



Two new sacoglossan sea slug species (Opisthobranchia, Gastropoda): *Ercolania annelyleorum* sp. nov. (Limapontioidea) and *Elysia asbecki* sp. nov. (Plakobranchoidea), with notes on anatomy, histology and biology

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Abstract

Two new sacoglossan species, belonging to the genus *Ercolania* Trinchese, 1872 (*Ercolania annelyleorum* sp. nov.) and the genus *Elysia* Risso, 1818 (*Elysia asbecki* sp. nov.) are described from Lizard Island, Great Barrier Reef, Australia. Anatomy of both species was reconstructed by analyzing histological serial sections. Radula morphology was investigated by using light microscopy and scanning electron microscopy. Sequence analyses (NeighborNet; sequence divergence) and tree reconstructions showed for both species their distinction from con-generic species, but also two distinct mitochondrial lines in the new *Ercolania* species.

Adults as well as freshly hatched juveniles of *E. annelyleorum* sp. nov. have been found in clusters of the ulvophycean alga *Boodlea* sp., which are sucked out by piercing the cell walls with their radular teeth. This new species differs from other, similar transparent, *Ercolania* species by its pattern of the green branches of the digestive gland and the presence of two distinct red patches, one in the anterior and the other in the posterior third of the dorsal body part. This coloration and furthermore the combination of following characters distinguishes the new species from all other described *Ercolania* species so far: rhinophores, elliptic in cross section, with one distinct branch of digestive gland running half way up; cerata not inflated; smooth cutting edge of sabot-shaped tooth; two-lobed prostate gland and presence of two allosperm receptacles with no re-opening of the receptaculum seminis to the outside. According to sequence divergence data of CO1, two mitochondrial lines seem to be present in the new species, which are clearly distinct from all other included *Ercolania* species.

Elysia asbecki sp. nov. differs from other *Elysia* species by its whitish coloration with orange and dark brown dots and a distinct lighter spot in the neck region of the head. The rhinophores exhibit a black and yellow ribbon at the tip. The species has distinct reddish patches at the anterior base of the parapodia (at the conjunction with the head), one along the middle part of the parapodial edge on both sides and very distinct lateral patches at the end of the foot. CO1 sequences clearly distinguish this species from all closely related *Elysia* species. The food source of *Elysia asbecki* sp. nov. could not be verified yet. Measurements of photosynthetic activity within these two new species indicate that *E. annelyleorum* sp. nov. digests chloroplasts immediately after sequestration, whereas *Elysia asbecki* sp. nov. shows high maximum quantum yield values, similar to *E. timida* (Risso, 1818) and *E. crispata* (Mørch, 1863), both known as long term retention forms.

Key words: Sacoglossa, new species, photosynthetic activity, DNA taxonomy, bar coding, phylogeny

Introduction

Only few gastropods have such a specialized feeding strategy like the opisthobranch taxon Sacoglossa. While feeding mainly on siphonous or siphonocladous algae, they pierce the algal cell wall and suck out their contents. Many of these slugs are cryptic by appearing as green as their algal food source, due to the sequestration of chloroplasts in the digestive gland system for some time. This probably has led to their