

# TROPHIC RELATIONSHIPS DYNAMICS OF RINGED SEAL (*PUSA HISPIDA*) AND BEARDED SEAL (*ERIGNATHUS BARBATUS*) FROM CHUKOTKA OVER THE LAST MILLENNIA (BY STABLE ISOTOPES METHOD).



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## ABSTRACT

We studied sea mammal remains from cultural layers of ancient Eskimo settlement on the eastern coast of the Bering Strait. Stable-nitrogen ( $\delta^{15}\text{N}$ ) and stable-carbon ( $\delta^{13}\text{C}$ ) isotope ratios were measured in collagen from 99 impuberal ringed seals and 33 impuberal bearded seals over 800-2370 BP (cal). Stable-nitrogen isotope analysis revealed that ringed seals (mean  $\delta^{15}\text{N} = 18.1\%$ ) were enriched over bearded seals (14.9%). Consequently, ringed seals occupied higher trophic level versus bearded seals. It was found nonhomogeneity of ringed seal isotope ratio during this period. All ringed seal bones found on the settlement were divided into two groups: with accepted isotope ratio and with poor content of  $^{13}\text{C}$ . Comparison with literary data exhibits that the dynamics is connected with climatic changes in the North Pacific.

## THE AREA OF INVESTIGATION

The region of investigation is a northeastern part of the Chukchi Peninsula on the coast of the Bering Strait near Cape Dezhnev.



## OBJECTIVE AND RESEARCH GOALS

Objective:

To trace trophic relationships dynamics of ringed seal and bearded seal from northeastern Chukotka over the Late Holocene

Research goals:

- 1). Analyzing stable carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotope ratios from archaeologically deposited seal bone collagen.
- 2) Evaluate difference in the isotope ratios between two species
- 3). To trace process of changes isotope ratios over 2500 years

## METHODS

1. We chose to use the seal humerus from stratigraphic levels that comply six consecutive period of time from 420 year BC to 1140 AD year. These bones are numerous in the archeological samples of seal bones. Furthermore, both bones are sufficiently reliable for morphological, species-level identifications in seals.
2. Modern sample was collected from this area for comparison in 1990.
3. Seal bones were identified using the RAS IEE Biocenology and Historical Ecology Laboratory comparative collection. Bones are sufficiently reliable for morphological, species-level identifications in seals.
4. Collagen was extracted from ringed seal (n = 99) and bearded seal (n=33) bones using standard methods.



Figure 1. Excavation of ancient Eskimo settlement.

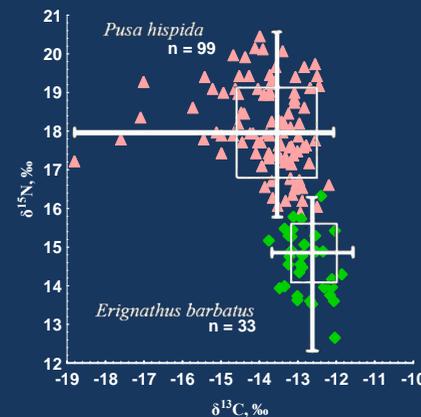


Figure 2. Stable carbon and nitrogen isotopes values from ringed and bearded seals humeri bone collagen.

## RESULTS

Stable-nitrogen isotope analysis revealed that two species have different isotope value (fig.2). Ringed seals (mean  $\delta^{15}\text{N} = 18.1\%$ ) were enriched over bearded seals (14.9%). Consequently, ringed seals occupied higher trophic level versus bearded seals. Mean observations of carbon isotope values for the two species were not far different, but ringed seal  $\delta^{13}\text{C}$  had mainly range of values, than bearded seal. It demonstrates the high trophic plasticity of ringed seal.

Our data represents that nutrition of bearded seals varied over last 2500 years didn't vary.  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  were approximately constant over that time.

Carbon and nitrogen isotope ratios of ringed seals represented occurrence of nutrition dynamics over last millennia (fig. 3). We find that during the period from 250 to 670 was broadening of diet for majority. And we not be observed presence of individuals from different populations with other (less enriched) isotope ratios, which was present in the all other layers.

We supposed that it may be related to climatic changes in the North Pacific in that time. Literary data confirm occurrence of warming over period from 250 to 670.

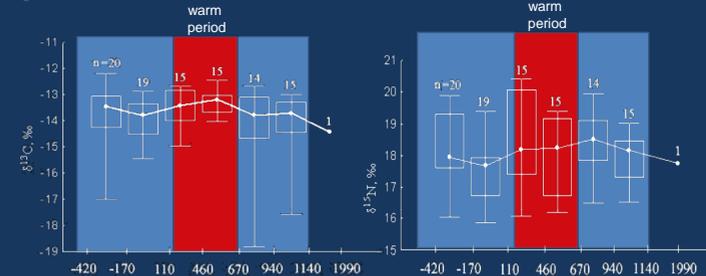


Figure 3. Stable carbon and nitrogen isotopes values from ringed seals humeri bone collagen plotted against calendar date

## CONCLUSION

- Two species: ringed and bearded seal had different ecology and stable isotope ratios over last millennia.
- Ringed seal is plastic species and it's nutrition depends up climatic characteristics.
- Bearded seal is highly specialized species and environment didn't have a profound effect on his nutrition.

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