**Description of the archaeological site Kaniskak**

The ruins of the ancient Eskimo settlement Kaniskak are situated on the bluff of the Bering Strait shore, 14 km to the southwest from Cape Dezhnev (East Cape),  the easternmost point of [Asia](https://en.wikipedia.org/wiki/Asia), about 20 m a.s.l. (66°02′ N, 169°56′ W). It occupies territory 30 x 80 m. Across this area, the cultural layer thickness varied from 50 to 120 cm. Two pits (2x3 m) located in close proximity were excavated in the thickest part of the cultural layer. Four horizons were differentiated in the profile according to their structure and composition (Knyazev, 1995):

0-40 cm – the every-year melting part of the cultural layer, distinguished by its lighter color, loose structure, lack of wood flinders, pebbles and whalebones; bone remains and artifacts are not numerous. The upper part (0-10 cm) of the horizon is a contemporary sod;

40-60 cm – the same in composition, but darker and denser;

60-80 cm – differs by large amount of artefacts, bones of birds and mammals; whalebone artefacts, ceramics and wood flinders are usual as well as pebbles;

80-120 cm – dense in structure with large amount of pebbles, artefacts are numerous, especially ones made from whalebone and wood. The lower boundary of the horizon goes over the buried peaty dense sod.

The horizons of the pits were taken by thinner layers, their thicknesses varied from 5 to 19 cm. From each layer bones of mammals and birds were carefully collected for laboratory analyses (Dinesman et al., 1999; Savinetsky, 2002).

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**List of ∆R estimates complied for the Northern Pacific**

**Chukchi Sea**

Marine shells with known collection date (from McNeely et al., 2006)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Laboratory code | Taxon | Year | Locality |  Latitude |  Longitude | δ 13C, ‰ | Conventional date, yr BP | ∆R, yr |
| CAMS-57292 | *Macoma calcarea* | 1913 | Chukchi Sea, AK | 70.4000 | 161.4167 | +0.1 | 1060 ± 40 | 610 ± 45 |
| CAMS-33143 | *Serripes groenlandicus* | 1913 | Chukchi Sea, AK | 70.4000 | 161.4167 | +1.69 | 760 ± 50 | 310 ± 55 |
| UCIAMS-6559 | *Serripes groenlandicus*  | 1913 | Chukchi Sea, AK | 70.4000 | 161.4167 | +1.69 | 770 ± 25 | 320 ± 35 |
| CAMS-46752 | *Mya truncata*  | 1913 | Pt. Barrow, AK | 71.4000 | 156.4833 | +1.56 | 920 ± 40 | 470 ± 45 |
| TO-8020 | *Astarte borealis*  | 1913 | Pt. Barrow, AK | 71.4000 | 156.4833 | +2.89 | 1010 ± 60 | 560 ± 65 |
| CAMS-57293 | *Mytilus edulis*  | 1913 | Pt. Barrow, AK | 71.4000 | 156.4833 | -0.1 | 870 ± 40 | 425 ± 45 |
| CAMS-57294 | *Musculus niger*  | 1913 | Pt. Barrow, AK | 71.4000 | 156.4833 | +0.2 | 1010 ± 30 | 560 ± 35 |

**Bering Strait**

Paired dates from the Kaniskak archaeological site. Age-depth models were first constructed with terrestrial dates and level age estimations were then used (see details in text). Asterisks mark estimated δ 13C values

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Location | Site | Feature | Conventional date, yr BP | Material | δ 13C, ‰ | Laboratory code | ∆R, yr |
| Chukotka | Deznevo | Pit 1, Level 1 | 1480 ± 45 | Seal | -13.69 | IEMAE-1446 | 45 ± 70 |
| 975 ± 45 | Age-depth model |
| Chukotka | Deznevo | Pit 1, Level 2 | 925 ± 20 | Ringed seal | -12.5 | NUTA2-23234 | -555 ± 45 |
| 1025 ± 35 | Age-depth model |
| Chukotka | Deznevo | Pit 1, Level 4 | 1925 ± 25 | Ringed seal | -13.5 | NUTA2-23236 | 410 ± 45 |
| 1070 ± 35 | Age-depth model |
| Chukotka | Deznevo | Pit 1, Level 6 | 1790 ± 45 | Seal | -14.31 | IEMAE-1462 | 250 ± 60 |
| 1100 ± 35 | Age-depth model |
| Chukotka | Deznevo | Pit 1, Level 8 | 1930 ± 55 | Seal | -12.9 | IEMAE-1447 | 330 ± 75 |
| 1170 ± 45 | Age-depth model |
| Chukotka | Deznevo | Pit 1, Level 10 | 2040 ± 25 | Ringed seal | -12.4 | NUTA2-23238 | 335 ± 95 |
| 1260 ± 70 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 1 | 1860 ± 80 | Seal | -13\* | IEMAE-954 | 400 ± 85 |
| 1000 ± 20 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 2 | 1560 ± 80 | Seal | -13\* | IEMAE-894 | 95 ± 85 |
| 1010 ± 15 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 2 | 1980 ± 25 | Ringed seal | -14.8 | NUTA2-23242 | 510 ± 35 |
| 1010 ± 15 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 4 | 1820 ± 80 | Seal | -13\* | IEMAE-883 | 345 ± 85 |
| 1025 ± 10 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 5 | 2010 ± 80 | Seal | -13\* | IEMAE-929 | 530 ± 85 |
| 1030 ± 10 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 6 | 1980 ± 25 | Ringed seal | -12.8 | NUTA2-23244 | 500 ± 40 |
| 1035 ± 10 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 7 | 2550 ± 85 | Seal | -13\* | IEMAE-895 | 1060 ± 90 |
| 1040 ± 10 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 11 | 2785 ± 90 | Seal | -13\* | IEMAE-893 | 1250 ± 95 |
| 1080 ± 15 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 11 | 2100 ± 25 | Ringed seal | -13.1 | NUTA2-23246 | 570 ± 40 |
| 1080 ± 15 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 12 | 2010 ± 45 | Seal | -13.5 | IEMAE-1445 | 475 ± 50 |
| 1090 ± 15 | Age-depth model |
| Chukotka | Deznevo | Pit 2, Level 12 | 2165 ± 25 | Ringed seal | -12.4 | NUTA2-23249 | 630 ± 35 |
| 1090 ± 15 | Age-depth model |

Marine shells with known collection date (from McNeely et al., 2006)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Laboratory code | Taxon | Year | Locality |  Latitude |  Longitude | δ 13C, ‰ | Conventional date, yr BP | ∆R, yr |
| CAMS-33142 | *Mytilus edulis* | 1913 | Port Clarence, AK | 65.2500 | 166.6667 | -0.79 | 800 ± 50 | 350 ± 55 |
| UCIAMS-6557 | *Mytilus edulis* | 1913 | Port Clarence, AK | 65.2500 | 166.6667 | -0.79 | 975 ± 20 | 525 ± 30 |
| CAMS-57291 | *Hiatella arctica* | 1913 | Teller, AK | 65.2667 | 166.3667 | +1.8 | 1030 ± 40 | 580 ± 45 |
| UCIAMS-6558 | *Hiatella arctica* | 1913 | Teller, AK | 65.2667 | 166.3667 | +1.8 | 900 ± 20 | 450 ± 30 |

**South-Western part of the Bering Sea**

Radiocarbon dates of sea otters from Commander Islands (see details in text)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Museum collection code | Collection date | Conventional date, yr BP | δ 13C, ‰ | Laboratory code | ∆R, yr |
| S-53992 | 1939 | 985 ± 30 | -13.3 | NUTA2-24988  | 525 ± 40 |
| S-53988 | 1939 | 1030 ± 30 | -13.1 | NUTA2-24990    | 570 ± 40 |
| S-53990 | 1939 | 960 ± 30 | -14.1 | NUTA2-24991  | 500 ± 40 |

Paired dates from archaeological sites in Buldyr and Shemya Islands (Wester Aleutian Islands, see details in text)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Location | Site | Feature | Conventional date, yr BP | Material | δ 13C, ‰ | Laboratory code | ∆R, yr |
| Buldyr\* | KIS-008 | Pit 4, Unit E | 1240 ± 40 | Marine mammal | -14.8 | Beta-200551 | 530 ± 60, 520 ± 60, 470 ± 60 |
| 330 ± 40 | Grass | -27.7 | Beta-200550 |
| Shemya | ATU-023 | Pit 2, Level 2 | 2965 ± 30 | Hemilepidotus sp. | -16.0 | NUTA2-24993    | 500 ± 60 |
| 2130 ± 30 | Canada goose | -23.3 | NUTA2-24992    |

\* - Data from Corbett et al., 2008; 2010; Corbett, 2011

**Northern Kuril Islands**

Paired dates from archaeological sites in Makanrushi and Rasshua Islands (from Fitzhugh, Brown, 2017)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Location | Site | Feature | Conventional date, yr BP | Material | δ 13C, ‰ | Laboratory code | ∆R, yr |
| Makanrushi | Bukhta Zakat 1 | TP1, L2 | 1720 ± 30 | Strongylocentrotus sp. | -3.4 | Beta 326214 | 515 ± 45 |
| 830 ± 20 | Charcoal | -24.3 | OS-98008 |
| Makanrushi | Bukhta Zakat 1 | TP1, L2 | 1570 ± 30 | Nucella sp. | +2.0 | Beta 326215 | 365 ± 45 |
| 830 ± 20 | Charcoal | -24.3 | OS-98008 |
| Makanrushi | Bukhta Zakat 1 | TP1, L2 | 1770 ± 30 | Nucella sp. | +1.1 | Beta 326216 | 565 ± 45 |
| 830 ± 20 | Charcoal | -24.3 | OS-98008 |
| Makanrushi | Bukhta Zakat 1 | TP1, L2 | 1700 ± 30 | Strongylocentrotus sp. | -1.1 | Beta 326217 | 495 ± 45 |
| 830 ± 20 | Charcoal | -24.3 | OS-98008 |
| Makanrushi | Bukhta Zakat 1 | TP1, L2 | 1640 ± 30 | Strongylocentrotus sp. | +1.8 | Beta 326218 | 435 ± 45 |
| 830 ± 20 | Charcoal | -24.3 | OS-98008 |
| Rasshua | Rasshua 1 | TP1A, L3 | 1870 ± 40 | Littorina sp. | +0.6 | Beta 326222 | 640 ± 55 |
| 860 ± 20 | Charcoal | -26.2 | OS-98009 |
| Rasshua | Rasshua 1 | TP1A, L3 | 1540 ± 30 | Nucella sp. | +1.6 | Beta 326223 | 310 ± 45 |
| 860 ± 20 | Charcoal | -26.2 | OS-98009 |
| Rasshua | Rasshua 1 | TP1A, L3 | 1820 ± 30 | Strongylocentrotus sp. | -4.6 | Beta 326224 | 590 ± 45 |
| 860 ± 20 | Charcoal | -26.2 | OS-98009 |
| Rasshua | Rasshua 1 | TP1A, L4 | 1990 ± 40 | Nucella sp. | +0.3 | Beta 326220 | 695 ± 55 |
| 920 ± 20 | Charcoal\* | -27.1 | OS-98011 |
| 890 ± 25 | Charcoal\* | -24.4 | OS-98012 |
| Rasshua | Rasshua 1 | TP1A, L4 | 1770 ± 30 | Strongylocentrotus sp. | +1.1 | Beta 326221 | 475 ± 45 |
| 920 ± 20 | Charcoal\* | -27.1 | OS-98011 |
| 890 ± 25 | Charcoal\* | -24.4 | OS-98012 |
| Rasshua | Rasshua 1 | TP1A, L4 | 1660 ± 30 | Nucella sp. | +0.8 | Beta 326225 | 365 ± 45 |
| 920 ± 20 | Charcoal\* | -27.1 | OS-98011 |
| 890 ± 25 | Charcoal\* | -24.4 | OS-98012 |
| Rasshua | Rasshua 1 | TP1A, L4 | 1980 ± 30 | Nucella sp. | +0.6 | Beta 326226 | 685 ± 45 |
| 920 ± 20 | Charcoal\* | -27.1 | OS-98011 |
| 890 ± 25 | Charcoal\* | -24.4 | OS-98012 |
| Rasshua | Rasshua 1 | TP1A, L4B | 1740 ± 30 | Littorina sp. | +0.7 | Beta 326219 | 465 ± 55 |
| 890 ± 20 | Charcoal | -24.6 | OS-98014 |

\* - Pooled age of two charcoal dates (908 ± 16) was used for ∆R calculations (see Fitzhugh, Brown, 2017 for details)

**South-Eastern part of the Bering Sea**

Shell *Protothaca staminea* from Pavlof Harbor, Alaska Peninsula (from McNeely et al., 2006)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Collection date | Conventional date, yr BP | δ 13C, ‰ | Laboratory code | ∆R, yr |
| 1937 | 700 ± 50 | +0.1\* | USGS-0234 | 240 ± 55 |

\* - The value of δ 13C is estimated

Paired dates from archaeological sites in Adak (Central Aleutian Islands) and Carisle (Eastern Aleutian Islands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Location | Site | Feature | Conventional date, yr BP | Material | δ 13C, ‰ | Laboratory code | ∆R, yr |
| Adaka | ADK-011 | Feature 1, Unit 1, Level 1 | 1325 ± 15 | Shell | -c | UCIAMS-28896 | 615 ± 35; 605 ± 35; 555 ± 35; 525 ± 35; 515 ± 35; 465 ± 35  |
| 1235 ± 15 | Fish  | -13.3 | UCIAMS-28899 |
| 335 ± 15 | Ptarmiganb  | -20.3 | UCIAMS-28900 |
| 320 ± 20 | Charcoalb | -c | UCIAMS-28902 |
| Adaka | ADK-012 | Unit 2 | 2455 ± 20 | Rockfishb | -14.4 | UCIAMS-22162 | 600 ± 35 |
| 2470 ± 15 | Rockfishb | -14.3 | UCIAMS-22273 |
| 1865 ± 15 | Thrush legd | -16.7 | UCIAMS-22161 |
| 1515 ± 15 | Charcoal | -24.7 | UCIAMS-22158 |
| Adaka | ADK-009 | Unit 1, Level B | 1210 ± 20 | Greenling | -10.1 | NUTA2-20548 | 495 ± 35; 430 ± 35 |
| 345 ± 20 | Ptarmigan | -18.5 | NUTA2-20555 |
| Adaka | ADK-009 | Unit 1, Level E | 1585 ± 20 | Greenling | -11.8 | NUTA2-20549 | 665 ± 40  |
| 480 ± 20 | Ptarmigan | -18.7 | NUTA2-20556 |
| Adaka | ADK-009 | Unit 1, Level K | 1475±20 | Greenling | -12.2 | NUTA2-20550 | 575 ± 40  |
| 445±20 | Ptarmigan | -19.3 | NUTA2-20557 |
| Adaka | ADK-009 | Unit 1, Level L | 1535 ± 20 | Greenling | -11.7 | NUTA2-20551 | 580 ± 40  |
| 530 ± 20 | Ptarmigan | -19.8 | NUTA2-20936 |
| Adaka | ADK-009 | Unit 1, Level N | 1765 ± 20 | Greenling | -11.5 | NUTA2-20553 | 560 ± 40  |
| 835 ± 20 | Ptarmigan | -19.1 | NUTA2-20937 |
| Carlislee | AMK-0003 | Unit 4, Level 10 | 2760 ± 15 | Greenling | -12.7 | UCIAMS-175340 | 515 ± 35 |
| 1905 ± 20 | Charred twigs | - | UCIAMS-167641 |
| Carlislee | AMK-0003 | Unit 4, Level 13 | 2710 ± 15 | Greenling | -13.2 | UCIAMS-175341 | 445 ± 40 |
| 1925 ± 20 | Charred twigs | - | UCIAMS-167642 |
| Carlislee | AMK-0003 | Unit 4, Level 16 | 2865 ± 15 | Greenling | -13.5 | UCIAMS-183751 | -220 ± 35f |
| 2760 ± 15 | Charred twigs | - | UCIAMS-175110 |
| Carlislee | AMK-0003 | Unit 5, Level 6 | 1235 ± 15 | Greenling | -13.2 | UCIAMS-175343 | 410 ± 35; 520 ± 35 |
| 370 ± 20 | Charred twigs | - | UCIAMS-167638 |
| Carlislee | AMK-0003 | Unit 5, Level 10 | 1210 ± 15 | Greenling | -13.1 | UCIAMS-175342 | 405 ± 35; 495 ± 30 |
| 355 ± 15 | Charred twigs | - | UCIAMS-167639 |
| Carlislee | AMK-0003 | Unit 5, Level 15-16 | 1245 ± 15 | Greenling | -13.7 | UCIAMS-183750 | 505 ± 45 |
| 335 ± 15 | Charred twigs | - | UCIAMS-167640 |

a – Data from Khasanov et al., 2015

b – Dates pooled before ∆R calculations, see Khasanov et al. (2015) for details

c – Fractionation occurred during sample graphitization of the AMS measurement in these samples, and their δ13C values are not shown

d – This terrestrial date was excluded because of mixed terrestrial and marine diet of the thrush; see Khasanov et al. (2015) for details

e – Data from West et al., 2019

f – This ∆R measurement was excluded. Similar ages of the marine and terrestrial counterparts could be obtained due to contamination of this bottom layer with older terrestrial materials; see West et al., 2019 for details

**South-East Alaska and British Columbia**

Marine shells with known collection date (from McNeely et al., 2006). Asterisks mark estimated δ 13C values

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Laboratory code | Taxon | Year | Locality |  Latitude |  Longitude | δ 13C, ‰ | Conventional date, yr BP | ∆R, yr |
| CAMS-46263 | *Mytilus californianus* | 1909 | Amphitrite Point, BC | 48.9167 | 125.5397 | +0.04 | 810 ± 50 | 360 ± 55 |
| CAMS-46264 | *Mytilus edulis* | 1909 | Ucluelet Hbr., BC | 48.9333 | 125.5500 | -0.24 | 850 ± 50 | 405 ± 55 |
| TO-8015 | *Mya arenaria* | 1909 | Ucluelet, BC | 48.9333 | 125.5500 | +2.26 | 900 ± 50 | 450 ± 55 |
| UCIAMS-6009 | *Mya arenaria* | 1909 | Ucluelet, BC | 48.9333 | 125.5500 | +2.26 | 725 ± 20 | 275 ± 30 |
| CAMS-46265 | *Musculus discors laevigatu* | 1909 | Forbes Is., BC | 48.9417 | 125.5000 | +1.51 | 670 ± 50 | 220 ± 55 |
| UCIAMS-6008 | *Musculus discors laevigatu* | 1909 | Forbes Is., BC | 48.9417 | 125.5000 | +1.51 | 775 ± 25 | 325 ± 35 |
| CAMS-46266 | *Megayoldia thraciaeformis* | 1909 | David Channel, BC | 48.9917 | 125.3250 | +0.89 | 760 ± 50 | 310 ± 55 |
| CAMS-46270 | *Mytilus edulis* | 1955 | Wickaninnish Bay, BC | 49.0500 | 125.7333 | +0.02 | 820 ± 40 | 350 ± 45 |
| CAMS-33136 | *Mya arenaria* | 1955 | Tofino, BC | 49.1333 | 125.8667 | -0.57 | 950 ± 50 | 480 ± 55 |
| CAMS-17913 | *Macoma* | 1935 | Graham Is., BC | 53.3000 | 132.4167 | 0\* | 680 ± 50 | 220 ± 55 |
| CAMS-17921 | *Mytilus* | 1935 | Graham Is., BC | 53.3000 | 132.4167 | 0\* | 780 ± 50 | 325 ± 55 |
| CAMS-46269 | *Siliqua patula* | 1937 | Masset, BC | 54.0167 | 132.1000 | +0.94 | 850 ± 50 | 395 ± 55 |
| CAMS-46267 | *Musculus discors laevigatus*  | 1910 | Skidegate, BC | 53.2333 | 132.0000 | +1.11 | 680 ± 50 | 230 ± 55 |
| CAMS-46268 | *Mya truncata* | 1910 | Skidegate, BC | 53.2333 | 132.0000 | +3.04 | 650 ± 40 | 200 ± 45 |
| CAMS-06562 | *Nucella canaliculata*  | 1867 | Sitka Sound, AK | 57.0000 | 135.5000 | 0\* | 890 ± 60 | 410 ± 65 |
| CAMS-17910 | *Macoma* | 1907 | Admiralty Is., AK | 57.1000 | 134.1000 | 0\* | 1120 ± 60 | 670 ± 65 |
| CAMS-17912 | *Macoma* | 1907 | Admiralty Is., AK | 57.1000 | 134.1000 | 0\* | 990 ± 70 | 540 ± 75 |
| CAMS-17911 | *Macoma* | 1907 | Thomas Bay, AK | 57.3000 | 132.8540 | 0\* | 1050 ± 50 | 600 ± 55 |
| CAMS-17922 | *Mytilus* | 1907 | Thomas Bay, AK | 57.3000 | 132.8540 | 0\* | 920 ± 60 | 470 ± 65 |
| CAMS-17923 | *Mytilus* | 1907 | Thomas Bay, AK | 57.3000 | 132.8540 | 0\* | 980 ± 60 | 530 ± 65 |
| CAMS-17914 | *Macoma* | 1934 | Chatham, AK | 57.5000 | 135.0000 | 0\* | 970 ± 50 | 515 ± 55 |
| CAMS-17920 | *Mytilus* | 1934 | Chatham, AK | 57.5000 | 135.0000 | 0\* | 910 ± 50 | 455 ± 55 |
| CAMS-13751 | *Pododesmus macrochisma*  | 1939 | Kodiak Is., AK | 57.7000 | 154.0000 | 0\* | 780 ± 50 | 320 ± 55 |
| CAMS-17824 | *Mytilus* | 1907 | Glacier Bay, AK | 58.7600 | 136.3500 | 0\* | 910 ± 60 | 460 ± 65 |
| CAMS-13749 | *Acmaea mitra* (Rathke) | 1956 | Middleton Is., AK | 59.4300 | 146.3300 | 0\* | 820 ± 50 | 350 ± 55 |
| UCIAMS-6031 | *Mytilus edulis* (Linné) | 1913 | Orca, AK | 60.5722 | 145.7000 | -2.70 | 895 ± 20 | 445 ± 30 |

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