



Չ.Չ. mk<sup>1</sup>, B.Չ. լgj<sup>1</sup>, G.Չ. ֆgdbg<sup>2</sup>, K.Չ. իhgjgdh<sup>1</sup>  
 E.Չ. յյgdh<sup>2</sup>, D.K. Dexbldbg<sup>4</sup>, E.Չ. Iheyd<sup>5</sup>, Չ.B. Iheydh<sup>4</sup>,  
 Չ.Չ. Ihih<sup>3</sup>, Չ.Չ. Kligh<sup>6</sup>

<sup>1</sup> GBBHdghehby, Չ KgdL -Ith  
<sup>2</sup> hghhukxy dhfigby «Fbllh», Չ Kudlud  
<sup>3</sup> GMB, Չ KgdL -Ith  
<sup>4</sup> hnbqkabc ndmevl FM, Չ Fhkd  
<sup>5</sup> Mgbkbl rll Hch, KR  
<sup>6</sup> Iehglhehbqkabc bgklblm JG, Չ Fhkd

gb

Revն Qmdhikdh]h fhjy Չ ijbhւ յիյկկբբ yeyeky klvx յգԸ ֆիյbdhԻԸ kmrb, baklgԻԸ dd յիյg]by . Չ jkrbnjhdԸ bklhjbb ihagdcghahckdh]h hkdhgԻԸdhięby Qmdhikdh]h revն յmԻ jhev b]լ իյęgb յjbbԻ jkdjulby b adjulby յիյg]h յիheb . Ldbո wliԻ, ih kԸ bbfhkԻb, [ueh gkdhevԻԸ, Չ kfh յih յkbbggԸ hԸ K]gԻԸ lpbndԸ b K]gh]h Ehb]h]h hdg յihbahreh Չ ihagf ֆbhpgԻ յebhpgԻ [ęgdԻ b ęgdԻ 2004], beb Չ Չ kjgf ֆbhpgԻ [IheyԻԸ, 1997]. IhęgԻ, hdhglavgh յkbbggԸ hԸ K]gh]h Ehb]h]h b Lboh]h hdg յihbahreh hdheh 10,5 luk. eԻ gal [Elias et al., 1997].

Jevն gԻ Qmdhikdh]h fhjy ojd]jbamlky յյggghklvx b g[hevrbԻ m]ęfb gԻęhg յihguo kԻęghԻ Fm hkljhhf յյլey b ih]wԻ Qmdhldb]em]bgu fhjy gԻ ijurԻ 55 ֆ.

Չ ֆիյbdgkԻԸ kԻlh յ Qmdhikdh]h fhjy յյmgԻhufԸ յյm[ԻԸ kԻjul յիեփghւ յիյkԻԸ hԻԸ k]jbbm]ęjghufԸ յիյԻԸ 8 000-14 200 eԻ [Keigwin et al., 2006; Hill et al., 2007], hԻęby յmklęheęgh]h hajkԻ, aihegyxsb յih]ęgu յehhebgԻ, Չ lԸ hkhgu յihju ֆԸ [Phillips et al., 1988]. Չ յիյkԻԸ kԻԸ յյm[hԻԸ kԻbgԻ fhjkdh]h [mյby Չ 0,3-5 ԻԸ hԸ յիյ kԻjul męggԻ յajԻ khklysbԸ ba]իեփghuo fhjkdԸ hԻԸ b ihkԻbxsԸ hԻębc ֆbhpgԻ յebhpgԻ [Imfbgh, 1981].

Չ 1978 յ kբեֆ IheyjgԻ k]h -hklhgԻ wԻkԻpbԸ BgklblmԻ hdgheh]bb Ը. Չ.Չ. Rbjrh յ G KKKJ Չ iյԸ Qmdhikdh]h revն յյmgԻhufԸ յյm[ԻԸ [ueb kԻjul ihag]l]bgu hԻԸ . Gb[hevrc kԻjulԻ ֆhsgԻԸ hgb hԻԸ]ԻԸ Չ pgljęvghԸ kԻ revն, յ յյkęgu k ihfsvx ֆԻjhnmgkԻԸkԻԸ]h geԸ [Kb]1994; IheyԻԸ, 1997]. Չ յիheb Ehg յ ih յիեմ]իյhuf Իեհ յիեփghuo beh [ueb kԻjul miehlggu ę]blu, dh]ju [ueb bg]i]l]b]hgu dd hajgu hԻęby [ Iębk b, 1982] gbԻ -kjęcklhpgh]h hajkԻ

Չ 2006 յhm Չx]h -aigԻ kԻ Qmdhikdh]h fhjy k[h] յ fhjkdh]h [mԻԻ Rmյ» [ueb յիյgu յիե]hԻԸ յիյ յիյ ebkԻ R-1,2 ֆյg]ghԻ

ebkltā fkrllā 1:1 000 000. Bkihevaheky dđ h[uguc dhfiedk flhh [jeh]bkdhc ktfdb revn (kckfhdmkld, khgj, hgguc ijh[hhl[hj k ihfsvx ghjley b [jmg]lhc [jm[db]), ld b h[eb]bgevguc [mj]hnc dhfiedk, ihaheyxsb [mj]blv g[em[hdb (h 50 f ih hkd̄m ) kdbgu g[ed]hhv [Debgbdh b ., 2001]. Kdbgu 1 [ue ijh[mjg lhd k dhjbgfbb 69°0'31.8"kr, 179°19'12.1" a, 10 df d k] -kjh -hklhdm hl fuk Rfb, g [em[bg fhjy 37 f, b kdjue 5,5 f hkd̄h . Kdbgu 2 [ue ijh[mjg lhd k dhjbgfbb 70°33'2.8"kr, 179°23'43.3" a, 35 df d x]m h xgnc hdhgghklb h- jgley, g [em[bg fhjy 39 f, b kdjue 12-fljhuc jaja .

Ihemggū jamevllā [mjgby djgu [ueb knhl]jnbjhgū b hibkgū, k uegbf eblheh]bkdb dhfiedkh . Ba dhjh dhfiedk hl[bjebkv ijh[u ey bamgby [jgme]fljkbkh] b fbgjeh]bkdh] khkl, ld ey hijegby khjshoky hkd̄ h[jgbkdb hklldh : nhjfbgnj, hkljdh, kihj b iuevpu, blhfuo hhjhkec, hguo iebghfjn . Bkkehgby ijhhbekv e[hj]h]byo GBBHdkg]kheh]by, GBJB, «Ejdh » b EM . H[japu ey hijegby [jgme]fljbb b fbgjeh]bkdh] khkl lyehc njdpbb, ld ey kihjhh- iuevph] b fbdjhnmgkklbkdb gebah hl[bjebkv ba hkd̄h k bg]jehf 10-50 kf b gkdhc hdheh 100 ] Ij[u ih]ebkv afhjbgx b ukmrbgx, ihke [h hl]fuebkv b ba gbo baedebkv fbdjhnkkbebb .

E[hj]h]gu ieh]gblgu bkkehgby b h[j]hd ihmggū jamevllā ijhhbekv ih ijbylhc Jhkkbb flhd [Dh]mj 1992 ]. Fljglgy bkld h[japh ekv flhf klmigl]h [fh]af]gbbgy ey jbh]ejhgh]h [bjhgby bkihevaheky flh mkdh]blēvgnc fkk -kidljh]lbb (AMS), ihmggū [bjhdb dhj]dlbjhebkv km]hf [kcg]h]h wndl(860 e) b ijhebkv deg]guc hajk .

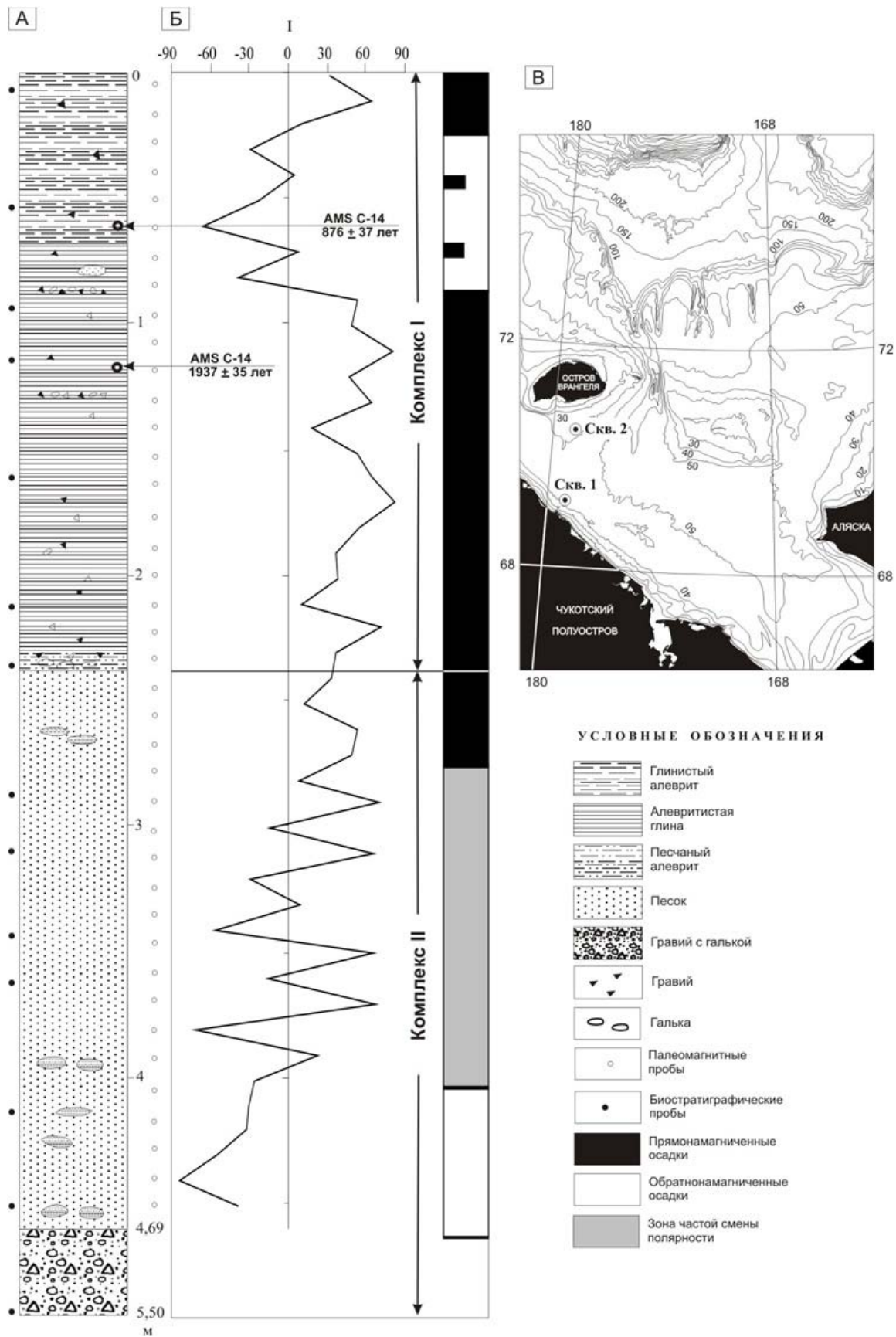
### Jamevllā

#### Радиоуглеродное датирование

ey jbh]ejhgh]h [bjhgby [ueb hlh]jgu nj]glu b ljb jdhbg fheexkdh : h[jap ba kdbgu 1, b ljb h[jap ba kdbgu 2. Ihemggū [bjhdb (lā . 1) kblēvklmx h [jehpg]hf hajk hkd̄h . Ij k]h [j]h]ky [eal]gv fnehc hajk hkd̄h kdbgu 1. Kdh]h]klb hkd̄hg]dhiegby jchg kdbgu 2 a ihag]ecklhp] -]ehpg]huc hjahd jfgb agblēvgh bafgyebkv . Ld, jōgbc flj hkd̄h gdh]beky a 10 luk. e, gbe]b 3 flj hkd̄h gdh]bekv a ihel]ju lūky b deg]guo e .

#### L[ebp]

kd̄gū	h]bahgl kf	Fljbe	kl f	E	<sup>14</sup> C hajk, e	Deg]guc hajk (ajm] 860 e)
1	50-60	Margarites	525	AA75303	876±37	khjfguc
1	116-121	H[ehfdb jdhbg	7	AA75302	1937±35	975±34
2	121-128	Astarte (?)	320	AA75301	9201±61	9367±85
2	191-198	Portlandia	70	AA75300	9441±68	9542±42
2	428-433	Cylichna (?)	9	AA75299	10592±69	11166±77

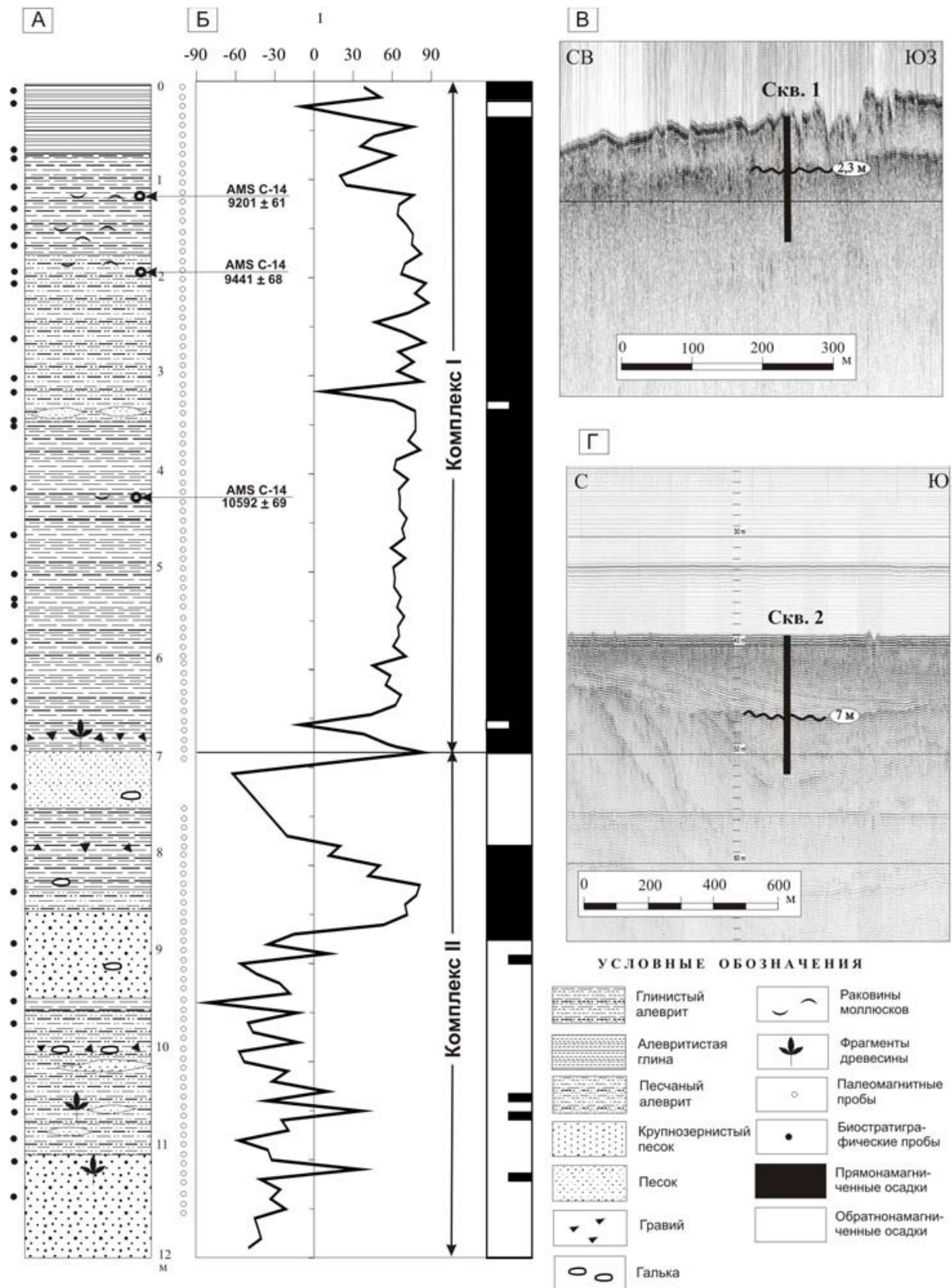


**Рис. 1. Разрез скважины №1, расположенной у мыса Шмидта.**

А – литологическая колонка;

Б – кривая наклона естественной остаточной намагниченности после размагничивания при температуре 230-560°C в интервале амплитуд переменного магнитного поля 10-80 мТ и радиоуглеродные датировки;

В – схематическая батиметрическая карта с местоположением скважин.



**Рис. 2.** Разрез скважины №2, расположенной у острова Врангеля.

А – литологическая колонка,

Б – кривая наклонения естественной остаточной намагниченности после размагничивания при температуре 230-560°C в интервале амплитуд переменного магнитного поля 10-80 мТ и радиоуглеродные датировки;

В – фрагмент профиля, полученного при помощи профилографа, проходящего через точку бурения скважины 1,

Г – фрагмент профиля, полученного при помощи профилографа, проходящего через точку бурения скважины 2 (местоположение скважин – на рис. 1).



## Палеомагнитные исследования

□ h[japo ba jögc fklb h[bo bkkehgguo kdbg ueylky dhfhggli iyyfnc iheyjghklb . □ kdbg 1 □ ahg□ iyyfnc iheyjghklb ueylky dhjhldy ahg□ h[jlghe iheyjghklb b mklhd ihgbgguo gdehggbc dhfhggli kklgghe hklhghc gflgbbghklb (30° b fg□ ), dhlhyy fh□ yeylvky jamevllhf [bhlmj]pbc Gbgb□ klb jajah□ kdbg ojdjbamxlky ijbfmsklggh h[jlghe iheyjghklv□ , hafhgh , khhlklmxsc hjlhah□ Flmyf□ . Hgdh□ , kmllhf wjhabhgggh]h gkh]ekby □ djhe□ wlbo hkdh□ , gevay bkdexlv hafhghklb b [he□ jg]h hajkl□ . □ jögc klb wlhc ahgu □ kdbg 1 g[exlky dhjhldy ahg□ klhc kfgu iheyjghklb , □□ kdbg 2 - dhjhldy ahg□ iyyfnc iheyjghklb (jbk. 1, 2).

### Изучение гранулометрии и минералогического состава осадков

Jaja kdbg ih eblheh]bb fhgh ihjaeblv g□2 hkghguo dhfiedk□ , dhlhju□ khhlklmx□ kckfhdhfiedkf□ , jaegguf□ ihjoghklv□ gkh]ekby (j bk. 2). □ a[h□ kdbgu 1 (bgljē 4.69-5.5 f) [ue kdju□ ]egh -]jbcguc kehc k iehoh hdlggufb ]evdfb , ur□ dhlhjh]h ae]□ kehc lfg h -kjh]h kjgc iehlgklb , ohjhrh hkhjbjhgggh]h iebhh]h e]b□ (bgljē 3.65-4.69 f). e□ j□ ih jajam g[exlky inkligguc ijoh□ dikgh -]jbcghe lhes□ (bgljē 2.4-3.65 f). ur□ hlflbd 2.4 f eblheh]bkd□ ojdjbjklbd jad h fgyxlky , b urae]xsb□ hkdb h[fbgyxlky □ dhfiedk I (bgljē 0-2.4 f). □ gbgc klb (0.66-2.4 f) dhfiedk ijklg□ aegh- klah -kjufb b aegh -kjufb , iehlgufb b hgv iehlgufb , ehfdbfb , gtehoh khjbjhggufb iehlufb fdblfb b e]hieblfb . Akv hlfklky fkkhu( h 20%) dexgby s[gy , jku□ , ]jby b ]evdb . jogyy kv dhfiedk□ (0-0.66 f) ijklg□ kjufb , fy]dbfb ikgufb , ke[h khjbjhggufb fdblfb , k]khe . Akv hlfgu dhfhd [he□ iehlg]h hkd□ b]jhf h 4 ff, ]hylguc geh] ]ebgkluo dlure, baklguo □ i]bebh - htebh ahg□

Jaja kdbgu 2 ld□ eblky g□□ dhfiedk□ : I (0-7 f) b II (7-12 f). Gbgb□ dhfiedk ojdjbamxlky ihurgguf kh]gbf djmighh[ehfhgh]h fljbe□ , khjbl hdlggmx ]evdm g□ ]em[bg□ 7.4; 8.5; 9.2 b 10 f. Hkdb gb]h dhfiedk□ ijklg□ ijkegbf lfg h -kjuo k aeghtuf , l]guf b dhjbguf hllgdfb, iehlguo , □pehf ohjhrh khjbjhgguo iehlho□ e]b□ b e]blho□ iehl□ . Hlfklky ijkehb b ebgau djmigh]h e]b□ b fedhajgbklhx ikd□ G□ ]em[bg□ 11.2 f - m]enbpbjhggy rbrd□ , □ bgljē 9.94-10.05 f - nj]fg□ jkbgu . G□ ]em[bg□ 11.38 f □ h[ehfd□ bafggghc( eb]gblbabjhgghc ?) jkbgu kljgu ajg□ mlb]ggh]h ]bik□ . Ih□ [bghdmeyjhf bg imdhbguc kjhklhd ijhajguo djbkteeh□ rklh]h h[ebd□ . G□ ]em[bg□ 8 f ihurgh kh]gb□ ]jby (h 19%). □ jögc klb dhfiedk□ hlfg h [hevrh□ dhebklh rmd kexu□ .

ur□ k gkh]ekbf ae]xl□ hkdb dhfiedk□ I, kehgggh]h lfg h -kjufb h ]guo , k dhjbguf beb aeghtuf hllgdfb e]hieblfb b iehlufb e]blfb , khjbjhd□ dhlhjuo fgyly h□ ohjhr□ h iehoh□ □ gbgc klb kljgh kdhegb□ fedbo ghdlgguo dfgguo h[ehfd□ b heagguc nj]fg□ jkbgu . Dh□□ hlfklky fedb□ iylg□ b ijfad b ]bjh]hebl□ . □ bgljē 5.35-6.23 f □ agblevghf dhebkl□ (h 70.1 %) kljgu eabklh -dj]hlgu□ ]j]u( dhgdjpb?) .

Khkl□ lyehc njdpbb □ hlehgyo h[bo kdbg hleblky [hevrbf jaghh]abf - □ kjgf □ ijh□ gklulky 18-30 fbgjeh□ . hfbgbjmxsbf yeyxlky ]jmiu ]guo ]mguo (1.9-51.8 % , ijh[e□ ibjbl□ ) , fhghdebgguo ibjhdkg□ (2-22.8 % , ]eguf h]jahf ]b□ ) , fnb]heh□ (1-25.9 % , ijbfmsklggh h[udghggy ]h]hy h[fgd□ ) , wibhl□ -phbabl□ (2-34.7 % , ijbfmsklggh wibhl□ ) , □

pbjdhg (2-16 %), ljg (1-8.8 %) b lbgbklu fbgju (3-21.2 %). Hklevgu fbgju kljklky, dd ijbeh, dhebkl, g ijuksbo 10%.

### Споры и пыльца

geba kihjhh iuevpu kidljh, uegguo ba hkdh h[bo kdbg, kblavklm h megghf kljghbb jogc klb khkhgh]h oet Qmdhikdh]h revn. Nhjfbjhg b gbgc klb jaja ijhbkoheh mkehbyo hghkblevgh lih]h debf, dh] g ljjblhjbb ijhbajkleb ek lgh]h lbi k evx, kb[bjkdof djhf b jahc. jogyy klv jaja nhjfbjhekv, dh] g ljjblhjbb ijheet ekhlmghuc b lmgjhuc lbi jkblevghklb (jkl. 3, 4).

kidljh, kljgguo ijh[ b gbgbo klc h[bo kdbg ( dhfiedk II), ijheet iuevp ]hehkfegguo jklgbc Hkh]ggh rbjhdh ijkeg jh Pinus: *Pinus sibirica* 9-20 %, *Pinus off. silvestris* L. - 6-19 %, *Pinus subgen Haploxylon* b *Pinus subgen Diploxylon* -5-15 %. Ihklhyggh jbkmlklm iuevp jh *Tsuga* - 1-3 %, *Juniperus sibirica* 1-2 % b bbggh *Larix*. Kb ihdjulhkfegguo jklgbc ijheet iuevp jau jhbghc *Betula ex. sect., albae* 5-29 %, *Salix* sp. - 1-5 %, *Alnus* sp. - 3-15 %; dmkljgbdhu - *Alnaster* sp. - 1-10 %. Iuevp lj b dmkljgbdh dhfiedk khkleyl 3-16 % h h[s]h dhebkl iuevpu b kihj. Kj b kihjuo jklgbc ijheet kihju kf *Polypodiaceae* - 1-17 %, *Sphagnum* sp. - 1-14 %, bbggh *Lycopodium, Ophyoglossum, Osmunda*. h ko ijh[ jbkmlklmxl kihju foh *Breales* b bbggu ajgkihj b iuevpu fahahckdh]h hajkl.

jogc klb jaja kdbg kihjhh iuevpu kidlju ojdjbamxl ihkligguc ijoh h ekhlmgh]h lbi jkblevghklb d lmgjhfm. kidljh ijh hfbgbjmxl lyygbklu b kihjuo jklgby Ba jkguo b dmkljgbdhuo nhjf hijegu *Betula ex. sect. albae* - 2-5 %, *Alnaster* - 1-10 %, *Salix* sp. - 4-10 %, *Betula sect. nanae* - 8-15 %, *Juniperus sibirica* - 0-2 %, *Picea obovata, Picea* sp. - 0-5 %, *Pinus sibirica* - 0-6 %, *P. silvestris* - 0-4 %. Ijhehggguo nhjff iehahckdh]h hajkl g [he 3 %, jbkmlklmxl [hevrf] dhebkl jkblevgu hklldb kihju foh *Breales*.

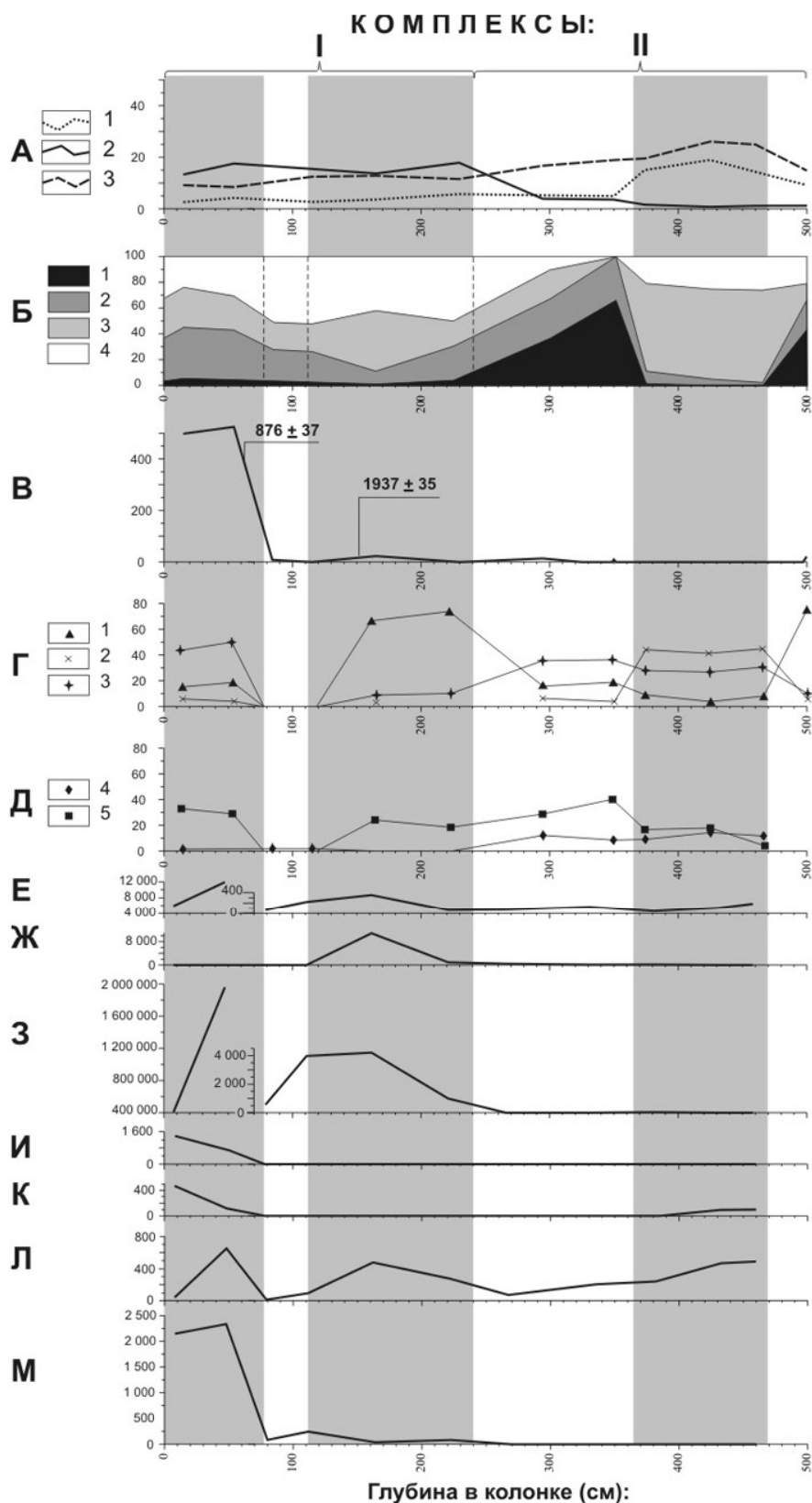
### Моллюски

kdbg 1 g jem[bg 0.6 f kljg jdhbgu fhjkdh]h fheexkd *Margarites costalis* (Gould), bglj[ 1.2-1.5 f kljg dhfiedk, khklhysbc ba *Macoma calcarea* (Gmel.), *Yoldiella intermedia* (M. Sars), *Cyclocardia ventricosa* (Gould) b fedbo ghijebfuo h[ehfdh ]kljih]h (hijegby .K. Jmh]h).

kdbg 2 g jem[bg 0.5 f kljg jdhbgu *Nucula pernula* (Müller), bglj[ 1.2-1.94 f - jdhbgu fhjkdbo fheexkd]h *Astarte* sp., *Astarte* (*Nicania*) *montagui* (Dilwyn), *Ciliatocardium ciliatum* (Fabricius), *Cardidae* sp., *Mya* sp. bglj[ 4.28-4.33 f hlf] fedbc h[ehfdh jdhbgu fheexkd] *Cylichna* sp. (?)

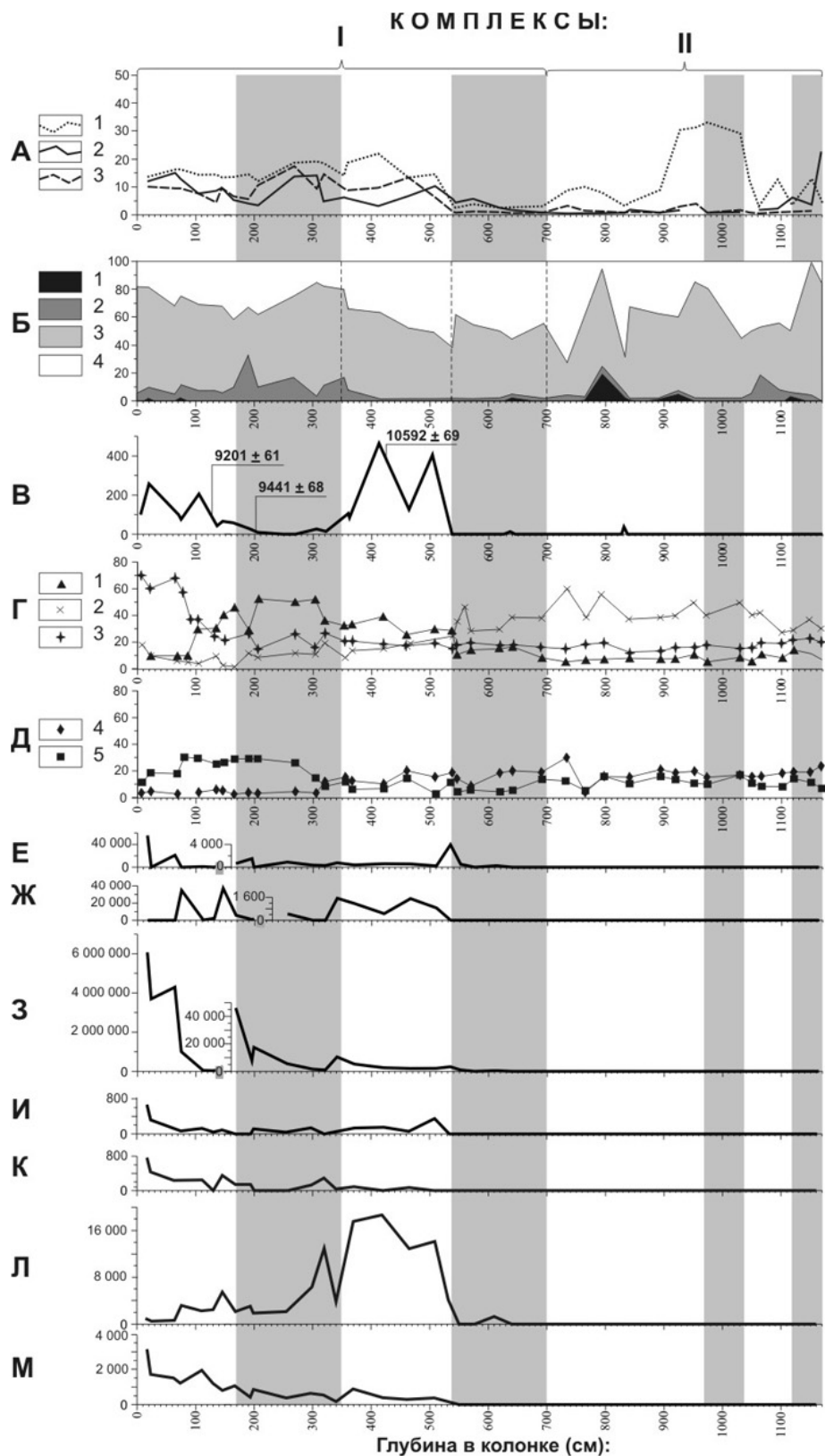
### Бентосные фораминиферы

gbgbo klyo jajah h[bo kdbg ( 1 - gb 3 f, 2 - gb 8.35 f) nhjfbgnju g [ueb h]gmgu. h]apo ba kdbgu 1 bglj[ 0.8-3.0 f hijegu dhfiedku nhjfbgnj hkgghf [hjevgh]h b jdlbkdh- [hjevgh]h lbi, dhlju fh]eb gkeylv g]em[hdb hijkgggu [kkcu k ihbggghc ijhbghc ]f]lmjhc: *Haynesina orbicularis* (Brady), *Haynesina asterotuberculata* (Voorth), *Retroelphidium atlanticum* Gud., *Buccella frigida* (Cushm.), *Criboelphidium granatum* Gud, *Toddinella lenticulare* Gud. ijh[ ba kfhc jogc klb jaja (0-0.6 f), kljgu dhfiedku nhjfbgnj, khjso h 25 h 34 bh Akv ijheet jdlbkd- *Guttulina lactea* (Walk. Et Jacob), *Buccella troizkyi* Gud., *Cribronion obscurus* Gud, *Haynesina orbicularis* (Brady) b] ., jdlbkdh -[hjevgu



**Рис. 3. Распределение литологических и биостратиграфических характеристик по разрезу скважины 1:**

А – содержание минералов тяжелой фракции, в %: 1 – эпидот-цоизита, 2 – моноклинных пироксенов, 3 – роговой обманки; Б – гранулометрический состав, %: 1 – гравий, 2 – песок, 3 – алеврит, 4 – пелит; В – содержание бентосных фораминифер (шт./г осадка); Г-Д – споры и пыльца (1 – сумма древесных мелколиственных, 2 – сумма кустарниковых мелколиственных, 3 – сумма трав, 4 – сумма голосеменных, 5 – сумма споровых), Е-З – содержание диатомовых водорослей (шт./г осадка): Е – переотложенных, Ж – пресноводных, З – морских, И-М – содержание водных палиноморф (шт./г осадка): И – акритархов, К – органических остатков фораминифер, Л – зеленых водорослей, М – цист динофлагеллат. Радиоуглеродные датировки показаны на кривой В.



**Рис. 4. Распределение литологических и биостратиграфических характеристик по разрезу скважины 2:**

А – содержание минералов тяжелой фракции, в %: 1 – эпидот-цзоизита, 2 – моноклиных пироксенов, 3 – роговой обманки; Б – гранулометрический состав, %: 1 – гравий, 2 – песок, 3 – алеврит, 4 – пелит; В – содержание бентосных фораминифер (шт./г осадка); Г-Д – споры и пыльца (1 – сумма древесных мелколиственных, 2 – сумма кустарниковых мелколиственных, 3 – сумма трав, 4 – сумма голосеменных, 5 – сумма споровых), Е-З – содержание диатомовых водорослей (шт./г осадка): Е – переотложенных, Ж – пресноводных, З – морских, И-М – содержание водных палиноморф (шт./г осадка): И – акритархов, К – органических остатков фораминифер, Л – зеленых водорослей, М – цист динофлагеллат. Радиоуглеродные датировки показаны на кривой В.



- *Buccella frigida* (Cushm.), *Cribrononion incertus* (Will.), *Nonionella auricular* (H.-A.-et Earl.), *Retroelphidium atlanticum* Gud. b □ □ Agblevgh fgvr □ [hjevgh -jdlbkdb □ [hjevghuo bh □ . Djhf □ lh]h, hlfiky hklthgh [hevrv □ dhebklh ikgbkluo (j]exlbgbjhguo ) nhjfbgnj] □ kdbg □ 2 □ kfhc gbgc klb jaja □ , nhjfbgnju h[gmgu lhevdh □ bgljæ 8.32-8.38 f □ . Dhfielk khklhb □ ba 5 bh □ : *Retroelphidium selseyense* (H.-A. et Earl), *Retroelphidium atlanticum* Gud., *Cribrononion obscurus* Gud, *Criboelphidium granatum* Gud, *Retroelphidium* sp. juv. Dhfielku ldh]h lbi □ fh]eb kmsklhtv jhylgc kjh □ g]em[hdb □ hijkggguo [kkcg □ k ihbggghc ijbhgghc lfijlmjhc . ur □ ih jajam ijh[u hdaebkv ijdlbkdb gfufr h jem[bgu 5.1 f. Ijh[u ba bgljæ 3.54-5.1 f khj □ h □ 6 h 11 bh □ , □ dhlhjuo ijh[exl □ ijkbleb oheghhguo ghgbhgb □ , j]hwvnbmfm □ , djb]hwvnbmfm □ . Ijh[u ba jogc klb jaja □ khj □ h □ 15 h 34 bh □ , dhebklh wdafieyh □ mēbbiky h 496-525 f □ . Akv ijh[exl □ jdlbkdb □ - *Guttulina lactea* (Walk. Et Jacob), *Buccella troizkyi* Gud., *Cribrononion obscurus* Gud, *Haynesina orbicularis* (Brady) b □ ., jdlbkdh -[hjevgh □ b □ - *Buccella frigida* (Cushm.), *Cribrononion incertus* (Will.), *Nonionella auricular* (H.-A. et Earl.), *Retroelphidium atlanticum* Gud. b □ □

### Диатомовые водоросли.

Ba hlehghc □ , kdjuluo kdbgf □ 1 b 2, blhfb mklghegu □ hkghghf □ h[jap □ , hlhjggguo ba jogbo klc jajah □ kdbg, j □ bo h[sy bkeggkly □ hkdb jvbjm □ □ rbjhdbo ije □ - h □ 120 klhjd /j □ 6.1 feg. klhjd /j □ ijb wlf fdkbfevgu dhgpgljpb □ blhfc (4.3 - 6.7 feg. klhjd /j □) ijbmjhg □ d jogbf □ 64 kf hkdh □ kdbgu 2 (Jbk. 4). blhfhu □ kkhpbpb □ ba ihjoghklgh]h kehy hgguo hkdh □ ggh]h jehg □ Qmdhklkh]h fhjy ijklegu ijbmsklggh km[eb]hjevgh □ (*Paralia sulcata*), oheghhghuf □ gjblbkdbf □ (*Thalassiosira antarctica*+*T. gravida*, *T. nordenskioldii*, *kihu* j □ *Chaetoceros*) b eh □ -gjblbkdbf □ (*Fossula arctica*, *Fragilariopsis oceanica*, *F. cylindrus*, *Attheya septentrionalis*, *Navicula vanhoeffenii* b □ .) bfb □ , lh hlj □ kmjhu □ eh □ -]bjheh]bkdb □ mkheby j]bhg □ b gagblevgh □ ebygb □ [jbg]hhfhjkdbo h □ g □ ]bjheh]bkdmx □ h[klghdm □ aighc.klb Qmdhklkh]hfhjy [Iheydh □ , 1997].

□ gbgc klb jaja □ kdbgu 1 (3.8-5.0 f) kljgu ebrv bbggu □ h[ehfdb klhjd fhjkdbo blhfc ba]hh □ *Pyxidicula* b *Hemiaulus*, jhylgh, ijhlehggu □ . □ bgljæ □ hkdh □ 2.65-3.8 f ihyeylky gfg]hbkeggu □ ijkghhgu □ b □ blhfc □ , lbibgu □ ey ijhlhguo hfh □ ukhdb □ rbjh □ kjgh]h ihemrjby (*Aulacoseira subarctica*, *Diatoma hyemalis*, *Frustulia vulgaris*, *Fragilaria ulna*, *Neidium bisulcatum*, b □ .) ur □ ih jajam □ khkl □ h[bevguo b ldkhghfbkdb jaghh[jaguo blhfhuo dhfielkh □ ijh[exl □ fhjkdibu □ .

□ kdbg □ 2 blhfb mklghegu □ hkghghf □ □ jogc ihehbg □ jaja □ (bgljæ hkdh □ 0-5.4 f). □ bgljæ □ hkdh □ 3.4-5.4 f □ khkl □ blhfhuo kkhpbpb □ hfbghjmx □ fhjkd □ b □ blhfc □ , gh ijbkmklmx □ b ijkghhgu □ , lh kblavklm □ h agblevgh □ ebygb □ jgh]h kld □ Djhf □ lh]h, kljxlky *Pyxidicula zabelinae*, *Cosmiodiscus insignis*, *Thalassiosira punctata*, *Thalassiosira manifesta*, *T. yabei*, *Pyxidicula schenckii*, lbibgu □ ey gh]g □ K]ghc Ipbndb □ . Gebb □ h[bevguo bh □ jh □ *Actinocyclus yeylky* ojdjguf ijbagdhf blhfhuo kkhpbpb □ iebhpg □ - jgg]h ieklhpg □ K]ghc Ipbndb [ mā □ , 1969; Iheydh □ , 1997]. Bo ijbkmklm □ □ hkd □ kblavklm □ h ijhpkko jafu □ b ijhleghby gh]ghuo fhjkdbo hkdh □ □ ijbh □ nhjfbjhgy bamgguo hlehghc

## Водные палиноморфы.

□ b dhebklh hguo iebghfhjn □ hkdō bamēbkv balō□ h[japh□ , lh b blhfhu□ hhjhkeb . Dhgpgljpbh hguo iebghfhjn □ bamgguo hkdō jvbjmxl □ ijēō hl□ h 19 luk. wda.] kmoh]h hkdō . Fdkbfvgu□ dhgpgljpbh hguo iebghfhjn hlfgu □ kdbg□ 2, □ h[jap□ ba bgljē□ 4.20-4.22 f (Jbk. 4). Gbgb□ klb jājah□ kdbg□ g□ khjl□ hguo iebghfhjn . □ khkl□ dhfiedkh□ , ūēgguo □ jōgbo klyo jājah□ kdbg, hlfgu bghne]ēēlū , aēgu□ hhjhkeb , djb]jōb b hklldb nhjfbgnj .


ēy jōgbo 50-70 kf hkd□ ba h[bo kdbg ojd]jgh ijh[ēgb bghpbkl □ khkl□ hguo iebghfhjn (57-60 %). Hlghkblēvgh□ khjgb□ ijkghhguo aēgu□ hhjhkeē khklēy□ 9-19 % . □ hkdō jōg]h bgljē□ kdbgu ijh[ēkl p bklū ]ljhljnguo oheghhguo w]b]ēbgguo bh□ bghne]ēēlū (*Islandinium minutum* (34 % □ khkl□ kkhpbpbc bghpbkl□ ), *Islandinium? cezare* (13 %), *Echinidinium karaense* (10 %) b ]jmi□ bh□ *Brigantedinium* (14 %)), ojd]jgu□ ēy h□ iheyjguo b km[iheyjguo jēgh□ . Ld□ hlfgu p bklū *Pentapharsodinium dalei* (14 %), *Operculodinium centrocarpum* k ]h fhjnneh]bkdbfb jāghbghklyfb (10 %) b *Spiniferites elongatus* (4 %). h 2 kdbg□ □ khkl□ kkhpbpbc bghpbkl hfbgbjmxl p bklū hljnguo ( nhlhkglabjmxsbo ) bghne]ēēlū *Operculodinium centrocarpum* k fhjnneh]bkdbfb jāghbghklyfb (32 %), □ ld□ ijbkmlklmxl bū -bgbd]ju , ihklmiegy ]jbg]hhfhjkdbō h□ *Pentapharsodinium dalei* (2 %) b *Spiniferites elongatus* (3 %), gēbb□ dhl]juo □ kkhpbpyo bghpbkl yēylky ojd]jghc hkh]ggklyx khjfguo b ]hehpghuo hkdh□ Qmdh]kdh]hfhjy [ *Radi et al, 2001*].

## Остракоды.

□ ijhc kdbg□ hkljdhū h]g]mgu □ jōgf (I) dhfiedk□ (0.1-0.6 f). □ gbge□ klb dhfiedk□ ijbkmlklmxl klh]db *Cytheropteron occultum* Whatley and Masson, 1979, *Jonesia acuminata* (Sars, 1866) b *Semicytherura complanata* (Brady, Crosskey and Robertson, 1874). k□ mdaggu□ bū yēyxly fhjkdbfb , b ojd]jbamxl mkehby grg]h rēvn□ [Rh]jgdh□ , 2001; *Stepanova et al., 2007*]. □ jōgc□ klb dhfiedk□ (0.1-0.2 f) kljgu : *Normanicythere leioderma* (Norman, 1869), *Elofsonella concinna* (Jones, 1857), *Sarsicytheridea macrolaminata* Elofson, 1941, *S. bradii?* (Norman, 1865), *Acanthocythereis dunelmensis* (Norman, 1865).

□ jāja□ lhjhc kdbgu hkljdhū kljgu □ hkvfb h]japo . H]japu bgljē] 5.35-5.42 f khjbl fgh]hbkegguo (hdheh 600 wda.g□ 100 ]j kmoh]h hkdō ) ijkghhguo hkljdh□ , ijbge]bo b] : *Candona* spp., *C. lacustris*, *Ilyocypris bradyi* (Sars, 1890), *Cytherissa lacustris* Sars, 1866. Km] ih ūkdhc bkeggklyb klh]hd b khklm dhfiedk□ , hkdhg]hiegbo ijhbko]beh □ mkehbyo gbadhc ]bjhbgf]db (hajh, ē]mg□ ).

□ jōgc□ klb jāja□ kdbgu 2 (ūr□ 3.7 f) kljgu hkljdhū , ojd]jbamxsb□ fhjkdb□ mkehby: gmljgg]h rēvn□ - kheghh]hhgu□ *Cytheromorpha macchesneyi* (Brady and Crosskey, 1871), w]b]ēbggu□ - *Heterocyprideis sorbyana* (Jones, 1857), fēdhgh- fhjkdb□ *Sarsicytheridea bradii* (Norman, 1864), b kjg]h rēvn□ : *Cytheropteron nodosoolatum* (Neale and Howe, 1975), *A. dunelmensis* b *Rabilimis* sp. Ihkehtēvy kfg□ h]klghhd h□ ijkghhghc d kheghh]hhghc b ē□ d fhjkdhc kblēvklm□ h□ mēgbb ]ēm]bg fhjy

H[kmgb□ 

Jāja hkdh□ , ihemgguc ijb ]mjgb□ kdbg □ ijheb□ Ehg]□, ih eblheh]h- [bhkl]b]jnbkdbf gguf□ , fhgh jāēlv g□ 2 hkghguo dhfiedk□ : ]hehpghu□

jög]h dhfiedk□ b gbesb□ , ijbmsklggh h]j]gh g]j]bggu□ ,  
dhlhju□ fü khhlghkbf k ihagbf iebhpghf - whiecklhpghf .

Jbhm]ejhgh□ lbjhgb□ hj]gbkdbo hklldh□ ba hkdh□ kdbg  
kblävklm□ h ijbmsklggh jgg]hehpghhf hajkl□ hkdh□ jöge□ klb  
jaja□ 2 kdbgu b ihag]hehpghhc- jöge□ klb dhehgdb1 kdbgu .

Kihjhh -iuevp□ kidlju□ ba h]japh□ jögbo□ kle□ jajah□ kdbg  
kblävklm□ h ekhlmghuo□ b lmghuo□ mkehbyo dhgp□ ihag]h iecklhp□ b  
]hehp□ . Nhjfbjhgb□ gbgbo□ kle□ jajah□ kdbg ijhbköhbeh □ mkehbyo  
hlgkblevgh ieh]h debf□ □ ihagf iebhp□ b/beb whiecklhp□ dh]□ g□  
ljblhjbb ijhbajkleb ek□ lgh]h lbi□ , k evx , djhf b ]jahc . Ihh]guc  
iebghdhfiedk fh□ [ulv khikleg k iebghdhfiedkfb ikphkdhc kblu  
Qmdhldb[[Iijh□ , 1966](#)] b nhjfbhc m]bd ]eykdb [[Brigham-Grette & Carter, 1992](#)].

Jkijegb□ ih jajam b bhhc khkl□ dhfiedkh□ hkljdh□ b hguo  
iebghfhjn g□ gkm□ kfhklhylevghc kljlb]jnbkdhc bgnhjfb□ , gh iheagh  
hihegyx□ jamevll□ jm]bo [bhkljlb]jnbkdbo bkkeghc bgnhjfb□ ih  
kj□ h]blgby . Gebb□ ijkgghguo hkljdh□ □ bg]j]e5.35-5.42 mdau□ g□  
hajgu□ beb]m]ggu□ mkehby hkdghdhiegy .

Ijh]egb□ □ khkl□ dhfiedkh□ [ghkguo nhjfbgnj□ ldbo nhjf□ , dd  
*Elphidium origonense, Retroelphidium selseyense, Sigmomorpha sp., Quinqueloculina longa,*  
*kblävklm□* h]ebaklb ih]j]bgguo keh□ iebhp□ -whiecklhp□ , lh hibkgh ey  
kj□ Qmdhldb[[Iijh□ , 1966](#)] , ohly wlb o]dl]gu□ bu kljgu □ hkghghf □ lhc  
klb dheghd kdbg, dhlhju□ o]dl]bamxky ijyfhc g]j]bgghklvx, □□ bfx□  
ahfh iecklhpghuc hajkl .

Lh □ kfh□ g]exlky b □ khkl□ blhfhuo dhfiedkh□ ba h]japh□ ,  
hlh]j]guo ba gbgc□ klb ijyfhg]j]bgguo hkdh□ . lh ke□ bbfhklb, iebhp-  
whiecklhpghu□ blhfhu□ b [ghkguo nhjfbgnju [ueb ijhleghu ba  
gbgc□ klb jaja□ , ijb] bkiuleb kfuc gedbc ijghk b g□ ij]iteb  
kmsklgghc ij]hldb : jkdhe□ jdhbgd b igpb]c, bo hdlugby, bklbjgby .  
O]dl] w]habhgg]h gkh]ekby g□ mjhg□ 7 f□ □ kdbg□ 2 (Jbk. 2), ihdau□  
ihkehlvguc uoh□ g□ wlmihjögkly jaebguo keh□ gbg]h kckfhdhiedk□ ,  
b debghnhj]gh□ g]sbgb□ hkdh□ jög]h dhfiedk□ h□ uklmixsbo□ kle□  
w]habhgg]h gkh]ekby. Ldbf h]jahf , gevay bkdexlv kfuc [ebgbc ijghk b  
ijhleghb□ hj]gbkdbo hklldh□ .

### Bklhjby

Kmy□ ih jaf□ iebhpghuo b lj]bguo hleghc Qmdhldh]h ihemhklj□  
[[Iijh□ , 1966](#)], ]eykdb[ [Brigham-Grette and Carter, 1992](#)] b hklj□ j]ley [xgb□ ,  
[1990; Gualtieri, 2003](#)], □ld□ ih ]heh]h- ]hnbakdbf gguf□ ih Qmdhldhfm revnm  
[[Grantz et al., 1978; Phillips et al., 1988; Keigwin et al., 2006; Hill et al., 2007](#)], kh]j]guc  
revn Qmdhldh]h fhjy ghghd]j]gh ih]j]eky fhjkd]b lj]k]kkbyf b ]j]kkbyf .  
G□ kmr□ baklg□ fhjkd]b b dhglbgglevgu□ hkd]b ihlb k□ ihjaegbc  
lj]bgc kblfu□ , □ld□ iebhp□ . □lh □ jfy □ ]j]e□ revn□ kdjuxlky  
]hehpghu□ hkd]b , ij]j]ksb□ eb]h dh]j]gu□ ih]hu□ , eb]h iebhpghu□ hkd]b .  
Ldbf h]jahf , g□ hkghbb grbo gguc , fhgh kmblv ebrv h]j]f□ wibah□  
hkdghdhiegy ( iebhp□ - whiecklhp□ ) b h kfhf fnehhf (kfu□ jöb ihag]h  
iecklhp□ - ]hehp□).

Iebhp□ -whiecklhpghuc wli□ ]heh]bkdhc bklhjbb ih grbf gguf□  
o]dl]baheky km]dhglbgglevgufb mkehbyf . Agblevguc ja□ □ hiehpghu□  
ih]hu□ kyag□ ih grfm fggbx□ , k ]em]hdhc ]j]kkbc b ihkemxsc□ bklhjbc  
jkdjulby ]j]gh□ ijheb□ . Hleghby wli]h hajkl□ , baklg□ □ ]j]bhg□ ,  
ijklegu□ fhjkd]bf b eexbevgufb n]pbyf , gfb □ , ih ke□ bbfhklb, □

□ ijheb□ Ehg]□ kdjulū lhevdh ēexbevgu□ hkdb , ijkleggu□  
 ikdfb , jhcgbdfb b]ēgbdfb .  
 Ijkleylky gh[uguf hlkmklb□ hkdh□ [hevrc klb ljbghe  
 kbklfū □ jajau kdbg, ijh[mjgguo gfb □ ijheb□ Ehg]□. Wlh fh□ [ulv  
 h[tykgggh jkihehgbf bamgguo jajah□ □ ijeb□ kmohimlghc ijfuub ,  
 khbgyrc □ ijhrehf hkljh□ jg]ey kih[jwf Qmdhldh]hihemhkljh□ . Gōhdb  
 g□ hkljh□ jg]ey hklldh□ ffhglhhc nmgū k deb[jhggufb jbhmljehgufb  
 hajklfb □ bgljā 2.192-13.580 luk. e□ ijheb bkkehlc [Vartanyan et al.,  
 1995] d ūhm h kmsklhgbb □ ijhrehf kmohimlgh]h fhkl□ □ ge□ jhehpg□ hkljh□  
 jg]ey [ue hleg h□ fljbdhhc kmrb [Ohidbgk 1975], □ jamevll□ lh  
 ffhglhy nmg□ hkljh□ ljbjhe□ b ufjā Grb ggu□ ih kdbgf □  
 ijheb□ Ehg]□ ihljw□ wlmhdm ajgby.

jm]bf hafhguf h[tykggbf fh□ [ulv iehsgy wjhabhgy ylevghklv □  
 ijbhū jljkkbb fhjy . □ ijbhū ihgbgy mjhg y fhjy, ih- bbfhm , mglhekv  
 klv fhjkdbo hkdh□ ijb]jghc klb , hlehbrcoky □ ijrlmxsbc  
 ljgk]jkkbguc wli□. Wlbf fhgh h[tykglv ijbkmklb□ ihgyuo fhjkdbo ljkk g□  
 ijbe]xsc fljbdhhc kmr□ Qmdhldb b ]eykdb , □ ld□ g□ hkljh□ jg]ey b  
 hlkmklb□ kbgojhgguo fhjkdbo hkdh□ □ ijheb□ Ehg]□. Dhjeylgu□ iecklhpghuf  
 ljkk kmrb fhjkdb□ hlehgby h[gjmgū h grgc klb Qmdhldh]hrevn□ , g□  
 jem[bgo kur□ 100 f [Polyak et al., 2007].

Bklhjby gklmibrē □ jhehpg□ ljgk]jkkbb m□ g□ ja jkkfljbekv □  
 ebljlm]□ lh grbf ggu□ gklmiegb□ ljgk]jkkbb □ jehgō k jagufb jem[bgfb  
 fhjy ijhbkoheh □ jagh□ jfy , khhlklggh, b kdjhklb hkdhdhiegy  
 fgyebkv □ agblevghc kligb Kfg□ hkdh□ , dexsbo ijkghgu□ dhfiedku  
 hjlgkdbo hklldh□ , fhjkdbfb - ihkligg□ ih fm fhgh kelv ūh□ h  
 fegghf lfi□ ljgk]jkkbb . □ ijheb□ Ehg]□ jfy ijboh□ fhjy □ jehg□ hkljh□  
 jg]ey hpglky ijb]jgh □ 11 luk. e□ , b kdjhklb hkdhdhiegy iehl□ h 9  
 luk. e□ ga□ [ueb agblevgu , □ alf kdjhklb jadh kgbabekv □ jehg□ mih]jvy  
 Qmdhldb ijboh□ fhjy ijhbahrē khkf ggh, 2-3 luk. e□ ga□ b kdjhklb  
 hkdhdhiegy klhev □ agblevgu , lh b ey ij]hehpgghc ljgk]jkkbb m  
 hkljh□ jg]ey .

ūhu .

□ g]em[hdb□ kdbgu , ijh[mjggu□ gfb □ ijheb□ Ehg]□ mih]jvy Qmdhldb  
 b m h-□ jg]ey , kdjueb hkdb mo dhfiedkh□ . jōgbc bglj]bjmky dd  
 hkdb ihkegc ljgk]jkkbb , g□ lh mdaux□ jhehpgu□ jbhmljehgu□  
 lhjhdv . □ kdbg□ 2, jkihehgghe fhjkl□ , fhjky ljgk]jkkby gekv hdhev  
 11 luk. e□ ga□ b ojd]jbahekv [ukljufb lfiib, ddmfmeylbguf  
 ūjgbgbf b aihggbf ihgbgbc jevn□ □ ld□ bglgkbguf  
 ijhehgbf fljbe□ [he□ jgbo hkdh□ . jōgyy klv hkhghc dhegdb  
 kdbgu hdeuekv □ mkehbyō, [ebadbo d khjgguf , k fegghc kdjhklvx□ , □  
 ld□ gebbf fhjkdh]h eh]h ihdjh□ . Hlegh□ hkdh□ 1 kdbgu ijhbkoheh  
 □ ihagf jhehpg□ b hijeyekv d]bgufb ijhpkkfb [j]hhe [jabb □ jbf□  
 h[s]h ld]hgbkdh]h ih]imgby .

lh ieh]gblguf b iebgheh]bkdbf ggu□ , hajkl gbg]h  
 eblhklj]j]nkdh]h dhfiedk□ □ h[bō kdbgo - ihagtebhpg-  
 whiecklhpghuc . Kihjh- iuevpu□ kidlju ba wlh]h dhfiedk□ hljkl mkehby,  
 lē□ khjgguo, kohgu dhfiedku baklgu ba iebhpgu□ hleghc ]eykdb .  
 lh kc bbfhklb, hkdb wlh]h dhfiedk□ aihgyxl iehhebgū , jaggu□ □  
 fehu□ b dēghahckdb□ ihjhu hkhgh]h oē□ revn□ Qmdhldh]h fhjy. Bamggū  
 gfb jajau hljkl wliu bklhjb jkdjulby jbg]h□ ijheb□ , gh ey ūykgyby

kh[ulbc h[ dhgp whiecklhpg h[ g[e[ ]hehpg gh[ohbfu  
evgerb [mjhu j[hlu []j]bhg .

### Ebljlmj

□□ Fhnhkljmdlmju b h[klghdb d[ghahckdh]h hkdhgdhiegy h  
jg]ey . heh]by , eblhbgfbd b jhkkuih[jahgb □ ijbjguo ahgo ]dlbdb.  
E., 1990, k76-84.

egdh □□ ., [egdh](#) □□ .[Geh nhjfbjhgby fhdgbkdbo kyac](#)  
[Ipbndb b \]dlbdb ja \]bg\]h ijheb □ gh\]g](#) . Kljbjnby b ]heh]bky  
dhjeyby 2004. Lhf 12, □ 2, k 72-89.

ma □□. b]hfb □ hkd[ iecklhpg]h b ihagtabhpg]h hajk□  
[hjevgh h[eklb Lboh]h hdg Hkghgu ijh[efu fbdjhihg]heh]bb b  
hj]gh]ggh]h hkdhgdhiegy □ hdgo b fhjyo. E .: Gmd□, 1969. C. 5-27

Debggdh H.B., [Ddhah](#) □□, [Aubgkdb](#) L.□ Ghu logkdb kikh[u b  
logheh]by ihbg]evgh]h [mjgby kdbg g]revn . A[ijgd gmd. ijp hgGLM ,  
kj . □ijgbh- ]heh], b□ . 36, hgpyd, 2001, k . 144-148.

Dh]mj □□ Ijfbgg b ieh]g]guo flh□ ijb ]heh]bkdhc ktd□  
revn . Flhbkdh ikh[b□ ih ]heh]bkdhc ktd□ fkr□ 1:50 000, K??B ,  
Kgd□-Ij]mj] , 1992, 144 k

Iebb □□ .[H\[klghd hkdhgdhiegy □ Qmdhkdhf fhj b npbevgh -](#)  
[kbf\]pbhggu ahgu \]h revn](#) . Ij]efu ]hfjaneh]bb , eblheh]bb b  
eblhbgfbd revn . E ., 1982, k 47-76.

Ijh H.F. [Kljbjnby b nmg fhjdbo fheexkdh \]j\]guo hlehgc](#)  
[Qmdhkdh\]hihemhkljh](#) . Ljm□BG [G KKKJ] □ . 155. Fhk□ . 1966. 252 k

Iheydh □□. [\]dlbkd b fhj \]jabb □ ihagf d\[ghah](#) . Fhk□ . Gmguc fhj] ,  
1997. 145 k

Imfbgh □□. [Kljbjnby d\[ghahckdh\]h ihdj□ hklgh- \]dlbkdhc](#)  
[revnhhc h\[eklb KKKJ heh\]by b fbg\]gby \]dlbkdhc h\[eklb KKKJ K□](#)  
[gmguo \]mh□](#) , E., 1981, k 7-27.

Kbh □□. [Wdheh\]byrevnuo kh\[sk□ nhjfbgn\] b iehkj \]hehpg](#)  
[\]bg\]h b Qmdhkdh\]h fhj](#) . E ., Gmd□, 1994, 95 p.

Ohidbg □□. [Bkljby mjgy fhj □ \]bg\]bb a□ inkegb 25 000 e□ . \]bg\]by □](#)  
[d\[ghah . ehklhd](#) , 1975. k 2-27.

Rhjgdh □□. [Dekk Ostracoda, hlyu Platycopida b Podocopida // Kbjgdh □□. \(j\) Kibkh b h\[ kh\[hghbmsbo \[kihahghgu \]jabbkdbo fhj b ijbesbo \]em\[hdhghguo kl□ \]dlbdb // Bkkehgby nmgu fhj](#) . 2001. L. 51. □ 59. Kgd□-Ij]mj] K. 99-103.

*Brigham-Grette J., Carter, L.D.* Pliocene marine transgressions of northern Alaska: circumarctic correlations and paleoclimatic interpretations. 1992. Arctic 45, p. 74-89.

*Elias S.A., Short S.K., Nelson C.H., Birks H.H.* Life and times of the Bering land bridge. Nature, 1997, Vol. 382, p. 60-63.

*Grantz A., Mann D., May S.* Multichannel seismic-reflection data collected in 1978 in the Eastern Chukchi Sea. US Geological Survey Open File Report 86-206. 1978.

*Gualtieri L., Vartanyan S., Brigham-Grette J., Anderson P.M.* [Pleistocene raised marine deposits on Wrangel Island, northeast Siberia and implications for the presence of an East Siberian ice sheet.](#) Quaternary Research, 2003, vol. 59, p. 399-410.

*Hill J.C., Driscoll N.W., Brigham-Grette J., Donnelly J.P., Gayes P.T., Keigwin L.* New evidence for high discharge to the Chukchi shelf since the Last Glacial Maximum. Quaternary Research. Vol. 68, 2007, p. 271-279.

*Keigwin L., Donnelly J., Cook M., Driscoll N., Brigham-Grette J.* Rapid sea-level rise and Holocene climat in the Chukchi Sea. Geology, 2006, Vol. 34, N. 10, p. 861-864.



