



**Use of the classification and structure of coastal
zone macro-vegetation for global and local eco-
regional identification of coastal areas in the
North Pacific**



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What is the problem?

The problem of classification and correct determination of coastal eco-systems.



- The problem of ecosystem-based management in coastal zone is that the off-shore ecosystem is rather separate and quite differ from shelf and open sea ecosystems.
- As we associate this zone with kelp vegetation and multi-special benthic communities, it is usually have more difficult structure and composition.
- It has great importance for open sea communities as it is a key-point area for bio-cycles of many dominant species of open sea ecosystem. (Fishes and Shellfishes).
- It has specific spatial pattern as it usually has great length and it is quite narrow (only up to 30-40 m in depth).
- It is usually is a buffer between sea and land biota and it is more sensitive for any kind of negative influence.
- It has great social importance and it takes strong human impact.

It force to determine a special model of classification and spatial definition.
And a a special model of management as well.

Why are the algae?



- The correct and natural classification and subdivision of coastal ecosystem one of the priority tasks of near shore investigations.
- The problem of classification and sub-division of coastal zone is the problem of choosing the correct and universal marker for determine the borders of homogenous communities. And it should be the hierarchical system of parameters according the levels of regional sub-division of coastal zone.

The algae community and sea macro vegetation as a whole.

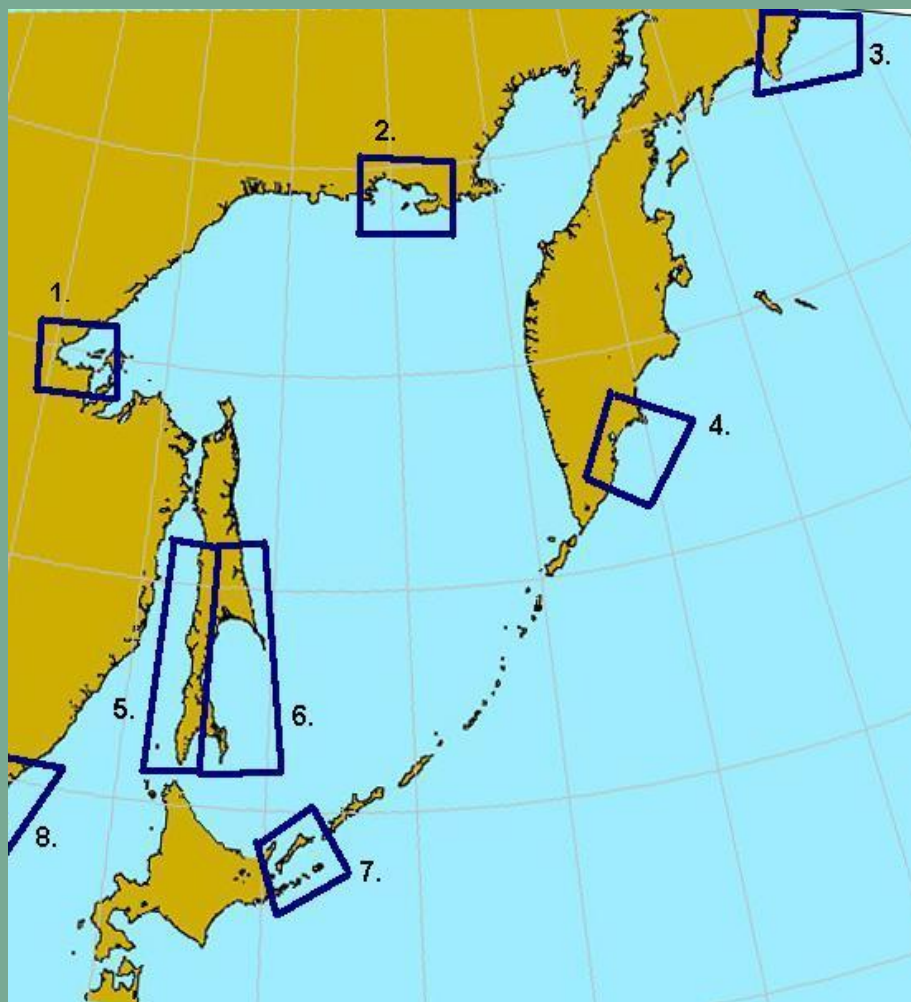
- More stable component of ecosystem than any others, as it is biocenosis formative component
- The algae component of ecosystem is sensitive for life conditions and for any kind of impacts
- It has multispecial structure , many of the species are the good indicative eco-objects
- It can be easy characterized by qualitative and quantitative parameters

Terms of reference

- The program of algae flora pointed eco-system monitoring of coastal zone of Far East Seas provides by Russian Federal Institute of Fisheries and Oceanography (VNIRO) since 1997.



Area of studies



The regions of eco-monitoring studies of near shore communities (VNIRO 1997-2005)

Eco-polygons:

1. Okhotsk Sea (W), Udskeya Bay
2. Okhotsk Sea (NE), coast Odiyan Bay
3. Bering Sea (NW) , coast of Northern Kamchatka
4. Bering Sea (W) , Kamchatckiy Bay
5. Japanese Sea (NE), coast of west Sakhalien
6. Okhotsk Sea (SW), coast of east Sakhalien
7. Okhotsk Sea (S), Sothern Kuriles Islands
8. Japanese Sea(NW), Russian mainland coast

Methods and Materials



We use the scuba diving methods for sampling the qualitative and quantitative specimens of benthos macro algae.

Besides, a great number of collected specimens of algae at the different Russian herbarium collections was observed.

For purposes of phyto-geographic and floristic statistical analyses literature data were involved.

DataBase:

The original data base contain more than 40000 notes of distribution more than 400 species Chlorophyta, Rhodophyta and Phaeophyta from the Far East Seas of Russia



Discussion

What the vegetation homogeneity is indicate ?

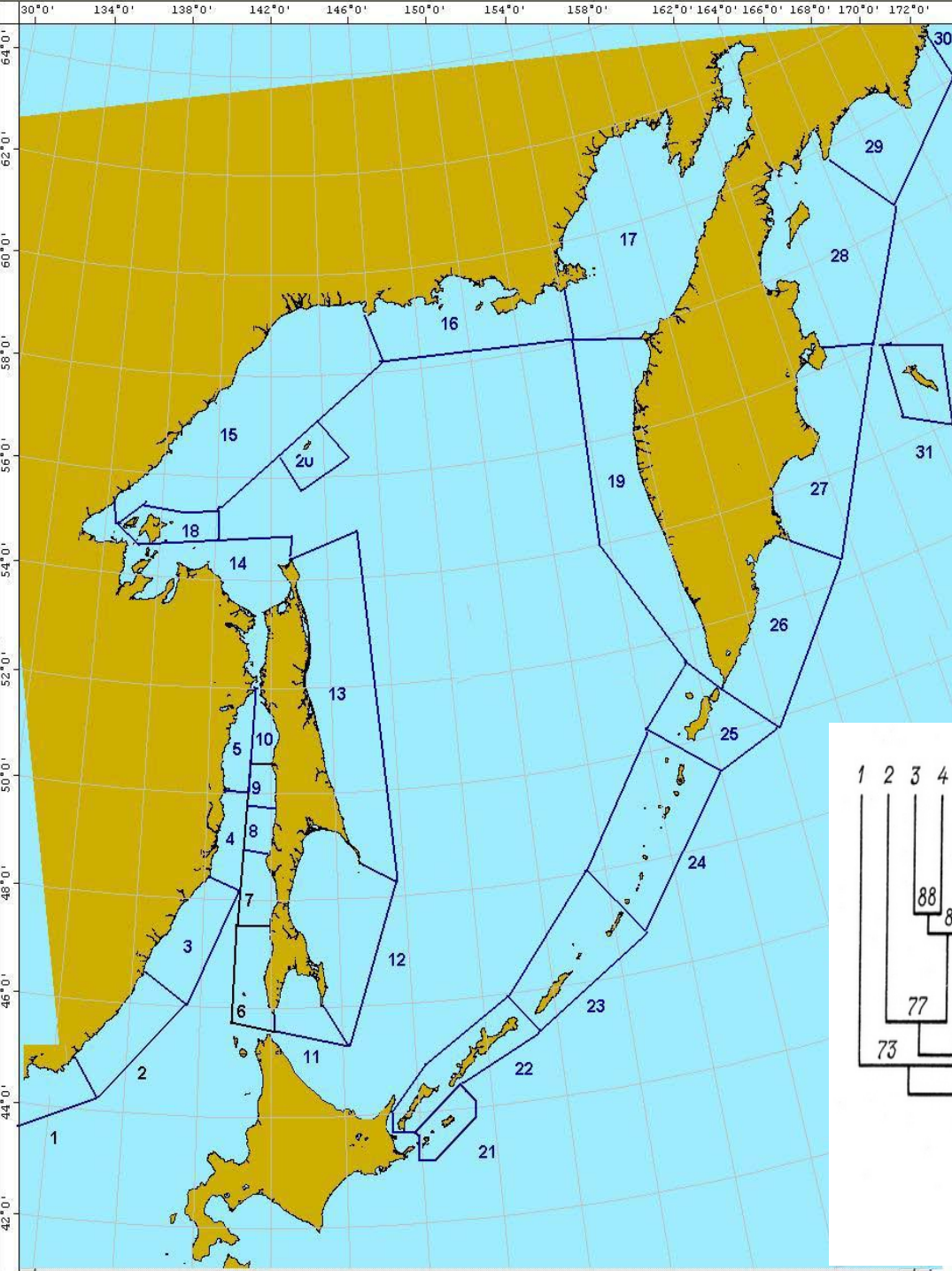


- The composition of plants at any point of coastal line is a result of activity global and local ecological factors and the process of flora-genesis.
 - The global ecological factors are:
 - 1 Climate
 - 2 Ocean currents
 - 3 Geomorphology of the coast and associated ways of taxon migration
 - The local ecological factors are:
 - 1 The hydrology activity
 - 2 The bottom conditions
 - 3 The chemical and physical properties of water
- We suggest, that the homogenous structure of algae community at the spatial area confirm the homogeneity of life condition and the history of community formation at the same area.
- It can be used as natural criteria for eco-region determination.

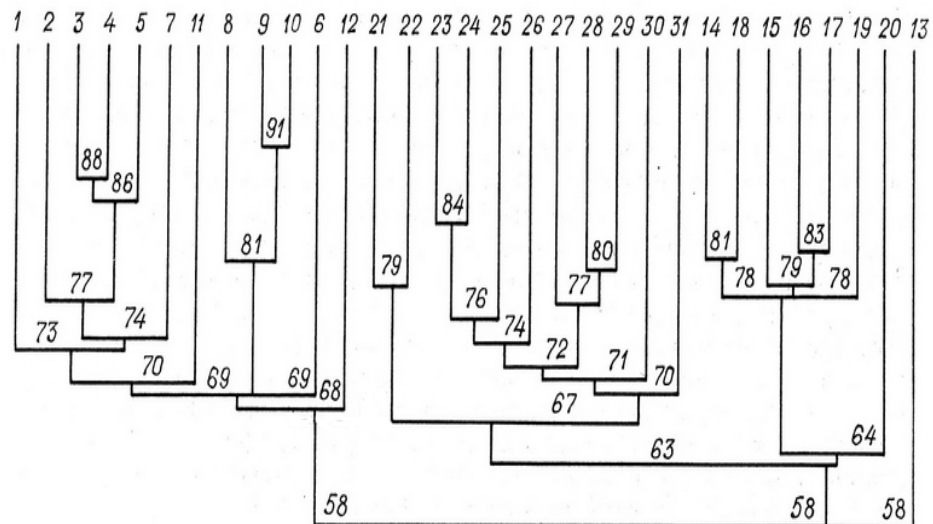
Criteria relevant to the determination of unit eco-regions of coastal zone for sub-regional identification purposes.

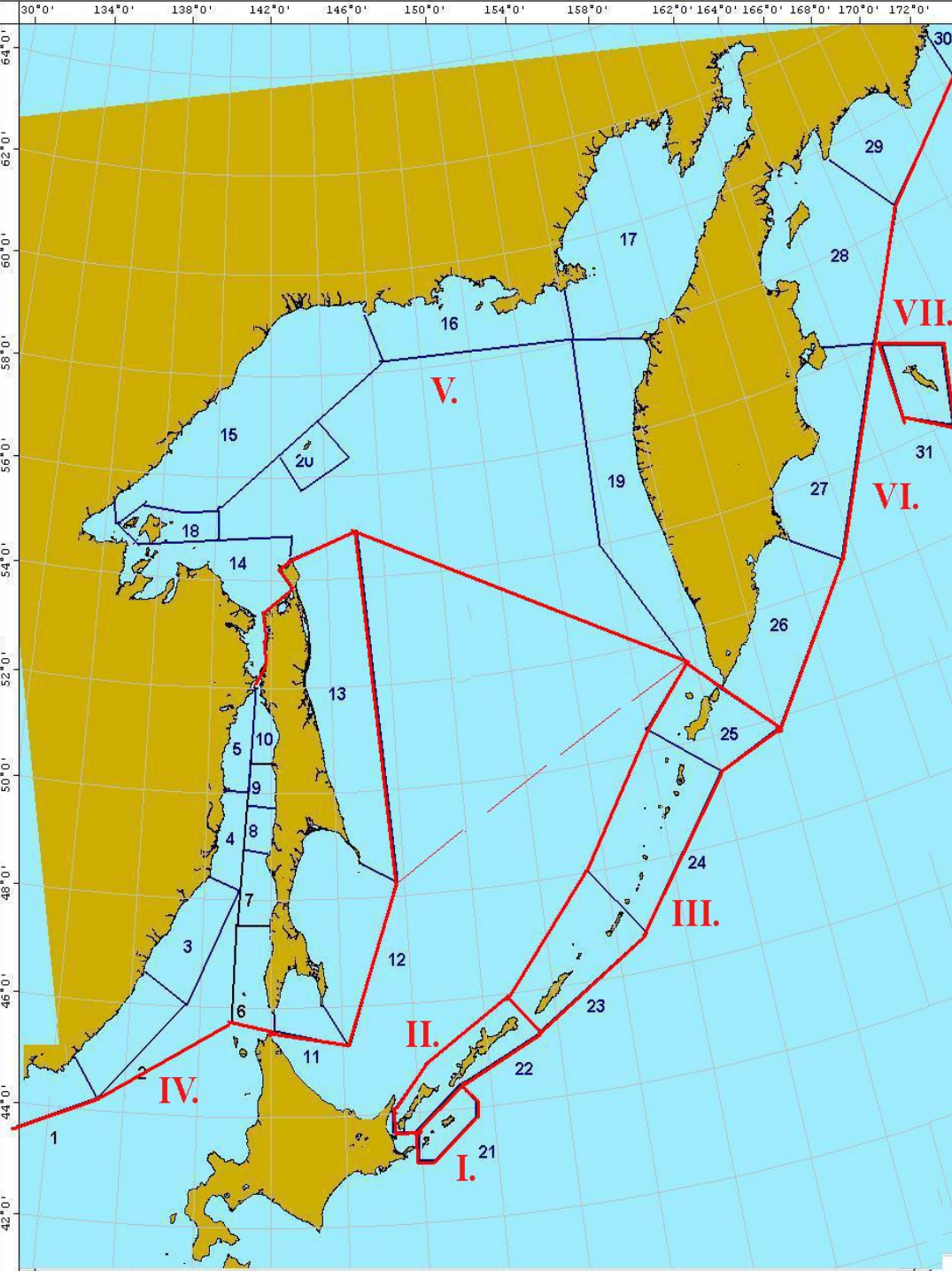


Method	Criteria relevant	Level of regional zone determination		
		Global	Regional	Local
Floristic analysis	Index of Biodiversity (BI), Index of taxonomy composition (TI)	Yes		
Phyto-geographic analysis	Phyto-geographic Index (PhGI)	Yes	Yes, if usable	
Dominant and co-dominant analysis	Index of dominant taxonomy composition (DTI)	Yes	Yes	Yes
Indicator species and Indicator taxonomy groups analysis	The model of spatial distribution of indicator species and taxonomy groups (MSDSG)	Yes	Yes	Yes
Analysis of vertical composition of algae vegetation	The model of vertical composition of algae vegetation (i.e. the scheme of vertical distribution of algae communities) (MVDC)		Yes	Yes, if usable
Analysis of vertical distribution of indicator species and taxonomy groups	The model of vertical distribution of indicator species and taxonomy groups (MVD SG)		Yes, if usable	Yes



The one-dimension clustering of local algae floras at the coastal zone of North Pacific, (%)



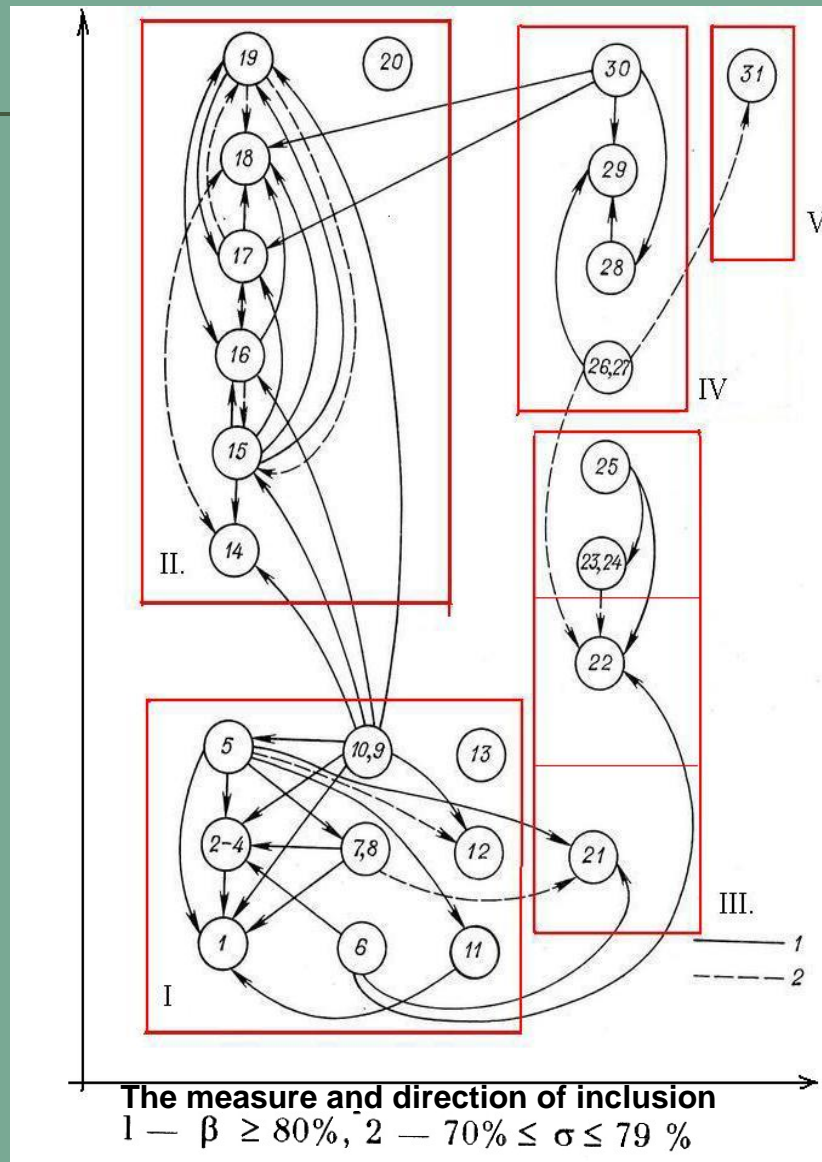


The sub-regional identification scheme of coastal zone for Northern Pacific seas of Russia By method of Floristic analysis analysis.

Eco-regions:

- I - Southern Kuriles Islands region
- II - Little Kuriles Islands region
- III - Northern Kuriles Islands region
- IV - Japanese sea and Sakhalien region
- V - Okhotsk Sea region
- VI - Bering sea region
- VII – Komandor Islands region

Dominant and co-dominant analysis



The oriented chart of mutual relations by dominant and co-dominant analysis of algae flora of Russian Far East seas

Eco-regions:

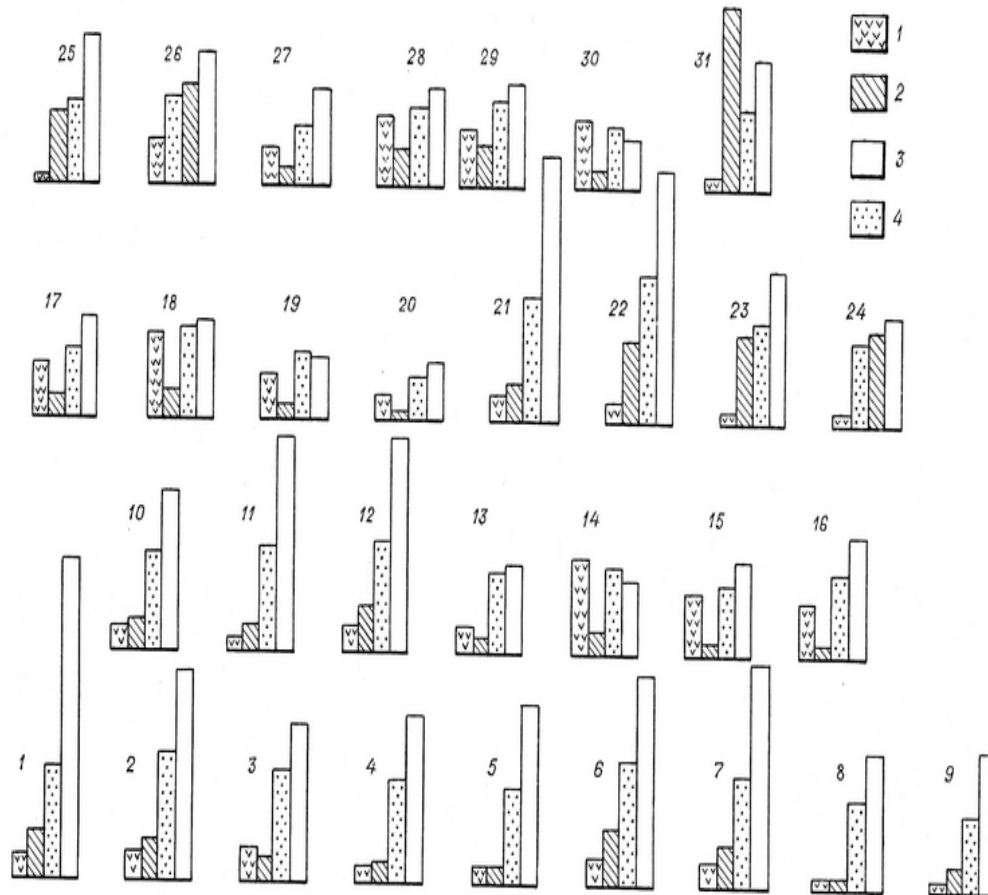
- I - Japanese sea and Sakhalien region
- II - Okhotsk Sea region
- III - Kuriles Islands region (All subregions)
- IV - Bering sea region
- V - Komandor Islands region

Phyto-geographic analysis of local algaefloras

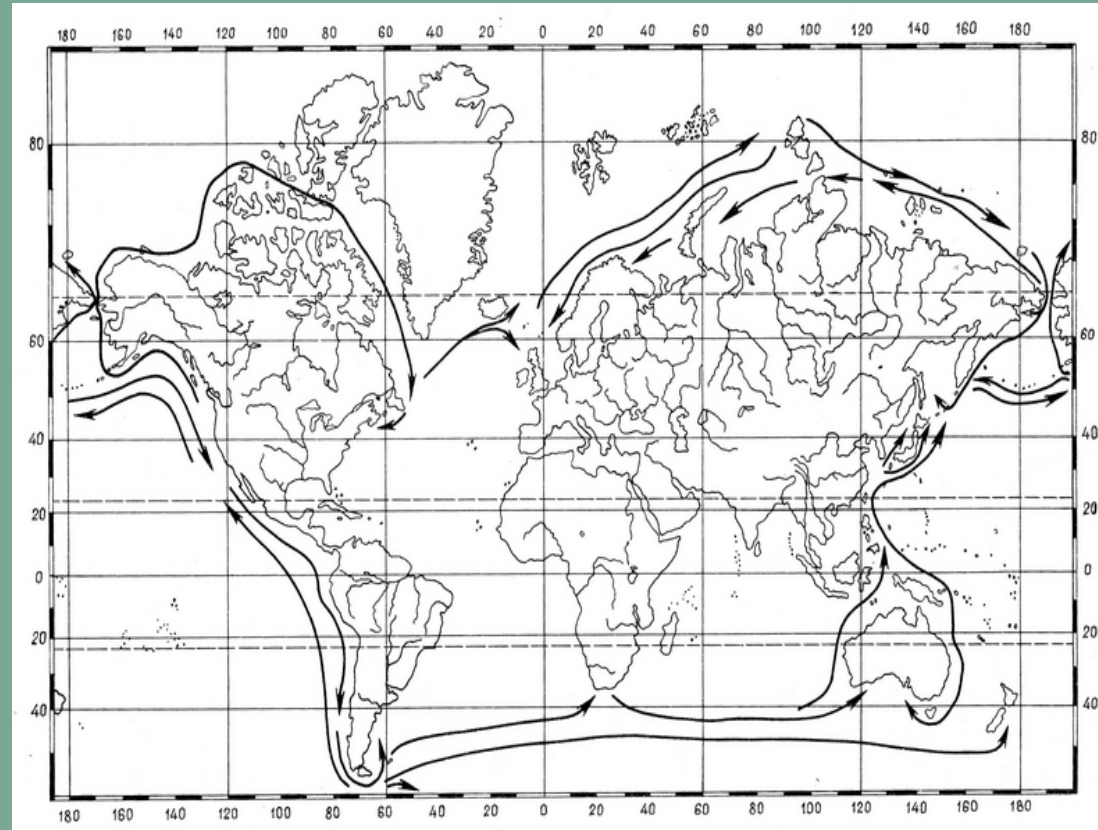


Groups of algae by origination

1. Atlantic origination
2. American origination
3. Asia origination
4. Asia and American origination



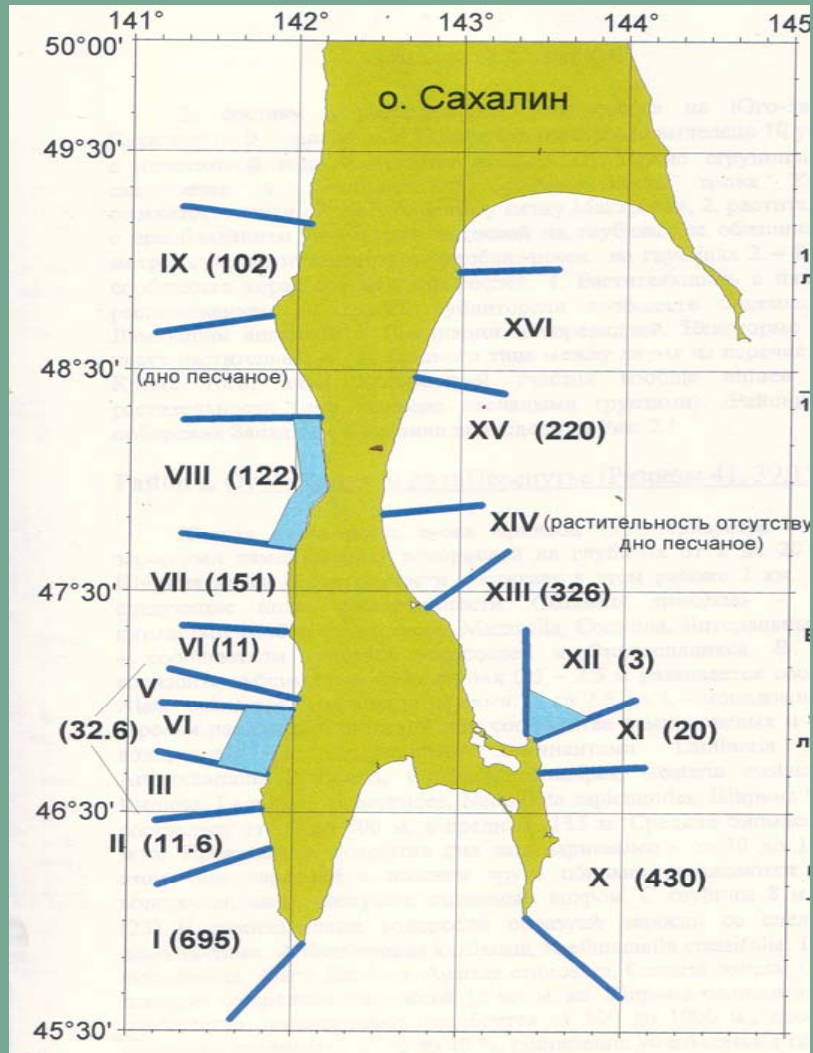
Using of phyto-geographic analysis to describe process of regional flora genesis.



The migration ways. Contacts of Far East algae flora with other world algae floras.

Analysis of vertical composition of algae vegetation:

regional sub-division of coastal ecosystem of Southern Sakhalin Island



Stratigraphic column 1 (top):

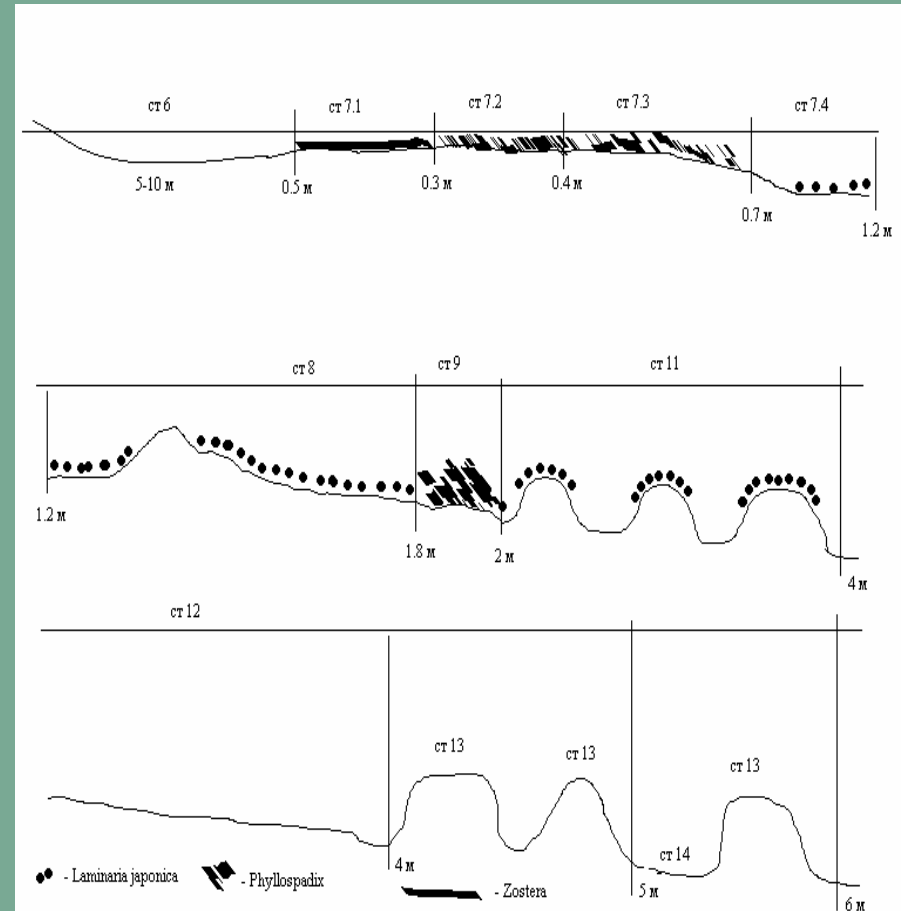
- 160.1, 18.1
- 160.2, 18.2
- 159
- 158, 17
- 157, 16.2
- 156, 16.1
- 155, 15

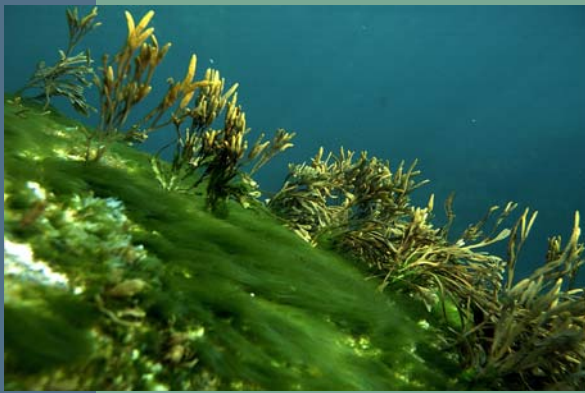
Stratigraphic column 2 (bottom):

- 162
- 21/20/19
- 161
- 160.1
- 160.2

Legend:

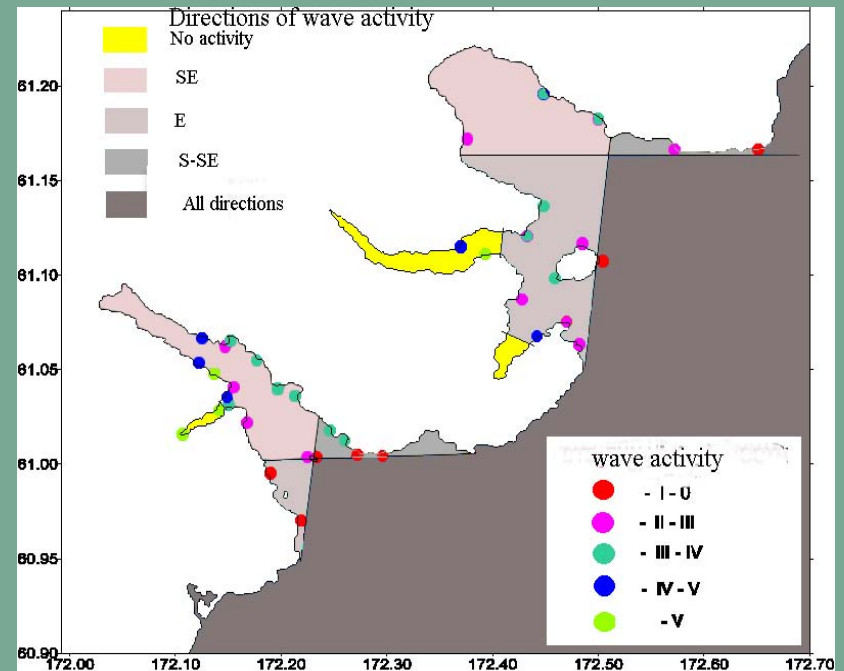
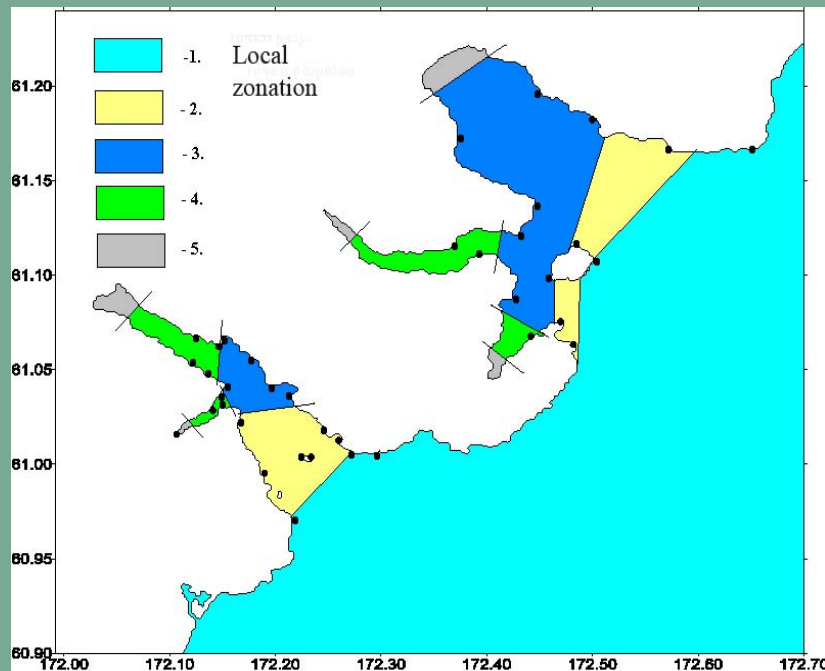
- • • - *Laminaria japonica*
- ▨ - *Phyllospadix*



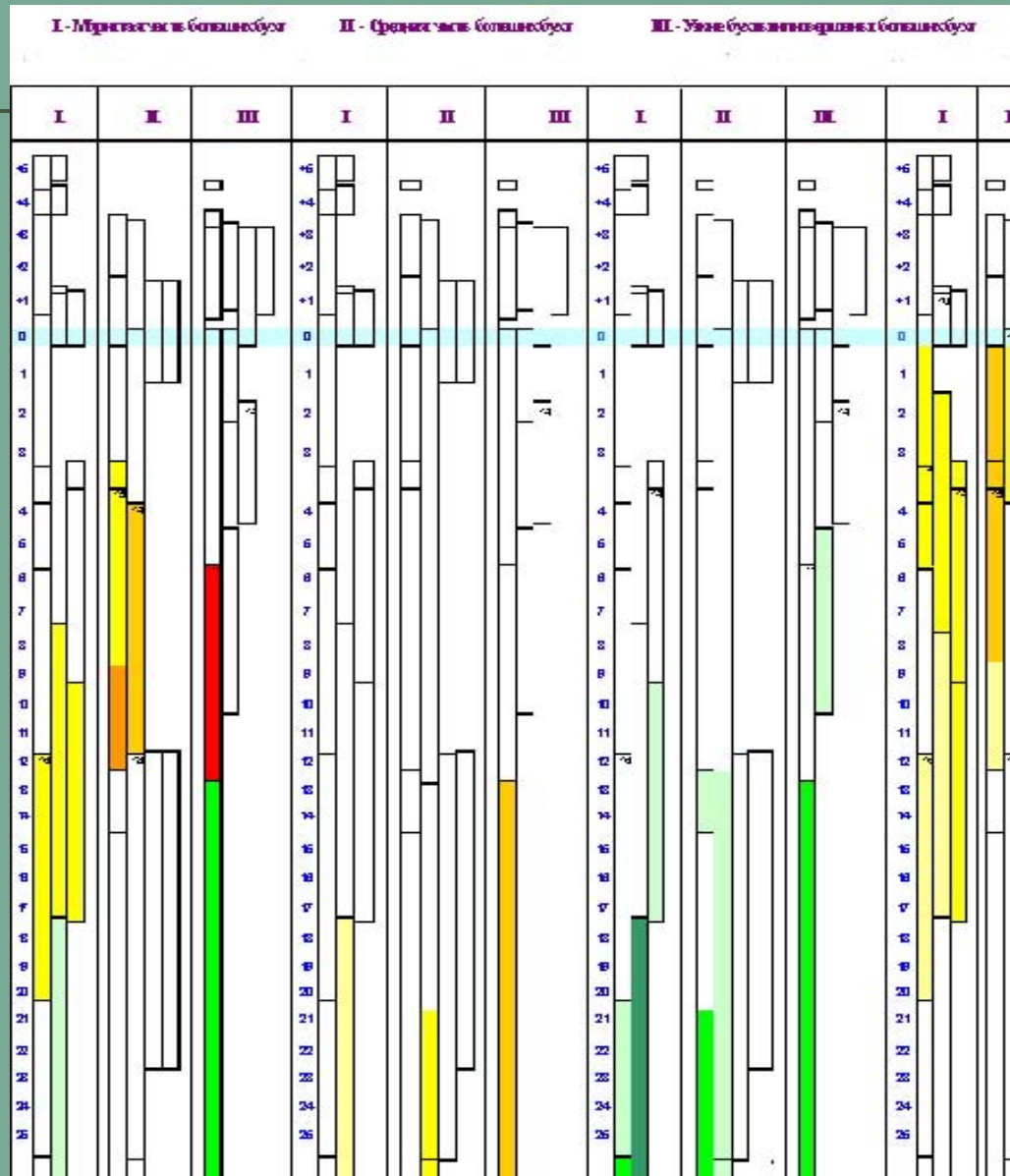


Analysis of vertical distribution of indicator species and taxonomy groups

Local sub-division of coastal line of bays of St. Peter and St. Poul and Glubokaya (Berin Sea, Eastern Kamchatka)



Distributions of dominant Laminariales at the offshore communities of Bays of St. Peter and St. Poul and Glubokaya (Berin Sea, Eastern Kamchatka)



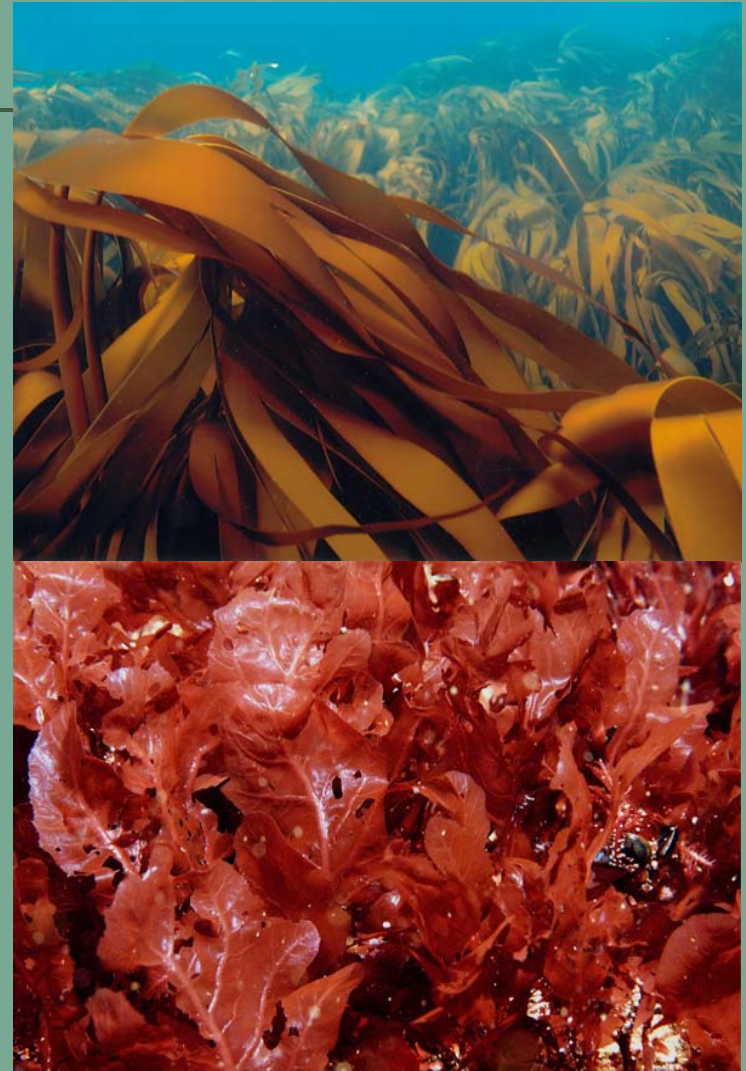
Summary

- There are system of 3 groups of parameters of sea algae vegetation for describing and delineation marine sub-regions can be used.
 - The first ones – the parameters record peculiarity of global plants aggregation as flora of coastal region, such as biodiversity index, dominant-co-dominant index and phyto-geographical composition of algae flora.
 - The second one - parameters record peculiarity of regional plants aggregation. The most sensitive parameter of these group is the vertical structure of vegetation (i.e. the vertical distribution of algae communities)
 - The third one – are the parameters record peculiarity of local distribution of algae species and algae communities. The most sensitive at the local scale are the analysis of vertical distribution of indicator species and taxonomy groups and spatial analysis of distribution of indicator species and taxonomy groups.



Summary

- The long term eco-system monitoring can be based on the same set of parameters. The parameters tracing are have to be chosen according level of regional sub-division unit.
- The using of several kinds of parameters for tracing is greatly recommended.



Thank you for your attention!
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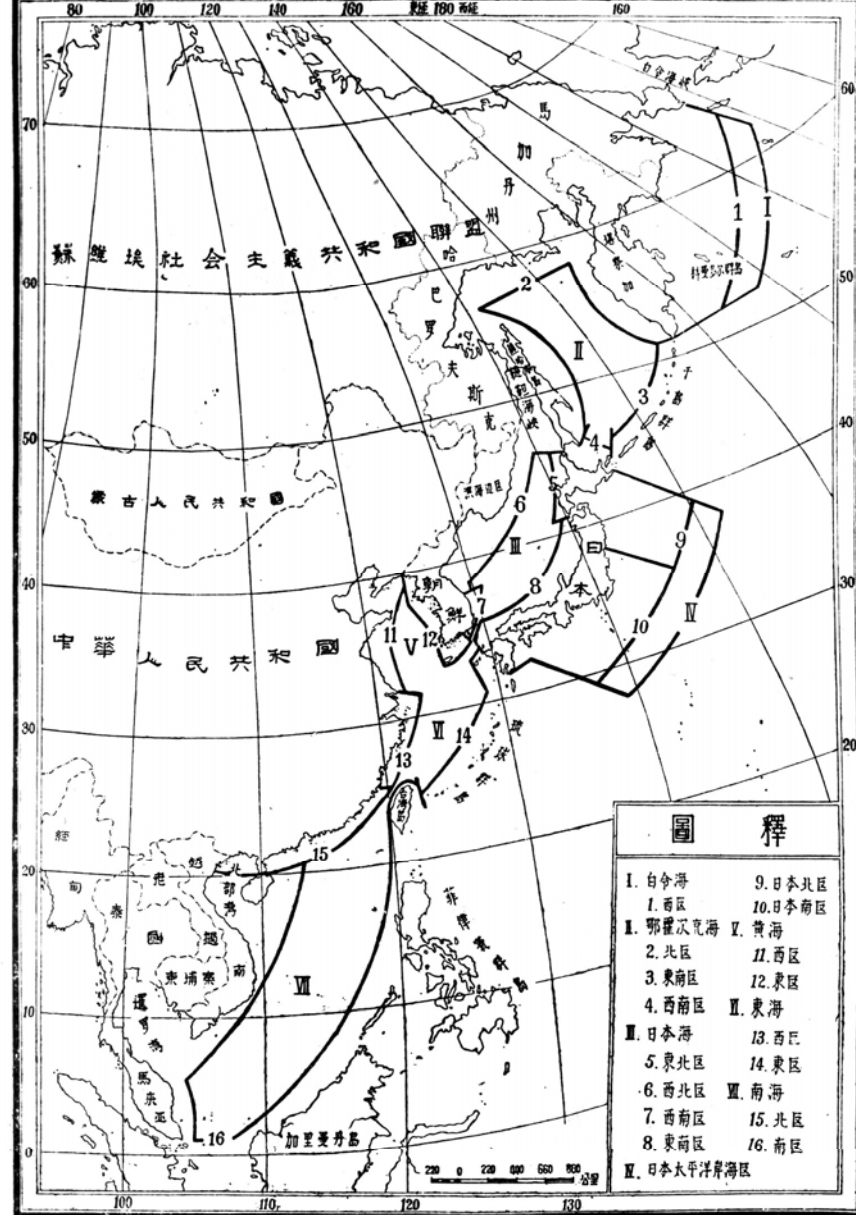


Рис.5. Региональное деление флоры морских водорослей в веро-западной части Тихого океана (по Tseng a. Chang, 59).

