

Resources of *Laminaria (Saccharina) japonica* on the southwestern coast of Sakhalin island in recent years. Tasks of investigations for the near period

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Abstract: The current state of the resources *Laminaria japonica* on the coasts Sakhalin island is satisfactory. In also the time, the large areas of stone ground are not populated. Recent year the resources of algae continue to be reduced, especially in the places of fishing. Exception case with associations of macrophyte was found in the extreme south of Sakhalin Island (fishing is not). Here the decrease of the biomass of algae is not observed. To the next five years we planned the complex investigations of hydrobiological for the purpose to establish the reasons for the reduction of the resources of *Laminaria japonica* on the coast of Sakhalin. Analogous investigations are planned by Japanese researchers from Hokkaido Central Fisheries Experiment Station on the west coast of Hokkaido. As the hypothesis three groups of the reasons, which most probably influence the development of the succession of associations, are examined by us. These are oceanographic causes, anthropogenic and biotic factors. The force of the influence of each for us is in prospect to determine in the course of the planned five-year studies. For the solution of the problems presented, Sakhalin Research Institute of Fisheries and Oceanography plans to create two testing areas for the hydrobiological monitoring, with the setting for each of the station of the autonomous measurement of temperature. Annually planned to make oceanographic observations in Sea of Japan along 47° 20' N. Furthermore, in the work will be begun to operate one autonomous stream gauge (shore of the southern part of Tatarskiy Strait, Japan sea).

Introduction

Laminaria japonica is a single species of brown algae that is commercially taken along the south and southwestern coast of Sakhalin Island (Fig. 1). As regards to commercial capture of *Laminaria japonica*, we divide the entire southwestern Sakhalin coast and Aniva Bay into two regions of fisheries: traditional and potential region. In traditional areas, *Laminaria japonica* has been continuously taken since the 1950s of the last century, and in the potential region this species has been taken sporadically. Not more than 10 enterprises are successfully working in the traditional region where native people are involved as seasonal workers. *Laminaria japonica* is captured at shallow sites

down to 4 m in depth using an algal gear; a catch per effort (1 person for a working day) is 500 kg. At deeper than 4-5 m, algae are taken with the help of divers; a catch per effort (1 diver for a working day) is 1500 kg. No damage is caused to thickets of *Laminaria japonica* by these two methods. When thalli with rhizoids are captured, substrate is released for new spores, and mosaic capture of plants keeps enough thalli for their reproduction.

The recent researches during 10 years have shown a steady low stock of *Laminaria japonica* in the traditional region and comparatively high stock in the potential region (Fig. 2).

However, along the southwestern coast of Krillion Peninsula (southwestern coast of Sakhalin Island) a total *Laminaria* biomass has gradually decreased

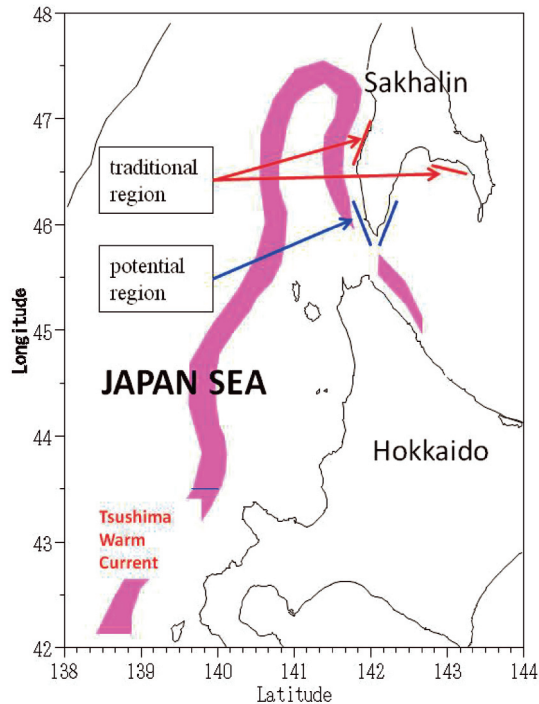


Fig. 1. The region of *Laminaria japonica* fisheries on Sakhalin

as well, and for the last three years it declined as great as three times. In our opinion, there has been a change in dominants since 2005 in this commercial region. In plant communities, *Laminaria japonica* became an attendant species instead of the co-dominant one, and its number continues to decrease. It was replaced by *Kjellmaniella* and *Arthrothamnus* (See Table 1).

Despite reducing in *Laminaria* distribution areas, the algal size-weight characteristics actually did not

change after the 1950s. Only during the last 10 years there have been observed significant fluctuations in these characteristics.

The diving counting survey in 2007 showed that in the traditional region *Laminaria japonica* formed monodominant thickets at depths from 0 to 3 m. The width of thickets varied from 6 to 150 m. In 2007, a projective bottom algal cover varied from 20 to 100%. The area occupied by commercial algae was 0.6 km². The survey showed that density of commercial thalli varied from 2 to 28 ind./m² (average: 9.9 ind./m²) specific biomass from 0.38 to 32.8 kg/m² (average: 10 kg/m²). The area occupied by the non-commercial algae was 0.07 km²; their mean density was 163 ind./m², mean specific biomass 8.4 kg/m². Mainly commercial thalli prevailed (85%) in the *Laminaria japonica* thickets. Based on the 2007 survey, this year can be considered as productive. As a result, in 2007, a commercial stock of *Laminaria japonica* along the western Sakhalin coast was minimal for the last 10 years.

Thus, in 2007, as in previous years, resources of *Laminaria japonica* remained at the extremely low level. On the contrary, its commercial capture (in traditional region) increased comparing to 2005.

We may conclude that the problem of *Laminaria japonica* resources is actual, so it is important to find solution for this problem.

In this connection, SakhNIRO and Hokkaido Central Fisheries Experiment Station scientists are ready to begin joint researches and to implement their part of works.

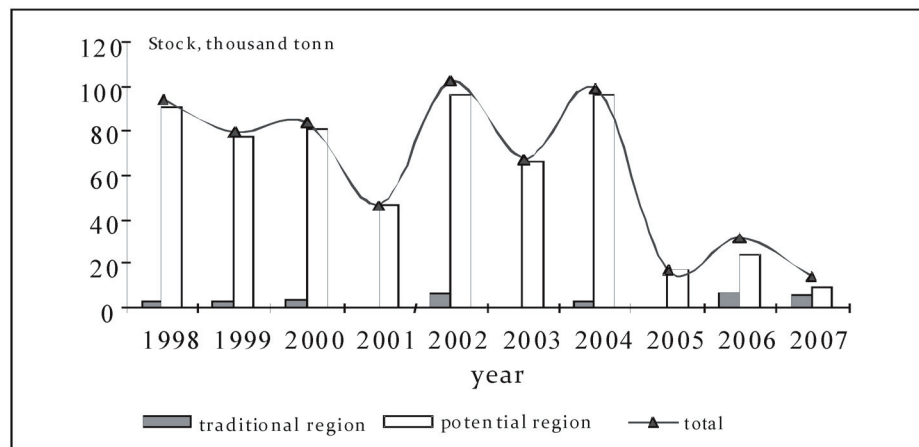


Fig. 2. The moving of stock *Laminaria japonica* of the southwest Sakhalin

Goal and tasks of Program

Based on the goal of Program: to reveal causes of reducing the *Laminaria japonica* fields along the southwestern Sakhalin coast and to develop methods for their recovery, the following tasks are to be performed.

1. To find trends of seasonal and interannual changes in quantitative characteristics and distribution areas of *Laminaria japonica* and Corallinales associations on the study sites near stm. Antonovo and Cape Tukotan;
2. To perform a seasonal re-description of macrophytobenthos composition on the study site near stm. Antonovo. To make a comparative analysis of the results obtained with the archive materials;
3. To study dynamics of *Laminaria japonica* sporification in order to determine optimal timing for seeding spores on natural and artificial substrates when recovering its fields.
4. To study daily diets of sea urchins inhabiting *Laminaria* fields in order to calculate necessary areal values when recovering.
5. To obtain data on currents and water temperature in the southwestern Sakhalin coast during the period of development of *Laminaria japonica* microscopical stages. To make analysis of chlorophyll-a concentration, contents of biogenic

elements, water temperature and salinity, and *Laminaria* survival in the long-term aspect (September – March).

6. To conduct experimental works on seeding coralline-covered bottom with zoospores of *Laminaria japonica*.

Methods for implementing research works

Different methods are intended to be used during research works:

1. A diving method for sampling will be used to perform all six tasks of study. However, it will be particular depending on specific task.
2. The work with archive materials will allow making a comparative analysis of the results obtained with the data of past years. Besides the own archive data, it is planned to get acquainted with the experience of Japanese researchers studying the phenomenon “isoyake”.
3. Measuring devices for temperature, salinity and dissolved oxygen are suggested to be used on the study areas from a boat once a month. They are to record intra-daily changes of water temperature during development of zoospores and gametophytes and other process (since September through April). Besides, one stationary current gauge will be used. The research vessel “Dmitry Peskov” and TeraScan satellite system will be

Table 1. Change dominant in community beside Krilion Peninsula

Year	Seaweed	Sown area km ²	Biomass, kg/m ²	Total biomass, t.t	Commercial biomass, t.t
1998	<i>Laminaria japonica</i>	0.01	20	0.3	0.2
	<i>Arthrothamnus kurilensis</i>	0.014	7	0.1	
	<i>Kjellmaniella crassifolia</i>	0.013	5	0.07	
2007	<i>Laminaria japonica</i>	0.01	2	0.03	0.02
	<i>Arthrothamnus kurilensis</i>	0.017	9	0.15	
	<i>Kjellmaniella crassifolia</i>	0.019	7	0.13	

used to conduct Hydrographic surveys.

4. After sampling by means of the diving method, it is necessary to preserve and then to make camera processing of materials.

Work areas and Schedule time

The Program was intended for 5 years. The work area SakhNIRO is located between the town of Chekhov and Shebuninka River (Fig. 3). The more detail surveys will be conducted in the coastal zone between Cape Tukotan and town of Nevelsk, and also on study areas near stm. Antonovo and Cape Bogdanovich. Stationary instruments of the type "Potok" will be set on each study area for measuring near-bottom water temperature. They are to record intra-daily changes of water temperature during development of zoospores and gametophytes (since September through April). A stationary current gauge will be set between Moneron Island and Krilion Peninsula for the period since September through April. Oceanographic observations will be conducted along the latitude linking Cape Slepikovskiy and Cape Zolotoy. The work interval

will be twice a year (April and September). The 5 year researches are expected to be resulted in revealing causes of stock decline for *Laminaria japonica* and developing methods for recovering its resources.

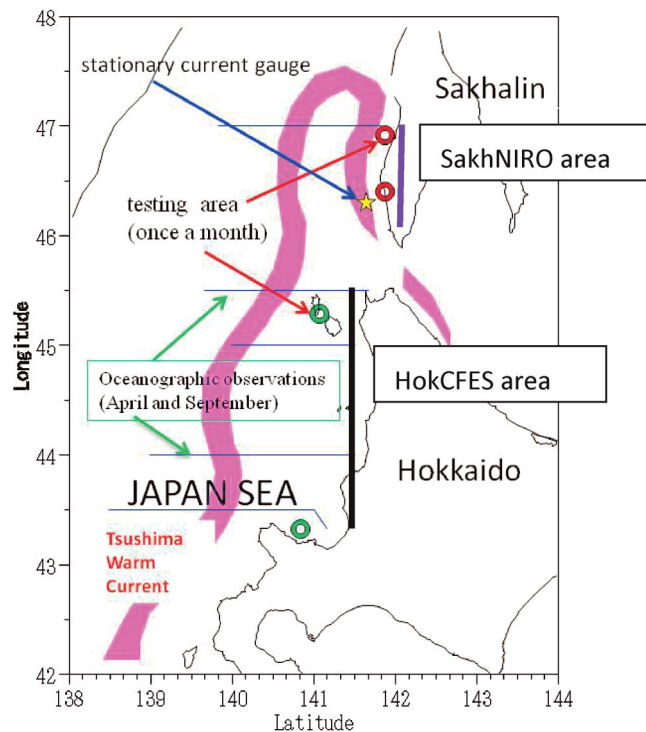


Fig. 3. Work areas and Schedule time