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Nyctiphanes simplex (Crustacea: Euphausiacea) temporal association among embryogenesis and early larval development with female molt and ovary cycles

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Embryogenesis (single cell to twitching stage) and early larval stages (nauplius to calyptopis 3) internal morphology of the sac-spawning species *Nyctiphanes simplex* was investigated to explore its temporal association with gonad development and molt development cycles. Krill were collected and incubated shipboard in July 2007 and March 2010 in the Gulf of California. Cleavage patterns were similar to what is observed in broadcast-spawning species, suggesting a close phylogenetic consistency between krill species with distinct spawning strategies. *Nyctiphanes simplex*, like broadcast-spawning krill species, had eight Kranzzellen (K1–K8) cells during the blastula stage. The gonad of ovigerous females with embryos in the cell division stage is in the multiplication stage (Stage I). From the nauplius stage, most females are in previtellogenesis (Stage II). Only females with metanauplii occasionally have gonads in vitellogenesis (Stage III). Gonad maturity (Stage IV) occurs only after the release of the embryos from the ovigerous sac. Females with an ovigerous sac were invariably at the intermolt stage, suggesting a precise synchronization among processes of molting, gonad development and embryo release to produce consecutive broods. Lipid and carbohydrate storage decreased exponentially throughout embryonic and early larval development, depending on their endogenous reserves. When metanauplii leave the ovigerous sac, they have low storage lipid (,2%) and carbohydrate (,5%). These proportions suggest a theoretically short period-of-no-return (,2 days), when they transform into the first feeding stage (calyptopis 1).

Palabras clave: *Nyctiphanes simplex*, gonad development, embryogenesis, early larval development, molting

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