
SCIENTIFIC NOTES

THE VALUE OF FILAMENTOUS ALGAE FOR THE GROWTH OF *CHANOS CHANOS* (FORSK).

by

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In the Philippines a fixed opinion seems to exist about the feeding habits of *Chanos chanos*, locally named bangos. According to Herre and Mendoza (Ref. 3) and Adams, Montalban and Martin (Ref. 1) the bangos feeds upon diatoms and other plankton organisms, the leaves of submerged flowering plants and algae; they consume large quantities of filamentous green algae. The fry feeds upon plankton and the surface scum on the muddy bottom of quiet shallow bays and tidal creeks. Frey (Ref. 2) is a little more definite, stating that „Milkfish fry subsist on the food reserves of the yolk sac until they reach a length of approximately 1.5 cm. The food they begin eating at this time in the ponds consists of blue-green algae and associated organisms growing on the bottom. When they reach a length of 5 to 10 cm the food preference begins to shift to the filamentous algae, and proper steps must then be taken to satisfy these new dietary requirements of the fish.”

Thus it is generally accepted that *Chanos fry* feeds upon tiny algae growing on the bottom of the ponds, whereas the taste of older fish changes to filamentous algae.

In the Philippines a method of culture is even based upon this opinion and consists of either trying to promote the growth of bottom algae or filamentous algae by draining the ponds and exposing the bottom to the rays of the sun for some days.

It is recorded that sometimes filamentous algae are collected and moved to ponds in which they do not grow naturally.

The highest production of algae was recorded by Frey (Ref. 2) in ponds with a bottom of peaty clay, either compact or matted in structure or slimy clay, slightly organic and gelatinous in consistency. The lowest production was recorded on sandy mud, sand-shell mixture and compact clean sand pond bottoms.

In comparison with the Philippines the opinion in Indonesia about filamentous algae is much less unanimous.

De Jaager and van Lawick van Pabst (Ref. 4) state that *Chanos* (locally named bandeng) does not feed upon living water plants, but on plants which have started to disintegrate. Moreover bandeng feeds upon blue-green algae and diatoms. The growth of the latter may be promoted by draining of the pond.

The opinion of van Kampen (Ref. 5) is fully in accordance with that of the Philippines, whereas Sunier (Ref. 9) stated that although the main food of the larger sized bandeng consists of submerged plants, they often feed upon blue-green algae and diatoms.

Reyntjes (Ref. 7) concludes that the food which the bandeng needs for its growth consists mainly of blue-green algae and diatoms which grow on the bottom of the ponds. Bandeng does not feed upon Spermatophyta although algae, which develop on dying parts of these plants are consumed.

Schuster (Ref. 8) takes it as proved that if blue-green algae and diatoms occur in a pond, then these organisms will represent a high percentage of the stomach contents of growing *Chanos*.

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Fishes present in ponds with a great quantity of filamentous algae have, however, proportionally more blue-green algae in their stomach contents than might be expected. Furthermore Schuster states that the stomach of fish from ponds with filamentous algae are found empty more often than those of fish from ponds with blue-green algae. Schuster more or less agrees with the opinion of De Jaager and Van Lawick Van Pabst, assuming that decay has to soften the vegetable fibres of filamentous algae and Spermatophyta before Chanos can feed on these plants. According to Schuster great amounts of the soften fibres can be consumed.

It is a remarkable fact that none of the authors mentioned previously has tried to support his opinion by means of experimentally obtained yield data. Markus (Ref. 6) was the first to do this with data from ponds in the vicinity of Djakarta (Table 1).

Table 1.

Relation between the quantity of filamentous algae and the production of bandeng (Data from the Pekulitan complex near Djakarta, Jan./Febr. 1936).

Pond No.	Amount of filamentous algae during the growth period	Yield of Chanos kg/ha	Pond No.	Amount of filamentous algae during the growth period	Yield of Chanos kg/ha
51	Very few	14.9	28	Many	207.1
52		23.9			
40	Few	28.1	53	Abundant	195.9
45		53.6	54		176.4
49		41.1	55		234.0
			56		272.9
46	Moderate	107.9			
47		79.4			

From these results it may be concluded that the presence of filamentous algae in these ponds did materially increase the yield. However, these data may not be considered as giving conclusive proof, since they were obtained from several ponds, between which differences other than those of algae population may have existed. Moreover no distinction is drawn between dead and living filamentous algae.

It is almost certain that the presence of filamentous algae in fish ponds would not have attracted so much attention if their presence had not raised another problem in Indonesia. In consequence of the presence of the filamentous algae the fish ponds form excellent breeding places for larvae of mosquitoes. Consequently in Indonesia objections have always been raised against the presence of these filamentous algae, and a system of pond culture has been developed by Reyntjes in which the filamentous algae were destroyed periodically in the ponds in order to get rid of the mosquito larvae (Ref. 7).

The author carried out an experiment in 1939 in a rectangular pond near Djakarta in which the value of living filamentous algae for the growth of bandeng in comparison with decaying algae was studied. For this purpose the pond was divided into 24 plots of equal size (Fig. 1). Before the experiment was started the pond had been in use for 7 years, so it may be assumed that the characteristics of the bottom were sufficiently homogeneous for the purpose of the experiment. The soil was not analysed, but it may be described as a red alluvial loam, probably rather poor in nutrients and with a high sand content.

The supply of the seawater was controlled by a big sluice gate (Fig. 1), from which a supply canal ran between two rows of 12 small ponds. The water entered the ponds from the supply canal by means of bambu tubes. The size of these small ponds was 800 m².

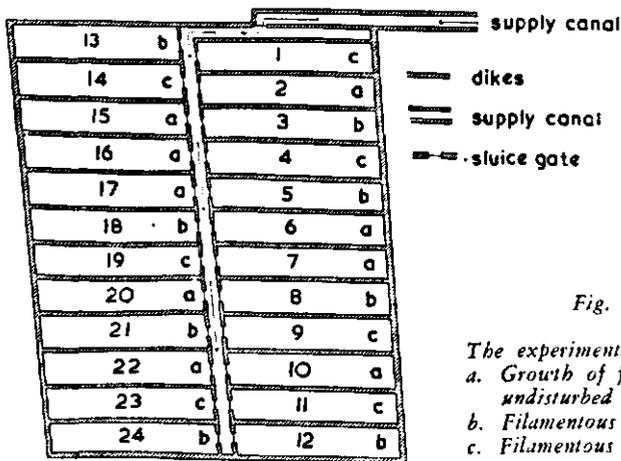


Fig. 1.

The experimental field
 a. Growth of filamentous algae undisturbed
 b. Filamentous algae piled up
 c. Filamentous algae removed.

The experimental treatments were :

- undisturbed growth of filamentous algae;
- filamentous algae in the ponds heaped up as often as necessary during the experiment. This treatment represents a kind of green manuring.
- filamentous algae repeatedly removed from the pond during the experiment.

The cost of treatment a was obviously less than that of b and c.

The first experiment started April 11, 1939 with 25 Chanos fingerlings per plot. The average weight of the fish was approximately 14 grams and the length 12 cm. This experiment ceased on July 15, 1939, so that the growth period lasted 95 days. During the experiment the salt content of the water was determined at intervals learning that there were only slight variations from 30 parts per mille. The heaping up and the removal of algae was carried out as often as necessary. In order to avoid differences between the plots the people who removed or heaped up the algae in the appropriate plots also regularly walked through the plots in which the algae were left undisturbed. The number of heaps of algae in the plots receiving treatment b varied considerably but there was no correlation between these numbers and the yield of Chanos. The height of the heaps, which were covered with a little soil, exceeded the water level by a few centimeters.

The second and third experiment were carried out simultaneously, each in one half of the pond plots. The plots were stocked on July 24 and 25, 1939 and were cropped on October 27 and 28, 1939, so the growth period of the fish coincided with the second part of the dry monsoon. The duration of the experiments was again 95 days.

The aim of these experiments was the same as that of the preceding one. In experiment no. 2 the plots were again stocked with fingerlings of 25 Chanos per plot each with an average weight of 14 grams, while in experiment no. 3 the plots were stocked with 20 Chanos per plot, each weighing 200 grams.

In these experiments again the salt content of the water varied very slightly. During these experiments the water in the plots was replenished regularly.

The amount of algae in the plots varied in the same way as in experiment no. 1. At the end of the experiments 2 and 3 the fish in the plots where the algae was heaped up showed signs of discomfort, probably through lack of oxygen.

The quantity of algae during experiments 2 and 3 was much less than during experiment 1. This may have been due to the removal during the first experiment

of the algae. It is, however, also possible that this must be considered as a seasonal phenomenon.

At the end of the experiments all fish in each plot were counted and weighed separately. The results are given in table 2. There appeared to be no difference in fertility between the northern and the southern part of the experimental field.

Table 2.
Experimental data about the average growth per fish in grams in plots with a size of 800 m² in 95 days.

Mean weight at the start of the experiments	± 14 grams				± 14 grams				± 200 grams			
Number of replicates	8				4				4			
Growth period	11-4-39 — 15-7-39				25-7-39 — 28-10-39				24-7-39 — 27-10-39			
Treatments	Number stocked		Average growth	m	Number stocked		Average growth	m	Number stocked		Average growth	m
		cropped				cropped				cropped		
a. algae undisturbed	200	169	226	4	100	99	270	9	80	66	167	10
b. algae piled up	200	175	163	4	100	86	194	6	80	75	137	6
c. algae removed	200	164	152	4	100	91	162	7	80	78	126	8

From table 2 the following conclusions may be drawn :

1. The average growth of the fish was greatest in the plots in which the filamentous algae grew undisturbed. The differences with the other treatments were significant in the 3 experiments ($P = 0.05$).
This means that the presence of *living* filamentous algae in ponds of the type in which the experiments were carried out is valuable for the growth of the *Chanos*.
2. The presence of heaped up algae does not seem to be important. The growth of *Chanos* present in these plots was in all experiments higher than in those plots where the algae were removed, but the difference was only significant in the second experiment ($P = 0.05$). The possibility must, however, be taken into account that continued green manuring with piled up algae may result in a permanent significant difference.
3. There is no evidence that the filamentous algae are only of value in a decomposing condition.

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