OYSTERS: Reattachment As Method of Rearing Cultchless Hatchery Oysters

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Cultchless European oysters, Ostrea edulis, were artificially reattached to asbestos-cement boards. After 4 months' submersion, the oysters showed growth rates and morphology superior to those of nearby tray-grown stocks; they demonstrated natural reattachment to the panels. Experiments were conducted to identify a suitable gluing technique to take advantage of this phenomenon and to investigate the potential for reattachment as a field-rearing technique.

The most significant development in oyster hatchery economics in recent years has been cultchless setting (Pacific Mariculture 1967, Long Island Oyster Farms 1970, Anon. 1969). Great efficiency is achieved in the juvenile phase by eliminating bulky cultch and oyster mortality due to crowding loss on cultch. However, the rearing of a free juvenile oyster to harvest has presented the industry with new problems. It may not be practical to place small free oysters directly on the bottom because of high loss due to siltation, movement by currents (MacKenzie 1970), and bottom-dwelling predators, especially blue crabs in the Chesapeake area (Edwin Powell). The traying of cultchless oysters to harvest may present economic problems due to the handling necessary to alleviate crowding and to control fouling organisms.

Rear Cultchless Oysters

An alternate approach is to rear cultchless oysters under controlled conditions to a size allowing efficient growth in the hatchery (approximately $\frac{1}{4}$") and then reattach the oysters to a substrate for placement in the field to harvest. Such a method would permit the efficiency of the hatchery cultchless operation; at the same time, it would allow optimal spatial distribution of oysters later in the field. This may provide conditions for maximum growth and desirable shell dimensions. A rearing system incorporating small flat panels as the substrate for reattachment offers potential for the mechanization of all necessary handling operations.

INITIAL EVALUATION

Experiments were begun in June 1971 to determine the biological response of oysters to reattachment and to identify a suitable artificial substrate and glue. Experimental work in developing and evaluating artificial cultch materials has identified asbestos-cement board as the most widely successful (Marshall 1970). Plastics coated with various materials have been tried as natural set collectors but, as yet, with no marked success. To evaluate asbestos board as a substrate for reattachment, 2' x 1' panels of $\frac{1}{4}$" material were cut. Six-month-old European oysters, Ostrea edulis, were attached at 3" spacings on both sides. Two types of glue were used, a 2-part epoxy compound (Polypoxy Underwater Patching) and a polysulfide-based calking material (Boatlife--Life Calk).

4 Months In Water

The panels were suspended vertically from a raft in a sheltered cove in Maine's Damariscotta River in June 1971. After 4 months in the water, they were removed for examination. A large proportion of the reattached oysters had fallen off. This indicated that the method of attachment was as yet unsatisfactory. The fault probably lay in insufficient drying time allowed for the glues before submersion. However, those that remained attached showed a very favorable response in several aspects. The reattached oysters responded to the substrate by depositing the new shell of the left valve in close

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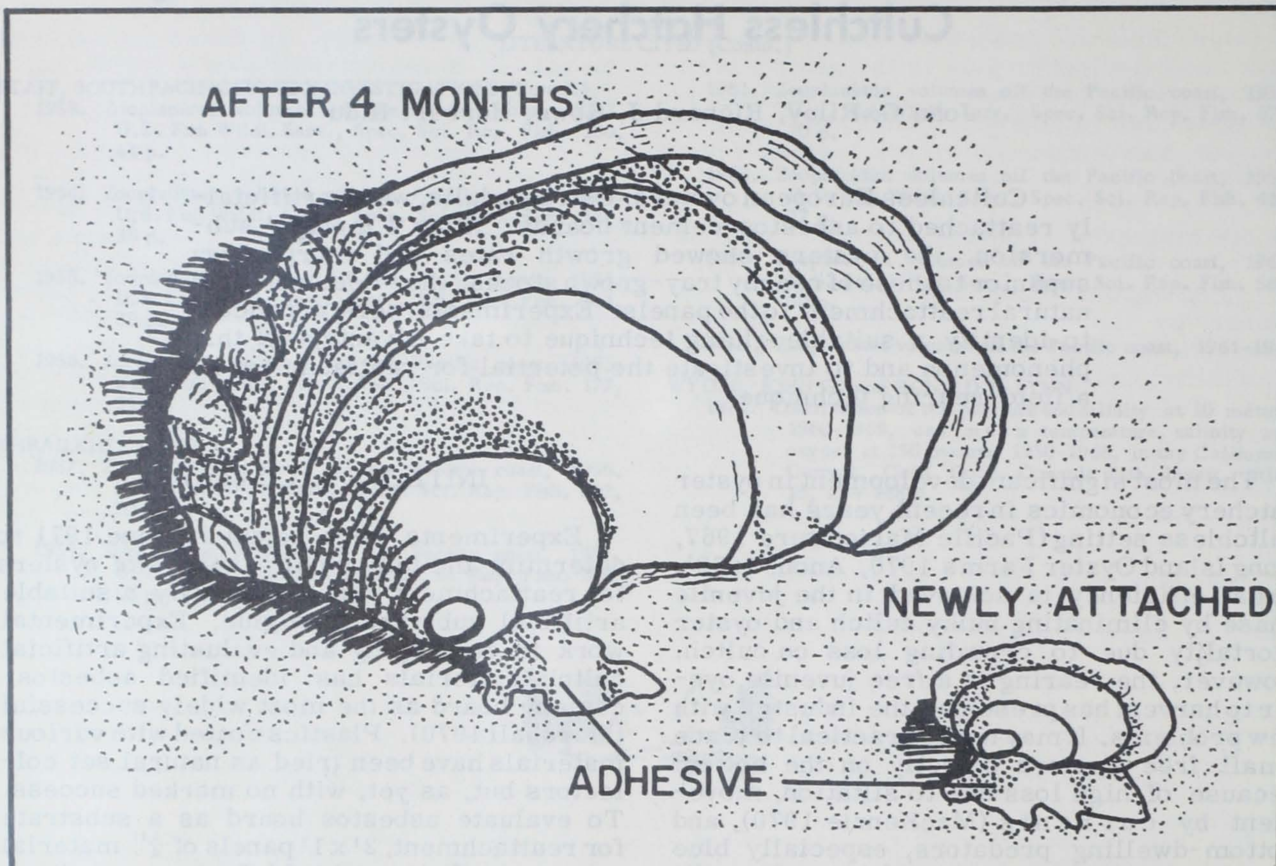

Growth response of the European oyster when attached to asbestos cement-board panel. New shell growth of the left value is tightly adhered to the flat surface around most of its margin.

proximity to the substrate. The result was that a very permanent new adhesive was formed that probably would be able to support the oyster in position to a harvestable size (Figure).

The oysters' growth rate exceeded rate of oysters in the laboratory or in nearby screened cages. Moreover, the attached oysters maintained a more symmetrical shell morphology. This has bearing on the ultimate sale price.

DEVELOPMENT OF GLUING TECHNIQUE

Despite the high losses due to falling off in the initial tests, the results were encouraging. A second pilot experiment was performed to find a suitable adhesive and method of applying it. In addition to the original two glues, we used a fiberglas resin (Valspar Super Iso-Resin) and a portland-cement-based waterproof patcher (Quick Plug, Reardon Co., Toms River, N.J. 08753). The adhesives were made up according to directions. The juvenile oysters were attached simply by putting spots of glue at 4" centers on each panel, and pressing the shell into the glue.

Variables other than different glues were investigated: (1) attachment by upper (right) valve or lower (left) valve, (2) drying oysters before gluing versus gluing wet, and (3) curing time for glue before submersion. After appropriate drying times, the panels were hung from raft as in first experiment.

Comparative Values of Glues

After two months in the water, the panels were removed and examined for loss through falling off and mortality of the reattached oysters. The fiberglas resin formed the strongest bond. However, it required that the oysters be dry before gluing; also, it necessitated several hours' curing time before submersion. A further fault lay in the fact that it was simple, using this low-viscocity resin, to glue together inadvertently the two valves of the oyster--thereby preventing opening. The Polypoxy Resin and the Life Calk gave a high incidence of falling off and proved messy to apply. The portland-cement Quick Plug yielded the best overall results. Besides giving zero mortality and zero loss due to falling off, it was nontoxic and took minimal drying time.

Using Portland Cement

Using the portland cement, juvenile oysters may be taken out of the water, glued in place on a panel, and the panel submerged immediately. It was not the strongest glue tested, but it is doubtful that any artificial glue used on the small oysters could maintain support for the 2 to 3 years necessary to harvest. All that is required is positioning of the juvenile until natural reattachment occurs--1 to 2 weeks under favorable growing conditions. Concerning orientation, during the few months of submersion, it appeared that growth rate and gluing success were equally good, whichever valve was attached; permanent natural reattachment was most apparent where the right valve was uppermost, as in Figure, but further investigation is required into this aspect.

CONCLUSIONS

The initial experiments indicated that reattachment is a technically feasible method, using asbestos-cement board as an artificial substrate, and a quick-drying portland cement as the gluing agent. Reattachment has potential as a means of rearing cultchless hatchery oysters. More extensive work is now in progress to evaluate the system quantitatively on a long-term basis, to determine the optimum spatial arrangement of the oysters on the panels and of the panels themselves, and to compare growth rate and survival to those of conventional rearing methods.

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