

MfG_E_Nishikigoi of Nagaoka_Essence

Nishiki-Goi of Nagaoka (Nishikigoi)

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1. Nishiki-Goi (Colored carp , Nishikigoi)

(1) Figures in introduction



Typical colors of Nishiki-Goi
Oomori, "Pictorial book Nishiki-Goi",
Ikeda-Shoten(1976) (Japanese)



"Kouhaku", sold at the highest price in the contest held in 2018. (\$ 1,850,000)

Not only excellent balance and color in the three-stage pattern but also extraordinary growing speed, over 1 meter at age nine years old.

(2) What is Nishiki-Goi -- from leaflet "Nishikigoi of Nagaoka" (Nishikigoi)

Nishiki-Goi, known as the symbolic fish of Japan, were created exclusively in Japan as an ornamental fish. The origin of breeding and raising Noshikigoi dates back to approximately 200 years ago. In the Yamakoshi District of Niigata Prefecture, the villagers customarily raised edible magoi, black carp.

During the early decades of 19th century, a mutant carp with light red spots was found among a lot of magoi.

Since then, nearly 100 different varieties of beautiful Nishiki-Goi were produced through the breeders' continued efforts in the research and development of breeding techniques.

Yamakoshi's Nishiki-Goi became popular throughout Japan after being on display at the Tokyo Taisho Exposition held in 1914.

Currently, Yamakoshi's lots of Nishiki-Goi are exported to various parts of the world.

The colorful carp, which can grow quite large, sometimes over 100 cm, are praised as the world largest garden fish. One of the reasons Nishiki-Goi have continued to attract many admirers is that species have a special attractiveness with the traditional Japanese aesthetic sense of simplicity and tranquility known as "wabi sabi" in Japanese.

These "swimming objects of art" are highly valued around the world as an important part of Japanese culture.

(Kasuga) Indeed, traditional Nishiki-Goi, Kouhaku and Sanshoku are quite gorgeous. On the other hand, recent popular Nishiki-Goi, Goshiki, Asagi, Shusui and so on, are rather elegant.

Goshiki is made from Asagi and Taisho-Sanshoku.

Both traditional and recent popular types are quite beautiful, in particular when they are large.

(3) History - -- from leaflet "Nishikigoi of Nagaoka"

Magoi were originally a winter food source

In Yamakoshi, a community in a harsh mountainous region known for its heavy snowfall, the people were often isolated during a snowy half a year due to a lack of access to neighboring communities.

Therefore, the people began raising edible magoi as a source of protein.

Magoi eggs hatched in terraced ponds in spring and the fry (young fish) were released into terraced rice paddies.

They grew together with the rice plants, while the mature carp, including the parent fishes, were raised in terraced ponds.

Before the arrival of the snowy months, all the magoi were transferred from the terraced paddies and ponds to household garden ponds. They were kept in the garden ponds as a valuable food supply in winter season.

This tandem linking system of rice farming and magoi raising is the origin of the present-day combined system of rice farming and Nishikigoi raising.

During the early decades of 19th century, a mutant carp with light red spots was found among a lot of magoi.

Keeping it and raising it finally brought about the beautiful Nishikigoi of the present day.

2. Guide-point of Nishiki-Goi in Yamakoshi (Nishikigoi)

The best beautiful color in Nagaoka, I suggest, is that of Nishiki-Goi. Yamakoshi district is famous for the birthplace of the Nishiki-Goi, beautifully colored carps, which can grow quite large, sometimes over 100 cm. Their bodies are very beautiful beyond description. Fish bodies of large Nishiki-Goi, putting delightful red on a thick velvet-like white and/or exquisite (superb) lacquer-like black are extremely gorgeous. Yamakoshi is also known as the largest Nishiki-Goi farming place. Nishiki-Goi ponds are scattered in the entire area of the district. Scenery of a lot of the Nishiki-Goi ponds found in morning mist spread within wide view area is also well known for one of the best beautiful scenery, and I recommend it the most beautiful camera-spots in Nagaoka in all seasons.



It is characteristics of the Yamakoshi's Nishiki-Goi that, other than winter having snow, breeders put Nishiki-Goi into the paddy pond. Typical large-scale breeders have a few hundred paddy ponds. The most important aim is to identify the parents of the Nishiki-Goi in each paddy pond.

3. Nishiki-Goi breeding (Nishikigoi)

(1) Circumstance for breeding

Yamakoshi district is famous for the birthplace of the Nishiki-Goi, beautifully colored carps. Yamakoshi is also known as the largest Nishiki-Goi-farming place.

You can see Nishiki-Goi ponds here and there in the entire area of the district. I heard there are several advantages in production of the Nishiki-Goi in Yamakoshi.

They are, first, possessing good parent carps, namely not only beautiful but having strong resistance to diseases, and second having know-how of filtering good adult candidates from fingerling Nishiki-Goi (remaining adult is about one from ten thousands or more), and the last suitable natural condition, in particular water in terraced ponds.

Prospects of a lot of the Nishiki-Goi ponds found in morning mist spread within wide view area is also well known for beautiful scenery, and one of the beautiful camera-spots in Nagaoka in all seasons.

(2) Selections, selections, and selections

Nishikigoi spawn 200,000–300,000 eggs once.

Breeders cull fries 3 or 4 times while three months until winter.

In the first culling breeders remove fish which are deformity, have no pattern. In this first culling, the number of fries is decreased by one-tenth, and eventually the number is decreased by few hundreds.

In the second and the thirs culling, breeders look at fish's body, equality, and pattern.

Thereafter fish are raised in mud ponds until fall.

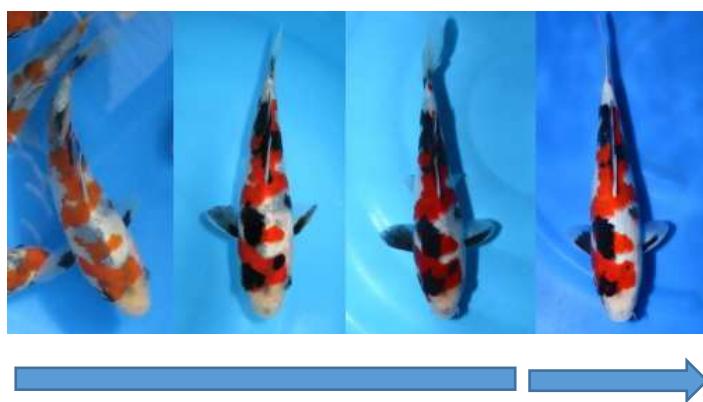
Breeders have a great expectation on the remained young fishes.

The following figures are shown drastic changes in Nishiki-Goi during the first year.

Skills of culling must be very difficult.

It is said that culling is an experience-related task and applying AI is greatly expected.

In shouwa-sanshoku, black parts have a strong tendency to move.



Growth and change during summer

(3) To breed in paddy ponds

One of the important jobs in the first winter is giving much high-quality feed with keeping fairly high water temperature to grow large, at least larger than 20, or 25 cm. This criterion is based on escaping ability from dangerous bird-attacks in paddy ponds in next year.

In next April, after snows have melted away, breeders make final selections of Nishiki-Goi with future potential, and release them in mud ponds.

At that time, jumbo one year old Nishiki-Goi will be over 35 cm.

4. Color pigments of Nishiki-Goi (Nishikigoi)

(1) Judgement points to Japanese Nishiki-Goi appreciation

Judgement points at Koi-competitions are their colors (Hi= red, Shiroji= white, and Sumi= black) along with their degrees of body size and pattern-steps. Kohaku-koi, one of representative type of Nishiki-Goi, is commonly judged based on their red Hi pattern and pure white Shiroji. (Koi in Japanese means carp.)

While looking at Tancho koi, they are judged based on the degree of roundness in their Maruten, namely round spot on the head, and the quality of their white Shiroji. Showa-sanshoku are judged based on the distribution patterns among red Hi, white Shiroji, and black Sumi in whole body.

(2) True Colors of Nishiki-Goi

The pigments kept in the skin cells bring different colors: red, black, blue, etc, into Nishiki-Goi. We can separate these pigments in three groups, red-yellow, black, and white.

a) Firstly, the red-yellow group is called Carotenoid, and the black group is Melanin. They are both light-adsorption type. There are about 20 different kinds of Carotenoid pigments that are found in fish. However, Nishikigoi has only 3 kinds; Lutein, Zeaxanthin and Astaxanthin. These pigments are kept in the koi's skin surface to make them look red. These red pigments are not produced by koi, itself.

Koi absorbs these pigments from their food or muds and keep them in the pigment cells. The koi that are sold in stores are usually fed color enhancement food (color-up food) to get bring out pigments.

b) Secondly, the pigment called Melanin brings black color into carp by itself. It is protective coloration for carp. Therefore, the color changes according to where they live. If they are in a dark place, their color will be pitch-black. When they are in a brighter place, their color will become grey. Carp changes their color instantly depending on the circumstance. However, this only applies to natural carp,

Magoi lives in natural rivers and mud ponds. The black color on Nishikigoi wouldn't change by circumstance.

Black color is improved in species of varieties.

Blue color is caused by the Melanin pigment. The water prism makes the dark color of bottom of the sea look blue to your eyes. The same happens to koi. The skin of the koi works like the prism to make the black Melanin color blue to your eyes.

And lastly, the last color group is white. It is light-reflection type, and the pigments are not resolved yet.

Light-adsorption type	Pigments
Red-Yellow pigment group	Orange Carotenoid protein
	Not being produced by koi, itself
Black-blue pigment group	Melanin
	Carotenoid
Light-reflection type	Being produced by koi, itself
	Pigment
White pigment group	Not identified yet

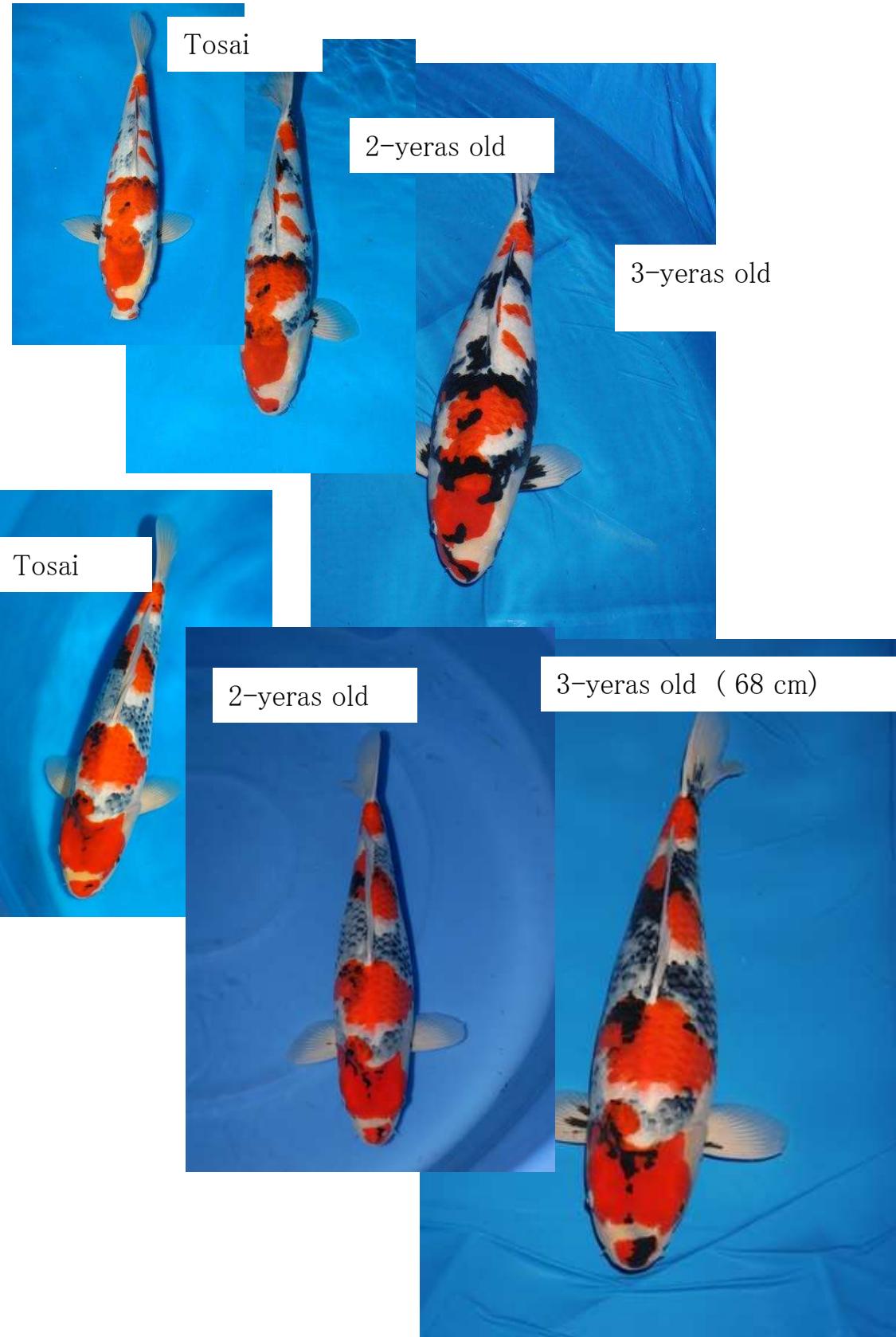
Table Difference of pigments included in Nishiki-Goi

(3) Color change in process of growing

As you can see in the next figures, black color only appear to change in process of growing. On the otherside, position of red and white colors would hardly change.

If you look closely the former position of black, you can find that there were shown gray color on the position.

There seems to be a secret or magic for koi-breeders.



http://www.nishikigoi.co.jp/news/2009/03/post_31.html

5. AI application to Nishiki-Goi breeding

(1) Application to culling Nishiki-Goi (Filtering)

It is said that the most difficult work for Nishiki-Goi breeding is culling, to predict future-change of their body patterns.

Body patterns of Nishiki-Goi change greatly during one year from birth. For example, pale grey-blue parts change to black or no-black, and it is difficult to predict the patterns one year later. Moreover, patterns sometimes change in not only saturation but also lightness. This predictability is said to be very complicated skill and one of the most important skills for Koi-breeders.

Therefore, Nishiki-Goi breeders expect that AI application is exceed the limit of human eye filtering Nishiki-Goi. First it can handle more judgement parameters at once, and second AI application never tired of work watching Nishiki-Goi.

Year 2019 was the first year several breeders have tried AI-application to Nishiki-Goi selecting.

I am confident of AI application to culling Nshiki-Goi, that it has a brilliant future. I am looking forward to seeing how excellent Nishiki-Goi with AI-applicatiion grows.

(2) Pros and cons of AI culling

Pros and cons of AI application to Nishiki-Goi culling are as follows:

Pros AI can deal with many parameters simultaneously.

And that some of the parameters may too difficult to select, because they seem impossible to consider from breeder's experience.

Cons It is difficult to accumulate examples a lot.

Nishiki-Goi is nature lives, then experiment is executed only one time per year. Under such a restriction, it is necessary to search year by year pattern-changes and accumulate examples a lot.

Therefote it can be imagined easily that vast amounts of data accumulate regarding individual Nisjhiki-Goi is really difficult.

Appendix AI application to Igo

(1) History of "AI and Igo players games"

Since AI software won the champion of Chess in 1997, next target had shifted to Igo game

They said that it was impossible to win, because Igo was the highest level game of intuition required to master its intricate strategies.

However AI software had surpassed one of the world's top players, the holder of 18 international titles in 2017.

(2) Characteristics of AI Igo

The important characteristics of AI Igo is first, a number of game experience with strong opponents including himself, second learning ability by himself without not only set sequence (standardized set of tactics) but also basic rules of the Igo game.

(3) Advantageous points of AI Igo

A characteristic of the modern AI is a simultaneous consideration of a huge number of parameters.

This is a reason that human can not understand the meaning of results created by AI.

Moreover, AI-Igo software have made themselves stronger and stronger by playing huge number of Igo-games automatically with AI-Igo software.

World ranking of the Igo game players (August 2020)

順位	氏名	所属	性別	年齢				
1	申真誦	韓国棋院	M	20y05m	40	戎毅	中国棋院	M 25y09m
2	柯潔	中国棋院	M	23y00m	41	一力遼	日本棋院	M 23y02m
3	芈昱廷	中国棋院	M	24y07m	42	張濤	中国棋院	M 29y05m
4	朴廷桓	韓国棋院	M	27y07m	43	王星昊	中国棋院	M 16y06m
5	楊鼎新	中国棋院	M	21y10m	44	陳梓健	中国棋院	M 20y07m
6	連笑	中国棋院	M	26y04m	45	楊楷文	中国棋院	M 23y07m
7	辜梓豪	中国棋院	M	22y06m	46	井山裕太	日本棋院	M 31y03m
8	江維傑	中国棋院	M	28y10m	47	屠曉宇	中国棋院	M -
9	丁浩	中国棋院	M	20y02m	48	王澤錦	中国棋院	M 21y06m
10	范廷鈺	中国棋院	M	24y00m	49	韓一洲	中国棋院	M 23y06m
					50	劉宇航	中国棋院	M 19y01m
					51	許皓鋐	台湾棋院	M 19y04m
					52	金明訓	韓国棋院	M 23y04m

Appendix Goshiki

(1) One of the hopeful varieties after the Gosanke

Nishiki-Goi Goshikj is produced by mating (crossing) of parents, Nishiki-Goi Asagi and Taisho-sanke (Taisho-sanshoku).

As the name suggests, Goshiki means five colors in English.

Asagi usualy has a complex combination of colors the parents have, namely red, blue, white, grey, blue, and Navy blue.

It has been one of my favorite Nishiki-Goi variation since I found it at a Koi breeder shop about 10 years ago.

The owner of the shop showed several Nishiki-Goi, two years old. All of them were Goshiki. I felt that it is not only gorgeous but also Wabi sabi in Japanese (taste for the simple and quiet).

Nishiki-Goi Asagi is a variation of colored carp that has thin indigo blue under each scale one by one.

It is one of the traditional variatiions of Nishiki-Goi.

The scalp of Asagi looks like a stitch, the mesh of a basket.

The atitch is the characteristics of Asagi, put beautiful scales on the body. The circumference of the scale is clear.

As it grows, the scale's covering grows larger, and looks gorgeous and funtastic, very attractive.

In recent years, with the efforts of the Nishiki-Goi breederrs, new typeof Gosjiki has been produced from Kohaku. Then Goshiki has changed more beautifully and more gorgeous at a tremendous speed.



Goshiki

(2) Mating (crossing) of parents

Taishou-sanshoku,

One of varoation group, Gosanke

The Gosanke means three representative variations of Nishiki-Goi:

Kouhaku, Taishou-sanshoku, and Shouwa-sanshoku.

Most variations are produced by crosing parents choosing from the Gosanke group, in addition to Ougon and German species group.



Kouhaku



Taishou-sanshoku



Shouwa-sanshoku

Asagi



Scales of Asagi
looking like a stitch

Asagi is one of the original varieties of Nishikigoi. It's not known for sure when this variety mutated from the magoi, or why it was given this name, but it seems to have been at least early in the 19th century, and the Asagi-lineage wild carp is counted as one of the ancestors of the modern Nishikigoi. There are two major types in the Asagi family.

Gunjo Asagi

Their body color is clear indigo blue. Aka Matsuba, Ki Matsuba and Kigoi were produced from the Gunjo Asagi.

Narumi Asagi

Each scale of a Narumi Asagi is dark indigo in the center, surrounded by paler blue. This type of Asagi produced some varieties with a white foundtion; Kohaku, Taisho Sanshoku, Shiro Bekko, Goshiki and Ai Goromo.

Excerpt from Zen Nippon Airinkai webpage

<http://zna.jp/eng/nishikigoi/variety/asagi.html>

(3) It looks like artwork of roosters by Jakuchu.

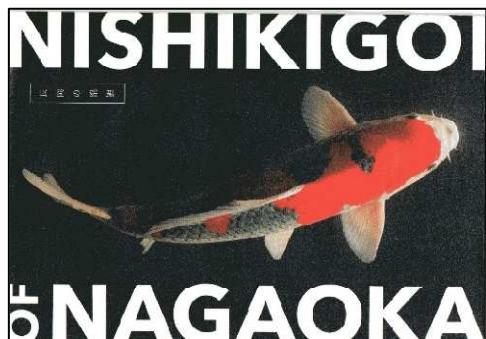


Jakuchu Nanten-yuukeizu



Gunkeizu

Nishikigoi of Nagaoka (Leaflet by Nagaoka city 2017)
(Revised partially by Kasuga)



(1) What is Nishikigoi

Nishikigoi, known as the symbolic fish of Japan, were created exclusively in Japan as an ornamental fish. The origin of breeding and raising Noshikigoi dates back to approximately 200 years ago. In the Yamakoshi District of Niigata Prefecture, the villagers customarily raised edible magoi, black carp.

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(2) Topography

The benefit of heavy snowfall provides abundant water sources

The Yamakoshi district, the birth of Nishikigoi, is located in a steep yet fragile mountainous area, which has been formed on an ancient seabed covered with sedimentary mud and sand.

And then, moved slowly rising up over a span of five million years, which is thought deeply related with the formation history of the Japan Islands.

This area is called the "20-Village Community", where the locals have established a unique cultural zone with similar cultural aspects.

In winter, Yamakoshi has heavy snowfall, which usually accumulates and reaches heights of over four meters. During spring thaw, landslides often occur in Yamakoshi. Even though this particular natural environment has caused tremendous damage to the people who have continued to live in this community, the melting water in spring and summer is a precious water source indispensable for their daily life. This melting water is the key element for the Nishikigoi industry in Yamakoshi.

(3) Agriculture

Unique water supply and water control system

Yamakoshi has a special water supply system that utilizes melt water, rain water, spring water, and ground water from horizontal wells. These wells run horizontally into the mountains to draw out ground water.

They are perfect for this mountainous topography and natural environment blessed with strata that easily absorb the abundant melt water. Furthermore, there are social network called "Maki", which play an important role in controlling the local water supply. Maki are groups of related families. The maintaining of the members' livelihood and management of natural resources in this area are all based on these "Maki" groups.

These water supply and control systems have enabled the people to build terraced ponds, which are flexibly used as ponds for carp breeding in usual times and as reservoirs for rice farming in the dry season.

These systems have helped to bring about Yamakoshi's unique agricultural methods including the breeding and raising of Nishikigoi.

Nishikigoi of Nagaoka

(4) History

Magoi were originally a winter food source

In Yamakoshi, a community in a harsh mountainous region known for its heavy snowfall, the people were often isolated during a snowy half a year due to a lack of access to neighboring communities. Therefore, the people began raising edible magoi as a source of protein.

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(5) Industry

Breeder's continued strenuous efforts helped nishikigoi become a global business

Various efforts in improving cross-breeding and raising Nishikigoi have been made since the prototypes of Nishikigoi first appeared in the Edo period. Cross-breeding technology tremendously improved in 1916 with the shift from pure-strain cross-breeding to hybrid cross-breeding, which produced an extensive array of new species, establishing the foundation of the present-day Nishikigoi culture.

Through these continued efforts of the people from generation, this method of rice farming and Nishikigoi raising in Yamakoshi's terraced paddies and ponds has developed extensively into an effective business operation in the mountainous area, which is normally considered unsuitable for agriculture.

Industrialized Nishikigoi farming is making relatively favorable progress in terms of nurturing successors who are willing to make positive commitments in taking over the Nishikigoi farming business. Since Yamakoshi's Nishikigoi farmers expanded their business globally early on, a great number of overseas dealers and admirers from all over the world gather annually in Yamakoshi during the season of collecting (harvesting) Nishikigoi from outdoor ponds, which begins in October.

In the future, an increasing number of overseas tourists are expected to visit Yamakoshi for their pilgrimage to the mecca of Nishikigoi.

(6) Landscape

Unique management produces the beautiful terraced paddies and ponds

In Yamakoshi, many terraced paddies were converted to terraced ponds for raising Nishikigoi. The mountainous region with its terraced paddies and ponds is a nostalgic landscape not found any other in Japan.

Regular maintenance including the cutting back of vegetation around the paddies and ponds is necessary to insure that the slopes get plenty of sunshine.

These kind of efforts are a unique feature of Yamakoshi that helps to maintain biodiversity and the various functions of the biosphere, as well as to protect endangered animals..

The preservation of rare species and human activity in the area are coincidentally intertwined.

In the early snows, the ponds are snowless spots dotting the white canvas of the land. During the months of deep snow, the edges of the tall ridges of snow surrounding the ponds accentuate the snowy landscape, which amazes all who come to see this panoramic view. In the snowy season, all is mely in white.

From the early spring to fall, these terraced paddies and ponds are always filled in wuth water. We are able to see the beautiful view everyday.

(7) Community

External Nishikigoi networks overcame a crisis

On October 23, 2004, the Great Chuetsu Earthquake hit the Chuetsu Region of Niigata Prefecture.

Most of the main roads in the Yamakoshi District had been fractured and collapsed as well as many of the terraced paddies and ponds.

All the residents were forced to evacuate, leaving behind their rice plants, cattle, and Nishikigoi, into which they had poured their hearts and souls.

However, the people in the community completed the reconstruction of their terraced paddies and ponds in three years by making the best use of their knowledge of water management and the mutual collaboration-cooperation system of the "Maki" network. Thus, the life in Yamakoshi began again.

Furthermore, Nishikigoi breeders from many parts of Japan visited the earthquake-stricken Yamakoshi immediately after the disaster and provided support by rescuing and loaning out parent fishes.

Nishikigoi admirers around the world also extended helping hands to the devastated community by presenting donations.

Restoration efforts in Yamakoshi were possible through not only internal bonds between the locals but also external bonds based on the network of supportive people from many other places in domestic and abroad.