FISHERIES RESEARCH BOARD OF CANADA
Translation Series No. 2001

The algae of the coastal waters near Yurii Island (Lesser Kuril Chain)

by O. S. Rybakov

Original title: Vodorosli pribrezhnykh vod ostrova Yurii (Malaya Kuril'skaya gryada)

From: Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaistva i Okeanografii (TINRO) (Proceedings of the Pacific Scientific Research Institute of Fisheries and Oceanography), 65: 201-211, 1968

Translated by the Translation Bureau(PH)
Foreign Languages Division
Department of the Secretary of State of Canada

Fisheries Research Board of Canada
Biological Station
Nanaimo, B. C.

1972

18 pages typescript

FRB 2001

DEPARTMENT OF THE SECRETARY OF STATE
TRANSLATION BUREAU

FOREIGN LANGUAGES DIVISION

CANADA

SECRÉTARIAT D'ÉTAT
BUREAU DES TRADUCTIONS

DIVISION DES LANGUES ÉTRANGÈRES

TRANSLATED FROM - TRADUCTION DE	INTO - EN
Russian	English

AUTHOR - AUTEUR

Rybakov, O. S.

TITLE IN ENGLISH - TITRE ANGLAIS

The algae of the coastal waters near Yurii Island (Lesser Kuril Chain)

Title in foreign language (transliterate foreign characters)

Vodorosli pribreshnykh vod ostrova Yurii (Malaya Kuril'skaya gryada)

REFERENCE IN FOREIGN LANGUAGE (NAME OF BOOK OR PUBLICATION) IN FULL, TRANSLITERATE FOREIGN CHARACTERS.
RÉFÉRENCE EN LANGUE ÉTRANGÈRE (NOM DU LIVRE OU PUBLICATION), AU COMPLET, TRANSCRIRE EN CARACTÈRES PHONÉTIQUES.

Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaistva i Okeanografii (TINRO)

REFERENCE IN ENGLISH - RÉFÉRENCE EN ANGLAIS

Bulletin of the Pacific Scientific Research Institute for Fisheries and Oceanography

PUBLISHER - ÉDITEUR	DATE OF PUBLICATION / DATE DE PUBLICATION			PAGE NUMBERS IN ORIGINAL / NUMÉROS DES PAGES DANS L'ORIGINAL
USSR Academy of Sciences	YEAR / ANNÉE	VOLUME	ISSUE NO. / NUMÉRO	201-211
PLACE OF PUBLICATION / LIEU DE PUBLICATION				NUMBER OF TYPED PAGES / NOMBRE DE PAGES DACTYLOGRAPHIÉES
USSR	1968	65	---	18

REQUESTING DEPARTMENT / MINISTÈRE-CLIENT: Environment F.R.B.

BRANCH OR DIVISION / DIRECTION OU DIVISION: Biological Station Nanaimo, B.C.

PERSON REQUESTING / DEMANDÉ PAR:

YOUR NUMBER / VOTRE DOSSIER N°: 769-18-14

DATE OF REQUEST / DATE DE LA DEMANDE: Sept. 9, 1971

TRANSLATION BUREAU NO. / NOTRE DOSSIER N°: 1037

TRANSLATOR (INITIALS) / TRADUCTEUR (INITIALES): PH

DATE COMPLETED / ACHEVÉ LE: JAN 14 1972

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

DEPARTMENT OF THE SECRETARY OF STATE
TRANSLATION BUREAU
FOREIGN LANGUAGES DIVISION

CANADA

SECRÉTARIAT D'ÉTAT
BUREAU DES TRADUCTIONS
DIVISION DES LANGUES ÉTRANGÈRES

CLIENT'S NO. / N° DU CLIENT	DEPARTMENT / MINISTÈRE	DIVISION/BRANCH / DIVISION/DIRECTION	CITY / VILLE
769-18-14	Environment	Biological Station	Nanaimo, B.C.
BUREAU NO. / N° DU BUREAU	**LANGUAGE / LANGUE**	**TRANSLATOR (INITIALS) / TRADUCTEUR (INITIALES)**	**DATE**
1037	Russian	PH	JAN 14 1972

From Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaistva i Okeanografii (TINRO), Vol. 65, 1968, p. 201-211

THE ALGAE OF THE COASTAL WATERS NEAR YURII ISLAND (LESSER KURIL' CHAIN)

O. S. Rybakov

*/201/

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Material for the present article was provided by fragmentary collections and observations made in the area of the Lesser Kuril' chain in June--July 1964 by scientific officers of the algological group of the Sakhalin department of TINRO (Pacific Research Institute for Fisheries and Oceanography) supervised by V. F. Sarochan.

It was only in the 1920s that the marine algae of the Kuril' Islands began to be studied more intensively. Only fragmentary information concerning the flora of these islands is to be found in most published Russian sources. Slightly larger lists of the algae found in coastal waters of the Kuril' Islands are given by G. I. Gail (1949) and E. S. Zinova (1954a, 1954b), but no reference is made in their writings to the vegetation of the Lesser Kuril' chain.

The operations of the Kuril'-Sakhalin expedition of the USSR Academy of Sciences in 1946, 1947 and 1949 undoubtedly supplemented our information concerning the composition of the flora, the distribution pattern and the range of

* Numbers in right margin indicate corresponding pages in original text.

algae along the shores of the South Kuril' Islands, but they are concerned with the coastal waters of Shikotan, Kunashir and Iturup Islands. Furthermore, the articles of O. G. Kusakin (1956, 1958, 1961) are devoted solely to the study of littoral groupings of the flora. Exceptions are provided by the articles of A. D. Zinova (1959) and N. F. Mikhailova (1959), whose authors give information concerning the species composition of marine algae inhabiting the littoral and sublittoral zones.

The most significant of the numerous Japanese publications is a large review of the results of study of the algae of the Kuril' Islands compiled by M. Nagai (1940--1941), in which reference is made to 187 species. It is noted in articles by S. Ueda (1933) and T. Kinosita (1943) that there are fairly extensive resources of algae in the Kuril' Islands and that the commercially exploitable weed beds in the shallows around small islands of the Lesser Kuril' chain are particularly large. There are two references in the Great Japanese Encyclopaedia (1937, 1938) to abundance in the waters of the Lesser Kuril' chain, and especially to the abundance of Laminaria around the Islands of Polonskii, Zelenii, Yurii, Anuchin, Tanfil'ev, Demin, Shishka, Lis'ie and Banka Opasnaya.

Therefore, the foregoing review of studies of the algae of the Kuril' Islands shows that research in this area, especially in the area of the southern part of the Lesser Kuril' chain, has not been sufficiently broad and is far from having been carried out by up-to-date methods. Subsequent study of the algae of /202/ the islands referred to above will make it possible to establish the floristic composition of this area, and assessment of the stocks of commercially exploitable algae will make it possible to make even wider use of this valuable raw material in the national economy.

MATERIAL AND METHOD

The material was collected in coastal waters of Yurii Island (Lesser

Kuril' chain), all along its shores. The research and estimation of the stocks of commercially exploitable algae were carried out on the SRT* "Alatyr'", a research vessel of the DVNPPR+ TINRO. Operations were conducted simultaneously from the vessel and from a small boat (because of its deep draft, the vessel was unable to approach close to the shore) with the assistance of skin divers in accordance with a previously decided plan of profiles and stations; the quantity of algae from measured plots of the bottom was recorded at points on the profiles and at the stations. The profiles ran from the water's edge and stations were occupied at intervals of 100--200 m. In all, 8 profiles were worked and 35 stations were occupied (12 from the vessel and 23 from the small boat).

In places with the most characteristic vegetation, collections of algae which are not commercially exploitable were made in passing. These collections led to the establishment of some significant features concerning the distribution of the macrophytes accompanying commercially exploitable algae and made it possible to assess the species composition of the algae of the given region. In addition, the beds were examined visually from the small boat to determine the coefficient of projective coverage of the bottom by commercially exploitable algae as percentages of the bare spaces or of other plants.

The biomass of the commercially exploitable algae and other quantitative characteristics were determined on board the vessel, where the locations of beds of commercially exploitable algae were also plotted on plane table maps. The final processing of the data obtained, determination of the classification of the commercially exploitable algae and of the plants accompanying them, determination of stocks and other analytical operations were carried out under laboratory conditions.

Stocks were calculated on the basis of mean algal biomass and density and the length of the shoreline.

---

* Medium-sized trawler - Trans.
\+ Far Eastern Scientific and Commercial Fishing...?

BRIEF PHYSIOGRAPHIC DESCRIPTION OF THE INVESTIGATED AREA

Yurii Island forms part of the Lesser Kuril' chain. It lies 3.3 km northeast of Anuchin Island. The island is 7.4 km long, 1.8 km wide and rises 30--40 m above sea level. The shores are steep and rocky; it is only in a few places that they are gently sloping with shingle and sand beaches. They are fringed by a large quantity of reefs below and above the water extending seaward for a distance of up to 1 km.

The shores of Yurii Island are washed by Pacific waters on one side and by the waters of the South Kuril' Strait on the other (see fig. 1). The shoreline is not heavily indented and there are only two bays sheltered from the breakers and the winds: Katernaya and Shirokaya on the northwestern coast of the island. The remainder of the coast is exposed. The stony bottom, the abundance of reefs and inshore rocks and also the excellent water exchange and, consequently, the profuse aeration and excellent supply of organic and mineral matter here create favourable conditions for the development of an extensive algal zone.

THE ALGAE OF COASTAL WATERS OF YURII ISLAND /203

In practical use of algae it is very important to know the distribution pattern of commercially exploitable beds their vertical and horizontal zoning, the total stocks and the areas of richest production. Solution of these questions is one of the crucial aspects of the organization of rational seaweed farming on a scientific basis.

We investigated commercially exploitable macrophytes in the coastal waters of Yurii Island in the middle of June 1964. It was discovered as a result of the research that commercially exploitable algae were unevenly distributed both with respect to species composition and with respect to the number of plants (see fig. 2). Five species were found in commercial quantities: Laminaria japonica, L. angustata, L. saccharina, Cymathere japonica, and Arthrothamnus

Figure 1. The Lesser Kuril' chain and Yurii Island (sketch map).

Numbered on figure: 1. Yurii Island 2. Voeikov Strait 3. South Kuril' Strait 4. Cape Severnyi 5. Shirokaya Bay 6. Cape Shirokii 7. Katernaya Bay 8. Cape Katernaya 9. Cape Baklanii 10. Yurii Island 11. Cape Biven' 12. Cape Lomot' 13. Cape Yuzhnyi 14. Yurii Strait 15. N 16. S

---

bifidus.*

---

* The authors are given in the list of macrophytes on p. 15.

The coastal region of Yurii Island may be divided into two areas which differ sharply one from the other: the northwestern coastal region which has a fairly weak current and the southeastern region on the Pacific side, which has a strong current. This circumstance determines the species composition of the

commercially exploitable algae.

Three species of commercially exploitable algae are found along the northwestern coast: Laminaria japonica, Cymathere and Laminaria saccharina. /204/ Their distribution is conditioned by the different degrees of wave action (breakers) and the different types of bottom material.

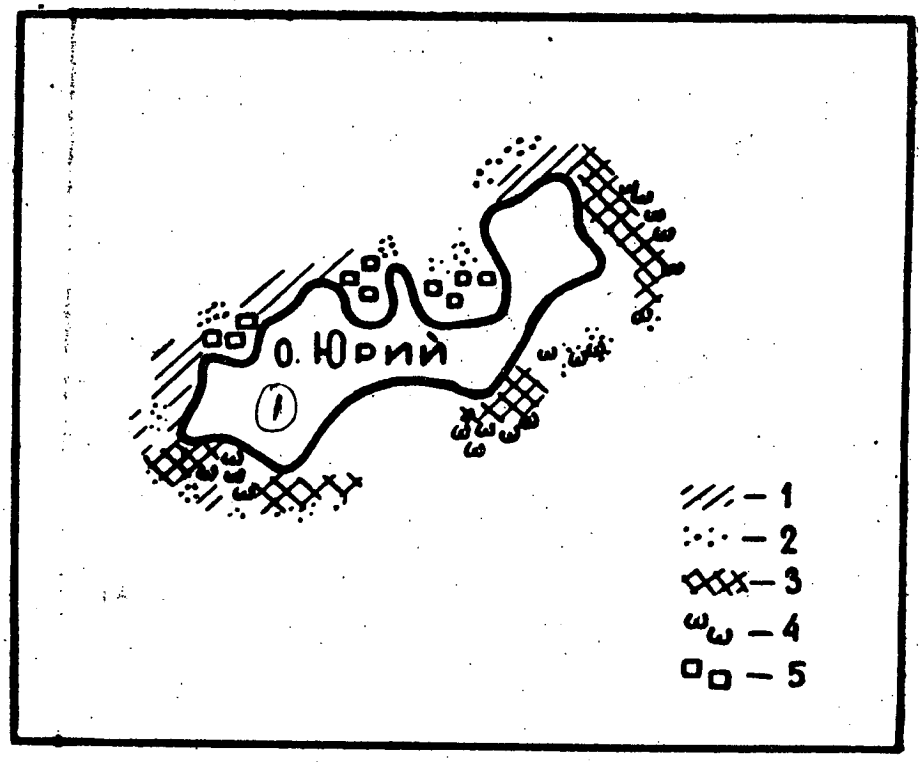

Figure 2. Distribution of commercially exploitable algae around Yurii Island.
1) Laminaria japonica; 2) Laminaria saccharina; 3) Laminaria angustata;
4) Arthrothamnus; 5) Cymathere.
Numbered on figure: 1. Yurii Island.

We also found three species of commercially exploitable algae along the southeastern coast of Yurii Island: Laminaria angustata, L. saccharina and Arthrothamnus. There the distribution of the vegetation is affected by only one factor, the nature of the bottom material, since the southeastern coast is open

throughout its length and is exposed to the breakers to an equal degree.

For convenience of exposition the unnamed headlands will be denoted by the letters A, B, C, D (fig. 1)(translator's note -- the headlands are in fact not denoted in this manner on fig. 1).

With respect to the environmental conditions of the algae the north-western coast may be divided into the following areas: protected from wave action (breaker factor III--IV) with stony-silty-sandy bottom -- Shirokaya and Katernaya Bays; open areas subjected to wave action (breaker factor II--III) with the same type of bottom material, the area between Cape Biven' and point B; open areas (breaker factor II--III) with a stony bottom -- from point B to Cape Katernyi and Cape Shirokii; finally, open areas with increased water exchange (breaker factor II) and a stony type of bottom -- from point A to Cape Biven' and from point C to Cape Severnyi (fig. 1). Breaker factors are stated in accordance with the principle of E. F. Gur'yanova (1925). (See note on p. 18).

Laminaria japonica, Cymathere and Laminaria saccharina grow for preference on a stony bottom. However, they react differently to the degree of wave action.

In places protected from wave action (breaker factor III--IV), with a /205
stony-silty-sandy bottom it is mainly beds of Cymathere which are found, and these consist of plants with a blade of the shape distinctive of this species. It is broadly oval, with a narrow grooved median band and broad, undulating corrugated margins. The length of such a blade does not exceed 2 m, and its width reaches 1 m. Cymathere grows at a depth of between 2 and 6 m. Its beds are on average 60--75 m wide and they form a zone which extends seaward for 800 m. The biomass per 1 m^2 is slight and varies in the range 11--11.6 kg. The stocks per 1 km of shoreline are estimated at 3 300 centners (translator's note -- 1 Soviet centner = = 100 kg) in Katernaya Bay and 2 090 centners in Shirokaya Bay.

The qualitative composition of the macrophytic algae which are not

commercially exploitable is here represented by many species. The main background of the littoral zone is provided by Fucus evanescens, Pelvetia wrightii and Corallina pilulifera. Fucoids are abundantly covered by the epiphyte Pylaiella litoralis. Halosaccion glandiforme, Laurencia sp. and Tichocarpus crinitus grow on the lower levels of the littoral zone. Within the bays, where the bottom is silt and sand Zostera nana and Z. marina grow profusely at a depth of 0.5 m; Z. asiatica is found at greater depth. Acrosiphonia sp., Monostroma splendens and Cladophora glaucescens are found among the Zostera beds. Corallina officinalis, Pachyarthron cretaceum, Iridaea cornucopiae, Scytosiphon lomentaria, Ceramium kondoi, Dumontia incrassata and Phyllospadix iwatensis inhabit pools which are connected to the sea by channels. Kjellmaniella gyrata, Desmarestia viridis and Cystoseira hakodatensis, which invariably accompany Laminaria species, are developed in the sublittoral zone; large quantities of Coilodesme californica are attached to Cystoseira hakodatensis as an epiphyte.

In places subjected to wave action (breaker factor II--III) where there is a stony-silty-sandy bottom Cymathere beds are also found at a depth of between 2 and 6 m, but they extend seaward for no more than 300 m owing to the subsequent deepening. The blade of Cymathere is of the same broadly oval shape as in areas isolated from wave action. Its biomass reaches 10.5 kg per 1 m^2, and the stocks per 1 km of the coast are 5 200 centners, i.e. twice as great as in areas protected from wave action. The composition of the fauna is sparser here. The most abundance species of the littoral zone is Gloiopeltis furcata f. coliformis, which grows profusely in this zone on stones. There is a strip of Zostera marina 10 m from the water's edge at a depth of 0.5 m, after which the Z. marina beds are interrupted and Z. asiatica appears at a depth of 4 m; Ptilota asplenioides, Rhodymenia pertusa, Desmarestia viridis, Cystoseira hakodatensis and Coilodesme californica are found in quantity at this depth.

The large forms found here were members of the Laminariales: Alaria tâeniata, A. praelonga, Costaria costata, Kjellmaniella gyrata and Agarum cribrosum. Chlorophyta were absent from this area.

Along the open stretches of the northwestern coast unprotected against wave action (breaker factor II--III), where the bottom is stony, Laminaria japonica grows in large quantity at depths of 4--8 m, forming fairly dense beds with a biomass of 25 kg/m^2 which form a strip up to 200 m wide.

The blade of Laminaria is quite different in shape from that of Cymathere. It reaches a length of 3--4 m and a width of 30--50 cm, the median band is fairly broad and the margins are only slightly undulating. Individual thalli weigh 2.8 kg. The stocks per 1 km of coast are 9 580 centners.

There are few species of algae in these areas. The Rhodophyta found /206/ are Pterosiphonia bipinnata, Kallymenia reniformis, Rhodymenia palmata, and Callophyllis rhynchocarpa. Of the species accompanying Laminaria japonica, a zone of Alaria species and Cystoseira hakodatensis is clearly marked Zostera species and Chlorophyta are not found.

Along open parts of the coast where wave action is strong, in the Yurii and Voeikov Straits (breaker factor II), Laminaria japonica forms extensive beds, the width of which reaches 100 m on average. Morphologically, Laminaria does not differ in any way from the plants on the preceding part of the coast, but its mean biomass is here considerably higher at 43.2 kg/m^2. The stocks per 1 km of coast are 10 800 centners, which is the highest figure along the northwestern coast of the island. Vertical and horizontal distribution are the same as in the preceding area of the coast. The floristic composition corresponds completely to the type of coast described above.

The distribution of Laminaria saccharina along the northwestern coast of Yurii Island is ubiquitous. Beds of it are found in all the parts of the coast

previously enumerated. It grows in separate patches and does not form a continuous belt. Its thalli are small and the mean weight of each of them is 500 g. Its biomasses are very low by comparison with the biomasses of Laminaria japonica and Cymathere; the maximum biomass reaches 4.5 kg/m^2.

The total stocks of commercially exploitable macrophytes along the northwestern coast of Yurii Island are 90 400 centners (table 1).

With respect to the environmental conditions of algae the entire southeastern coast may be divided into three areas: an area with a sandy bottom, between Cape Lomot' and Cape Yuzhnyi, an area with a stony-sandy bottom, between Cape Baklanii and point D and an area with a stony bottom between Cape Severnyi and Cape Baklanii, between point D and Cape Lomot' and between Cape Yuzhnyi and point A. Breaker factor is I along the entire southeastern coast.

The development of Laminaria angustata, L. saccharina and Arthrothamnus plants and their abundance are here uneven.

Between Cape Lomot' and Cape Yuzhnyi there are no algae at all, which is explained by the existence of a sandy bottom. Zoospores which settle on to a sandy bottom are damaged by the moving sand grains, with the result that scarcely any appearance of gametophytes is observed on a sandy bottom (Gail, 1935). There is no vegetation at all here with the exception of isolated clumps of Desmarestia viridis.

Beds of Arthrothamnus and Laminaria saccharina are found in places with a stony-sandy bottom. The width of their beds does not exceed 30--40 m. Arthrothamnus thalli consist of several loriform linear blades extending from triangular formations densely intertwined with rhizoids. The alga grows only on a stony bottom at a depth of 5 m. The mean weight of a single thallus is 300 g. The biomass of Arthrothamnus reaches 6.5 kg/m^2 and the stocks per 1 km of shoreline are 970 centners. Laminaria saccharina beds develop here on a stony-sandy bottom at a depth of 12 m. Its stocks per 1 km of coast are 960 centners.

The qualitative composition of the algae in this area is poor. The most notable feature is the absence of Rhodophyta and Chlorophyta; the flora consists mainly of large forms of Phaeophyta which accompany commercially exploitable algae: Kjellmaniella gyrata, Alaria taeniata, A. praelonga, L. yezoensis and Cystoseira hakodatensis.

The coastal waters of areas of the southeastern coast of Yurii Island with a stony type of bottom are characterized by abundant development of Laminaria angustata and Arthrothamnus bifidus. The high current velocity, the strong wave action and the existence of hard bottoms create excellent aeration, which undoubtedly has a positive effect on the growth of these forms. Laminaria /208 angustata is found at a depth of from 4 to 5 m. The thallus consists of a slender, fairly short stem and a ribbon-like blade with regular margins and without a distinct median band. The base of the blade is a narrow flat wedge without any furrows. The rhizoids are small and very slender but compact and very firmly attached to the bottom, which enables the algae to withstand the strong current and the breakers. Laminaria angustata, like L. saccharina, has slime ducts only in the blade, unlike Laminaria japonica, which has them both in the blade and in the stem.

Laminaria angustata is not distinguished by high biomass figures, since the maximum weight of its blade is only 1 kg, despite its great length, which may be 12 m or more. The biomass of Laminaria angustata ranges from 4.8 to 5.7 kg/m^2. Stocks per 1 km of shoreline are slightly more than 300 centners (table 2).

Arthrothamnus beds occur at a depth of 8 m along the open coast; its biomass is twice as great as in places with a stony-sandy bottom and reaches 12 kg. Stocks per 1 km of the coast are approximately 2 000 centners.

In the coastal waters of this area Laminaria saccharina is represented by the bullata form. Its characteristics are the presence of depressions and raised areas along the blade of the thallus which resemble the pattern of an

automobile tyre tread, and a heavily undulating margin. It grows at a depth of between 5 and 9 m and occurs in a few patches. Its stocks per 1 km of coast are 50--70 centners.

The total stocks of all the commercially exploitable species along the southeastern coast of the island are 19 470 centners (table 2).

With regard to the floristic composition of rocky areas of the southeastern coast of Yurii Island, it is represented almost exclusively by Rhodophyta and Phaeophyta. The Chlorophyta found here are Acrosiphonia sp., Cladophora glaucescens and Monostroma splendens. The most abundant species are Gloiopeltis furcata f. coliformis, Fucus evanescens and Pelvetia wrightii, which proliferate in the littoral zone; Rhodymenia palmata, Myriogramme yezoensis, Ptilota filicina, Constantinea subulifera, Phycodrys fimbriata, Odonthalia corymbifera, O. aleutica, and Halosaccion glandiforme, which inhabit the sublittoral zone; the most prevalent of the algae which accompany Laminaria angustata, Laminaria saccharina and Arthrothamnus are Alaria taeniata, A. praelonga, L. yezoensis, Agarum cribrosum , Cystoseira hakodatensis and various species of Sargassum.

In summing up the results of the work and in analyzing the distribution of commercially exploitable algae in the coastal waters of Yurii Island, we may note a number of interesting features firstly, Laminaria angustata and Arthrothamnus occur only along its southeastern coast in waters where current velocity is high, whereas Laminaria japonica and Cymathere develop in the coastal waters of the northwestern coast where the current is fairly calm; secondly, these species have their maximum biomass on open stretches of the coast with a stony type of bottom subjected to strong wave action; thirdly, with regard to the distribution of Laminaria saccharina, it occurs all along the coast, irrespective of the wave action and, like the foregoing species, prefers hard bottoms.

/210/

1 Таблица 1

2 Распределение промысловых водорослей у северо-западного побережья острова Юрий

3 Тип побережья	4 Характер грунта	5 Район	6 Водоросль	7 Средняя биомасса, кг/м²	8 Запасы, ц
9 Защищенный от волнения, III—IV степень прибойности	10 Каменисто-илисто-песчаный	11 Бухта Широкая	12 Циматере	11,6	9 460
			13 Ламинария сахарина	4,5	2 550
		14 Бухта Катерная	15 Циматере	11,0	7 470
			16 Ламинария сахарина	3,4	350
	17 Каменисто-илисто-песчаный	18 От м. Бивень до пункта Б	19 Циматере	10,5	7 850
			20 Ламинария сахарина	2,3	50
21 Открытый, II—III степень прибойности	22 Каменистый	23 У м. Широкий	24 Ламинария японская	25,2	7 230
			25 Ламинария сахарина	1,7	30
	26 Каменистый	27 От пункта Б до м. Катерный	28 Ламинария японская	25,2	14 460
			29 Ламинария сахарина	1,7	50
30 Открытый с повышенным водообменом, II степень прибойности	31 Каменистый	32 От пункта В до м. Бивень	33 Ламинария японская	43,2	24 460
			34 Ламинария сахарина	1,2	80
	35 Каменистый	36 От пункта А до м. Бивень	37 Ламинария японская	43,2	16 310
			38 Ламинария сахарина	1,2	50
			39 ВСЕГО:		90 400

Key to Table 1: 1. Table 1 2. Distribution of commercially exploitable algae along the northwestern coast of Yurii Island 3. Type of coast 4. Nature of bottom 5. Area 6. Alga 7. Mean biomass, kg/m^2 8. Stocks, centners 9. Protected from wave action, breaker factor III--IV 10. Stony-silty-sandy 11. Shirokaya Bay 12. Cymathere 13. Laminaria saccharina 14. Katernaya Bay 15. Cymathere 16. Laminaria saccharina 17. Stony-silty-sandy 18. From Cape Biven' to point B 19. Cymathere 20. Laminaria saccharina 21. Open, breaker factor II--III 22. Stony 23. Around Cape Shirokii 24. Laminaria japonica 25. Laminaria saccharina 26. Stony 27. From point B to Cape Katernii 28. Laminaria japonica 29. Laminaria saccharina 30. Open with increased water exchange, breaker factor II 31. Stony 32. From point C to Cape Biven' 33. Laminaria japonica 34. Laminaria saccharina 35. Stony 36. From point A to Cape Biven' 37. Laminaria japonica 38. Laminaria saccharina 39. TOTAL.

1 Таблица 2.

2 **Распределение промысловых водорослей у юго-восточного побережья острова Юрий**

3 Тип побережья	4 Характер грунта	5 Район	6 Водоросль	7 Средняя биомасса кг/м²	8 Запасы, ц
	9 Песчаный	10 От м. Ломоть до м. Южный	11 Растительности нет		
	12 Каменисто-песчаный	13 От м. Баклаий до пункта Г	14 Ламинария сахарина	6,40	2,170
			15 Артротамнус	6,5	2 210
16 Открытый с сильным волнением, I степени прибойности	17 Каменистый	18 От м. Южный до пункта А	19 Ламинария узкая	5,7	1 030
			20 Артротамнус	1,0	240
				12,0	5 440
	21 Каменистый	22 От пункта Г до м. Ломоть	23 Ламинария узкая	5,4	510
			24 Артротамнус	1,0	80
				10,6	2 880
	25 Каменистый	26 От м. Северный до м. Баклаий	27 Ламинария узкая	4,8	760
			28 Артротамнус	1,1	90
				9,2	4 060
			29 ВСЕГО:		19 470

Key to Table 2: 1. Table 2 2. Distribution of commercially exploitable algae along the southeastern coast of Yurii Island 3. Type of coast 4. Nature of bottom 5. Area 6. Alga 7. Mean biomass, kg/m^2 8. Stocks, centners 9. Sandy 10. From Cape Lomot' to Cape Yuzhnyi 11. No vegetation 12. Stony-sandy 13. From Cape Baklanii to point D 14. Laminaria saccharina 15. Arthrothamnus 16. Open with strong wave action, breaker factor I 17. Stony 18. From Cape Yuzhnyi to point A 19. Laminaria angustata 20. Arthrothamnus 21. Stony 22. From point D to Cape Lomot' 23. Laminaria angustata 24. Arthrothamnus 25. Stony 26. From Cape Severnyi to Cape Baklanii 27. Laminaria angustata 28. Arthrothamnus 29. TOTAL.

List of Macrophytes found in Coastal Waters of Yurii Island /210/

C H L O R O P H Y T A

1. Enteromorpha linza (L.) J. Ag.
2. Monostroma splendens (Rupr.)
3. Cladophora glaucescens (Griff.) Harv.
4. Acrosiphonia sp.

P H A E O P H Y T A

5. Pylaiella litoralis (L.) Kjellm.
6. Desmarestia viridis (Mull.).
7. Scitosiphon lomentaria (Ligb.) J. Ag.
8. Coilodesme californica (Rupr.) Kjellm.
9. Laminaria saccharina (L.) Lamour.
10. L. s. f. bullata Ag.
11. L. japonica Aresch.
12. L. angustata Kjellm.
13. L. yezoensis Miyabe.
14. Kjellmaniella gyrata (Kjellm.) Miyabe.
15. Cymathere japonica Miyabe et Nagai.
16. Agarum cribrosum (Mert.) Bory.
17. Costaria costata (Turn.) Saund.
18. Arthrothamnus bifidus (Gmel.) J. Ag.
19. Alaria taeniata Kjellm.
20. A. fistulosa Post. et Rupr.
21. A. praelonga Kjellm.
22. Pelvetia wrightii (Harv.) Yendo.
23. Fucus evanescens Ag.
24. Cystoseira hakodatensis (Yendo) Fensh.

25. Sargassum sp.

R H O D O P H Y T A

26. Porphyra sp.

27. Constantinea subulifera Setch.

28. Dumontia incrassata (Mull.) Lamour.

29. Gloiopeltis furcata f. coliformis (Harv.) Okam.

30. Lithophyllum okamurai Foslie.

31. Lithothamnion sp.

32. Corallina officinalis L. /211/

33. C. pilulifera Post. et Rupr.

34. Pachyarthron cretaceum (Post. et Rupr.) Manza.

35. Tichocarpus crinitus (Gmel.) Rupr.

36. Callophyllis rhynchocarpa Rupr.

37. Kallymenia reniformis J. Ag.

38. Iridaea cornucopiae Postet Rupr.

39. Rhodoglossum phyllocarpum (Post. et Rupr.) A. Zin.

40. Rhodymenia pertusa (Post. et Rupr.) J. Ag.

41. Rh. palmata (L.) Grev.

42. Halosaccion glandiforme (Gmel.) Rupr.

43. Platythamnion yezoensis Yamada et Tokida.

44. Ptilota asplenioides (Turn.) Ag.

45. P. filicina (Farl.) J. Ag.

46. Ceramium kondoi Yendo.

47. Phycodrys fimbriata (De la Pyl.) Kyl.

48. Laingia pacifica Yamada.

49. Myriogramme yezoensis Yamada et Tokida.

50. Polysiphonia sp.

51. Laurencia sp.

52. Pterosiphonia bipinnata (Post. et Rupr.) Falkenb.

53. Odonthalia corymbifera (Gmel.) J. Ag.

54. O. aleutica (Mert.) J. Ag.

55. Phyllospadix iwatensis Makino.

56. Zostera nana Roth.

57. Z. marina L.

58. Z. asiatica Mikl.

BIBLIOGRAPHY

Gail, G. I. The development cycle and dynamics of beds of Laminaria japonica. Trudy DV filial AN SSSR. (Transactions, Far Eastern branch, USSR Academy of Sciences), Vol. 1, 1935.

Gail, G. I. Promyslovye vodorosli Sakhalina i Kuril'skoi gryady. (Commercially exploitable algae of Sakhalin and the Kuril' chain). Vladivostok, Primizdat, 1949.

Gur'yanova, E. F., Zaks, I. G. and Ushakov, P. V. The intertidal zone of Kola Bay (preliminary communication). Rab. MBS, Len. obshch. estestvoispyt. (Work under the programme of international biological cooperation, Leningrad Naturalists Society), Vol. 1, 1925.

Zinova, A. D. A list of the marine algae of South Sakhalin and of the southern islands of the Kuril' chain. Issledovaniya Dal'nevostochnykh morei SSSR. (Research on the Far Eastern seas of the USSR), No. 6, 1959.

Zinova, E. S. Algae of the Sea of Okhotsk. Tr. Botanich. inst. AN SSSR. (Trans. Bot. Inst. Acad. Sci. USSR), Ser. 11, No. 9, 1954a.

Zinova, E. S. Algae of the Tatar Strait. Tr. Botanich. inst. AN SSSR. (Trans. Bot. Inst. Acad. Sci. USSR), Ser. 11, No. 9, 1954b.

Kusakin, O. G. Concerning the fauna and flora of the intertidal zone of Kunashir Island. Tr. problem. i temat. soveshch. Zool. inst. AN SSSR. (Transactions of special problem and topic conferences, Zool. Inst. Acad. Sci. USSR), No. 6, 1956.

Kusakin, O. G. Seasonal changes on the intertidal zone of the South Kuril' Islands. Vestnik LGU. (Herald of Leningrad State University), No. 3, biology series, No. 1, 1958.

Kusakin, O. G. Some features of the distribution of the fauna and flora in the intertidal zone of the South Kuril' Islands. Issledovaniya Dal'nevostochnykh morei SSSR. (Research on the Far Eastern seas of the USSR), No. 7, 1961.

Mikhailova, N. F. The distribution of higher algae along the shores of Shikotan Island. Botan. zhurn. (Botanical Journal), Vol. 14, No. 3, 1959.

Kinosita, T. Algal resources of Hokkaido Island and a general description of the ecology and state of reproduction. (In Japanese). Suisankenkyüsi, Vol. 38, No. 8. Russian translation by L. I. Khovrin (translator's note -- it is not stated whether the Russian translation is published). 1943.

Ueda, S. Morphology and systematics of algae. (In Japanese). An entry in Vol. 5 of the Japanese Fisheries Encyclopaedia, Tokyo 1933. Russian translation by L. I. Khovrin (translator's note --it is not stated whether the Russian translation is published).

Nagai, M. Marine algae of the Kuril' Islands, 1--2 Journ. Fac. Agric. Hook. Univ., Vol. 46, No. 1--2, 1940--1941.

Translator's note on the term 'breaker factor'.

The Russian term 'stepen' priboinosti' is not, as far as I can establish, embodied in an exactly equivalent concept in English. I have rendered it (p. 7 et seq.) by 'breaker factor'. Another alternative would be 'swash factor'. The scale employed runs in the reverse order to the Russian/international scale of wave strength ('shkala stepeni volneniya') and the term may embody the idea of the duration as well as the strength of breaker action. It was for this last reason that I rejected 'breaker strength' as a rendering.