

THE FIRST RECORD OF *EURYTEMORA VELOX* (LILLJEBORG, 1853) (CRUSTACEA, CALANOIDA) OUTSIDE OF EUROPE, GENETIC IDENTIFICATION WITH SURPRISE

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The euryhaline species *Eurytemora velox* (Lilljeborg, 1853) is an active invader like some other *Eurytemora* species. Having Ponto Caspian origin, it has been actively spread in fresh and brackish waters throughout Europe during recent decades. At present, the species is found even in Western Siberia. No one record of this species outside of Europe and Western Siberia was done.

This paper presents finding of mitochondrial haplotype *E. velox* in North American waters by molecular-genetic methods with morphological identification. This specimen has nITS genes of north Atlantic American *E. cf. affinis* and mixed *E. velox* – *E. cf. affinis* 18SrRNA gene. We suppose it is result of interspecies hybridization between European *E. velox* and North American *E. cf. affinis*. Possibly *E. velox* was invaded north America with the ballast water of ships from Western Siberia, what supported by identity of studied population to population from the lake in the Ural city of Cheljabinsk. What is surprising, hybrid of the same two species was observed in the Ural, whereas *E. cf. affinis* was never found outside of the North American Atlantic coast.

Keywords

DNA sequencing, *Eurytemora velox*, invasive species, alien species, European Invasions in America, the USA, Ponto Caspian species, interspecies hybridization

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References

- Abdullina GK, Bondar MS (2019) Zooplankton of water bodies of the Arctic tundra of the Yamal Peninsula. article in the proceedings of the conference of the XXI International Scientific and Practical Conference I: 297-304 (In Russian)
- Alekseev VR, Sukhikh N, Abramson N (2009) Introduction of Sibling Species to the Ecosystem of the Baltic Sea. Doklady Akademii Nauk. 429(5):694–697.
- Bening AL (1938) Materials on the hydrobiology of the Ural River. Bolshaya Emba. Proceedings of KazFAN USSR, vol. 11. M. - L. (In Russian)
- Burton RS (1990) Hybrid breakdown in developmental time in the copepod *Tigriopus californicus*. Evolution 44: 1814-1822.
- Cabrol J, Tremblay R, Winkler G (2020) Differential eco-physiological performances of two pseudocryptic species of the *Eurytemora affinis* complex (Copepoda, Calanoida) in the St. Lawrence estuarine transition zone: a reciprocal transplant experiment. Crustaceana 93:379–404, <https://doi.org/10.1163/15685403-00003973>
- Ermolaeva NI (2016) Zooplankton of different types of water bodies of the Yamal Peninsula in 2015. Scientific Bulletin of the Yamalo-Nenets Autonomous Okrug 2(91):56-62 (In Russian)
- Ermolaeva NI (2017) Species composition and spatial distribution of zooplankton in the Gulf of Ob and Gydan Bay. Proceedings of the III All-Russian Scientific Conference with International Participation. Institute of Water and Environmental Problems SB RAS. Novosibirsk Pages I:91-99 (In Russian)
- Favier JB, Winkler G (2014) Coexistence, distribution patterns and habitat utilization of the sibling species complex *Eurytemora affinis* in the St Lawrence estuarine transition zone. Journal of Plankton Research 36: 1247–1261, <https://doi.org/10.1093/plankt/fbu063>
- Gaviria Melo S, Forro L (2000) Morphological characterization of new populations of the copepod *Eurytemora velox* (Lilljeborg, 1853) (Calanoida, Temoridae) found in Austria and Hungary. Hydrobiologia 438: 205–216, <https://doi.org/10.1023/A:1004173704289>
- Hall TA (1999) Bioedit: A user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. Nucleic Acids Research 41: 95–98.

- Kos MS (2016) Calanoid copepods of the families Stephidae and Temoridae of the seas of Russia and adjacent waters. Keys to the Fauna of Russia. Zoological Institute RAS, St. Petersburg 179: 1–108. (in Russian)
- Kotov A, Taylor D (2022) *Daphnia japonica* sp. nov. (Crustacea: Cladocera) an eastern Palearctic montane species with mitochondrial discordance. PeerJ. 10. e14113. 10.7717/peerj.14113.
- Lee CE (2000) Global phylogeography of a cryptic copepod species complex and reproductive isolation between genetically proximate populations. Evolution 54: 2014–2027.
- Liu P, Xu L, Xu S, Martinez A, Chen H, Cheng D, Dumont H, Han B, Fontaneto D (2017) Species and hybrids in the genus *Diaphanosoma* Fischer, 1850 (Crustacea: Branchiopoda: Cladocera). Molecular phylogenetics and evolution. 118. 10.1016/j.ympev.2017.10.016.
- Muravevsky SD (1923) Observations on the spring plankton of the river. The Urals and its oxbow lakes. Russian Hydrobiological Journal, II (1-2) (In Russian)
- Pace ML, Strayer DL, Fischer D, Malcom HM (2010) Recovery of native zooplankton associated with increased mortality of an invasive mussel. Ecosphere 1: 1–10
- Pandourski I, Evtimova V (2006). First record of *Eurytemora velox* (Lilljeborg, 1853) (Crustacea, Copepoda, Calanoida) in Iceland with morphological notes. Historia Naturalis Bulgarica 17: 35-38.
- Parent GJ, Plourde S, Turgeon J. (2012) Natural hybridization between *Calanus finmarchicus* and *C. glacialis* (Copepoda) in the Arctic and Northwest Atlantic. Limnology and Oceanography 57: 1057–1066.
- Petrus J. (1989) *Eurytemora velox* (Crustacea, Calanoida) a Mallorca. Bolleti de la Societat d'Historia Natural de les Balears 33: 201-206.
- Quintana XD, Antón-Pardo M, Bas-Silvestre M, Boix D, Casamitjana X, Compte J, et al. (2021) Identifying critical transitions in seasonal shifts of zooplankton composition in a confined coastal salt marsh. Aquatic Sciences 83: 69. <https://doi.org/10.1007/s00027-021-00824-5>
- Sabanev PL (1930) *Eurytemora velox* (Lill.) in the empty part of the Dnieper. Selected. Etc. Dnipro biol. mill. 5. (In Russian)
- Samchyshyna L, Gromova Y, Zorina-Sakharova K (2020) Recent distribution of *Eurytemora velox* (Lilljeborg, 1853) (Copepoda, Calanoida) in brackish and fresh waters of Ukraine. Crustaceana: 93(3–5): 275-281, <https://doi.org/10.1163/15685403-00003992>
- Sars GO (1897) *Temorella lacinulata* (Fischer). Annual of the Zoological Museum of the Imperial Academy of Sciences. St. Petersburg. 2: 66.
- Sars GO (1902). Copepoda Calanoida, Parts IX & X, Temoridae, Metridiidae, Heterorhabdidae. An Account of the Crustacea of Norway, with short descriptions and figures of all the species. Bergen Museum. 4: 97-120, pls. 65-80. (look up in IMIS)
- Sipps K, Arbuckle-Keil G, Chant R, Fahrenfeld N, Garzio L, Walsh K, Saba G (2022) Pervasive occurrence of microplastics in Hudson-Raritan estuary zooplankton. Science of The Total Environment 817(11) :152812
- Smirnov CC (1940) On the so-called hybrids in the genus *Eurytemora* Giesbr. (Copepoda). Reports of the Academy of Sciences of the USSR 26(6): 615-618. (In Russian)
- Stepien JC, Malone TC, Chervin MB (1981) Copepod communities in the estuary and coastal plume of the Hudson River. Estuarine, Coastal and Shelf Science 13(2): 185-195. [https://doi.org/10.1016/S0302-3524\(81\)80075-8](https://doi.org/10.1016/S0302-3524(81)80075-8).
- Sukhikh N, Abramova E, Holl AC, Souissi S, Alekseev V (2020) A comparative analysis of genetic differentiation of the *E. affinis* species complex and some other *Eurytemora* species, using the CO1, nITS and 18SrRNA genes (Copepoda, Calanoida). Crustaceana 93(3–5): 931–955. <https://doi.org/10.1163/15685403-bja10074>
- Sukhikh N, Lazareva VI (2022) First results of a molecular genetic analysis of the European invader *Eurytemora velox* (Crustacea, Calanoida). Inland Water Biology 15(2):205-208. DOI: 10.1134/S1995082922020122
- Sukhikh N, Souissi A, Souissi S, Holl AC, Schizas NV, Alekseev V (2019) Life in sympatry: coexistence of native *Eurytemora affinis* and invasive *Eurytemora carolleeae* in the Gulf of Finland (Baltic Sea). Oceanologia 61: 227-238. <https://doi.org/10.1016/j.oceano.2018.11.002>
- Sukhikh NM, Souissi A, Souissi S, Winkler G, Castric V, Holl A-C, Alekseev V (2016) Genetic and morphological heterogeneity among populations of *Eurytemora affinis* (Crustacea: Copepoda: Temoridae) in European waters. C.R. Biologies 339: 197–206, <https://doi.org/10.1016/j.crv.2016.03.004>
- Sukhikh NM, Alekseev VR (2013) *Eurytemora caspica* sp. nov. from the Caspian Sea: One more new species within the *E. affinis* complex (Copepoda: Calanoida, Temoridae), Proceedings of the Zoological Institute RAS 317(1): 85–100.
- Tamura K, Stecher G, Kumar S (2021) MEGA 11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution* <https://doi.org/10.1093/molbev/msab120>
- Thompson JD, Higgins DJ, Gibson TJ (1994) CLUSTAL W: Improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. Nucleic Acids Research 22: 4673–4680.
- Vezhnovets VV, Sysova EA, Zaidykov IY, Naumova EY (2012) Biological peculiarities of two Copepod species (Crustacea, Copepoda, Calanoida) as possible causes of changes in their geographical ranges. Russian Journal of Biological Invasions 3(4): 243-250.