AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
BATCH #18

AM00-0000-G696

1. SUBJECT CLASSIFICATION

A. PRIMARY
Agriculture

B. SECONDARY
Fisheries--Japan

2. TITLE AND SUBTITLE
Report of fishcultural investigations in Japan

3. AUTHOR(S)
Swingle,H.S.; Moss,D.D.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1969	23p.	ARC JA639.3.A897

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Auburn

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-RAA-952	
12. DESCRIPTORS	**13. PROJECT NUMBER**
Japan	
	14. CONTRACT NUMBER
	CSD-1581 GTS
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

REPORT OF FISHCULTURAL INVESTIGATIONS IN JAPAN

H. S. Swingle
D. D. Moss
Auburn University
Agricultural Experiment Station
Auburn, Alabama

Project: AID/csd-1581

Date: April 15, 1968

Title: Increasing Fish Production by Improved Fishcultures

Revised: August 15, 1969

REPORT OF FISHCULTURAL INVESTIGATIONS IN JAPAN[1]

USAID-Auburn University Project (AID/csd-1581) Increasing Fish Production by Improved Fishcultures - Phase I

H. S. Swingle, Project Director, Auburn University
D. D. Moss, Asst. Project Director, Auburn University

April 15, 1968

We were met at the Tokyo International Airport at 8:45 p.m. on October 18 by Dr. Yoshihiro Matida and Mr. H. Kumada of the Freshwater Fisheries Research Laboratory, Hino-Shi, Tokyo. These gentlemen, with Dr. Katsuzo of the Tokyo University of Fisheries, planned our itinerary and arranged for its implementation. Mr. M. Yano, assistant secretary for Training Coordination Section, Overseas Technical Service Division, served as guide and interpreter. This Division deals principally with the training of students and scientists from various developing countries throughout the world. The training programs in freshwater fisheries lasts from 6 months to a year and all costs for transportation and maintenance of participants are borne by the Japanese government.

Hamana Ko Branch-Shizuoka Prefecture Fisheries Experiment Station

Our first trip was to Hamamatsu to which we traveled by express train along coastal areas and mountains. We passed well-kept farms, tea plantations and rice paddies. The first stop was at Shizuoka Prefecture Fisheries Experiment Station, Hamana Ko Branch. Mr. Okani, engineer, was in charge (the

[1]This report is based on a survey made October 18 to October 23, 1967.

title "engineer" in Japan applies to any person doing technical work, whether or not formal training was in engineering or biology). Work at this Station dealt chiefly with culture of eel, Ayu (Plecoglossus allivelis), common carp, loach, sea bass, oysters and seaweed.

Technical personnel at the Station included 10 scientists and 3 assistants. Physical facilities consisted of a modern building with several well-equipped laboratories and offices and a total of 72 concrete ponds and pools constructed at a cost of 50,000,000 yen ($139,000). Of particular interest was the dual water system supplying the "wet" laboratory and concrete ponds. Each tank or pool could be supplied with freshwater from a 340-meter deep well and brackishwater from the adjacent bay, Hamana Ko Lake. Thus, water of any salinity from 0.2 to 18 parts per thousand can be supplied for long periods. The ponds were used with freshwater while studying feeds needed to grow eels to marketable size. Brackishwater was used in the ponds to study factors affecting the maturation of eggs as this normally occurs after the eels have migrated back out to the ocean.

Eel Culture

Eel culture is carried on both in still-water ponds and in running water. Eel larvae are caught at the beginning of their migration from the sea into the mouths of the freshwater streams. At this time they weight approximately 0.2 gram and have a length of 4 to 5 centimeters. These small fish are stocked into rearing ponds at the rate of 5,000 per m^2 of surface area of water. Here they are fed until they reach a size of 5 to 30 grams. They are then stocked into production ponds

at the rate of approximately 10,000 per hectare for the still-water ponds. Rate of stocking for running water was not given. By the time the fish are 1 1/2 years old, they weigh approximately 200 grams, at which time they are harvested and sold. Eel production per hectare averages 10,000 kg. In the running water method of culture, the small eels are placed in the upper ponds of a series through which a freshwater stream is flowing, and as they become sufficiently crowded to materially reduce growth, approximately one-half the number is shifted to the next pool downstream similar to the procedure used in trout culture.

Eels are fed frozen trash fish and also various types of meals. The meals usually consist of 60 percent fish meal, 30 percent potato starch, and 10 percent of a commercial mixture containing yeast, distillers solubles, soybean cake, dried milk and other materials. These materials, obtained in powder form, are mixed with water to form a stiff paste. A small amount of carboxy methyl cellulose (CMC) is frequently added to bind the food materials together. These artificial feeds are produced by various feed companies and sell for approximately 120 yen[1] per kg ($0.15/lb). It required an average of approximately 1.5 pounds of feed to produce 1 pound of eel. Eel sold for 500 to 700 yen per kg ($0.63/lb to $0.88/lb). Fish meal, the main ingredient in the feed, cost 70 yen per kg ($0.09/lb).

---

[1] 360 yen equals $1.00; 1 yen equals 0.28 cent.

A novel method of trapping wild eels was observed. This consisted of placing 2-meter sections of hollow bamboo poles with one end closed in various areas on the bottom of the bay. A string and float was attached to each bamboo trap to mark its location. At intervals the bamboo eel traps were carefully raised and upended in a boat to remove the eels.

Other Fish Cultures

Loach culture is being investigated but nothing is far enough along to report. Sea bass and mullet are raised in shallow areas of the bay, which are blocked off with nets. That is, nets are placed across a narrow tidal outlet so that the fish cannot escape. No special management is given, and the production is a result of the natural food-producing ability of the area. The prices received for various fish species are as follows:

Species	Yen/Kg	Cents/Lb
Eel	500-700	.63-.88
Ayu	300-3,000	.38-3.77
Common carp	800-1,500	1.00-1.89
Sea bass	200-300	.25-.38
Large sea bass	1,000	1.26

Oyster Culture

Much of the work at this Station dealt with oyster culture, using the hanging shell method. Holes are punched in clean oyster shells with a hammer and punch. Usually 25 to 30 shells are placed on a wire with plastic spacers separating the shells at intervals of 10 centimeters. The wire is bent around into a narrow

U-form so that the loops can be placed over a longitudinal bamboo pole supported on stakes driven into the bottom of the bay. A man can make 100 of these loops per day. In this area, the difference between average high and low tide is approximately 1 meter. The wire loops are placed about 6 inches below high tide and extend about 18 inches farther down into the water. In this area, the salinity is approximately 18 ppt. Spat set from June to August; during this period, loops are set out in areas where the greatest set of spat can be obtained. After the young oysters have set, the loops are placed on submerged bamboo poles or wires in the bay where they remain until the oysters grow to marketable size. This requires approximately 1 1/2 years at which time one loop contains from 10 to 15 kg oysters, including the shells. Harvest is from 30 to 40 tons of oysters per hectare (including shells). These shell out approximately 30 percent meat. Production of oysters from the Lake Hamana Ko area, a bay of 72 square kilometers (17,800 acres), is estimated at 400 to 500 tons annually. A charge of 1 yen per m^2 of surface water area utilized is levied upon private oyster growers. These funds are received by the Ministry of Agriculture and Forestry, which designates areas available for culturing oysters.

Some work has been done with raft culture of oysters, but no rafts were observed during our visit. A single raft is reported to support approximately 200 strings of oyster shells, each about 2 meters long. The longer strings are used here because the rafts are placed in deeper water. The raft is made

of bamboo and is 3 meters by 4 meters. At this Station we took a number of pictures of oyster culture.

Seaweed Culture

The edible seaweed, called Nori, is grown on nets suspended horizontally 6 inches below high tide on bamboo poles. The mesh appeared to be 3 to 4 inches square. Small clumps of the seaweed are attached at closely spaced intervals on the submerged net in November. Rapid growth of Nori occurs during cold weather, December to March, at salinities greater than 10 ppt. Harvest is effected by careful removal of the net with the attached seaweed and subsequently air-drying the seaweed during sunny days. The dried seaweed is stripped off the net in sheets and sent to the market. Sale price is approximately 2,500 yen per kg ($3.15/lb). Nori is widely used in soups and is consumed in the dried state with rice and fish dishes.

Licenses or fees are not required for those fishermen culturing Nori, apparently because the seaweed grows only during the colder winter months when activities in the bay area such as recreation and fishing are much reduced.

Motokawa Fish Culture Farm

This privately owned farm, located near Maebashi, was visited on October 20, 1967. Emphasis here was on conditioning the common carp for market. As carp come from production ponds, they often have bad flavors especially if the pond water is low in oxygen or if flavor-producing algae or other conditions exist. At

this farm carp from production ponds are taken to conditioning ponds and kept there without food for approximately 1 week before being sold. The concrete conditioning ponds have a recirculating water system, the water passes from the pond containing fish through filters of sand and gravel and is then pumped to overhead raceways, approximately 2 meters above the pond surface, and subsequently flows back into the pond containing the fish. Formerly, well-water was pumped into the ponds continuously, but this proved unsatisfactory because when the fish from ponds with warm water were placed directly into ponds containing cold well-water, many would die. Consequently, the present system was set up using the same water over and over, but passing it through sand and gravel filters. This way the water temperature in the conditioning ponds was approximately the same as that of the production ponds from which the carp were taken. In this clear water, within 1 week, the intestine of the carp is thoroughly cleaned out and bad flavors and odors have disappeared. This system is quite interesting as it guarantees carp of good quality for the market. It is of interest here to note that the Israelis have also had trouble with bad flavors in carp and they believe it comes from the carp eating certain types of filamentous algae such as Oscillatoria. In ponds at Auburn, we have often noted that fish which come from waters low in oxygen do not have a good flavor. Consequently, it would also be desirable to run tests on conditioning ponds for market fish at Auburn.

Two types of filtering systems were used. In one, the pond had a false bottom covered with 50 centimeters of gravel, overwhich was approximately 2 meters of

water. As fish were held in this water, much of the waste materials settled down onto the gravel, the water passed down through the gravel into the false bottom, and was then pumped back for aeration and recirculation. In the second system, adjacent ponds were located around a pond which served as a filter. The concrete ponds containing the fish had a vertical slot from top to bottom of the pond. A screen across this vertical slot prevented passage of fish from one holding pond to another. Water could pass freely from the conditioning ponds into the adjacent filter pond, then passing down through sand and gravel into pipes laid under the gravel, back to the pump where it was again lifted up to the overhead troughs and splashed back into the conditioning ponds. One filter pond approximately 4 meters by 6 meters was used for 3 holding ponds of approximately the same size. Each of these ponds was capable of holding from 4 to 7 tons of carp during the conditioning period. In these filtering systems, the gravel had to be changed and cleaned approximately once every 6 to 8 weeks. In one pond where the bottom of the pond acted as a filter, 7 tons of fish were being held. The dimension of the pond was 7 meters by 6 meters by 2 meters deep. In other ponds belonging to the same dealer, the polluted water came up through the bottom of the filter, passed upward into an area above the gravel and was pumped out of the top. These ponds had false bottoms with a plate perforated with small holes over which 50 centimeters of gravel was placed. Contaminated water then entered the compartment below the false bottom, passed upward through the filter and then taken out by the pumps.

It is possible that this method might reduce the frequency with which the gravel needs to be changed, and make it easier to flush out the filter.

Mr. Ichinosuke Motokawa, owner of this fish culture farm, conditions approximately 400 tons of carp per year from his own production ponds. In addition, he purchases fish from other fish growers in the area. After conditioning, the carp are shipped alive to markets in Tokyo, usually in a tank truck having a capacity to carry 1 ton of fish.

The dealer operating the conditioning ponds for carp also had a number of fish-out ponds. He charged 300 to 500 yen per fisherman. The catch was not limited. He was able to do this because carp are rather difficult to catch. Other operators with fish-out ponds charged for the carp or trout by the weight of fish caught.

Tanaka Fish Culture Farm

This fish farm is located at the village of Annaka, in Gumma Prefecture. The culture here is exclusively with carp in a running-water system. This particular operation has been reported in the Progressive Fish-Culturist by Dr. Kawamoto and in FAO publications. A large irrigation canal runs through Mr. Tanaka's place. Water from this canal is diverted into a small pond from which the water passes back into the canal. Farther down the canal, the water is diverted through a second pond, and again passes back to the canal. Mr. Tanaka operates

some 15 or so such ponds, some of which he rents on an annual basis at the rate of $1.50/m^2 of surface area. Since the irrigation canal has a very large flow of water, the amount of water diverted in any one pond is probably less than 1/20th to 1/50th of the total flow. However, the greater the number of ponds upstream from a particular pond, the lower the production obtained, apparently because of gradual accumulation of waste products from the upper ponds.

The ponds were small, from 20 to 70 m^2 each. The sides were lined with rocks and cement, the bottoms were of earth and the depth of water was approximately 2 meters. One-year-old carp were stocked up to 10,000 per 56 m^2 (200/m^2). Fish were fed from 12 to 17 times a day, from 6 a.m. to 9 p.m. during the summer months. The feed used was silkworm pupae and pelleted feeds. In a 56 square meter pond, 120 kg of silkworm pupae plus 100 kg of pelleted feed (39,000 kg/ha/day) were fed per day. Two methods of regulating feeding were used. One required experience and the fish at each feeding were fed until feeding activity almost ceased and most of the fish had left the feeding area. The other method is similar to that which we use at Auburn for channel catfish, estimating the size of the standing crop and then feeding between one and two percent of their weight per day. The owner estimated that it cost 180 yen for the feed to produce 1 kg ($0.28/lb) of fish. One pool having an area of 42 square meters and a depth of 2 meters, had a flow of 0.4 tons of water per second. This pond contained 9,600 carp (230/m^2). Highest production was 5.6 tons of carp from a pond containing 30 square meters (187 kg/m^2). Another pond containing 25 square meters yielded 4 tons of carp per year (160 kg/m^2). The conversion of food to carp is 1.3 to

1.4. One ton of dried silkworm pupae costs 87,000 yen ($0.11/lb). Pictures were taken of the carp during the feeding period. This was quite an impressive sight and shows what can be done with running-water cultures. This same type of culture occurs in a number of places in Japan and is a very good use for irrigation water. Water is first passed through fishponds in which large numbers of fish are being fed and then passed back into the irrigation canal and out on the rice fields. In certain areas, it is claimed that this results in increase in rice production of approximately 20 to 25 percent.

Nagano Prefecture Fisheries Guidance Station

On October 21, we visited the Saku Branch, Nagano Prefecture Fisheries Guidance Station, which has a staff of three technical workers. In the absence of the director of the Station, Mr. H. Sasaki, engineer, explained the operation of the Station. The purpose of the Station was research demonstration, and advice to fish growers. The research dealt with culture of the Ayu (*Plecoglossus allivelis*), a salmonid, and the common carp. Mature Ayu migrate from the sea to spawn in the upper reaches of freshwater rivers. A landlocked form from Lake Biwa also migrates upstream to spawn. Fingerlings are caught with seines as they descend the rivers and are sold for 10 yen each (2.8 cents).

Culture of Ayu was not seen as all the ponds had been drained and the fish sold in September. Ayu also are stocked in running-water ponds where their culture is similar to trout. The small fish are placed in upper-most ponds and

as they grow, they are graded according to size and gradually shifted into other growing ponds downstream. The harvest is reported as approximately 40 kg per square meter of raceway. At harvest, Ayu average approximately 70 grams each. Generally, Ayu are fed on a mixture of 40 percent fish meal, 20 percent wheat flour, 15 percent silkworm pupae, and 25 percent of a commercial mixture which contains vitamins, meals, and other materials. This is fed as a paste but the conversion is approximately 3 to 1, because emphasis is placed upon raising the fish as rapidly as possible to market size to get the highest price. The earliest fish produced in this area sell for 1,000 yen per kg ($1.26/lb) and later ones for an average of 700 yen ($0.88/lb). Feed costs approximately 70 yen per kg ($0.09/lb).

Feed used by the Station for its research was approximately the same as the Courtland trout diet. The figures below are in percent:

whitefish meal	38	soybean meal	3 to 10
wheat flour	35	soybean oil waste	0 to 10
rice bran	15	salt	1
alfalfa meal	5	vitamin mix	0.5 to 1
tortula yeast	1.5		

The Culture of Carp in Rice Fields

This culture is on a small scale and consists of two types. The first method is the culture used before rice is planted. It is for the production of carp fingerlings for stocking ponds. The rice paddy is filled with water in April and 200,000 carp eggs are stocked into 0.1 hectare. Natural foods only are used. In late May or June, the water is drawn down. The fish move into a small sump in a corner of

the paddy and approximately 20,000 fingerlings, 4 centimeters long, weighing 1 gram each, are harvested per 0.1 hectare.

The second method is rice plus fish. In July, the paddy is flooded, rice is planted, and then fingerling fish from the spring draining in May or June are stocked at the rate of 2,000 per 0.1 hectare. There is no production of carp to harvestable size in ponds along with rice. Large fingerlings produced in the rice paddies are also used for stocking the carp production ponds.

In this area of Japan, the running-water ponds produce a harvest of up to 50 kg carp per square meter. Production in still-water ponds is between 0.5 and 0.7 kg carp per square meter. The feed used for carp is approximately the same as for Ayu although it may have somewhat less protein.

Water Filtration Experiments

The laboratory was using to study carp feeds a series of ten wooden tanks 30 inches by 32 inches by 24 inches deep. Water from spigots fell about 2 feet into the tank. The bottom of the tank had an outlet with a riser on the outside extending approximately halfway up the depth of water, so that all the water could not flow out of the tank. This overflow water passed into a trough leading to the outside of the building and then into a sump 4 feet by 14 feet where the water then flowed up through a perforated plate, through 50 centimeters of gravel, to the upper part of the filter, where it was picked up by pumps and circulated back through the system. Several electric heaters were placed in the filter, keeping the water approximately 16° C for research purposes. The depth of the water

in the filter was approximately 2 feet above the top of the gravel. The entire filter was covered with waterproof paper over which was a plastic roof to keep out rain. The research worker believed that bacteria purified the water in this system. The water did look quite clean and pure as it came back to the tanks. This, however, brings up the question of what is the best type of filter to remove wastes from fish. It would not appear that such a filter would greatly reduce the ammonia content of the water or reduce the carbon dioxide content. Research is needed to determine if it would be better to allow the water to pass down through the rocks and gravel out in the sunlight so that various organisms might grow better on the rocks, or if good results could be obtained by the method described above where bacteria and other organisms not requiring sunlight might break down some of the compounds and aid in taking out some of the particulate and soluble matter. No analyses were being made on the water as it left the feeding compartment or as it returned to the feeding compartment, so it was impossible to evaluate the effectiveness of this filter.

In the experimental ponds outdoors, feeding of carp was stopped whenever the temperature reached 10° C.

Carp Production in a Converted Rice Paddy

One farmer raised rice and fish for a short time and decided that fish culture was more profitable. Consequently, he converted the rice pond into a carp pond. Since this pond was supplied with irrigation water, a certain amount of water passed through the pond. In addition, an electric aerator was in the pond which

pumped the water from a depth of approximately 12 to 18 inches and sprayed it back into the pond in a circle of about 15 feet in diameter. The pond had an area of 800 square meters and during the past year, the production amounted to 3 tons of carp, equivalent to 3.75 kg/m^2 or 37,500 kg/ha or 33,000 lbs/acre.

Production of Carp Fingerlings in an Irrigation Pond

The Research Station here operated a 3-hectare irrigation pond for the production of carp fingerlings. The main purpose of the pond was to hold water from the irrigation system until the dry period of the year, at which time roughly half of it was used on the rice paddies. In July, the pond was stocked with 300,000 common carp fingerlings 4 centimeters long. In past years, they have obtained roughly 70 percent survival. They harvested 20 tons of carp (2.6 tons/acre) 50 to 100 grams in size from this pond in the past year. These larger carp are used by the carp farmers to stock in the ponds to raise to marketable size--marketable fish are usually 1 kilo in size. The Station sold the carp fingerlings to fishfarmers for a total of approximately 5 million yen. Cost of production and tax paid was approximately 40 percent of this amount. This money went to the Prefecture Government and was available for use by the Research Station.

Following the visit to this Station, we left by car in late afternoon, passing through small towns and valleys in the mountains. We then took a bus over the mountains to Shimosuwa City, passing over narrow roads through the mountains. The roads were of concrete, but so narrow that whenever the bus met a truck or car on a curve, one or the other had to back up for the other to get around. Most

of these roads in the mountains were approximately wide enough for one car; or at most, one and a half cars. The night was spent at the Japanese hotel called the Yakko, where Dr. Moss and I enjoyed living in Japanese style in everything except the communal bath. Here I ate raw, uncooked fish and upon return to Auburn this may be a very interesting subject for study by our parasitologists.

Shimsuwa Branch-Nagano Prefecture Fisheries Guidance Station

On the morning of October 22, we visited the Nagano Prefecture Fisheries Guidance Station. Research at the Station, directed by Mr. Minoru Nato, principally is on culture of carp in floating pens. The net compartments were 9 by 9 meters, 1.5 meters deep. The net extended about 6 inches above the surface of the water and was attached to another net extending about 2 feet above the water to prevent fish jumping out. The nets were of small mesh (3 centimeters stretch mesh) and made of vinyl fiber. The portion of the net underwater consisted of two layers of netting material to preclude loss of fish should holes develop in one of the nets. Steel drums were used for floats for the nets. The cost for each impounding net was 100,000 yen ($278.00), and the life expectancy is three years, after which new netting material is intalled at a cost of 30,000 yen ($83.00).

The pens are stocked in May with 5,000 carp (70 grams each), and are harvested in September to November by floating the impounding net to shore and loading the fish directly onto tank trucks. At harvest, the carp average about 800 grams, with approximately 90 percent survival. Production is 3.5 to 4 tons

per pen (43.2 to 50 kg/m^2). Carp are fed a pelleted feed, 1/4 inch by 1/2 inch pellets, containing approximately 45 percent protein. Principal ingredients are fish meal and soybean meal. Cost of commercially prepared fish food is 65 yen/kg ($0.09/lb). A sinking pellet is used, but since the fish are fed very slowly, generally four times daily, it was thought that very little feed was wasted. Conversion is approximately 1.5 to 1. Pen culture of carp in this area started 7 years ago and at present, 105 impounding nets are in use in Lake Suwa, with 7 being operated by the Research Station. Lake Suwa is a natural lake with a surface area of 14 square kilometers (3,500 acres), a maximum depth of 7 meters and an average depth of 4.5 meters. This lake, at an elevation of 760 meters, freezes over to a maximum depth of ice of 20 centimeters during winters and maximum water temperature is 30° C during summer.

This completes our resumé of fish culture establishments visited in Japan. There was insufficient time to schedule a visit to the Freshwater Fisheries Research Laboratory in Tokyo. However, materials showing the organizational arrangement and principal research projects are attached. Also attached is a sheet summarizing carp culture in paddy fields as practiced in Nagano Prefecture.

COPY

CARP CULTURE IN PADDY FIELDS

Paddy fields suitable for culture.

1. Rich in water supply.
2. Easy to flow in and out.
3. Not be flooded.
4. Located at a convenient distance.

Preparation for culture.

1. AZE (low dyke separating paddy fields) is made strong, if it is 40 centimeters in height and 30 centimeters in width.
2. Set wide screens at inlets and outlets of water.
3. Dig 50 centimeters deep and 2-3 meters square per 10 a. near inlet.

Connection with a rice crop.

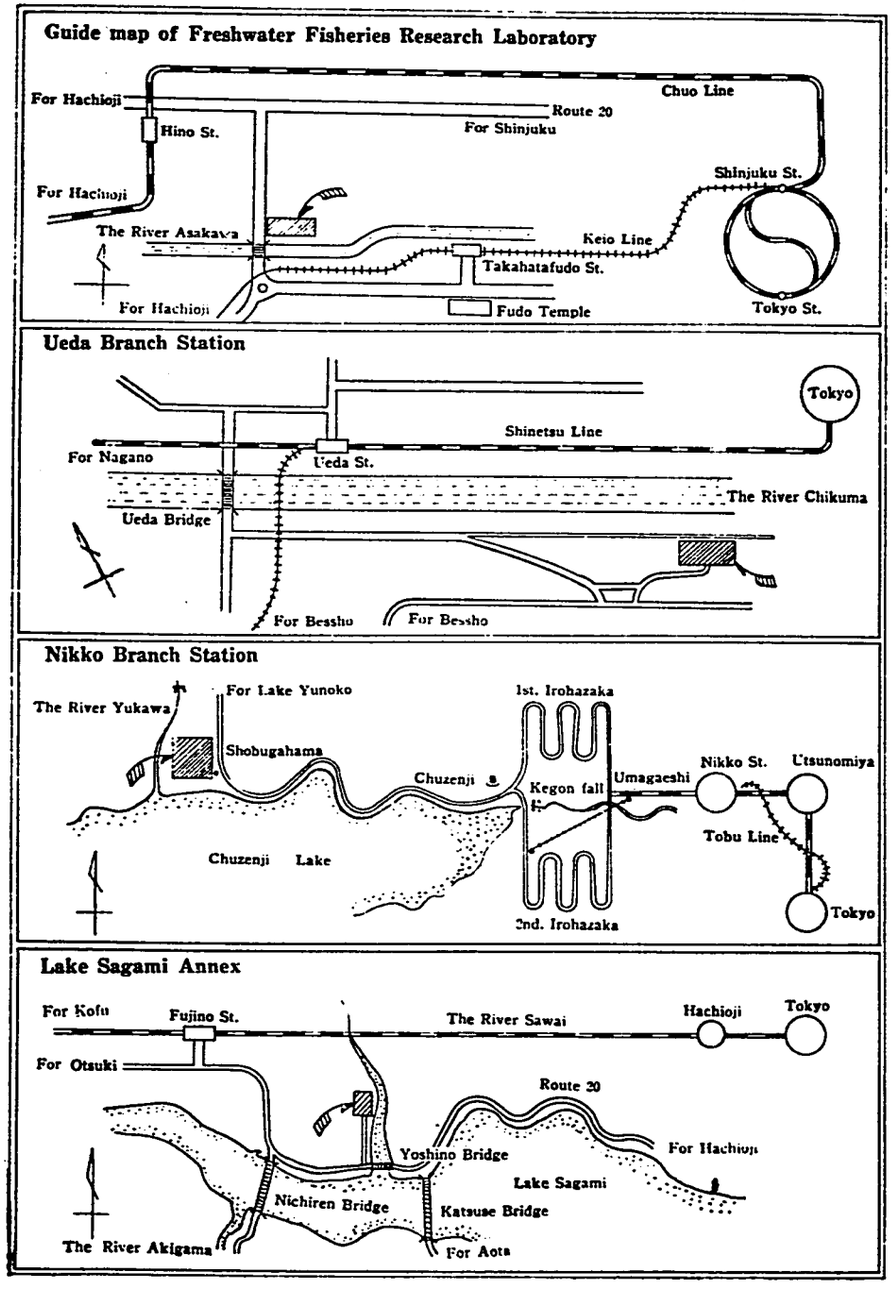
1. Select a kind of rice which has comparatively not many ears.
   EX: No. 311 Shinko, Fukushima-mochi.
2. Transplant not more than twenty stumps per one square meter.
3. Use the agricultural chemicals least poisonous to fishes.
   EX: NIP (2.4-Dichlorophenyl-4-nitrophenyl ether) as herbicide.
   KASUMYN (Kasugamycyn) for rice blight.

Methods of culture (per 10 a.).

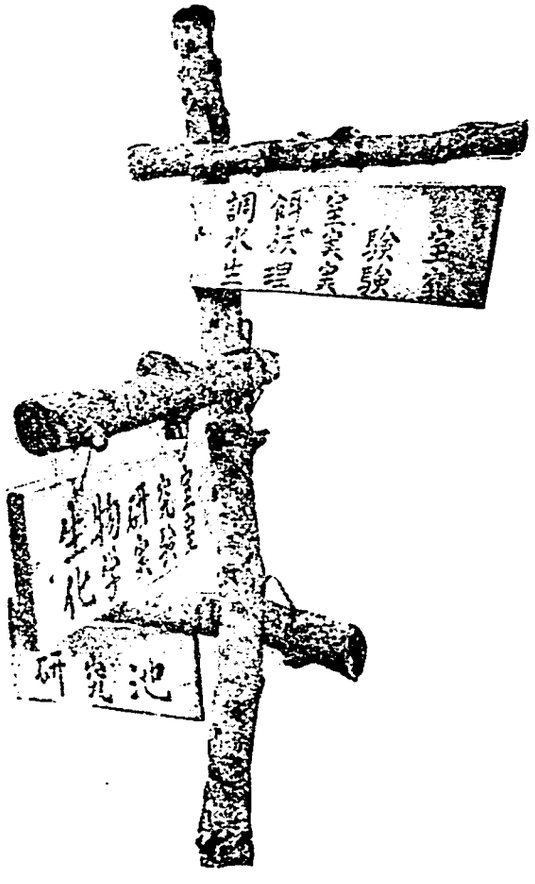
PERIODS		Ist	IInd	IIIrd	IVth
Start	Time	Late in May	Early in June	Early in July	Early in June
	Size	egg	B.L. 1.5 cm	B.L. 4 cm B.W. 1 gm	B.L. 10 cm B.W. 30 gm
	No.	eggs from 20 fishes	30,000	3,000	300
Start	Time	Early in June	Early in July	Late in Sept.	Late in Sept.
	Size	B.L. 1.5 cm	B.L. 4 cm B.W. 1 gm	B.L. 10 cm B.W. 30 gm	B.L. 20 cm B.W. 300 gm
	No.	1 or 2 million	20,000	1,500	210

Written by Nagano Prefecture
fisheries guidance Saku Branch
October 21 - 9:30 to 11:20

COPY



An OUTLINE

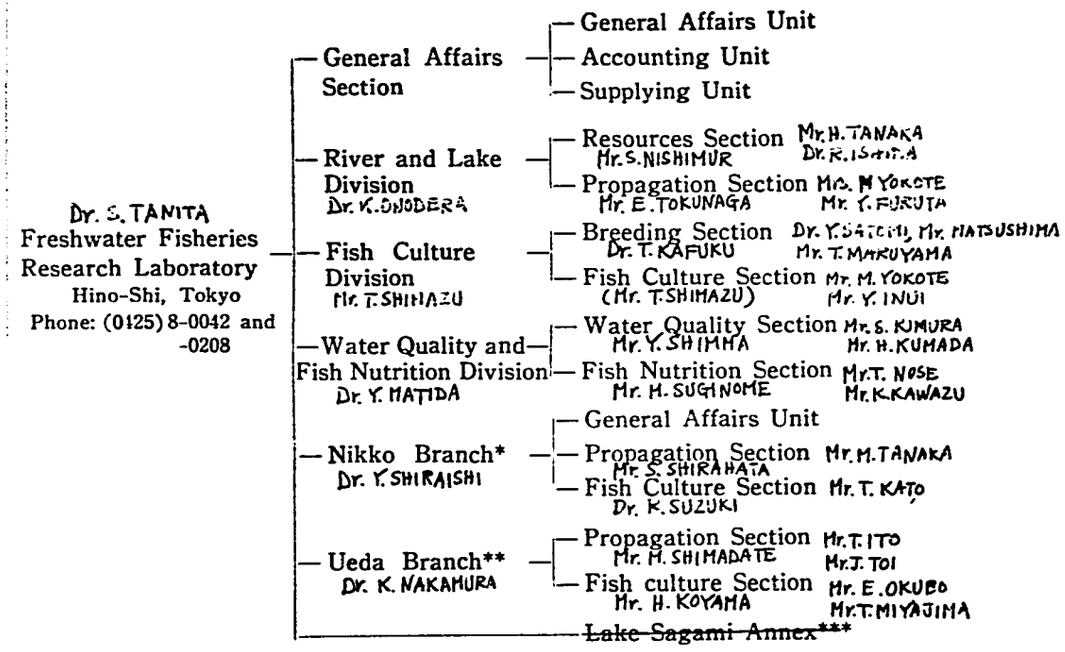


1966

Freshwater Fisheries Research Laboratory
Fisheries Agency

Photo: A guidepost standing in the court of Hino-Headquarters appointing the direction of fish rearing ponds and laboratories

ORGANIZATION



Number of Staffs:

Items	Laboratory Headquartrs	Nikko Branch	Ueda Branch	Lake Sagami Annex	Total
Clerk	13	5	2	0	20
Technical	26	13	8	1	48
Temporary	6	3	0	0	9
Total	45	21	10	1	77

* Nikko-Shi, Tochigi Prefecture. Phone: (0288) 5-0055

** Ued-Shi, Nagano Prefecture. Phone: (0268) 2-0594

*** Fujinomachi, Tsukui-Gun, Kanagawa Prefecture. Phone: (0426) 84-2141

OUTLINE AND SHORT HISTORY OF RESEARCH

The Freshwater Fisheries Research Laboratory is an only national institute in charge of researches on the production of freshwater fishes.

The general research problems are the maintenance of production of fish resources and their forage organisms, fish culture and breeding, the control of environment, and physiological problems concerning nutrition of fish, metabolic requirement, haematological problems, qualities of natural and artificial fish feed, and fish diseases. The economic problems on the circulation of produced materials and on the general aspect of econmical management of fish culture and freshwater fisheries are also studied.

The Freshwater Fisheries Research Laboratory was established in June 1949, when the former Central Fisheries Station, Ministry of Agriculture and Forestry, was divided into the present eight Regional Fisheries Research Laboratories.

(1) *The headquarters* of the present laboratory opened its business and research in the building of the former Central Fisheries Station (the present site of the Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-Ku, Tokyo).

In April 1953, it moved to the present location, where abund nt undergound water of good quality was obtained.

(2) *The Nikko-Branch*, began its history in 1906 as a hatchery under the control of the then existing Imperial Property Bureau of the Mininistry of Imperial Household, engaging in trout culture and breeding. After 1949, the hatchery was transferred to the Fisheries Agency as the Nikko Hatchery and engaged in the production and distribution of eggs and seedlings. However, as the national requirement of more profound research increased through the prefectural developmeut of trout culture and hatchery entertainment, the national hatchery started newly as present organization — The Nikko Branch, Freshwater Fisheries Research Laboratory. The principal subjects are, breeding of trout races including hybridization, and the management of fish production in lakes and streams of highland.

(3) *The Ueda Brnach* was established in November 1940 as the Ueda Branch, Centraral Fisheries Station, Ministry of Agriculture and Forestry. The institution was donated by Ueda-Shi, Nagano Prefecture. The aim of projects was orientated to the fish production in midstreams and also

in farm ponds. In 1949, it was attached to the Freshwater Fisheries Research Laboratory as the Ueda Branch, and has continued its particular subjects till now.

(4) *The Lake Sagami Annex* was initially established as Yose Test Station, Central Fisheries Station and there the limnological survey and the development of fishery in the man-made lake was studied. In September 1950, a new laboratory was established at the present site and started its business and research as the Lake Sagami Branch. In 1965, the Branch was reduced its organization into an Annex, but the facilities are fully utilized. (Closed in 1967)

FACILITIES

(1) *Headquarters*

Estate 31,950 m²
Buildings 1,740 m² (including official residences : 510m²)
General affairs office, Training institute,
Biology laboratory, Chemistry laboratory,
Special laboratory, Pump house, Transformer house,
Store house and Garage
Fish ponds 2,400 m²

(2) *Nikko branch*

Estate 576,920 m²
Buildings 1,930 m² (including official residences : 540m²)
General affairs office, Training institute.
Dormitories, Laboratories, Hatchery Workshop,
Garage, Boat house, and Store house
Fish ponds 8,590 m²
Boats 6

(3) *Ueda branch*

Estate 27,170 m²
Buildings 1,070 m² (including official residences : 550m²)
General offairs office, Laboratories,
Hatchery, Workshop, Green house,
Pump house, Store house,
Fish ponds 3,780 m²

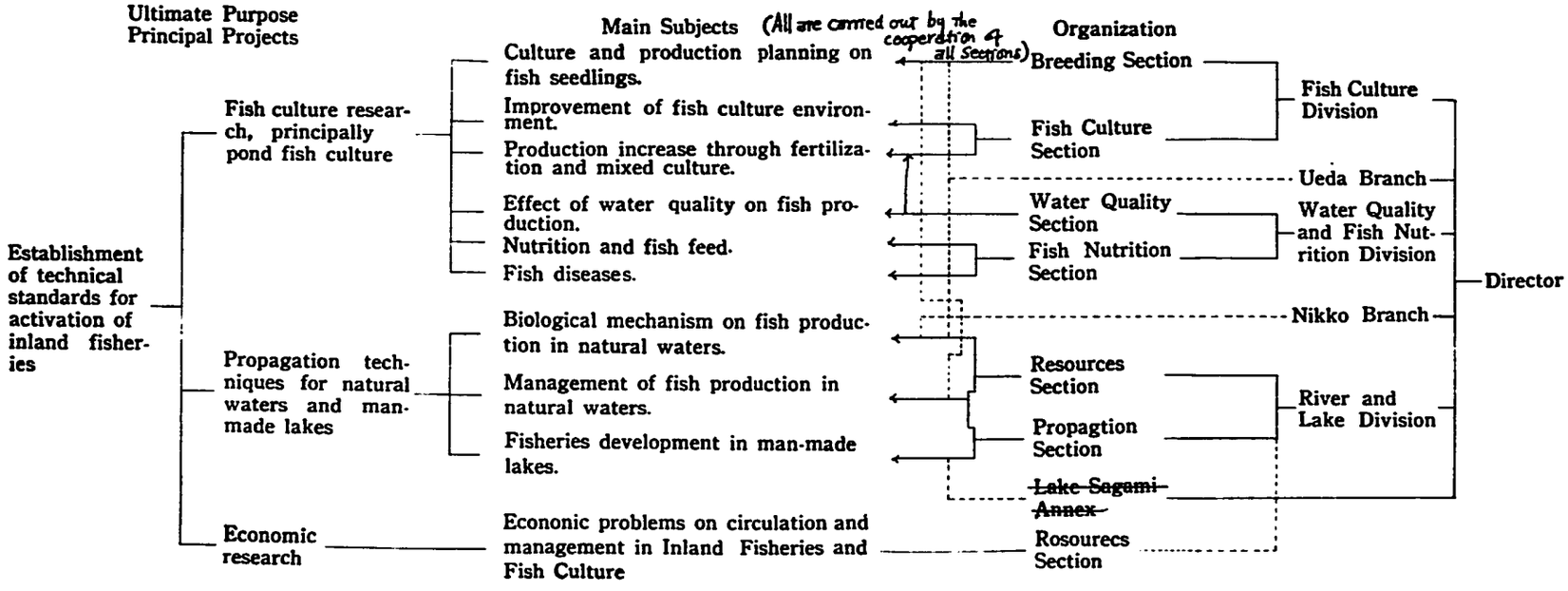
(4) *Lake Sagami Annex*

Estate 7,530 m²
Buildings 330 m² (Laboratory, etc. 230m²; residences, 100m²)
Laboratory and Store house
Boats 4

PRINCIPAL RESEARCH PROJECTS ('65)

1. Stocking efficiency or standard stocking density especially in the case of Ayu, *Plecoglossus altivelis*.
2. Methods of catch estimation in rivers.
3. Production of forage organisms.
4. Individual growth of fish in rivers
5. Carrying capacity in a trout stream.
6. Raciation of cyprinid fishes
7. Fisheries biology and population researches on pond smelt, *Hypomesus olidus*.
8. Fisheries biology on land-locked trout.
9. Photoperiodic effect on maturation of Ayu, *Plecoglossus altivelis*.
10. Ecology and population dynamics of fish by means of echo survey.
11. Culture of exotic species.
12. Propagation mechanism of daphnids as forage organisms.
13. Tilapia culture.
14. Production on fish seedlings.
15. Fertilization by orga ic and inorganic materials and circulati n of nutrient.
16. Physiology of Phytoplankton production.
17. Toxicity of chemicals in relation to inland fishery management.
18. Relation of water quality to productivity of natural waters.
19. Nutrition research on feed protein.
20. Pathological research on nutritive disease or disorder.
21. Propagation of important species in midstreams especially on minnows, *Tribolodon hakonensis* and *Zacco platypus*.
22. Insect drift of running waters into fish ponds.
23. Fish production in farm ponds.
24. Limnological research in Lake Sagami, a man-made lake.
25. Fishery development in man-made lakes.
26. Fisheries development in cold water area.
27. Breeding and hybridization in trout species.

PRINCIPAL PROJECTS AND MAIN SUBJECTS OF DIVISIONS AND BRANCHES (1967)



EXOTIC SPECIES IN HINO HEADQUARTERS

Scientific Names	Common Names or Original Names	Date of Import	Countries from where imported	Presnt status	Remarks
Tilapia mossambica Peters	St. Peter's fish	1954. 7.	Thailand	Distributed widely	
Perca flavescens Mitchill	Yellow perch	1960.10.	U. S. A.	Reserved in Hino	
Lepomis macrochirus Rafinesque	Bluegill sunfish	〃	〃	Distributed widely	
Morone interrupta Gill	Yeowll bass	〃	〃	All died	
Aplodinotus grunniens Rafinesque	Freshwater drum	〃	〃	〃	
Catla catla H. Buchanan	Catla	1961.12.	India	〃	Catla, Indian carp
Labeo rohita (H. Buchanan)	Rohu	〃	〃	〃	Labeo, Indian carp
Cirrhina mrigala (H. Buchanan)	Mrigal	〃	〃	〃	Cirrhina, Indian carp
Tilapia nilotica Linnaeus	St. Peter's fish	1962.12.	Egypt	Distributed widely	
Tilapia zillii Gervais	St. Peter's fish	〃	〃	〃	
Acipenser güldenstädti Brandt	Ocetp	1963. 4.	U. S. S. R.	All died	
Acipenser baeri Brandt	Ocetp	1964.10.	〃	Reserved in Hino	Propagated in the palace of H. I. H. Crown Prince Akihito
Idus idus (Linnaeus)	Silver orfe	1965. 3.	England	〃	
Puntius schwanenfeldii (Bleeker)	Lampam	〃	Indonesia	〃	
Cirrhina molitorella (Cuv. et Val.)	Mud carp	1966. 6.	Taiwan	〃	Chinese carp

Publications

1. Bulletin of the Freshwater Fisheries Research Laboratory (In Japanese, annual or semi-annual).
2. Miscellaneous Reserch Reports.
   Series A: Summaries of foreign literature (Two or three issues a year)
   Series B: Publitations for P.R. (Irregular)
3. Annual report of the Freshwater Fisheries Research Laboratory published by Secretariat of Agiculture, Forestry and Fisheries Research Council, Ministry of Agriculture and Forestry.