

THE CULTIVATION OF SUGPO (*PENAEUS MONODON* *FABRICIUS*) IN THE PHILIPPINES¹

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TWO PLATES

INTRODUCTION

Sugpo (Plate 1, fig. 1), a kind of shrimp known scientifically as *Penæus monodon* Fabricius, is now cultivated on a commercial scale in Philippine estuarine fishponds either together with the bañgos, *Chanos chanos* (Forskål), or separately by itself. Considered a table delicacy, sugpo commands the highest price among the shrimps being sold in the local markets. A kilo which generally contains from eight to twelve individual sugpo, measuring from six to ten inches long, costs as much as eight pesos.² A hectare of fishpond on the average can produce around three hundred and fifty kilos of sugpo of marketable size after six months of cultivation.

Sugpo is being caught with other shrimps in the open sea by means of trawls operated in connection with powered fishing vessels of over 3 tons gross. The composition of the shrimp catches of these vessels reveals the presence in great quantities of *Penæus indicus* Milne-Edwards, *P. canaliculatus* Olivier, *P. affinis* Milne-Edwards, *P. incisipes* Spence-Bate, and *P. monodon* Fabricius. In this connection it has been noted that in all these catches sugpo is always much less in number compared with the other shrimps.

The rostrum of the sugpo is straight, dorsally elevated into a laterally compressed crest. The rostral formula is $\frac{6-7}{3}$, that is, 6 to 7 teeth lined along the upper margin and 3 teeth on the lower edge of the rostrum. The antennular scales reach beyond the eyes and the longer antennular flagellum is shorter than the peduncle. The fourth to the sixth abdominal segments

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² One peso, Philippine currency, is equivalent to fifty cents, United States currency.

are carinated on the middorsal line. The male is differentiated from the female by the presence of the petasma, a membranous development of the endopodites of the first pair of its pleopods. The male genital opening is situated at the coxopodites of the fifth pair of pereopods. The female, on the other hand, has its sternum divided longitudinally into a median cleft, immediately between the fifth pair of pereopods. The sides of this cleft appear as a flattened calcified plate called the "thelycum." This structure extends from the base of the coxopodites of the fourth pair of pereopods to the posterior border of the sternum. The female genital opening is located on the coxopodites of the third pair of pereopods. The exopodite of the first pair of pleopods is long and flat, while the endopodite is less developed, appearing like a small bud.

In life the sugpo fry can be easily recognized from any other penaeids because of its dark color. The body of a sugpo fry is almost black except the dorsomedian longitudinal plane which is light brown. The antennæ and antennules are divided into small cylindrical alternating black and white bars. Almost all of these beautiful colorations disappear as the sugpo grows except for the black bars striating the antennules.

The general appearance of a sexually mature sugpo is deep green. The edges of the pleopods are fringed with short, fine, orange-red hair. The outer surface of both the pereopods and pleopods has two irregular yellow blotches. There are about six arched horizontal almost black bands cutting across each segment and extending from side to side. These are permanent external markings of a live sugpo from the fry stage to sexual maturity.

The movements of the sugpo in the water are effected by means of a backward and forward sculling movements of the pleopods or swimmerets. When on the bottom undisturbed, it may be seen wading on the mud by either the combined movements of the pereopods and pleopods or each of these functioning independently of the other. The animal raises its cephalothorax at about an angle of forty-five degrees with the level of the bottom, the sixth somite comprising the telson and uropods hanging low trailing on the ground. While at this position and when intruded upon, the abdomen is folded U-shaped in preparation to throw itself forward or backward in short sudden jerks.

The sugpo, like any other crustacean, grows when it molts. The bigger sugpo after shedding off its hard shell lays still,

almost motionless for sometime until the exoskeleton attains its normal state of hardness. On the other hand, sugpo fry immediately after throwing off their shell move about as actively as before the shedding off of the hard shell. While molting the hard or old shell is disrupted dorsally at a point between the cephalothorax and the first somite. The head comes out first and almost simultaneously the appendages and the body are released at the same time.

FEEDING HABITS OF SUGPO

The sugpo is a plankton feeder although most often it is also carnivorous. In glass aquaria the sugpo feeds on small bits of shrimps and fishes. The food is seized by the pincers and is then pushed back into the mouth. In the pond the sugpo may be seen nibbling on algæ (lumut). Considering the small size of its digestive system, the plant and fish food consumption during its life time is probably very small. An examination of stomach contents of some sexually mature sugpo revealed the presence of fish fragments, bits of crustaceans, filamentous blue green algae, diatoms and mud particles.

Sugpo in all its life stages, especially during its fry stage, relishes plankton (lablab) food. Lab-lab is a biological association of minute plants and animals growing on the mud floor of fishponds. Rabanal in 1949 listed the following as the components of lab-lab.

I. Plant components.

Division—Thallophyta.

Subdivision—Fungi.

Class—Schizomycetes.

1. Bacteria—Cocci, bacilli, and spirilli.

Class—Myxophyceæ (blue-green algæ).

Order—Cocogonales—One-celled or colonial forms, not filamentous.

Family—Chroococcaceæ.

1. Chroococcus.

Order—Homogonales—filamentous forms.

Family—Oscillatoriaceæ.

1. Oscillatoria.

2. Spirulina.

3. Phormidium.

4. Lyngbya.

Family—Nostocaceæ.

1. Anabaena.

Class—Bacillariophyceæ—the diatoms.

Order—Centrales—Discoid forms.

Family—Achnantheceæ.

1. Achnanthes.

2. Coconeis.

Family—Naviculaceæ.

1. Pleurosigma.

2. Gyrosigma.

3. Pinnularia.

4. Navicula.

5. Mastogloia.

6. Amphipleura.

7. Amphiprora.

8. Stauroneis.

9. Diploneis.

Family—Nitzschiaceæ.

1. Nitzschia sigma.

2. Nitzschia closterium.

Family—Surtrellaceæ.

1. Surirella.

2. Camphylodiscus.

Family—Fragilariaceæ.

1. Fragilaria.

Family—Gomphonemataceæ.

1. Gomphonema.

Class—Chlorophyceæ.

Order—Ulothricales.

Family—Cladophoraceæ.

1. Cladophora.

2. Chaetomorpha.

Order—Ulvales.

Family—Ulvaceæ.

1. Enteromorpha intestinalis.

II. Animal components.

Phylum—Protozoa.

Class—Mastigophora (Flagellata).

Order—Phytomonadida.

Family—Chlamydomonadidæ.

1. Carteria.

Class—Sarcodina (Rhizopoda).

Order—Lobosa (moebaeæ).

Family—Amoebidæ.

1. Amoeba.

Class—Infusoria (Ciliata).

Order—Holotrichida.

Family—Holophryidæ.

1. Coleps.

Family—Trachelliidæ.

1. Deliptus.

Family—Ophryoglenidæ.

1. Colpidium.

- Order—Hypotrichida.
 Family—Plagiotomidæ.
 1. Spirostomum.
 Family—Oxytrichidæ.
 1. Oxytricha.
 2. Stylonychia.
 3. Stychotricha.
 Family—Euplotidæ.
 1. Euplotes.
- Order—Peritrichida.
 Family—Vorticellidæ.
 1. Vorticella.
- Order—Heterotrichida.
 Family—Stentoridæ.
 1. Folliculina.
- Phylum—Platyhelminthes—flatworms.
 Class—Turbellaria.
 Order—Polycladida—Larger forms with intestine much branched. Common.
- Phylum—Nemathelminthes—round worms.
 Class—Nematoda—Free-living worms. Common.
- Phylum—Rotifera—The rotifers or wheel animacules. Several forms. Common.
- Phylum—Mollusca.
 Class—Gastropoda.
 Order—Pulmonata.
- Phylum—Annelida.
 Class—Chaetopoda.
 Subclass—Polychaeta—Larvae and adults represented
- Phylum—Arthropoda.
 Class—Crustacea.
 Subclass—Entomostraca.
 Order—Copepoda—Several forms and at various stages
 Order—Ostracoda.
 Subclass—Malacostraca.
 Order—Amphipoda.
 Order—Decapoda—Larval forms only.
- Class—Insecta.
 Order—Diptera—Larval forms.
 Order—Coleoptera—Larvae and adults.

SUGPO FRY

Migration of sugpo fry.—Sugpo fry generally appear along the shores of Manila Bay in the early part of May. Every year they are found in abundance in the same place from May to October. They measure from 10.0 to 15.2 millimeters or an

average length of 12.6 millimeters. They are being caught in almost all places in the Philippines where bañgos fry are also found. Sugpo fry make their way into tidal rivers, creeks, lagoons, and other shallow places with brackish water by means of the incoming water due to high tide. It has also been observed that in masses of drifting seaweeds are often found many sugpo fry attaching to them as they are carried to the shores by the inflowing current from the open sea. It has been noted too that sugpo fry are abundantly found clinging about various hydrophytic flowering plants and semiaquatic grass of the family Gramineae growing in swampy places below the tide line immediately after storms which usually occur in the months of June, July and August. The sugpo fry migrate towards the shore and into brackish waters for feeding and shelter. They stay in those places for a period of not less than six months when they return to the sea to spawn.

Sugpo fry fishery.—Sugpo fry, like the bañgos fry, are now a distinct and lucrative fishery in many places in the Philippines where they are being caught. An experienced fisherman can catch as many as from 400 to 1,500 sugpo fry a day. The catches are sold to fish farm owners at three to five pesos per hundred.

A sugpo fry collector uses a small banca, a large earthen jar, a white large-mouthed porcelain bowl and a triangular dip net. The collector usually sits in the stern hold of his banca towards the prow. The banca is kept in motion and its course determined by a wooden steer which is set on one side of the boat as the collector paddles on the other side to maintain the direction of the course. This wooden steer serves as a robot steersman, thus saving the employment of an extra man.

The large earthen jar is preferred because it is highly permeable and keeps the water in it cool all the time. It is provided with tiny holes about its greater surface diameter to allow the water to leak through. These devices serve as an aeration and at the same time prevent the overflow of the water as it is being poured from time to time in small amounts into the jar. A few dry twigs or shredded banana leaves are placed inside the jar for the sugpo fry to cling on. Precaution is, however, taken in choosing the right kind of twigs to use as the sugpo fry are very sensitive to some plant saps which are often toxic to them.

The white porcelain bowl is used for transferring the sugpo fry from the dip net into the earthen jar because their presence

is easily detected in a container with a white background. In a receding tide the white porcelain bowl becomes very handy in collecting sugpo fry left in very shallow waters. This method of collecting sugpo fry is very strenuous as a collector has to move from one place to another for the purpose of hunting for the fry. Besides, during the months of June, July, August, and September the water is usually turbid thus making it very difficult to detect the presence of sugpo fry under three inches from the surface of the water.

Collecting sugpo fry is made easier with the use of bundles of twigs or grass tied to a long rope line at an interval of about two meters. A sugpo fry collector at frequent periods visit the device for collecting the fry. A dip net is scooped beneath the individual bunches and as the former is being raised each bunch is shaken to liberate the sugpo fry. Experienced collectors catch as many as 10 sugpo fry from an individual bunch at a time. Collecting sugpo fry by means of this method is also done at night with the use of light or flashlight.

THE CULTIVATION OF SUGPO

Preparation of sugpo fry nursery.—The success or failure of the cultivation of sugpo depends mostly on the manner a sugpo fry nursery is prepared. A well prepared nursery (Plate 1, fig. 2) is free from predacious animals like water snakes (*Chersydrus granulatus*), apahap (*Lates calcarifer*), ten pounder (*Elops hawaiiensis*), tarpons (*Megalops cyprinoides*), biang puti (*Glossogobius giurus*), mudskippers (*Periophthalmus schlosseri* and *P. barbarus*), bengal swamp eels (*Synbranchus bengalensis*), silver piko eels (*Muraenesox cinereus*), and igat or eel gobies (*Taenioides gracilis*). Crustaceans such as crabs belonging to the families Portunidae, Grapsidae, Potamonidae and Ocypodidae must likewise be carefully eliminated as they are also heavy feeders on sugpo fry.

A sugpo fry nursery pond is usually the smallest compartment in a brackish-water-fishpond system. The size varies according to the amount of capital invested in the project by the individual fishpond owner. However, nursery ponds measuring not bigger than 17 by 17 meters are common especially in regions bordering Manila Bay. Each pond has wood gates, 1.5 to 2 feet wide, which are provided with wood slabs to control water and also with fine-meshed bamboo screens covered with abaca cloth (sinamay) to prevent the entrance and exit of sugpo fry and also of predatory species.

About four to six weeks before the nurseries are to be stocked they are first cleaned, drained and sunned until the floor cracks to dryness. The bottom of each pond is thoroughly levelled and during the process of levelling all those predacious animals not killed by exposure to sunshine are carefully collected and killed. This process is accomplished in about a month or so depending on the condition of the weather. If there is sunshine everyday the whole process could be finished in a shorter period of time. A week after the bottom is levelled, tidal water is allowed into the pond to a depth ranging from 3 to 10 centimeters. This height of water is maintained inside the pond even after freshening each pond with new tidal water. All these conditions are conducive to a luxuriant growth of lab-lab and in about less than a month the nursery pond will be ready for planting with sugpo fry.

Stocking sugpo fry in the nursery.—In stocking a nursery pond with sugpo fry, each jar container is carefully set in the water, the mouth tilted to one side until the fry are able to swim out. Stocking is done during the coolest part of the day when the temperature of the water in the nursery pond approximates that of the water in the jar. It has been found that late afternoon or early in the morning is the best time for planting sugpo fry in the nursery.

Care of the sugpo fry.—After stocking the nursery pond its water is increased and maintained to about a foot in depth. At frequent periods freshening is done by means of letting out the stagnant water during low tide and then admitting in new water at high tide. During this process the sluice gate is carefully screened to prevent the escape of sugpo fry and the entrance of harmful animals.

Small bundles of dry twigs are placed inside the nursery ponds for the tiny sugpo fry to cling on. They are better observed while clinging about the twigs and measurements of representative samples to determine their rate of growth are facilitated by just raising the twigs attached with sugpo fry. In this connection it has been found that after the sugpo has attained a size of about 54 millimeters long they lose their clinging instinct.

Filamentous algae should not be allowed to grow inside a nursery pond because once the sugpo fry get entangled with the filaments of the algae they cannot release themselves and eventually die. Besides, lumut growth is always very thick such that it prevents the free movements of sugpo fry especially

when these like to be at the bottom of the pond to stay away from the excessive heat of the sun.

Preparation of the sugpo rearing pond.—The rearing pond (Plate 2, fig. 1) is generally located adjacent to the nursery pond to facilitate planting. The regular size of this pond is around half a hectare to one hectare. Its sluice gates are properly screened to prevent the escape of young sugpo and the entrance of harmful animals. Before the pond (Plate 2, fig. 2) is stocked with young sugpo, it is drained, cleaned, and allowed to dry for at least a week so that all their enemies are killed. The rearing pond may be planted with algae which serves as food for the growing sugpo and also for the bañgos fingerlings which are generally reared in the same pond. The water inside the rearing pond is changed from time to time by taking advantage of tidal changes.

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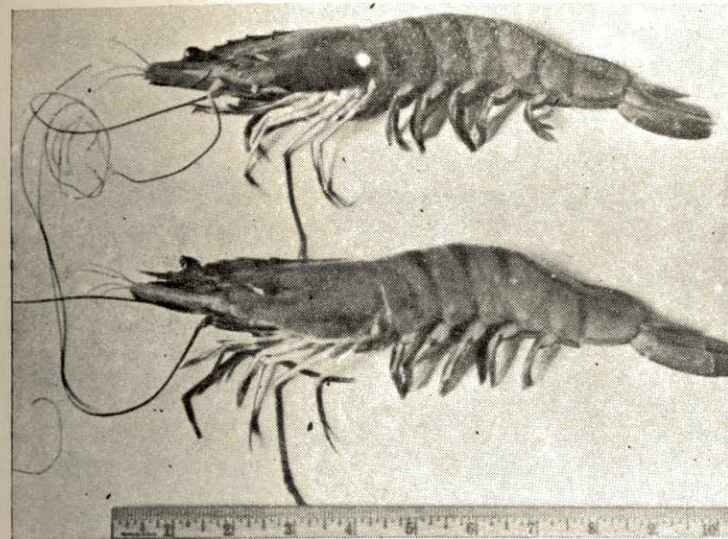
ILLUSTRATIONS

PLATE 1

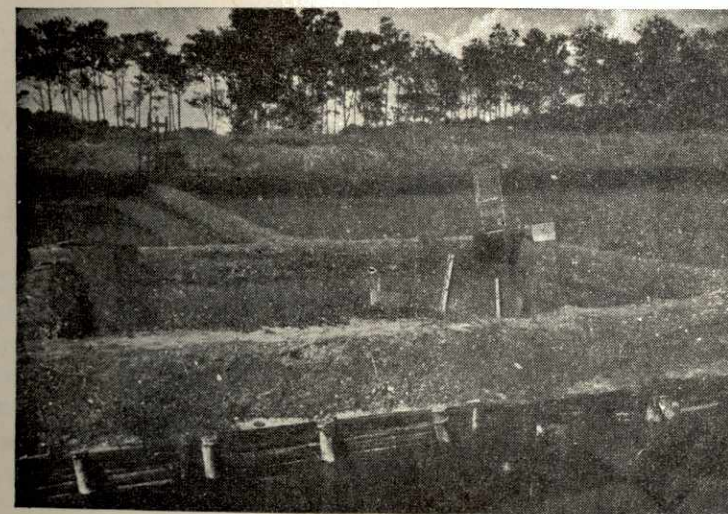
- FIG. 1. Picture of sugpo.
2. A system of nursery ponds for sugpo fry.

PLATE 2

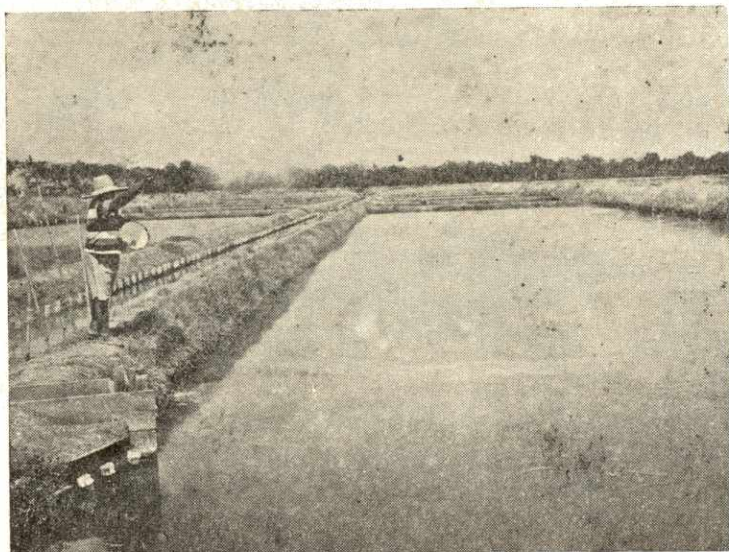
- FIG. 1. A series of sugpo rearing ponds.
2. A sugpo rearing pond undergoing preparation.



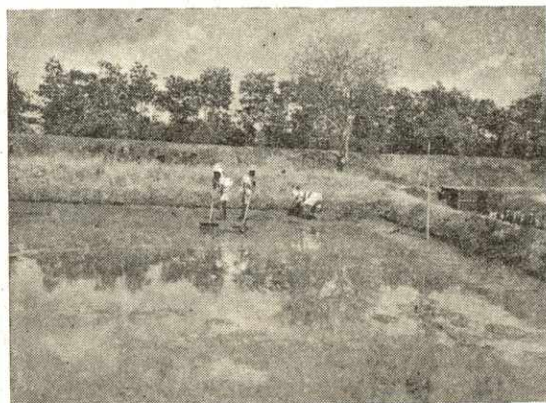
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