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## A Pictorial Record of the Hatching and Early Development of the Eulachon (*Thaleichthys pacificus*)

Eulachon (Columbia River smelt), *Thaleichthys pacificus*, contribute substantially to the commercial and sport fisheries of the lower Columbia River (Pruter, 1965). In 1969, the economic value of the sport fishery was estimated at \$570,000,<sup>1</sup> and commercial fishermen harvested 1,120,000 pounds at a return of over \$280,000. Eulachon provide the public with an easily accessible product for the dinner table during February and March. They are caught commercially in the mainstem river with gill nets, but commercial and sport fishermen alike are allowed to capture them with dip nets in the tributaries.

Mature three- and four-year-old eulachon enter the river in the late winter and early spring when water temperatures range from 4° to 10°C. From 7,000 to 31,000 eggs are laid by each female; spawning is at night. The eggs, which are about 1 mm in diameter, become attached to the substrate (usually to a grain of sand) by a delicate outer membrane that ruptures and forms an adherent peduncle.

Although some information has been compiled on the adult stage of the eulachon in the Columbia River (Smith and Saalfeld, 1955), little is known about the early life history and development of the egg and fry. This paper presents a pictorial record of the development and hatching of the egg.

### Procedure

Ripe eulachon were obtained from the Cowlitz River; eggs were fertilized in 250-ml beakers and then placed in covered incubation trays (Fig. 1). The bottoms of the trays were lined with a thin layer of fine sand and supplied with flowing water from the Columbia River. Temperature of the water used for incubation and hatching ranged from 6.5° to 9.0°C (Fig. 2).

A 35-mm camera mounted on a compound microscope was used to photograph the stages of development. Photographs were taken at an exposure time of 1/15 second and a magnification of 35X.

### Embryonic Development

The embryo follows a typical teleostean development. Three hr after fertilization, the blastodisc can be seen as a transparent yellow cap on the yolk (Fig. 3). At 30 hr

<sup>1</sup>Economic values and poundage of the commercial and sport fisheries were supplied by Clint Stockley, Washington Department of Fisheries, Vancouver.

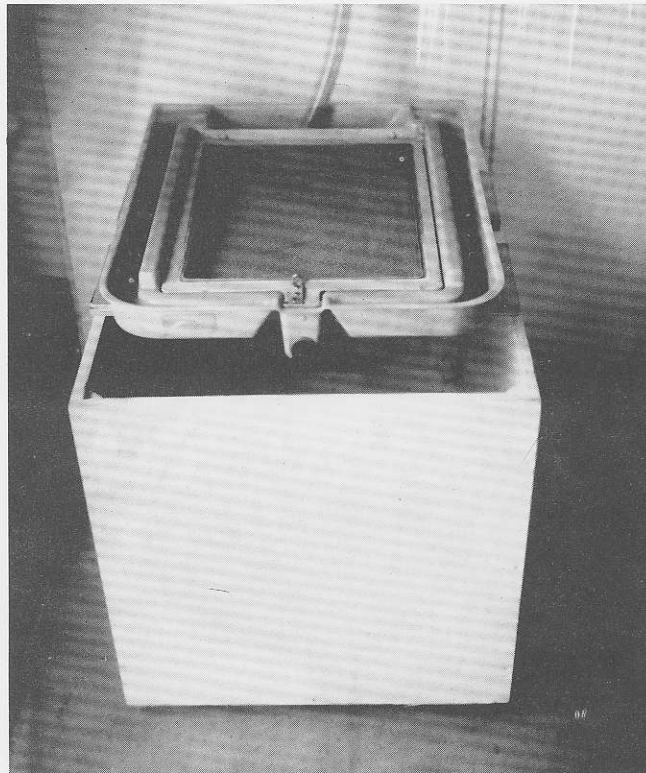


Figure 1. Incubation tray used for holding eggs.

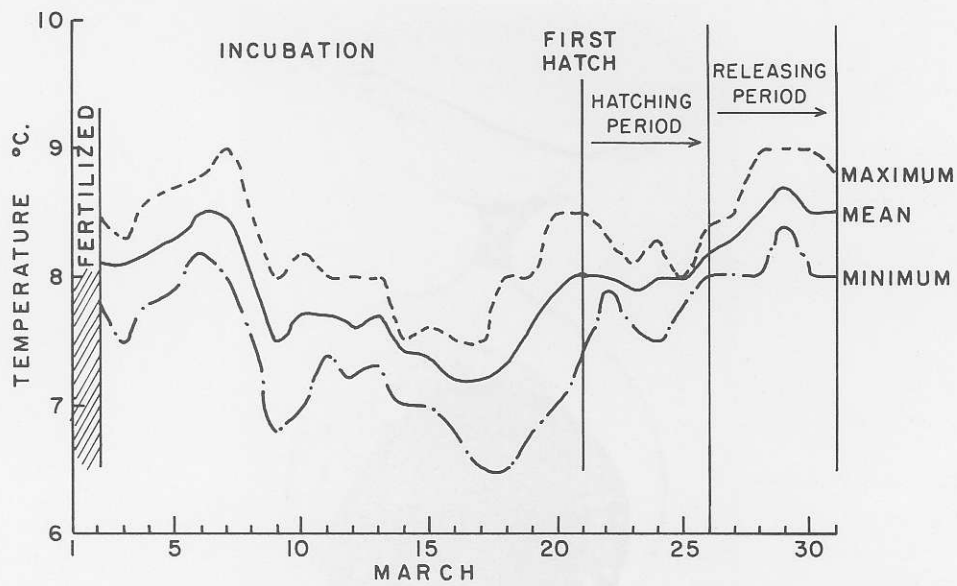
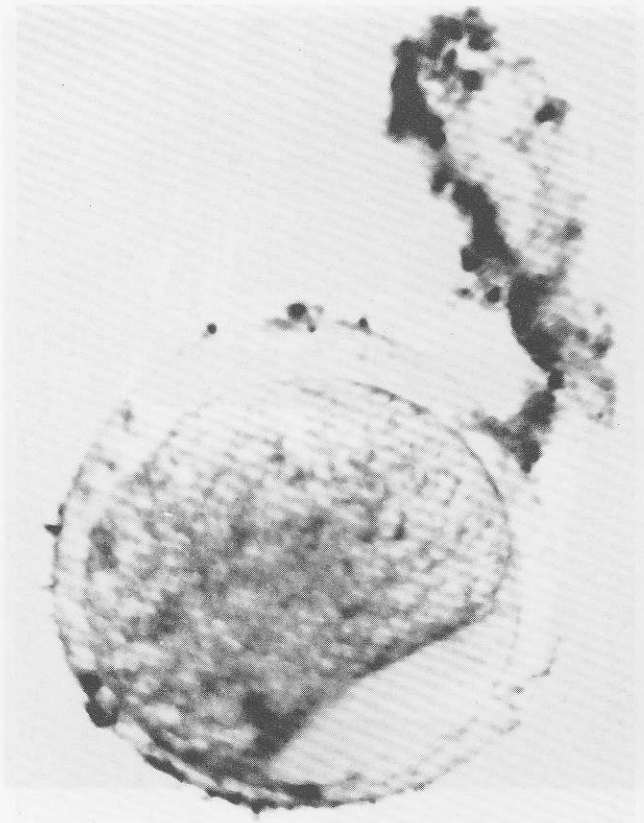
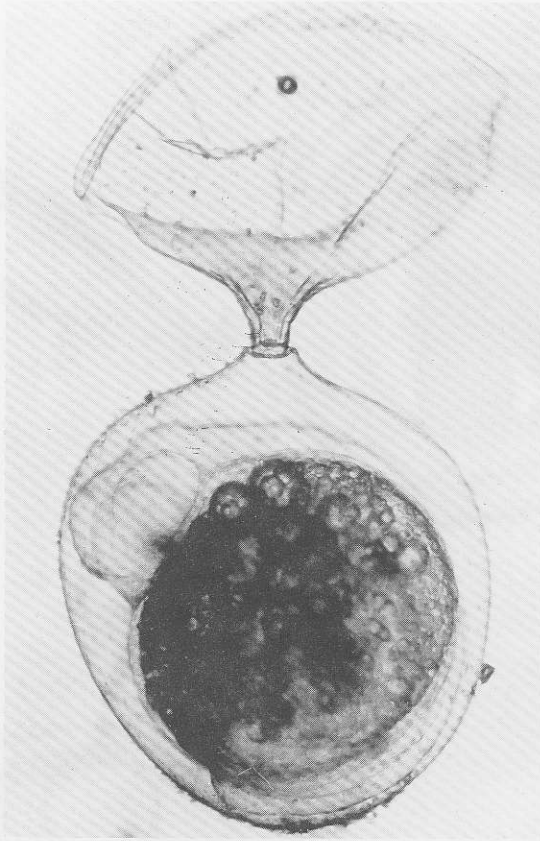


Figure 2. Daily maximum, minimum, and mean temperatures of water used in the incubation and hatching of eggs.

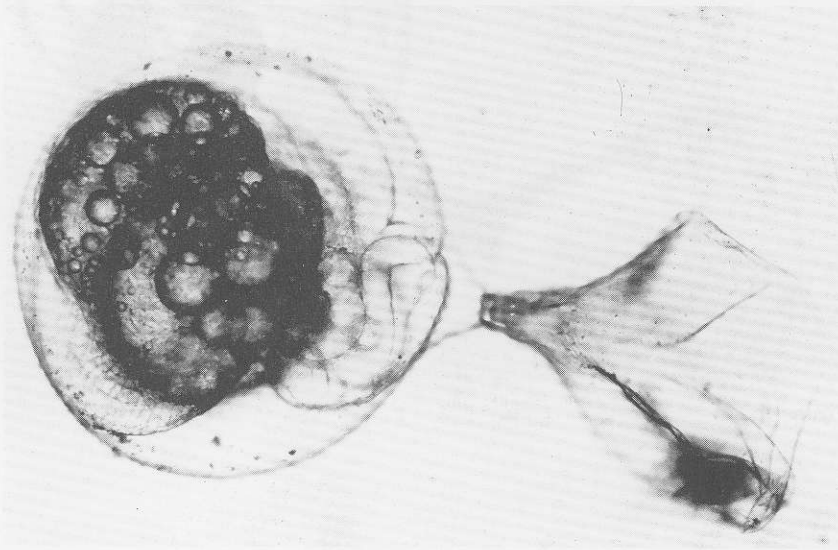


(Figure 3a.)

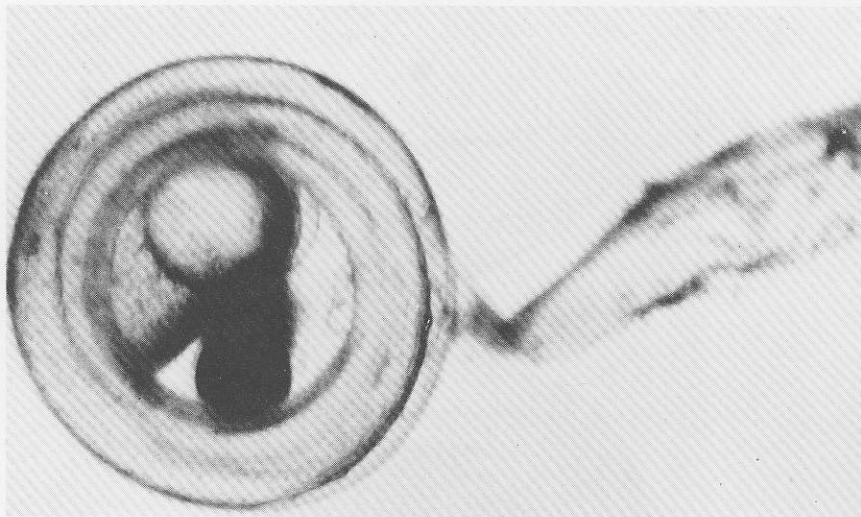


(Figure 3b.)

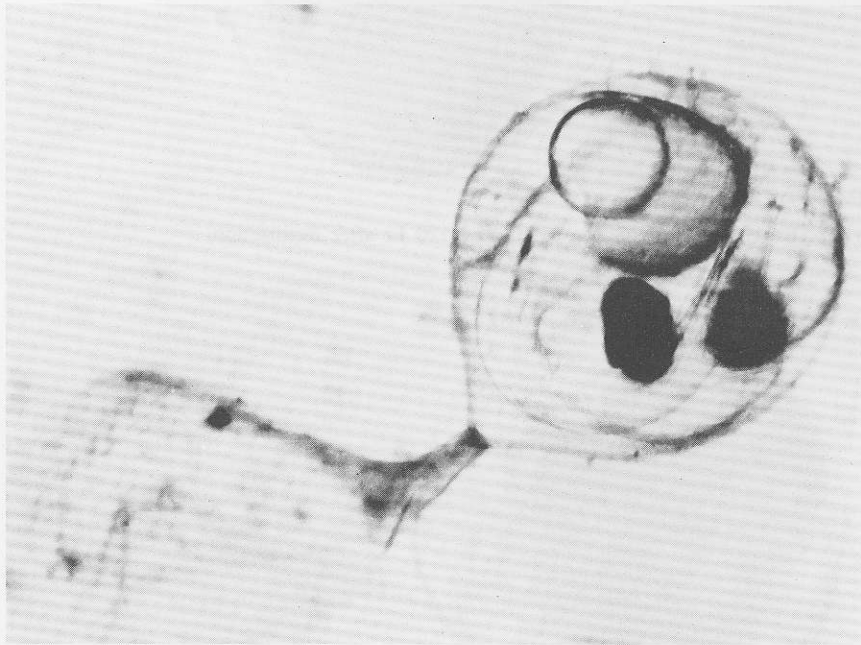
Figure 3. Development of an egg 3, 30, and 120 hr after fertilization.



(Figure 4a.)

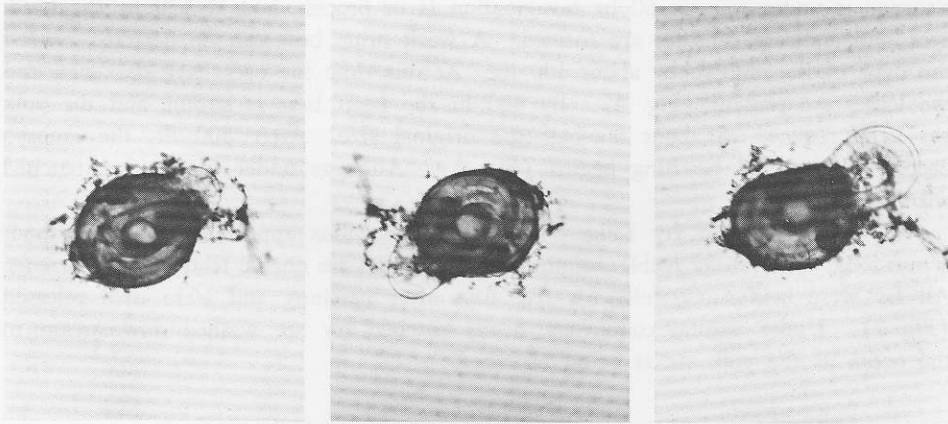


(Figure 4a.)

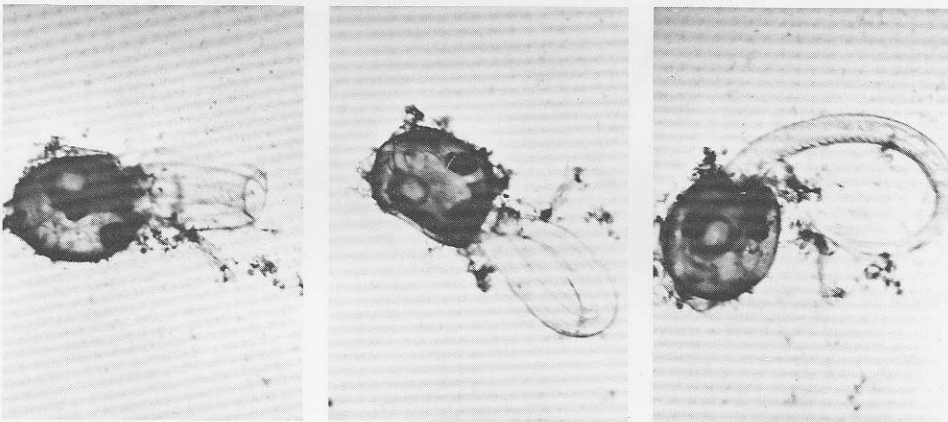


(Figure 4b.)

Figure 4. Development of the egg 300, 400, and 500 hr after fertilization.



(Figure 5a.)



(Figure 5b.)

Figure 5. Hatching sequence of a fry, 10, 20, 25, 30, 35, and 40 minutes after rupture of the membrane.

cleavage is under way, at 60 hr invagination is in process, and at 120 hr the head, eyes, and auditory capsules are formed. A weak heart beat can be detected behind the nape of the embryo by about 300 hr. At this time the eyes have darkened and the lenses are present (Fig. 4). By 400 hr the heart beat is strong, and the yolk has been reduced to about one-half the original size. After 500 hr, the embryo becomes active and hatching begins (Fig. 5). All eggs under observation hatched within five days.

The newly hatched fry (Fig. 6) have a diaphanous appearance and are about 4 mm long. They have feeble swimming motions and are unable to negotiate currents. All fry were held successfully for five days after hatching and were then released (Fig 7). Under natural conditions, newly hatched fry are washed downstream to the ocean as the yolk sac is being absorbed.

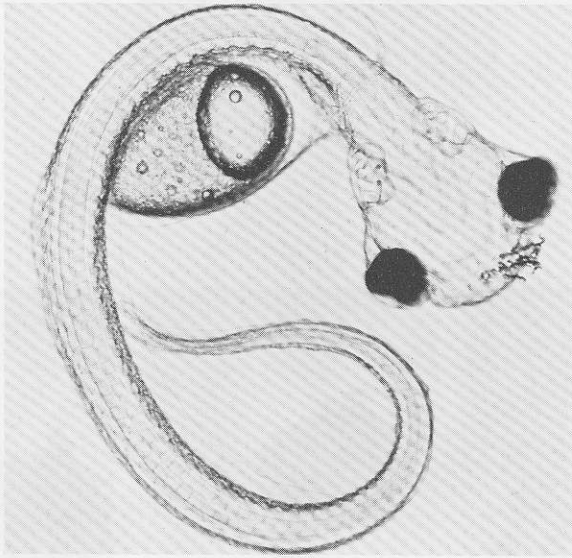


Figure 6. Newly hatched fry.

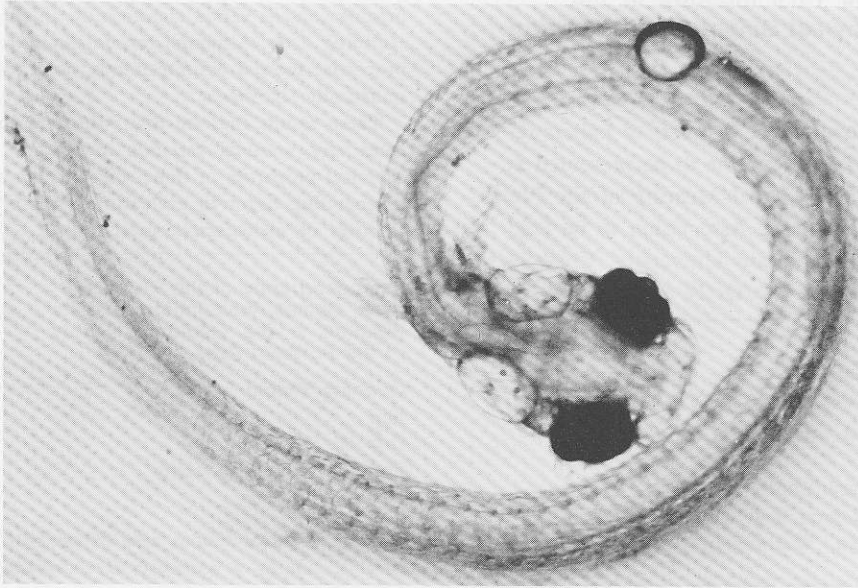


Figure 7. Five-day-old Eulachon fry.

#### Literature Cited

- Pruter, A. T. 1965. Commercial Fisheries of the Columbia River and Adjacent Ocean Waters. Bureau of Commercial Fisheries, Fishery Industrial Research, Vol. 3, No. 3. pp. 17-68.
- Smith, Wendell E. and Robert W. Saafeld. 1955. Studies on the Columbia River Smelt (*Thaleichthys pacificus*). Fish. Res. Papers, Wash. Dept. Fish. Vol. 1, No. 3. pp. 3-26.

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