UDC 58

MACRO WATER PLANT OF ABKHAZIAN SHELF OF THE BLACK SEA

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Last great algological researches on Abkhazia shelf were conducted in 1960-1970s. In connection with USSR disintegration, war conflict, maritime scientific researches in this region were not realized more than 20 years. In July 2010 South scientific centre RAS for the first time conducted the complex ecosystem researches in the contemporary history of Republic of Abkhazia, the modern estimation of phytobentos condition was one of the challenges. Phytobentos sample taking is conducted in the littoral zone of Abkhazian shelf at the depth of 50m in the borders of work territory. At the row of stations with depths from 10 to 50m sea bottom dredgings were conducted with drag, bottom silt probes were selected with bottom-grab Van Veen, a part of the material was collected at breakwaters.

Macro water plants in the soil probes, collected with bottom-grab Van Veen were absent. Drag is appeared to be the most efficient, in the result of several dredging in the point with coordinates of 43º08'09" n.l. and 40º24'09" e.l. with deepness of 34 m, water plants, attached to small boulders, with total mass to 0,5 kg were raised. Among macro water plants the representatives of red water plants – Ceramium, Polysiphonia and brown – Cystosira, Dilophys predominated. Green water plants in the deep-water probes were not detected. At the same time predominance of the green and red water plants is detected in the littoral zone in fouling hydrotechnic construction (breakwaters) communities. Earlier A.A. Kalugina-Gutnik showed that water plants species composition is poor, because of loose grounds domination – just 113 of species or 38,7% from the general numerical strength of macro water plants of the Black sea, at that the leading position is taken by red and brown water plants. In the course of researches 33 water plant species were detected, from them green water plants – 11, red – 14, brown – 8. The conclusion of A.A. Kalugina-Gutnik about thickets water plants absence at the great part of Abkhazian shelf is actual nowadays. It is interesting to note that earlier for Abkhazian shelf water plants of Cystosira kind were not mentioned. The finding of *Cystosira crinita* testifies about widening of its areal resettlement in the south-east part of the sea.

The researches were conducted in the summer period and that is why the representatives of the winter-spring algal flora (Bangia, Urospora, Pylaiella, Ectocarpus and others). typical for adjoining area of Big Sochi were not detected. In the same time 13 species of brown and red water plants are detected, earlier not mentioned in the south-east part of the Balck sea, but usual in the water area of Big Sochi.

Steady tendency of green water plants increase is marked for Russian part of the Black sea waters. For Abkhazian shelf this tendency is not so expressed, and insignificant presence of green and red water plants of polysaprobic group testifies about small limnetic flowing and minor removal of biogenic elements. In the last decade for Russian part of the Black sea waters narrowing of water plants areal to 5-15 м, practically algal ring at the solid understratum deeper 20m absented or significantly fragmented. Detection of water plant communities in the waters of Abkhazia at the depth of 40 м, testifies about absence of negative phenomena that probably connected with more favourable ecological atmosphere.

Regionalization of the Black sea littoral part and revelation of 14 flora regions were conducted by A.A. Kalugina-Gutnik. Such extraction preserves actuality and corresponds to the modern phyto-geographical regionalization. The new phyto-geographical region is separated in the work of V.N. Nikitina and O.A. Lisovskaya for the south-east part of the Black sea – “continental slope of the north-west part of Colchis coast”, apparently such separation is rightful and the borders of phyto-geographical region are necessary to be enlarged, including Abkhazia shelf in it.

Key words: macro water plants, Abkhazia, Abkhazian shelf, seaside zone, fragmentation.

Last years the row of algaeology researches was conducted in the north-east part of the Black sea [9; 1; 12; 10; 3; 5; 11]. New data of species composition and sea macro water plants distribution were received, estimation of negative influence, connected with the economic activity growth in the region is mentioned. All field studies in the mentioned works were conducted in the frames of the Black sea waters of Russian part. The last large algaeology researches at the shelf of Abkhazia were conducted in 1960-1970s [6; 2]. In connection with USSR disintegration by the war conflict, sea scientific researches were not realized more than 20 years. In July 2010 South scientific centre RAS at the invitation of the head of Republic of Abkhazia and JSC “Rosneft” for the first time conducted the complex ecosystem researches in the contemporary history [7;8], the modern estimation of phytobentos condition was one of the challenges.

Phytobentos sample taking is conducted in the littoral zone of Abkhazian shelf at the depth of 50m in the borders of work territory. At the row of stations with depths from 10 to 50m sea bottom dredgings were conducted with drag, bottom silt probes were selected with bottom-grab Van Veen, a part of the material was collected at breakwaters. Water plants determination was conducted according to classical determinant [4] considering the modern taxonomic changes (www.algaebase.org).

Macro water plants in the soil probes, collected with bottom-grab Van Veen were absent. Drag is appeared to be the most efficient, in the result of several dredging in the point with coordinates of 43º08'09" n.l. and 40º24'09" e.l. with deepness of 34 m, water plants, attached to small boulders, with total mass to 0,5 kg were raised. Among macro water plants the representatives of red water plants – Ceramium, Polysiphonia and brown – Cystosira, Dilophys predominated. Green water plants in the deep-water probes were not detected. At the same time predominance of the green and red water plants is detected in the littoral zone in fouling hydrotechnic construction (breakwaters) communities.

Earlier A.A. Kalugina-Gutnik showed that water plants species composition is poor, because of loose grounds domination – just 113 of species or 38,7% from the general numerical strength of macro water plants of the Black sea, at that the leading position is taken by red and brown water plants. In the course of researches 33 water plant species were detected, from them green water plants – 11, red – 14, brown – 8 (see in table). The conclusion of A.A. Kalugina-Gutnik about thickets water plants absence at the great part of Abkhazian shelf is actual nowadays. It is interesting to note that earlier for Abkhazian shelf water plants of Cystosira kind were not mentioned [6]. The finding of *Cystosira crinita* testifies about widening of its areal resettlement in the south-east part of the sea.

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In the last decade for Russian part of the Black sea waters narrowing of water plants areal to 5-15 м, practically algal ring at the solid understratum deeper 20m absented or significantly fragmented [9; 2; 1; 10; 3]. Detection of water plant communities in the waters of Abkhazia at the depth of 40 м, testifies about absence of negative phenomena that probably connected with more favorable ecological atmosphere. Regionalization of the Black sea littoral part and revelation of 14 flora regions were conducted by A.A. Kalugina-Gutnik. Such extraction preserves actuality and corresponds to the modern phyto-geographical regionalization [11]. The new phyto-geographical region is separated in the work of V.N. Nikitina and O.A. Lisovskaya for the south-east part of the Black sea – "continental slope of the north-west part of Colchis coast", apparently such separation is rightful and the borders of phyto-geographical region are necessary to be enlarged, including Abkhazia shelf in it.

Table

Macro water plants of Abkhazia shelf and Big Sochi region

Species	I	II	III	IV	V
CHLOROPHYTA					
Ulothrix flacca (Dillw.) Thur.	ab	r	o		+
U. pseudoflacca Wille	ab	r	o		
U. implexa (Kütz.) Kütz.	ab	r	o		
Pseudopringsheimia congluens (Rosenv.) Wille	ub	r	?		
Pringsheimiella scutata (Reinke) Marschew.	bt	a	o		+
Bolbocoleon piliferum Pringsh.	shb	r	o		
Phaeophilla dendroides (Crouan) Batt.	bt	r	o		
Ph. engleri Reinke	bt	r	o		
E. wittrockii (Wille) Kylin	shb	r	o		
Entocladia viridis Reinke	c	c	o	+	+
E. perforans (Huber) Levr.	shb	r	o		
Monostroma latissimum (Kütz.) Wittr.	shb	r	o		
M. oxyspermum (Kütz.) Doty	shb	r	o		
M. fuscum (Post. et Rupr.) Wittr.	ab	r	o		
Capsosiphon fulvescens (Ag.) Setch. et Gardn.	shb	r	o		
Blidingia minima (Näg.) Kylin	bt	r	o		
B. marginata (J. Ag.) P. Dang.	bt	r	o		
Percursaria percursa (Ag.) Bory	shb	r	o		
Enteromorpha prolifera (O. Müll.) J. Ag.	c	r	o		
E. flexuosa (Wulf.) J. Ag.	bt	a	o	+	+

E. clathrata (Roth) Grev.	c	a	o		+
E. crinita (Roth) J. Ag.	c	r	o		
E. linza (L.) J. Ag.	bt	l	o	+	+
E. compressa (L.) Grev.	c	l	o		+
E. intestinalis (L.) Link.	c	l	o	+	+
E. torta (Mert.) Reinb.	shb	r	o		
Ulva rigida Ag.	bt	l	lt	+	+
Chaetomorpha crassa (Ag.) Kütz.	bt	r	o		+
Ch. aërea (Dilw.) Kütz.	bt	a	o	+	+
Ch. linum (Müll.) Kütz.	bt	a	o		+
Ch. gracilis Kütz.	bt	r	o	+	+
Rhizoclonium riparium (Roth) Harv.	c	r	o	+	
Rh. tortuosum (Dillw.) Kütz.	shb	r	o		
Rh. inplexum (Dillw.) Kütz.	bt	r	o		+
Cladophora albida (Huds.) Kütz.	shb	a	o	+	+
C. laetevirens (Dillw.) Kütz.	shb	l	o	+	+
Urospora peniilliformis (Roth) Aresch.	ab	a	sw		
Cladophoropsis membranacea (Ag.) Börg.	ст	r	ss		
Bryopsis plumosa (Huds.) Ag.	shb	l	sw	+	+
B. hypnoides Lamour.	lb	a	o		
B. corymbosa J. Ag.	ст	r	ss		
Codium vermilara (Olivi) Delle Chiaje	bt	l	lt		
Ostreobium queckettii Born. et Flah.	c	r	?		
PHAEOPHYTA					
Pylaiella littoralis (L.) Kjellm.	аб	r	sw		
Ectocarpus confervoides (Roth) Le Jolis	c	a	sw		
E. penicillatus (Ag.) Kjellm.	shb	r	sw		
E. siliculosus (Dillw.) Lyngb.	c	a	sw		
Feldmannia irregularis (Kütz.) Hamel	bt	l	ss		
Entonema oligosporum (Strönf.) Kylin	shb	r	sw		
E. parasiticum (Sauv.) Hamel	shb	r	sw		
Myrionema strangulans Grev.	shb	r	sw		
M. balticum (Reinke) Foslie	ub	r	sw		
Ralfsia verrucosa (Aresch) J. Ag.	c	l	lt	+	
Elachista fucicola (Vell.) Aresch.	shb	r	sw		
Leathesia difformis (L.) Aesch.	shb	r	sw		
Cylindrocarpus microscopicus Crouan	lb	r	?		
Stilophora rhizodes (Ehrh.) J. Ag.	shb	l	ss		
Dictyota dichotoma (Huds.) Lamour.	bt	a	ss	+	
D. linearis (Ag.) Grev.	bt	r	ss		
**D. faciola* (Roth) Howe	bt	l	ss	+	+
**Padina pavonia* (L.) Gaill.	bt	l	ss	+	+
Sphacelaria cirrhosa (Roth) Ag.	ab	l	lt	+	+

S. tribuloides Menegh.	bt	r	lt		
Halopteris scoparia (L.) Sauv.	shb	a	lt		+
Cladostephus verticillatus (Lightf.) Ag.	shb	l	lt	+	+
Scytosiphon lomentaria (Lyngb.) J. Ag.	ab	l	sw	+	+
Petalonia zosterifolia (Reinke) Kutze	shb	r	?		
Punctaria latifolia Grev.	shb	r	sw		
Striaria attenuata (Ag.) Grev.	shb	a	o		
Asperococcus bullosus Lamour.	shb	r	o		
**Cystoseira crinita* Bory	lb	l	lt	+	+
RHODOPHYTA					
Asterocytis ramosa (Thw.) Gobi	bt	r	ss		
Erythrotrichia carnea (Dillw.) J. Ag.	bt	a	ss		
**Goniotrichum elegans* (Chauv.) Zanard.	bt	r	ss	+	+
E. reflexa (Crouan) Thur.	shb	r	ss		
**Erythrocladia subintegra* Rosenv.	bt	a	ss		+
Bangia fuscopurpurea (Dillw.) Lyngb.	shb	l	sw		+
Kylinia secundata (Lyngb.) Papenf.	shb	a	o	+	+
**Kylinia microspora* (Näg.) Kylin.	lb	r	o		+
**Kylinia virgatula* (Harv.) Papenf.	shb	r	o	+	+
Acrochaetium daviesii (Dillw.) Näg.	shb	r	o	+	
**Acrochaetum savianum* (Menegh.) Näg.	lb	r	o		+
Rhodochorton peniciligorme (Kjellm.) Rosenv.	ab	r	lt		+
Rh. purpureum (Lightf.) Rosenv.	ab	r	lt		
Nemalion helminthoides (Vell.) Batt.	lb	l	ss		+
**Gelidium crinale* (Turn.) Lamour.	bt	l	lt	+	+
Peyssonnelia rubra (Grev.) J. Ag.	bt	l	lt		
P. dubyi Crouan	shb	a	lt		
Epilithon membranaceum (Esp.) Heydr.	bt	l	lt		
**Melobesia farinosa* Lamour.	bt	l	o		+
Choreonema thyretii (Born.) Schmitz	bt	r	?		
Corallina officinalis L.	bt	l	lt	+	+
C. mediterranea Aresch.	lb	l	o	+	
C. granifera Ell. et Soland.	lb	a	lt		+
Jania rubens (L.) Lamour.	bt	l	lt		
Grateloupia dichotoma J. Ag.	lb	l	lt		
Cruoriopsis rosenvingii Börg.	lb	a	lt		+
**Gracilaria verrucosa* (Huds.) Papenf.	bt	l	lt	+	
G. dura (Ag.) J. Ag.	bt	c	lt		
Spaerococcus coronopifolius (Good. et Wood.) Strackh.	lb	r	lt		
Hypnea musciformis (Wilf.) Lamour.	bt	r	lt		
Gigartina acicularis (Wulf.) Lamour.	bt	r	lt		
G. teedii (Roth) Lamour.	bt	r	v		

Antithamnion plumula (Ell.) Thur.	shb	a	o		+
**Ceramium arborencens*	ub	a	o		+
**C. ciliatum* (Ell.) Ducl.	lb	l	ss	+	+
**C. deslongchampii* Chauv.	shb	r	o	+	+
**C. diaphanum* (Lightf.)Roth	bt	l	o		+
**C. rubrum* (Huds.) Ag.	c	l	o	+	+
**C. strictum* (Ell.) Ducl.	bt	l	o		+
**Callitamnium corymbosum (J. E. Smith) Lyngb.*	lb	l	o	+	+
Apoglossum ruscifolium (Turn.) J. Ag.	shb	l	lt		
Polysiphonia denudata (Dillw.) Kütz.	bt	l	o	+	+
**P. nigrescens* (Dillw.) Grev.	bt	r	o	+	+
**P. subolifera* (Ag.) Harv.	lb	l	o		+
Lophosiphonia obscura (Ag.) Falkenb.	lb	a	o		+
L. reptabunda (Suhr) Kylin	lb	a	o		+
**Chondria dasyphylla* (Wood.) Ag.	bt	a	o		+

* Absent in the list of A.A. Kalugina-Gutnik (1975) for the south-east part of the Black sea
I. Phyto-geographical belonging: a – Arctic; ub – upper boreal; mb – mid-boreal; lb – low- boreal; bt – boreal -tropical; st – subtropical; c – cosmopolite; e – endemic.
II. Continuance of vegetation: lt – long-term; o – one-year; ss – seasonal summer; sw – seasonal winter.
III. Occurrence: ls – leading species; a – accompanying, r – rare.
IV. Proprietary data
V. V.N. Nikitina, O.A. Lisovskaya (2013)

References

1. *Афанасьев Д.Ф., Корпакова И.Г.* Макрофитобентос российского Азово-Черноморья. Ростов-на-Дону, 2008.
2. *Блинова Е.И.* Водоросли-макрофиты и травы морей европейской части России (флора, распространение, биология, запасы, марикультура). М., 2007.
3. *Громов В.В.* Макрофитобентос южных морей России. Водоросли северо-кавказского побережья Черного моря, прибрежно-водная растительность Азовского моря и Северного Каспия. Palmarium Academic Publishing. 2012.
4. *Зинова А.Д.* Определитель зеленых, бурых и красных водорослей южных морей СССР. М., 1967.
5. *Никитина В.Н., Лисовская О.А.* Макрофитобентос верхних отделов береговой зоны российского побережья Черного моря / Труды СПб общества естество-испытателей. 2013. Т. 81.
6. *Калугина-Гутник А.А.* Фитобентос Черного моря. Киев, 1975.

7. *Матишов Г.Г., Матишов Д.Г., Степаньян О.В.* Оценка современного состояния экосистемы Черного моря (Республика Абхазия) // Доклады АН. 2014. Т. 454. № 6.
8. *Матишов Г.Г., Степаньян О.В.* Морские исследования у берегов Абхазии // Природа. 2014. № 11.
9. *Митясева Н.А., Максимова О.В., Георгиев А.А.* Флора макроводорослей северной части российского побережья Чёрного моря // Экология моря. 2003. Вып. 64.
10. *Симакова У.В.* Структура и распределение сообществ макрофитобентоса в зависимости от рельефа дна (Северокавказское побережье Черного моря). Автореф. на соиск. учен. степени канд. биол. наук. Москва, 2011.
11. *Степаньян О.В.* Современное разнообразие макроводорослей Азовского, Черного и Каспийского морей // Доклады АН. 2014. Т. 458. № 2.
12. *Теюбова В.Ф., Мильчакова Н.А.* Флористическое разнообразие макрофитов российского шельфа Чёрного моря (от м. Панагия до м. Видный) / Состояние экосистем шельфовой зоны Чёрного и Азовского морей в условиях антропогенного воздействия. Краснодар: КубГУ, 2011.

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