Early Development of *Mytilopsis leucophaeata*

(Bivalvia : Dreissenacea)

BY

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(1 Plate)

SEVERAL KEYS HAVE BEEN PUBLISHED for identification of bivalve larvae based on characters of the larval shell, or prodissoconch (CHANLEY & ANDREWS, 1971; LOOSANOFF, DAVIS & CHANLEY, 1966). However, none describe *Mytilopsis leucophaeata* (Conrad, 1831), an estuarine species distributed along the North American east coast from New York to Florida and from Texas to Mexico (ABBOTT, 1974; EMERSON & JACOBSON, 1977). The objective of the present study was to describe the development of larval and juvenile *M. leucophaeata.*

In early 1975, I monitored the abundance of bivalve larvae in a man-made embayment on Virginia Key, Miami, Florida, supporting a population of bivalves composed almost exclusively of *Mytilopsis leucophaeata.* No other adult bivalves were observed and greater than 99% of all larvae collected and reared through metamorphosis in the laboratory were later identified as *M. leucophaeata.* Natural (filamentous algae) and artificial (cotton thread) spat collectors were sampled for metamorphosing bivalves. Tidal flushing was restricted with salinities decreasing from 22‰ to 8‰ after late spring rains. Heaviest set of spat occurred two weeks after the onset of this annual rainy season. Temperatures varied from 13° C (January) to 30° C (July), averaging 26° C during spatfall. In the spring of 1976, sexually ripe adults exposed in the laboratory to 35° C seawater (10‰) for 20 minutes spawned within one hour of treatment. Larvae were reared through metamorphosis at three salinities (10, 24 and 32‰) using techniques commonly applied in the culture of bivalve larvae (LOOSANOFF & DAVIS, 1963). Serial samples of both naturally set larvae and juveniles (1975 material) and laboratory cultured larvae and juveniles (1976 material) were cleaned in a buffered sodium hypochlorite solution (see CARRIKER, 1979) then examined on an AMR-900 scanning electron microscope.

Though the effects of the three salinities were not significant on either the timing of, or the size at, metamorphosis ($P > 0.05$), it is interesting that these brackish water bivalve larvae were capable of growth to metamorphosis at near-oceanic salinities (32‰).

Characteristics of the hinge line are used to differentiate bivalve species both as larvae and adults (REES, 1950; LUTZ & JABLONSKI, 1978; SIDDALL, 1978). Serial development of the hinge line in *Mytilopsis leucophaeata* is shown in Figure *1*. Using the terminology of CHANLEY & ANDREWS (1971), *M. leucophaeata* develops "knobby"

Explanation of Figures *1* and *2*

Figure *1*: SEM photomicrographs of hinge lines of *Mytilopsis leucophaeata* at two times prior to metamorphosis: a) 2 days after fertilization (DAF); shell length = 74 μm; b) 6 DAF; shell length = 180 μm; and at three times subsequent to metamorphosis: c) 12 DAF: maximum shell dimension = 270 μm; d) 18 DAF: maximum shell dimension = 375 μm; e) 28 DAF: maximum shell dimension = 500 μm; showing shelf under the umbo

Figure *2*: SEM microphotograph of juvenile *Mytilopsis leucophaeata* (0.5 cm maximum dimension) (a) with pits randomly dispersed anterior to pallial line; and (b) a magnified view of pit (3 μm in diameter)

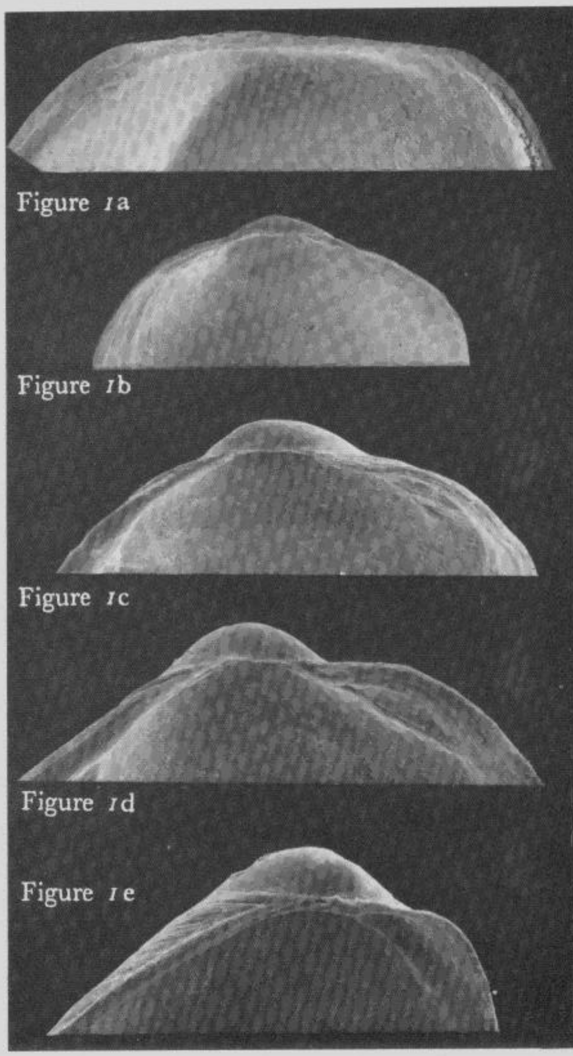

Figure 1a

Figure 1b

Figure 1c

Figure 1d

Figure 1e

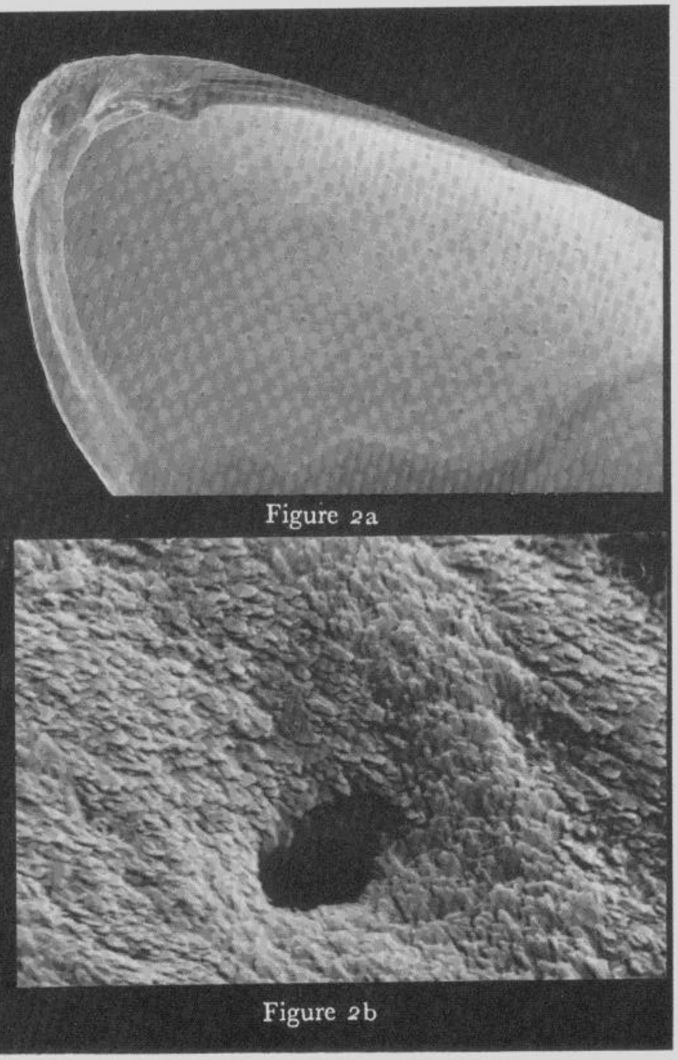

Figure 2a

Figure 2b

umbones which became "skewed" anteriorly following metamorphosis. At 26° C, larvae fed a mixed phytoplankton diet (*Isochrysis galbana*, *Monochrysis lutheri* and *Tetraselmis suecica*) metamorphosed 6 to 8 days after fertilization at a mean shell length (parallel to the hinge line) of 210 μm (n = 25). Neither larvae nor juveniles of *M. leucophaeata* possess hinge teeth at any stage. The "triangular tooth" referred to in ABBOTT's (1974) description of *M. leucophaeata* is a projection of the shelf near the beak, not to be confused with hinge teeth. Because the adult ligament is broad, the shell presumably does not require teeth for stabilization of the opening and closing motion of the valves. For the adult population sampled, mean maximum shell dimension was 2.2 cm (n = 125).

Figure 2 shows a typical juvenile (0.5 cm maximum shell dimension). Evenly dispersed and uniformly shaped tubules penetrate the inner calcareous crossed-lamellar layer typical of the Dreissenacea (KENNEDY, TAYLOR & HALL, 1969a). These tubules range in diameter from 3 to 5 μm and should not be confused with the very small tubule-like structures occurring in mytilids (an order of magnitude smaller). The tubules of *Mytilopsis leucophaeata* are uniformly distributed in, and restricted to, the older regions of the shell bounded by the pallial line. This distribution suggests a secondary origin for the tubules (KENNEDY, TAYLOR & HALL, 1969b). In their brief review of tubulate bivalve shells, KENNEDY *et al.* (1969b) state that these tubules penetrate the periostracum. Such was not the case in the material examined in the present study. The tubules of *M. leucophaeata* first appear in metamorphosed juveniles (0.5 mm maximum shell dimension) and are seen in individuals of all larger sizes.

To summarize:

(1) in the population of *Mytilopsis leucophaeata* studied, gamete release consistently occurred as salinities decreased during the annual rainy season;

(2) settlement of spat peaked 2 weeks after gamete release in natural populations; in the laboratory at 26° C, well fed larvae metamorphosed in 6 to 8 days;

(3) *Mytilopsis leucophaeata* larvae and post-larvae are euryhaline, capable of development to metamorphosis at 10 to 32‰;

(4) neither larvae nor older stages of *Mytilopsis leucophaeata* possess hinge teeth;

(5) shells of juvenile and older *Mytilopsis leucophaeata* are tubulate; tubules are restricted to the older shell regions bounded by the pallial line and do not penetrate the periostracum.

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