

Gomez-Gutierrez, J., (2003).

Hatching mechanism and accelerated hatching of the eggs of a sac-spawning euphausiid

Nematoscelis difficilis

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Among 86 described species of euphausiids, 26 have a sac-spawning species in which the female attaches the eggs to the thoracic legs, the rest have a broadcast-spawning, releasing their eggs into the ocean (Mauchline and Fisher, 1969; Mauchline, 1980; Brinton et al., 2000). Little attention has been paid to early embryology, hatching mechanism or hatching success of sac-spawning euphausiid species. A recent study would be interesting to know more about egg release, hatching mode and brood care in the interpretation of the systematic relationships within Euphausiacea (Maas and Waloszek, 2001). Gomez-Gutierrez(2002) showed that three broadcast-spawning euphausiid species from the California Current System (CCS) display 3 different embryo hatching mechanisms (backward, forward and flipping) and that nauplius 2(N2), metanauplius (MN) and calytopis I (CI) stages may sometimes hatch from the egg, instead of the more usual nauplius I(NI). The interbrood period and spawning season duration of *N. difficilis* are unknown, it is not yet possible to estimate the lifespan fecundity. Accordingly, I report the hatching mechanism of N2, PMN and MN of *N. difficilis*. And, the comparison of a description of morphology between N2 of sac-spawning and broadcast-spawning species is provided to help in its identification in field studies.

Ovigerous females of *N. difficilis* were collected offshore at depths >200m, at 3 stations HH5 (440036N, 1250061W), CR4 (415598N, 1253102W) and ED3 (421502N, 1253987W) with a 1 m² MOCNESS net during Aug. 2002. The ovigerous females were transferred into 11 bottles of surface seawater and incubated on board inside a cold room 10 ±0.5 until several days after all the eggs hatched. If a female detached her ovigerous sac or her eggs hatched, she was removed from the bottle. Sacs were monitored every 2-4h until all larvae hatched. Development of the embryos after spawning was classified as proposed for several broadcast spawning euphausiid species. .

Embryos of *N. difficilis* usually hatch as pseudometanauplius (PMN) or metanauplius (MN). When ready to hatch, the PMN or MN embryos extend and contract their first and second antennae in swimming movement, breaking the chorion into almost equal halves joined by one small section in the anterior part of the chorion. The mandibles play a secondary role in cutting the chorion. Then the embryo pushes itself backwards with the first and second antennae to escape from the chorion. This is known as **'push-off' hatching**. The elapsed time from the first to last hatching for broods was <2.1h. Development time to the PMN at 10 was ~55-60h and to MN ~84h. Eggs of one brood of *N. difficilis* hatched backward at 47h as nauplius 2 (N2) rather than as PMN or MN. Therefore, a morphological description is provided of the free swimming *N. difficilis* N2. It is expected that *N. difficilis* N2 could be found in the ocean, a taxonomic complication for the identification of nauplii, and therefore a comparison is made with N2 stages of the most abundant broadcast-spawning euphausiid species (*E. pacifica*, *T. spinifera*, *T. inspinata*) in the same geographical range. Both sac-spawning and broadcast-spawning strategies in euphausiids have shown high flexibility in the hatching schedule. However, early hatching in sac-spawners and late hatching in broadcast-spawners are usually associated with low embryo hatching success.

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次回 (5/1) は山口先生と福井亮平君にお願いしています。