CONNECTIVITY OF THE *EUSIRUS PERDENTATUS* SPECIES COMPLEX ON THE ANTARCTIC CONTINENTAL SHELF

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CONTEXT OF THE STUDY

Eusirus perdentatus (Chevreux 1912) is a large-sized and abundant species on the Antarctic continental shelf. Previous genetic studies based on COI, CytB and ITS2 markers revealed cryptic diversity within this nominal species (Baird et al. 2011, Verheye and d'Udekem d'Acoz, in press). The model species used in the present study are two species of the *E. perdentatus* species complex, which can be distinguished by small morphological differences, and by coloration patterns (**Fig. 1**).

Connectivity between populations of a species results from an interaction of often contradictory processes. First, traits related to the organism's ecology, life history and behaviour will influence its dispersal ability. As amphipods have a strictly brood development, they are potentially poorly dispersive. However, the two model species are very widespread to circum-Antarctic, indicating that compared to most other benthic amphipods, they appear very mobile. *E. perdentatus* is reported to be a benthic to bentho-pelagic carnivorous predator. Observation data would indicate that they are good swimmers that can occasionally be found in the water column.

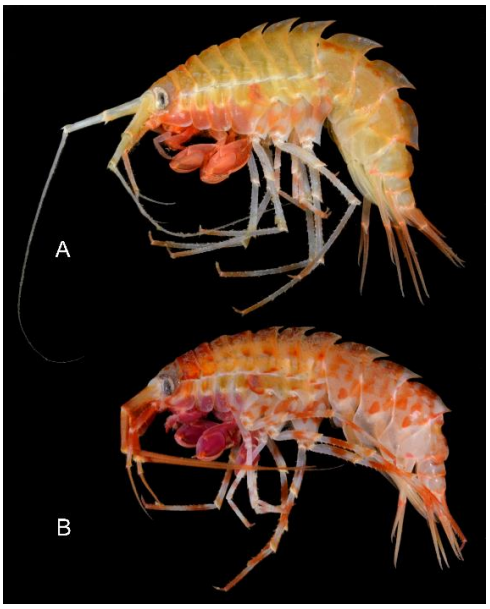


Figure 1. The two species of the *perdentatus* complex, showing distinctive coloration patterns. A. *Eusirus* **sp. nov.**, spotted coloration and B. *Eusirus perdentatus*, marbled coloration.

The connectivity of (temporarily) pelagic organisms will be highly influenced by hydrodynamics, as pelagic drift is considered the most effective dispersal mechanism. As such, the Antarctic Circumpolar Current, which circles in a clockwise direction around Antarctica, as well as the Antarctic Coastal Current, which flows in the opposite direction closer to the continent, are considered major factors influencing the connectivity of Antarctic marine organisms.

The present study aims to assess the **genetic structure** and **connectivity** of the populations of the two model species on the Antarctic continental shelf, in order to achieve a better understanding of the physical and biological factors influencing their dispersal.

MATERIAL AND METHODS

Abundant material was collected in a number of stations all around the continent (**Fig. 2**). DNA was extracted from pleopods of *Eusirus* complex *perdentatus* specimens from all around the Antarctic continent. The mitochondrial cytochrome c oxidase subunit I (COI) (~850 bp) was amplified by PCR. In addition, DNA samples from both species were sent to AllGenetics & Biology (A Coruña, Spain) for microsatellite development using high-throughput sequencing. As a result, 16 of the designed primer pairs were used to amplify polymorphic microsatellite loci in the two studied species using Type-it Multiplex PCR Master Mix (Qiagen, Antwerp, Belgium). Fragment lengths were analyzed by Macrogen Inc. on a ABI3730XL Genetic Analyzer, using GeneScan LIZ 600 size standard, and further scored using the microsatellite plugin of Geneious R11.

RESULTS

A total of 239 COI sequences were obtained from both species, and added to existing COI data (Baird *et al.* 2011). One haplotype of *Eusirus* sp. nov. can be found in all sampled regions, except for the Ross Sea.

It is not the case for *Eusirus perdentatus*, which presents no shared haplotypes between the Peninsula area and the Adélie Coast/Tressler Bank regions, with the Eastern Weddell Sea acting as a transitional area (**Fig. 2**).
F_{ST} values indicate significant differentiation between the Adélie Coast, Tressler Bank, the Eastern Weddell Sea and the Peninsula area populations.

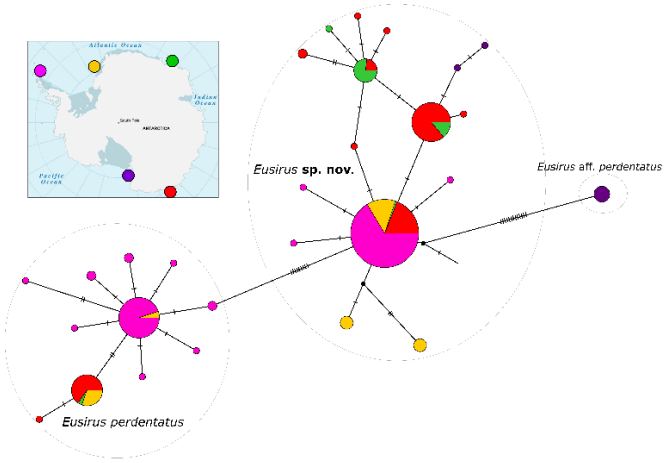
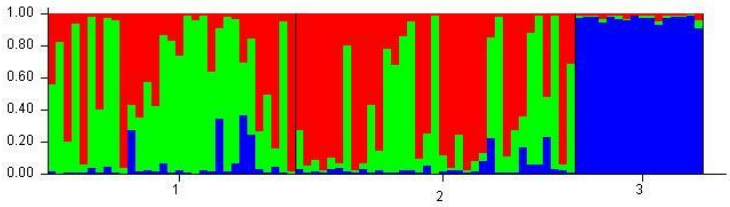


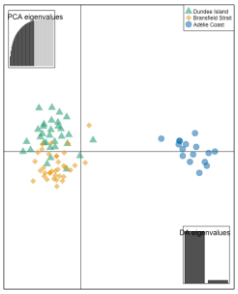
Figure 2. TCS haplotype network of the *E. perdentatus* complex.

A total of 82 specimens of *Eusirus perdentatus* from three locations (Dundee island, Bransfield Strait and Adélie Coast) were genotyped for the 16 microsatellite loci. For *Eusirus* sp. nov., a total of 154 individuals from six locations (Dundee island, 3 stations in the Bransfield Strait, Eastern Weddell Sea and Adélie Coast) were successfully genotyped. For both species, all analyses (F_{ST} values, DAPC scatterplots, membership analyses and structure plots) indicate genetic differentiation between the Adélie Coast individuals and all other populations (**Fig. 3**), which is however much higher in *E. perdentatus* (F_{ST} =20.07–22.7%) than in *E.* sp. nov. (F_{ST}=2.09–3.52%).

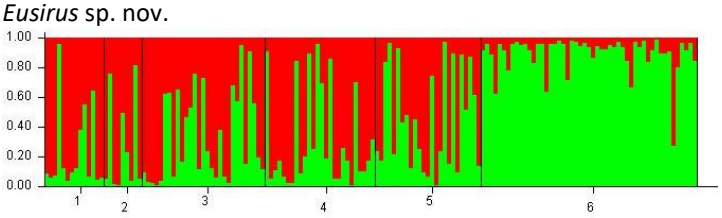
Eusirus perdentatus



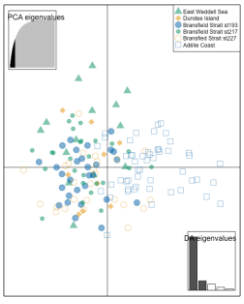
K = 3, (1) Dundee Island, (2) Bransfield Strait and (3) Adélie Coast.



Eusirus sp. nov.



K = 2, (1) East Weddell Sea, (2) Dundee Island, (3) Bransfield Strait st193, (4) Bransfield Strait st217, (5) Bransfield Strait st227 and (6) Adélie Coast.



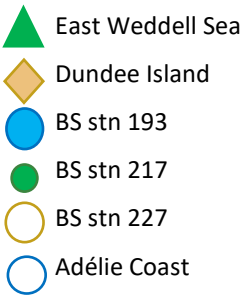


Figure 3. Structure plots (left) and DAPC plots (right) for *E. perdentatus* and *E.* sp. nov.

CONCLUSIONS AND PERSPECTIVES

Thanks to the Antarctic Science Bursary, which funded the microsatellite development and labwork, an extensive dataset composed of COI mt gene and 16 microsatellite loci was obtained for two sister species of the *Eusirus perdentatus* complex. Significant genetic differentiation was detected between the populations from distant regions (Peninsula, East Weddell Sea, Tressler Bank and Adélie Coast), which was found to be higher for *E. perdentatus* than for *E.* sp. nov. Whether such contrasting patterns between the two species could be related to ecological differences and/or differing demographic histories related to Plio-Pleistocene glacial cycles will be further investigated. This study will be the object of a peer-reviewed publication.