and are buried in the gravel to hatch. In the middle of May of each year, the Siberian taimen in the upper reaches of the Heilongjiang River will gradually increase in temperature as the Heilongjiang River hydrolyzes and freezes. After the male fish selects the appropriate river section as the spawning ground, use the tail fin to swing on the river bed, and dig the coarse sand or fine gravel into the oval-shaped spawning pit. The male fish swims around the egg pit and waits for the female. Wu Jinren pit, quickly meet, the body quickly separated from each other close to the righteousness, swim away, and later into the pit together, so repeated swimming 2 to 3 times, female fish began to ovulate, male fish sperm at the same time, After the spawning is completed, the male fish tail fin will be covered with fertilized eggs, and stay for a long time near the egg pit before leaving the egg pit . After the Yalu River thawed in May in June, the Shiluo River ichthyosis began to swim back and forth, laying eggs in the sandy bottom of the upper reaches of the rushing river, with the habit of burying eggs.

It is known from Table 4 that the age of the first sexual maturity of the Sichuan taimen is less than that of the two other species. Big difference.

### **3 Distribution**

Sichuan taimen are distributed in the tributary water system on the north side of the Yangtze River Basin south of the Qinling Mountains, upstream of the Minjiang River in northwestern Sichuan, and along the Dadu River to the territory of Qinghai Province, the Taibai River and the Shuihe River, a tributary of the Hanjiang River at the south foot of the Qinling Mountains. Before the 1970s, Sichuan, Shaanxi, and Zheluo were widely distributed, almost throughout the upper reaches of the Minjiang River and Dadu River, and the Qingyi River, Tianquan River, Dachuan River, and Maco River were all distributed. Since the 1970s, since 1998, in the known distribution areas, most of Shaanxi and Sichuan have not seen traces of the activities of Sichuan, Shaanxi, Zheluo, and some areas have disappeared. The distribution area is now gradually shrinking, roughly 30 ° north latitude. 20'-34010 ', longitude 100031 east. At present, the Ma Ke River at the border of Bangma County, Guoluo Tibetan Autonomous Prefecture, Qinghai Province and Aba County, Sichuan is also distributed. The Ma Ke River is the main spawning water area of Sichuan taimen.

The Siberian taimen are mainly distributed in the Volga, Picola, Baikal Lake, Emur River systems in Russia, the Ob River system in Kazakhstan, the Heilongjiang River system in China, and the Irtysh River system. It is distributed in the middle and upper reaches of Heilongjiang, the upper reaches of Wusuli River and Nenjiang River, the upper reaches of Mudanjiang River and Songhua River, and mountain streams in Jingpo Lake Stream, the Irtysh River in Xinjiang, Hanas Lake. The towels are larger in the upper reaches of the Wusuli River and Heilongjiang River, and are the cold-water economic fish fl of the Heilongjiang River. Now with the expansion of people's activities and the increase in frequency, China's distribution area is gradually shrinking, roughly at latitude 43020 '. 53040 'east longitude 1200 ~ 134040'. The existing populations of Siberian taimen in the Heilongjiang River Basin have been divided into three small, unconnected, areas, namely the upper Heilongjiang River and its tributaries north of the Greater Xing'an Mountains, and the upper Nenjiang River south of the Greater Xing'an Mountains with its tributaries, the Songacha River and other waters upstream of the Ussuri River. Korean taimen is a rare species in China, and it is only shared by the Yalu River. It is distributed in China above the Thirteen Daogou upstream of the main stream of the Yalu River and in its mountain stream.

## References

Dong Chongzhi, Li Huaiming, Zhao Chungang, etc. Research on the Conservation Biology of the Endangered and Famous Dicholathy I The distribution area and change of philodendron [J]. Journal of Fisheries, 1998, 11 (1): 65-70.

Wang Yikang. Fish taxonomy [M]. Shanghai: Science and Technology Press, 1958.

Zhang Chunlin, Liu Chenghan. Investigation of Minjiang fish survey and its distribution [J]. Journal of Sichuan University, 1957, (2): 221-247.

Xljlj, Lin. The endangered causes and protection measures of Sichuan, Shaanxi, Zheluo, Salmon in the waters of Marco River [J]. Gansu Agriculture, 2007, (6): 87-88.

Huang Quan, Zhou Jingxiang, Liu Chunli, etc. A comparative study on the breeding strategies of the sockeye salmon, saury, and white ichthys sylvester of the Yalu River Flower Lamb [J]. Journal of Jilin Agricultural University, 2001, 23 (2): 93-95.

Zhang Juemin, Li Huaiming, Dong Chongzhi, etc. Fish Journal of Heilongjiang Province [M]. Harbin: Heilongjiang Science and Technology Press, 1995.50-52.

Dong Chongzhi, Li Huaiming, Zhao Chungang, etc. Research on the Conservation Biology of the Endangered and Famous Dichthysius II. The traits and ecological data of philodendron [J]. Journal of Fisheries, 1998, 11 (2): 34-39.

Dong Chongzhi, Li Huaiming, Zhao Chungang, etc. Research on the Conservation Biology of the Endangered and Precious Dichroid III The resource evaluation and the endangered original culprit of Jellyfish [J]. Journal of Fisheries, 1998, 11 (2): 40-45.

Dong Chongzhi, Li Huaiming, Zhao Chungang. Wait. The endangered and famous Zhe Luochi. Research in conservation biology IV. Habitat habitat and protection strategy of Jellyfish [J]. Journal of Fisheries, 1999, 12 (1): 22-24.

Le Peiqi, Chen Yiyu. Red Book of China's Endangered Animals (Fish) [M]. Beijing: Science Press, 1998, 29.31.

Ding Ruihua. Sichuan Fish Journal [M]. Chengdu: Sichuan Science and Technology Press, 1991.

Wang Jilin, Jiang Zhuoqun. Fishery resources and fishery areas in Qinghai Province [M]. Xining: Qinghai People's Publishing House. 1988.

Shen Zhixin, Tang Wenjia, Li Kemao. The survival crisis and protection countermeasures of Chuanshan Zheluo Salmon [J]. Freshwater Fisheries, 2005, 35 (4): 25-28.

Lou Mingxun. Qinling Fish History [M]. Beijing: Science Press, 1987.

Tang Wenjia, Li Kemao, Shen Zhixin. Precious salmonids ~ Chuan I Shanzhe Luo salmon [J]. Fisheries Science, 2006, 25 (5): 261 ~ 262.

Zhao Zhengjie. The Rare and Endangered Zoology of Northeast China [M]. Beijing: China Forestry Press, 1979.

Sun Zhaohe, Zhao Wen, Wang Qingyou, etc. Imagination of Ishikawa's biology and its resource protection and artificial breeding [J]. Journal of Jilin Agricultural University. 1992, 14 (4): 135 ~ 137.

Cui Xishun, Zhou Changhai, Li Guofang, etc. Study on the fishery biology of philodendron in the Qinghai section of the lower Wusuli River [J]. Heilongjiang Aquatic Products, 2004 (2 "): 43-45.

Ding Ruihua. Research on Conservation Biology of Tiger Fish V. Habitat Characteristics and Protection Countermeasures [J]. Sichuan Animals, 1995, 14 (4): 144-146. Tiger Jiayu and its conservation plan [J]. Scientific Fish Farming, 1996, (3): 29.

20. Nikoliski (translation by Gao Xiu). Heilongjiang River Fishes. Beijing: Science Press, 1960: 42-47.

Yin Jiasheng, Kuang Youyi, Xu Wei, etc. Study on the feeding habits of the sage fish in Wusuli River [A]. See: Cao Guangbin, Uladimir Beleyev, Steven Chur. Proceedings of the 2nd International Symposium on Ecology and Fish Diversity of Large Rivers in Northeast Asia and North America [C]. Harbin: Heilongjiang Science and Technology Press. 2007, 195-200.

Sun Zhaohe, Li Zhongping, Wang Qingyou, etc. The diet, growth and reproduction of nine cold water fishes in Changbai Mountain [J]. Journal of Jilin Agricultural University, 1992, (2): 7-94. Ren Murian. Heilongjiang fishes [M]. Harbin: Heilongjiang People's Publishing House, 1981: 17-19.

Bai Guizhi, Wang Weidong, Zhang Jiebin, etc. Study on the sexual maturity biology of female

typhoid [J]. Scientific Fish Farming, 2002, (1): 14.

Zhou Yangcao, Wu Wanrong. A preliminary study on the conditions and habits of the spawning grounds of Dachuanhe tiger fish [J]. Journal of Hydrobiology, 1987, 11 (4): 375-376.

Zhou Yangyuan, Wu Wanrong, Yao Weizhi. Hu Jiayu Biological Research [J]. Journal of Southwest Agricultural University, 1994, 16 (1): 72-75.

Wu Yunfei, Tan Qijia. The characteristics of fish fauna in the Qinghai-Tibet Plateau and the place where it formed Analysis of historical reasons [J]. Acta Zoologica Sinica, 1991, 37 (2): 135-152.

Yin name. Fish ecology [M]. Beijing: China Agricultural Press, 1995.

Xue Zhenyu, Huang Shangwu, Yan Rongyuan. The squirrelfish, philodendron and their natural hybrids in Heilongjiang basin [J]. Journal of Hydrobiology, 1959, (2): 215-220.

Liu Chenghan. Research on Sichuan fish fauna [J]. Journal of Sichuan University (Natural Science), 1964, (2): 96-138.

Liu Chenghan. Sichuan Tiger Jiayu [J]. Aquatic Science and Technology Information. 1978, (4): 21,

Kimura, S. Description of the fishes collated from the Yangtze-Kiang, China, by late Dr. K. Kishinouye and his party in 1927-1929 [J]. JShanghaiSciInst, 1934, 3 (1): 23-25.

Shi Bainan, etc. Geographical distribution data of fish in Sichuan Province [A]. Compilation of abstracts of the 30th anniversary symposium of the Chinese Zoological Society [C]. 1965.

Zhou Yangcan, Wu Wanrong. Preliminary study on the biology of *Brucella salmonella* [A]. Compilation of abstracts of the 4th National Membership Congress and Academic Annual Conference of the Chinese Society of Marine Limnology [I]. 1984.

Gao Xizhang. Sichuan Zheluo salmon (*Huehobleekeri* Kimura) original description revision [J]. Journal of Animal Taxonomy. 1981, 6 (1): 84.

Wu Yunfei, Chen Yuan. Fish in Guoluo and Yushu areas in Qinghai Province [J]. Journal of Animal Taxonomy, 1979, 4 (3): 287-296.

Ding Ruihua: Qing Zuping. Research on Conservation Biology of Tiger Jiayu I. Distribution area and its changes [J]. Sichuan Animals, 1994, (4): 152-154.

HoleikJ, Hensel K. Nieslanik J, eta1. The Eurasian Huchen, Hucho hucho [M]. Netherlands: Dr W Junk Publishers, 1988. 41-141.

Li Sizhong. Investigation and research of fish in northern Xinjiang [J]. *Acta Zoologica Sinica*, 1966, 18 (1): 41-56.

Xie Yuhao. Celebrating the fish in the Yalu River [A]. See: Editor-in-Chief of China Fish Society. *Proceedings of fish science* (5) [C]. Beijing: Science Press, 1996, 91-100.

Huang Haoming. Status of salmonid fish resources in Jilin Province [J]. *Freshwater Fisheries*, 1988, (6): 24-25.