

ASSAY OF THE GOBY FRY (IPON) FISHERIES OF THE LAOAG RIVER AND ITS ADJACENT MARINE SHORES, ILOCOS NORTE PROVINCE

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FIVE PLATES AND TWELVE TEXT FIGURES

ABSTRACT

In this recent survey of the goby fry industry of Ilocos Norte Province conducted from November 1954 to February 1955, notes on the general biology of the gobies constituting the fishery, the socio-economics of the industry, effectiveness of the arrangement of the fishing gear in relation to the physiographic conditions of the Laoag River and its watersheds, and the assay of the escapement from the six periodic "runs" of the 1954-1955 ipon season were considered as bases for the appropriate conservation measures of the ipon fishery.

INTRODUCTION

In line with the program of the Bureau of Fisheries to look into the proper conservation and utilization of economic fish "seed" sources of the country, this account of the goby fry (*ipon*) fishery industry of the Laoag River and its adjacent marine shores, Ilocos Norte Province, has been undertaken from November 1954 to February 1955, in three separate field trips. The ipon (juvenile stages of gobies) fishery is one important segment of the commercial fisheries of the Philippines, primarily because the ipon are utilized as food of the people in the Ilocos provinces, and secondarily because the goby fish fry naturally hatched from the sea are the source of the goby fishery in the river systems of the region.

The protracted and periodic appearance of ipon in northern and northwestern Luzon, commencing in September and lasting through February each year is always unstable. Intensive fishing done at the marine shores and river systems tends to deplete the ipon fisheries, in spite of the enforcement of Fisheries Administrative Order No. 9, that restricts the use of fishery devices such as *chinchorros*, *tangar* nets and barricade ipon traps of *bobos*.

It was necessary, therefore, to undertake the assay of the ipon industry in Ilocos Norte Province in compliance with the re-

quest of Governor Damaso T. Samonte, of Ilocos Norte, for an amendment of Fisheries Administrative Order No. 9, designed to increase the duration of the prohibition of the use of bobo traps.

In 1934 a field survey of the importance of the goby fry fisheries of the Ilocos regions was undertaken. Municipal and provincial officials clamored for a fisheries administrative order which would restrict the catching of ipon so that the upstream inhabitants of the towns of Ilocos regions would also benefit from the ipon fisheries. The main object however, was to replenish the stocks of gobies in the watersheds.

In the recent survey of the goby fry fishery industry (November 1954 to February 1955) the general biology of the gobies constituting the fishery, the socio-economics of the industry, effectiveness of the arrangement of the fishing gear in relation to the physiographic conditions of the Laoag River and its watersheds, and the assay of the escapement from the six periodic runs (September to December and January to February) were considered as bases for the appropriate conservation measures of the ipon fishery.

THE BIOLOGY OF GOBIES

Many species of gobies inhabit rivers, lakes, tidal and marine shores of the Philippines. Although a number of these species are important sources of fish protein food, very little is known of their biology.

In 1940 Manacop worked on the biology of *Sicyopterus ex-traneus*, an important source of *anga* of the Cagayan river, Oriental Misamis Province. He found that this particular species of goby breeds or spawns on the upper courses of streams of this river and that the pelagic larval goby floats downstream towards the sea. They linger in the marine shores adjacent to the river for a duration of one month before they seek entrance to the mouth of the river to continue their journey upstream. The breeding habits and embryology of *Mirogobius lacustris* had been worked out by Blanco (1947). Landlock gobies, particularly *Mirogobius lacustris* and *M. stellatus*, breed within the confines of their environment. The *biang puti* (*Glossogobius giurus*) similarly inhabits Laguna de Bay but spawns in brackish and marine waters.

Species of gobies collected in the brackish and fresh-water portions of the Laoag River, Ilocos Norte Province, during the survey were as follows: *Chonophorus melanocephalus* (Bleeker);

Chonophorus ocellaris (Broussonet); *Eleotris melanosoma* (Bleeker); *Glossogobius biocellatus* (Cuvier and Valenciennes); *Glossogobius celebius* (Cuvier and Valenciennes); *Glossogobius giurus* (Buchanan and Hamilton); *Gobiosoma isignun* (Herre); *Illana bicirrhosa* (Weber); *Ophiocara aporos* Bleeker; *Rhyacichthys aspro* (Kul and Van) and *Sicyopterus lacrymosus* (Herre) (Plates 1 to 5).

Six of these species of gobies, namely, *bukto* (*C. melanocephalus*); *bunog* (*C. ocellaris*); *vivot* (*E. melanosoma*); *balla* (*G. giurus*); *campa* (*R. aspro*); and *paliling* (*S. lacrymosus*) composed the bulk of postlarval stages of gobies of the September-December 1954 and January-February 1955 ipon season.

SPAWNING GROUNDS AND BREEDING HABITS OF GOBIES

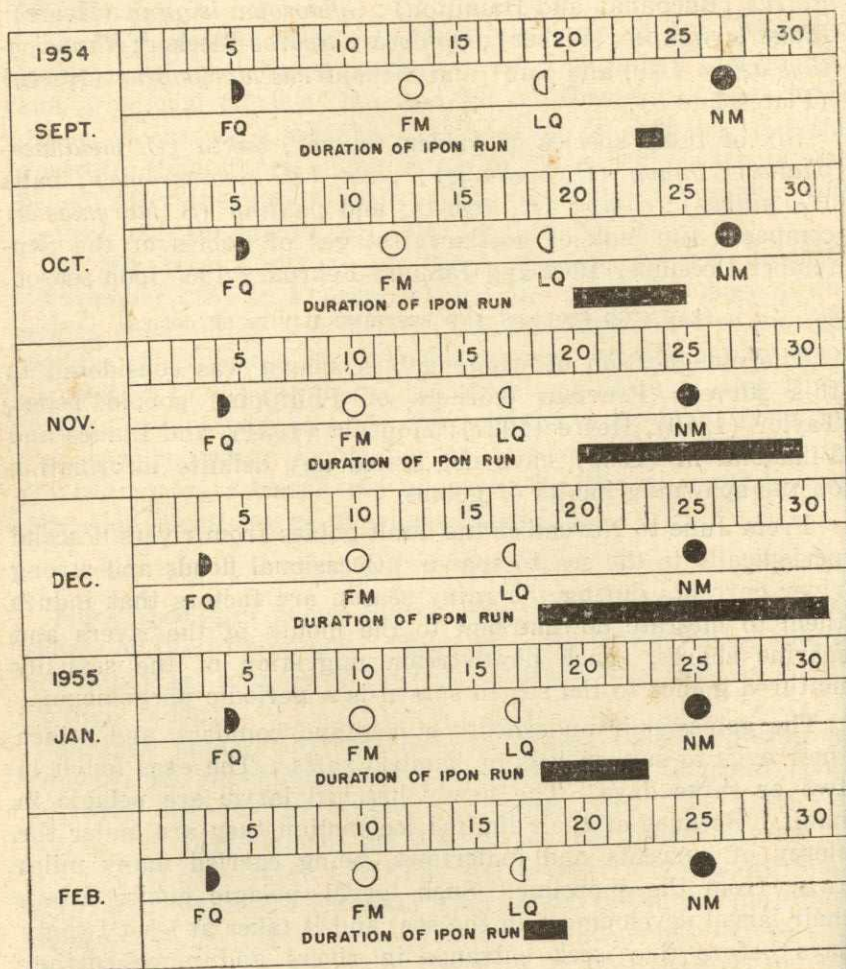
The old question of where gobies spawn was considered in this survey. Previous workers of Philippine goboid fishes, Taylor (1919), Herre (1927), Montilla (1931), and Blanco and Villadolid in (1939) have not stated any definite information on the spawning habits of gobies.

From June to November the adult gobies from rivers descend periodically to the sea to spawn. Occasional floods and strong river currents during the rainy season are factors that induce them to migrate downstream to the mouth of the rivers and marine shores. Such downstream migration of the sexually matured gobies to the sea to spawn is a periodic phenomenon.

The gobies pair underneath stones and boulders, and attach their eggs to sunken logs or bamboo rafts. The eggs hatch in two or three days. The newly hatched larvae are pelagic in habit. Because of their limited locomotion they are under the mercy of currents and undertows, being carried many miles away from the shoreline. Such larval, pelagic gobies attain their larval development in the sea, and it takes at least twenty days before they seek entrance in rivers and move further upstreams.

The appearance of such juvenile stages of gobies at the Laoag River and adjacent marine shores usually follows nine or ten days after the full moon of each month and their migration upstream follows the higher tides after the lunar period (text fig. 1.) The periodic appearance and migration seem to be affected by lunar and tidal influence, the same observation had been reported by Taylor in 1919; Montilla in 1933; Herre in 1927; Blanco in 1938 and Blanco and Villadolid in 1939, in the ipon fisheries of

Cagayan River, Cagayan Province and the Ilocos provinces. The claim that the gobies which are the sources of ipon spawn in fresh water had not been established in this work.



TEXT FIG. 1. Monthly lunar periods, Sept.-Dec. 1954, Jan.-Feb. 1955, and duration of goby fry (ipon) runs at the Laoag River, Ilocos Norte and its adjacent marine shore.

Examination of the swift flowing streams with stony bottom of the headwaters of the Laoag River at Piddig, Solsona, Banna and Nueva Era did not show any goby nest or fish eggs underneath stones and boulders. Plankton collections in the upper courses of rivers contained no newly hatched gobies.

The gobies in northern and northwestern Luzon do not spawn throughout the year. As a general pattern gobies in northern

Luzon spawn in September up to February, after the sexually matured gobies have been swept down by river inundations, to the river mouth and marine shores.

Goby fry appear along the marine shores of Barrio Pandan, Caoayan and Barrio Mindoro, Vigan in Ilocos Sur Province, although there are no adjacent fresh-water river systems, except tidal streams. Under such a condition gobies spawn in either brackish or in marine shores. The November "run" of ipon at the Pandan and Mindoro shores were composed of paliling (*S. lacrymosus*).

The appearance of five to six species of goby fry in a single run in all the six runs in September to December 1954 and January and February 1955, at the Laoag River was a common phenomenon.

The causes of variation of the date of appearance of ipon runs in the Philippines are due to variation of the time of high and low water, the effect of currents of the Pacific Ocean and the China Sea, the different sources of ipon fry from five species of gobies, and the variation of environmental conditions (Manacop, 1953).

The protracted condition of the spawning activities of gobies is also primarily due to absence of enough goby stock spawners throughout the year and secondarily due to the two prevailing monsoons, the wet and the dry seasons which adversely cause the difference in high and low water as affected by currents.

The multiple spawning habits of fishes is a common phenomenon that has been reported by Bromhall (1954) in *Mugil cephalus*; Manacop (1953) in *S. extraneus*; Mane (1929) in *Arius* spp; Clark (1929) in *A. californiensis*; and Thompson (1919) in *L. tenuis*. This particular behavior in fishes is due to the presence of three types of eggs in sexually matured female fish, namely, the immature, intermediate, and matured types of eggs in their ovarian sacks. The presence of intermediate group of teleost eggs of tropical fresh-water fishes is associated with a prolonged spawning season (Fulton, 1899 and Clark, 1925).

Gobies in general cannot be compared to the Salmon to possess "homing instincts." At the Pandan shores of Caoayan and Mindoro shores of Vigan, Ilocos Sur, the bulk of the ipon run in October and November was the paliling (*S. lacrymosus*). The tidal streams adjacent to these marine shores are some 15 miles from the mouth of the Santa-Abra River. Gobies and goby fry caught at Pandan and Mindoro in Ilocos Sur were therefore

brackish or marine forms. If this assumption is not true then larval gobies which probably originate at the Santa Coast would be carried away by the sea current northward and subsequently caught at Pandan and Mindoro shores of Ilocos Sur. This condition would disprove the validity of the "homing instincts" of gobies. Advanced stages of gobies, especially the paliling, have the habit to linger along the seacoast during adverse conditions in September, October, and November in the Ilocos regions, but this does not mean they always trace their course back to where they had been originally hatched in fresh-water, to begin their fresh-water habitat.

By following the duration of each of the ipon runs in November to December and January and February at Laoag River at various points at Pariir, Parang, Sarrat; Santiago, Solsona, Piddig, Dingras; Tabtabagan, Banna and Nueva Era, the *tartarac*, juvenile gobies of different age groups were caught with the *paculod* and the *kitang*. Adult gobies caught were mostly "spent". *Bobos* of the *paculod* could also impound newly hatched gobies, but these were not found.

SPECIES OF GOBIES CONSTITUTING THE GOBY FRY RUNS

The goby fry of each of the "runs" appear in vast shoals at the marine shores and at the mouth of rivers. They are reddish or pale orange in color, transparent, usually 15 to 20 millimeters long. They are caught with chinchorro and tanga nets, as they are brought in by the incoming highest tides. It is rather difficult to determine what batches or species of gobies constitute the particular run. However, there are instances when a single batch of cross-barred postlarval gobies are caught in a single haul of ipon net. These are larval gobies that had been delayed in entering river mouth due to inclement weather. These larval gobies are usually larger than those of other batches. Those who have had the opportunity to study juvenile stages of fishes can readily tell to what group or batch they belong. The duration of the fishing activity at the marine shores and mouth of rivers usually last from two to four days, depending upon the number of batches composing the particular run for the month.

The goby fry after entering the fresh water gradually change their mode of life from the pelagic to demersal habit. However, when they move in schools they swim at middepth of shallow water. Two or three days later the transparent amber color of the goby fry becomes darker due to morphological changes

their external features. The fry develop characteristic body patterns of cross bar pigments in their ctenoid scales due to the differences of grouping of dark chromatophore pigments in them. Each species of goby fry has its own distinct character parr marks (Plate 3, figs. 1-2; Plate 4, figs. 1-2; Plate 5, figs. 1-2).

Studies of postlarval stages of gobies composing the run in each particular month of the 1954-1955 ipon season indicated six species of gobies, namely, bukto (*Chonophorus melanocephalus*); bunog (*Chonophorus ocellaris*); virot (*Eleotris melanostoma*); balla, (*Glossogobius giurus*); campa (*Rhyocichthys aspro*) and paliling (*Sicyopterus lacrymosus*).

FEEDING OF GOBIES

The juvenile gobies scattered at sand bar margins, river pools, and gravelly bottom, feed on detritus materials attached to stones. The feed is mostly algal and diatom materials as revealed from microscopic examination of materials teased out from stomach of young gobies.

It is a common site to observe the manner of feeding of both the adult and the young of the paliling (*Sicyopterus lacrymosus*), bukto (*Chonophorus melanocephalus*) and bunog (*Chonophorus ocellaris*) in rapid flowing streams. As they cling to stones and pebbles by means of their adhesive rounded ventral suckers the gobies scrape the organic matter mostly diatoms and detritus material on the stone with their teeth of their lower jaw assisted with their conical canine teeth of their upper jaws. Gobies are generally bottom feeders as shown by the ventral position of the mouth. The lower jaw which is provided with sharp teeth is covered by the upper jaw which is likewise provided with canine teeth. Clinging to stones and scraping of food on the stones are simultaneous behavior of gobies when feeding, followed by skipping from one stone to another, when the food is consumed.

Young gobies when migrating also stop to feed. Areas of stones are covered by mats of feeding gobies in banks of the meanders, but when such schools are disturbed will refloat and follow lines of route and keep on moving upstream following the unbroken "line" route of movement, miles and miles during the duration of the run, two to three weeks after they have sought entrance at the mouth of the river.

At the river margins, pockets, tide pools, gravelly bottoms and margins of sand bars were observed various forms of

"blooms" of blue greens. The higher forms of algae found common were represented by the following genera: *Spirogyra*, *Calothrix*, *Penium*, *Zygnema*, *Oedogonium*, and *Cosmarium*. Such forms are sources of food of maturing gobies.

Fresh-water diatoms such as *Oscillatoria* spp., *Spirulina* spp., and *Navicula* spp. and zooplankton forms (*Euglena*, *Sinocephalus*, *Cyclops*, and Rotifers) occur in significant quantities in rivers and are utilized as food for young gobies.

MANNER OF MIGRATION

There are six so called "runs" of ipon at the Laoag River and its adjacent shores, known in Ilocano as *apta* for the month of September; *pasaran* in October; *papait* in November; *lumalade* in December; *paturay* in January; and *salsalput* in February. These names for each particular run each month from September and December and January and February in the succeeding year are hypothetical. A close observation on the composition of the bulk of the particular runs indicates that they are the heterogeneous juvenile stages of the different species of gobies.

Observation of the first and second "run" of ipon (1954) showed that they reached some 34 to 50 kilometers from the mouth of the Laoag River. The fry of *C. melanocephalus* and *S. lacrymosus* were the bulk of the ipon runs.

The route of migration of schools of ipon was observed and followed from barrio Parang to Sarrat, a distance of three kilometers on the northern margin of the Laoag River in November and December 1954, and January and February, 1955. The run was composed of the species of balla, bukto and paliling (*C. melanocephalus*; *C. ocellaris* and *S. lacrymosus*). The schools followed a definite single route about one meter from the edge of the river along the curvatures of the river bank on sandy and gravelly bottom, 6 to 12 inches deep. When the ipon was disturbed the school of ipon dispersed for a while, but they resumed their course to join the same route ahead. Sometimes there were short parallel routes of one batch, presumably distinct species close to the route adjacent to the river edge, thus forming a narrow long strip, 5 to 10 inches wide of migrating fry. One could see clearly ahead signs of upstreams moving goby fry. The goby fry swim at the middepth of the shallow water, one fish nose to nose to the other followed by others, at the rate of 500 to 1,000 meters a day.

ASSAY OF GOBY FRY ESCAPEMENT

In each of the particular ipon runs from September to December and January to February there were six batches or shoals which appeared simultaneously in each of the run. The bulk of the catch per run caught with ipon barricade traps consisted of *S. lacrymosus*, *G. giurus*, *C. ocellaris*, and *C. melanocephalus*. The paliling, *S. lacrymosus*, which appeared along the coast and which sought entrance at the mouth of the river were usually larger and had decided cross bars. Because of their creeping and slow movement upstream they were easily caught in the series of barricade traps.

Calculated at an average of 100 goby fry (ipon) for the dominant species of goby *C. melanocephalus* for every square meter, along the two banks of the Laoag River, there would be theoretically 2,000,000 fry for the 10-kilometer distance from barrio La Paz to the town of Laoag for the October 1954 run.

For the succeeding 10-kilometer distance of the same run of ipon, the escapement in October at an average of 75 goby fry or a decrease of 25 per cent, the resultant escapement would be 3,500,000 fry of *C. melanocephalus* of the 20-kilometer run on both banks of the river.

Likewise, the 10-kilometer "run" along the same banks of the Laoag River up to the town of Banna, sitio Tab-tabagan, next to Dingras at a distance of 30 kilometers and calculated at an average of 50 fry per square meter to the next 10 kilometers, there would be a total escapement of 4,500,000 fry.

This particular set-up of theoretically estimating the average number of escapement of goby fry (*C. melanocephalus*) based at an average of 100 goby fry to the square meter on one opposite bank for the first 10-kilometer distance, and 75 goby fry, to a square meter to the second 10-kilometer distance and 50 goby fry to a square meter, to the third 10-kilometer distance, there would be a significant escapement for each particular "run". In spite of the effect of the removal of the goby fry, by 16 boat chinchorro, 50 tangar nets, and bobo barricade traps in operation at the Laoag River, there would be no actual depletion of the ipon fisheries.

During the September and October 1954 ipon "run," it was necessary to determine how far the ipon escapement has reached upstream. At Barrio Tab-tabagan, Banna, some 34 kilometers

from Laoag, or 45 kilometers from the mouth of the Laoag River, the juvenile of *C. melanocephalus* (bukto) and *S. lacrymosus* were abundant.

At Piddig, Ilocos Norte, the young stages of *C. melanocephalus* were few at gravelly bottoms and margin of the river. This can be accounted for the fact that the Piddig-Tonoton tributary of the Laoag River abruptly flows northeast, reaching the foot of the low hills, some 30 kilometers from the mouth of the Laoag River (figs. 2-3).

The bukto *C. melanocephalus* and balla *C. ocellaris* have finer texture of body form, being needlelike when they compose the ipon schools, can easily migrate upstreams, without stopping to feed. The paliling were not as abundant as those of the bukto and balla, at a distance of 16 kilometers of the Laoag River.

Assay of the goby fry that has escaped the numerous barricade traps at points of observations at Rioeng, San Mateo, Sitio Sarrat, San Antonio, Pariir, and Parang and even as far as at points of observation at Tonoton, Piddig, Santiago, Solsona and Tab-tabagan, and Banna revealed the existence of gobies of different age groups of each of the particular species of gobies.

It is of interest to note that runs of gobies in September could reach further upstream in each of the above branches of the Laoag River when the river bed is still affected by floods, but the succeeding runs do not, as a rule, reach the upper stretches of the Laoag River, especially beyond Tab-tabagan, Tonoton, and Santiago. The river tributaries are very narrow, and shallow, and dams of irrigation projects within the river obstruct the continuous route of migration of the juvenile gobies further up. Such conditions were observed at the tributary of the Laoag River at the town of Nueva Era where gobies did not exist.

The existence of batches of young gobies (*tartarac*) in the Laoag River could be maintained if there were no barricade traps (*paculod*) at San Mateo, Pariir, and Parang. These traps usually operate effectively, two weeks after the gobies have reached the upper trunk of the Laoag River. Besides these traps, the *tartarac* can also be caught with fish poison in fish enclosures at margins of the river and by the sac-saclang method of goby fishing. Goby fry that have escaped at regions at the lower course of the river are eventually caught at the headwater of the Laoag River. Such practice should not be allowed

to insure the maintenance of the balance of stock to carry on the growth of gobies in the succeeding ipon season. Dams of irrigation projects in the upper courses of the river should provide fish ladders to enable ipon migrants to reach the farthest tributaries of the river.

Table 1 shows the monthly composition and bulk of goby fry. The two most significant species which compose the bulk of each run are bukto (*C. melanocephalus*) and paliling (*S. lacrymosus*) as indicated in the commercial landings of pamoboan and paculod ipon traps. The balla (*G. giurus*) are in the runs of September and October. The different age groups of this particular species were caught with set lines, *kitang*. Bunog, *C. ocellaris*, virot, *E. melanosoma*, and campa, *R. aspro*, composed also the bulk of the ipon run but were not so abundant as those of the bukto and paliling.

SOCIO-ECONOMIC ASPECT OF THE IPON FISHING INDUSTRY

There were 16 ipon-chinchorro outfit operated at the mouth of the Laoag River at sitio La Paz. Each outfit is itemized in Table 2, as to size of boat and net, necessary accessories and manpower in its operation. The boat alone costs about 500 pesos, accessories, 200 pesos, and the net costs about 1,000 pesos, giving a total of 1,700 pesos for a single unit of ipon equipment. The manpower as indicated consists of 18 paddlemen, 1 pilot, 1 net man, 1 rope man and 22 men to pull the net in actual operation. The total capital invested in the 16 boat chinchorro-ipon equipment is 27,200 pesos, and the total manpower is 704.

A single unit of boat-chinchorro ipon net outfit is a sort of cooperative enterprise capitalized by 10 or 15 members, each having equal number of shares.

The total value of the catch is divided into two parts, one half goes to the capitalist, the other half to the helpers. The capitalists share equally in the expenses involved for the minor repairs of boat and net, purchase of net accessories, and payment of fishing privileges.

The tangar net operators at the marine shores of La Paz are 50 in number. They are individually owned by fishermen who do not own larger equipment, like boats and chinchorros. These tangar nets are usually operated by heads of families and members of the families. Some 15,000 pesos¹ are invested in

¹One peso equals fifty cents U. S. currency.

tangar nets and 50 to 100 people are needed in their operation.

The methods of operation of chinchorro and tangar nets had been already described by Blanco and Villadolid (1939); Montilla (1931); Umali (1934) and Manacop (1953).

There were 18 pamoboan traps in operation from the fishing sitios of La Paz, Lubbot, Suyo, Tangid and Santa Maria, of Laoag, and 24 paculod traps at Sarrat, sitios Poblacion, Pariir, and Parang. For locations of barricade traps as indicated in the sketch map and class location A-F (Table 3), 2,665 bobos were used. For each particular location the number of traps varied and also the expenses involved in the cost of equipment and materials for each class location of the traps. Some 43,430 pesos is the total investment for all the pamoboan, piñgi, and paculod traps constructed and actually operated in the November "run".

Estimates on the expenses involved in the operation of a pamoboan outfit are shown in Table 4. The highest item is 3,000 pesos for 200 bobos at 15 pesos each, or 77 per cent of the capital investment, and the costs of necessary equipment and materials is 3,677 pesos, or 22 per cent of the total investment for one unit of pamoboan of 200 bobos.

A unit of pamoboan usually has 15 membership of adult fishermen who contribute in kind, materials and equipment needed and the manpower to construct and operate the barricade trap of bobos. Incidental expenses incurred during the construction and in the operation of the traps are borne by the members themselves.

The preparation and construction of the barricade traps (pamoboan) at the Laoag River start two days after the regular fishing of the goby fry at the mouth of the river and its adjacent shores. Not all the pamoboan operators build the barricades at one time but they build them in succession depending upon the rate of migration of the goby fry upstreams. The people at La Paz build their barricade bobo traps by bringing to the river banks bamboo splits, bamboos, sawale mattings, stones, gravel, and such equipment as wooden hammers, shovels, and bolos. The last items to arrive are the bobos, banana trunks, fish baskets and the bagaybay pieces of long and narrow, coarsely woven cotton cloths.

One pamoboan outfit consists of 16 adult fishermen who have contributed in kind, materials and equipment. Possession of the location of the pamoboan in the Laoag River is usually

hereditary. Whoever is the head man among the group in the outfit has acquired the site of the trap from his father, a practice still respected among pamoboan operators. This is still followed so as to avoid disputes among the head men of the barricade trap outfits. The head man is responsible for the acquisition of fishing permit from the Municipal Treasurer. The fee paid is at the rate of 15 centavos² for each bobo laid in the barricade traps in the first zone, of five succeeding pamoboan; 12 centavos for the second set of five succeeding pamoboan and 10 centavos for the third set of five succeeding traps; 8 centavos for each bobo in the fourth zone and 6 centavos for the fifth-zone.

In any group or society of fishermen in the Ilocos regions the *anito*, or *anting-anting*, is still observed among pamoboan fishermen during the first day of setting the barricade dams. A bamboo cross is stuck at the edge of the river where the trap starts. Nearby on the sandy beach are dugouts where in the pebbles and stones previously gathered, are stored until they are used. The bundles of bamboo pegs and stakes are placed near the bamboo cross. When the ceremony starts, a good-sized pig is butchered on top of the bundle of tulus. The sacrificial pig and the bamboo cross are said to bring good luck in fishing. The rite is obvious for the simple reason that the killing of the pig is necessary for the preparation of the picnic at the river. The food is served with the native drink of *basi*, which is enjoyed by the members of the pamoboan who all belong to the fishing barrio.

The bamboo fish trap (bobo) as a single unit of catching fish is not an indigenous fishing gear in the Philippines. It might have been introduced by our Malay forefathers. The gradual evolution of the manner of the use of the bobo in the barricade traps is unrecorded in the Ilocos Regions. The construction and operation of the barricade traps might have been developed through "trial and error" years ago. In no other place in the Philippines than Ilocos Norte, particularly in the Laoag River, can one observe the intricacies of the setting of series of river barricades of bobos for catching ipon.

Although the bobo fishermen are unschooled, their experience in setting barricade in ipon bobo traps in strategic locations in the main trunk of the river and meanders, above or below

² One centavo equals one-half cent U.S. currency.

a river delta, sandy or gravelly bar, swift flowing streams, and other places is unsurpassed. Bobo fishermen are human "beavers" or "bobo engineers" who build river dams of bamboos, pegs, banana sheath, sand, stones, and bobos.

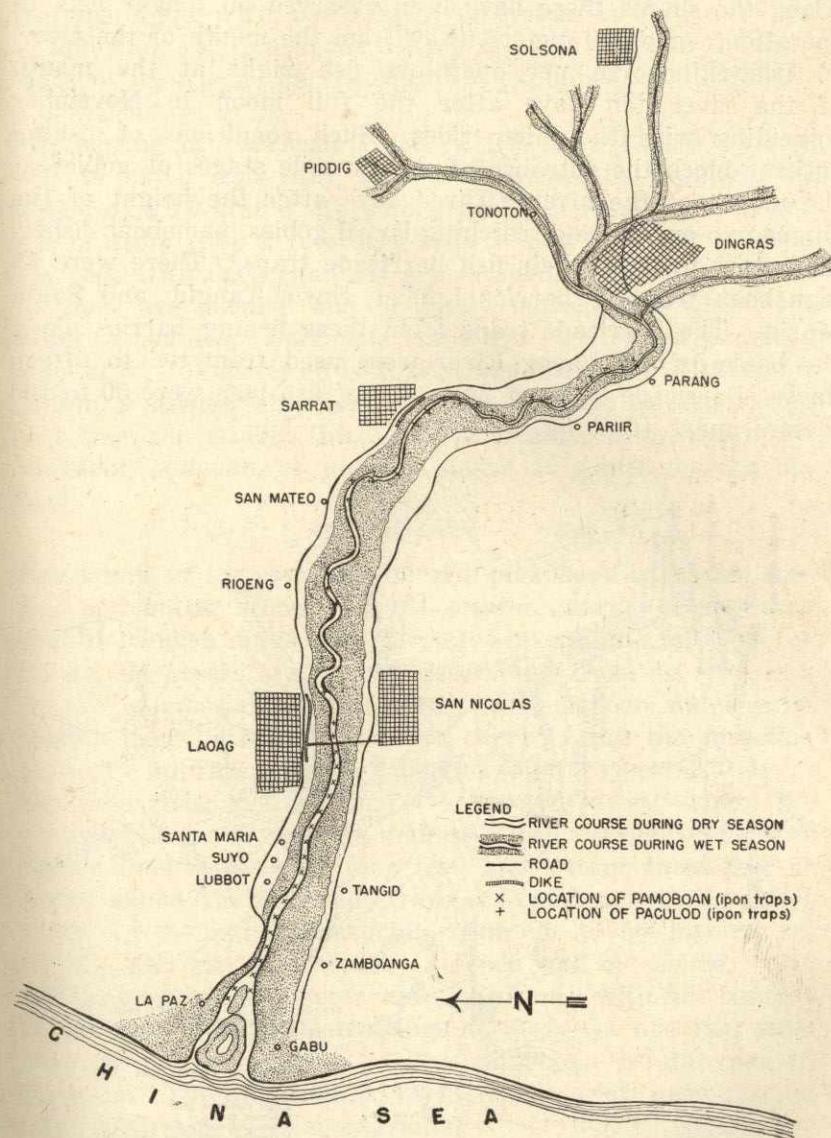
One objective of the study of the various types of barricade traps is to establish the fact that such methods contribute to the depletion of the ipon fisheries in a given river system where there are many fishermen, barricade ipon traps operating in each of the six ipon runs from September-December and January and February in each year.

THE LAOAG RIVER AND ITS TRIBUTARIES

The sketch map of the Laoag River, its branches and tributaries is compared to a tree with its trunk and its several ramifying branches. The river flows from east to west at the main trunk, towards the China Sea. The town of Laoag with its barrios, borders each side of the main trunk of the Laoag River. Sarrat is located on the northern side of the river, some eight kilometers from Laoag. The barrios of Sarrat, such as Pariir and Parang, are on the south side of the river meander. The river has three main branches, the Tonoton-Piddig; the Dingras-Solsona, and the Dingras-Banna, tributary. The rivulets and streams of these branches flow from the north, northwest, east to west and southeast towards the west at the junction at Sarrat. Towns and sitios of barrios on level plains and meandering valleys are located far apart, on both sides of the Laoag River. The river bed is wide during the wet season and narrow during the dry season. The occurrence of river meanders and bends in relation to incised river beds, contour gradients and other physiographic features will be explained in details in relation to the installation of *paculod* barricade traps.

The maps show the locations of chinchorro, tangar nets at the marine shores adjacent to the river mouth and also the locations of pamoboan and paculod traps of the barrios of Laoag as far as Parang, Sarrat, where the river bends and starts to branch off.

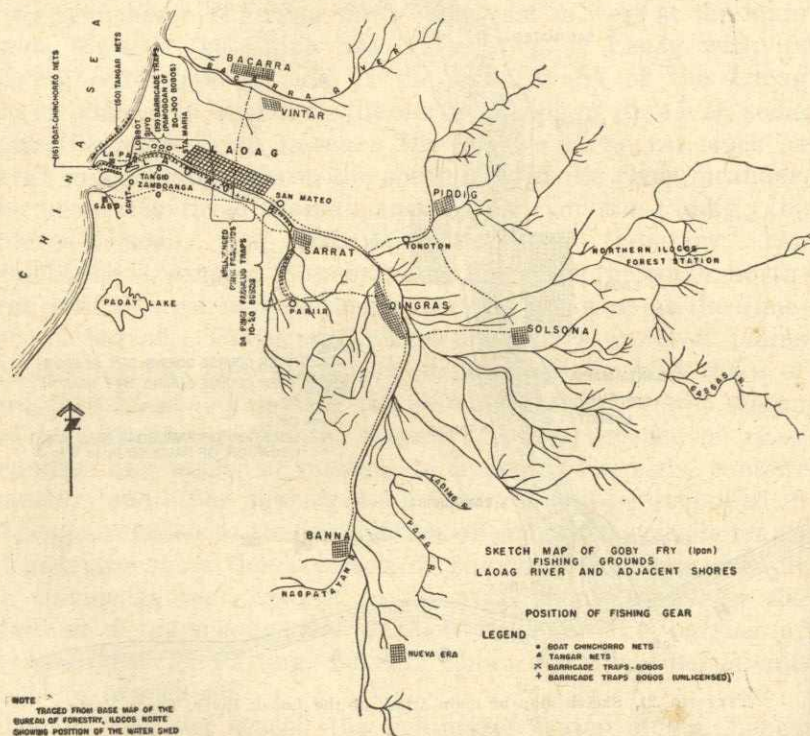
During the wet season the volume of water of the Laoag River is great and turbid due to the landwash from the adjacent hills and mountains. The river is wide at its mouth, about one kilometer during June, July, and August. At the beginning of the dry season in October the river starts to narrow and becomes clear (text fig. 2).



TEXT FIG. 2. Sketch map of main trunk of the Laoag River, Ilocos Norte.

The ipon fisheries are commercially important along the marine shores of the fishing barrios of Gabu and La Paz and the Laoag River and its tributaries. The fish contraptions and fishing outfits at the mouth of the Laoag River and marine shores are strategically located as indicated in the sketch map of goby fry (ipon) fishing grounds of the Laoag River and marine shores.

Along the shores there have been observed 50 tangar nets in operation, some 500 meters away from the mouth of the river, 16 boat-chinchorro net operators fish right at the mouth of the river ten days after the full moon in November coinciding with the lunar tides. Such conditions of fishing entirely block the entrance of the juvenile stages of gobies at the mouth of the river. Three days after the height of the chinchorro operators of catching larval gobies, pamoboan fishermen start to build their fish barricade traps. There were 19 pamoboan traps at barrios Lubbot, Suyo, Tangid, and Santa Maria. The barricade traps from these fishing barrios along the banks of the Laoag River were used from ten to fifteen days. Barricade traps of 20 to 300 of fish pots were 50 to 100 meters apart (text fig. 3).



TEXT FIG. 3.

IPON BARRICADE AND FISH POTS

Previous studies of the ipon fisheries have failed to bring into light the exact facts about the installations of bobo traps in relation to the suitability of a fishing area. Physiographic

conditions of the portions of the river system at the site of the trap and their relation to the setting of these traps in the light of present knowledge on rheology are explained in the following discussions.

The setting of barricade traps of fish pots (bobos) across rivers to catch goby fry migrating upstream requires the selection of a favorable site with gravelly or sandy bottom and water of from 2 to 3 feet deep with a slow or swift current. River beds with deep channels are avoided. Where the banks of a river are parallel and of sandy bottom and where the channel is not deep, barricade traps are constructed provided a space of 50-100 meter on both sides are available. Under this condition, a straight line barricade fish pots can be constructed except that the middle third is left open as a provision for escapement, *padaoan*, of juvenile stages of gobies moving upstream.

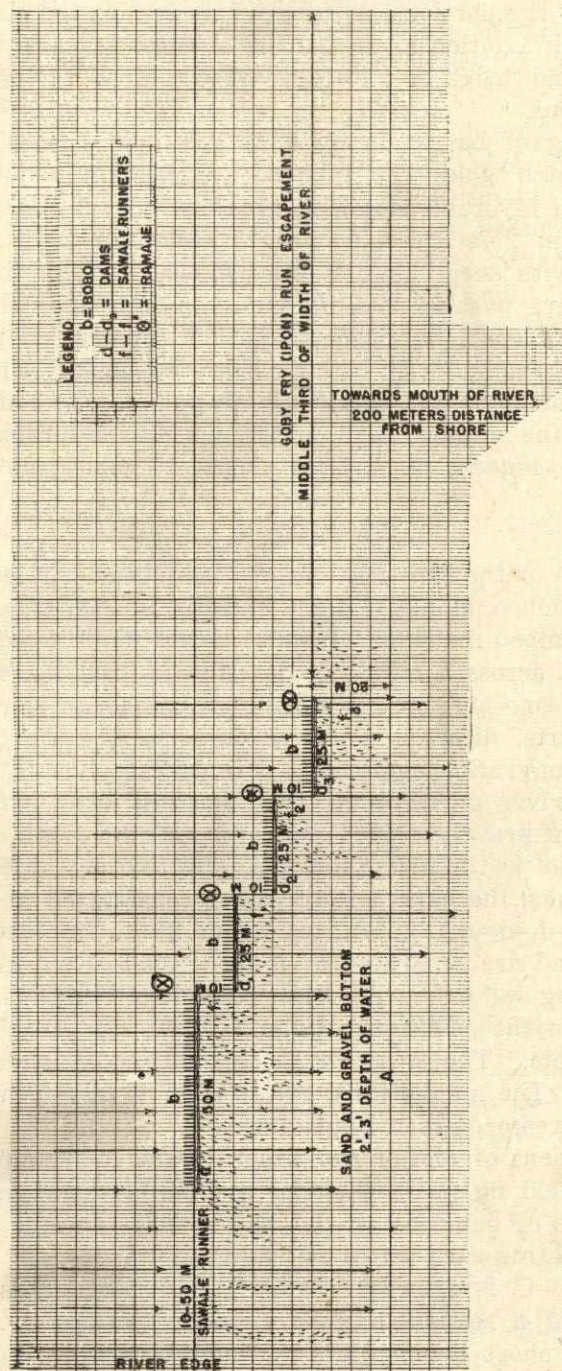
THE PAMOBOAN

The details of the construction of a pamoboan barricade consisting of bamboo, stones, banana sheaths, stakes, pegs, woven splints of bamboo mattings (sawale), scare cloth, *bagaybay* or fish pots, set across a river are described. Text fig. 4-A is a plan view of one half or one wing of a pamoboan showing its necessary parts, direction of river current, and the direction of goby fry migration against the flow of the river.

Near the river mouth, some 5 kilometers away, where the river bed is of gravel, pebbles and sand, and the depth of water at the channel is three or four feet, and two or three feet at the river banks, the barricade traps are constructed in a series of dams ($d-d_1-d_2-d_3$) measuring from 25 to 50 meters, respectively, and are separated by a fence wall of sawale, 10 to 20 meters long and one meter wide, reinforced with five bamboo tulus wherein the sawale mattings ($f-f_1-f_2-f_3$) are tied with bamboo splints. The wing of the pamoboan is staircase in appearance. The middle third of the river is left open for the passage upstream of ipon migrants.

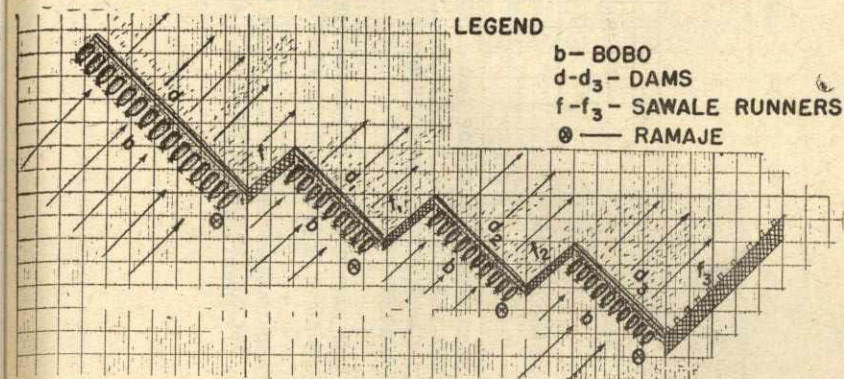
A complement of one of the wings of the ipon trap is also illustrated (text fig. 4-B) showing the similar arrangement of the barricade of bamboos ($d-d_3$) and sawale fence or runners ($f-f_3$), separating each series of fish pots.

Text fig. 4-C is a perspective view of the details of the installation of a section of a barricade consisting of bamboo rails tied to short bamboo stakes (tulus) each 2.5 feet to 3



TEXT FIG. 4-A. Plan view of one-half barricade trap (pamoboan) showing accessory parts, direction of river current and direction of goby fry (ipon) against current.

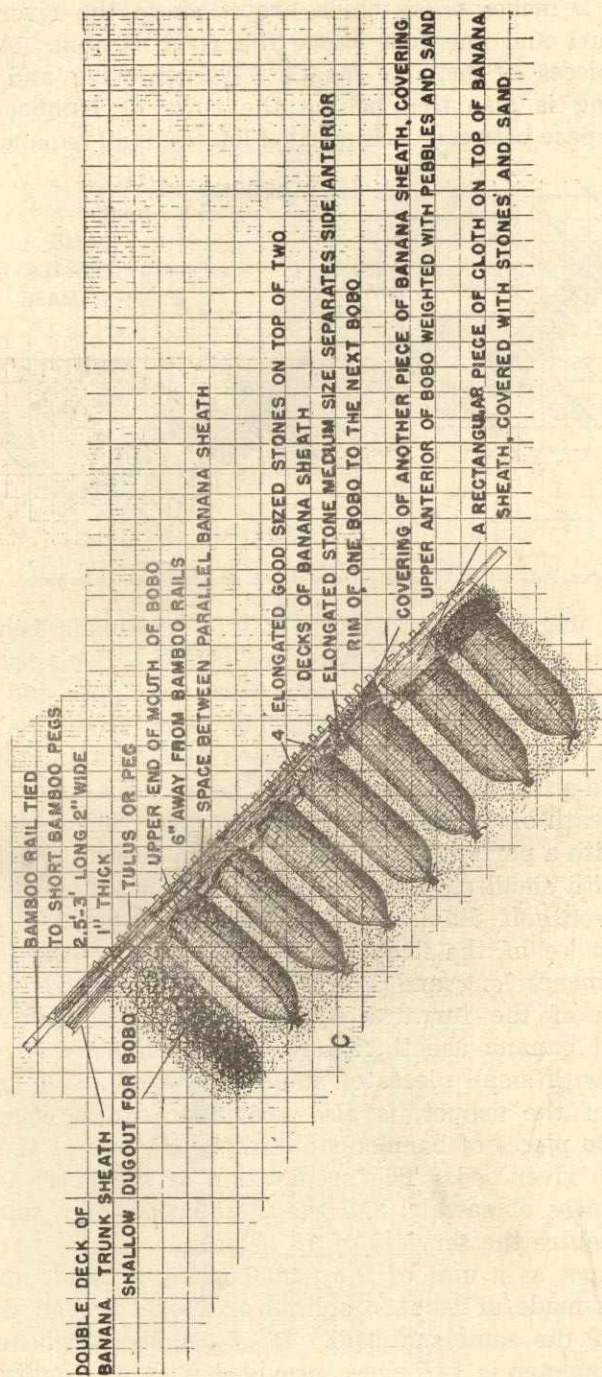
feet long, 2 inches wide which are stuck to the river bed, 5 inches apart and one foot above the river bottom. A double deck of pieces of banana sheath 5 inches wide and several meters long is also tied behind the rows of bamboo stakes, leaving a space between each parallel longitudinal banana sheath.



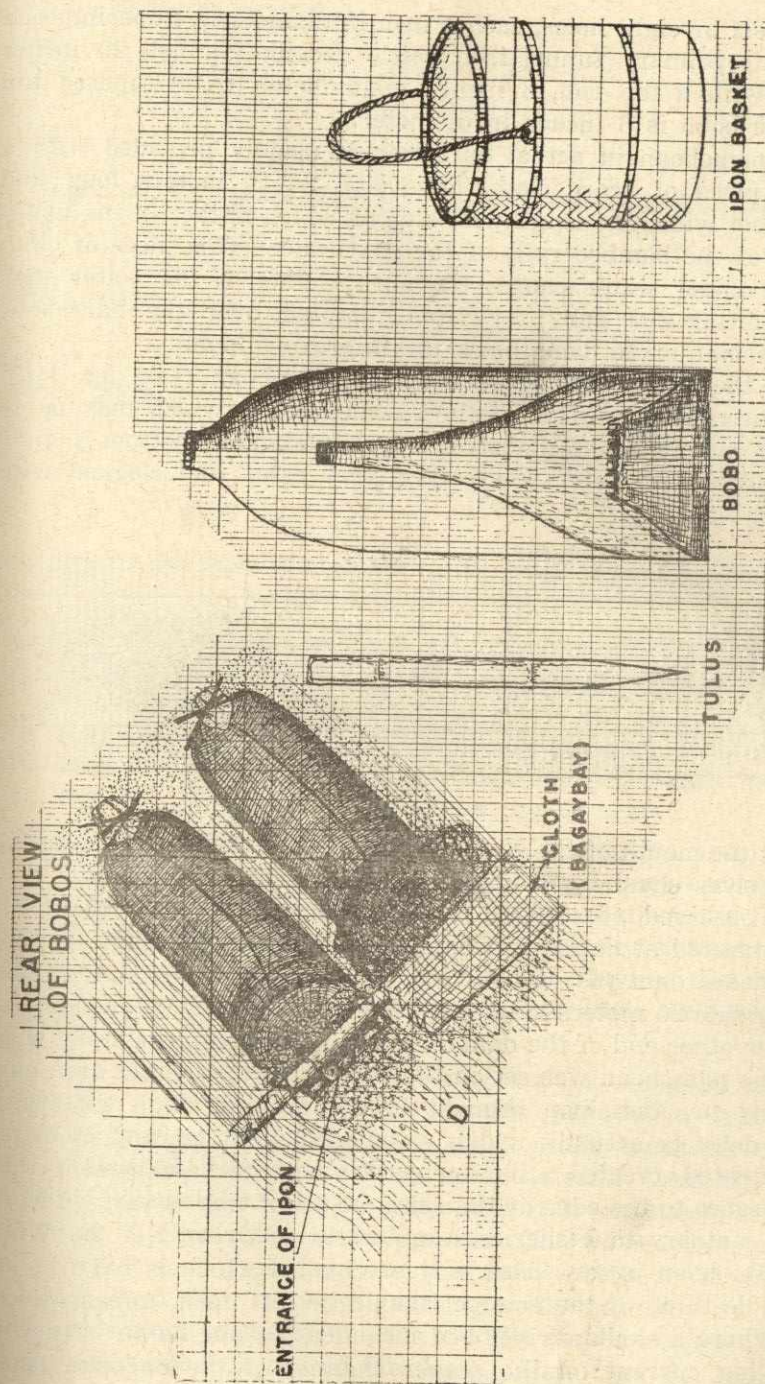
TEXT FIG. 4-B. A perspective view of one wing of pamoboan.

Shallow dugouts at the river bottom are made behind the barricade, wherein the fish pots are placed. Each fish pot is half buried in the hollow pit, such that the upper end or face is lightly tilted upwards and 6 inches away from the bamboo rails of the barricade. To complete its installation, four elongated good-sized stones are placed behind the two decks of banana sheath of the rails of bamboo stakes. These stones are covered with a portion of a piece of banana sheath, which is also covered with small stones or pebbles. Small stones are placed at the lower half diameter of the fishpot, covering the eight entrance holes of the fishpot. A rectangular piece of coarse cloth, 20 inches long and 12 inches wide, is placed above the upper rim of the forward end of the fishpot to cover the stones and banana sheath, after which this piece of cloth is weighted with small pieces of stones and sand (text fig. 4 D). The end of the fishpot, is also provided with a covering of cloth. Two pieces of bamboo stakes keep the end of the fishpot intact with river bed. The preparation of the barricade, runners of fences of sawale, and the installation of a number of fishpots require the services of 16 fishermen.

The fishpot as a unit of the pamoboan trap is an important one. It is made of bamboo splints or spokes woven with fine weavers of the same material. It is usually 43 inches high. Its face diameter is 14 inches, provided with a primary funnel



TEXT FIG. 4-C. Perspective view of panoboan showing details of its installation.

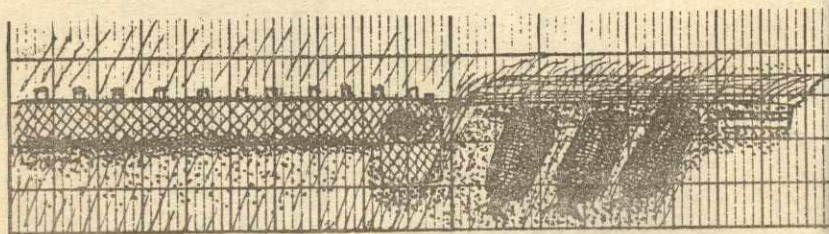


TEXT FIG. 4-D. Front view of dam and bobos.

with six or eight holes, each 1 inch in diameter. Superimposed on this primary funnel is a bottle necklike funnel, 20 inches long with a top end, 3 inches in diameter. The tapered top of the bobo is 3 inches in diameter.

A pamoboan in actual operation is usually provided with a long piece of scare cloth, *bagaybay*, 25-50 meters long and one foot wide, one lengthwise side of which is taut in the upper edge of the bamboo rails of the barricade. This piece of cloth when under water causes the abrupt flow of the water thus prohibiting the goby fry from jumping over the barricade. These man-made dams block the migrating ipon.

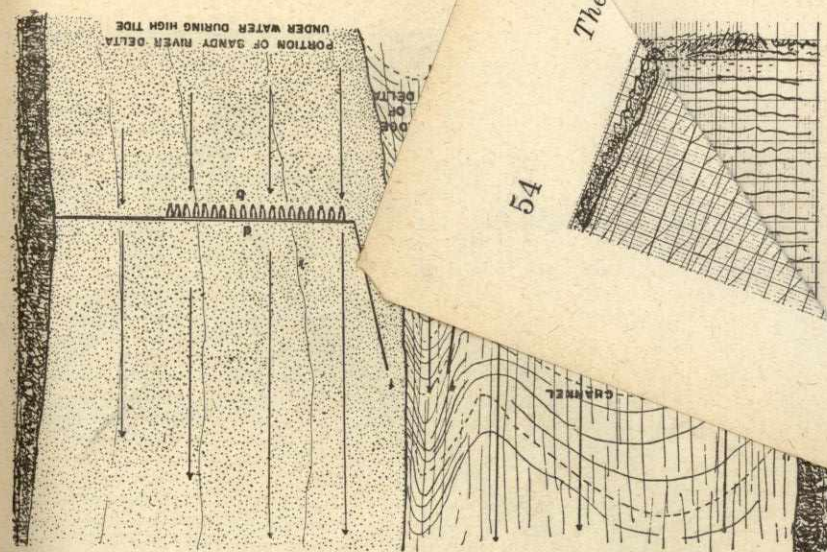
At the extremities of each of the pamoboan (text fig. 4-E) is illustrated a portion of the sawale runner which may be 10 to 50 meters from the river edge of shallow bottom 1 to 5 feet, depth of water where it is very calm, and clogged with algae.



TEXT FIG. 4-E. Extreme view close to river edge.

At the mouth of the Laoag River where a delta exists creating two river channels, a unique way of setting a barricade trap was observed (text fig. 5). One wing of the pamoboan was constructed at one river channel, composing one single row of barricade dam (*d*) and rows of bobos (*b*) with a fence runner of sawale 20 meters long and which is diagonally perpendicular to the other end of the dam of bobos. One complementary wing of the pamoboan was set on the portion of the deltoid area purposely to catch ipon brought in by incoming high tide when the delta is actually under water. Such an arrangement, as illustrated, creates a narrow passageway for escapement with reference to the edge of the delta. Such a trap is very effective but contrary to Fisheries Administrative Order No. 9. When a pamoboan is set across a river channel which is narrow, the middle third of the channel should be left open, unbarricaded.

Where a shallow river bed meanders on one bank with swift flowing current on the deeper channel of the opposite bank,



TEXT FIG. 5. A plan sketch of a pamoboan on one side of a channel, beside a delta, Laoag River, Ilocos Norte.

barricade trap can be constructed occupying only one-half or two-thirds of the shallower portion of the entire width of the river, leaving the other third of the width of the river with deep channel as escapement. In this case the pamoboan forms like a fish ladder of trap of bobos which runs diagonally across (text fig. 6).

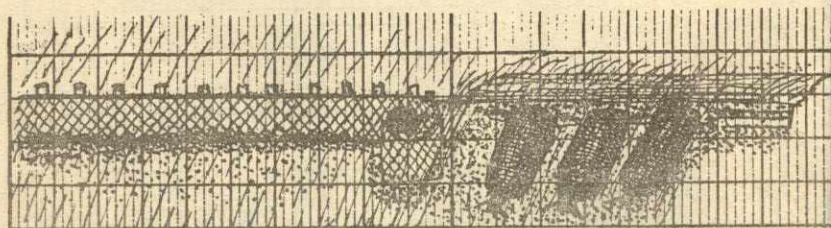
At the lower course of the river, 5 kilometers from the river mouth, there are usually areas of sand bars occupying the center of the river bed thus creating two channels; if these channels are shallow and of sandy or gravelly bottom, one barricade trap, *piñgi*, may be constructed leaving the other opposite unbarricaded for free passage of fishes and bancas (text fig. 7).

At the upper course of the river meanders, some 10 to 15 kilometers away from the river mouth, *paculod*, a type of barricade trap of 5-20 fishpots is used. Such types of traps are constructed at one or both sides of the river (text fig. 8). Some six kilometers from the river mouth a pamoboan barricade trap is illustrated (text fig. 9). The river channel is about 3 feet to 4 feet deep and each side of the river bank is 2 feet to 3 feet in depth, with gravelly bottom. At one bank the contour of the river bank slightly curves necessitating the unsymmetrical layout of the dams. Note that the escape-

with six or eight holes, each 1 inch in diameter. Superimposed on this primary funnel is a bottle necklike funnel, 20 inches long with a top end, 3 inches in diameter. The tapered top of the bobo is 3 inches in diameter.

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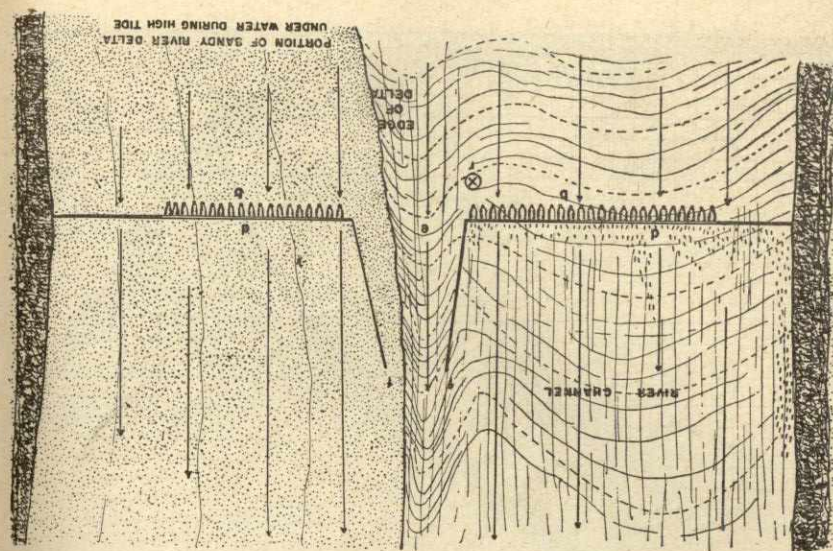
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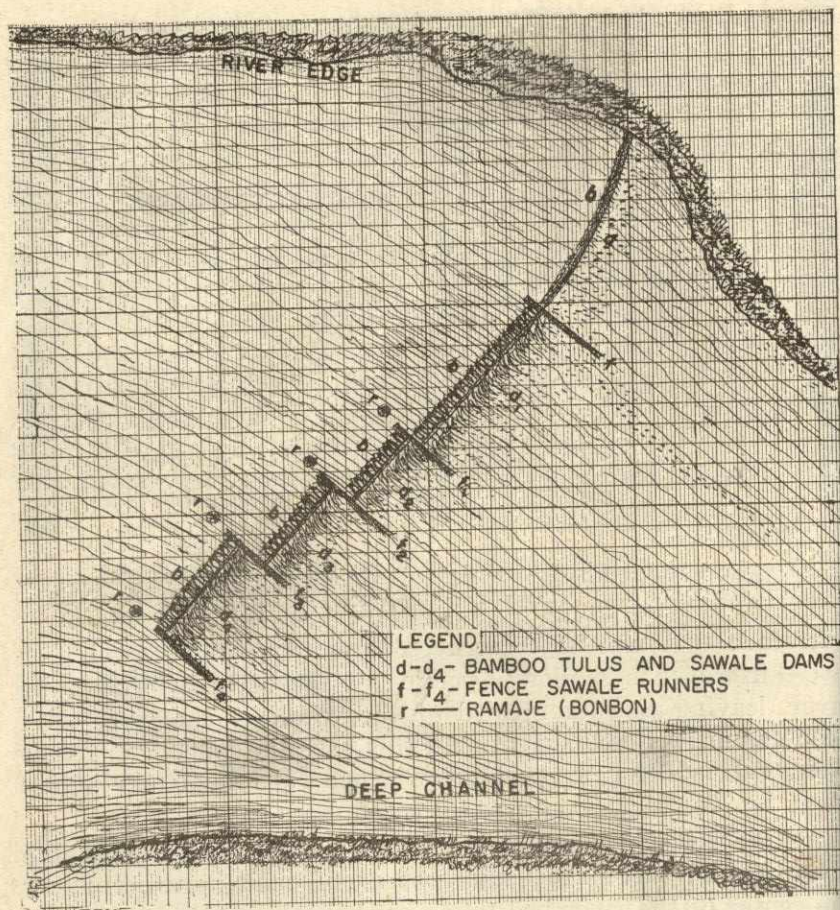


TEXT FIG. 5. A plan sketch of a pamoboan on one side of a channel, beside a delta, Laoag River, Ilocos Norte.

barricade trap can be constructed occupying only one-half or two-thirds of the shallower portion of the entire width of the river, leaving the other third of the width of the river with deep channel as escapement. In this case the pamoboan forms like a fish ladder of trap of bobos which runs diagonally across (text fig. 6).

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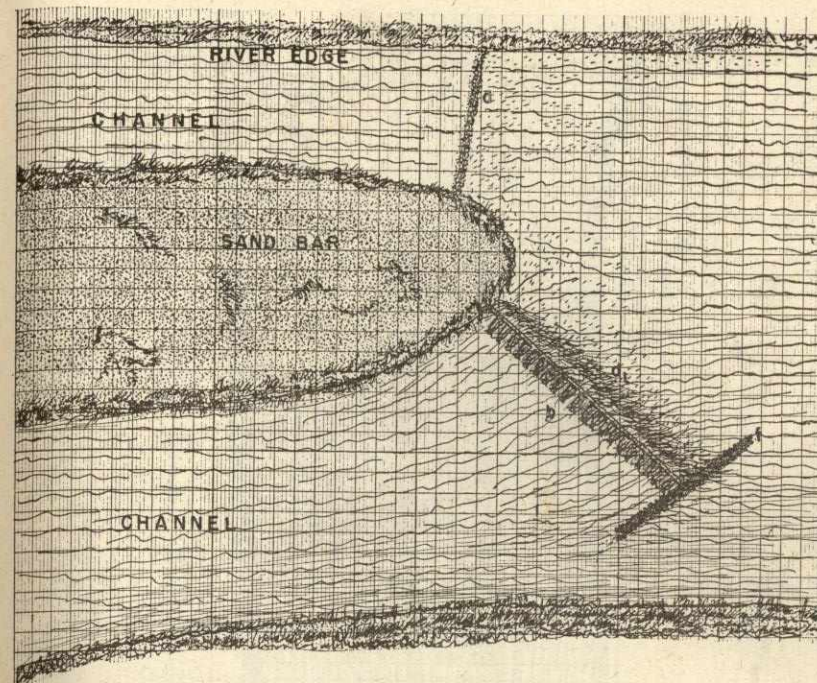
At the upper course of the river meanders, some 10 to 15 kilometers away from the river mouth, *paculod*, a type of barricade trap of 5-20 fishpots is used. Such types of traps are constructed at one or both sides of the river (text fig. 8). Some six kilometers from the river mouth a pamoboan barricade trap is illustrated (text fig. 9). The river channel is about 3 feet to 4 feet deep and each side of the river bank is 2 feet to 3 feet in depth, with gravelly bottom. At one bank the contour of the river bank slightly curves necessitating the unsymmetrical layout of the dams. Note that the escape-



TEXT FIG. 6. Perspective view of a pamoboan across a meander.

ment is made to taper with the streamflow by means of runners of fences of sawale (f_1 - f_2). While the escapement is narrow and tapering, the velocity of the river current particularly enclosed by the fences is usually swifter, thus making the migrating ipon unable to move faster at the escapement.

Text fig. 10 is a sketch plan of a pamoboan constructed above a river delta. The sandy delta is usually elongate, with two unequal width of the channels. The pamoboan barricades have two unequal unsymmetrical wings which are set ten to fifteen meters above the area. Note the crown of fishpots strategically installed with reference to the contour at the edge of the delta. The position of the padaoan or escape ment (3) with the runner fences of sawale mattings (f - f_1)



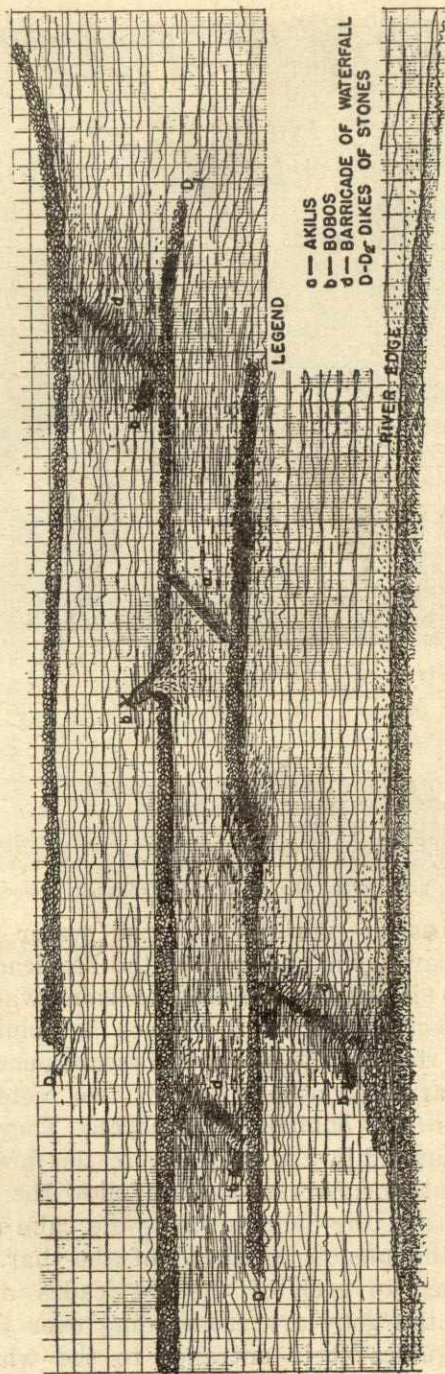
LEGEND

- d - DAM OF STONES ACROSS CHANNEL
- d₁ - DAM OF TULUS AND SAWALE
- b - ROWS OF BOBOS
- f - FENCE OF SAWALE RUNNER

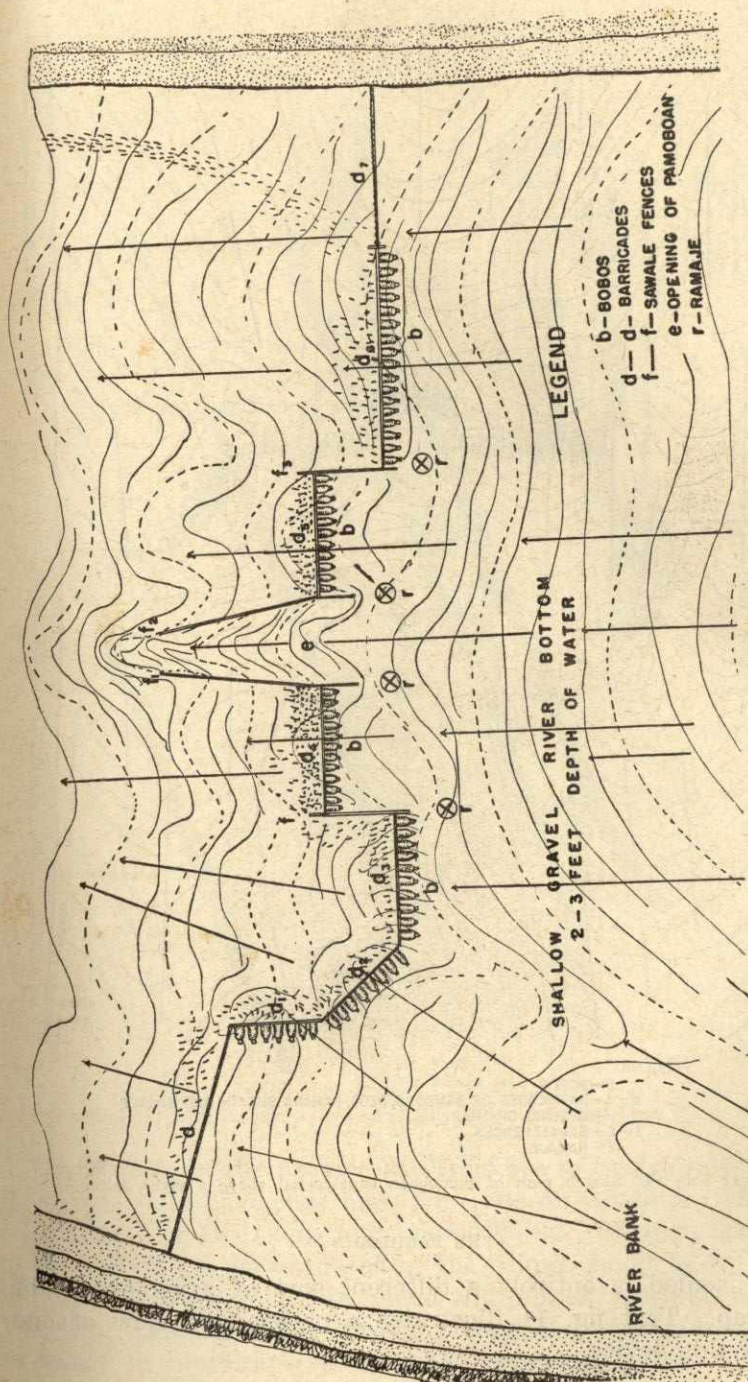
TEXT FIG. 7. A ping, diagonally set across a channel; perspective view.

indicates swiftness of the flow of the water downstream. Above the sand bar facing the area of the barricade of fishpots (b) and (d_1 - d_4) is usually an area of calm water, easy for the migrating ipon to bag in the bobos as compared to the opposite channel facing the padaoan, escapement (e) at the corners of the barricade usually one or two meters away are bunches of twigs (r) *bonbon* or *ramajes*. They protect the barricade being carried by the swiftness of the flow of water.

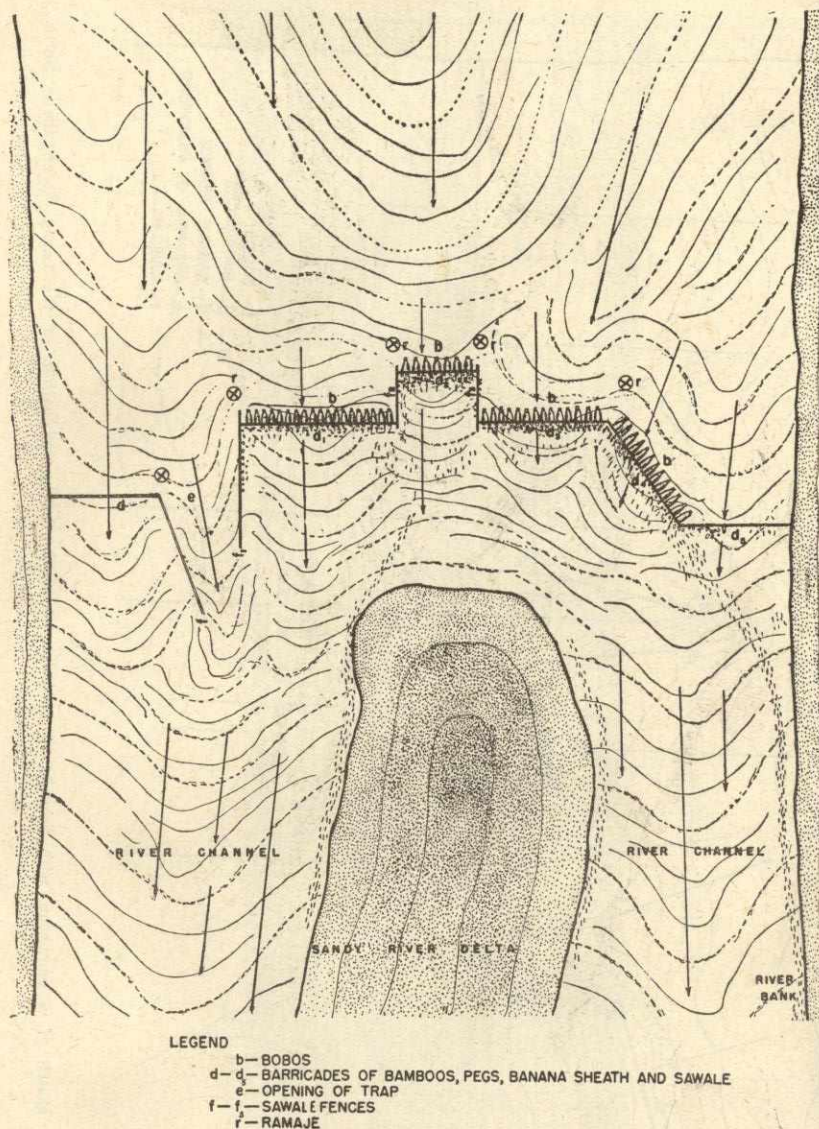
Goby fry migrating upstream always follow the shallow margins of the river and the delta towards the calm area affected by the dam of the pamoboan ahead of the bar. The cloth, *bagaybay*, attached to each of the barricades at d - d_1 - d_2 - d_3 and d_4 prevents the goby fry from going over the barricade and eventually guides their entrance to the water passages leading to the series of the fishpots.



TEXT FIG. 8. A paculod set on a side of a stream; perspective view.



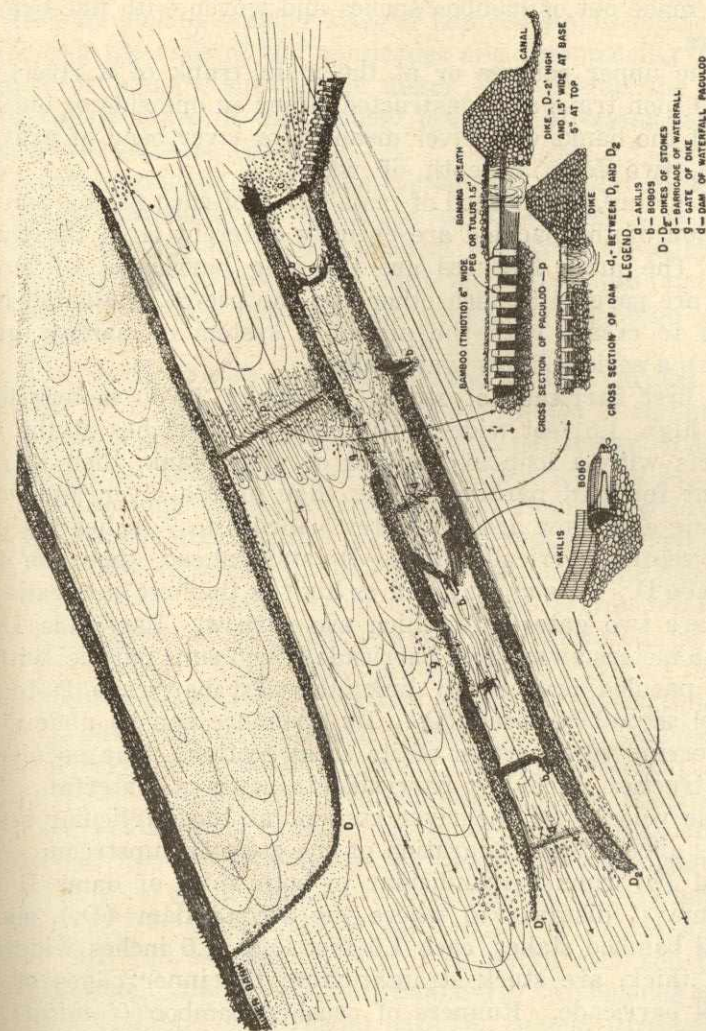
TEXT FIG. 9. A plan sketch of a pamoboan with relation to condition of width, depth, and bottom of the Laoag River, Ilocos Norte.



TEXT FIG. 10. Sketch plan of pamoboan constructed above a river delta.

THE PACULOD

The paculod is entirely a different sort of arrangement of upon trap. Text fig. 11 illustrates a perspective view of one wing of this device.



TEXT FIG. 11. Paculod, perspective view, sitio Rioeng. Laoag River, Ilocos Norte.

The fishpots in the paculod are from six to twelve in number. Each fishpot is 27 inches high with one or two inner funnels, 5.5 inches and 19 inches high, respectively. Directly attached to the rim of the forward end of the fishpot which is 13 inches in diameter is the funnel provided with six entrance holes, each 1 inch in diameter. The secondary funnel, which is bottleneck in shape, is superimposed upon the primary funnel. It is 19 inches high, short of 8 inches to reach the end of the fishpot

which is 2.5 inches in diameter. Like the bigger-sized fishpot it is also made out of bamboo spokes and woven with fine bamboo weavers.

In the upper courses or at the main trunk of a river, the paculod ipon traps are constructed either on one side or on both sides of the banks of a river meander or river bend of gravelly bottom, two feet in depth of water.

In structure, the method of installation of each fishpot and the operation of the paculod are entirely different from the pamo-boan. The main features are the long barricades of stones which are parallel to each other and the use of graduated level bottom to create with the aid of a system of narrow gates (*vance*) a series of low waterfalls.

The first barricade of stones is usually 30-50 meters long, 2 feet high, 1.5 feet wide at the base and 5 inches at the top. It starts with a loop at the end of river bank, then it runs straight forward parallel to the edge of the river and semi-enclosing a shallow area of water 5 inches to 7 inches high.

The second barricade stones D_1 start ahead, then the first barricade D . It is as long and as high as the first barricade but there are two gates (*g*) which are narrow. Barricade D_1 is 10 to 15 meters away from barricade D and runs parallel with it.

The paculod proper (*p*) links the first barricade D to the parallel second barricade D_1 . Its structure can be understood by referring to a portion of its cross section. The paculod is a construction of a low barricade to cause a waterfall. The increase velocity of the river current at the particular sector hinders abruptly the migration of the goby fry upstream. The paculod (*p*) runs perpendicular to both sides of dams D and D_2 , some $\frac{2}{3}$ distance to where the second dam (D_2) starts. Several bamboo stakes, each 1.5 feet long, 1.5 inches wide and 1 inch thick, are stuck straight from the inner edges of the parallel barricade. Runners of crushed bamboo (*tinidtid*), 10 to 15 meters long and 6 inches wide, are placed behind the rows of bamboo pegs so that it cannot be flown with the current of the water. Two pieces of banana sheath of the same dimensions as that of the *tinidtid* are placed behind and on top of the rows of the bamboo pegs. Small stones, gravels or pebbles are placed behind the dams of bamboo pegs, crushed bamboo and banana sheath making the level of river bed higher than that below, by one foot, so that an abrupt flow of water is actually created by the construction of the paculod proper (*p*).

The gates at barricades D_1 are usually one meter long. They are built by placing smaller sizes of bamboo stakes straight line connecting the ends of the barricades and then placing crushed bamboo or banana sheath one meter long behind the stakes. With the structure of the paculod proper (*p*), water falls into both of the gates at (*g*).

Another barricade D_2 is constructed with similar dimensions as that of barricade D_1 and runs parallel with it at 2 feet distance. A diagonal prolongation of barricade D_2 at the posterior extremity is reinforced with bamboo stakes and short and narrow sawale mattings, to protect the erosion of the barricade.

The enclosed narrow strip is formed by the parallel barricades and D_2 is usually referred to as the *canyon* of the paculod. There are several installations in this particular space. A bamboo screen (*akilis*) 2 feet long, 1.5 feet wide is set across the posterior ends of barricades D_1 and D_2 purposely to screen the fishpots set in a series at the lower section of the barricade. About one meter distance from the bamboo screen, *akilis* (*a*) are set two pairs of small fishpots along the sides of the barricades D_1 and D_2 . All the fishpots face the direction of the flow of the water. In between these two fishpots is placed a bamboo screen across the barricades and in line with the front face and forward end of each fishpot to check the migration of the ipon further so as to allow them entrance in each of the fishpots. The third small fishpot is set on the outer barricade D_2 opposite the gate at (*g*) to catch goby fry that enters the gate. At about one meter from the gate at barricade D_1 , a perpendicular barricade (*d*) to D_1 and D_2 is constructed to create a small, narrow waterfall as shown in the cross section between D_1 and D_2 . The fourth small fishpot with runners of two bamboo screens is set at the middle of the canal with the *canyon* further below the dam of waterfall at d_1 , purposely to catch goby fry that drop with the current of waterfall at the d_1 that seek entrance at the gate near the paculod (*p*). The fishpot is half-buried and its upper rim is slightly tilted upwards such that pieces of stones cover the lower rim of the pot to allow the goby fry to enter the small holes of the inner funnel. Below the fourth pot and the side gate further below, is set the fifth with its bamboo screen *akilis* (*a*). The bamboo screen is set perpendicular to the sides of the face rim of the bobo at sides of dams D_1 and

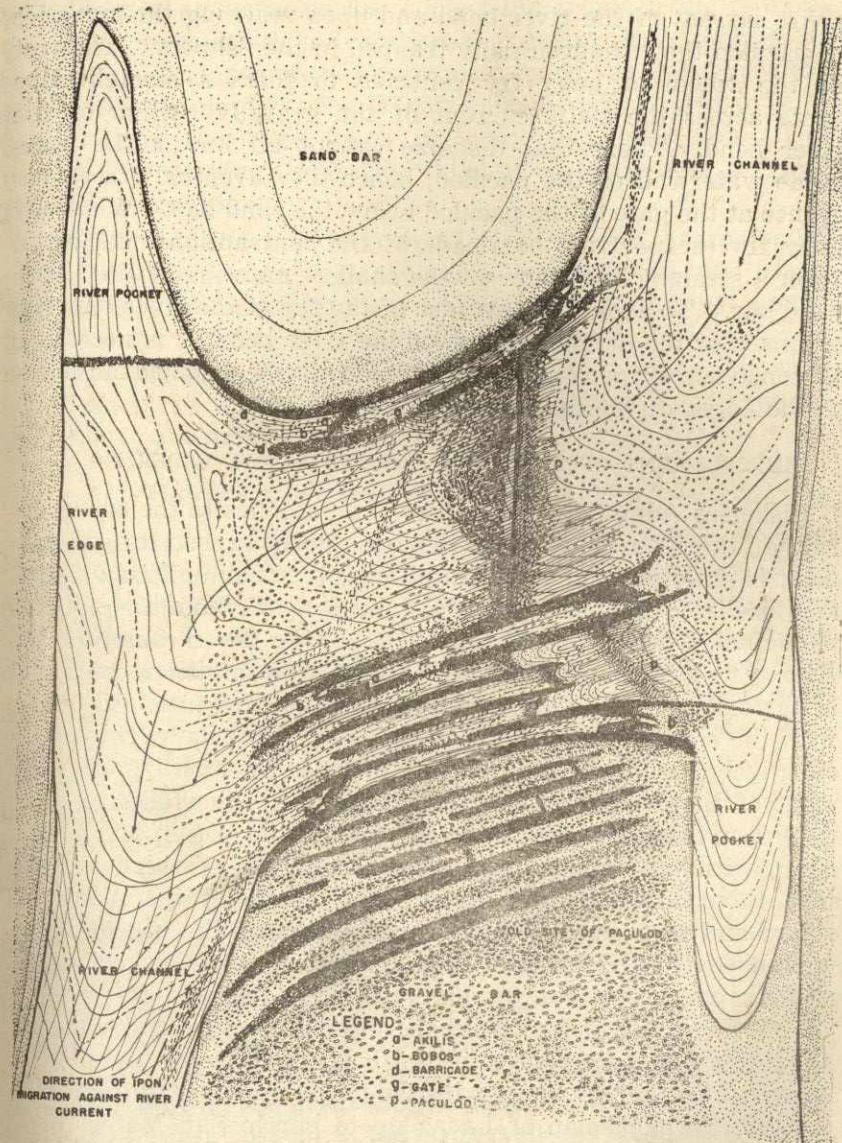
D₂. To set the *akilis* firm, a narrow canal is cut perpendicular to the barricade and the lower portion of the bamboo screen is set in the canal, afterwards covering its side with small pebbles. The second strip of narrow barricade below the fifth bobo is also installed similarly as the barricade at D₁. This interior dam is set purposely to check the migration of the goby further to allow them to reverse their course towards the sides of dam D₂ to seek entrance at the nearest gate at (g) and to bag later at bobo below this gate.

The paculod installed at the opposite banks of a river bend can be fully understood by referring to text fig. 12, and by having a general knowledge of the physiographic conditions of a river bend in relation to the adjoining contour of the landscape, nature of gradient of river flow (swift river bend current) as affected by the narrow opposite river channels, river pockets, opposite sand and gravel bars and the uneven level of the gravel bottom of the river bend.

Aware of the operation of the paculod in a normal flow of water of river with parallel banks, the construction of a similar barricade trap in an abnormal flow of water in a river meander or river bend is unique, requiring a knowledge of the physiographic characteristics of the river bend.

As the dry season in January approaches, the Laoag River becomes narrow, from the numerous tributaries, branches and its main trunk. Such a condition exists for the duration of the dry season up to the month of May. In the sketch map of the main trunk of the river is noted the existence of several meanders. In big river systems the occurrence of meanders is not an unusual phenomenon. The helicoidal or spiral flow occurs at bends, generated by solid obstacles (stones, pebbles etc.) in the river bend. It will be recalled that a meandering stream is characterized by deeps and shoals below the outer banks of curves by shallow or crossings at the inflection between successive loops by construction of scrolls at the inner curved banks. The resultant meander channel is asymmetrical in cross-profile irrespective of whether or not the stream is incised (text fig. 12 and fig. 2). The typical river bed form is associated with spiral flow of the river which takes place at bends.

The effectiveness of the capture of goby fry in enormous quantities with paculod traps in meanders can be explained fully by the manner of goby fry migration in abnormal physiographic conditions.



TEXT FIG. 12. Sketch plan of a paculod at opposite banks of a river bend.

It is noted that the paculod can be installed in a bend (text fig. 12) on both sides of a sand bar and a gravel bar. At the lower narrower river channel, the schools of goby fry seek the shallow margins of the bar, avoiding the deepest portion of the channel. The route of migration is more or less a straight line usually one foot wide. The goby fry migrants are against

swift current of the river bend and upon reaching the entrance of paculod they are eventually trapped in the fishpots. The rest of the school of goby fry continue to form a straight line route across the swift current of the gravelly bottom of the river bend. Those that disperse cannot all hurdle the man-made waterwall of the paculod, hence they eventually seek entrance at the gate of the paculod below the sand bar. Whatever goby fry escape from barricade of the contraptions will again form a straight line route on the shallow margins of the upper sand bar. To avoid the entrance of the fry at the river opposite channels of the deltoidal areas of the river bend, it is necessary to construct or prolong the barricade of the paculod adjacent to the edges of the upper and lower bars.

ENFORCEMENT OF FISHERIES ADMINISTRATIVE ORDER NO. 9

Fisheries Administrative Order No. 9 applies to the conservation of the ipon fisheries of the Ilocos provinces. Its enforcement is national in character, although the communities affected are localized. There has always been apathy on the part of municipal police forces of the towns on the lower course of the river system to enforce the restrictions and prohibitions contained in the order. It takes fish wardens of the Bureau of Fisheries, with the cooperation of the Philippine Constabulary, to enforce effectively Fisheries Administrative Order No. 9. The enforcement of the order requires the teaching of fisherfolks to erect their ipon barricade traps at their proper distances of 200 meters apart with the proper opening of the middle of third of each trap to prohibit the use of chinchorro nets at the mouth of rivers and to observe complete prohibition of the use of bobos in January and February. The enforcement of Fisheries Administrative Order No. 9 was not strictly followed in previous years. However, with the cooperation of police and constabulary agents of Ilocos Norte, the bobo traps were installed at spaces of 200 meters apart with the middle opening of each trap.

From the poblacion of Laoag up to barrio San Mateo, there were several piñgis and paculods which were operating without the proper licenses from the Municipal Treasurer of Laoag, Ilocos Norte. In the Municipality of Sarrat up to sitio Pariir, there were registered 24 paculod traps.

Considering the position of the chinchorro nets and the barricade traps at the main trunks of the Laoag River, such traps were decidedly responsible for the blockading of the normal trend

of migration of larval gobies. The main trunk of the river is, therefore, considered the bottleneck causing the blockade of migration. In spite of the enormous catch of the chinchorro and pamoboan operators, there is still enough goby fry that could escape from the bobo traps in every particular run. This results from leaving the middle third of the river open for free passage of the ipon.

With the interest of the provincial as well as municipal officials and the public in particular to conserve the ipon fisheries, the natural stocking of any river system with goby "seeds" to insure the stability of a balance stock of adult goby spawners in the succeeding ipon season could be maintained by rigid enforcement of Fisheries Administrative Order No. 9 and its subsequent amendments.

FISHERIES ADMINISTRATIVE ORDER NO. 9-1

An amendment of Fisheries Administrative Order No. 9 which is concerned with the conservation of the ipon fisheries of the Bacarra-Vintar River in Ilocos Norte is Fisheries Administrative Order No. 9-1. It prohibits entirely to catch or cause to be caught, purchase, sell, offer or expose for sale dead or alive or have in possession thereof any that is called *ipon* caught from the Bacarra-Vintar River and its branches from October 1 to December 1 inclusive each year.

The towns of Bacarra and Vintar are mostly affected by this ipon conservation measures. The fact that there is always an assurance for the protection of the goby fry in the river by the police forces of these towns during the ipon season, there is hope for a complete replenishment of goby stocks at the Bacarra-Vintar watersheds throughout the year. River fishermen of these watersheds prefer to catch adult gobies with their *kitang* and *conocon*, rather than catch immature gobies with bobos.

An effect of the enforcement of Fisheries Administrative Order No. 9-1, is the assurance of goby fry to be swayed away by the China Sea current to the nearest shores southward during inclement weather in September, October, and November, so that the ipon from the Bacarra marine shores seek entrance at sitios of La Paz and Gabu of the Laoag River, the Bacarra-Vintar River mouth being 10 kilometers from the Laoag River.

The dominant sources of goby fry of the Bacarra-Vintar River are *Chonophorus melanocephalus* (bukto); *Eleotris melanosoma*

(*bukto*, *bunog*, *balla*, *viroto*, etc.) will be caught with *kitang*, *dala*, *tabocul*, etc. during May, June, July, and August each year.

The municipal officials favor the proposed recommendations because the fishing fees for the 24 *paculod* traps only amount to an insignificant sum of ₱42.00 a year. Such amount will be doubled or quadrupled during the months of May to August when the people will pay their license fees for their *kitang*, set lines.

RECOMMENDATIONS

The District Fishery Officer and Deputy Fish Wardens assigned to a Fishery district where ipon fisheries is an important industry should seek the cooperation of the Provincial Governors and municipal officials so that constables and police agents can cooperate in the strict enforcement of Fisheries Administrative Order No. 9 and Act No. 4003 and its amendments.

The writer has personally observed the negative attitude of municipal officials in the enforcement of Fisheries Administrative Order No. 9, especially the proper patrolling of rivers and marine shores during the ipon season. Municipal officials and forces believe that Fisheries Administrative Order No. 9 is a national conservation measure that should be enforced by Fish Wardens of the Bureau of Fisheries.

It is seldom that the Governor of a province takes interest in the conservation of the ipon fisheries. In this connection, the Bureau of Fisheries should consider the petition of Governor Damaso T. Samonte of Ilocos Norte Province, to increase the duration of the prohibition of the use of bobos in barricade ipon traps in the Laoag River by considering the following recommendations:

1. The use of bobo traps should be prohibited at all times from September to December and January and February each year at points from Ermita of Laoag; San Mateo, San Antonio, Pariir, Parang of Sarrat, and towns of Dingras, Solsona, Banna Piddig, and Nueva Era.

2. The catching of young gobies (*tartarac*) with methods of *sac-saclang*, *sac-sacao*, fish enclosures (*sarep*) with the use of "tuba" should be prohibited at all times of the year in the Laoag River.

3. Section 3 of Fisheries Administrative Order No. 9 should be amended to include sections (d) and (e) embodying the above recommendations.

4. The life histories of the five species of gobies producing the sources of goby fry (ipon) should be studied during the ipon

season to determine their breeding, spawning, and migration habits, as basis for future ipon regulations.

5. Data on the ipon landings should be gathered from year to year to determine the economic value of the fishery.

SUMMARY

An analysis of the data on ipon gathered during the ipon season of September–December 1954 to January and February 1955 in Ilocos Norte is here presented in this report.

Certain phases of the biology of gobies, such as their habitat, nature of breeding, multiple spawning and feeding habits, have been taken into consideration. Gobies are found to be landlock, some are marine or brackish forms. Catadromous species of gobies spend their later life in fresh water and then go back to the sea to spawn after which their larval stages seek entrance at the mouth of rivers. The "homing instinct" of gobies is not a well established phenomenon in the life history of gobies. The periodic appearance of goby fry is due to lunar and tidal influences. The variation of the duration of their appearance in certain localities of the Philippines is due to the climatic monsoons and difference of high and low water as affected by the sea currents of the Pacific Ocean and China Sea; the goby fry are derived from different genera and species and the presence or absence of abundant goby spawners.

The ipon fishery in any particular river system in the Ilocos regions is regularly affected by intensive methods of exploitation, since the stages of fish composing the ipon periodic runs are immature fish which are caught and utilized as protein food by the people in that region, besides their importance of natural stocking of the inland waters.

The breakdown of the methods used is fully discussed in conjunction with the socio-economic aspects of the ipon industry.

Barricade ipon traps such as the *pamoboan* and *paculod* are described and illustrated in relation to the nature of physiographic conditions of the river system, a point which has been overlooked by former ipon fishery investigators.

Evaluation of the goby fry ipon escapement in each of the ipon run is taken into account to determine the extent and availability of naturally hatched goby seeds to replenish the watersheds.

This exploratory survey aims to establish the impending depletion of the ipon fisheries in Ilocos Norte. Remedial conservation measures are therefore recommended.

TABLE 5.—Estimated quantity and value of ipon landings at the Laoag River and Marine Shores September–December 1954 to January–February 1955.

Month	Quantity in cans ^a	Value pesos
September	200	2,000
October	1,200	9,600
November	1,433	11,464
December	2,405	19,430
January	400	4,000
February	12	144
Total	5,650	P46,638

^a One 5-gallon cans = 15 kgs. net weight of fresh ipon.

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APPENDIX

COMMONWEALTH OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE AND COMMERCE
OFFICE OF THE SECRETARY
MANILA

FISHERIES ADMINISTRATIVE }
ORDER No. 9

SUBJECT: Regulations for the conservation of certain species of fish, commonly called "ipon" in the Northern Provinces of Luzon.

Pursuant to the provisions of Sections 4, 7, 13 and 19 of Act No. 4003, entitled "An Act to amend and compile the laws relating to fish and other aquatic resources of the Philippine Islands and for other purposes" as amended, and for the protection and conservation of certain species of fish known as Ipon in Northern Luzon, which are the fry of gobies, belonging to *Gobiidae* and *Elcotridae*, the following rules and regulations are hereby promulgated for the information and guidance of all concerned:

1. *Definition*.—For the purpose of this Administrative Order, the following terms as used herein shall be construed as follows:

(a) *Ipon* shall mean the fry and fingerlings or young of gobies found in the Provinces of Ilocos Norte, Ilocos Sur, La Union and other provinces of Northern Luzon.

(b) *Trap* shall include bobo, sarep, pataya, pamoboan, padait, paculod, pamalibtocan (known as palibtuk in Alilem, Ilocos Sur), burayoc, paed, and similar fishing traps and fishing devices.

2. *Restrictions*.—Licenses and permits issued by a municipal council shall contain provisions to the effect that:

(a) No trap shall be constructed within 200 meters distance from the mouth of any river or of any branch thereof toward its source and no two traps shall be less than 200 meters apart.

(b) Fish traps shall be so made or constructed as to leave open a third of the width of the river, creek, streams, or outlet of a lake to allow the free passage of fishes and fry during their migration up or down stream, and to permit the passage of launches, acts and other crafts.

(c) The licensee assumes responsibility for any and all the acts of his agents and employees, contractors, and employees of the contractors connected with his fishing operations.

(d) The terms and conditions of the license permit for contract are subject to change at the discretion of the Secretary of Agriculture and Commerce.

3. *Prohibition.*—It shall be unlawful for any person, association or corporation:

(a) To use bobo, or other similar device in catching ipon, from January 1 to March 31 of each year;

(b) To use *sarcop*, *paculod*, *cascasad*, *sac-saclang*, *pasursor*, or *kitang*, from April 1 to May 31 of each year;

(c) To use chinchorro, tangar and garamgam (nets) at the mouth of any river, from January 1 to March 31 and from September 1 to December 31 of each year.

4. *Exemption.*—For scientific, educational, or propagation purposes, any person, association, institution, or corporation of good repute may be granted by the Secretary of Agriculture and Commerce, or his duly authorized representative, free of charge, a permit to catch or cause to be caught "Ipon" by any method during any period, subject to such conditions as said Secretary may deem wise to impose for the proper conservation of these species. Any person who shall catch fish under such permit, but used same for purposes other than those mentioned herein above, shall be subject to the same penalties as if no license had been granted.

5. *Enforcement.*—For the purpose of enforcing the provisions of this Administrative Order, fishery inspectors, agents or officers; members of the Philippine Constabulary; members of municipal and municipal district police; members of the secret service force, inspectors, guards and wharf-fingers of the customs service; internal revenue officers and agents; officers of the coast guard cutters and lighthouse keepers; and such other competent officials, employees and persons, as may be designated in writing by the Secretary of Agriculture and Commerce, are hereby made deputies of said Department Head and empowered.

(a) To ascertain whether persons found fishing are duly provided with licenses required in the Fisheries Act and in this Administrative Order;

(b) To arrest any person committing or attempting to commit an offense against the provisions of Act No. 4003 and of this Administrative Order;

(c) To administer oaths and to take testimony in any official matter or investigation conducted by them touching any matter under the authority of the Fisheries Act, and this Administrative Order; and

(d) To file the necessary complaint in court and report such violations to the Secretary of Agriculture and Commerce, for appropriate action (Sec. 5, Act No. 4003, as amended).

In addition to the deputies so designated in the first paragraph of this section, the municipal mayors of the municipalities concerned shall act as such deputies and enforce these rules and regulations in their respective jurisdictions.

6. *Penalties.*—Any person, institution, association or corporation who shall violate any of the provisions of this Administrative Order shall be liable to prosecution and, upon conviction, shall suffer the penalty provided in Section 83 of Act No. 4003, which is a fine of not more than two hundred pesos, or imprisonment for not more than six months, or both, in the discretion of the court.

7. *Repealing provisions.*—Department Order No. 4, series of 1923 and Department Order No. 6, series of 1924, and all other orders and regulations or parts thereof inconsistent with the provisions of this Administrative Order are hereby revoked.

8. *Date of effectivity.*—This Administrative Order shall take effect on October 1, 1939.

(Sgd.) BENIGNO S. AQUINO
Secretary of Agriculture and Commerce

APPROVED: July 28, 1939.

(Sgd.) MANUEL L. QUEZON
President of the Philippines

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Chonophorus melanocephalus* (Bleeker).
2. *Eleotris melanosoma* (Bleeker).
3. *Glossogobius biocellatus* (Cuvier and Valenciennes).
4. *Glossogobius celebius* (Cuvier and Valenciennes).
5. *Glossogobius giurus* (Buchanan and Hamilton).

PLATE 2

- FIG. 1. *Gobiosoma isignum* Herre.
2. *Illana bicirrhosa* Weber.
3. *Sicyopterus lacrymosus* Herre, female.
4. *Sicyopterus lacrymosus* Herre, male.

PLATE 3

- FIG. 1. Goby fry (ipon), *Chonophorus melanocephalus*, 17 mm. long.
2. Goby fry (tartarac), *Chonophorus melanocephalus*, 20 mm. long.
3. Goby fry (tartarac), *Chonophorus ocellaris*, 17 mm. long.

PLATE 4

- FIG. 1. Goby fry (ipon), *Eleotris melanosoma*, 20 mm. long.
2. Goby fry (tartarac), *Glossogobius giurus*, 15.5 mm. long.

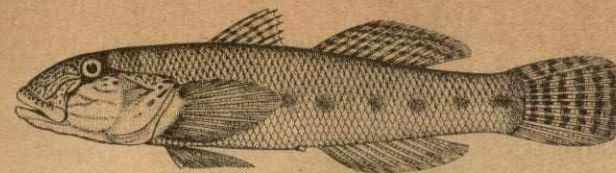
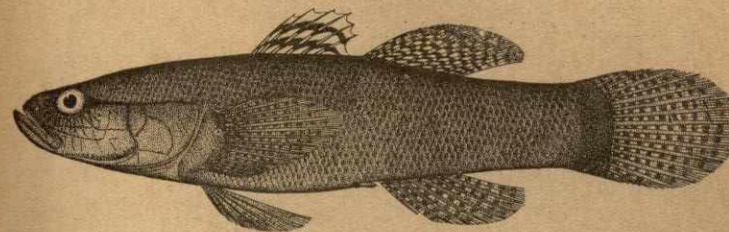
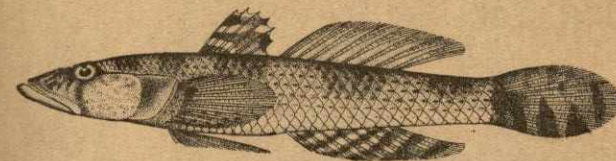
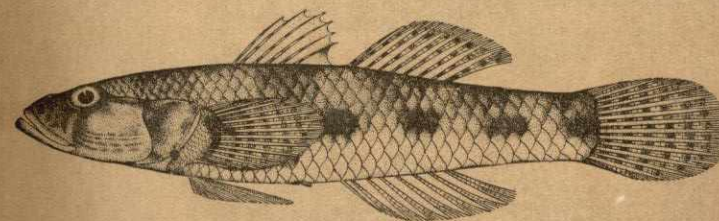
PLATE 5

- FIG. 1. Goby fry (ipon), *Gobiosoma isignum*, 13 mm. long.
2. Goby fry (tartarac), *Sicyopterus lacrymosus*, 19 mm. long.

TEXT FIGURES

- FIG. 1. Monthly lunar periods, September-December, 1954, to January-February, 1955, and duration of goby fry (ipon) runs at the Laoag River, Ilocos Norte and its adjacent marine shore.
2. Sketch map of main trunk of the Laoag River, Ilocos Norte.
3. Sketch map of goby fry (ipon) fishing grounds, Laoag River and adjacent shores.
4. A, Plan view of one-half barricade trap (pamoboan) showing accessory parts, direction of river current and direction of goby fry (ipon) against current; B, a perspective of one wing of pamoboan; C, perspective view of pamoboan showing details of its installation; D, front view of dam and bobos; E, extreme view close to river edge.
5. A plan sketch of a pamoboan on one side of a channel, beside a delta, Laoag River, Ilocos Norte.
6. Perspective view of a pamoboan across a meander.

7. A pingi diagonally set across a channel; perspective view; *d*, Dam of stones across channel; *d*₁, dam of tulus and sawale; *b*, rows of bobos; *f*, fence of sawale runner.
8. A paculod set on a side of a stream; perspective view.
9. A plan sketch of a pamoboan with relation to conditions of width, depth, and bottom of the Laoag River, Ilocos Norte.
10. Sketch plan of pamoboan constructed above a river delta. *b*, Bobos; *d-d*₂, barricades of bamboos, pegs, banana sheath and sawale; *e*, opening of trap; *f-f*₂, sawale fences; *r*, ramaje.
11. Paculod perspective view sitio Rioeng, Laoag River, Ilocos Norte.
12. Sketch plan of a paculod at opposite banks of a river bend.

FIG. 1. *Chonophorus melanocephalus* (Bleeker)FIG. 2. *Eleotris melanosoma* (Bleeker)FIG. 3. *Glossogobius biocellatus* (Cuvier and Valenciennes)FIG. 4. *Glossogobius celebius* (Cuvier and Valenciennes)FIG. 5. *Glossogobius giurus* (Buchanan and Hamilton)

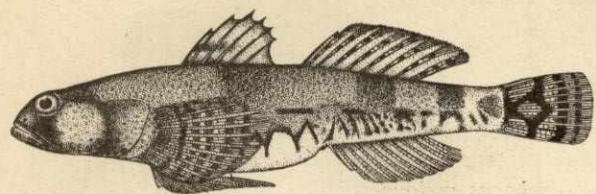


FIG. 1. *Gobiosoma isignum* Herre

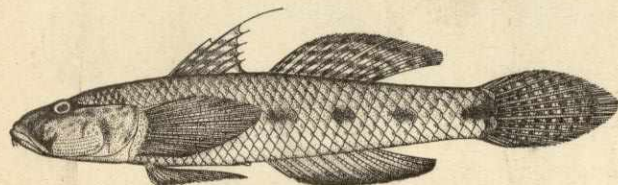


FIG. 2. *Illana bicirrhosa* Weber

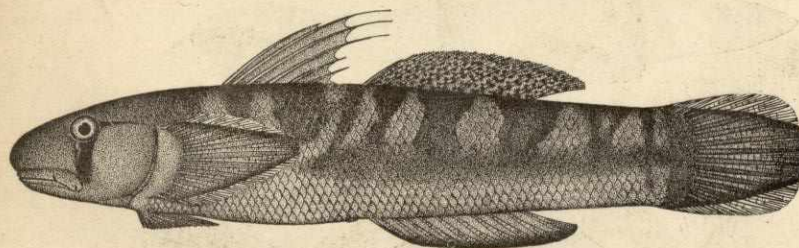


FIG. 3. *Sicyopterus lacrymosus* Herre, female

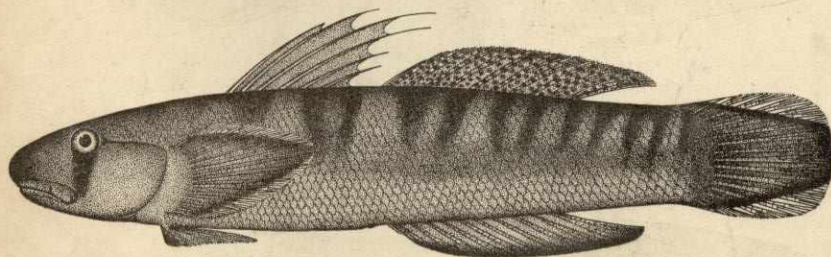


FIG. 4. *Sicyopterus lacrymosus* Herre, male



FIG. 1. *C. melanocephalus* (ipon)

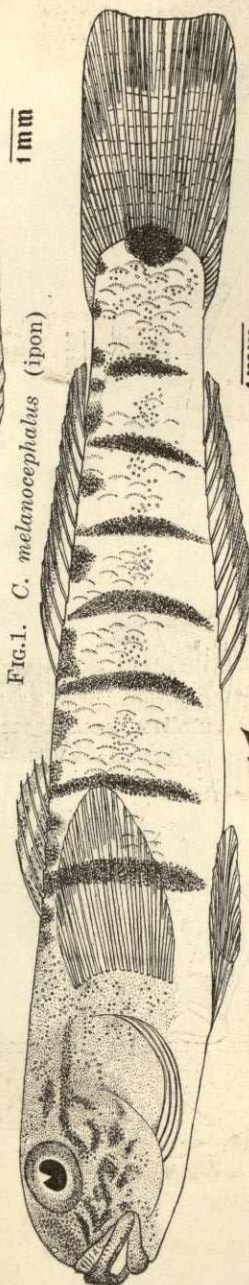


FIG. 2. *C. melanocephalus* (tartarac)

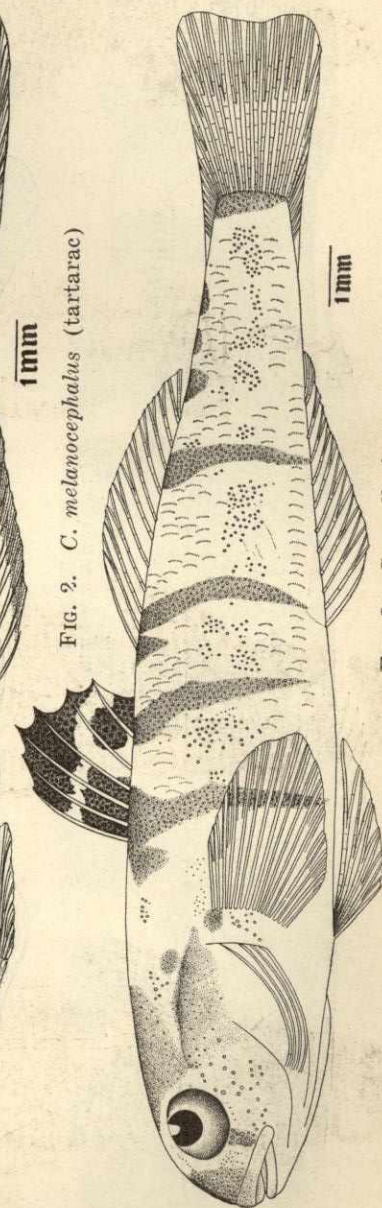


FIG. 3. *G. ocellaris* (tartarac)

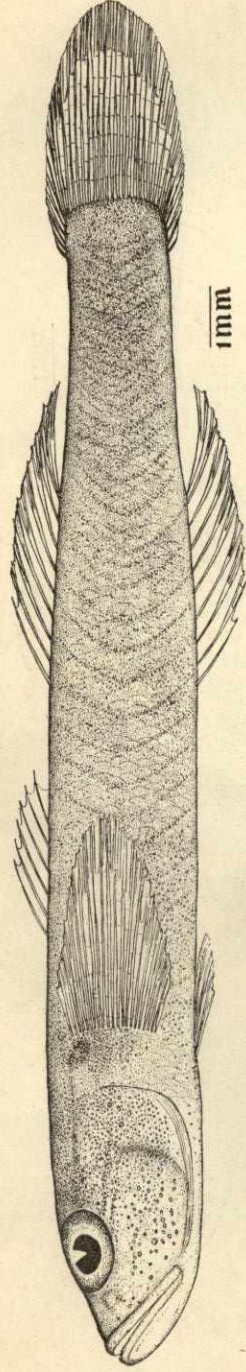


FIG. 1. *E. melanosoma* (ipon)

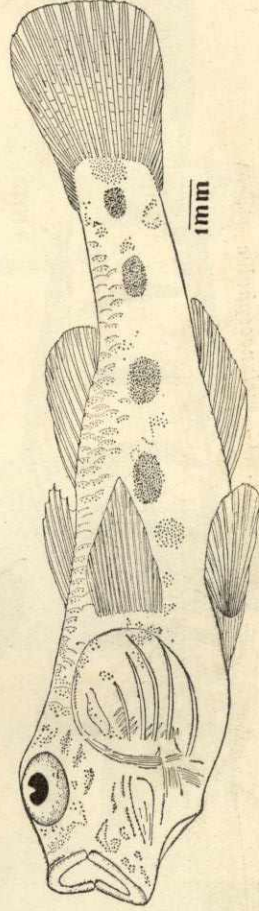


FIG. 2. *G. giurus* (tartarac)

PLATE 4

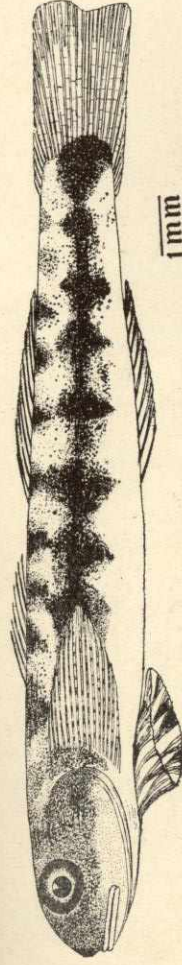


FIG. 1. *Gobiosoma isignum* (ipon)

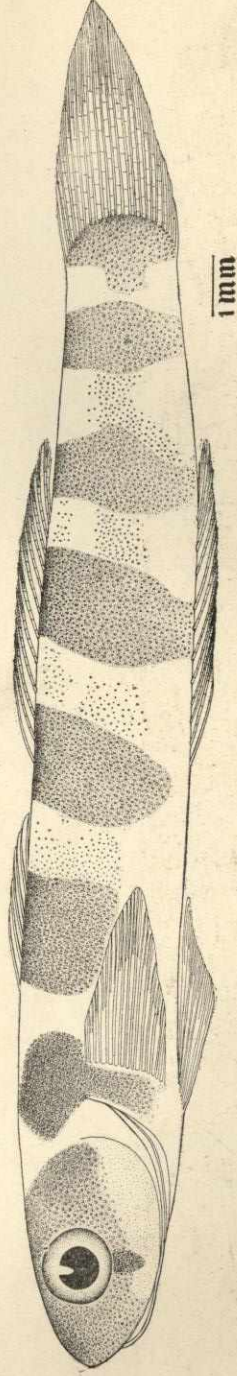


FIG. 2. *S. lacrymosus* (paling)

PLATE 5

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