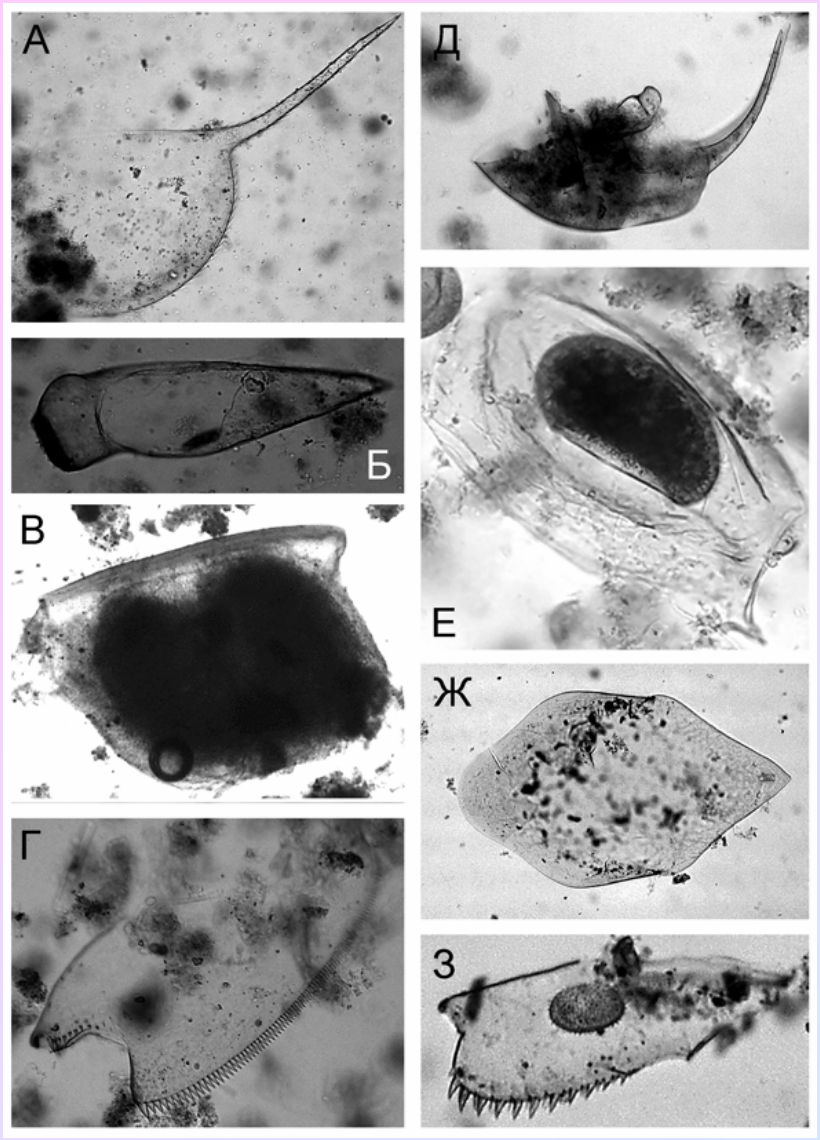
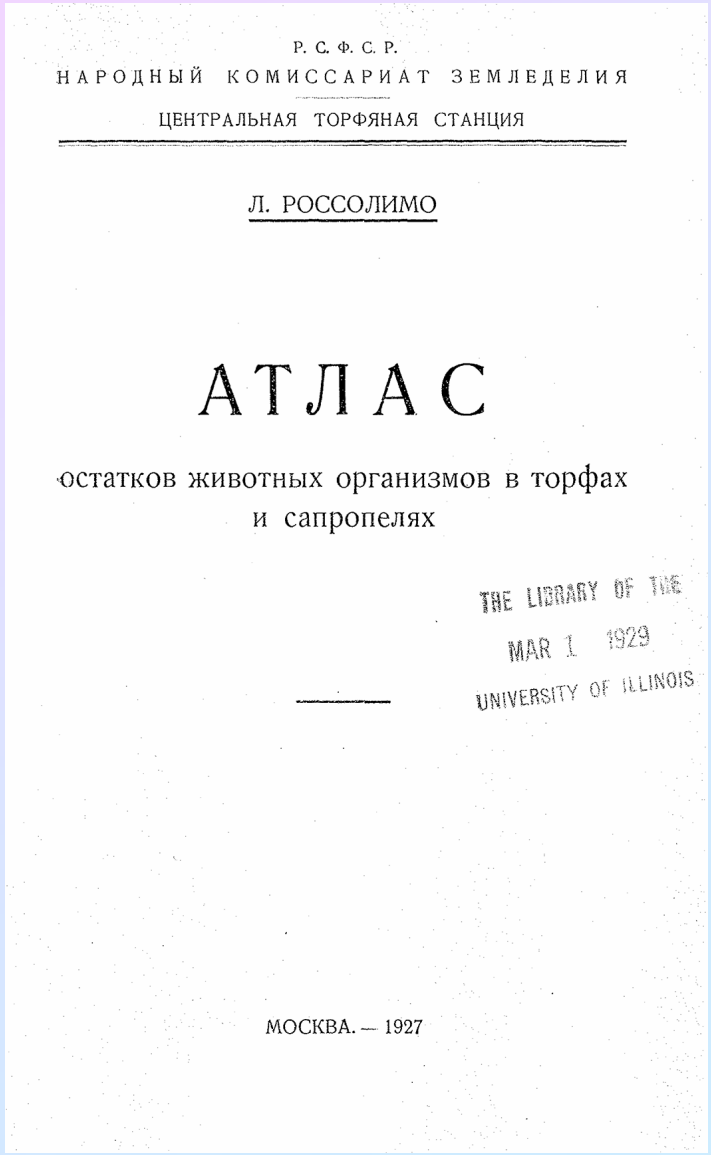
Вымирание жаброногих ракообразных Северо-Востока Евразии в позднем плейтоцене-раннем голоцене как свидетельство биоценотического кризиса в пресноводных водоемах в регионе в это время

А.А. Котов

Лаборатория экологии водных сообществ и инвазий
Институт проблем экологии и эволюции им. А.Н. Северцова РАН, г. Москва

Фрагменты в кладоцер донных отложениях – число публикаций по позднему голоцену не подается исчислению





Р. С. Ф. С. Р.

НАРОДНЫЙ КОМИССАРИАТ ЗЕМЛЕДЕЛИЯ

ЦЕНТРАЛЬНАЯ ТОРФЯНАЯ СТАНЦИЯ

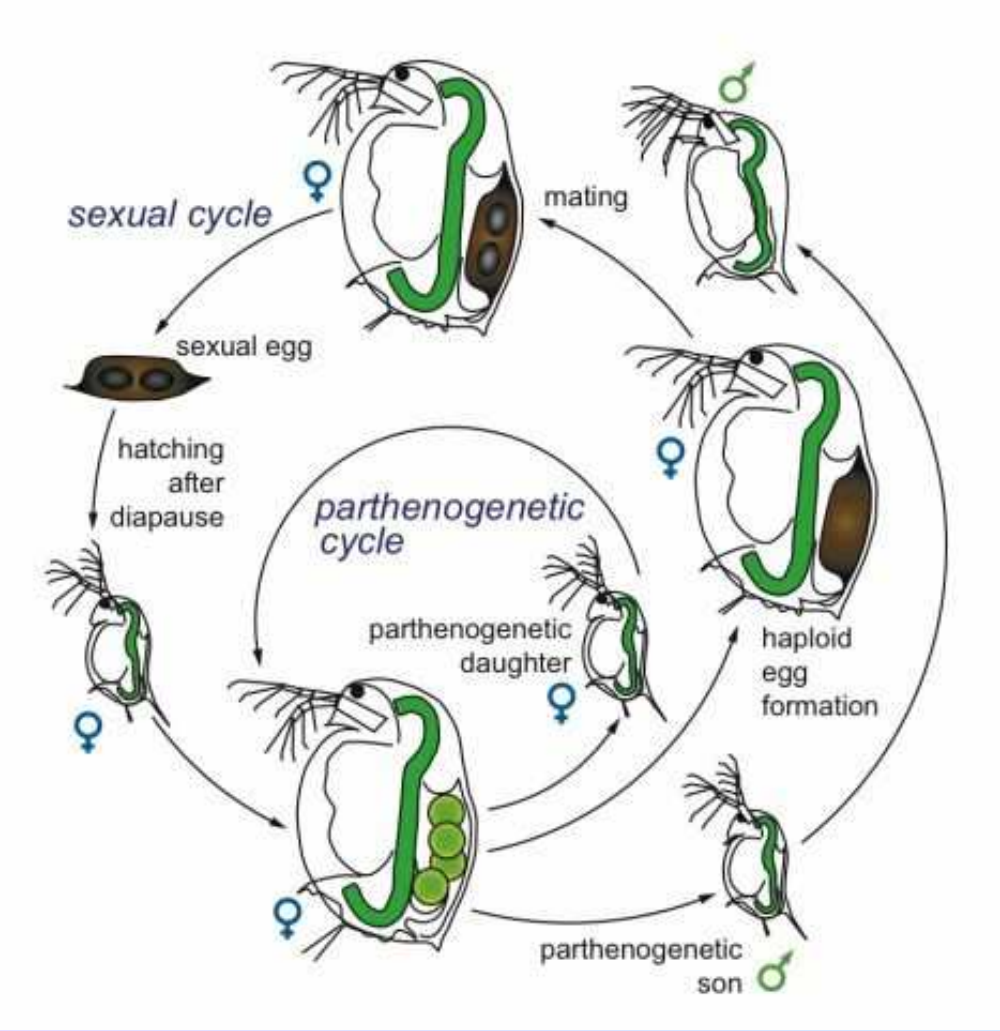
Л. РОССОЛИМО

АТЛАС

остатков животных организмов в торфах и сапропелях

МОСКВА. — 1927

Жизненный цикл ветвистоусых ракообразных отряда Anomopoda

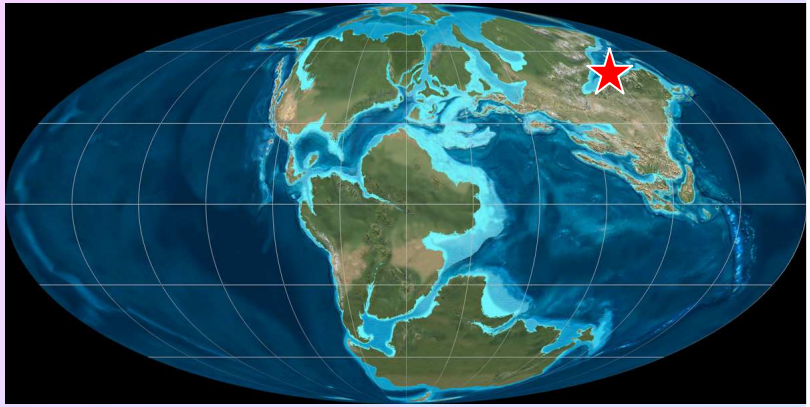


Эфиппиальная самка *Daphnia* cf. *pulex*

Л.А. Фролова на Индигирке

Прибрежье некоего озера

Кладоцеры немыслимо древни...



Kotov and Taylor *BMC Evolutionary Biology* 2011, **11**:129
http://www.biomedcentral.com/1471-2148/11/129

BMC Evolutionary Biology

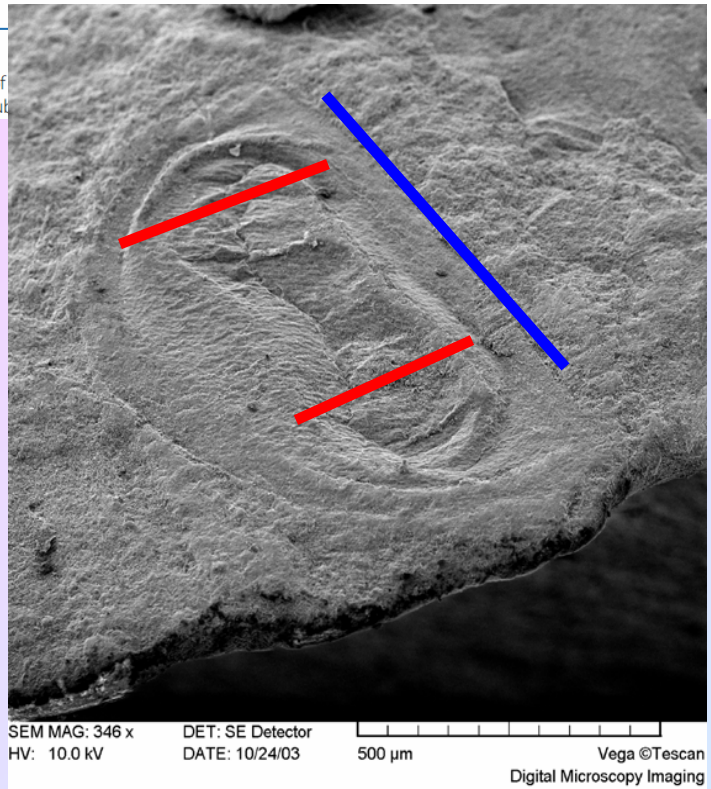
RESEARCH ARTICLE Open Access

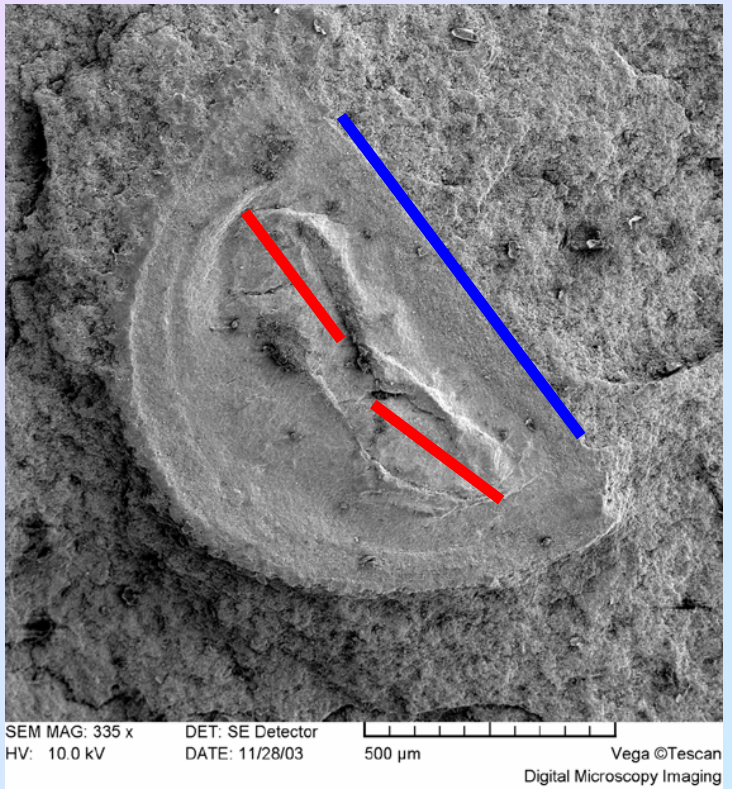
Mesozoic fossils (>145 Mya) suggest the antiquity of the subgenera of *Daphnia* and their coevolution with chaoborid predators

Alexey A Kotov[1*] and Derek J Taylor[2]

Abstract

Background: The timescale of
The origin of the two main sut



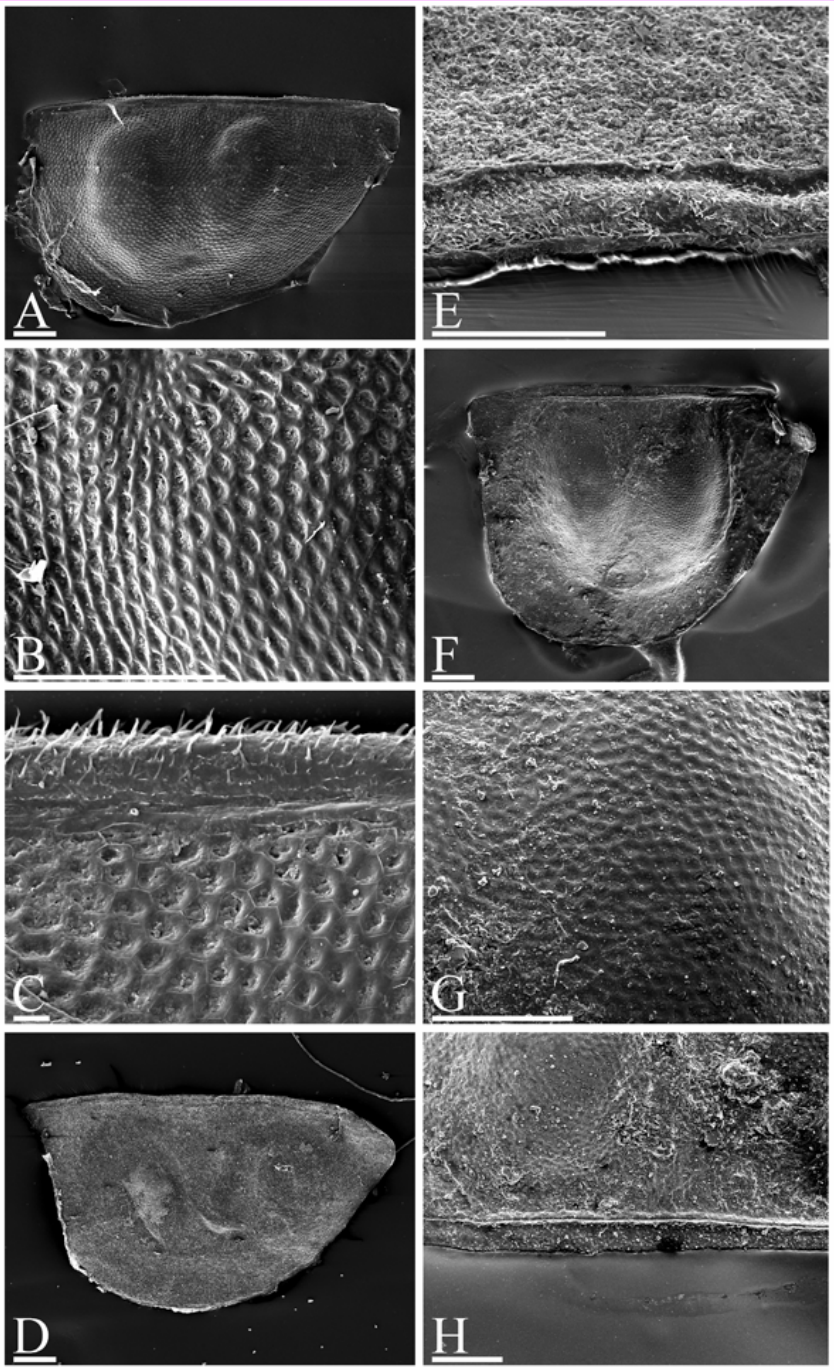


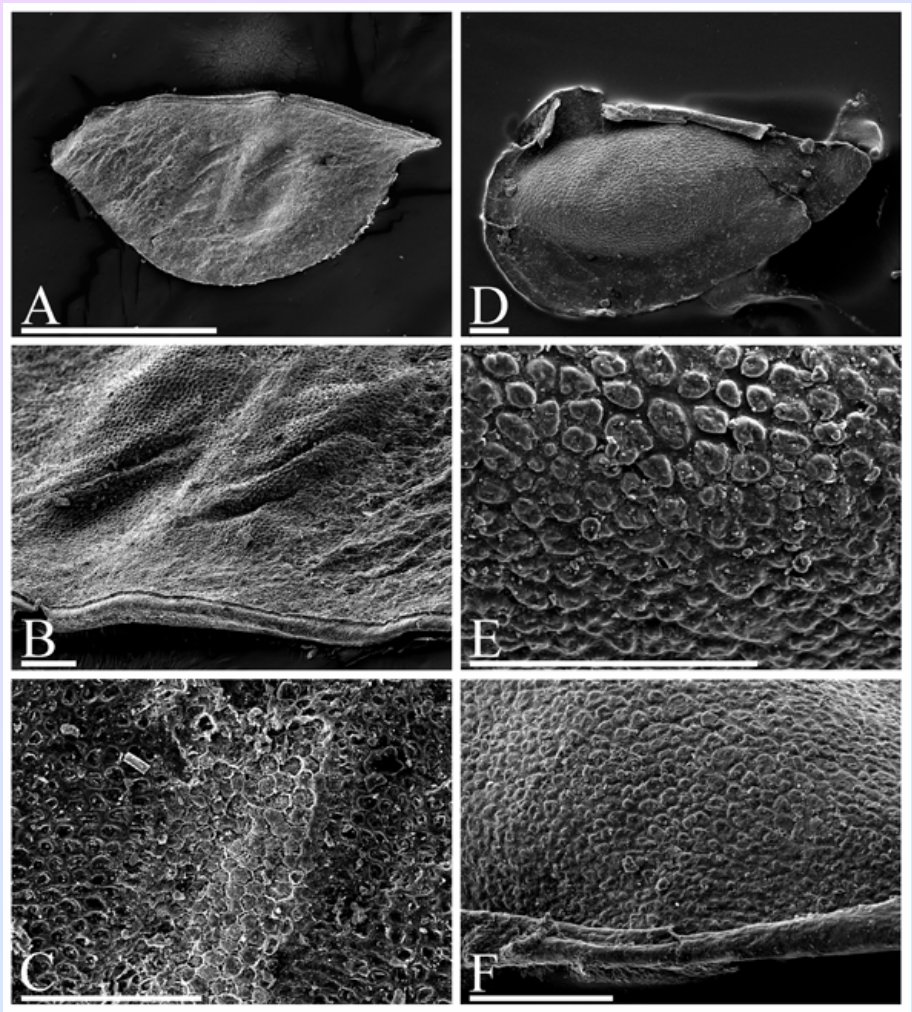
(Хотонт, граница J/K, около 145 млн. лет назад)

подрод *Daphnia* (*Daphnia*)

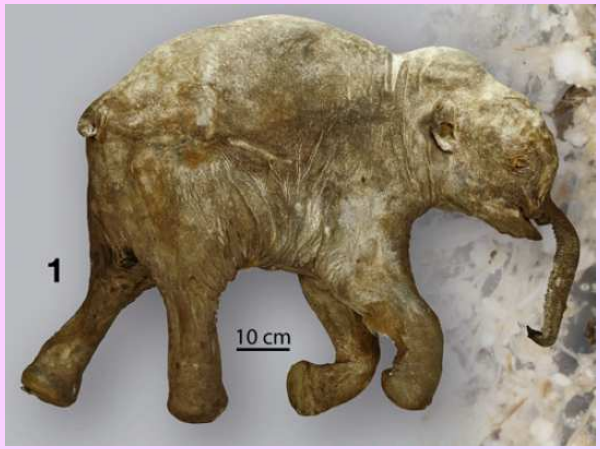
подрод *Daphnia* (*Ctenodaphnia*)

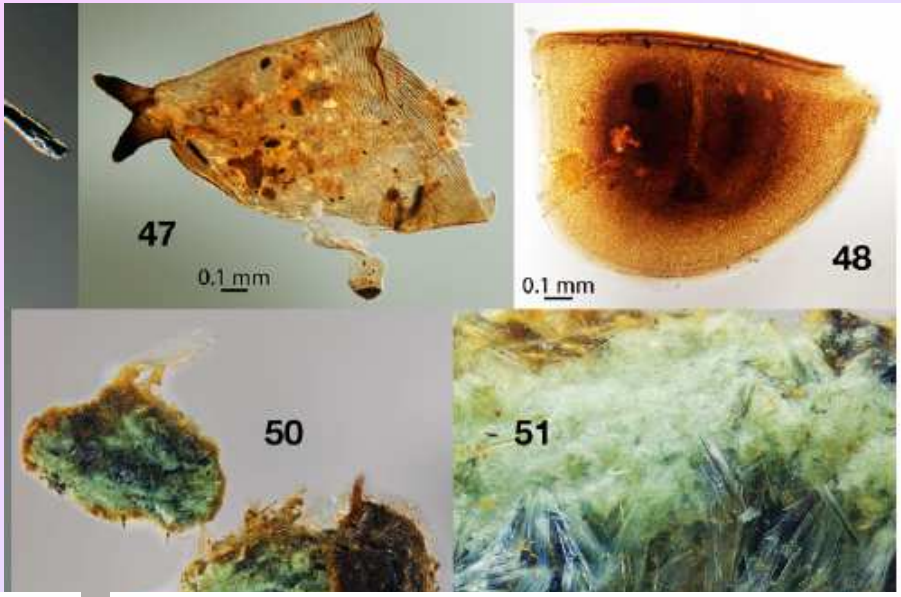
Плиоцен – плейстойен – ранний голоцен от Светы Кузьминой – Таймыр, Юкон, Аляска (мерзлота и не очень)





Мамонтенок Люба





Quaternary International 255 (2012) 231–238

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Environmental reconstruction inferred from the intestinal contents of the Yamal baby mammoth Lyuba (*Mammuthus primigenius* Blumenbach, 1799)

Pavel A. Kosintsev [a], Elena G. Lapteva [a], Svetlana S. Trofimova [a,*], Oksana G. Zanina [b], Aleksey N. Tikhonov [c], Johannes Van der Plicht [d]

[a] Institute of Plant and Animal Ecology, Ural Branch, Russian Academy of Sciences, ul. Vos'mogo Marta 202, Yekaterinburg 620144, Russia
[b] Institute of Physicochemical and Biological Problems of Soil Science, Russian Academy of Sciences, Pushchino, Moscow oblast 142290, Russia
[c] Zoological Institut, Russian Academy of Sciences, Universitetskaya nab. 1, St. Petersburg 199034, Russia
[d] Center for Isotope Research, Groningen University, Nijenborgh 4, 9747 AG Groningen, Netherlands

ARTICLE INFO

Article history:
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ABSTRACT

The article presents the results of a complex investigation of the intestinal content of the frozen mummy of a baby woolly mammoth (*Mammuthus primigenius* Blumenbach, 1799) found in 2007 in the Yamal Peninsula (Western Siberia). The mummy belongs to a female mammoth calf approximately 1–1.5 months of age, and it has been named "Lyuba". Analysis of bone tissue yielded a ^{14}C date of 41,910 (+550/−450) years ago. Analysis of detritus material from the large intestine yielded a ^{14}C date of 41,700 (+700/−550) years ago. These dates practically coincide, thus denoting synchronism of the time of the baby mammoth's death and the formation of its intestinal contents. This time correspond to the middle part of MIS 3, or the Middle Weichselian Pleniglacial. Pollen, phytolith, plant macrofossil and mineral analyses of the intestinal content were carried out. Reconstruction of the environment where the baby mammoth lived is given based on the intestinal content analyses. The data suggest that the baby mammoth lived in tundra-like landscapes dominated by grass–sedge communities with forbs and *Betula nana*.

Quaternary Science Reviews 30 (2011) 3935–3946

Contents lists available at SciVerse ScienceDirect

Quaternary Science Reviews

journal homepage: www.elsevier.com/locate/quascirev

Palaeo-environmental and dietary analysis of intestinal contents of a mammoth calf (Yamal Peninsula, northwest Siberia)

Bas van Geel [a,*], Daniel C. Fisher [b], Adam N. Rountrey [b], Jan van Arkel [a], Joost F. Duivenvoorden [a], Aline M. Nieman [c], Guido B.A. van Reenen [a], Alexei N. Tikhonov [d], Bernard Buigues [e], Barbara Gravendeel [a,f]

[a] Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Science Park 904, P.O. Box 94248, 1090 GE Amsterdam, The Netherlands
[b] Museum of Paleontology, University of Michigan, 1109 Geddes Ave., Ann Arbor, MI 48109-1079, USA
[c] Faculty of Archaeology, Leiden University, Reuvensplaats 3, P.O. Box 9515, 2300 RA Leiden, The Netherlands
[d] Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia
[e] International Mammoth Committee, Saint Mandé, France
[f] Netherlands Centre for Biodiversity Naturalis – National Herbarium of The Netherlands – Leiden University, Einsteinweg 2, P.O. Box 9514, 2300 RA Leiden, The Netherlands

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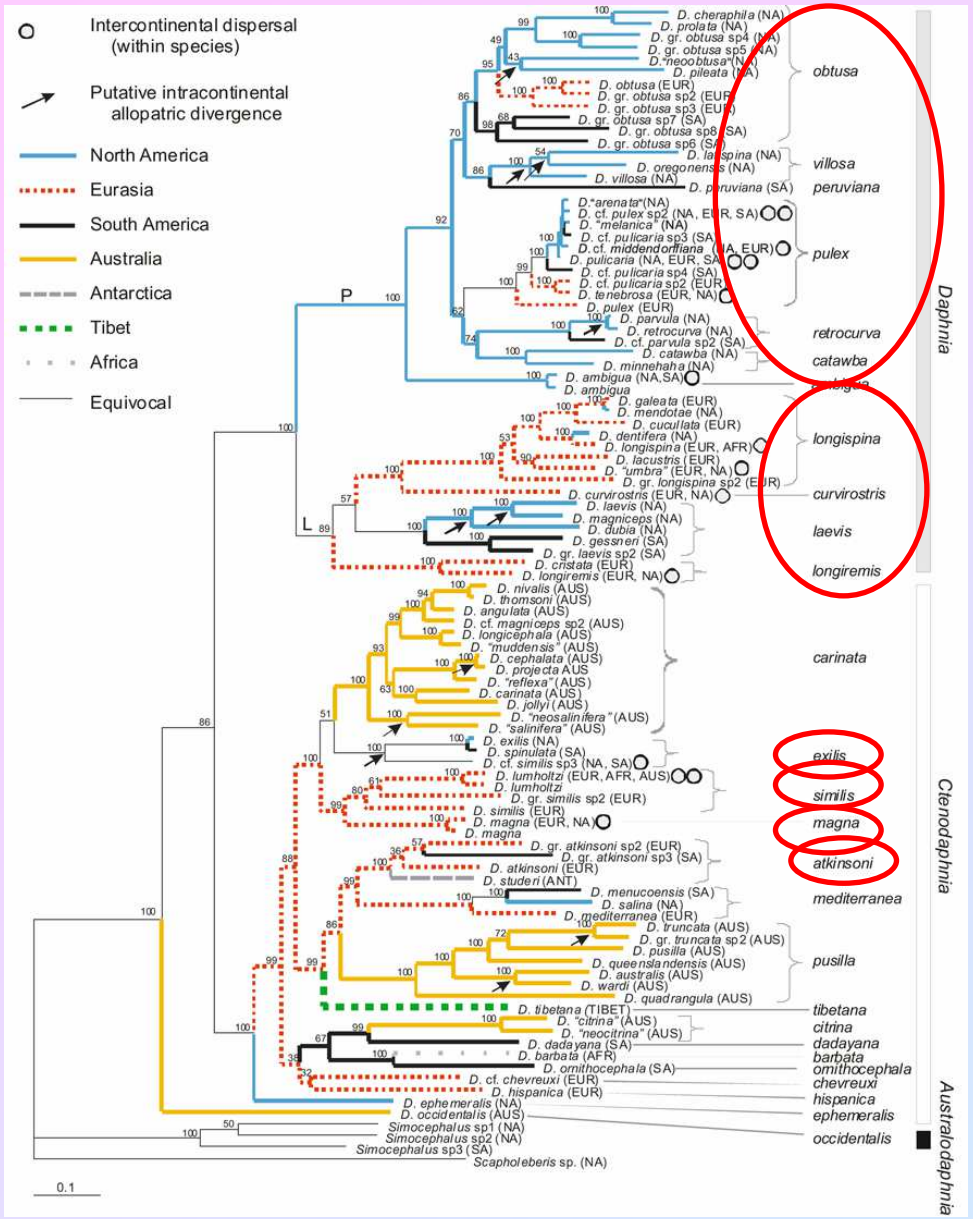
Available online 17 November 2011

Keywords:
Ancient DNA
Coprophagy
Fungal spores
Lyuba
Macrofossils
Mammoth calf
Permafrost
Pollen
Siberia
Silica-based DNA extraction

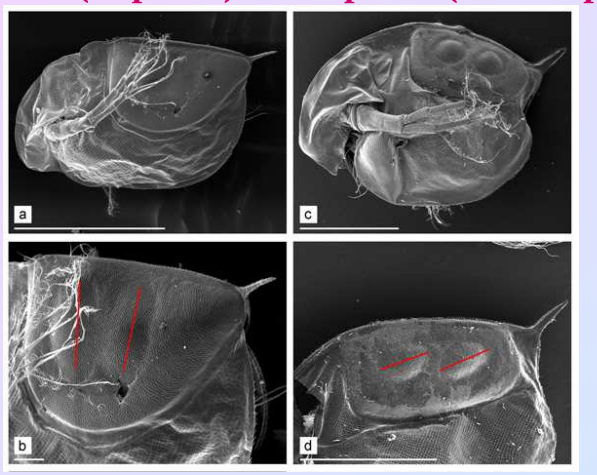
ABSTRACT

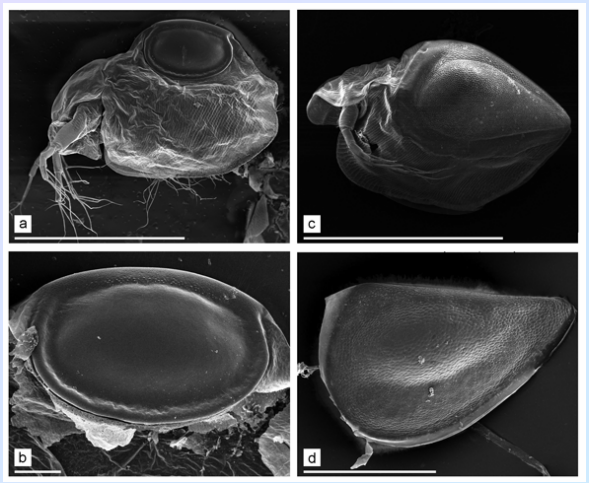
Intestinal samples from the one-month-old Siberian mammoth calf 'Lyuba' were studied using light microscopy and ancient DNA to reconstruct its palaeo-environment and diet. The palynological record indicates a 'mammoth steppe'. At least some pollen of arboreal taxa was reworked, and thus the presence of trees on the landscape is uncertain. In addition to visual comparison of 11 microfossil spectra, a PCA analysis contributed to diet reconstruction. This yielded two clusters: one of samples from the small intestine and the other of large-intestine samples, indicating compositional differences in food remains along the intestinal tract, possibly reflecting different episodes of ingestion. Based on observed morphological damage we conclude that the cyperaceous plant remains and some remains of dwarf willows were originally eaten by a mature mammoth, most likely Lyuba's mother. The mammoth calf probably unintentionally swallowed well-preserved mosses and mineral particles while eating fecal material deposited on a soil surface covered with mosses. Coprophagy may have been a common habit for mammoths, and we therefore propose that fecal material should not be used to infer season of death of mammoths. DNA sequences of *trnL* and *rbcL* genes amplified from ancient DNA extracted from intestinal samples confirmed and supplemented plant identifications based on microfossils and macro-remains. Results from different extraction methods and barcoding markers complemented each other and show the value of longer protocols in addition to fast and commercially available extraction kits.

Систематика рода *Daphnia*



***Daphnia* (*Daphnia*)** ***Daphnia* (*Ctenodaphnia*)**

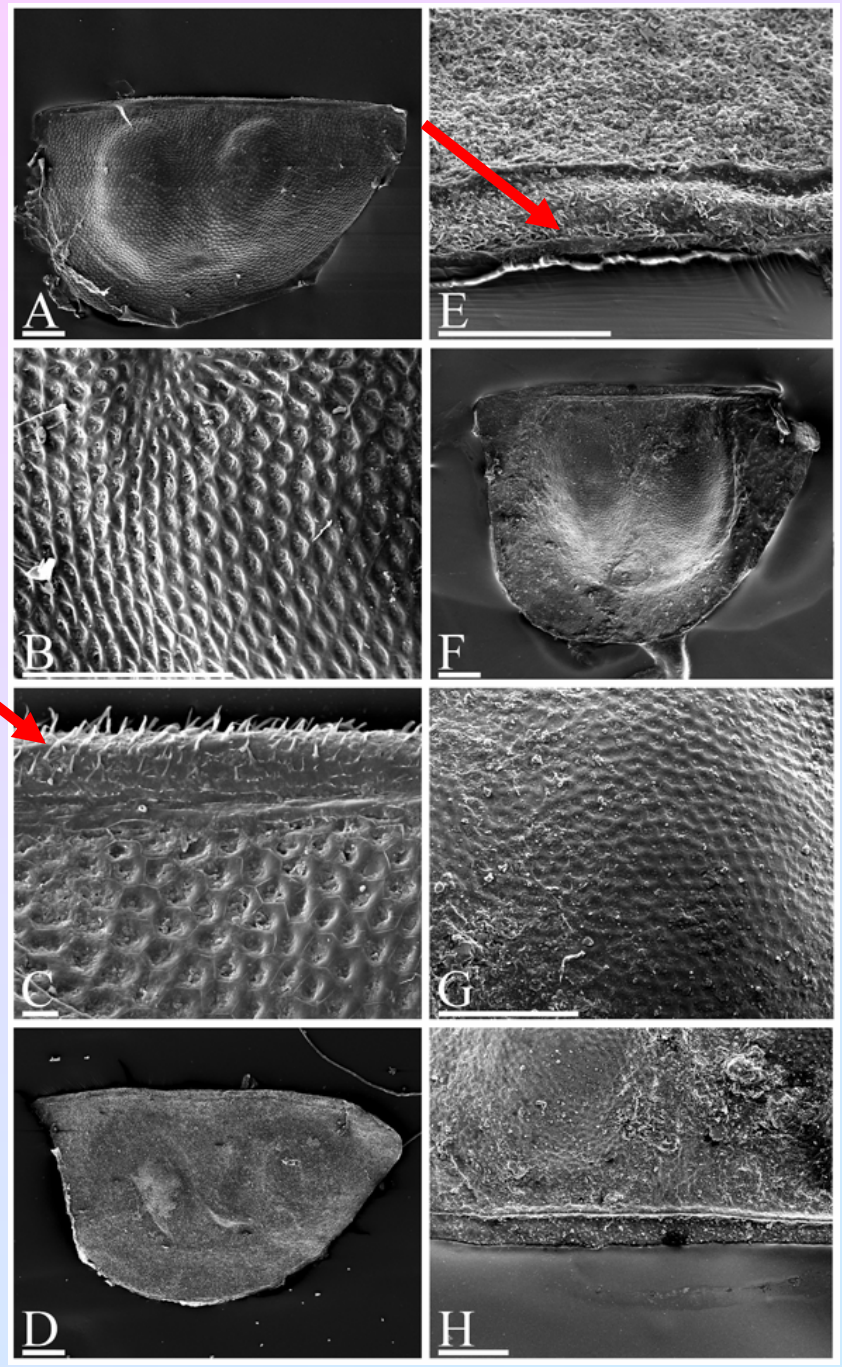




Daphnia* (*Ctenodaphnia*)** ***Simocephalus

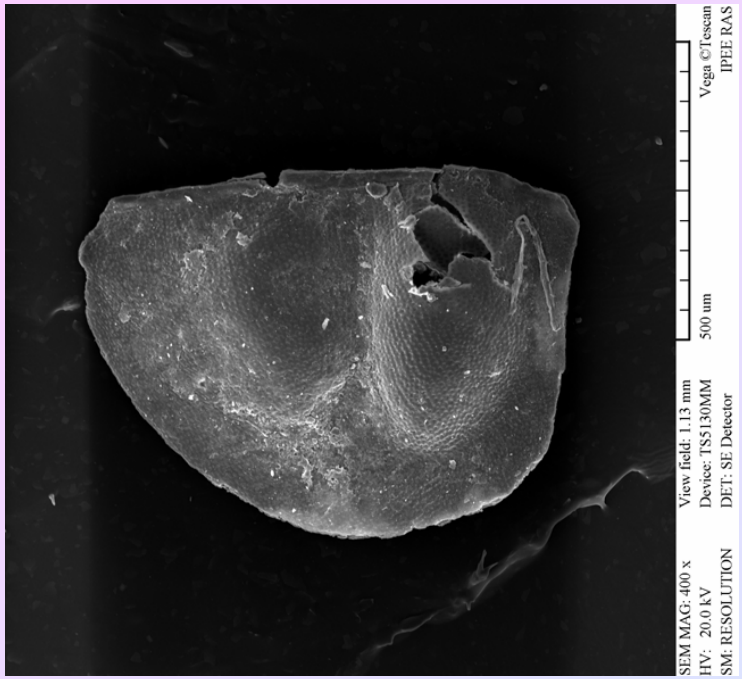
Phylogenetic tree for 92 species of *Daphnia*, based on Bayesian analysis of CO1, 12S and 16S mtDNA sequences (from Adamowicz et al., 2009)

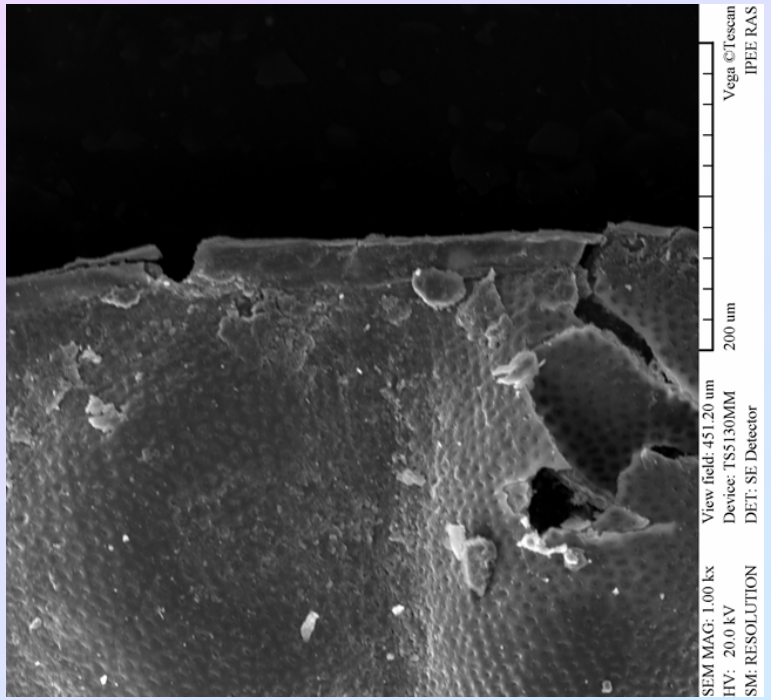
Различение эфиппиумов *Daphnia* (*Daphnia*)



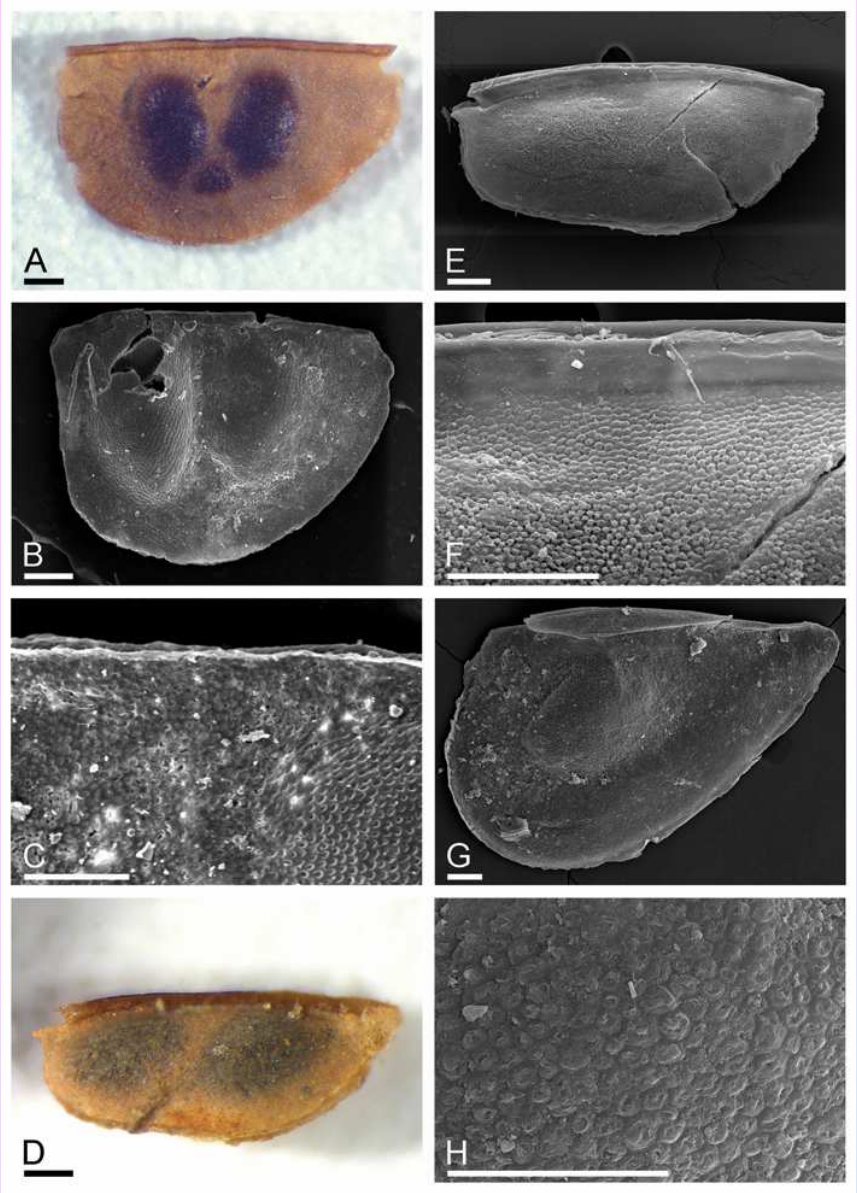
***D. pulex* group**
***D. longispina* group**

Эфиппиумы *Daphnia* (*Daphnia*) из шерсти мамонтов





Группа видов *D. longispina*



BOREAS An international journal of Quaternary research

Taphonomic phenomenon of ancient hair from Glacial Beringia: perspectives for palaeoecological reconstructions

IRINA V. KIRILLOVA, JOHANNES VAN DER PLICHT, STANISLAV V. GUBIN, OKSANA G. ZANINA, OLGA F. CHERNOVA, ELENA G. LAPTEVA, SVETLANA S. TROFIMOVA, EUGENY V. ZINOVYEV, ANTON A. ZHAROV, ELENA O. FADEEVA, THIJS VAN KOLFSCHOTEN, FEDOR K. SHIDLOVSKIY AND ALEXEY A. KOTOV

BOREAS

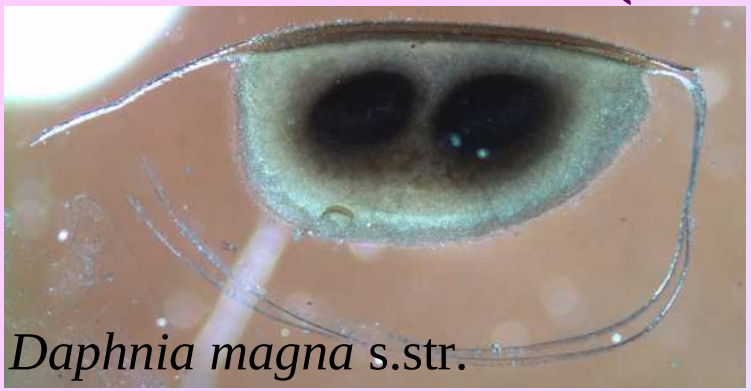
Kirillova, I. V., van der Plicht, J., Gubin, S. V., Zanina, O. G., Chernova, O. F., Lapteva, E. G., Trofimova, S. S., Zinovyev, E. V., Zharov, A. A., Fadeeva, E. O., van Kolfschoten, T., Shidlovskiy, F. K. & Kotov, A. A. 2016 (July): Taphonomic phenomenon of ancient hair from Glacial Beringia: perspectives for palaeoecological reconstructions. *Boreas*, Vol. 45, pp. 455–469. 10.1111/bor.12162. ISSN 0300-9483.

An accumulation of mammoth hair, discovered in the Bol'shaya Chukochya River valley (northeast Yakutia, Russia), was found to contain remains of terrestrial and aquatic organisms, including plants, insects, crustaceans, birds and mammals. Radiocarbon dating indicated that this post-mortem taphocoenosis represented multiple time periods. The mammoth hair was dated to older than 45 ka BP, the plants were dated to 12 750±50 a BP (which corresponds to a shift in the environmental conditions and landscapes during the formation of thermokarst in northeastern Russia) and the bird feathers were dated to 4115±40 a BP. A scenario of the formation of this fossil assemblage is proposed, covering the MIS 3-1 time range. The hair also yielded various Arctic branchiopod crustaceans, which inhabit shallow temporary water bodies and therefore are important for reconstruction of palaeoenvironments. The cladoceran subgenus *Daphnia* (*Ctenodaphnia*), currently absent from the Asian part of Beringia, is reported from this region for the first time. The study demonstrates that the discovered permafrost-preserved hair is a unique repository of Ice Age organisms.

Эфиппиумы Daphniidae

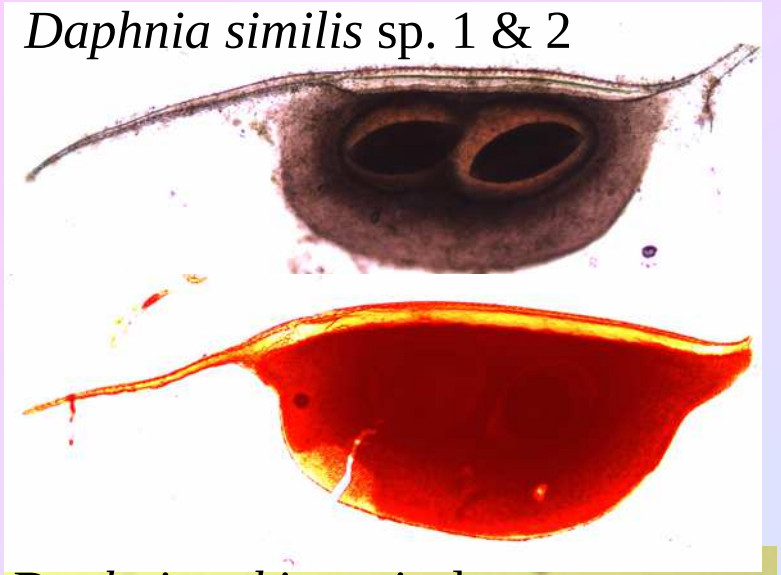
A-C, *Daphnia* (*Daphnia*) cf. *longispina*
D-F, *Daphnia* (*Ctenodaphnia*) sp.?
G-F, *Simocephalus* sp.

Различение эфиппиумов современных *Daphnia* (*Ctenodaphnia*)

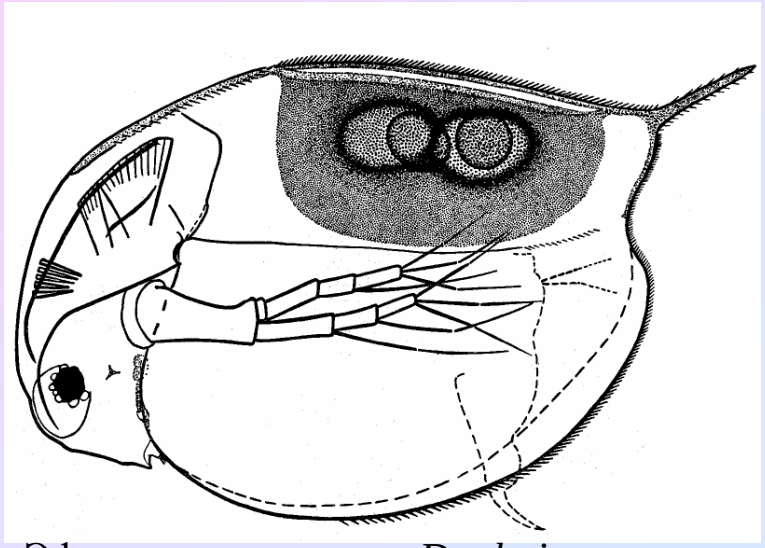


Daphnia magna s.str.

Daphnia similis sp. 1 & 2

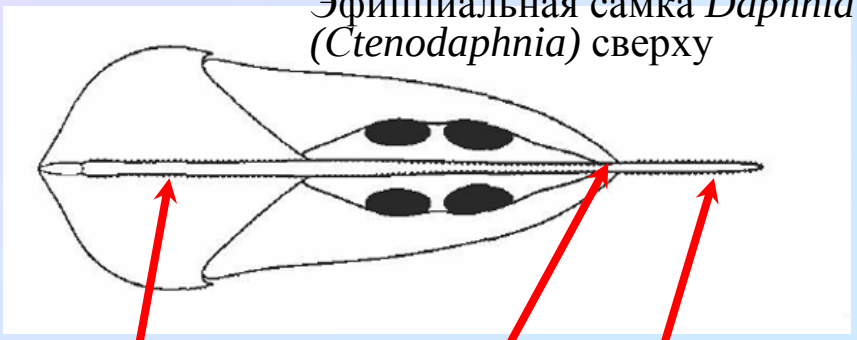


Daphnia atkinsoni s.lat.

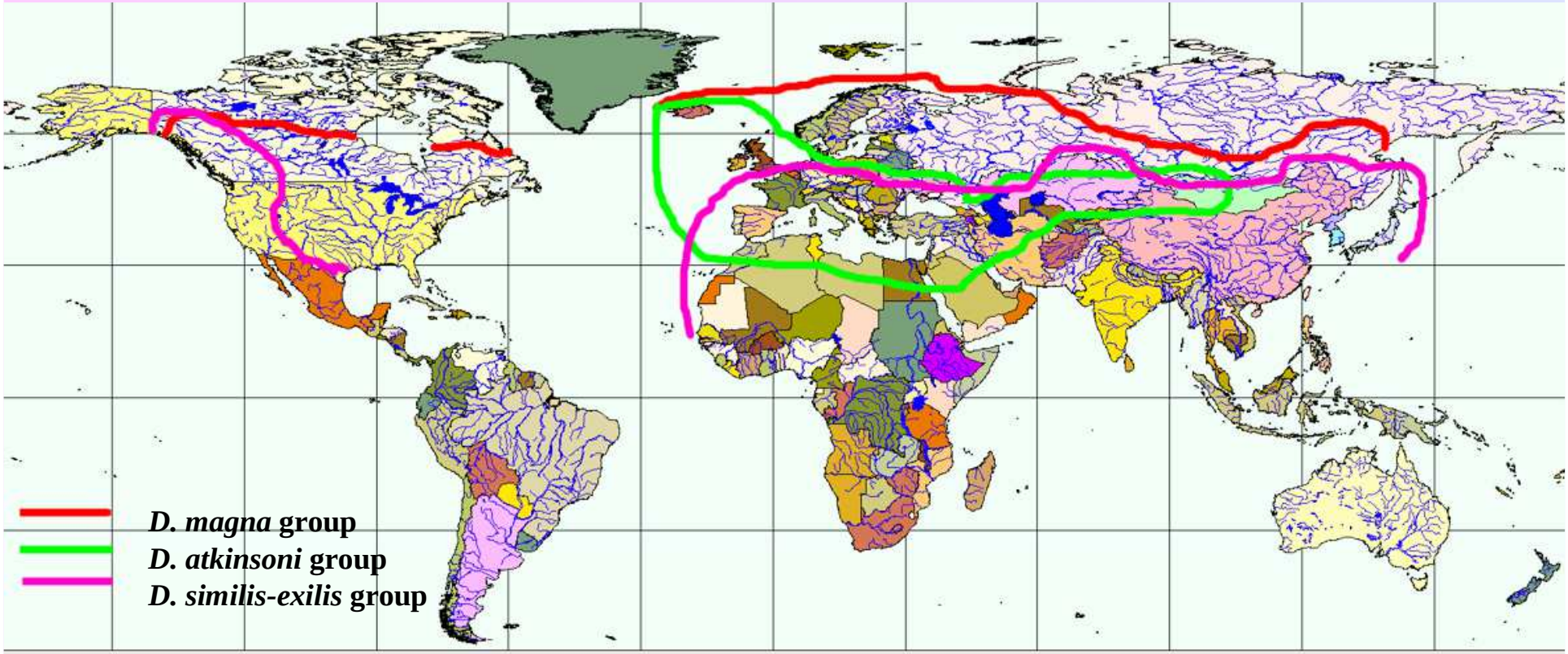


Эфиппиальная самка *Daphnia (Ctenodaphnia) magna*

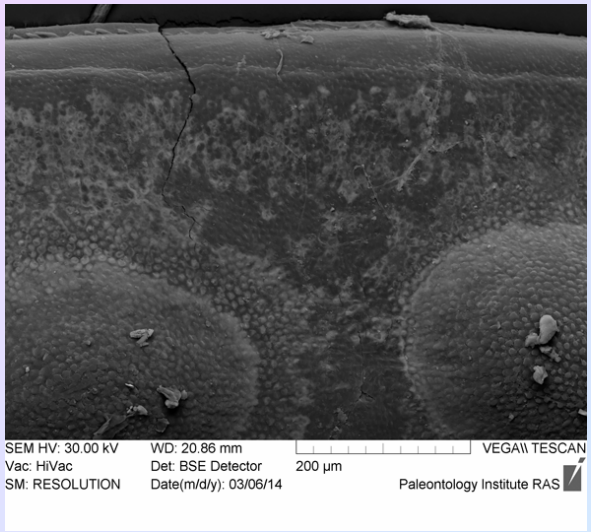
Эфиппиальная самка *Daphnia (Ctenodaphnia)* сверху



Современные ареалы трех групп видов

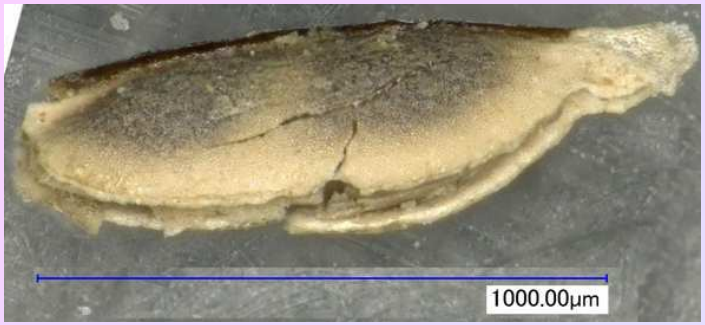


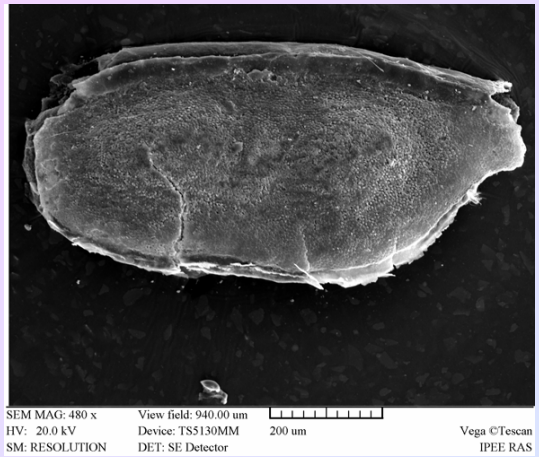
Эфиппиумы *Daphnia* (*Ctenodaphnia*) из шерсти

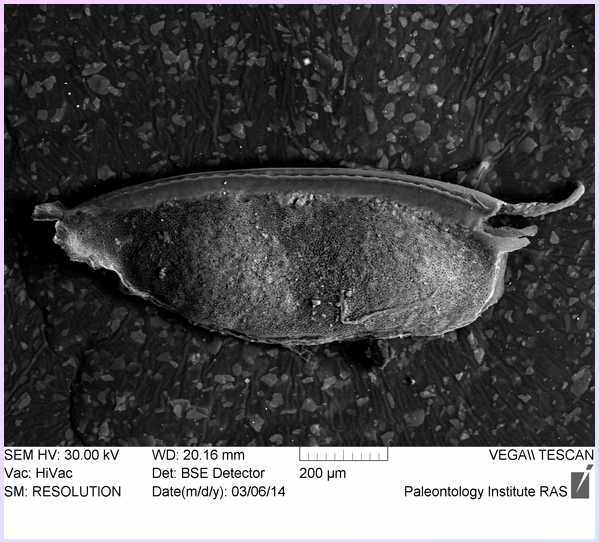


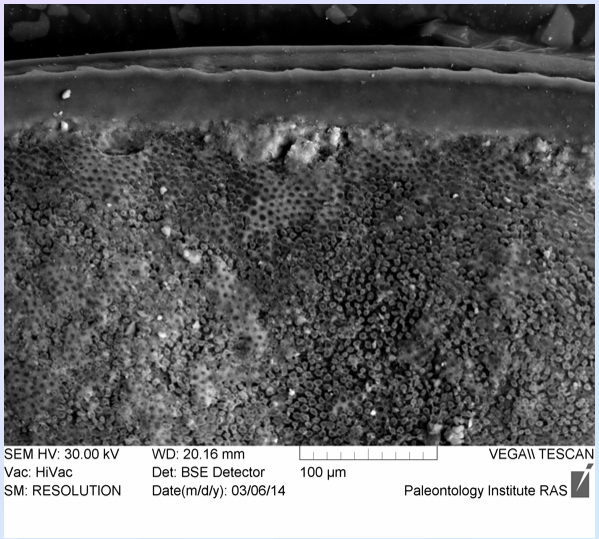
Вроде, никуда не попадает?

Эфиппиумы *Daphnia* (*Ctenodaphnia*) из шерсти с реки Чукочья

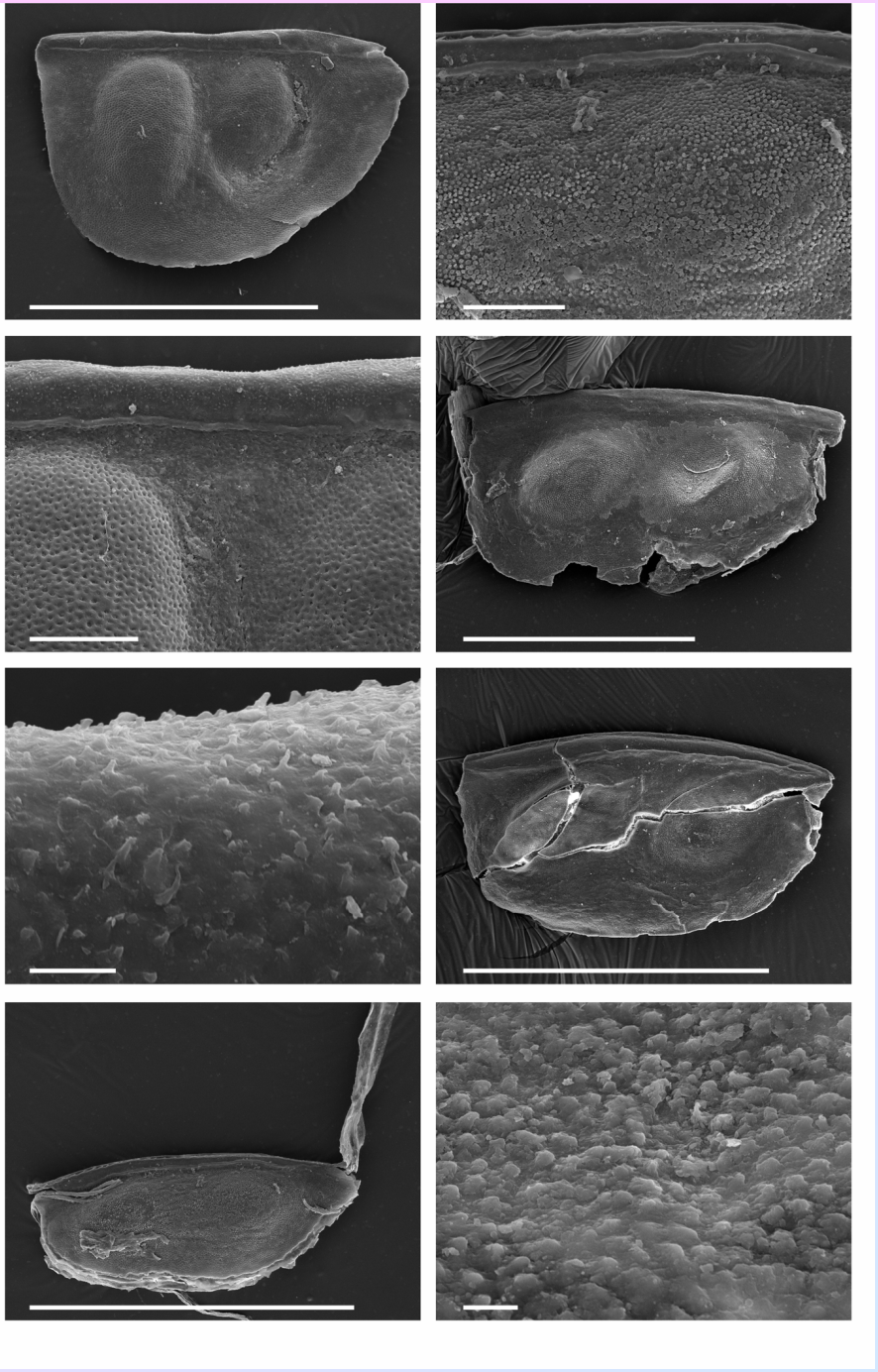






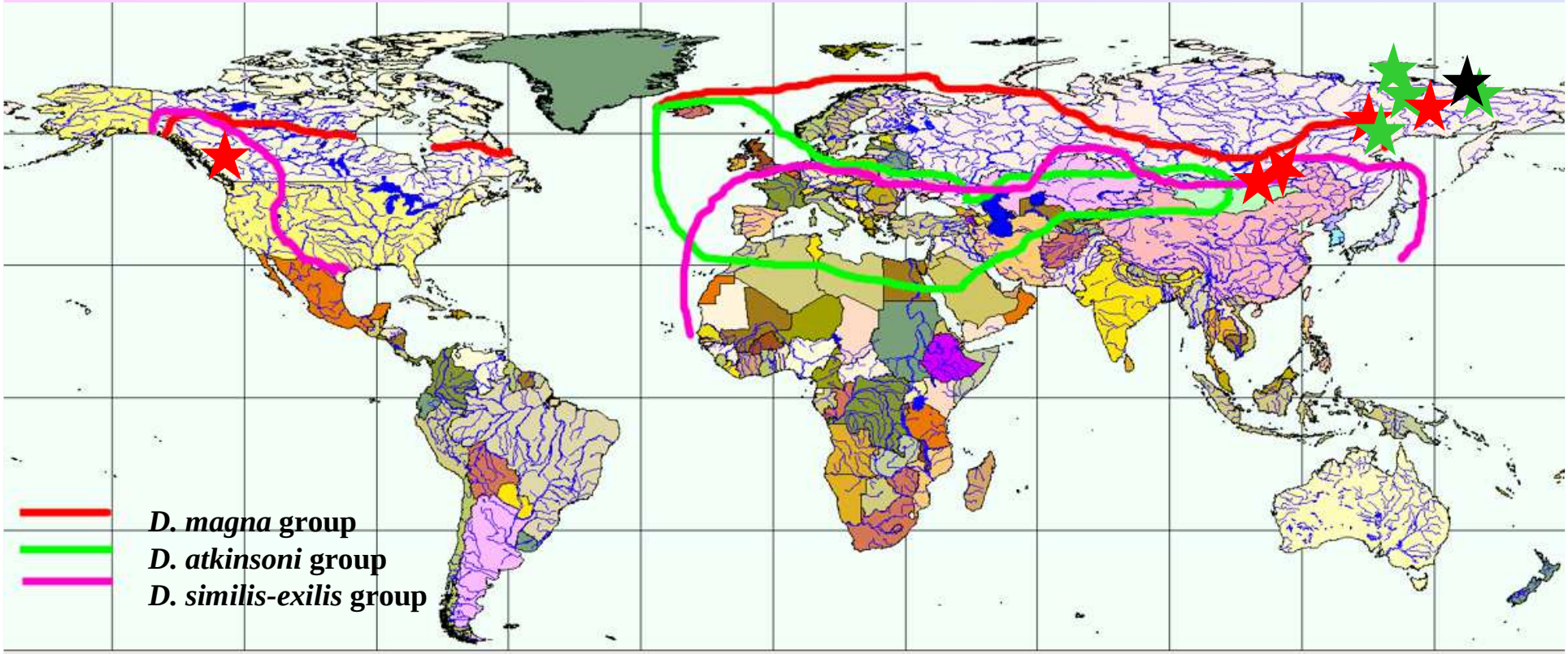


группа видов *Daphnia atkinsoni*

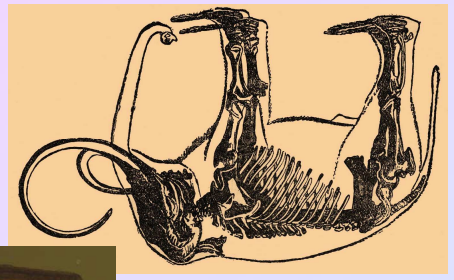


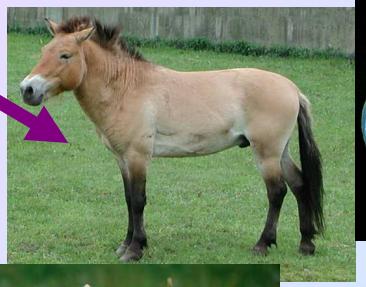
Находки эфиппиумов даний из шерсти мамонта с реки Аллаиха

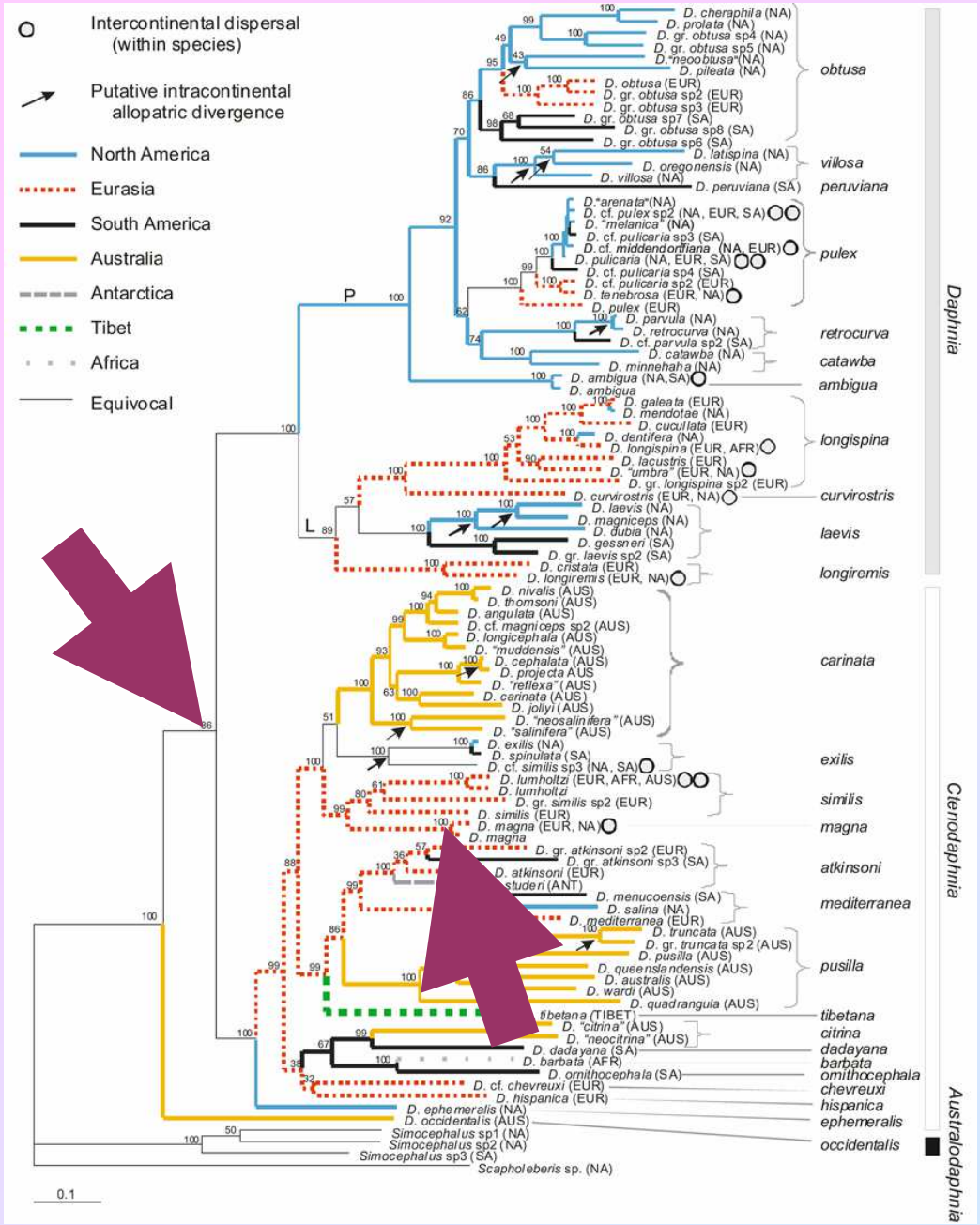
Современные ареалы трех групп видов



Аналогия с эволюцией наземной биоты



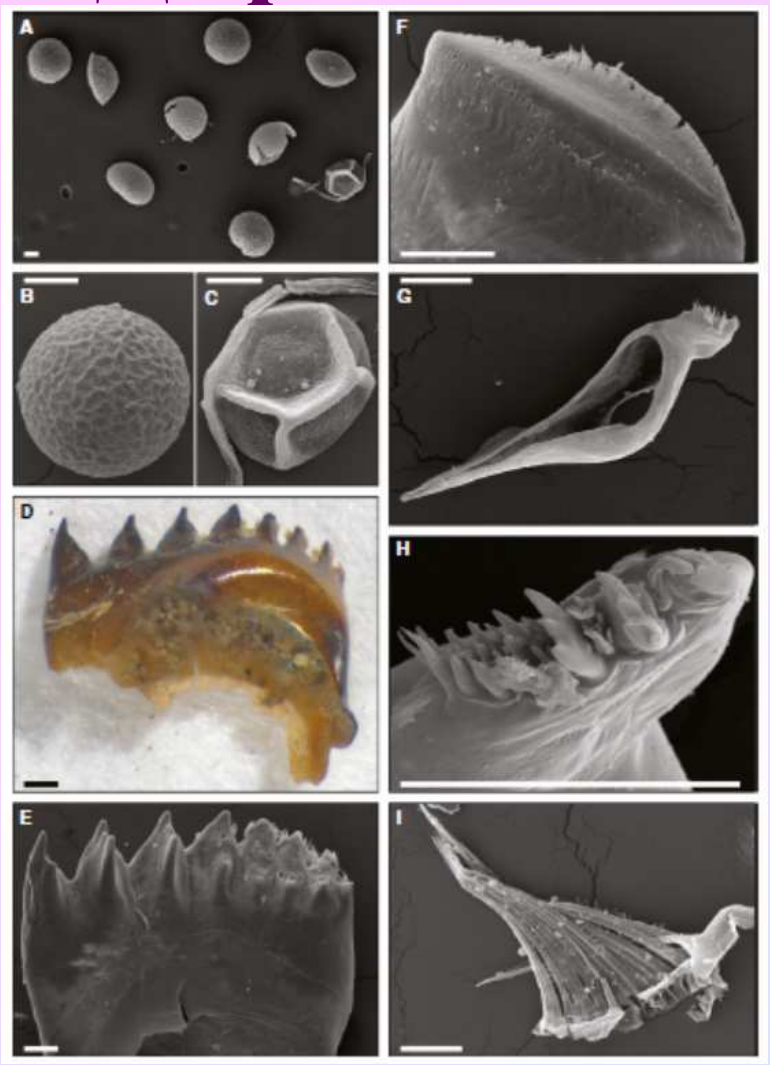


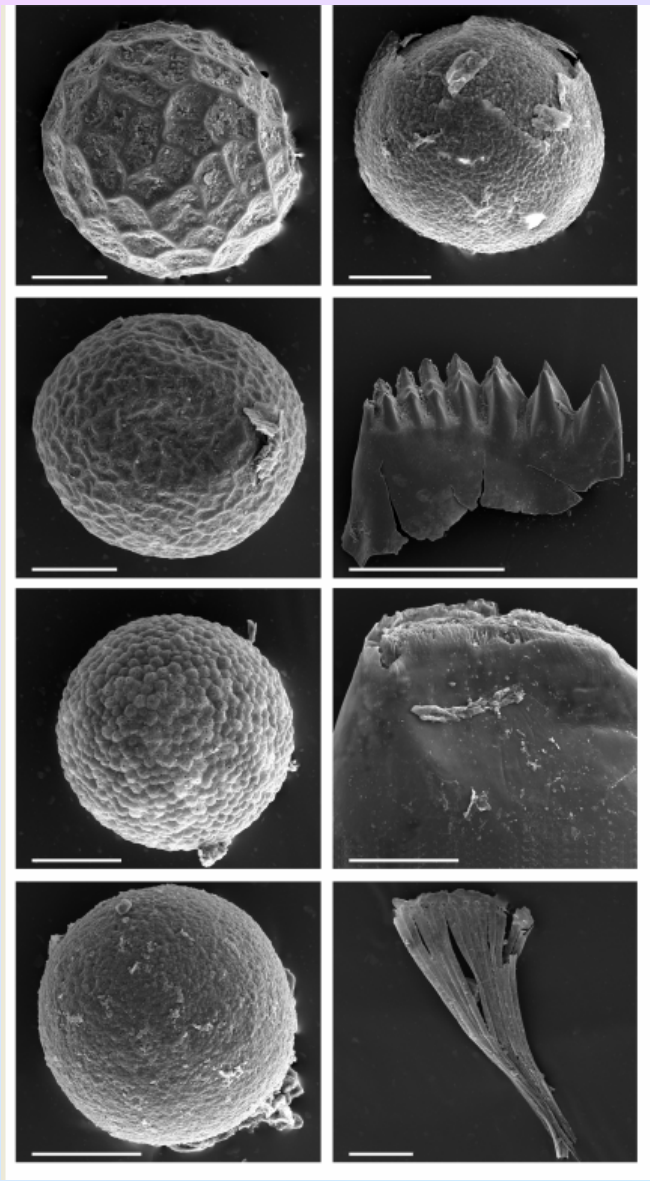


Важность находок:

биогеографическая калибровка «молекулярных часов»

Дафниями дело не ограничилось





Остатки жаброногих ракообразных из шерсти мамонтов. Слева – мамонт с Чукочьей, справа – с Аллаихи

СПАСИБО!!!!!!!

*** Моим коллегам А.А. Жарову, Е.И. Изюмовой, И.В. Кирилловой, О.Ф. Черновой**

*** Р.А. Ракитову и А.Н. Неретиной за помощь при работе на СЭМ;**

*** Ф.К. Шидловскому, С.А. Кузьминой, Л.А. Фроловой за предоставленные образцы.**

Огромная благодарность РФФИ за поддержку данных работ (проект 18-04-00398 а) и за поддержку конференции (проект 18-34-10006 мол_г)