



## Morphology, morphogenesis, and molecular phylogeny of a new brackish water ciliate, *Pseudourostyla cristatoides* n. sp., from Songjiho lagoon on the coast of East Sea, South Korea

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### Abstract

A new brackish water urostyleid ciliate, *Pseudourostyla cristatoides* n. sp. was collected from Songjiho lagoon on the coast of East Sea, South Korea, and investigated based on morphology, morphogenesis, and 18S rRNA gene sequences. *Pseudourostyla cristatoides* is characterized by the following features: slender to elliptical body shape; colourless to dark grey in colour; size *in vivo* about 220–265 × 85–125 µm; flexible and slightly contractile body with narrowly spaced extrusomes (trichocyst type) throughout the whole cell; 2 contractile vacuoles on left side of cell at about 25% and 75% of body length; 84–115 adoral membranelles, 20–30 frontal cirri, 1 buccal cirrus, 2 frontoterminal cirri, 17–25 midventral pairs, 2 pretransverse, 6–12 transverse cirri, 5–7 left and 4–5 right marginal rows, and 10–13 dorsal kineties; 30–106 macronuclear nodules and 3–5 micronuclei; brackish habitat (salinity 3–5‰). This new species is very similar to *P. cristata*, but distinguished primarily by contractile vacuoles (2 vs. 1 in number; positioned 25%, 75% of body length vs. ahead of mid-body), dorsal kineties (10–13 vs. 8), hyaline layer underneath pellicle (inconspicuous vs. conspicuous), habitat (brackish vs. freshwater), and participation of posterior cirri of rear corona in fronto-ventral-transverse cirral anlagen (yes vs. no). Additionally, intra-/inter-specific pairwise genetic distances of the 18S rRNA gene sequences supported that the Songjiho population is a novel species (intra-specific distances of 0.07–0.12% among three *P. cristata* populations vs. inter-specific distances of 0.93–1.00% between *P. cristatoides* and three *P. cristata* populations).

**Key words.** *Pseudourostyla cristatoides*, brackish water ciliate, infraciliature, morphogenesis, 18S rRNA, phylogeny

### Introduction

The genus *Pseudourostyla* Borror, 1972 is mainly characterized by the continuous adoral zone of membranelles, frontal cirri arranged in the bicorona, midventral cirral pairs only, and 2 or more left and right marginal rows (Berger 2006). So far, five species have been assigned to this genus, all of which are limnetic or terrestrial (Berger 2006; Paiva & Silva-Neto 2006; Chen *et al.* 2010; Paiva *et al.* 2012). Recently, Kumar *et al.* (2010) reported that the marginal rows of *P. franzi* (now classified as *Hemicycliostyla*) do not originate from a common anlage during morphogenesis and this species likely belongs to another genus. Moreover, the phylogenetic analyses based on the 18S rRNA gene sequences did not support the monophyly of *P. cristata* and *P. franzi* (Chen *et al.* 2010; Yi & Song 2011). Paiva *et al.* (2012) subsequently transferred *P. franzi* as a member of the genus *Hemicycliostyla* with a redefinition of this genus.

The morphology, morphogenesis, and molecular characteristic of *Pseudourostyla cristata* (Jerka-Dziadosz, 1964) Borror, 1972, a type species of this genus, has been widely studied (Jerka-Dziadosz 1964, 1965, 1972; Borror 1972; ; Tchang *et al.* 1982; Grim & Manganaro 1985; Chen *et al.* 2010). The new species described in the present study belonging to *Pseudourostyla* is most similar to this type species.

The Songjiho lagoon is located on the eastern coast of South Korea (Lee & Yu 2011). Based on radiocarbon dating, the lagoon was formed ca. 7,800 years ago (Yum 2001). Coastal lagoons are transitional ecotones existing limnetic and oceanic environments that can contain both limnetic and brackish/marine ciliates. Thus, a diverse number of organisms may inhabit in this environment (Loreau & Mouquet 1999; Grinièné *et al.* 2011). Nevertheless, no studies on ciliates in this lagoon have been conducted.