GOVERNANCE SYSTEM OF FLOOD CONTROL IN TOKUGAWA JAPAN:

as the case study
on the coexisting system of human being and nature
in the Echigo Plain.

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Summary of this paper:

This paper explains and certifies the historical character of co-existent system between human life and natural disaster in the Tokugawa Era by means of authentic historical approach. People's thoughts and stances, in that time, against the natural hazard (flood) were peculiar and different from our own age. They considered the natural disaster as mainly the acceptable or the submit-to in general. Of course they made effort to prevent and control the flood of the river within their engineering technology. They made banks as the open levee deliberately to accept the damage over their technological level. Rivers were not only the hazard promoters but also the mother of the grace. People received various benefits from their rivers and they thought rivers were treasure box of the land. They called the flood as the fulfilled water (Mansui) and called the flood control as the water protection (Bousui). The open levee was the damage acceptable and coexisting technology for them. The modern essential idea of flood control is, on the contrary, the very containment by the modern engineering technology like the concreting. Modern flood control, therefore, is performed as the huge engineering projects by the modern state. This change disconnected many traditional channels of the local people participation to the flood control. The thought and idea of the fulfilled water or the water protection had disappeared. This paper describes this peculiar governance system. we have already lost, with using the local historical materials concerning flood control of the Shinano River.

1. Introduction

1-1. Identifying the problem

Japan started its industrialisation at the end of nineteenth century. Before this period, Japan was dependent on the regional natural environment while also being restricted from it, just as the case with the feudalistic farming society was. As was found in the historical research until now, the people of the farm village society in the Tokugawa period made their living by depending on the choice of crops, cultivation of the land for rice and crops, the use of river and irrigation, the use of mountain forests and plains (*satoyama*). The important point here is that they were not just dependent on the natural environment. They have designed and utilised technology of the period to overcome environmental limitations, while continuing to create new possibilities.

Regional natural environment provided 'nature's blessing' to be used in living, as well as 'natural disaster' which destroyed it. In order to take measures against this, communal relationship based on the unique family organisation, '*mura*' organisation for the self-government in charge, and '*kumi*' organisation classified by their purpose, were formed by the people living on the Japanese Archipelago after the seventeenth century. They have also formed organisations according to the needs. It was this special system of 'communal groups' of people working in the regional society that made it possible for people to coexist with nature in the Japanese society before industrialisation.

In this paper, 'flood' will be taken up as the natural disaster which destroys people's living, with focus on the great flood caused at the longest river in Japan, Shinano River, especially the Echigo Nishikanbara region where the lowest stream is located. The purpose is to find how the people of the region in question have responded, and how they

have overcome and come to live with this disaster which they face every two or three years.
The reason for taking up this issue is due to the fact that the social structure for 'flood' in the Tokugawa period Japan before the industrialisation has not necessarily been uncovered in the research until now. In the rural village society of the Tokugawa period Japan, what kind of flood countermeasures which take on different forms according to regions, have the people taken? Did they keep silent and helpless with insufficient civil engineering technology in the harsh natural environment? Or did they underestimate their technology, and chose to coexist with the natural environmental? We shall use historical analysis to draw some conclusion to these questions.

2. Flood and the Flood Control in the Shinano River

2-1. The great rivers of Japan and Shinano River

The large-scale rivers of Japan are generally characterised by its short length from the upper stream to the estuary, and its steep slope. Due to these characteristics, water flows in at an instance; water level rises rapidly, and flooding settles down at a short period of time. It is said that in the early modern times, the countermeasures for flooding revolved around how the effect could be minimised and how the living could be protected from the rapidly increasing and powerfully ebbing away flood.

The Shinano River, taken up in this report, is the largest river in Japan, with branching streams in the upper streams called Chikuma River and Sai River. On average, the amount of rainfall is low and drought occurs frequently, but various water hazards were triggered at times of flood. As expected, the form of flooding differs greatly between the upper and lower stream.

It is the upper stream Chikuma River where Japan with the conditions mentioned above, typically undertakes the so-called "short-term match" flood countermeasures. We have already conducted a research regarding the '*kawayoke-fushin*' which is the civil engineering work for Chikuma River's flood countermeasures in the Ueda/Chisagata region [Hasebe, Takahashi, Yamauchi;2009]. In this region, as a measure against flooding, discontinuous walls of levee, called "Kasumitei" have been constructed. Whenever flow of water accumulated, excessive water was actively lead towards the inner side of the embankment in order to minimise the effect. It can be said that this was an embankment system which 'put up with' the hazard. It was known that the '*Mura-kumi*' affected by the floods, managed the smaller-scale floods they themselves, while Ueda domain and the Tokugawa *Bakufu* (Government) supported for the funds when larger-scale flooding was concerned.

The lower stream of Shinano River in the Echigo Kanbara region, dealt with in this paper, is completely different from the upper stream Ueda region in terms of the form of hazard and flood countermeasures. As was noted in the Murayama's report, the slope is extremely gentle in the lower Shinano River stream in Niigata plains. The overflowing river water slowly streams along the plain fields, which have small elevation range between high and low. However, this was also an area which suffered from water hazard with recurring floods every once in two years. The floods that occurred in this area formed rather slowly, and lasted for several ten days. Therefore, the flood control efforts were devoted in the construction of facilities to drain the accumulated waters called 'bad water' and as expected, water irrigation facilities for the utilisation of water had to be constructed simultaneously to the drainage facilities; the flood control system was complex.

Especially in the 'Nishikanbara-gun' region, there are three enormous 'Kata (Gata)', lagoons– 'Yoroi-gata', 'Ta-gata', and 'Oo-gata' – located in the low land area between three large rivers of Shinano river, its branching streams of Nakanokuchi River, and Nishi river, and some small rivers connected these. In the north end of the region, is the Shinano river estuary, where the Niigata port is located. Niigata Port is the locus of circulation, connecting the product distribution of Shinano region as a whole and the distribution of shipping from cargo ships. In order to maintain the function of the port, it was thought that governing the flow of water from Shinano River was necessary. In order to do so, the drain canal construction project that is the main plan of the flood control system of Nishikanbara region received so much dissent until the end that it continued to become the reason for delaying flood control plan to take place.

2-2. The success of Tokugawa period Japan in avoiding the "Collapse of civilisation"

The flood that occurred in the Shinano River regions during the Tokugawa period can be considered as the natural disaster which basically occurred as part of the normal climate change. According to "Collapse" by Jared Diamond [Jared Diamond, 2005] which took up the case of natural environment destruction caused by human activities bringing about the collapse of society as a whole, and introduced issues of natural disaster through the theory of civilisation, Japan is said to be a society which faced the dangers of destroying the ecosystem at the beginning of Tokugawa period. However, it had successfully avoided destroying civilisation by means of *Bakufu* central government and Han domains' policy to encourage forest growth and regeneration (This fact earned Japanese forestry high appraisal).

Conrad Totman's research, *The green archipelago: forestry in preindustrial Japan*, written in 1998, was the source of underlying evidence for this suggestion. Totman pointed out the fact that the Japanese archipelago has experienced ecosystem destruction three times in history, and that the forests of the primitive times have diminished by the seventeenth century[1]. It was said that between the seventeenth and nineteenth century, the demand for firewood and charcoal has increased in all areas of the Japanese archipelago, which caused a daily shortage in wooden materials and regional exhaustion of the 'Kinai' forests in around Osaka, causing serious environmental issue. This marked the approach of so-called 'early modern predation'. In the documents existing in each region, they numerously mention the enforcement of policies to plant vegetation and regenerate the land, as well as increase in the lawsuit cases regarding the use of forests. As a result, regenerative forestry and protection forestry plans were taken place by the Bakufu central government and many Han domains, Japanese archipelago changed over to become a 'Green Archipelago', and reached the Meiji Restoration Period of the mid nineteenth century.

Totman's suggestions are not necessarily accepted as the established theory within Japan's research in the history of forestry policy, but it can be thought that they are appropriate from the perspective of historical studies[2].

[1] According to Totman, the three instances of destruction in ecosystems in the history of Japan started with the 'ancient city construction boom' of the seventh to eighth century, which lead to the exploitation of the 'Kinai' forests (ancient predation). The second destruction occurred in the war period of the late sixteenth century, in the case where construction for castles and erection of temples brought the exhaustion of nearby forestry resources, and at the same time, the logging of high quality forestry resources in the nation. Until then, it was an era of the exploitation of forestry, but since then the domestic market for wood material have expanded, regenration and protection of forests took place, making Japan a "Green Archipelago". The third destruction was the forest exhaustion which occurred during the 1930s and 1940s' period of collective war efforts and war restoration period.

[2] The work is still under verification, but even within the papers of Ministry of Agriculture and Forestry, "Documents Regarding The History of Japanese Forestry Policies", 1971 (copy of the 1930-1934 volume, Chouyoukai), which investigated the forest regeneration policies of the forests owned by the domains, it is

The mountain forest regions in the Shinano River's upper and middle stream has been "managed" as *satoyamas* and communal forests, but there are not many mountain forests that were actively afforested by Bakufu central government and Shohan domains. In actual fact, it can be noted that it was the regional farmers who have established a common ground within these forests and have undertaken the forestry protection in effect. From the mountain forest related sources such as *The History of Niigata Prefecture*, *The History of Nagano Prefecture*, and *The History of Gunma Prefecture*, the following can be analogically reasoned regarding the history of the mountain forests in the Shinano river regions. Since the eighteenth century, there have been heated arguments regarding matters of mountain rights and boundaries, assuming the interest in the use of forest resources as its social background. There have been increases in the demand and production of charcoal. However, at the same time, there were clashes of rights and boundary disputs between those villages who shared the same common grounds, lawsuit and mediators came into play, and stable rules for the use of mountain as a common ground has established regionally. It can be said that this stable manner of using the mountain, have led to the maintenance and protection of regional forests. Furthermore, the *satoyama* forests around the mountain valley have been used and managed by the villages nearby.

3. Flood and Flood Control in the Nishikanbara area

3-1. Flood conditions of the Nishikanbara area

Nishikanbara area is the lowest hollow of the Echigo plains. For this reason, the levee often collapsed due to the melt water and heavy rain in the Shinano River. Flood and overflow occurred once in two or three years, and once overflow occurred, the vast cultivated land changed into muddy land in a blink of an eye, making it difficult to distinguish the boarders of the cultivated land. As a result, the quality of the cultivated land changes drastically, and in order to take actions against this, they have chosen to swap their share of the land by the lot (refer to the report by Yamauchi).

Flood which brought the greatest damage to the region, was the case when 'Yokotagire' – phenomenon named after the location, referring to the collapse levee of the Yokota region, located in the upper stream of Shinano River – occurred. The levee collapse of this sort was often seen from the beginning of the seventeenth century. Small to mid-scaled collapse of levee and great floods occurred every two to three years and water disasters recurred, and the amount of floods occurrences have reached over a hundred times between the seventeenth to the mid-nineteenth century of the Meiji Restoration period. The most well-known disaster is the 'Houreki-no-Yokotagire' of 1757, 'Ishin-no-Daikozui' of 1868, and the 'Yokotagire' of the Meiji period, 1896, which occurred in July, caused by the rainy season front, resulting with great damage of seventy-five deaths, two-thousand-five-hundred houses washed away, eighteen-thousand hectares of rice field washed away or submerged. The enormous drain canal, 'Ookozu-bunsui', which discharged the floodwaters of upper stream Shinano river to the Sea of Japan, commenced its construction in 1909 as a modern civil engineering plan, and the damage from 'Yokogire' flooding was behind the scenes of this event.

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reported that Aizu, Akita, Bakufu, Okayama, Kagoshima, Kanazawa, Kochi, Ogura, Sasayama, Shonai, Shinjyo, Sendai, Tsu (Hikone), Tokushina, Nagoya, Hitoyoshi, Hirosaki, Fukui, Fukuoka, Matsue, Mito, Morioka, Yamaguchi, Wakayama, and before the Toyotomi period, Shinto Shrine areas in the Imperial Court were evident to have undergone active forest regeneration policies by the Shohan domains. In order to discuss from the perspective of ecosystem maintenance, not only the Han-domain owned forests, but also the existence of activities in daily management of the 'Satoyama' by the village groups must be emphasised.

3-2. The Flood Control structure in the Nishikanbara area

In the Tokugawa period, the area of cultivated land was more than twenty thousand hectares. The centres of the irrigation waterways, which supplied for the whole cultivated area, were the three rivers: Shinano River which flowed in parallel to the north-eastern estuary, Nakano-kuchi River, and Nishi river. However, as explained before, these three rivers also functioned as drain canals. Having lagoons as the base, the fixed amount of 'bad waters' that accumulated in the entire lowlands was washed out to the Japan See through these three rivers. However, a waterway especially for drainage did not exist until the nineteenth century, and whenever excessive floods occurred, civil engineering plans were made to drain the 'bad waters'. The people in the region started a campaign to realise the civil engineering plan towards the Han domains and Bakufu central government which they were under control. Especially after the seventeenth century, when the rice fields were newly developed, large scale measures to improve the quality of drainage function for the whole Nishikanbara area was required. Two major plans against the disaster that the flood brings were considered to protect the whole region.

One was to release the floodwater at the upper stream of Shinano River at the Japan Sea side, and to prevent it from flowing into the inner Nishikanbara area. In order to realise this, civil engineering plans to excavate water drain canals from the upper stream of Ookozu to the Japan See was necessary. This plan was occasionally planned and suggested after 1720s when regional leaders suggested it to the Tokugawa Bakufu government, but it was not realised until the above mentioned 'Ookozu-bunsui' canal was built in 1922 due to the technological and social limitations.

Another method was to excavate a special drainage system which would directly drain the collection of 'bad water' in lowlands to the Japan Sea without letting it flow into the three great rivers. The only technical difficulties faced was with the excavation due to the fact that there were mountains and sand dune areas including Yahiko, Kakuta and Kugami in the coastal areas. However, when the 'Shinkawa' plan of digging an underground drain tunnel in Nishikawa was introduced to discharge the 'bad waters' in the Yoroi-gata, Ta-gata, and Oo-gata lagoons to the Japan Sea, it became more possible for it to be realised. The excavation project of the Shinkawa made it possible for the three lagoons to take place the development of new rice paddies, it attracted the attention of Tokugawa Bakufu government, Nagaoka domain, and Murakami domain. In 1818, this unprecedented plan started in the form of receiving the petitions of the nearby villages. First period of construction completed in 1820, and the development of new rice paddies proceeded simultaneously. After that, the construction continued in 1826, 1833, 1966, and finally in 1909, with the use of modern methods of construction, the repair works were completed.

The 'Ookozu-bunsui' canal which discharged water in the upper stream of Shinano river to the Sea of Japan was completed in 1922. With this plan, Nishikanbara as a whole was released from the water disasters of flooding. From then on, the region transformed into a granary producing quality rice, and known as Japan's leading rice-producing district. The flood control of Nishikanbara area eventually became a modernistic one which 'managed nature'.

3-3. The flood control system in the Nishikanbara area

The Echigo Kanbaragun of the Tokugawa period was a region under the so-called 'Irikumi control'[3]. The region was divided and governed under the Tokugawa-Bakufu,

[3] The Japanese Archipelago in the Tokugawa period was collectively controlled by Tokugawa government (Bakufu) and the feudal lords (Shodaimyo). Since the eighteenth century, ¼ of all the territory was under the

Nagaoka Han Domain, Mineyama Han Domain, Shibatashi Han Domain, and Kuwana Han Domain governments. The division of control by the several Han feudal lord was not favourable in the maintenance and management of the river and floods. Especially when conflict arouse between the feudal lords of different villages[4], complicated procedures became necessary. If it could not be resolved between the Han domains themselves, the Bakufu government intervened for resolution. Permission from Bakufu was needed in order to undertake a large-scale flood control plan or development plan. Flood control plans using the river was managed especially by the Bakufu central government. The construction was said to be 'Kuniyaku-bushin', where Bakufu supplied for parts of the construction costs, funding was sourced from villages all over the nation and imposed as a form of tax, 'Yakusen'[5].

Within the Nishikanbara region, peasant famers made a union of villages called 'Mura-kumi' to manage rivers, irrigation canals and drain canals. When flooding occurred, the village union worked together to make a petition and approached the Han domain and Bakufu government for implementing the flood control.

The Japanese society had conflicts between and mixing of the pre-modern and early modern elements in various dimensions, and this can be observed in the flood control system. Counter measures for floods differed between the Tokugawa Bakufu central government, Han domains and peasant farmers.

Tokugawa Bakufu central government was not as thorough as the government in the modern nation, but managed the river with the whole of the nation in mind. We can discover an 'early modern' character here which lead to the modern nation after the Meiji restoration. However, Han domain and farm villagers only dealt with water disaster considering their own advantages and what was appropriate under their rules and for their living. Here, we can observe a pre-modern quality, different from the modern attitudes towards flood control.

4. Flood Control and Living with Nature

4-1. Flood control and paddy field made from 'Shinkawa' waterway

Naka-gohya village, which was discussed by Futoshi Yamauchi earlier, is located around the Yoroigata lagoon. As explained above, the Yoroigata lagoon is at the lowest part of the marsh in the Nishi Kanbara area. Therefore, the drainage of this Yoroigata lagoon and the release of all the water that had accumulated there, that is 'bad water' from the lagoon, meant the discharging of the bad water from the entire area of Nishi-Kanbara hundred and the development of new rice paddy. As the overall size of the areas of Yoroigata, Tagata and Ohgata combined was more than 500 hectares, an extensive development of the new rice paddy was expected. It is therefore not suprising as noted previously, that not only the Bakufu central government, but also Nagaoka Han-domains and Murakami Han-domains, had considerable interest in the project of

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control of Tokugawa, and the remaining ¾ was under the control of approximately 28 daimyos. Tokugawa regime, along with the major cities, Kyoto and Osaka, spread its control over each territory. Daimyos controlled over a specific area, and not often would also have authority over a small region further afar. As a result there were cases where some areas were controlled by Bakufu and several feudal lords. Researchers call this "Irikumi controlled regions".

[4] "Villages" are self-governed administrative organization which was given to the farmers to disarm the farm village while the feudal lords prepared to control the territory between the sixteenth and seventeenth century.

[5] "Kuniyakubushin" is a flood control system, eployed by the Bakufu. The system call for the Bakufu pays ten to twenty percent of the construction fees depending on the amount of cost for the temporary costs incurred from sudden flood damage on the territories of feudal lords, vassal, temples and shrines with areas less that that which yields two hundred million koku of rice.

Riparian works along the Shinkawa canal. This project included the drainage of 'bad water' around three lagoons by the riverbed tunnel of the river Nishi, and it was proposed in 1737.

However the Niigata town which was the port town of the Shinano River estuary harbor, feared that the construction of drainage canal would cause the water level to decrease and moving the location of the estuary, leading to the loss of the function of Niigata Port. Niigata town strongly opposed the "Shingawa" construction plan. As a result, Bakufu central government had frozen the plan ever since for several ten years. In the meantime, the villages around the three lagoons have taken various actions since it had planned a new rice field development with the construction of drainage canals.
Incidentally, the villages around the three lagoons formed organisations of the '*Sone Kumi* group' (consisting of the 37 villages of Nagaoka domain) and '*Ajikata Kumi* group' (consisting of the 15 villages of Murakami domain), and have made a survey map for the construction of "Shinkawa" independently by the beginning of the nineteenth century. Since then, the two villages groups have proceeded their negotiations with the villages under the central government control and village along the Hirodori River which opposed the construction. They have furthermore, persistently continued convincing for the compensation of land to be made to the Uchino village which made the waterways to the Sea of Japan.

In April, 1815, the Sone group and Mikata group made a proposal to the Nagaoka domain for the construction of the Shinkawa and asked for it to be submitted to the Bakufu central government. Niigata town and Uchino village still continued opposing the idea, and Bakubu did not easily give permission for the construction. During this period, as a result of finding ways for compromise, such as making agreements with Niiagata town and strengthening the compensation for Uchino village, permission statement from the Bakubu central government was finally given two years after that, at the end of November, 1817[6].

Construction started immediately, but the underground tunnel that passed through the underground tunnel of Nishi River could not go without a constant construction to give it enough drainage function, spending ten years for a 'Shinkawa' with stable drainage function to be made. This construction that was completed in 1827, called for one million, one thousand and five hundred labourers and sixty thousand ryo of expenditure. Most of the labour was provided by the surrounding farmers, and at the same time, the *Sone* group of Nagaoka domain paid thirty-six-thousand ryo, while the *Ajikata* group Murakami domain paid twenty-four-thousand ryo. But since the Shinkawa functioned as a drain canal, discharging great amounts of bad water, the three lagoon areas were able to successfully make great reclamations. As a consequence, the arable land area which was developed for new rice fields, reached the area of two-hundred-and-thirty-eight hectares, producing seventeen new rice paddies in the Nagaoka Han domain villages, and twelve Bakufu villages[7].

4-2. Coexistence with natural disasters

Until the beginning of twentieth century, an unique rice cropping scene of "rice planting and harvesting with your soaked yourself up to the waistline" was seen in the Nishikanbara area and the village surrounding the 'Kata', lagoons. This way of rice cropping was very different from what would be seen elsewhere in islands of Japan. For

[6] "Okikizumi-Ofurei"

[7] However, most the new rice fields under the territory of Nagaoka domain came under the control of the Tokugawa regime the following year.

this reason, the farm environment surrounding the lagoons was criticised for the harsh labour and low productivity due to the insufficient flood control. On the other hand, lagoons and the surrounding natural environment themselves were treasured with their abundant catch of fish and native birds, and moreover was appreciated as a place for catching plentiful water animals. Where did such two extreme views of lagoons originate?
We must be aware of the fact that the relationship between humans in the pre-industrialisation period in the pre-modern society, and nature is different from the relationship that we see in modern society. There is a fundamental difference in people's views of the flood disaster then and now, and it is reflected in the nature of flood control plan evident between the two periods. The flood that often occurred in the pre-modern society was 'disasters by water', which destroyed the foundation of everyday life, leading to famine. However, the misfortune was something that had to be prevented by means of physical strength and will power. Since the damage caused was beyond which could be dealt with the human capacity inevitable limited, they had no choice but to 'put up with' the damage caused.

According to a book entitled 'The Peasant Biography (Hyakusho Denki), written in the 1680s, flood was appreciated as 'flavour of treasure land' that brought fertile land, irrigation system, river transport, and labour to the fishing industry. Flood was also termed as 'brimmed with water', from the visual description of its phenomenon, giving a toned-down impression from natural disaster. Moreover, the flood control measures were termed 'protection from water', which implied coexistence with the nature, far from the meaning of natural flood control system. We must realise the fact that these water disaster related terminologies, along with the secret technique of using discontinuous levee, 'Haze levee', to prevent excessive flood water, with the expectation that flood disaster of a certain size would occur.

The flood control plan in Japan proceeded in earnest with the use of engineering to build levee made from concrete and metals introduced from America since the Meiji Restoration period, and the use of techniques in pumping up water with energy-driven engine such as internal combustion engine and electricity. Since this was a great civil engineering project, it could not be continued without being treated as a project of the central government. In the end, people in the regional societies lost the opportunity to participate in the flood control plan and their ideas and motivation towards flood control naturally vanished.

The natural disaster caused by the flooding of Shinano River was also the means to make fertile crop land made from the landslide of the upper stream, and it brought 'blessings' of natural resources to the lagoons and their surrounding areas. However, in order to gain such richness, they had to endure a very harsh working environment and engage in difficult activities such as 'riceplanting and rice harvesting while you soaked yourself up to the waistline in the water', and at the same time to devise the use of the cultivated lands, including the 'warichi' system, of rotating of the allotments of the strips after a certain period.

5. Conclusion

The Nishikanbara area during Tokugawa period was a region which frequently faced flooding of the Shinano River. People used whatever technology they had to the fullest towards the 'water disaster' in order to 'prevent overflow'. This was action which accepted certain level of disaster while actively seeking measures to control the flood. Since after the mid-eighteenth century, regional villages formed '*Mura Gumi* groups',

and made efforts to realise the large-scale flood control engineering project with the full use of technology for the implication of flood water countermeasures and for the 'bad water' drainage project in the lowlands. At the same time, this realised the new rice field development, and flood control brought arable land, with the work of Bakufu central government which controlled the nation's rivers and Han Domains which governed the territories. However, modern flood control plan had to wait for large-scale civil engineering to be used as a nation-wide project after the Meiji Restoration period. With the completion of 'Ookoudubunsui', water canal of the Shinano River, in 1922, Nishikanbara area at last gained freedom from the Shinano river floods. The great granary which produce Japan's most favoured rice, 'Koshihikari', made an appearance in this manner.

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