

International Conference on

# AQUACULTURE & MARINE BIOLOGY

June 25-27, 2018 | Rome, Italy

## External ultrastructure of *in vitro*-cultured *Perkinsus olseni* isolated from the Manila clam *Ruditapes philippinarum*

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**P**erkinsosis is a major disease affecting the commercially important marine mollusk *Ruditapes philippinarum* (Manila clam) worldwide. In this study, we reported the external ultrastructure of *Perkinsus olseni*, which were cultured under laboratory conditions during different stages of its life cycle. Prezoosporangia that were formed after induction with Ray's fluid thioglycollate medium developed into zoosporangia, following the development of a discharge apparatus ranging in length from 9.8 to 18.6  $\mu\text{m}$ . The discharge apparatus worked as a stopper and detached before zoospores were released. Biflagellated zoospores were ellipsoidal in shape ( $3.72 \times 2.04 \mu\text{m}$ ), with 2 flagella each; only the anterior flagellum had a unilateral array of

mastigonemes. Liberated zoospores gradually transformed into immature trophozoites by losing the anterior flagella first and the posterior flagella later. The transformation of zoospores into trophozoites took approximately 2 weeks at 26°C. Mature trophozoites underwent schizogony by cell cleavage, and numerous merozoites developed into schizonts and were finally released by the rupture of the cellular membrane of the schizont within a few days. Our ultrastructural study will be useful for understanding the life cycle and propagation of *P. olseni*, which will benefit aquaculture systems around the world.

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