A PRELIMINARY LONGEVITY TEST OF BAÑGOS FRY IN STORAGE

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FOUR TEXT FIGURES

INTRODUCTION

The problem.—The improper handling of bañgos fry while in storage prior to stocking them in ponds has often resulted in tremendous mortality, due to overcrowding, unsuitable media used, and possibly other undetermined factors. Present practices of handling bañgos fry can be further improved through the study of these causative factors, especially in storage.

During recent years the bañgos fry catch has been fluctuating erratically so that sometimes severe shortages of fry supply have occurred, to the detriment of the bañgos fishpond industry. With the rapid increase in acreage of fishponds being developed throughout the Philippines coupled with the increasing application of improved technique in fishpond culture and management, there will be a consequent increase in demand for bañgos fry for stocking purposes. While opening of new fry fishing grounds might be necessary to cope with the ever-increasing demand of bañgos fry for stocking, the proper handling of bañgos fry catch from fry grounds would be a proper step in the maximum utilization and conservation of the bañgos fry fishery.

Object of the study.—The main object of the study is to find ways and means of reducing the mortality of fry while in storage prior to transit and/or stocking in ponds by the determination of the following possible causative factors: (1) The optimum volume of water required to hold a maximum number of fry in a standard earthen jar container; (2) the maximum number of fry that can be kept in storage; (3) the maximum number of days that the fry can be kept in storage before stocking; (4) the best water medium for storing fry; and (5) other factors contributing to the mortality of fry in storage.

Time and place of the study.—The study was conducted in Barrio Aplaya, Bauan, Batangas Province, close to the fry grounds of Batangas Bay, from April, 1944 to July, 1944, inclusive. The experiments were conducted in connection with

the bangos fry procurement and distribution program of the defunct Fish Culture Federation of the Philippines of the Bureau of Fisheries.

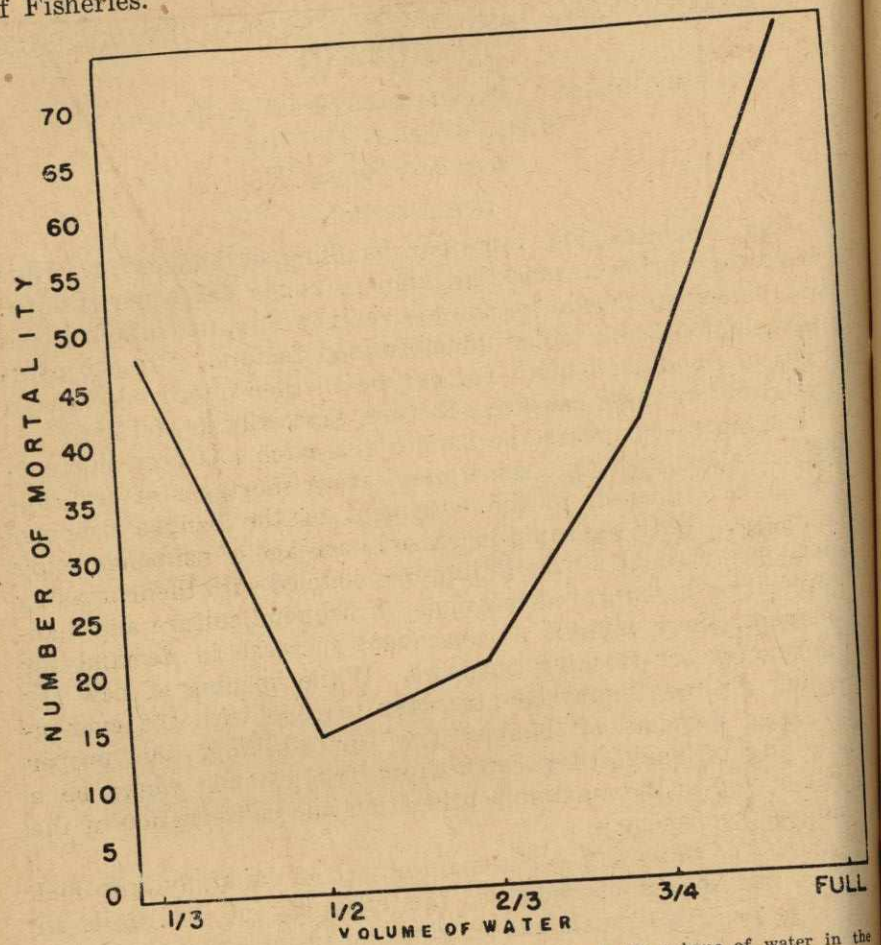

FIG. 1. Showing mortality rate of bangos fry in relation to the volume of water in the storage container.

MATERIALS AND METHODS

In the different experiments undertaken, the materials and equipment used include: (1) standard earthen jars (*palayok*, approximately 20-liter capacity); (2) a set of collecting net (*panagap*) for catching bangos fry; (3) bamboo pipettes for the removal of dead fry and foreign matters collected at the bottom of the experimental jars; (4) centigrade thermometer; (5) hydrometer; (6) salometer; (7) *sinamay* cloth for covering the experimental jars; (8) one binocular microscope; and

(9) petri dishes and dissecting needles for counting the number of dead fry in the experimental jars.

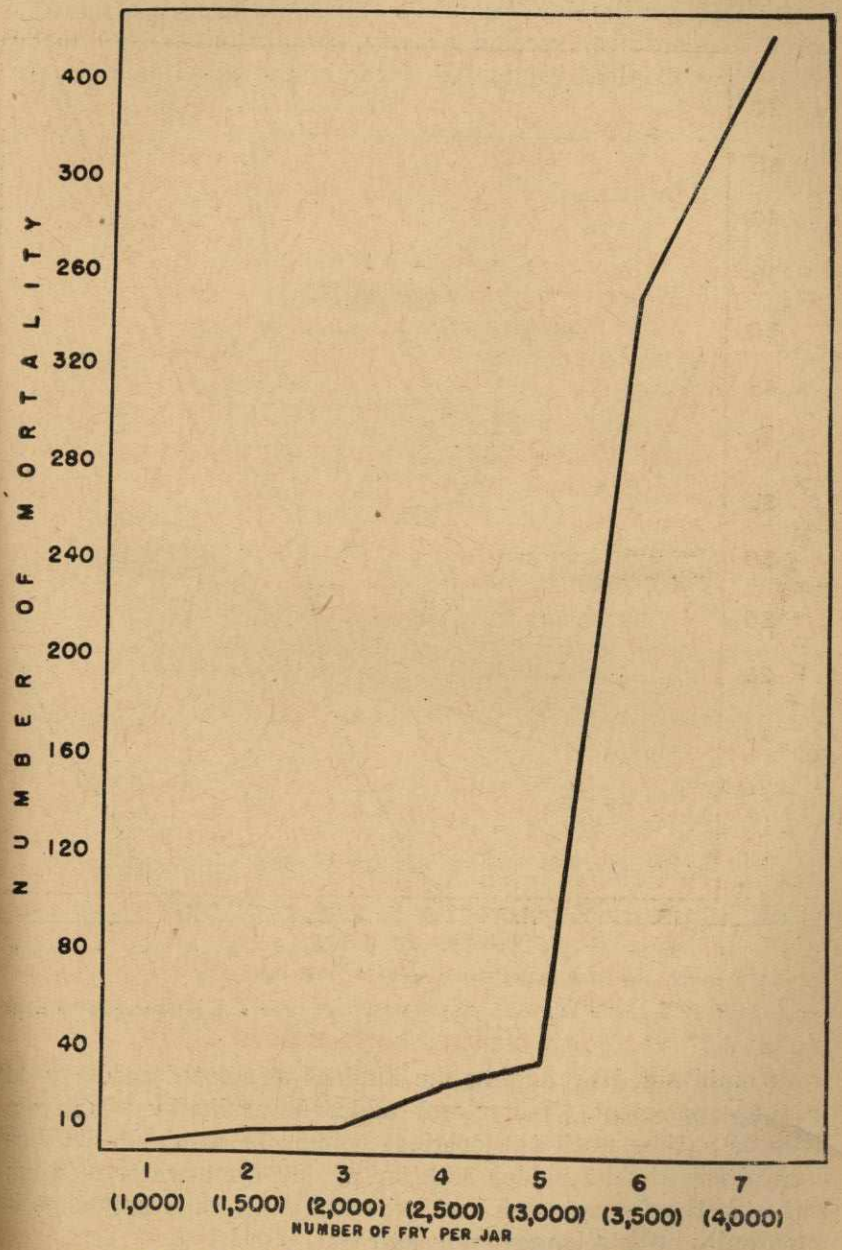

FIG. 2. Showing the optimum number of bangos fry for storage.

The bangos fry used in the experiments were freshly collected from the nearby fry grounds, selecting only those that looked strong and healthy for the study. Observations on mortality, water temperature, specific gravity, and salinity were made daily. The original volume of water in the experimental jars

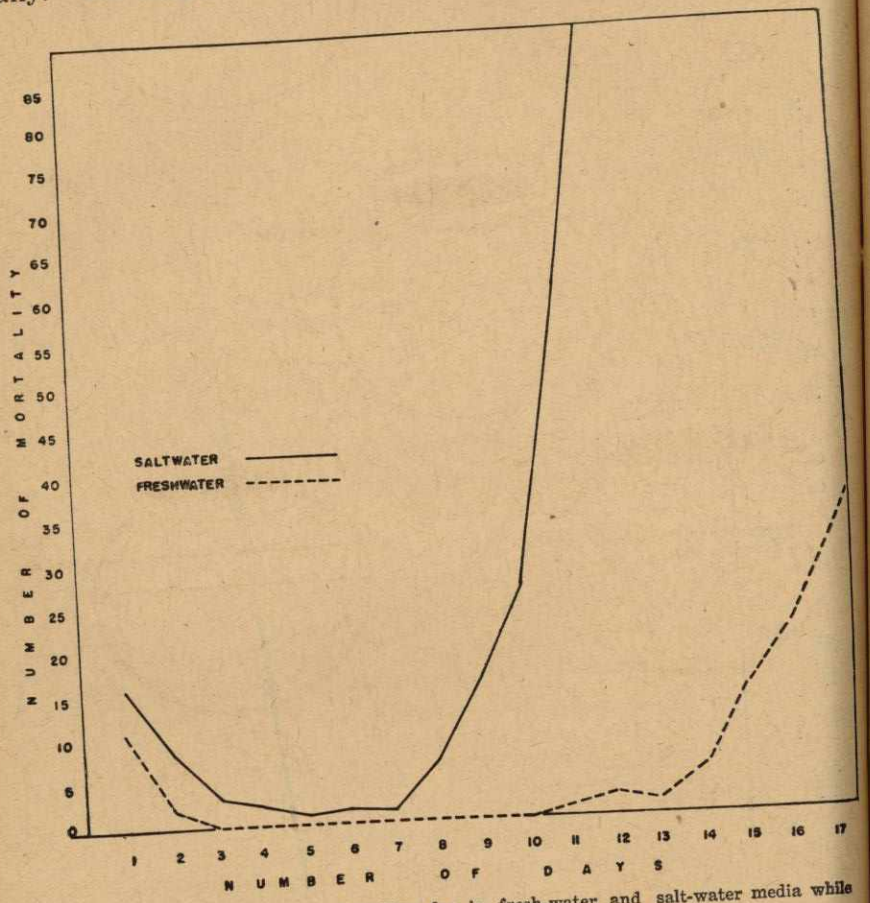

FIG. 3. Showing mortality rate of bangos fry in fresh-water and salt-water media while in storage.

were maintained by adding the kind of stipulated media used in the experiment. Water was added carefully by pouring a little at a time until the original volume is obtained. It has been observed that sudden addition of any fresh-water medium activates the fry so much and exhausts them physically that it apparently affects longevity in storage.

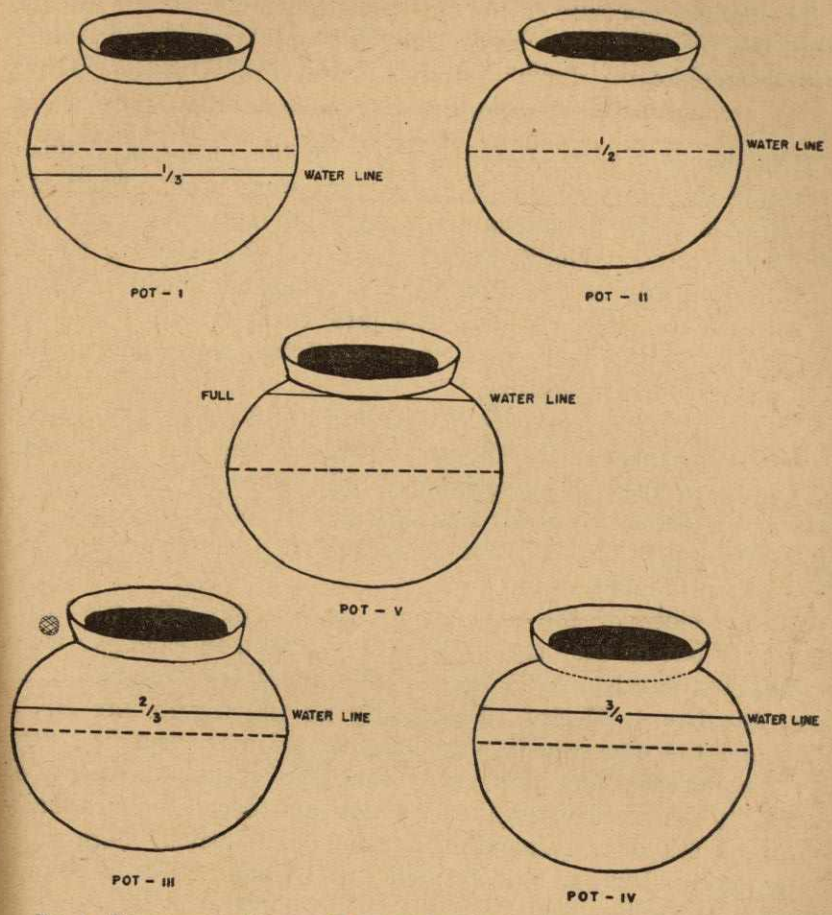

FIG. 4. Diagrammatic illustration how jars were filled with water for fry storage.

In all the experiments undertaken no artificial feeding or aeration was provided for the bangos fry in storage, and handling, as used by the commercial bangos fry dealers, was adopted.

DISCUSSION OF RESULTS

Experiment No. 1—Determination of the optimum volume of water in storage.—Five earthen jars were used. Each jar was filled with fresh sea water in the following proportion: Jar No. 1, ⅓ full; Jar No. 2, ½ full; Jar No. 3, ⅔ full; Jar No. 4, ¾ full; and Jar No. 5, full. Three thousand freshly caught fry were placed in each jar. The jars, covered with fine sinamay cloth, were kept in a well-ventilated storeroom under ordinary room temperature.

Results of Experiment No. 1.—Tables 1 and 3 show the results of this experiment. On the second day of the fry in storage, mortality in the five experimental jars were as follows: Jar No. 1 (⅓ full), 37 dead; Jar No. 2 (½ full), 10 dead; Jar No. 3 (⅔ full), 37 dead; Jar No. 4 (¾ full), 28 dead; and Jar No. 5 (full), 2,500 dead.

At the close of the experiment, on the 6th day, the total mortality out of the original 3,000 fry placed in each jar were as follows: Jar No. 1, 55 fry; Jar No. 2, 14 fry; Jar No. 3, 20 fry; Jar No. 4, 51 fry. Practically all the fry in Jar No. 5 died and the experiment was discontinued after the first day. It is apparent from this study that the greatest number of mortality occurred after the first day and decreased gradually until the 6th day. Except in Jar No. 5, relatively high mortality occurred in Jar Nos. 1 and 4 with 37 and 28 deaths respectively. Mortality may be attributed to overcrowding in Jar No. 1 which was ⅓ full and a limited air space in Jar No. 4 which was ¾ full. Relatively high maximum survival occurred in Jar No. 2 (½ full) and Jar No. 3 which was ⅔ full because of the ample air space provided. It was also observed that when the fry were newly introduced into the jars they tried to concentrate on the surface of the water to gasp for air.

Experiment No. 2.—Determination of maximum number of fry that can be economically kept in storage in a standard earthen jar.—Seven jars were used in this study and each was half filled with water. The number of fry placed in each jar was as follows: Jar No. 1—1,000 fry; Jar No. 2—1,500 fry; Jar No. 3—2,000 fry; Jar No. 4—2,500 fry; Jar No. 5—3,000 fry; Jar No. 6—3,500; and, Jar No. 7—4,000 fry. After covering them with sinamay cloth, the jars were placed in a well ventilated storeroom. This experiment was carried on for five days.

TABLE 1.—*Volume of water in relation to the conventional number (3,000) of fry used in storage.*

The medium used is sea water—Specific Gravity—1.018

June 1944		1/3 Jar 1		1/2 Jar 2		2/3 Jar 3		3/4 Jar 4		Full Jar 5	
Date	Time	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.
		°C.		°C.		°C.		°C.		°C.	
10	3:00 P.M.	30.0	------	30.0	------	30.2	------	30.0	------	------	------
11	8:00 A.M.	26.2	37	26.5	10	26.3	13	26.5	28	26	2,000
12	2:00 P.M.	28.5	------	28.5	------	28.5	------	28.5	------	------	------
13	3:00 P.M.	28.0	6	28.0	3	28.0	7	28.0	12	------	------
14	8:00 A.M.	26.0	9	26.0	------	26.0	------	26.0	7	------	------
		26.0	3	26.0	1	26.0	------	26.0	4	------	------
Total mortality		------	55	------	14	------	20	------	51	------	------

Note: Although the fry used in Jar 5 were of the same hatch with the fry used in the other jars, the observation was started in the following morning to allow the temperature of the medium to lower. The observation was stopped after 3 hours as most of the fry were dying.

TABLE 2.—*Number of fry in relation to a definite volume of water.*

Medium used—sea water—Specific Gravity—1.018

June 1944		Jar 1 1,000 fry		Jar 2 1,500 fry		Jar 3 2,500 fry		Jar 4 2,500 fry	
Date	Time	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.
		°C		°C		°C		°C	
5	8:00 A.M. -	26	------	26	------	26	------	26	------
	2:00 P.M. -	28	------	28	------	28.2	2	28	6
6	8:00 A.M. -	26	------	26	------	26	2	26	6
	2:00 P.M. -	28	3	28	------	28	------	28	------
7	8:00 A.M. -	26	------	26	------	26	3	26	7
	2:00 P.M. -	28	------	28	------	28	------	28	------
8	8:00 A.M. -	26	------	26	4	26	1	26	6
	2:00 P.M. -	28	------	28	------	28	------	28	------
9	8:00 P.M. -	26	------	26	1	26	------	26	2
Total mortality		------	3	------	5	------	8	------	27

June 1944		Jar 5 3,000 fry		Jar 6 3,500 fry		Jar 7 4,000 fry	
Date	Time	Temp.	Mort.	Temp.	Mort.	Temp.	Mort.
		°C		°C		°C	
5	8:00 A.M.	26	------	26	------	26	------
	2:00 P.M.	28	13	28	20	28	43
6	8:00 A.M.	26	12	26	204	26	356
	2:00 P.M.	28	------	28	------	28	------
7	8:00 A.M.	26	5	26	12	26	17
	2:00 P.M.	28	------	28	------	28	------
8	8:00 A.M.	26	5	26	7	26	7
	2:00 P.M.	28	------	28	------	28	------
9	8:00 A.M.	26	------	26	2	26	3
Total mortality		------	35	------	245	------	426

TABLE 3*a*.—*Kind of medium in relation to the number of mortality in storage.*

Day	Seawater		Freshwater (artesian well)		Rainwater [a]	
	Mortality	Temperature	Mortality	Temperature	Mortality	Temperature
		°C.		°C.		°C.
						25.8
1st	20	26.0	12	27.0		
2nd	10	26.5	3	26.0		
3rd	2	26.0		26.0		
4th		26.5		25.6		
5th		26.0		26.0		
6th		26.0		26.0		
7th	2	26.5		27.0		
8th	4	26.0		26.0		
9th	7	26.0		26.0		
10th	21	26.0		26.0		
11th	50	26.0		26.0		
12th	Plenty					

[a] Observation on jar with rain water was stopped after 15 minutes because most of the fry dropped dead at the bottom of the container.

TABLE 3*b*.—*Kind of medium in relation to the number of mortality in storage.*

Specific gravity of sea water—1.018

Day	Sea water		Fresh water (artesian well)		Total mortality
	Mortality	Temperature	Mortality	Temperature	
		°C.		°C.	
	12	27.0	10	27.0	22
1st	6	25.9		26.0	6
2nd	3	26.5		26.0	3
3rd	4	25.5		25.5	4
4th	3	26.0		26.0	3
5th	5	26.0		26.0	5
6th	3	26.0		26.0	3
7th	10	26.0		26.0	10
8th	24	26.0		26.0	24
9th	30	26.0		26.0	30
10th	70	26.0		26.0	70
11th	200	26.0	2	26.0	202
12th	Plenty	26.0	2	26.0	
13th	do	26.0	5	26.0	
14th	do	26.0	14	26.0	
15th	do	26.0	21	26.0	
16th					

Results of experiment No. 2.—Table 2 shows the result of this experiment. It appears that the mortality was in direct proportion to the increase in number of fry contained in each jar. On the third and fourth day after storage a minimum mortality occurred in Jars Nos. 1, 2, and 3, being three, five and eight, respectively. This may be due to the fact that they were not so crowded in these jars. In Table 2, mortality started on the first day in all jars, increasing to a maximum in the second day, especially in Jars Nos. 6 and 7 with 3,500 and

4,000 fry, respectively. Likewise, Jars No. 1 and No. 2, containing 1,000 and 1,500, respectively, although, they have the least number of deaths, could not be considered economical numbers for storage as there are other factors to be considered, such as cost of fry, storage space, and transportation expenses. However, the experiment seems to indicate that the economical number of fry in storage is between 3,000 and 3,500 per jar. Fry of about 3,500 in a jar may still be economical in the fry business, but in conservation point of view, there would be too much fry sacrificed and wasted especially when the fry handled are on a big scale. The economical number of fry that could be kept in storage per jar may be illustrated by the following (Table 4):

TABLE 4.—*Comparative cost of fry per thousand in relation to the number of fry that can be kept economically in storage.*

Basis: ₱1.00 per 1,000 fry; ₱.50 per jar container; and ₱.50 for handling per jar.

Number of fry per pot	Relative cost of fry per 1,000	Mortality per pot	Losses in fry mortality	Total cost of fry per thousand
	Pesos			*Pesos*
1,000	2.00	3	0.006	2.006
1,500	1.66	5	0.010	1.670
2,000	1.50	7	0.016	1.516
2,500	1.40	27	0.050	1.450
3,000	1.333	25	0.070	1.400
3,500	1.28	245	0.280	1.565
4,000	1.20	426	0.852	2.052

Granting that the cost of fry per thousand is ₱1.00; empty jar ₱0.50; and cost of handling ₱0.50. From these, the following can be deduced—A jar containing 1,000 fry costs ₱2.006, 1,500 fry ₱1.67; 2,000 fry, ₱1.516; 2,500 fry, ₱1.45; 3,000 fry, ₱1.40; 3,500 fry, ₱1.565; and 4,000 fry, ₱2.052.

Experiment No. 3—Determination of the best water medium for storage (Tables 3a and 3b).—In this study, two sets of observations were made. In the first set (Table 3*a*), two jars were used. One of the jars was filled with salt water and the other with fresh water from an artesian well. These jars were filled to about one-half. Then 3,000 newly caught fry were placed in each jar. The jars were covered with sinamay cloth and placed in a well-ventilated storeroom. In the second set (Table 3*b*), 3 jars were used; each was filled with fresh water from an artesian well, salt water and rain water, respectively. Then 3,000 fry were placed in each jar. The first and second sets of experiments were conducted separately at different times during the same bangos season in the same place.

Results of experiment No. 3.—Tables 3*a* and 3*b* show the results of the experiment. There was apparently high percentage of mortality during the first two days in the jars containing salt water, while those in the fresh water medium, the high percentage of mortality occurred during the first day in storage. The fry showed signs of adjustment in the jars to both media, although daily mortality was still noted in the salt water medium; however, it was relatively in small number. In the two series of experiments conducted, although there was high percentage of mortality on the first two days, decline of mortality was noted on the 3rd day. There was a sudden increase of fry mortality in salt water medium on the 9th day up to the 15th day when the experiment was stopped. The same condition was also true in fresh water medium, although the resurgence of death occurred on the 11th and 12th days in both series of the experiments. The two sets of experiments were conducted for a period of 12 days and 16 days, respectively.

In the rain water medium, the experiment was stopped after 15 minutes because the fry showed signs of restlessness immediately after they were placed in the jar. A few minutes later, the fry showed signs of exhaustion and became motionless on the surface of the water. Ultimately they sank to the bottom of the jar. The temperature of the rain water medium was 25.8° Centigrade before the fry were put in it. It is 3 degrees lower than the artesian water used in the experiment. It is believed that the fry could not readily adjust themselves to the temperature of the medium resulting in sudden chilling and stiffening of the fry. The exhaustion and death of fry in rain water medium may not be due only to the temperature difference as above indicated, but also the difference in fluid concentrations—that of the body fluid of the fry and that of the medium. Such difference in concentration may have created a strong osmotic pressure upon the fry and the effect may have been ominous to the fry in storage.

The results of the experiment showed that there was a big percentage of mortality, and the storage period in rain water was relatively shorter than in fresh water. Characteristic differences of fry in storage in both fresh water and salt water may be attributed to the following:

(*a*) The continuous changes in specific gravity and salinity of sea water in an earthen jar container even if there is addition of new water due to seepage and evaporation such that fry in storage always have to adjust themselves in conformity with the above changes.

(*b*) And, the presence of relatively more organic matter in salt water than in fresh water, like eggs and larvae of other fishes, shrimps, mollusks and microscopic plants and animals which are subject to death and spoilage, the decomposition of which naturally causes the souring and fouling of the medium.

SUMMARY

1. The study was conducted to find ways and means in improving methods in the handling of fry while in storage. The present study is a preliminary one and further experimental work including the transportation of fry will be undertaken in the future.

2. The results of the preliminary work show the following:

(*a*) Under ordinary conditions, fry in storage were dependent more upon the surface area than the volume of the medium as fry were found more on the surface especially when the fry were new in storage.

(*b*) In any medium used in the experiments, the first two days of storage may be considered the period of fry adjustment. High mortality was noted during the period.

(*c*) After two days in storage the daily mortality was practically insignificant although there was a recurrence of death on the 7th and 8th days in salt-water; and 11th and 12th days in fresh water.

(*d*) It is believed that mortality of fry in storage in salt water after they were adjusted in the container was due to the decomposition of organic matters innate in the salt water coupled with the constant changes of salinity and specific gravity brought about by the evaporation and seepage of the medium.

(*e*) The maximum number of fry that may be economically stored in an earthen jar container (20-liter) is about 3,000. The storage of 3,500 or over may result in wastage of fry.

(*f*) The mortality of fry in fresh water (artesian well) may be due more to exhaustion and lack of feeding while in the storage container, because at the time death recurred, they were noted to be emaciated. The fry food-reserves (yolk) was already absorbed. Artificial feeding was never undertaken.

3. Studies on artificial feeding with egg yolk, rice bran, flour, etc., as being practiced in Indonesia and French Indo-China, should be tried and looked into.

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ILLUSTRATIONS

TEXT FIGURES