

# ENUMERATION OF ALGÆ IN PHILIPPINE BAÑGOS FISHPONDS AND IN THE DIGESTIVE TRACK OF THE FISH WITH NOTES ON CONDITIONS FAVORABLE FOR THEIR GROWTH.

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## SUMMARY

Observation showed that out of the 43 species of algæ identified growing in Dagat-dagatan fishponds and the neighboring ponds, *Chaetomorpha* was the most common of the filamentous algæ. *Lyngbya* took the lead and followed by *Phormidium* of the blue-green algæ. Of the diatoms, *Mastogloia*, *Pleurosigma*, *Surirella*, *Chaetoceras*, *Biddulphia*, and *Nitzschia* were found predominant (Table 2).

Intestinal contents of five bañgos yielded 14 species (algæ and diatoms) recognizable and of these, *Chaetomorpha*, *Melosira*, *Navicula*, *Nitzschia*, *Pleurosigma*, and *Coscinodiscus*. Apparently these were taken upon more preferably than others, or they have not been digested when the intestinal contents were examined.

The common algæ and diatoms were sketched in six plates.

Among the 2,000 Philippine food fishes bañgos, *Chanos chanos* (Forskål), is undoubtedly the most important. The culture of this fish has developed into a thriving industry all over the Islands. Bañgos is available all the year round owing to the fact that it can be easily reared in ponds where it grows fast, being largely herbivorous. Moreover, it possesses a palatable flavor relished by the people. The fast rate of growth of bañgos together with its palatable flavor is due to the proper care it receives and the nutrition it gets from the algæ it feeds upon. At other times, cases have been reported\* of stunted bañgos with a sickening, earthy taste (lasang gilik). This peculiar taste may be due to the kind of food the fish has taken.

Algæ in fishponds, besides constituting the main bulk of natural food supply of the bañgos, serve as an excellent aerator in the pond. They purify and increase the biological productivity of the pond by providing shelter and attachment for epiphytic green and blue-green algæ as well as for other planktonic organisms.



Since algæ in general constitute the principal food of bañgos from the fry stage until it reaches marketable size it is essential that a detailed knowledge of the different kinds of algæ in a fishpond be secured. The objects of this work are:

- a. To make a systematic classification of the algæ available in a fishpond.
- b. To know the conditions favorable for their rapid growth by making observations on algal culture.
- c. To know what kinds of algæ are actually being used as food by the bañgos by examining the stomach and intestinal contents.

The work was carried out during the first semester of the school year 1947-1948. The first collection was started on June 12, 1947 and the last on September 10, 1947 at the Dagat-dagatan Fishery Experimental Station, Malabon, Rizal Province. Other collections were also made from a neighboring fishpond to make a comparison.

#### LITERATURE

"Diatoms have for many years been recognized as an extremely important source of food for planktonic animals." Haeckel (1890), Johnstone (1908), Lohman (1911), Gram (1912, 1930, 1931), Lebour (1921, 1922, 1923), Herdman (1923), Bigelow (1926), and Allen (1934) have published valuable discussions of the problems involved in the abundance of life in the sea.

Johnstone (1908) states: "The Diatomaceae are above all the most important organisms in the sea regarded from the point of view of their significance as producers of organic substance." The diatoms are the 'pastures of the sea' and corresponds to the 'grass of the land.' Gram (1930) wrote: "These enormous quantities of diatoms without doubt are the most important food for the pelagic copepod and indirectly for the fish larvae which develop after the great spring spawning period." Phifer (1923) likewise wrote: "Marine plants are the principal source upon which the fauna of the oceans depends for the energy necessary for existence. Undoubtedly the shore algæ produce organic material forming nutritive substance for bacteria which in turn are probably consumed by small protozoa. However, the phytoplankton are directly consumed and produce organic food in much larger quantities in as much as the real extent of their distribution is many times greater than that of the

shore forms. Of the groups in the phytoplankton such as diatoms, dinoflagellates, algal spores, cocolithopores, the first mentioned unicellular plants play the major role in the temperate seas."

Whipple (1927) states: "The fact that plankton are sensitive to changes in their environment make them good indicators of pollution and self-purification." Larger in size and more readily identifiable than bacteria, they offer an attractive means of gaging conditions of existence and with it the sanitary status of streams.

#### MATERIALS USED

Plankton net, research microscope, salinometer, thermometer, graduated cylinder, collecting spade, preserving bottles, presser and preserving fluids: Transeau's solution (for phytoplankton), and 10 per cent formalin.

#### PROCEDURE

Available algæ in both the rearing ponds and the nurseries were collected and preserved. Collections and observations were made once a week from June 10, 1947 to September 10, 1947 at the Dagat-dagatan Saltwater Fishery Experimental Station, Malabon, Rizal, and also from nearby fishponds for comparison. Specimens of phytoplankton which were collected by passing sufficient quantity of pond water through a plankton net were preserved in Transeau solution.

Lab-lab samples were collected with the aid of an improvised spade (a tin sheet attached to a long bamboo pole). These samples were then spread and dried on newspaper sheets. Before the samples were thoroughly dried they were studied under a microscope for identification and classification. Different kinds of growths were selected everytime a collection was made.

Algal growths observed on bamboo stakes, ceramic slabs, concrete gates, as well as wooden gates were collected by scraping them with the aid of a knife. Specimens collected were spread and dried on newspaper sheets after they have been identified and classified.

Filamentous green algæ found growing on different parts of the pond were collected, spread and dried on newspaper sheets. A representative of each specimen collected was isolated, pressed, and dried.



Data were taken as to algal growth, air temperature, salinity, and water temperature including weather condition every time a collection was made.

Various sizes of bangos from different ponds were caught and dissected. The digestive organs were preserved and the stomach and intestinal contents of each specimens were studied, identified and classified. Data were also taken as to the size and weight of each fish caught.

## COLLECTION RECORD NO. 1

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 12 June 1947.  
Time ..... 0900 A. M.  
Water temperature ..... 37° C.  
Air temperature ..... 32° C.  
Salinity ..... 10  
Weather ..... Cloudy.

## Observations:

N P<sup>1</sup> No. 1: Growth of dark green lab-lab was observed at the bottom but filamentous green algæ along the sides.

N P No. 2, 3: Luxuriant growth of filamentous green algæ all over these two ponds was noticeable.

N P No. 5: Thin growth along the north side of the pond but at center without any growth; thin growth on substratum at the south end was observed.

N P No. 6: Thick greenish white growth of lab-lab at the northeast side of the pond predominating.

N P No. 7: Growth of dark green lab-lab at the north and northeast side, prominent.

R P<sup>2</sup> No. 1: Growth of filamentous green algæ along the sides of the ponds only.

R P No. 2, 11: No algal growth seen.

## Plankton Collection:

Nurseries:	Sample A-1,
<i>Pleurosigma</i> -A	<i>Navicula</i>
<i>Lyngbya</i>	<i>Mastogloia</i> -A

Rearing Ponds—Sample A-2: *Peridinium venustum*, *Thalastiothrix*, *Ditylum*, *Coscinodiscus*, *Rhizosolenia*, *Pleurosigma*, *Syndra*, *Ceratium furca*, *Lauderia*, *Mastogloia*, *Dinophysis*, *Biddulphia*, *Surirella*, *Hemiaulus*, and *Chaetocerus*.

Nursery Pond No. 6—Sample No. 1: *Oscillatoria*, *Mastogloia*, *Phormidium*.

Nursery Pond No. 7—Sample No. 2: *Lyngbya*, *Pleurosigma*, *Mastogloia*, *Oscillatoria* (Fine strands), *Phormidium*.

Nursery Pond No. 7—Sample No. 3: *Oscillatoria*, *Lyngbya*, *Phormidium*.

<sup>1</sup> NP means nursery pond.  
<sup>2</sup> RP means rearing pond.

Nursery Pond No. 5—Sample No. 4: *Oscillatoria*, *Pleurosigma* (tiny), *Mastogloia*.

Nursery Pond No. 6—Sample No. 5: *Lyngbya*, *Oscillatoria*, *Mastogloia*.  
Rearing Pond No. 2—Sample No. 6: *Chaetomorpha*.

## COLLECTION RECORD NO. 2

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 18 June 1947.  
Time ..... 100 A.M.  
Water temperature ..... 30° C.  
Air temperature ..... 29.5° C.  
Salinity ..... 10.5  
Weather ..... Sunny

## Observations:

R P No. 1: Water was 2 feet deep with algal growth along sides of the pond only. Thin encrustations observed attached to the bottom which is muddy.

N P No. 5: Lab-lab growth poor. Dark bottle green color at North-west corner of the pond. Thin growth of similar algæ collected at the center of the pond.

N P No. 6: Algæ composed of thick blanket-like growth that begins to peel off from the substratum. Lab-lab is conspicuously colored yellow-green. Strands obviously old.

N P No. 7: Algæ of the dirty-green color predominating. Strands appear coarse with ends still attached to the substratum. Vertical growth scarcely reaching the surface of the water.

## Plankton Collection:

Nurseries—Sample B-1: *Favella*, *Coscinodiscus*, *Ditylum*, *Pleurosigma*, *Ceratium furea*, *Dinophysis*, *Pediastrum*.  
Rearing Pond—Sample B-2: *Peridinium*, *Pediastrum*, *Favella*, *Phormidium*.

## Algal Collections:

Rearing Pond No. 1—Sample No. 7: *Phormidium*, *Anabaena*, *Mastogloia*.

Rearing Pond No. 2—Sample No. 8: *Enteromorpha intestinalis*.

Nursery Pond No. 5—Sample No. 9: *Lyngbya*, *Pleurosigma*, *Mastogloia*.

Nursery Pond No. 6—Sample No. 10: *Lyngbya*, *Pleurosigma*.

## COLLECTION RECORD NO. 3

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 25 June 1947.  
Time ..... 0900 A.M.  
Water temperature ..... 30° C.  
Air temperature ..... 26.7° C.  
Salinity ..... 7  
Weather ..... Showering.



## Observations:

N P No. 1: Thick growth of *Chaetomorpha* covering surface of the pond. Some patches of *Enteromorpha* are entangled with the old strands of *Chaetomorpha*. No lab-lab observed on the bottom.

N P No. 5: Filamentous blue-green algæ are starting to grow towards the surface of the water at the south end of the pond.

N P No. 6: Small patches of thin growth of lab-lab could be seen all along the pond. Cakes of floating blue-green algæ floating at the south end.

N P No. 7: Thick growth of blue-green algæ is found all over the pond.

R P No. 1: Sparse growth of *Enteromorpha* along the sides.

## Plankton Collection:

Nurseries—Sample C-1: *Pleurosigma* (fine A), *Lyngbya*, *Mastogloia*, *Surirella*.

Rearing Pond—Sample C-2: *Chaetoceras* (Tiny A.), *Surirella*, *Lyngbya*, *Pleurosigma*, *Tintinnopsis*.

## Algae:

Nursery Pond No. 5—Sample No. 11: *Lyngbya*, *Microcoleus*.

Nursery Pond No. 6—Sample No. 12: *Oscillatoria*, *Mastogloia*, *Spirulina*, *Anabaena*, *Phormidium*, *Pleurosigma*.

Nursery Pond No. 7—Sample No. 13: *Lyngbya*.

## COLLECTION RECORD NO. 4

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 27 June 1947.  
 Time ..... 0900 A. M.  
 Water temperature ..... 30° C.  
 Air temperature ..... 28.8° C.  
 Salinity ..... 8  
 Weather ..... Sunny.

## Observations:

Nursery Ponds: These ponds were dried out and lab-lab was observed to be floating on all parts of the pond. On parts of the pond has dried, the scum was seen to grow on top of the mud.

Rearing Ponds: Water was deep and algal growth was observed floating only along the sides and corners of the pond. The water has newly been changed so abundant phytoplankton was expected.

## Plankton Collection:

Rearing Ponds—Sample D-7: *Chaetoceras*, *Biddulphia*, *Talassiothrix*, *Ditylum*, *Bacteriastrum*, *Surirella*, *Coscinodiscus*, *Rhizosolenia*, *Pleurosigma*, *Melosira*, *Navicula*, *Nitzschia*, *Coretron*, *Planktonislla*, *Lauderia*, *Clamydomonas*, *Marismopediä*, *Certium*.

## Algae:

Nursery Pond No. 6—Sample No. 15: *Lyngbya*.

Nursery Pond No. 1—Sample No. 16: *Lyngbya*, *Phormidium*.

Rearing Pond No. 5—Sample No. 17: *Chaetomorpha*.

Rearing Pond No. 6—Sample No. 18: *Chaetomorpha*.

## COLLECTION RECORD NO. 5

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 2 July 1947.  
 Time ..... 0900 A. M.  
 Water temperature ..... 29.9° C.  
 Air temperature ..... 28.2° C.  
 Salinity ..... 5.5  
 Weather ..... Sunny.

## Observations:

N P No. 1: Thick growth of filamentous green algæ all around the pond and some patches turning brownish in color were observed.

N P No. 5, 6, 7: Algæ collected were from those attached to the substratum. No floating algæ present. Water in these ponds were deep due to heavy rain. The vertical growth of filamentous algæ were not long enough to enable them to reach the surface of the water.

R P No. 1: Algal growth found only along the sides and corners of the ponds. Some patches growing on submerged pieces of ceramics. No growth whatsoever was observed in other rearing ponds.

## Phytoplankton Collection:

Rearing Ponds—*Planktoniella*, *Pleurosigma*, *Lauderia*, *Ditylum*, *Navicula*, *Biddulphia*, *Thalassiothrix*, *Chaetoceras*, *Corsthoron*, *Bacillaria*, *Asterinella*, *Bacteriastrum*, *Ceratium*, *Favella*, *Coscinodiscus*, *Rhizosolenia*, *Peridinium*, *Nitzschia*, *Surirella*, *Gyrosigma*.

Nurseries—*Surirella*, *Pleurosigma*, *Gyrosigma*, *Synedra*, *Peridinium*, *Mastogloia*.

## Algae:

Nursery Pond No. 7—Sample No. 19: *Lyngbya*, *Oscillatoria*, *Mastogloia*.

Nursery Pond No. 6—Sample No. 20: *Lyngbya*, *Oscillatoria*.

Nursery Pond No. 5—Sample No. 21: *Lyngbya* (old strands).

## COLLECTION RECORD NO. 6

Locality ..... Camus Fishpond, Navotas, Rizal.  
 Date ..... July 4, 1947.  
 Time ..... 10:00 A.M.  
 Water temperature ..... 33° C.  
 Air temperature ..... 30° C.  
 Salinity ..... 5  
 Weather ..... Sunny.

## Observations:

N P No. 1: This pond has been drained out. Lab-lab was seen to be growing on the surface of the drying mud. A few cakes of lab-lab floating near the gate.

R P No. 6: No growth of algæ observed at the middle of the pond. A few patches of green algæ along the sides and corners.



## Phytoplankton:

R P No. 6: *Thalassiothrix*, *Corethron*, *Chaetoceras*, *Pleurosigma*, *Navicula*, *Ditylum*, *Rhizosolenia*, *Ceratium*, *Coscinodiscus*, *Biddulphia*, *Peridinium*.

Nursery Pond No. 1: *Oscillatoria*, *Navicula*, *Pleurosigma*, *Surirella*, *Lyngbya*, *Rhizosolenia*, *Mastogloia*.

CNP No. 1: *Chaetomorpha*, *Phormidium*, *Tiny Pleurosigma*, *Mastogloia*. Sample No. 23.

CNP No. 1: Sample No. 22 *Lyngbya*, *Enteromorpha*, *Mastogloia*.

CNP No. 1: Sample No. 24 *Lyngbya* (small).

CNP No. 5: Sample No. 25: *Enteromorpha*.

CRP No. 6: Sample No. 26: *Chaetomorpha*.

## COLLECTION RECORD NO. 7

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 9 July 1947.  
Time ..... 10:00 A. M.  
Water temperature ..... 31° C.  
Air temperature ..... 29° C.  
Salinity ..... 5  
Weather ..... Showering.

## Observations:

NP No. 1: Abundant growth of *Chaetomorpha* covering the pond but no lab-lab growth was observed.

NP No. 5, 6, 7: Water in this pond was deep and no algal growth seen.

RP No. 1, 3, 6: Growth of filamentous green algæ on the sides and corners of the pond was common.

## Phytoplankton:

RP No. 6: *Biddulphia*, *Chaetoceras*, *Pleurosigma*, *Corethron*, *Pedias-trum*, *Coscinodiscus*, *Navicula*, *Rhizosolenia*, *Nitzschia*.

NP No. 2: *Amphiprora*, *Mastogloia*, *Stauroneis*, *Pleurosigma*, *Navicula*, *Thalassiothrix*.

NP No. 2: Sample 27: *Lyngbya*, *Chaetomorpha*, *Characium* (epiphytic on *Chaetomorpha*).

NP No. 3: Sample No. 28: *Aphanocapsa*, *Chaetomorpha*.

RP No. 2: Sample No. 29: *Lyngbya*.

## COLLECTION RECORD NO. 8

Locality ..... Meycauayan, Bulacan.  
Date ..... 14 July 1947.  
Time ..... 10:45 A. M.  
Water temperature ..... 33.5° C.  
Air temperature ..... 30° C.  
Salinity ..... 0  
Weather ..... Sunny.

## Observations:

Rearing Pond: There was abundant growth of *Rupia* (Digman) intertwined with growths of *Cladophora* and *Chaetomorpha*. At one corner of the pond were newly planted *Cladophora*.

Nursery Pond: This pond had growth of lab-lab at one end which was drying up.

## Phytoplankton Collection:

*Navicula*, *Pleurosigma*, *Amphiprora*, *Lyngbya*.

Nursery Pond—Sample No. 30: *Anabaena*.

Sample No. 31: *Cladophora*.

Sample No. 32: *Chaetomorpha*, *Melosira*.

Sample No. 33: *Chaetomorpha*.

Sample No. 34: *Lyngbya*.

Sample No. 35: *Horridium*.

## COLLECTION RECORD NO. 9

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 15 July 1947.  
Time ..... 9:00 A. M.  
Water temperature ..... 35° C.  
Air temperature ..... 30° C.  
Salinity ..... 8  
Weather ..... Sunny.

## Observations:

NP No. 5, 6, 7: With water deep due to strong rain the previous day.

NP No. 5: Lab-lab growth very poor appearing only at corners.

NP No. 6: Thick growth of blanket algæ peeling off from substratum. Conspicuously colored green, obviously old.

NP No. 7: Young and old growths appeared together making a dirty green in color. Vertical strands observed, with ends still attached to the substratum.

NP No. 2: Thick growth of filamentous green algæ scattered in patches all over the pond. Occasionally at different parts of the pond were lab-lab growth on top of *Chaetomorpha* filaments.

RP No. 1: Lab-lab growth at the sides and corner of the pond.

RP No. 3: Patches of lab-lab along the sides.

## Phytoplankton:

Rearing Pond: *Biddulphia*-A, *Coscinodiscus*, *Lauderia*, *Ditylum*, *Corethron*, *Nitzschia*, *Pleurosigma*, *Chaetomorpha*, *Thalassiothrix*, *Synedra*.

Nursery Pond: *Coscinodiscus*, *Biddulphia*, *Ditylum*, *Corethron*, *Pleurosigma*, *Thalassiothrix*, *Synedra*, *Chaetoceras*.

NP No. 3: Sample No. 36: *Chaetomorpha*, *Enteromorpha*.

NP No. 4: *Phormidium*, *Oscillatoria*, *Spirulina*-R.

RP No. 1: Sample No. 38: *Lyngbya*.

RP No. 2: *Gleocapsa*.

RP No. 3: Sample No. 40: *Oscillatoria*.

## COLLECTION RECORD NO. 10

Locality ..... Dagat-dagatan, Malabon, Rizal.  
Date ..... 23 July 1947.  
Time ..... 9:00 A.M.



Water temperature ..... 28° C.  
 Air temperature ..... 27° C.  
 Salinity ..... 5.5  
 Weather ..... Sunny.

*Observations:*

NP No. 1: No green algæ Lab-lab growth seem starting on bottom of pond.

NP No. 2, 3: Abundant growth of filamentous green algæ mostly mature *Chaetomorpha* in both ponds. Lab-lab growth on top of the filaments.

NP No. 5: Lab-lab growth on pond bottom starting to peel off.

NP No. 6: Old growth of lab-lab observed on the bottom apparently dying off.

NP No. 7: Lab-lab growth on south end of the pond obviously new growths.

RP No. 1: Filamentous green algæ along sides of the pond.

*Phytoplankton:*

Nursery Pond: *Surirella*-A, *Pleurosigma*-A, *Ditylum*, *Mastogloia*, *Navicula*, *Pediastrum*, *Bacillaria*, *Melosira*, *Biddulphia*.

RP No. 1—Sample No. 41: *Enteromorpha*, *Chaetomorpha*.

NP No. 2—Sample No. 42: *Chaetomorpha*, *Lyngbya*.

NP No. 6—Sample No. 43: *Lyngbya*, *Chaetomorpha*.

NP No. 6—Sample No. 44: *Lyngbya*.

## COLLECTION RECORD NO. 11

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... August 1947.  
 Time ..... 4:00 P. M.  
 Water temperature ..... 34° C.  
 Air temperature ..... 28° C.  
 Salinity ..... 3  
 Weather ..... Overcast.

*Observations:*

RP No. 1: Abundant growth of *Chaetomorpha* and some *Enteromorpha* in deep water. Algal growth mostly along sides and corners of pond seen.

RP No. 2, 3, 4: No algal growth observed.

NP No. 1: Very scarce growth of lab-lab.

NP No. 2, 3: Luxuriant growth of *Chaetomorpha*, with patches of lab-lab growing on floating filaments.

*Phytoplankton:*

Rearing Pond: *Pleurosigma*, *Surirella*, *Ditylum*, *Mastogloia*-A.

Nursery Pond: *Pleurosigma*, *Mastogloia*, *Surirella*, *Coscinodiscus*, *Navicula*, *Amphiprora*, *Biddulphia*, *Navicula*.

NP No. 6—Sample No. 45: *Lyngbya*.

NP No. 2—Sample No. 46: *Chaetomorpha*.

NP No. 7—Sample No. 47: *Surirella*, *Anabaena*, *Lyngbya*, *Mastogloia*, *Microcoleus*, *Oscillatoria*.

NP No. 2—Sample No. 48: *Chaetomorpha*, *Lyngbya*.

RP No. 1—Sample No. 49: *Enteromorpha*, *Chaetomorpha*.

## COLLECTION RECORD NO. 12

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 6 August 1947.  
 Time ..... 10:00 A. M.  
 Water temperature ..... 32° C.  
 Air temperature ..... 31° C.  
 Salinity ..... 5  
 Weather ..... Sunny.

*Observations:*

Nursery Ponds: NP Nos. 5, 6, 7, being drained for lab-lab culture. Young growths observed in NP Nos. 5 and 7. Filamentous green algæ abundant in NP Nos. 2 and 3.

Rearing Ponds: Filamentous green algæ growing in RP No. 1 mostly along the sides and corner. No algal growths observed in other rearing ponds.

*Phytoplankton:*

Nursery Ponds: *Pleurosigma*-A, *Surirella*-A, *Biddulphia*, *Mastogloia*, *Amphiprora*-A, *Melosira*.

Rearing Ponds: *Pleurosigma*, *Surirella*, *Amphiprora*-A, *Ditylum*, *Rhizosolenia*, *Navicula*, *Melosira*, *Mastogloia*, *Nitzschia*, *Chaetoceras*.

NP No. 2—Sample No. 51: *Chaetomorpha*.

NP No. 3—Sample No. 52: *Lyngbya*, *Anabaena*.

NP No. 3—Sample No. 53: *Enteromorpha*.

NP No. 6—Sample No. 54: *Lyngbya*.

## COLLECTION RECORD NO. 13

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 13 August 1947.  
 Time ..... 2:00 P.M.  
 Water temperature ..... 34° C.  
 Air temperature ..... 30° C.  
 Salinity ..... 0  
 Weather ..... Showering

*Observations:*

Nursery Ponds: Water deep due to storm and continuous rain for two days and two nights. No lab-lab growth observed except on top of filamentous green algæ and patches on the bottom of NP Nos. 5 and 7.

Rearing Ponds: Water deep in rearing ponds. Green algæ in RP No. 1 were all under water. No other growths observed.

*Phytoplankton:*

Nursery Ponds: *Pleurosigma*, *Mastogloia*, *Amphiprora*

Rearing Ponds: *Nitzschia*, *Ditylum*, *Navicula*, *Amphiprora*, *Mastogloia*, *Biddulphia*.

RP No. 1—Sample No. 56: *Enteromorpha*, *Chaetomorpha*.



- RP No. 1—Sample No. 57: *Chaetomorpha*.  
 RP No. 2—Sample No. 58: *Lyngbya*.  
 RP No. 2—Sample No. 59: *Lyngbya*.  
 NP No. 5—Sample No. 60: *Chaetomorpha*.  
 NP No. 6—Sample No. 61: *Lyngbya*.  
 NP No. 7—Sample No. 62: *Lyngbya*.

## COLLECTION RECORD NO. 14

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 20 August 1947.  
 Time ..... 2:00 P.M.  
 Air temperature ..... 31°C.  
 Water temperature ..... 28°C.  
 Salinity ..... 3  
 Weather ..... Cloudy.

## Observations:

Nursery Ponds: No algal growth in RP No. 1. Green algæ mostly *Chaetomorpha* abundant in RP No. 2, 3 conspicuously old with a yellow greenish color. Very scarce algal growth in NP No. 4. New growths of Lab-lab observed in Nos. 5 and 6. Floating lab-lab in NP No. 7, dark green in color.

Rearing Ponds: Old filaments of *Chaetomorpha*, yellow green in color intertwined with young filaments of floating *Enteromorpha* at different parts of the pond specially along the sides and corners.

No algal growth in other rearing ponds observed.

## Phytoplankton:

Rearing Ponds: *Biddulphia*, *Nitzschia*, *Pleurosigma*, *Chaetoceras*, *Navicula-A*, *Mastogloia*, *Ditylum*, *Chamaesiphon*, *Surirella*, *Coscinodiscus*.

Nursery Ponds: *Amphiprora*, *Melosira*, *Pleurosigma*, *Navicula*, *Nitzschia*, *Amphora*, *Mastogloia* *Chaetoceras*.

- RP No. 1—Sample No. 63: *Chaetomorpha*, *Enteromorpha*.  
 NP No. 1—Sample No. 64: *Chaetomorpha*, *Enteromorpha*.  
 NP No. 2—Sample No. 65: *Lyngbya*, *Chaetomorpha*.  
 NP No. 5—Sample No. 66: *Lyngbya*, *Microcoleus*.  
 NP No. 6—Sample No. 67: *Lyngbya*, *Microcoleus*.

## COLLECTION RECORD NO. 15

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 27 August 1947  
 Time ..... 9:00 A.M.  
 Water temperature ..... 31°C.  
 Air temperature ..... 27°C.  
 Salinity ..... 2  
 Weather ..... Cloudy.

## Observations:

Nursery Pond No. 1: No lab-lab growth observed today.

Nursery Pond No. 2, 3: Luxuriant growth of filamentous green algæ (*Chaetomorpha*) in both ponds. Lab-lab growth observed on top of filamentous green algæ.

NP No. 46: No algal growth visible.

NP No. 5, 6, 7: Growth of *Rupia* observed. Lab-lab growth very scarce.

RP No. 1: *Chaetomorpha* and *Enteromorpha* growth observed along sides and corner of the pond.

No algal growth in other ponds.

## Phytoplankton:

Rearing Ponds: *Chaetoceras-A*, *Ditylum*, *Merismopedia-B*, *Biddulphia*, *Melosira*, *Coscinodiscus*, *Pleurosigma*, *Thalassiothrix*, *Surirella*, *Rhisosolenia*, *Nitzschia*, *Mastogloia*, *Navicula*.

Nursery Ponds: *Pleurosigma*, *Surirella*, *Navicula*, *Coscinodiscus*, *Biddulphia*, *Ditylum*, *Chaetoceras*.

RP No. 1—Sample No. 69: *Enteromorpha*.

RP No. 1—Sample No. 70: *Cladophora*.

NP No. 2—Sample No. 71: *Lyngbya*.

NP No. 4—Sample No. 72: *Lyngbya*.

NP No. 6—Sample No. 73: *Lyngbya*, *Chaetomorpha*.

## COLLECTION NO. 16

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 3 September 1947.  
 Time ..... 10:00 A.M.  
 Water temperature ..... 29°C.  
 Air temperature ..... 28°C.  
 Salinity ..... 0  
 Weather ..... Sunny.

## Observations:

NP No. 1: No algal growth visible whatsoever.

NP Nos. 2, 3: Abundant, ripe-yellow filamentous green algæ with occasional growths of lab-lab on top of filaments.

NP No. 4: No algal growth.

NP Nos. 5, 6, 7: Very scarce growth of lab-lab but abundant growth of *Rupia* (digman) due to low salinity of water.

RP No. 1: *Enteromorpha*, *Chaetomorpha*, and *Cladophora*, growing along sides and corners of pond.

RP No. 2: No algal growth except on pieces of ceramics that have been submerged in water.

RP Nos. 3-11: No algal growth.

NP No. 2. Gelatinous bottle-green algæ collected. Found growing among the roots of grasses partially submerged in water.

## Phytoplankton:

Rearing Ponds: *Ditylum-A*, *Surirella*, *Pleurosigma*, *Coscinodiscus*, *Nitzschia*, *Melosira*, *Navicula*, *Biddulphia*, *Amphiprora*, *Chaetoceras*.

Nursery Ponds: *Biddulphia-A*, *Coscinodiscus-A*, *Pleurosigma*, *Ditylum*, *Thalassiothrix*, *Lauderia*, *Melosira*.



- NP No. 5—Sample No. 74: *Lyngbya*, *Melosira*.  
 NP No. 3—Sample No. 75: *Lyngbya*, *Cladophora*.  
 NP No. 2—Sample No. 76: *Cladophora*, *Lyngbya*.  
 NP No. 2—Sample No. 77: *Aphanocapsa*.  
 RP No. 2—Sample No. 78: *Chaetomorpha*.

## COLLECTION RECORD NO 17

Locality ..... Dagat-dagatan, Malabon, Rizal.  
 Date ..... 10 September 1947.  
 Time ..... 10:00 A. M.  
 Water temperature ..... 30°C.  
 Air temperature ..... 28°C.  
 Salinity ..... 2  
 Weather ..... Sunny.

## Observations:

- NP No. 1: No algal growth.  
 NP Nos. 4, 5: Luxuriant growth of mature filamentous green algæ with patches of lab-lab on top of floating filaments. Intermingled with the green algæ are growth of *Rupia* and *Chara*.  
 Nursery Pond No. 4: No algal growth.  
 Nursery Pond Nos. 5, 6, 7: These ponds were drained and dried, preparatory to cultivation of lab-lab.  
 Rearing Pond No. 1: Filamentous green algæ, *Chaetomorpha* and *Cladophora* growing luxuriantly. Growth of *Rupia* abundant.  
 RP Nos. 2-11: No algal growth except on bamboo stakes.

## Phytoplankton:

- Rearing Ponds: *Ditylum*, *Navicula*, *Surirella*, *Pleurosigma*, *Merismopedia*, *Melosira*, *Oscillatoria*.  
 Nursery Ponds: *Melosira*-A, *Amphiprora*, *Surirella*, *Chaetoceras*, *Spirulina*, *Coscinodiscus*, *Pleurosigma*, *Navicula*.  
 NP No. 2—Sample No. 79: *Cladophora*, *Lyngbya*.  
 NP No. 1—Sample No. 80: *Nostoc*, *Cladophora*.  
 NP No. 1—Sample No. 81: *Cladophora*, *Lyngbya*.

## COLLECTION RECORD

Stomach and Intestinal Contents of *Bañgos*

## Fish No. 1

Locality ..... RP No. 1, Dagat-dagatan.  
 Date ..... 4 October 1947.  
 Total length ..... 6.9 cm.  
 Standard length ..... 5.3 cm.  
 Depth ..... 1.3 cm.

Stomach contents: *Chaetomorpha*, *Pleurosigma*, *Navicula*, *Lyngbya*, *Achnanthes*.

Intestinal contents: *Chaetomorpha*, *Navicula*.

## Fish No. 2

Locality ..... RP No. 9, Dagat-dagatan.  
 Date ..... 5 October 1947.  
 Total length ..... 56 cm.  
 Standard length ..... 41 cm.  
 Depth ..... 9.5 cm.

Stomach contents: *Pleurosigma*, *Navicula*, *Coscinodiscus*

Intestinal contents: None

## Fish No. 3

Locality ..... RP No. 7, Dagat-dagatan.  
 Date ..... 8 October 1947.  
 Total length ..... 42.5 cm.  
 Standard length ..... 30.0 cm.  
 Depth ..... 7.0 cm.

Stomach contents: *Chaetomorpha*, *Lyngbya*, *Enteromorpha*, *Melosira*, *Cladophora*, *Coconeis*, *Navicula*, *Achnanthes*.

Intestinal contents: *Cladophora*, *Chaetomorpha*, *Melosira*, *Lyngbya*, *Coconeis*, *Navicula*.

## Fish No. 4

Locality ..... RP No. 1, Dagat-dagatan.  
 Date ..... 28 October 1947.  
 Total length ..... 27 cm.  
 Standard length ..... 22 cm.  
 Depth ..... 7 cm.

Stomach contents: *Coscinodiscus*-A, *Melosira*-A, *Chaetomorpha*, *Enteromorpha*, *Navicula*, *Pleurosigma*, *Mastogloia*, *Oscillatoria*, *Lyngbya*, *Rupia*.

Intestinal contents: *Melosira*-A, *Coscinodiscus*, *Chaetomorpha*, *Navicula*, *Mastogloia*.

## Fish No. 5

Locality ..... RP No. 1, Dagat-dagatan.  
 Date ..... 28 October 1947.  
 Total length ..... 26 cm.  
 Standard length ..... 21 cm.  
 Depth ..... 6 cm.

Stomach contents: *Melosira*-A, *Navicula*-A, *Achnanthes*, *Lyngbya*, *Coscinodiscus*, *Chaetomorpha*, *Amphiprora*, *Nitzschia*, *Mastogloia*, *Rupia*.

Intestinal contents: *Melosira*, *Coscinodiscus*, *Cladophora*, *Chaetomorpha*, (disintegrating), *Enteromorpha*, *Navicula*, *Amphora*, *Achnanthes*, *Oscillatoria*.

## SYSTEMATIC CLASSIFICATION

Division—SCHIZOPHYTA.

Class—Myxophyceae.

Order—Chroococcales.



- Family—Chroococcaceae.  
 Genus—*Aphanocapsa*.  
 Genus—*Merismopedia*.
- Order—*Hormogonales*.  
 Suborder—Homocystineae.  
 Family—Oscillatoriaceae.  
 Genus—*Oscillatoria*.  
 Genus—*Spirulina*.  
 Genus—*Phormidium*.  
 Genus—*Lyngbya*.  
 Genus—*Microcoleus*.
- Family—Nostocaceae.  
 Genus—*Nostoc*.  
 Genus—*Anabaena*.
- Division—CHRYSTOPHYTA.  
 Class—Bacillariophyceae.  
 Section—Centriceae.  
 Subfamily—Discoideae.  
 Tribe—Coscinodisceae.  
 Subtribe—Melosirinae.  
 Genus—*Melosira*.  
 Subtribe—Coscinodiscinae.  
 Genus—*Coscinodiscus*.  
 Genus—*Planktoniella*.  
 Subtribe—Lauderinae.  
 Genus—*Lauderia*.  
 Genus—*Corethron*.  
 Subtribe—Rhizosoleniinae.  
 Genus—*Rhizosolenia*.
- Subfamily—Biddulpheideae.  
 Tribe—Chaetocereae.  
 Genus—*Chaetoceros*.
- Tribe Biddulphiaeae.  
 Subtribe—Triceratineae.  
 Genus—*Ditylum*.  
 Subtribe—Biddulphinae.
- Section—Pennates.  
 Subsection—Araphidae.  
 Subfamily—Fragilarioideae.  
 Tribe—Fragilariaceae.  
 Subtribe—Fragilariinae.  
 Genus—*Synedra*.  
 Genus—*Thalassiothrix*.
- Subsection—Monoraphidae.  
 Subfamily—Achnantheideae.  
 Tribe—Achnantheae.  
 Genus—*Achnanthes*.

- Subsection—Biraphidae.  
 Subfamily—Naviculaoideae.  
 Tribe—Naviculeae.  
 Genus—*Navicula*.  
 Genus—*Pleurosigma*.  
 Genus—*Gyrosigma*.  
 Genus—*Mastogloia*.
- Tribe—Amphiproreæ.  
 Genus—*Amphiprora*.
- Subfamily—Nizschioideae.  
 Tribe—Nitzschieae.  
 Genus—*Nitzschia*.
- Subfamily—Surirelleideae.  
 Tribe—Surirelleae.  
 Genus—*Surirella*.
- Division—CHLOROPHYTA.  
 Class—Chlorophyceae.  
 Order—Ulvales.  
 Family—Ulvaceae.  
 Genus—*Enteromorpha*.
- Order—Ulothricales.  
 Suborder—Cladophorieae.  
 Family—Cladophoraceae.  
 Genus—*Cladophora*.  
 Genus—*Chaetomorpha*.
- Division—PYRROPHYTA.  
 Class—Dinophyceae.  
 Order—Dinoflagellata.  
 Family—Peridiniidae.  
 Genus—*Peridinium*.  
 Genus—*Ceratium*.
- Family—Dinophysidae.  
 Genus—*Dinophysis*.

## FIELD OBSERVATION OF THE LOCAL CULTIVATION OF ALGÆ

*Preparation of the nursery pond.*—The pond is first dried by letting out all water during low tide. Water that still remains at the gate or its vicinity is bailed or pumped out. All dirt and debris like grasses and other weeds are removed. Animals such as eels and snakes are eradicated. The pond bed is then thoroughly leveled with the use of a wooden rake and exposed to sunlight for a period of two weeks. Exposure for such a period serves to kill bañgos fry enemies, such as the eggs and fry of predatory species. It also helps to hasten the growth of blue-green algæ on the mud crust.







TABLE 3.—Dagat-dagatan nursery pond.

Kinds of algae	12 June 1948	18 June 1948	25 June 1948	2 July 1948	9 July 1948	15 July 1948	23 July 1948	1 Aug. 1948	6 Aug. 1948	13 Aug. 1948	20 Aug. 1948	27 Aug. 1948	3 Sept. 1948	10 Sept. 1948
	Chlorophyceae													
<i>Enteromorpha</i>						x	x		x		x			
<i>Chaetomorpha</i>					x	xx	xxx	xxx	xxx	xx	xx	xx		
<i>Cladophora</i>														xxx
<i>Pediastrum</i>			x											
Myxophyceae														
<i>Anabaena</i>				x				x	x					
<i>Aphanocapsa</i>					x								x	
<i>Lyngbya</i>	xx	xx	xx	xx	x		xx	x		xxx	xx	xx	xx	
<i>Merismopedia</i>												x	xx	
<i>Microcoleus</i>				x							x			
<i>Nostoc</i>														xxx
<i>Oscillatoria</i>	xx		x	xx										
<i>Phormidium</i>	x		x			xx								
<i>Spirulina</i>			x			x								
Bacillariaceae														
<i>Achnanthes</i>														
<i>Amphiprora</i>					x			x	xxx	x	x			
<i>Asteriastrum</i>														x
<i>Biddulphia</i>						x	x	x	x			x	xxx	
<i>Chaetoceras</i>											x	xxx		
<i>Corethron</i>														
<i>Coscinodiscus</i>														
<i>Ditylum</i>	x	x										x	xx	x
<i>Gleocapsa</i>		x												xx
<i>Gyrosigma</i>														
<i>Hemiaulus</i>				x										
<i>Lauderia</i>														
<i>Mastogloia</i>	xxx	x	xx	x	x		x	xx	x	x	x	x		
<i>Melosira</i>													x	xxx
<i>Navicula</i>	x				x		x	x	x		x	x		x
<i>Nitzschia</i>														
<i>Planktoniella</i>														
<i>Pleurosigma</i>	xxx	xx	xxx	x	x	x	xxx	x	xxx	x	x	x	x	
<i>Rhizosolenia</i>														
<i>Stauroneis</i>					x									
<i>Surirella</i>							xxx	x	xxx					x
<i>Syndera</i>														
<i>Thalassionema</i>														
<i>Thalassiothrix</i>					x							x		

TABLE 4.—Types of algæ in ponds and of algæ in the stomach and intestines of bañgos.

Kinds of algæ	Neighboring ponds				Stomach and intestinal contents				
	Carnus pond	27 June 1948	Maycawayan	14 July 1948	Fish No. 1	Fish No. 2	Fish No. 3	Fish No. 4	Fish No. 5
Chlorophyceae									
<i>Enteromorpha</i>	x	x							
<i>Chaetomorpha</i>	x	x		xx		xx	x	x	x
<i>Cladophora</i>				x					
<i>Pediastrum</i>									
Myxophyceae									
<i>Anabaena</i>									
<i>Aphanocapsa</i>				x					
<i>Lyngbya</i>	xxx	x		xx	x	x		x	x
<i>Merismopedia</i>		x							
<i>Microcoleus</i>		x							
<i>Nostoc</i>									
<i>Oscillatoria</i>									
<i>Phormidium</i>	x							x	
<i>Spirulina</i>		x							
Bacillariaceae									
<i>Achnanthes</i>									
<i>Amphiprora</i>						x		x	x
<i>Asterionella</i>				x					x
<i>Bacteriastrium</i>									
<i>Biddulphia</i>		x							
<i>Chaetoceras</i>	x	x							
<i>Coconeis</i>	x	x							
<i>Corethron</i>								x	
<i>Coscinodiscus</i>	x	x							
<i>Ditylum</i>	x	x				x		xxx	x
<i>Gleocapsa</i>	x	x							
<i>Gyrosigma</i>									
<i>Mastogloia</i>									
<i>Melosira</i>	xxx							x	x
<i>Navicula</i>		x		x			x	xxx	xx
<i>Nitzschia</i>	xx	x		x	xxx	x	x	x	x
<i>Lauderia</i>		x							x
<i>Planktoniella</i>		x							
<i>Pleurosigma</i>		x							
<i>Rhizosolenia</i>	xx	x		x	xxx	xx		x	
<i>Stauroneis</i>	xx	x							
<i>Surirella</i>									
<i>Syndera</i>	x	x							
<i>Thalassionema</i>									
<i>Thalassiothrix</i>	x	x							



## REFERENCES

1. ADAMS, W. D., R. MONTALBAN, C. MARTIN. Cultivation of Bañgos in the Philippines. P. I. Bureau of Science. (1929).
2. ALLEN AND CUPP. Plankton Diatoms of the Java Sea. *Ann. Jard. Bot. Buitenz.* Vol. XLIV. 1929.
3. CUPP, EASTER E. Marine Plankton diatoms of the West Coast of North America. (Bulletin of the Scripps Institution of Oceanography of the University of California. Vol. 5, No. 1) University of California Press Berkeley, Los Angeles. (1943).
4. NEWTON, LILY. A handbook of the British Seaweeds. (The Trustees of the British Museum). William Clames & Sons Limited, London & Beccles.
5. TILDEN, JOSEPHINA E. The Algæ and Their Life Relations. The University of Minnesota Press, Minneapolis, Minnesota. (1935).
6. SMITH, GILBERT, M. The Fresh Water Algæ of the United States. First Edition McGraw-Hill Book Co. Inc. New York & London. (1933).
7. WHIPPLE, GEORGE C. Textbook on the Microscopy of Drinking Water New York; John Wiley & Sons Inc. London; Chapman & Hall Limited. (1927).