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ARTIFICIAL HYBRIDIZATION OF SOME ATHERINID FISHES.—The known examples of natural fish hybridization have recently been listed by Slastenenko (1957, *Publ. Hydrobiol. Res. Inst. Univ. Istanbul, 4 (Fasc. 2–3):76–97*) and the demonstrations of artificial hybridization were discussed in the light of their phyletic relationships by Hubbs and Drewry (1959. *Publ. Inst. Mar. Sci. Univ. Texas, 6:81–91*). Slastenenko listed 212 hybrid combinations of which only 30 are of marine or brackish water fishes.

Two natural hybrids have been reported in the family Atherinidae: *Chirostoma chapalae* Jordan and Snyder X *C. consocium* Jordan and Hubbs (Jordan and Hubbs, 1919. *Stanford Univ. Publ. Univ. Ser. 40:1–87*) and *Menidia menidia* (Linnaeus) X *M. beryllina* (Cope) reported by Gosline (1948, *Evolution 2:306–13*). Hubbs and Drewry also reported an artificially produced hybridization of a *Menidia beryllina* female X *Membras martinica* (Valenciennes) male, the first such intergeneric cross known for atherinids. This cross was repeated in this study.

The purpose of this paper is to report several other artificial intergeneric and interspecific crosses of atherinid fishes. These experiments were conducted at the Chesapeake Biological Laboratory, Solomons, Maryland, during the summer of 1959. The gametes utilized in all the crosses were artificially stripped from the adults; the embryos and larvae were reared in an identical fashion to that described by Rubinoff and Shaw (1960, *Am. Mus. Novitates, No. 1999:1–13*).

Hybridization experiments utilizing three species, *Menidia menidia, M. beryllina,* and *Membras martinica,* in various combinations, provided a wide range of results as indicated in Table 1. In some of the hybrid and control experiments there were examples of total mortality. In most cases the poor survival rates in the hybrids may be at-

TABLE 1.—ARTIFICIAL HYBRIDIZATION OF ATHERINID FISHES

		Began hatching (Days)	Days in hatching	Number of eggs	% Hatched	% Eggs surviving 14 days	% of Hatch surviving 14 days
	INTERGENERIC						
I	*Membras martinica* ♀ X *Menidia menidia* ♂	9	5	689	9	0*	0
II	*Menidia beryllina* ♀ X *Membras martinica* ♂	10	1	—	—	0	0
III	*Menidia menidia* ♀ X *Membras martinica* ♂	7	5	—	—	0	0
	INTERSPECIFIC						
IV	*Menidia beryllina* ♀ X *Menidia menidia* ♂	10	4	388	56	6	12
V	*Menidia beryllina* ♀ X *Menidia menidia* ♂	7	2	—	—	0	0
VI	*Menidia beryllina* ♀ X *Menidia menidia* ♂	10	6	406	86	23	27
	INTRASPECIFIC						
VII	*Membras martinica* ♀ X *Membras martinica* ♂	9	6	644	61	0	0
VIII	*Membras martinica* ♀ X *Membras martinica* ♂	9	3	1029	2	0	0
IX	*Menidia menidia* ♀ X *Menidia menidia* ♂	10	5	148	70	15	22
X	*Menidia menidia* ♀ X *Menidia menidia* ♂	8	3	600	26	2	6
XI	*Menidia beryllina* ♀ X *Menidia beryllina* ♂	12	1	72	17	0	0

* One fish in this group survived 14 days.

tributed to a poor physiological condition of the eggs when the experiments were begun since similar low survival rates were found in the intraspecific cross (control) embryos of *Menidia* and *Membras*. Many of the adult specimens of *Menidia* and *Membras* which were examined during the last two weeks of June and the first week of July had already spawned, indicating that their peak breeding season had already passed by the time these experiments were initiated. Occasionally complete embryonic mortality has also occurred when the gametes were obtained at the height of the breeding season. This uneveness of survival rates may be the result of a combination of factors which were not controlled. For example, the experiments were conducted at room temperature (22–27°C.) which may have fluctuated more than natural environmental conditions. In addi-

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tion, there was also the possibility that the somewhat protracted breeding season of these species was maintained by individual variations in the "ripening" process; the uneven results could then be attributed to the experimenter's random selection of individuals in different states of physiological preparedness for breeding.

One fish of an intergeneric combination did begin to feed and survived 14 days after hatching. This fish was, however, lost accidentally before it had transformed sufficiently to determine how it had inherited such striking morphological differences as the keel of scales along the medial fins of *Membras* which are absent in *Menidia*.

Another interesting feature of the development of these fish is the procedure of hatching. Members of the same spawning would hatch over a considerable range of days even though all the siblings had reached the same stage of morphological development prior to the beginning of hatching. There is apparently no correlation between this spread of hatching and conditions such as crowding, since sibling embryos reared in isolation also hatch over a similar extended period. This variation in hatching may be of some survival value to a species which lays eggs in areas frequently exposed at low tides. Under such conditions it would be advantageous to insure some of the embryos hatching at a time which would not lead to their immediate desiccation.

Although hybridization between the genera *Menidia* and *Membras* is experimentally possible and it is likely that the offspring of such crosses could be reared under optimum conditions, it is extremely improbable that such hybrids will be found to occur naturally. These species are separated by rather distinct ecological preferences. Both species of *Menidia* are considerably less pelagic than *Membras*. During this study no specimens of *Membras* were taken in seine hauls. They were usually caught when attracted to a night

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light immersed in water. They were taken in 15–20 feet of water while they were swimming toward the light from deeper water.

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