# EXPLORATION OF NEW CHANOS FRY RESOURCES A TRIAL FOR OVERCOMING SEED SHORTAGE IN JAVA

by

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ABSTRACT

The exploratory fishing for Chanos fry on the islands of Lombok, Sumbawa and North Sulawesi and the experiments on long distance transportation of the fry from Makassar and Mataram to Djakarta are reported.

The paper points out that there is an estimated annual shortage of 100-120 million Chanos fry in central and west Java. This problem is considered to be chronic and serious.

The exploratory fishing survey revealed that in Lombok and North Sulawesi, there exist suitable Chanos fry resources which can be used for the culture of this species.

Transportation of the fry in oxygenated containers are technically and economically feasible, and fish farmers are willing to accept the fry introduced from other areas.

1. INTRODUCTION

Brackish water fish farms in Indonesia cover an area of about 167,000 hectares, of which 109,000 hectares are located on the island of Java.

There has been for a long time a shortage of Chanos fry supply due to the obvious situation between supply and demand. Whereas in certain regions the need for fry can be met sufficiently with local catches, or even by fry spontaneously entering the ponds, shortage of fry in Java, particularly those in West and Central Java, has been a chronic problem for the past twenty years.

Based on the traditional fish culture method, in which 4,000 fry is needed annually for normal stocking per hectare of pond, a stock of approximately 439 million Chanos fry is needed every year, of which only circa 372 million or about 84% can be provided.

Among the fry catching centers of Java, scattered along the north and east coasts of the island and the south and north coast of Madura, those of Madura and Banjuwangi are the most important ones and constitute the main source for most of the ponds of Java. About 30 to 40 million fry, distributed in Djakarta area for the surrounding places, are transported from Surabaja, covering a distance of about 900 kilometers, and passing through a long chain of collectors, middlemen and dealers.

Table 1 shows the situation of supply and need of fry in four important brackish water pond centres. It is obvious that those of West and Central Java suffers the worst fish seed shortage; as much as 118 million in 1970.

In general there are two distinct seasons in Indonesia, i.e. the wet season and dry season; 60 - 80% of the annual production comes from the wet season catches which last from September to January, while the remaining 40 - 20% is supplied by the dry season catches, which last for a shorter period (from April to June).

The price of fry in Djakarta is normally about 100% higher than that of the fry in the market in Surabaja. The price of fry in the period of April - June is normally 50 - 60% higher than during the period of September - January. The unstable and high prices of fry is shown in Fig. 1, and the relatively low price of adult fish of Rp. 25,000 - per quintal is obviously an unhealthy economical phenomenon.

In view of the possibility to intensify the culture system, which may cause increase in fry need, the fry situation would undoubtedly become more serious in the time to come. Since the resources on the islands of Java and Madura have already been fully exploited, new resources should be discovered outside these two islands and efforts have been made in the last two years. As long distance transportation of fry is necessary, a suitable location with regular air communication has to be selected. In accord with this factor, Mataram on the island of Lombok, Makassar and Menado on the island of Sulawesi are the most suitable locations for the purpose.

Laboratory experiments to determine the resistance of Chanos fry kept in closed oxygenated containers, while in transit were initiated in 1964 and 1965 from Makassar to Djakarta. Although encouraging results were attained, due to negative reaction of the local fry market, the trials were suspended.

Since 1968 surveys and catching trials have been carried out, followed by experiments on transporting fry.

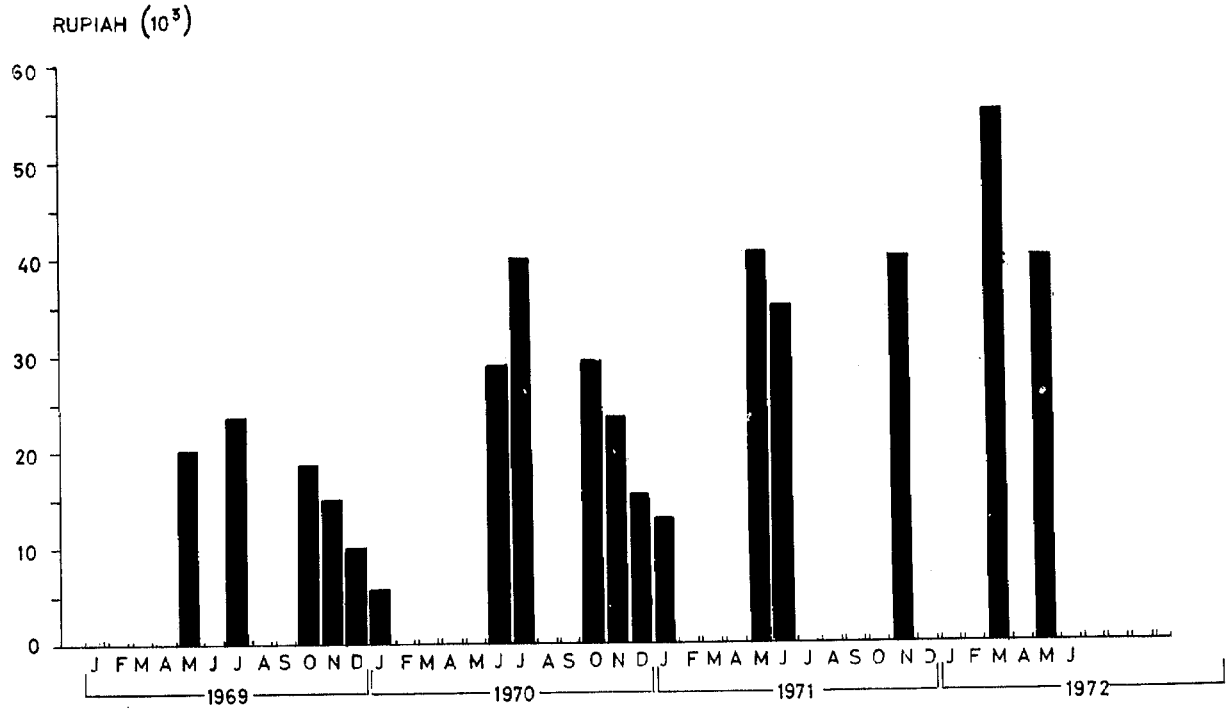


Fig. 1 Price fluctuation of Chanos fry at Djakarta, 1969-72 (per 10,000 fry)

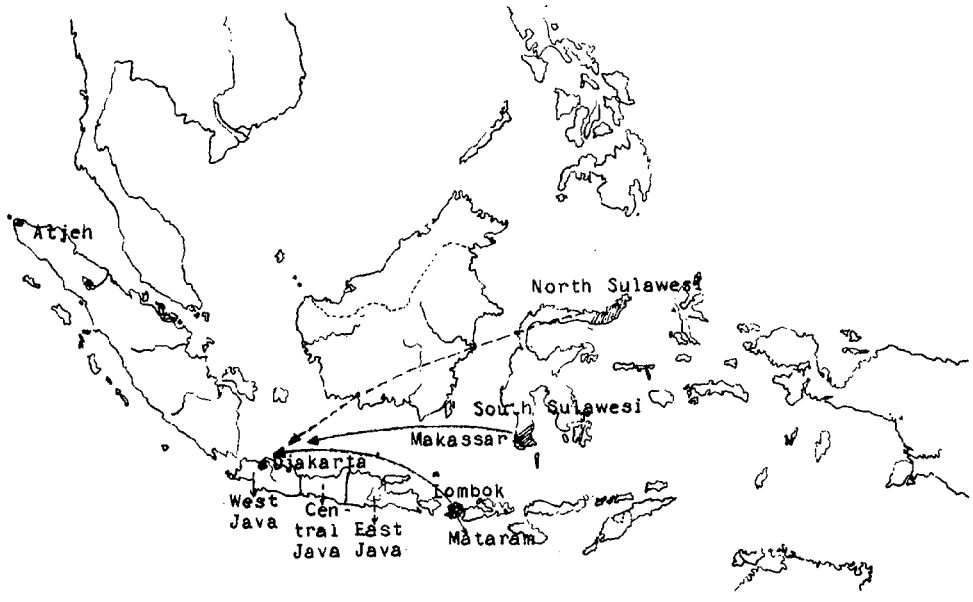


Fig. 2 Map of Indonesia indicating important fry resources

present flow of fry: ———

planned flow of fry: - - - - - - -

The island of Lombok proved to be one of the ideal localities. Almost all along the coast of the island, fry is abundantly available. On the other hand, there is only a small acreage of tambak available (about 300 hectares) and the possibility of extension is very limited in the island.

In May 1971 surveys and catching trials were conducted in some localities along the coast of North Sulawesi.

The result was promising and rendered encouragement for further development.

## 2. FRY RESOURCES

Taking the geographical distribution of the Chanos into account, it is reasonable to assume that the fry may be found throughout the country. The catching grounds which are of economic importance, may be arbitrarily grouped into:

Exploited - Along the north coast of Java and Madura; and along the coast of south Sulawesi and Atjeh.

Unexploited - Along the coast of the north, central, and south Sulawesi; Bengkulu (Sumatra); Bali, Sumbawa; Lombok; Timor; Kalimantan; and Ambon, etc.

Surveys and catching trials have been made to take advantage of the unexploited rich fry resources with respect to supplying fry to Java on the one hand, and starting the brackish water fish culture activities in the related regions, on the other.

## 3. CATCHING TRIALS

Two kinds of fishing gear were used in the experiments, scoop net and V-shaped trap net. The scoop net was made of fine-meshed cotton net, measuring about 80-100 cm in length. It is held in position by sticks forming a frame. It was used to find out whether Chanos fry is available in a particular place and to demonstrate the techniques of fry collecting to the local people. The demonstration was necessary because the local people were not accustomed to fry collecting. This involved preparation and use of equipments, recognition, sorting, and storing of fry.

The fry trap consists of two wings and a collecting net on the apex. The gear is stationary and set against the tidal current.

The wings were fixed loosely by means of a rope on vertical sticks of bamboo, planted in the sea bottom in such a way that the wings can move up and down following the tidal movement of the water.

During the experiments in different localities, the salinity of the water ranged from 24.0 to 31.0 °/oo in coastal waters, and from 4.0 to 11.0 °/oo in river mouths. The pH varied from 7.5 - 9.0 and the water temperature from 22° - 31°C. The range of tides varied from 0.40 - 1 50 M and the water current from 10 - 30 cm per second.

Catching operations with scoop net were carried out almost all along the coasts; fry trap were experimented in four localities, namely, at Djambi Anom on the west coast, Muara Supuk and Muara Tajek on the south coast, and Tandjung Luar on the east coast. Result of the trials conducted at Lombok is shown in Tables II and III.

## 4. TRANSPORTATION

Djajadiredja and Martono (1965), have stated that some inconveniences were found during transportation in the use of ordinary plastic bags. Folds and pleatings on the wall of the bag, have caused lethal damages to the fry.

Special shaped bags with rounded bottoms were then made and later square shaped ones were made, measuring 30 x 30 x 11 cm. Nevertheless, both types of newly-designed containers were ineffective. Leakages occurred very often, which caused heavy losses or even total mortality of the fry. (Table IV).

The use of small plastic jerry cans of litres capacity seems to be most efficient. Two plastic tubings of 5 mm diameter, were permanently fixed through the upper side of the can. The end of both tubings inside the can were sealed, and pores are made near the end which served as sieves.

The fry is introduced into the container, as soon as it is filled with water. While regulating the inflow of oxygen into the can through one of the tubes, one should measure the volume of the water flowing out through the other tubing to determine the volume of water and oxygen inside the container. Normally 7 litres of water is left in the container. The ends of the two tubings should then be tightly closed.

The length of time covered from the putting of the fry in the can and the time of release is 9 hours and 12 hours from Mataram and Makassar to Djakarta respectively.

## 5. HANDLING AND STORING OF FRY

Upon arrival at the destination, the fry is transferred into flat wooden basins of 0.70 M diameter. Each basin was filled with 10 lt. of water with depth maintained at about 4 cm. After renewal of the water, the dead individuals were removed. Changing the water and feeding the fry is done 2 - 3 times a day. At night the water is aerated by means of aquarium aerators. During storage, surface-well water is added, in which common salt and lime are added to adjust the salinity and pH to about 12 $^{o}/_{oo}$ and 7.5 respectively. 10,000 fry were kept in the storing basins for a maximum period of 4 days to ensure their vitality before distribution. The physico-chemical properties of the water in transport containers as well as in basins are shown in Tables V and VI.

## 6. ECONOMICAL ASPECTS

To supply the fry requirements of west and central Java, with an acreage of 55,600 ha of brackish water ponds, 152,890,000 fry is needed annually. With a local production of only 34,541,000 fry, a shortage of 118,349,000 fry has to be overcome with fry brought in from other regions.

The present fry coming from east Java could not exceed 49,750,000 fry, which means that there is still a shortage of at least 68 million fry, and consequently it could be assumed that 17,000 ha of ponds are being unstocked.

With the assumption of an average production of 400 kg/ha this shortage of fry can be regarded as a loss of 6,800 tons of fish, valued at Rp. 1,700 million per year.

To demonstrate the financial requirement to collect and supply one million fry to Djakarta the following analysis is given:

Income: Sale of 1 million fry (average price Rp. 30,000 - per 10,000) Rp. 3,000,000

Cost of production:

| | |
|---|---|
| Purchase of fry from collectors ..... | 650,000 |
| Depreciation of facilities and equipment ..... | 80,000 |
| Labour (handling, storing, counting) .... | 70,000 |
| Packing and transportation fee ..... | 75,000 |
| Rents, contribution, etc. ..... | 150,000 |
| 20% mortality and miscellaneous risks ... | 205,000 |
| Total costs | 1,230,000 |

Profit Rp. 1,770,000

## 7. DISCUSSION

The availability of Chanos fry throughout the whole island of Lombok has been proven by catching trials. Both scoop and trap nets are effective fishing gear. Along all gradually sloping beaches, the use of scoop nets can be practised, even by women and children. In places where manpower is very limited as it is usually the case in new fry grounds, the use of traps is preferable. The mouth of small rivers and creeks are suitable places for setting up the nets.

Introduction of motorized fry trawlers could even be taken into consideration for operation along the coastal area.

Comparing the oceanographical data, related to the number of fry caught during the experiments, there seems to be no correlation between the value of pH, salinity, temperature of the water and the production of fry. The length of time and range of the high tides is considered to have a definite influence on the catch (Table II).

From the data collected in a very short period during the catching trials, it is impossible to draw any conclusion about the population size of the fry. To estimate the potential production, further information and data are required, especially those related to the duration of catching seasons, the optimum production obtained in every catching place, the number of places suitable for catching centres, etc. Djambi Anom is the only place where catching operations have been practised every season during the first three years, and has shown monthly fluctuation (Table III).

The total fry production at Djambi Anom, the only place used for pilot catching, for the years 1968, 1969, 1970 were respectively 198,000; 185,000 and 280,000. The number of the fry collectors were 12 - 18 fishermen, who operated along a coast line of about 1 km.

Taking the above facts into account and considering that there are 30-35 suitable fry grounds with a total distance of 50 - 60 km, a potential production of 15 to 18 million fry could be expected.

Comparing the results of transportation with these reported by Djajadiredja and Martono (1965), it might be concluded that heavy losses during transportation can be prevented by protection against mechanical injuries. Therefore hard-walled containers will be more suitable for the transporting of the fry than plastic bags. Small jerry cans have shown good results.

With a density of 2,000 fry per litre, during 9 - 12 hours of transport, the rate of mortality varies from 0.21 - 1.64%. For economical reasons, however, the density should be increased to as much as 4,000 fry per litre.

During 3 - 4 days storage the rate of mortality is also low, which varies from 0.79 - 2.62%. These low rates of mortality after shipment prove that the closed system of transporting fry has little influence on the vitality of the fry. It should be noted that careful handling and good feeding system were carried out during storage.

For the local people, the exploitation of one of their natural resources would mean provision of employment and additional earnings. Their activities might be stimulated further by reasonable prices and this depends on the fry prices in Java markets. A good co-ordinated organisation is therefore necessary, both in the region of production and at the distribution centre.

## 8. ACKNOWLEDGMENT

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TABLE I. Supply and need of Chanos fry, 1970.

| Provinces | Acreage: ha | | Production | Need | | | Shortage/ Surplus(-) |
|---|---|---|---|---|---|---|---|
| | Acreage Bruto | Acreage Netto | 1000 fry | East monsoon 1000 fry | West monsoon 1000 fry | Total | |
| West Java & Djakarta | 30,900 | 21,630 | 24,476 | 30,900 | 54,075 | 84,975 | - 60,499 |
| Central Java | 24,700 | 17,290 | 10,065 | 24,690 | 43,225 | 67,915 | - 57,850 |
| East Java | 52,200 | 36,540 | 173,950 | 32,850 | 91,350 | 124,200 | 49,750 |
| South Sulawesi | 37,600 | 26,320 | 117,973 | 37,590 | 65,800 | 103,390 | 14,583 |

TABLE II. Fry catching trials with trap net in Lombok

| Place | Days from new moon | Number of operations | Number of fry caught | Average number of catch per operation |
|---|---|---|---|---|
| Tandjung Luar | 3 - 6 | 7 | 690 | 98.5 |
| Muara Supuk | 8 - 13 | 10 | 16,318 | 1,631.8 |
| Djambi Anom | 17 - 21 | 5 | 5,469 | 1,093.8 |
| Muara Tajak | 23 - 26 | 8 | 406 | 57.5 |

Source : Ayodhyoa, et al, 1969.

TABLE III. Monthly fluctuation of fry catch in Djambi Anom with scoop and trap nets.

| Months | Number of fry caught | | |
|---|---|---|---|
| | 1968 | 1969 | 1970 |
| January | - | 60,316 | 8,740 |
| February | - | - | - |
| March | - | - | - |
| April | - | 17,728 | - |
| May | - | - | - |
| June | - | - | 22,491 |
| July | - | - | - |
| August | - | - | - |
| September | - | 5,290 | - |
| October | 12,709 | 18,910 | - |
| November | 66,094 | 43,730 | - |
| December | 54,141 | 19,785 | - |

Source : Extension service, West Nusa Tenggara.

TABLE IV. Result of fry transportation trials in closed container

| Time of Trials | Type of Container | No. of trials | No. of Container | Duration of transport (hr) | No. of fry/1 of water | | Mortality (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Container | Wooden basin | During transport | During stocking period | Total |
| Nov.'68 | plastic bag | 3 | 12 | 9 | 2000 | 1000 | 18.91 | 1.11 | 20.02 +) |
| Dec.'68 | " | 3 | 13 | 9 | 1000 | 1000 | 1.04 | 0.34 | 1.38 |
| May '69 | " | 2 | 6 | 9 | 1000 | 1000 | 0.36 | 4.32 | 4.68 |
| Nov.'69 | " | 2 | 6 | 9 | 850 | 1000 | 7.19 | 6.72 | 13.91 +) |
| Feb.'70 | " | 1 | 2 | 9 | 1000 | 1000 | 0.12 | 0.45 | 0.57 |
| May '70 | " | 1 | 4 | 9 | 1000 | 1000 | 0.27 | 1.35 | 1.62 |
| June'70 | " | 1 | 3 | 9 | 1000 | 1000 | 0.27 | 1.35 | 1.62 |
| Oct.'70 | Plastic jerry can | 1 | 2 | 9 | 1600 | 1000 | 0.53 | 2.62 | 3.15 |
| Dec.'70 | " | 1 | 7 | 9 | 2000 | 1000 | 0.23 | 1.36 | 1.59 |
| June'70 | " | 1 | 9 | 9 | 2000 | 1000 | 1.64 | 1.65 | 3.29 |
| May '70 | " | 2 | 9 | 12 | 2000 | 1000 | 0.21 | 0.79 | 1.00 |

+) Leakage on the plastic bag.

TABLE V. Physico-chemical analyses of water in the jerry cans on arrival at Djakarta

| Date of arrival | Jerry can No. | Water temperature °C | pH | Salinity ppm | Free $CO_2$ ppm | Dissolved oxygen ppm | Remark |
|---|---|---|---|---|---|---|---|
| 19.5.72 | I | 30.0 | 6.5 | 20.5 | - | 12.81 | Free $CO_2$ undetermined |
| | II | 29.5 | 7.0 | 18.0 | - | 11.25 | |
| | III | 30.0 | 6.7 | 23.0 | - | 10.53 | |
| | IV | 30.0 | 6.7 | 21.5 | - | 10.82 | |
| | V | 30.0 | 7.0 | 20.0 | - | 9.84 | |
| | VI | 29.5 | 7.0 | 20.0 | - | 3.66 | Leakage |
| 24.5.72 | I | 30.1 | 7.0 | 21.0 | 5.32 | 19.67 | |
| | II | 30.3 | 7.0 | 15.0 | 4.81 | 15.76 | |
| | III | 30.0 | 7.0 | 22.0 | 6.24 | 16.52 | |

TABLE VI. Physico-chemical properties of the water during keeping-period at the laboratory

| Period | Jar | Water temperature °C | Room temperature | | pH | Salinity ppm | Free $CO_2$ ppm | Dissolved oxygen ppm |
|---|---|---|---|---|---|---|---|---|
| | | | Max. °C | Min. °C | | | | |
| 1st day | I | 27.0 | 29.0 | 27.0 | 7.0 | 11.0 | 6.65 | 4.06 |
| | II | 27.0 | 29.0 | 27.0 | 7.0 | 11.0 | 5.32 | 5.15 |
| | III | 27.0 | 29.0 | 27.0 | 7.0 | 12.0 | 6.65 | 3.95 |
| 2nd day | I | 27.0 | 27.0 | 27.0 | 7.0 | 15.0 | 4.99 | 4.34 |
| | II | 27.0 | 27.0 | 27.0 | 7.0 | 13.0 | 6.69 | |
| | III | 27.0 | 27.0 | 27.0 | 7.0 | 14.0 | 6.65 | 5.95 |
| 3rd day | I | 27.0 | 28.0 | 27.0 | 7.0 | 12.0 | 8.45 | 3.34 |
| | II | 27.0 | 28.0 | 27.0 | 7.0 | 12.0 | 6.65 | 3.69 |
| | III | 27.0 | 28.0 | 27.0 | 7.0 | 13.0 | 7.98 | 3.41 |