Incubator Incorporating Air-powered Water Flow for Marine Fish Eggs

During 1978 to 1980, the Northwest and Alaska Fisheries Center, National Marine Fisheries Service, NOAA, investigated the early life history of species important to the recreational fisheries of Puget Sound. The laboratory phase of the program was carried out at the Manchester Field Station, Manchester, Washington. One of the target species, lingcod (*Ophiodon elongatus*), spawns a demersal egg mass with an average incubation period of 7 weeks (Miller and Geibel 1973). Portions of egg masses were collected in the field, brought into the laboratory, and incubated for use in a variety of embryological and larval investigations.

Experience in the laboratory has shown that adequate ventilation of adhesive eggs is necessary to assure proper embryo development. Among the criteria for the design of an incubation device for such eggs were that it must provide water flow velocities sufficient to thoroughly ventilate egg masses as large as 100 mL while avoiding undue agitation, and that it must operate in either open or closed systems and remain functional during pumping or power failures. (Since the air compressors at the Manchester field station are coupled with an auxillary propane-powered generator, uninterrupted service can continue during power failures.)

Incubators were constructed of clear acrylic tubing and sheeting, cemented with acetone. The major components of each incubator unit are a central chimney, which provides the airlift; two water intake chambers; and two incubator baskets which hold the eggs (Fig. 1). The chimney is fitted with a glass-bead airstone at its base and two intakes (180° apart) are connected to the chimney just below the airstone. Both the bottom and removable lid of the incubator baskets are fitted with Nitex cloth (mesh size, 500μm). The cloth is secured by a removable, tightly fitting ring on the inside diameter of both the top and bottom pieces (Fig. 2). A retainer ring fixed to the outer wall of the incubator basket supports it in the water intake chamber. When an air stream is introduced into the base of the chimney, water is drawn through the intake chambers and incubator baskets into the base of the chimney and flows out the top. The chimney and water intake chambers are glued to an acrylic sheet base and acrylic sheeting is secured between the chimney and intake chambers to provide additional support. Current velocities are regulated by adjusting the air flow. The incubators must be deployed in water at least deep enough to cover the top of the chimney.

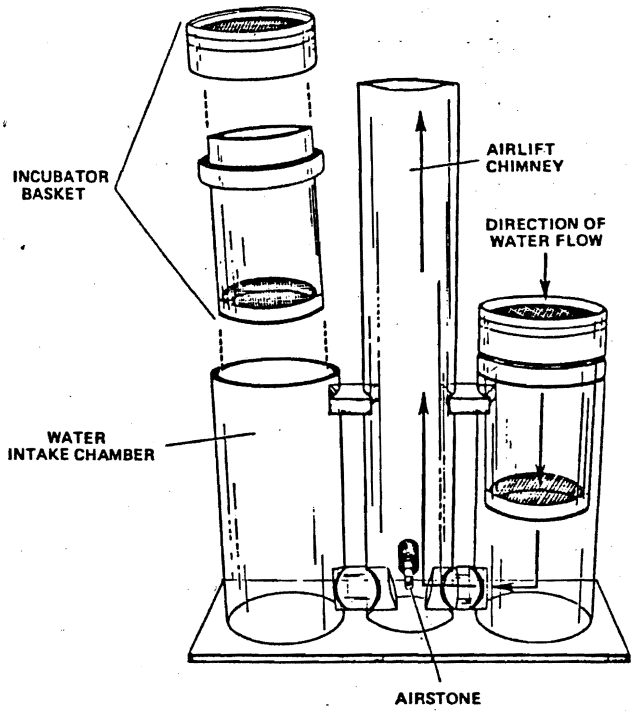

Fig. 1. Specifications for the airlift circulating incubator. Water intake chamber: 7 cm (OD), 3-mm sidewall, 15 cm high. Airlift chimney: 5.1 cm (OD), 3-mm sidewall, 30 cm high. A 2.5-cm (OD) port connects the chimney to the intake chambers, all of which are fixed to a base 24.0 X 9.5 cm and 6 mm thick.

The prototype of this incubator was constructed of polyvinyl chloride (PVC) pipe. If it is not necessary to monitor development visually, PVC may be more desirable than acrylic tubing, since it is easier to work with and is substantially less expensive. The incubators should be leached in water for not less than 3 days after the cement has cured, as a precaution against plasticizer toxicity.

Typically, hatching success of lingcod eggs incubated in this equipment was more than 90%. Several other species, including greenlings (*Hexagrammos* spp.), sailfin sculpin (*Nautichthys* spp.), cabezon (*Scorpaenichthys marmoratus*), tidepool sculpin (*Oligocottus maculosus*), and Pacific cod (*Gadus macrocepahalus*), have been hatched successfully in this incubator. This unit may also be suitable for incubating marine shrimp and crab eggs, as well as the adhesive

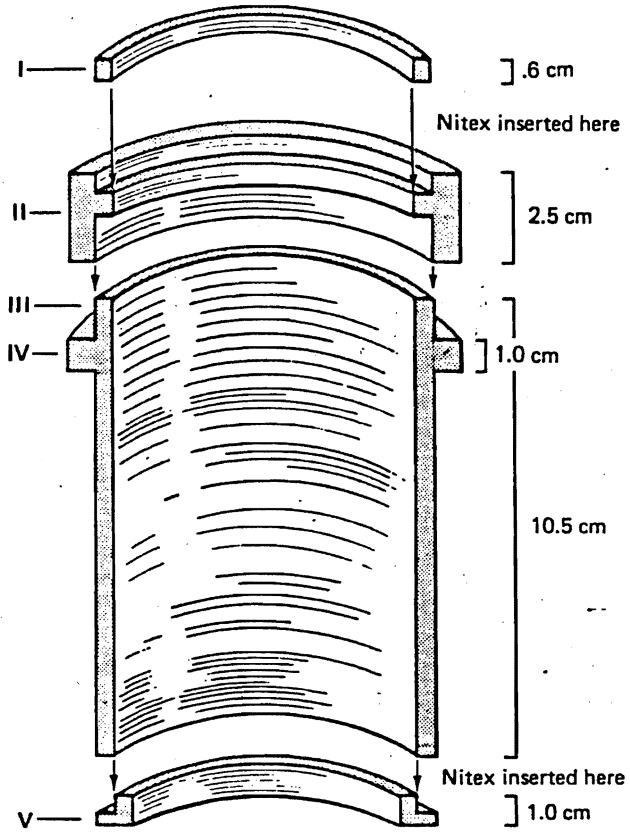

Fig. 2. Details of the incubator basket. Securement ring (I) for Nitex cloth: 6.5 cm (OD), 4-mm sidewall. Lid of incubator basket (II): 7 cm (OD), 6-cm sidewall, with the inside diameter milled to accept the securement ring and fit over the main body of the basket (III). Incubator basket (III): 6 cm (OD), 3-mm sidewall, 10.5 cm long. Retainer ring (IV): 7 cm (OD), 6-mm sidewall, with the ring milled to fit snuggly over the basket main body and cemented in place. Securement ring (V) for Nitex cloth bottom: 6 cm (OD), 6-mm sidewall, milled to fit securely into the bottom of the main body.

demersal eggs of freshwater fish species. The operational capability of this device in closed systems suggests it potential usefulness in toxicological investigations.

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Reference

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—Albert E. Giorgi, *Resource Ecology and Fisheries Management Division, Northwest and Alaska Fisheries Center, NOAA, 2725 Montlake Boulevard East, Seattle, Wash. 98112.*

Accepted 20 January 1982

Exposure of Largemouth Bass to Components of an Osmotic Infiltration Technique: Tolerance and Efficacy

When fishes are subjected to suboptimal environmental conditions, their natural resistance to disease may be significantly compromised. Bacterial epizootics in populations of susceptible fishes are common sequelae to stressful conditions. Treatment of bacterial disease in fishes may include removal or alteration of stressors and application of suitable antibacterial drugs. Although pathogens may be susceptible to various antibacterial drugs, the effectiveness of such drugs is transient and most have not been cleared for use in fish destined for human consumption.

Increased emphasis has recently been placed on the value of immunization as a preventive measure in the control of fish disease. Studies of the oral, parenteral, and infiltrative administration of antigens (vaccines) to fish have yielded inconsistent results. Oral immunization has not consistently produced high titers in young fish (Anderson and Nelson 1974; Klontz and Anderson

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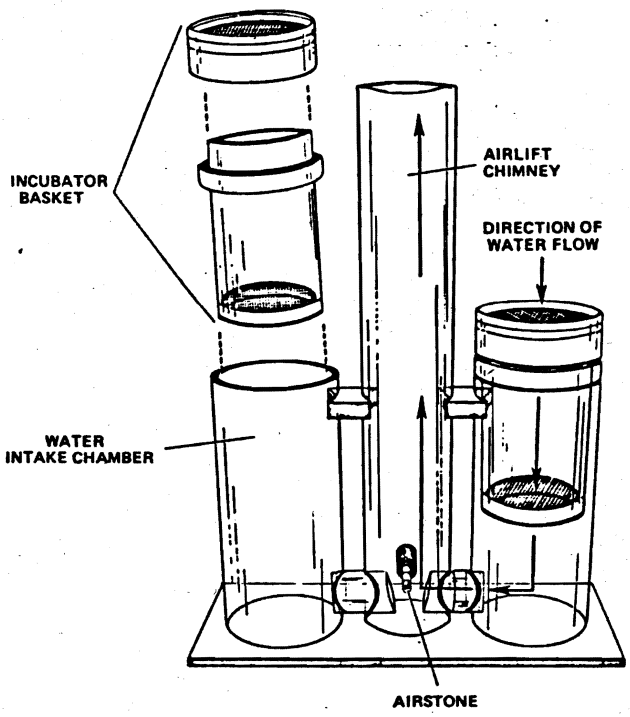

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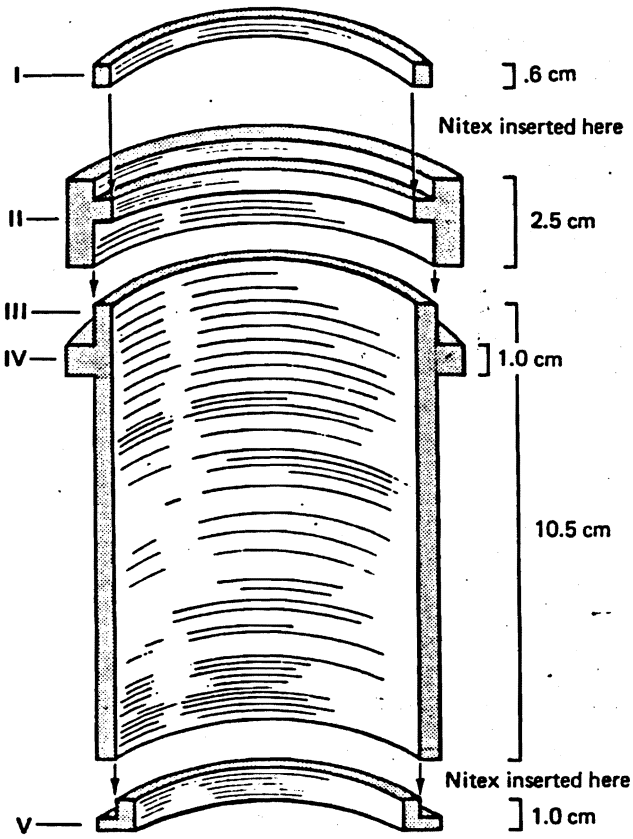

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