Protistan diversity along a transect across the South and North Atlantic Ocean exemplified by choanoflagellates (MSM82-2)

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BACKGROUND

Within marine habitats, unicellular eukaryotes (protists) are important components in ecosystem functioning as a major part of food-web dynamics [1]. Exemplified by studies from the Atlantic Ocean, only few approaches have been attempted to study the distribution [2] and diversity [3] of heterotrophic flagellates in the off-shelf waters. Most studies focused on neritic pelagic zones [4,5], which differ in their community composition compared to pelagic oceanic habitats. Supporting molecular metabarcoding approaches, cultivation-based studies are still of great necessity to create reliable data for reference databases and hence increase our knowledge on the ecological function of protists in marine ecosystems and refine biogeographical patterns by molecular and morphological characterization.

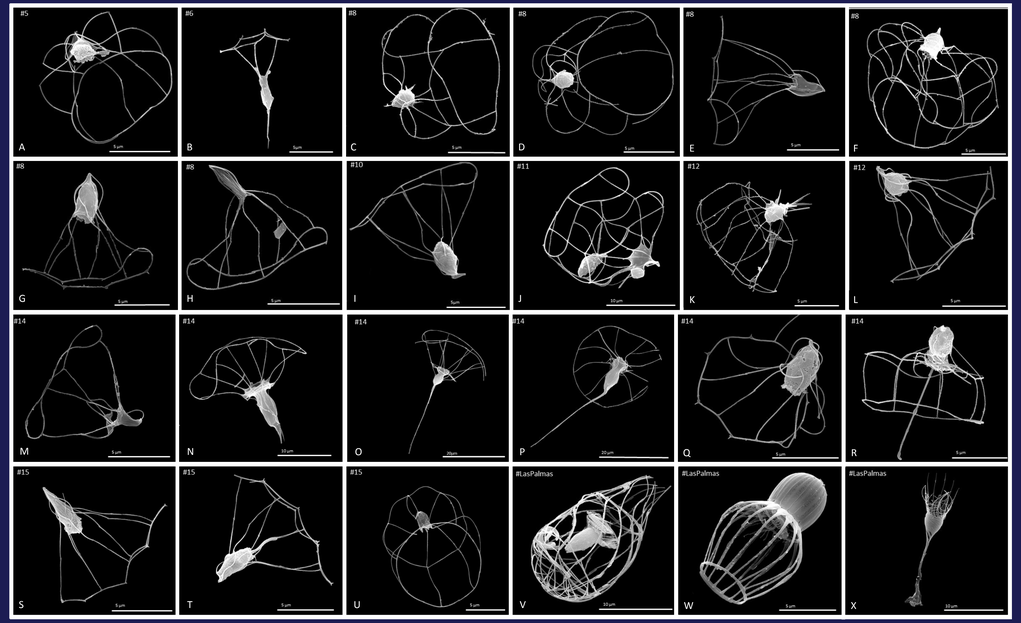

Fig. 2: Diversity of acanthoecid choanoflagellates along the transect: *Pleurasiga reynoldsii* (A, C, D, U), *Stephanacantha dichotoma* (B), *Pleurasiga echinocostata* (E, G, H), *Cosmoeca ventricosa* (F, J), *Parvicorbicula* sp. (I), *Cosmoeca takahashii* (K), *Stephanacantha* sp. (L, S, T), *Parvicorbicula zigzag* (M), *Parvicorbicula manubriata* (N), *Parvicorbicula socialis* (O, P), *Pleurasiga* sp. (Q, R), *Diaphanoeca grandis* (V), *Didymoeca costata* (W), *Acanthoeca spectabilis* (X). Scalebar in each image, '#' indicates sampling station.

MATERIAL AND METHODS

Surface water samples (5 L) were collected along a transect in sections of about 5° latitudes in the Atlantic Ocean during the cruise MSM82-2 (Fig. 1). On board, subsamples were transferred to 50 ml culture flasks filled with artificial seawater and sterile wheat grains as carbon source for bacterial growth. The culture flasks were regularly monitored with an inverted light microscope. Back in the laboratory, isolation was done by liquid aliquot method (LAM) [6]. Monoclonal cultures were transferred to culture flasks and further processed for molecular (transcriptome) and morphological analyses according to [7].

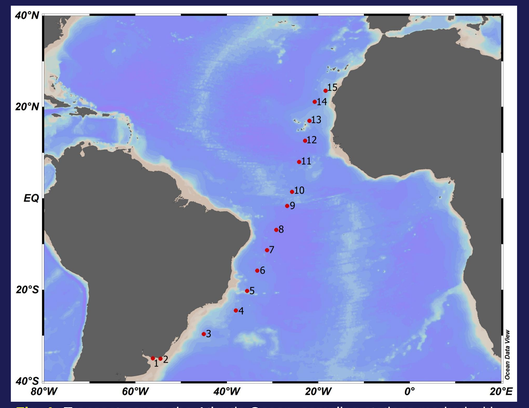

Fig. 1: Transcect across the Atlantic Ocean, sampling stations marked with a red dot. Map created with ODV [8].

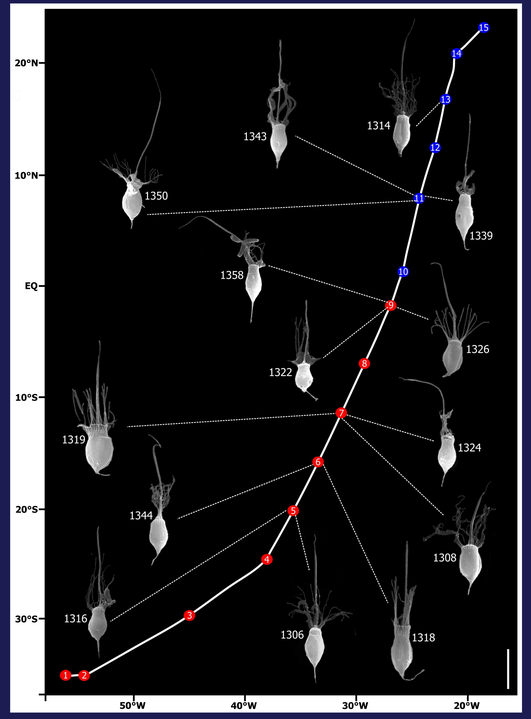

Fig. 3: Distribution of each morphotype cultured from craspedid strains of the genus *Hartaetosiga* along the transect.

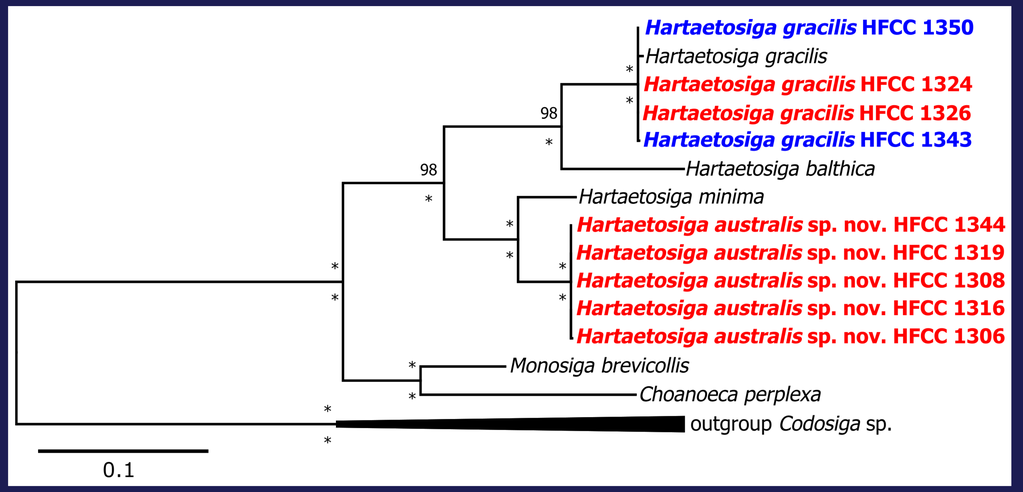

Fig. 4: Concatenated five-gene (SSU and LSU rDNA, hsp90, tubA, EFL) maximum likelihood phylogeny of the genus *Hartaetosiga* based on an unmasked alignment (11726 nt). Number of nucleotide substitutions per site defined by scale in the lower left. Support values for ML/BI given at each branch. 100 % ML bootstrap percentage support (mlBP) and 1.00 BI posterior probabilities (biPP) are denoted by a *. Otherwise, mlBP and biPP values are given at each branch respectively. Newly molecular described species/strains are marked by bold letters. Strains isolated from the Northern Hemisphere are displayed in blue, isolates from the Southern Hemisphere are displayed in red.

RESULTS AND DISCUSSION

We were able to record a high morphological diversity of acanthoecid choanoflagellates (Fig. 2) using scanning electron microscopy. We recorded acanthoecid species which were previously not reported from the off-shelf region of the Atlantic Ocean as well as morphotypes that cannot be assigned to any known loricate species, indicating a hidden diversity within this well-studied group of choanoflagellates. In addition, with a high isolation and cultivation effort, we enlarged the clade of the craspedid genus *Hartaetosiga* with several strains (Fig. 3,4), including a new species, *H. australis*. This new species was recorded only from sampling stations in the Southern Hemisphere, which may indicate a potential biogeographic distribution likely caused by the Equatorial Counter Current (ECC), dividing the northern and southern surface waters. Our data extends the dataset on biogeographic distribution patterns and provides further information on the dispersal potential for marine choanoflagellates.

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References

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