

Effects of food and light on naupliar swimming behavior of *Apocyclops royi* and *Pseudodiaptomus annandalei* (Crustacea, Copepoda)

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Abstract We examined the effects of food and light on the swimming behavior of nauplii of the cyclopoid *Apocyclops royi* (Lindberg, 1940) (Copepoda: Cyclopoida) and the calanoid *Pseudodiaptomus annandalei* Sewell, 1919 (Copepoda: Calanoida). Several behavioral parameters such as swimming patterns, speed, and trajectories exhibited distinct ontogenetic differences between the two species. When algae *Isochrysis galbana* (Haptophyta: Isochrysidales) were offered as food to the nauplii of *A. royi*, they showed fast circle swimming behavior, while nauplii of *P. annandalei* never exhibited such behavior, neither with, nor without algae. The different behavioral patterns between the nauplii of both species

suggest they both have different foraging strategies in detecting and capturing food.

Keywords Copepod nauplii · Ontogenetic adaptations · Swimming behavior · Trajectories

Introduction

Copepod nauplii are food items of larval fish (Sundby & Fossum, 1990). The cyclopoid copepod *Apocyclops royi* Lindberg, 1940 and the calanoid copepod *Pseudodiaptomus annandalei* Sewell, 1919 which are studied here, are commonly used as live fish food and provide important species in warm water aquaculture (Lee, 2005). The copepodids and nauplii of *Pseudocalanus* spp. are found to be major prey in larval fish gut contents (Lough & Mountain, 1996). The first-feeding diet of Arcto-Norwegian cod larvae was found to be >90% nauplii of the calanoid *Calanus finmarchicus* (Sundby & Fossum, 1990). Copepod nauplii were also found to be important components of the diets of larvae of spot *Leiostomus xanthurus* (Govoni & Chester, 1990), redfish *Sebastes* spp. (Anderson, 1994), Arctic cod *Boreogadus saida*, and sand lance *Ammodytes* spp. (Fortier et al., 1995), walleye pollock *Theragra chalcogramma* (Hillgruber et al., 1995), Atlantic mackerel *Scomber scombrus* (Fortier & Villeneuve, 1996), and summer flounder *Paralichthys dentatus* (Grover, 1998). Ringuette et al. (2002) showed that *Calanus* nauplii were dominant

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