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NOTES AND NEWS

POND PRODUCTION OF *ARTEMIA* IN PAKISTAN

Feroz A. Siddiqui
Marine Reference Collection and Resource Centre, University of Karachi,
Karachi-75270, Pakistan.

Currently our government and the private sectors are very much interested in the establishment of marine aquaculture. For the successful operation in aquaculture of finfishes and shellfishes, the basic requirement is the suitable diet, apart from proper environment. For the larvae, juveniles and adult stages of the culturing organisms the live *Artemia* is the ideal food. The aquaculturists the worldover are using live food for their culturing organisms, as the live food played an important role in the dietary management of aquaculture of finfishes and shellfishes (Sorgefoos and Kulasekarapandian, 1984), particularly during larval stages. The live nauplii of *Artemia* are used in aquaculture of finfishes and shellfishes due to being nutritionally balanced, non polluting, economically bearable, viable and readily acceptable to the culturing species. The adult *Artemia* is also used for feeding the aquarium fishes particularly so when there is a clear abundance of this resource which is cheaper and can economically compete with alternative artificial diet. By the use of *Artemia* the aquaculturists may obtain optimum growth and survival rate of the organisms. The life cycle of *Artemia* is very short, which is completed within two weeks especially during dry season in highly saline waters, the two weeks old *Artemia* starts producing cysts. These cysts become ready to harvest within a week.

MATERIALS AND METHODS

The present experiment was conducted in the same pond which was used in previous experiments (see Siddiqui and Tirmizi, 1993 and Siddiqui, 1996).

The *Artemia* culturing pond (25'x40') (Fig. 1) was renovated in late April-May (1997) through excavation, the floor of the pond was lined by plastic sheet which was covered by a thick layer of fine clay. The dikes were also raised and sloping made to maintain its depth around 3 fts, dikes were also lined by plastic sheets to prevent any leakage and seepage through the dikes and bottom.

Sea water of a salinity 34-36 ppt. was pumped and passed through a screen (mesh size, 1mm) to prevent entrance of finfish, shellfish larvae or other undesirable organisms in the *Artemia* culturing pond. This water was supplied from the mangrove area of Charikund channel.

The culturing pond was fertilized with organic (Chicken manure 5 kg.) and inorganic (Agrourea 1/2 kg.)/1000sq. ft., manuring procedure was repeated every second month.

The chicken manure was packed in a netted cloth bags and placed at the four corners of the pond and Agrourea was sprayed by hand on the pond water. The pond was left for five days to ensure bloom of phytoplankton before inoculation of *Artemia* nauplii.

One gram of *Artemia* (Golden West brand) cysts were placed in a glass aquarium for hatching. The aquarium was filled with filtered sea water of a salinity 34‰ at 30°C

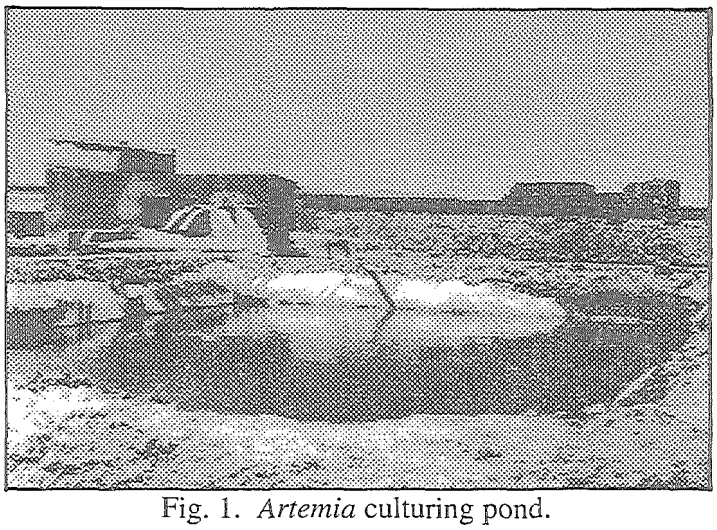

Fig. 1. *Artemia* culturing pond.

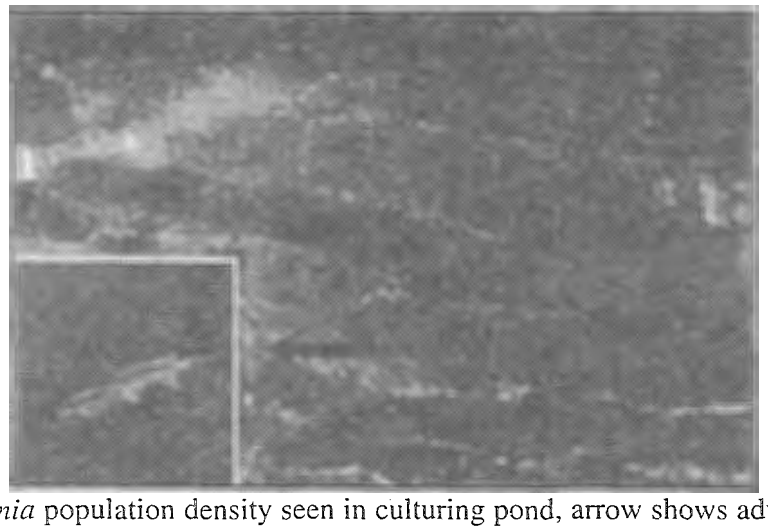

Fig. 2. *Artemia* population density seen in culturing pond, arrow shows adult *Artemia.*

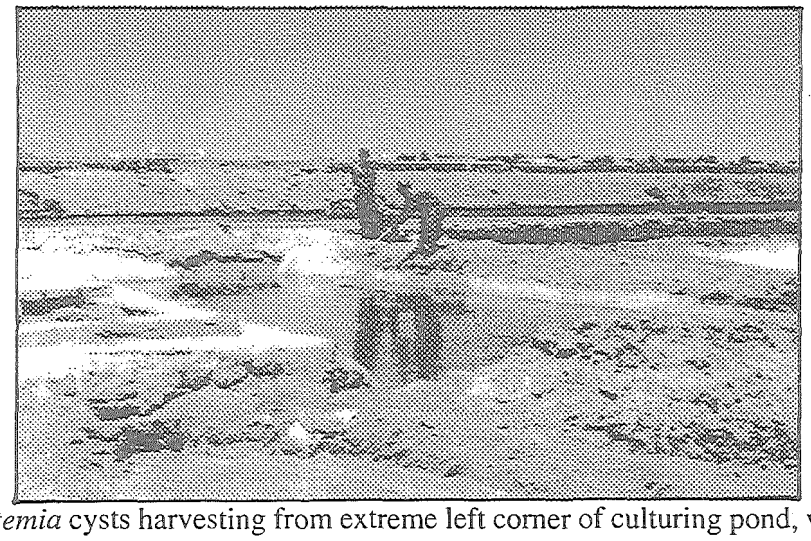

Fig. 3. *Artemia* cysts harvesting from extreme left corner of culturing pond, where cysts were aggregated.

temperature. After 12 hrs. the nauplii were hatched out from the cysts. Due to unavoidable circumstances nauplii were carried to the experimental site at Mauripur when they were three days old. First the nauplii were introduced slowly and gradual within the ponds water in a bucket for acclimatization. After 25-30 minutes nauplii were inoculated throughout the pond evenly at 15:30 hrs. on July 26, 1997.

After inoculation salinity (40-46‰) of the culturing pond was maintained by adding fresh sea water, height (2 to 2.5 ft.) of the water column was also monitored. After ten days the pond was densely populated (Fig. 2). The adult *Artemia* were seen carrying brood sacs filled with brown eggs (cysts) which were developed by oviparous mode of reproduction due to high salinity (150 to 190‰).

Table 1. Environmental parameters of the culturing pond for *Artemia* (*Golden West Brand*).

Date	Temperature (C°) Air & Water		pH	Salinity ‰	Remarks
26.07.97	32	34	9.4	59	3 days old nauplii was inoculated.
02.08.97	30	33	9.8-10.0	70	growth for was very slow.
04.08.97	31	33	9.8-10.0	75	" " "
12.08.97	30	33	9.9-10.0	85	" " "
22.08.97	30	33	10.0	105	population was dense.
23.08.97	32	31	8.7	164	-
26.08.97	33	32	9.7-8	164	different size of population was observed.
30.08.97	34	32	8.7	164	small quantity of cysts was observed.
08.09.97	33	32	8.8	260	most of the females were carrying cysts.
13.09.97	33-34	32	9.0	95	cysts collected after adding fresh sea water.
17.09.98	33-34	34	9.8	220	cysts collected.
11.10.97	32	33	9.8	300	cysts collected in small quantity.
15.10.97	34	35	9.9	400	population was thin.
16.10.97	33	34	8.7	220	after adding sweet water.
21.10.97	30	28	9.3	100	added more sweet water.
03.11.97	32	30	9.0-9.1	105	fresh sea water was added.
05.11.97	32-31	29-30	9.1	46	more sea water was added. and an ovoviviparus population was observed
12.11.97	32	33	9.1-9.2	150	cysts were present.
15.11.97	30	32	9.3-9.4	94	-

Physico-chemical parameters (i.e. salinity, water temperature, dissolved oxygen and pH) were observed and recorded regularly (Table 1).

Cysts were harvested regularly from the pond, usually in the morning. The cysts were aggregated near the corner of the pond according to the wind direction. Cysts were collected manually with a double screen dip-net and by bucket (Fig. 3). The size of double inner mesh screen dip-net was of 200 μm to remove adults and juveniles and the outer mesh was of 120 μm to retain cysts. The adult and juvenile *Artemia* were dropped back in the pond. The cysts were cleaned quickly with fresh water by using double screen mesh (200 μm and 120 μm) to remove large particles. The bulk of cysts was transferred into brine solution for 24 hrs. to remove heavy debris from the cysts, then the cysts were washed with fresh water for 5 minutes to remove all salts and left in fresh water container for 15 minutes to let the light debris and empty cysts float on the surface of the water and the cysts settled down on the bottom of the container. Then the cysts were quickly separated and washed with fresh water. After removal of excess water, cysts were weighed and then spread in thin layers over a cotton cloth for drying at room temperature. The air dried cysts were weighed, then stored in plastic bags and packed in glass jars/ bottles. Till date the preserved cysts are giving very good results (80% hatching).

Equipments and other inputs which were used during the experiment are pH meter, refractometer, dissolved oxygen meter, binocular microscope, balance, aerators, thermometer, suction pump 4" (axial flow), bottles, conical flask (glass), buckets, tubes, trays (plastic), strainers and containers.

OBSERVATIONS AND FINDINGS

Realizing the importance of the brine shrimp *Artemia* several attempts have been made to culture *Artemia* in the laboratory and in field also by using pond (25' x 40') cut off from a solar saltpan at Mauripure near Sandspit. For the first time *Artemia* culture has been conducted through inoculation of imported *Artemia* sp. from China and *Artemia franciscana* from America (Siddiqui and Tirmizi, 1993, Siddiqui, 1996). Another experiment was performed in 1997-98 in the same pond by using cysts of *Artemia franciscana* (Golden West brand) which were produced in 1996 at Maripure. During present experiment in total 749.42 grams (dry weight) of *Artemia* cysts were produced by the inoculation of 1 gram (dry weight) of cysts in the pond. The yield were very promising and encouraging. The cysts were harvested in reasonable quantity (Table 2). These dried *Artemia* cysts were stored in plastic bags. These bags were then housed in glass bottles.

These stored *Artemia* cysts have proven the best quality of dried cysts for their large number of hatch out (85%) and highest survival rate in artificial seawater, when given a trial. Artificial seawater is prepared in 3.5% of commercial seasalt or table salt in grams.

CONCLUSION

For the establishment of hatcheries of finfishes and shellfishes of marine water the culture of live food is a must to obtain better results in aquaculture. Brine shrimps *Artemia* are considered the best live food organisms because of their easy culture and cysts production on commercial basis. The negative results of previous experiments in marine

shrimp farming may be due to non availability of local seed and non availability of proper feed. There is a great potential for the production of *Artemia* and their cysts in the coastal areas of Pakistan because of long dry wheather of Sindh coastal area which is a favourable climatic conditions for *Artemia* culture, already been mentioned by Mahmood, 1995.

Table 2. Harvesting record of *Artemia* (Golden West brand) cysts during November 1997- April, 1998.

Date of Harvesting	Date of Preservation	Wet weight (grams)	Dry weight (grams)
27.11.97	08.12.97	135.00	66.28
22.12.97	01.01.98	74.50	36.95
04.02.98	16.02.98	290.15	147.11
10.02.98	03.03.98	154.10	77.11
03.03.98	10.03.98	122.00	60.10
10.03.98	18.03.98	85.00	42.25
18.03.98	24.03.98	90.15	46.73
28.03.98	11.04.98	100.00	50.22
31.03.98	18.04.98	90.00	46.00
28.04.98	06.05.98	210.00	102.92
30.04.98	21.05.98	127.00	63.75
		1477.90	749.42

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