Cover photos

(Upper left)
- Fries of Salmon and catching autumn Salmons by stationary netting at Abashiri offshore

* The photo of catching by courtesy of Mr. Masami Takahashi, Fisheries Graph K. K.

(Upper right)
- The larvae of scallop immunostained and catching scallops by girder seine fishery at Monbetsu offshore.

(Lower left)
- Eggs of Pacific herrings, on seaweeds at Otaru offshore.

(Lower right)
- Catching of Pacific herrings using the gill net, at the Atsuta fishery port

北海道

Guide of the **Local Independent Administrative Agency,**
Fisheries Research Department, Hokkaido Research Organization

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Local Independent Administrative Agency

Fisheries Research Department, Hokkaido Research Organization


Central Fisheries Research Institute	**Wakkanai Fisheries Research Institute**
Hakodate Fisheries Research Institute	**Mariculture Fisheries Research Institute**
Kushiro Fisheries Research Institute	**Salmon and Freshwater Fisheries Research Institute**
Abashiri Fisheries Research Institute	

Introduction

Hokkaido is an island of an extensive area endowed with lakes and marshes in the rich natural environment, and is surrounded by 3 seas, the Pacific Ocean, the Sea of Japan and the Sea of Okhotsk, respectively owing their unique characteristics.

Hokkaido is blessed with abundant natural aquatic resources, and serves as a major base for aquatic products production with a share of 25% of the country's fishery output. Amid these circumstances, fisheries research institutes, since their foundation in 1888, have contributed to the Hokkaido's fishery for more than one century.

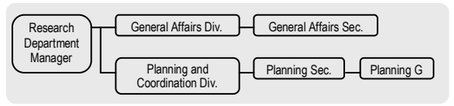
However, obliged to focus on coastal fishery, Hokkaido has recently faced a decrease in fish catch: entering the 21st century, there arise various issues, along the diversification of fishery environment, including a worsened habitat of useful kinds of fish. Under this backdrop, becomes stronger the need to seek for stabilization of the fishery businesses based upon the sustainable use of aquatic stock.

Toward this goal, the fisheries research institutes have set up the three fishery promotion pillars, that is, the promotion of fishery to bolster the community, securing the safety of aquatic products and their high level utilization, and the promotion of the fishery aimed at the coexistence with nature. Since the April of 2010, the prefecture-owned research institutes restarted as a local independent administrative agency, under the auspices of the Hokkaido Research Organization, a local independent administrative agency, commit themselves to experiments and researches of various kinds to solve the issues in fishery and achieve the goals.

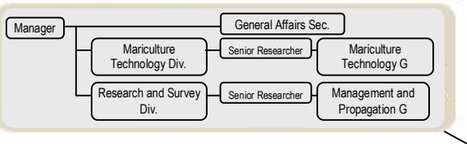
History of the Hokkaido Fisheries Research Institute

1888	Was established the former Chitose Central Hatch Station (Chitose Artificial Hatch Station of salmon and trout, in Hokkaido), the parent of the current Salmon and Freshwater Fisheries Research Institute.
Dec.,1901	The Hokkaido Fisheries Research Institute was established, on local budget, in the village of Takashima, Takashima-gun, Shiribeshinokuni; the institute was called "Takashima Honjo (center)". The state-run Chitose Central Hatch Station was transferred to the local government to be operated at local expense, which was renamed the Chitose Substation, Hokkaido Fisheries Research Institute.
Apr., 1907	The ownership of the Nishibetsugawa Salmon Artificial Hatch Station, as a donation, was transferred to local expense management, from the Nemuro fishery association and two other associations of Nemuro; The institute was renamed the Nishibetsu Substation of the Hokkaido Fisheries Research Institute to continue its business.
Apr., 1910	Along with the first phase Hokkaido Development Plan, it was again transferred from local cost management to governmental cost management. The both substations of Chitose and Nishibetsu were raised to the status of branch station.
Oct., 1910	A residential station was provided at Muroran, Kushiro and Wakkanai respectively.
Apr., 1916	The residential station was reorganized as a branch station to integrate the Nemuro Branch Station. The Hokkaido Fisheries Research Institute operates not only its own management, but also that of the branch stations of Chitose, Nishibetsu, Kushiro, Muroran, Nemuro and Souya.
Jul., 1927	With the 2nd phase Hokkaido Development Plan, both the stations of Chitose and Nishibetsu are separated from the Hokkaido Fisheries Research Institute so that their activities are integrated by a new institute, the Chitose Salmon Hatch Station.
Mar., 1928	Was established the Hakodate Branch Station of the Hokkaido Fisheries Research Institute.
Jul., 1931	The Hokkaido Fisheries Research Institute was completed and moved from Takashima town to Oaza Hamanakamachi 64, Yoichi town, Yoichi-gun. The Soya Branch Station of the Hokkaido Fisheries Research Institute was renamed "the Wakkanai Branch Station".
Apr., 1932	The Muroran Branch Station of the Hokkaido Fisheries Research Institute was shut.
Jun., 1934	39 hatch facilities in the private sector become state-owned. Under this new scheme, the Chitose Salmon Hatch Station, as a central station, was reorganized to be renamed the Hokkaido Salmon Hatch Station, establishing 4 new Branch Stations, Nijibetsu (former Nishibetsu), Kitami, Kunashiri and Etorofu.
Dec., 1936	This station, that is, the Hokkaido Salmon Hatch Station, was removed to Toyohira town, Sapporo-gun (current Toyohira Ward, Sapporo City) from Chitose. The Chitose Branch Station was established.
Sep., 1937	Was established the Oshima Branch Station of the Hokkaido Salmon Hatch Station.
Feb., 1941	The Hokkaido Salmon Hatch Station was renamed the Hokkaido Fishery Hatch Station which, includes, as branch stations, Oshima, Nijibetsu, Kitami, and Chitose work.
Jun., 1941	The Etorofu Shana fishery training center was newly established.
Oct., 1942	Was established the Abashiri fishery training center. (This center later became the Abashiri Branch Station of the Hokkaido Fisheries Research Institute.) The Tokachi Branch Station was established, as the organization separated from the Tokachi work, Nijibetsu Branch Station of the Hokkaido Salmon Hatch Station.
Apr., 1948	The Hokkaido Salmon Hatch Station, Teshio Branch Station was established.
Mar., 1950	The fishery training centers of Shana and Abashiri were disused.
Apr., 1950	Trough the remodeling of the state-owned fishery research organization, the Hokkaido Fisheries Research Institute was divided into two organizations, the Hokkaido District Fisheries Research Institute of the Fisheries Agency and the Hokkaido-owned Fisheries Research Institute. These two organizations, in parallel developed the fishery activities .
Aug., 1950	The Abashiri Branch Station and the Muroran Substation of the Fisheries Research Institute were opened. The fishery training center was established at Monbetsu and Rumoi.
Dec., 1950	This station of the Hokkaido-owned Fisheries Research Institute was reorganized into the branch stations of Wakkanai, Abashiri, Kushiro and Nemuro, as well as into substation of Muroran, Monbetsu and Rumoi.
Apr., 1952	The Water Resources Protection Law was enforced. According to this law, the Hokkaido Fisheries Hatch Station was divided into two organizations, the Hokkaido-owned Fisheries Hatch Station and the Hokkaido Salmon Hatch Station of the Fisheries Agency. The branch stations of Kitami, Nemuro (former Nijibetsu), Tokachi, Teshio, Chitose and Oshima which have been already opened are schemed to continue their operation at the same time.
Oct., 1957	At Mori Town, Kayabe-gun, the Hokkaido-owed fisheries Hatch/Salmon Growing Station was established.
1961	At Shikabe village, Kayabe-gun (current Shikabe town), was established the warm-water propagation laboratory of the Hokkaido-owned Fishery Hatch Station.
Sep., 1962	At Usu, Date town (current Date city), was established the Hokkaido seaweeds artificial collecting and incubation station.
May, 1963	The patent for walleye pollock ground meat-related technology was registered.
Mar., 1964	The Nemuro Branch Station of the Hokkaido-owned Fisheries Research Institute and the Rumoi Substation were abolished.
Apr., 1964	Along with the organizational remodeling of the Hokkaido-owned fisheries institute, the then existing system of "one fisheries institute and four branch stations" was abolished, and instead, the five fisheries research institutes, Hokkaido Central, Hakodate, Kushiro, Abashiri and Wakkanai were established. The locations of the substation s were designated with new names; Usu Substation of the Central Fisheries Research Institute, Muroran Substation of the Hakodate Fisheries Research Institute and Monbetsu Substations of the Abashiri Fisheries Research Institute.
Nov., 1965	At Tokoro town (current Kitami city), the two new fisheries institutes were established ; the one is the Hokkaido Saroma Seaweeds Incubation Station and the other the Saroma Substation of the Hokkaido-owned Abashiri Fisheries Institute.
Apr., 1969	The Mori Salmon Growing Station of the Hokkaido-owned Fisheries Hatch Station was renamed the Mori Branch Station, abolishing the branch stations of Kitami, Nemuro, Tokachi, Teshio and Oshima.
Apr., 1970	The Chitose Branch Station of the Hokkaido Fisheries Hatch Station was reorganized to start with the name of the Chitose Research Station.
Oct., 1970	The warm-water propagation laboratory of the fishery hatch station was shut down.
Jan., 1972	The Hokkaido-owned comprehensive center of mariculture fishery was founded at Shikabe village, Kayabe-gun (current Shikabe Town).
Nov., 1973	The Chitose Branch Research Station of the Hokkaido-owned Fishery Hatch Station was shut down. The Mashike Branch Station of the Hokkaido-owned Fishery Hatch Station was founded at Mashike town, Mashike-gun.
Oct., 1975	The Erimo Branch Station of the Hokkaido-owned Fishery Hatch Station was founded at Erimo town, Horoizumi -gun.
Oct., 1979	The Soya Branch Station of the Hokkaido-owned Fishery Hatch Station was established at Wakkanai City.
Jan., 1981	The following two substations were shut down; The Usu Substation of the Hokkaido-owned Central Fisheries Research Institute and the Saroma Substation of the Hokkaido-owned Abashiri Fisheries Research Institute.
Apr., 1982	The Muroran Substation of the Hokkaido-owned Hakodate Fisheries Research Institute and the Monbetsu Substation of the Hokkaido-owned Abashiri Fisheries Research Institute were raised in status to the branch station.
Oct., 1982	The Makkari Branch Station of the Hokkaido-owned Fishery Hatch Station was established at Makkari village, Abuta-gun.
Oct., 1983	The Kumaishi Branch Station of the Hokkaido-owned Fishery Hatch Station was established at Kumaishi town, Nishi-gun.
Nov., 1985	The Hokkaido-owned Fishery Hatch Station had been moved from Sapporo city. The new building was completed at Eniwa city.
Oct., 1988	The 100th anniversary of the project of salmon/trout hatch and release was held.
Feb., 1995	The new building of the Hokkaido-owned Central Fisheries Research Institute was completed at Yoichi town.
Oct., 2001	The 100th anniversary of the Hokkaido-owned Fisheries Research Institute from its foundation was held with a symposium for the commemorative ceremony.
Jul., 2004	The Mashike Branch Station of the Hokkaido-owned Fishery Hatch Station was reorganized and restarted as the Dohoku Branch Station, in the same way the Kumaishi Branch Station as the Donan Branch Station and the Mori Branch Station as the research center of the Donan Branch Station. The Doto Branch Station was established at Nakashibetsu town, and the Doto Freshwater Fisheries Office at Abashiri city. The branch stations of Erimo, Makkari and Soya were abolished.
Mar., 2006	The Monbetsu Branch Station of the Hokkaido-owned Abashiri Fisheries Research Institute was shut down.
Apr., 2006	The Hokkaido-owned Mariculture Fisheries Research Institute was newly established in Muroran city, by merging the Mariculture Comprehensive Center and the Muroran Branch Station of the Hakodate Fisheries Research Institute.
Apr., 2010	Following the organizational reform in Hokkaido (the institutes of laboratory and research were restarted with a status of independent agency), the six Hokkaido-owned Fisheries Research Institutes and the fishery hatch stations were respectively reorganized under Hokkaido Research Organization. In addition, the Hokkaido-owned Fishery Hatch Station was renamed the Salmon and Freshwater Fisheries Research Institute.

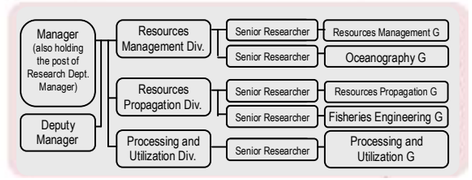
Fisheries Research Department



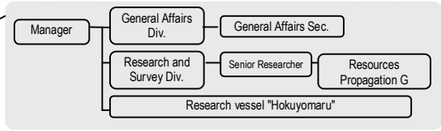
Central Fisheries Research Institute



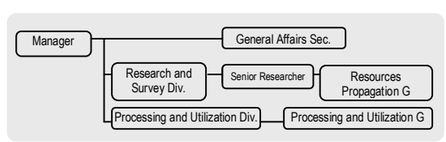
Mariculture Fisheries Research Institute



Wakkanai Fisheries Research Institute



Abashiri Fisheries Research Institute



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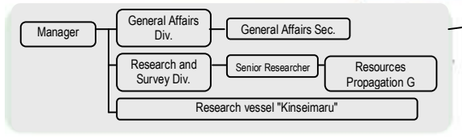
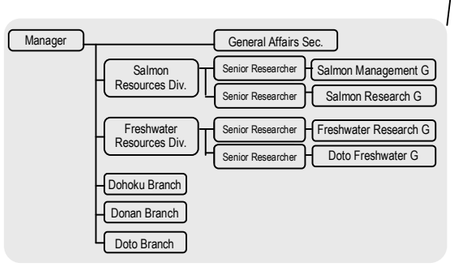
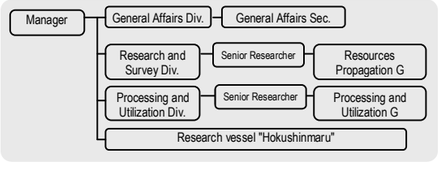


Salmon and Freshwater Fisheries Research Institute



Kushiro Fisheries Research Institute



Promotion of sea farming to enhance fishery production

- Stable fishery production -

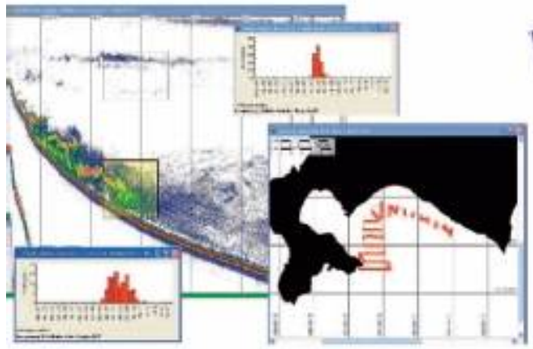
We plan and develop methods of stock management for sustainable development of marine fisheries resources around Hokkaido based on the results of biological and ecological research. We conduct surveys to study the distribution and abundance of target species for commercial fisheries, and to monitor water temperature and various types of plankton using our three research vessels. These survey data are used for prediction of fishing conditions, and for studying the relationship between stock conditions and environmental changes.

In 1996, the Japanese government established "The law for preservation and management of marine fisheries resources", and introduced a Total Allowable Catch (TAC) management system for walleye pollock, Japanese common squid, Pacific saury, and other species. This will require more progressive estimation of stock abundance and management methods.

Monitoring and estimation of fisheries and marine fisheries resources

We are developing a stock of information on the caches and the number of ships in operation which are the basic elements for the management and prediction of marine resources, as well as on the body length, weight and age of the marine life to be caught.

Furthermore, we use survey vessels to collect various kinds of data which cannot be obtained through fishing. By using the data stocked, survey is conducted over the level of aquatic resources and their trends in the sea areas surrounding Hokkaido to operate the fishery responding to the resources conditions.



With a fish finder, we determine the volume of the fish inhabiting the sea to evaluate the recourses and fishery conditions. This is an example of walleye pollock survey data analysis (Iburi offshore, Oshima, Hokkaido).

The data collected are used to assess the key aquatic resources in the sea area surrounding Hokkaido. Of the data above, the assessment results concerning the 23 kinds of fish and 47 sea areas are publicized in the Hokkaido fishery manageme nt manual. They are also reported at various conferences.

Development of stock management techniques for sustainable development of marine fisheries resources

Our effort is developed to study how to use the resources effectively and how to develop resources-friendly fishing tools, to secure a sustainable fishery stock. Based upon these research results, we propose management methods suitable for the kinds of fish and sea areas.

Survey on distribution of walleye pollock, atka mackerel and sailfin sandfish, by research vessels

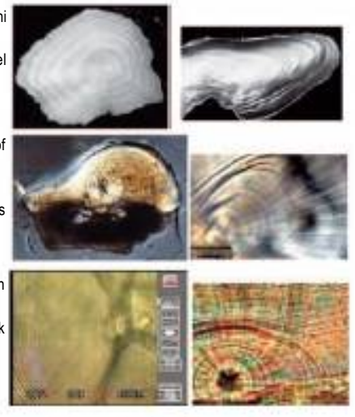
Referring to the growth rings of otolith, identify the age in years or in days whose data is used effectively to estimate the volume of resources.

Upper left: Otolith of Souhachi *(Hippoglossoides pinetorum)*
Right: Otolith of atka mackerel fish

Middle, righ: Otolith of Japanese common squid

Right : The central portion is enlarged.

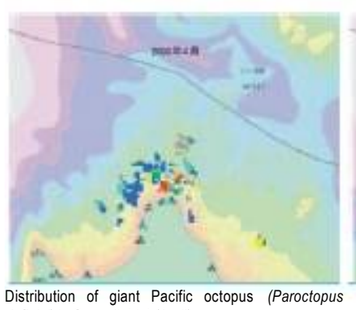
Lower, left: Otolith of sailfin sandfish
Right: Otolith of walleye pollock



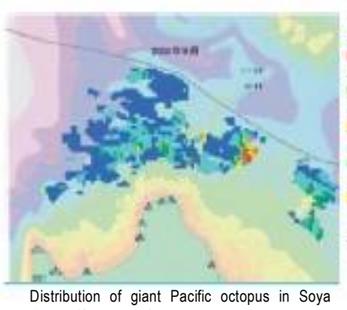
Otolith: Otolith is the crystal structure in the saccule of the fish, amphibians. As a fish grow, the age rings form; so with this data, it is possible to check the age in years and days of fish.

From the results of Sorinet research by the survey vessel, researchers on board examine fingerlings of flatfish which will grow further and become larger to a size of fishing.

With X rays, we check the number of spines of a ferring, in order to determine formations



Distribution of giant Pacific octopus *(Paroctopus dofleini)* in Soya district (April)

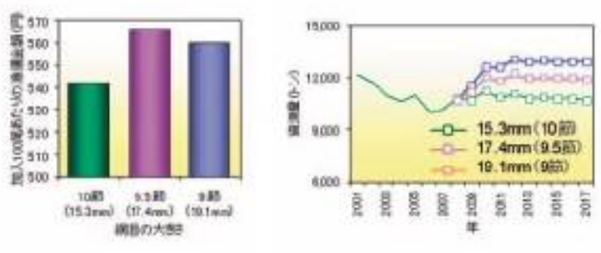


Distribution of giant Pacific octopus in Soya district (September)

Calendar of currents

By using a geographical information analyzer, a map indicating the distribution of giant Pacific octopus is prepared based upon the activities in fishery to identify seasonal changes of distribution. In addition, we have studied the characteristics of fishing methods, and established a calendar of currents to predict the time zones during which the currents suitable to fishing are produced. Based upon this information, we propose an effective resource management of maximizing the potential.

With a research vessel, we catch lobsters and shrimps, on a trial basis, to study the relationship between the sizes of lobsters fished and mesh sizes of the net meshes.



Left: For the fishing of Alaskan pink shrimp *(Pandalus eous)*, prediction of fishing amounts (in value) according to changes in net mesh size. Right: prediction of stock changes under the same condition; we propose an appropriate management method taking account of production amounts(in value) and changes in resource stock.

Effective management of marine fisheries resources

- Monitoring and prediction of fishery environmental fluctuations -

Research vessels of Hokkaido Fisheries Research Institutes

Three research vessels of the Fisheries Research Institute are deployed for the survey of stock of fish in the Hokkaido-surrounding area to investigate the stocks of bottom fish such as walleye pollock, atka mackerel, and for the survey of sardine, mackerel, Japanese common squid, Pacific saury which move circulate in wide ranges of area, and in addition, other various surveys including scallop larvae research and periodical marine observations. The survey, based upon by the research vessels, checks for the situation of stocks prior to starting the fishing, and for the data (information) of the fry which are expected to grow as fishery stocks. These efforts constitute a key position in the prediction of fishing condition and of the trends of stocks.

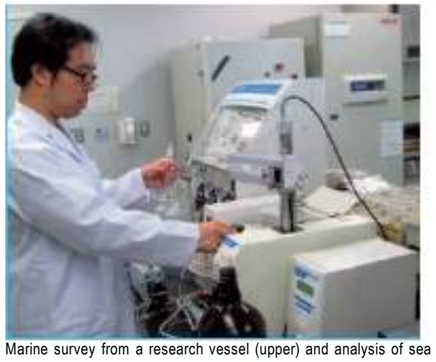
Hokuyomaru (237 tons), Wakkanai Fisheries Research Institute

Kinseimaru (151 tons), Hakodate Fisheries Research Institute

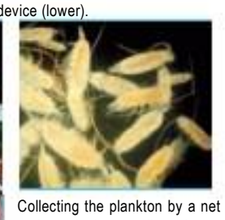
Hokushinmaru (216 tons), Kushiro Fisheries Research Institute

Monitoring and estimation of the marine environment

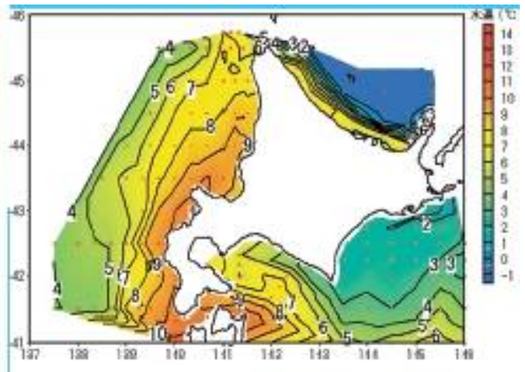
This activity is designed to accumulate the data for a long span of time through various approaches such as the grasping of marine fishery stocks, the prediction on the formation of fishing grounds, and the timing of releasing seeds and seedlings. By using the data accumulated for a long period, we intend to clarify changes in the marine environment, and to establish the technologies of predicting environmental changes and development of hazardous plankton.

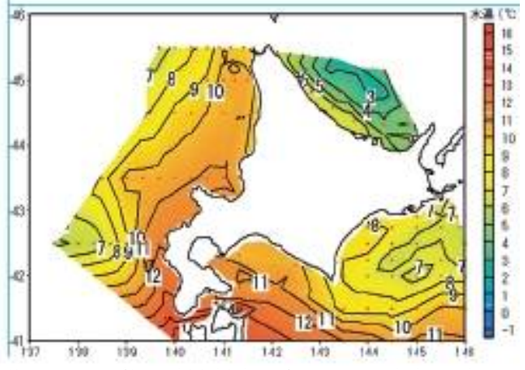


Marine survey from a research vessel (upper) and analysis of sea waters by using an state-of-art device (lower).

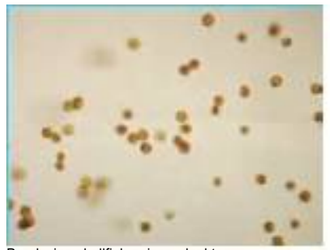


Collecting the plankton by a net and zooplanktons collected.

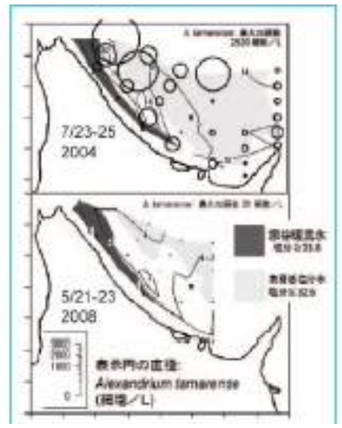




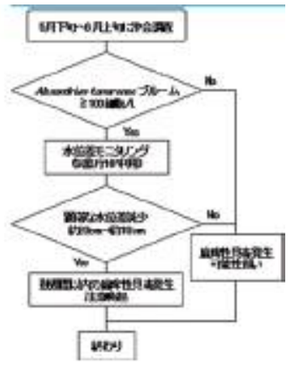
These are maps of horizontal distributions of average sea water temperatures for the period from 1989 to 2006 (at a depth of 50 meters) in the sea area surrounding Hokkaido prepared based on the results of periodical marine surveys by research vessels. With the data being accumulated for a long period, we can tell whether the measurements for each year is higher or lower than those of the preceding years.(Upper map; June. Lower map; December).



Paralyzing shellfish poison plankton
(Alexandrium tamarense)



Results of marine surveys and distribution of shellfish poison plankton
Up : Seasons where shellfish poison planktons prevail.
Below : Seasons where shellfish poison planktons less prevail.



Flow for the prediction of paralyzing shellfish poison planktons

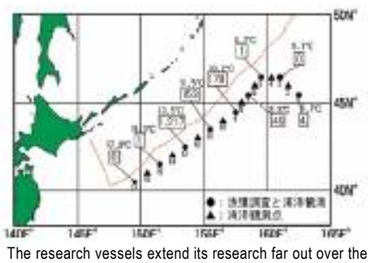
We surveyed the relationship between the developments of paralyzing shellfish planktons of marine environments, and has developed an approach of predicting production of shellfish poison planktons. By using this approach, we support appropriate shipment of scallops according to schedule.

Development of marine fisheries techniques and environmental prediction to ensure stable fisheries economics

Our effort focuses on the development and improvement of a precision technology of predicting the size of fish stock returning to the seashore, and the formation of fishery grounds, for the purpose of making effective the movement of vessels to fishing grounds, and for reducing the fish finding time and costs for fishing, as well as for stabilizing the fishery operation. The target kinds of fish under this approach are Pacific saury, Japanese common squid and walleye pollock. In addition, with the use of an information system, such predicted results are promptly delivered to a wider use.

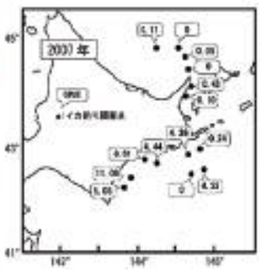
Fish hauling test with a drift net from the research vessel.

Measurement on board of the number and sizes of sauries.

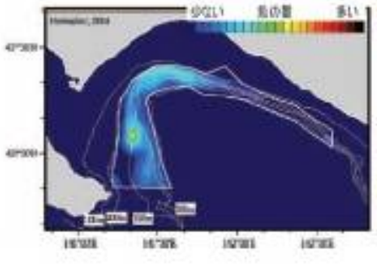


The research vessels extend its research far out over the sea of Hokkaido; the results of water temperatures and distribution of sauries are delivered as a quick report.

The number of fish caught per deck and per hour is used as an index to investigate their distribution.



The number of fished squids is determined for each fishing deck and per each hour, at each fishing point to derive the distribution; these results are given as a quick report.



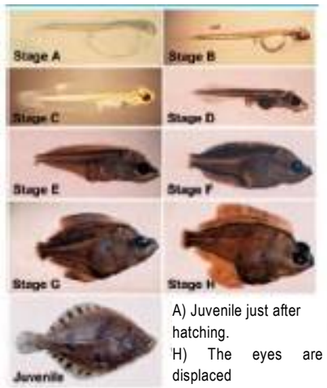
The distribution map of walleye pollock is established by a fish finder on board in order to predict the fishing grounds and the volume of fish circulating ; the data obtained is delivered as a quick report

Enhancement of fishery production

Large-scale sea farming of more than ten fish species, including Japanese flounder, Pacific herring, and Barfin flounder, shellfish such as the Japanese scallop and short-neck clam, sea urchins and also sea cucumber, is being promoted in various parts of Hokkaido. This research is essential for enhancing and stabilizing coastal fishery resources, and various aspects are currently being investigated. In addition, computer simulations of hydrodynamics are being conducted to estimate the influences of wave action and water current on fisheries resources. These research activities have led to the development of sea farming techniques to enhance fisheries production in Hokkaido.

Development of technology for seed production and enhancement appropriate for sea areas with specific characteristics

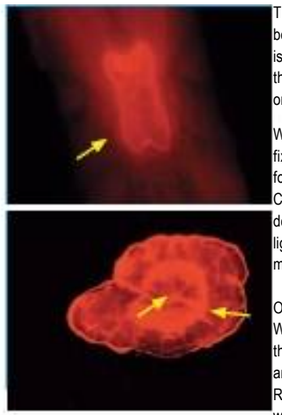
We are developing the technologies of sea farming aimed at increase of marine stocks or at their stabilization, including the technology of production, in large scales and in stabilization, of seeds and seedlings for release, and gasping the growth of specimens, their remaining rate and the recovery rate after release. To contribute to local developments, development of kombu-marine farming technology is also included in our activity.



A) Juvenile just after hatching.
H) The eyes are displaced

Process of growth of a Barfin flounder

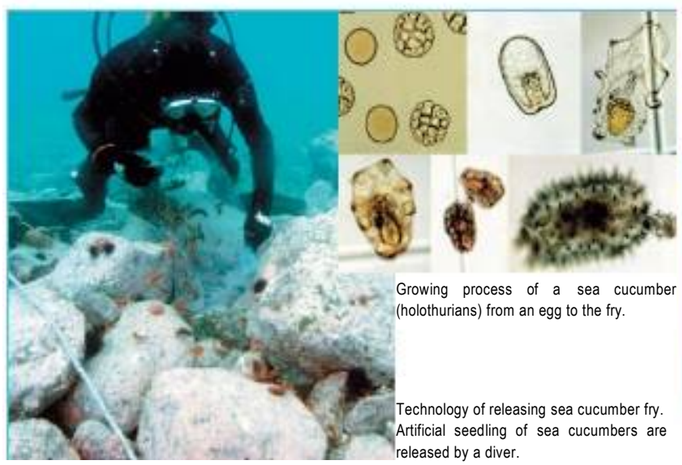
The artificial seeds of Barfin flounder are released from board



The intermediate cuneiform bone in the mouth of sea urchin is discerned, which indicates that this specimen is a released one.

When releasing, an ALC label is fixed to the artificial seedling to follow releasing effect. Confirmation can be made by detecting an orange-colored lighting with the fluorescent microscopy.

Otolith of a herring
We can detect the indicators in the form of a ring at the center and on its perimeter. Referring to these combinations, we can discern the groups of released fish.



Growing process of a sea cucumber (holothurians) from an egg to the fry.

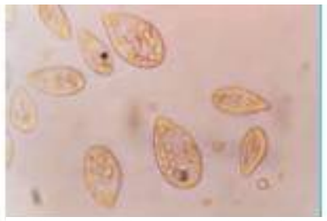
Technology of releasing sea cucumber fry. Artificial seedling of sea cucumbers are released by a diver.

We are developing the technology of breeding chijimi kombu *(Laminaria cichorioides)*.
Growing process of chijimi kombu

Development of technology for prevention of epidemics in fish and shellfish for enhancement of culture efficiency

In the process of breeding and farming seedlings, epidemics occur from time to time. In an significant case, the death in mass of seedlings is produced to afflict a significant damage. We are conducting researches on the measures for prevention of epidemics and give instruction on site. Preventive measures, including diagnosis/remedy of diseases, identification of causes and prevention of their spreading, are taken.

An anemic Japanese flounder with white gill (left), normal one (right)



Miamiensis avidus parasites in brain of fish causing scuticociliatosis.

Various pathological examinations for fish are conducted.

Development of technology for stabilization of key regional industries

The scallop fishery is one of the key industries in Hokkaido. Our effort is directed to the research/survey of fishery environment, and continuous monitoring, and to the improvement of streamlining technologies as well as to the emission of various kinds of information.

Survey of the habitat of scallops

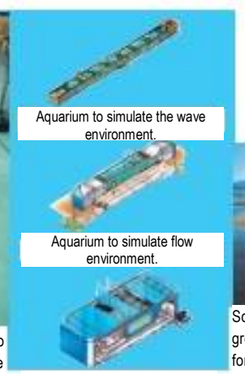
By immune staining, tell the difference of scallop fries. Information on collection of seedlings can be delivered promptly.

Ascidiella aspersa inhabiting the scallop suspension ropes, with a high risk of afflicting the shells in farming.

Investigation and research for creation of fishing grounds for effective use of ocean areas

Development of the seashore areas, reduction in algae grounds and tidal flats, as well as water quality worsening in closed sea areas are closed up as adverse effects. Efforts are developed over the preservation of seashore environment as place of spawning , growing and habitat of various organisms through civil engineering. We also conduct research and study to increase the production on fishing grounds.

With a purpose for the aquatic production industry, to survey the habitat of organisms, we clarify the characteristics of organisms' behavior, and their relationship with waves and flows of sea.



Aquarium to simulate environment stimulation.

Rocky shore denudation-afflicted sea bottom.

Scallop shells are spread to facilitate growing of short-necked clams' fries for colonization, and to restore and breed the nature.

Community of hosomekombu (*Laminaria religiosa) which is established to control the pressure of waves for an adequate environment for breeding sea urchins.*

Promotion of safety and increased utilization of marine products

We are studying some investigation techniques and technological developments aimed at quality control to enhance the value of local marine products and the utilization of unexploited stocks, and to increase the safety of Hokkaido marine products, as well as evaluation of their quality and planning of the efficient utilization of limited stocks.

Establishment of safety-promoting techniques for marine products

This project is to survey shellfish toxin from bivalves, resulting from their poisonous plankton, by specifying toxicogenic times and body positions, and we establish a stock of basic data in order to supply safe and free-from-anxiety marine products. Education for safety management is conducted based upon a survey of aquatic product pollutions due to food poisoning bacteria and parasites, as well as through hygienic surveys and seminars.

Test on scallops' toxigenicity

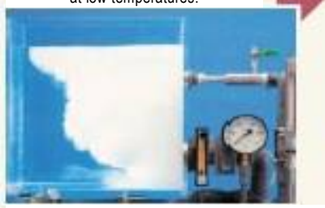
Test on bacteria of *Vibrio parahaemolyticus*

Hygienic survey of a processing plant

Development of techniques for maintaining the freshness and quality of fish, shellfish and processed marine products

For responding to the needs of consumers with preference for natural foods and good health, we develop technologies of high freshness and high quality to supply local marine products in fresh and good states. For this purpose, we establish and distribute manuals to keep marine products in fresh state and in good quality.

Restoring of shells' vitality by breeding at low temperatures.



Machine for producing high rate oxygen saltwater.

Pack of conserving scallop ligaments in high rate oxygen salt water

Control of rigor mortis of fresh scallop ligaments

Using highly oxygenated salt water, scallops are subject to restoration of their vitality by being bred at low temperatures and put in a state of breathing. Through this process, scallops are able to conserve their energy and to keep alive. This merit contributes to controlling of rigor mortis in the process of marketing.

Color torn improvement by blood removal

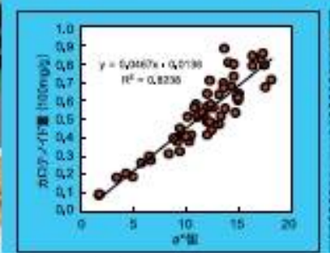
Freshness maintenance manual

Development of techniques for enhancing the value and quality evaluation of marine products

A survey of raw material characteristics is conducted, considering various factors such as locality of fishing, hauling timings, sizes, nutrition, healthiness, maturity and tastefulness. Under the same scheme, we help establishing the best brands of products depending upon the technology of quality evaluation for local aquatic products. And we develop a new processing technology to establish value-added products.

Quality evaluation of dried scallop ligaments

Commercialization of a product of scallop sushi



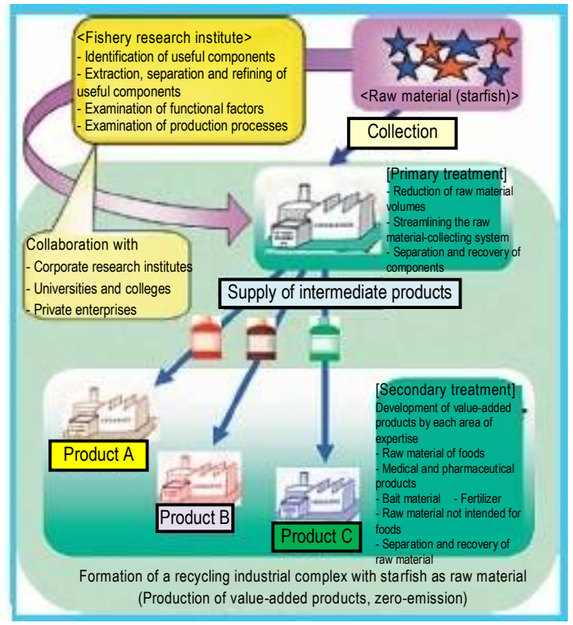
Relationship of salmon fresh color tone and carotenoid

Production manual

Development of techniques for efficient utilization of unexploited marine products

We develop a recycling technology of identifying, extracting, separating and refining the effective components, in order to desterilize the fish, shellfish and algae which currently are not sufficiently in the form of food materials and medical and pharmaceutical products. In order to make technical development more effective, we are aggressive in pursuing projects of in collaboration with other research institutes and entrepreneurs in the private sector.

Development of starfish utilization technology



Formation of a recycling industrial complex with starfish as raw material
(Production of value-added products, zero-emission)

Effective management of salmon enhancement programs and resources

Salmonids, commonly called "Sakemasu" in Japan, inhabit the North Pacific rim. Anadromous salmonids in Hokkaido include chum salmon, pink salmon, masu salmon, and sockeye salmon. Chum salmon in particular is the most important fishery species. It is supported mainly by a hatcheries program on the basis of accurate pre-season prediction and suitable management of adult-catch and fry-release during the season. We have been involved in many scientific studies including improvement of artificial breeding, accurate forecasting of adult runs, and restoration of the stream habitat to support salmon resources for fisheries. In recent years, from the perspective of biodiversity conservation, we have been studying the status of habitat environments and resource management for wild salmon.

Salmonids caught by fisheries programs in Hokkaido

Note) Upper : fish to be caught at the sea surface. Lower : fish to be caught in rivers

Salmon
Oncorhynchus keta

Pink salmon
Oncorhynchus gorbuscha

Cherry salmon
Oncorhynchus masou

Flow of artificial breeding

Returning of parent fish

Hauling of parent fish

Egg collection

Management of eggs and fries

Management of the fry

Fry before being released

Research and investigation for effective management of salmon enhancement

The management of sustainable stocks can be made by analyzing the stock structure and predicting the fish returning, based upon the accumulation of age data of returning parent fish.
In addition, we conduct a survey of the fry habiting the rivers and sea coasts to develop an effective hatching and release technology to have a higher returning ratio.

Identifying the stock structure by reading the age information on scales

Identifying a label on the otolith by inverted microscope

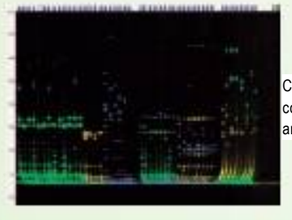
Survey on the fry flowing-down by a screw trap.

Survey on the coastal environment after the salmon fry enter the sea.

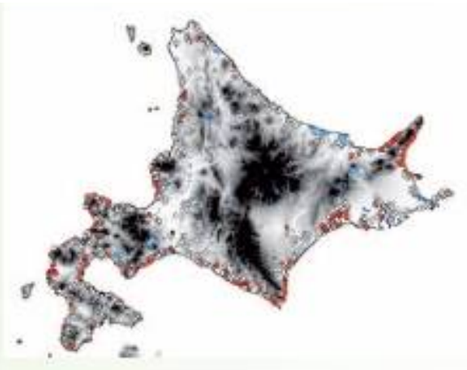
Research and investigation for conservation of biodiversity

In recent years, the importance of the conservation of biodiversity has been closed up. With this background, we conduct a biological study, such as counting of the number of fish going upstream which is helpful for the maintenance of the hereditary biodiversity of the artificially incubated fish and the stock management of wild salmons.

Run research of wild fish



Comparison of communities by DNA analysis



● : River where the presence of wild salmons is confirmed.
○ : River where the presence of wild salmons is not confirmed

Studies aimed at promotion of freshwater fisheries and aquaculture development, and conservation of freshwater ecosystems and environments

Both freshwater fisheries and inland aquaculture have been developed as important local industries in Hokkaido. For the sustainability and further development of freshwater fisheries, we carry out research on the biology, resource management and artificial propagation of target species. Technical developments for the prevention and treatment of fish diseases, and technical improvement of aquaculture production methods are important aspects of our work. We also conduct a wide range of research, on water environments, invasion by alien species, and conservation of rare species, in order to preserve the biodiversity in the rivers, lakes and wetlands of Hokkaido.

Technical development of resource management and artificial propagation in freshwater fisheries

Lives in rivers and lakes that are semi-closed systems tend to react to even slightest environmental changes caused by natural phenomena or human activities, varying their population. To cope with this issue, we grasp the ecological characteristics of target species and environmental features of each fishing ground, and based on the data obtained, we have been developing resource management techniques to control the catch volume and fishing period, and artificial propagation techniques.

Wakasagi smelt, corbicula clam, icefish

Research of Wakasagi smelt fry in Abashiri Lake

Distribution research of lamprey (*lethenteron japonicum*) larvae in Ishikari River

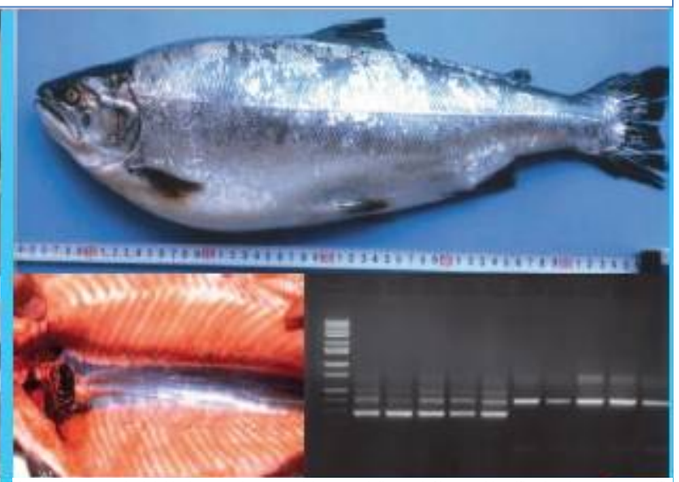
Shishamo smelt, lamprey larvae, kokanee

Technical improvement of inland aquaculture and prevention of fish diseases

We develop new culturing methods for the inland aquaculture, including sex control technique to produce only females of higher commercial values and sterilizing technique. In addition, we diagnose and treat fish diseases occurring in the aquaculture, and through monitoring, we determine in what environment fish disease occurs, to promote disease prevention, developing effective prevention methods.

Measurement of immune parameter

Prozotoa species are parasitic in gills or on the surface of fishes (left: *trichodina*, right: *ichthyobodo*)



Upper: Immatured triploid cherry salmon, and its gonad (lower left), sex identification by male-specific gene (lower right)

Evaluation and conservation of freshwater ecosystems

Researching the water quality, etc. of lakes in Hokkaido, we remain committed to study for preserving environment where diverse aqua creatures including useful fish species are living. Furthermore, to conserve the indigenous ecosystem of Hokkaido, we have been striving for research and study to protect endangered species such as Japanese huchen, and for development of measures to deal with exotic species such as technique for getting rid of black bass and bluegill, using an electric shocker boat.

Protection of one of the endangered species, Japanese huchen

Lake environment research in Kuttara Lake

3 exotic species (brown trout, bluegill, largemouth bass), the exotic species survey using an electric shocker boat at Hakodate Goryokaku