

**FOOD AND FEEDING HABITS OF SOME EGYPTIAN FISHES IN
LAKE QUARUN.**

Part I. *Tilapia zillii* (Gerv.) C. According to different sexes

By

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ABSTRACT

The material was collected over a four-months period from December 1969 to March 1970. The data so obtained were analysed by using the occurrence & the points methods. *T. zillii* of both sexes feed on plant material as well as on food of animal origin. The males & females took about nearly the same food items but with a slight difference in proportion. The percentage of fish with empty alimentary canals decreased gradually from December 1969 to March 1970. So, in December, 55.6% & 41.7% of the digestive tracts of males & females respectively were found to be empty; while in March, all the males had food in their alimentary tracts & 14.5% of the females were with empty digestive tracts. The plant components eaten by *T. zillii* of both sexes were diatoms: (*Coscinodiscus* spp., *Grammatophora* spp., *Lycophora* spp., *Synedra* spp., *Cocconeis* spp., *Navicula* spp., *Diploneis* spp., *Gyrosigma* spp., *Nitzschia* spp.). Cyanophyta (*Microcystis* spp., *Oscillatoria* spp., *Lyngbya* spp.); *Polysiphonia* spp.; *Ectocarpus* spp.; higher plant tissue & plant detritus. Animal organisms including *Prorocentrum unicans*, *Nereis* spp., *Ostracoda*, *Acartia latisetosa*, *Gammarus* spp., water insects, *Hydracarina*, *Gastropoda*, *Abra ovata*, *Cardium edule*, fish eggs, fish larvae, fish scales & animal detritus were used as food for Bolti (males & females). Insignificant quantities of inorganic particles were rarely seen in the alimentary canals of the females in February 1970 & March 1970.

It is of interest to mention that during December 1969, January & February 1970, the plant material, especially *Polysiphonia* spp., diatoms & Cyanophyta; were the most important food components for Bolti of different sexes, while the animal material was the second. The picture was reversed in March 1970, as it was found that the animal organisms particularly *Nereis* spp. & *Gammarus* spp. made up the principal food items for both males & females, while the plant components played the second role as food for Bolti of different sexes.

INTRODUCTION

The present paper is the second of a series dealing with food & feeding habits of some Egyptian fishes in Lake Quarun. The economical importance of *Tilapia zillii* (Gerv.), *Solea vulgaris* (Linn.), *Mugil saliens* (Risso.), *Mugil cephalus* (Linn.), *Mugil capito* (Cuv.) & the newly introduced fish: *Chrysophrys aurata* (L.), makes it desirable to study in detail the food of an entire community of fishes in Lake Quarun, which will appear in the forthcoming publications.

A description of lake Quarun & its environmental conditions were given by Gorgy (1959) & there is no need for their repetition.

The food of *T. zillii* of different sexes has not been previously described. The only investigation dealing with the nature of the ingested food of Bolti in Lake Quarun was that of Naguib (1961) who pointed out that *T. zillii* feeds on plants & animals. His work can only be considered preliminarily. By using the occurrence & points methods, we studied the food of Bolti according to different localities & we confirmed that *T. zillii* is omnivorous, eating plants as well as food material of animal origin & it accepts more plants (diatoms, Cyanophyta, *Polysiphonia* spp., *Ectocarpus* spp., higher plant tissue, etc.) than animal

food. Also it was noticed that there was a little difference in the composition of the food of fish caught from the different localities of the Lake (Abdel-Malek, 1971).

The present study presents the results of analysis of the whole gut contents of *T. zillii* (males & females) collected from December 1969 through March 1970, and its main objectives are to determine the most important food components for both the males & females & the changes occurring in the percentage composition of the different sexes.

MATERIAL & METHODS

Tilapia zillii specimens (males & females) were collected over a four-months period from December 1969 to March 1970 & these fishes ranged from 70 mm to 200mm long. The fish were caught by using the shore seine & cast nets, then they were killed the moment they were brought out of the water. The total length of each fish was measured. The entire digestive tract was removed from the body of the fish & then preserved in formalin (6%) for further examination in the laboratory.

The contents of the alimentary canals were examined & the food organisms were identified. The methods used for analysis of the results were the occurrence & points methods as described by Abdel-Malek (1971).

The occurrence method was used by many investigators :Allen, 1935 ; Frost, 1939, 1946 ; Frost & Went, 1940 ; Hartley, 1940, 1947, 1948 ; Hynes, 1950 ; Powles, 1958 ; Bishai & Abu-Gideri, 1962 ; McCormack, 1962 ; Watson, 1963 ; Abdel-Malek, 1963, 1963a, 1966, 1968, 1971 ; Maitland, 1965 ; Walburg & Nelson, 1966 ; Le Brasseur , and 1966 and many others.

The points method was tried by Neil, 1938 ; Swynnerton & Worthington, 1940 ; Allen, 1941, 1942 ; Frost, 1943 ; Van Somersen, 1946 ; Smith, 1947 ; Hynes, 1950 ; Naguib, 1961 ; Goodson, 1965 ; Abdel-Malek, 1971 & etc.

RESULTS

The first sample including 39 specimens of *T. zillii*, both males & females, was collected with a seine net on the 28 th. December 1969. It was found that 48.7% of the fish had food in their alimentary tracts. Plant material chiefly *Polysiphonia spp.*, diatoms & *Cyanophyta* were the predominant food items. *Polysiphonia spp.* occurred in nearly half the number of the alimentary canals examined & it formed 45.21% of the diet. Diatoms including *Grammatophora spp.*, *Nitzschia spp.*, *Synedra spp.*, *Cocconeis spp.*, *Gyrosigma spp.*, *Navicula spp.* & *Diploneis spp.* made up 14.8% of the diet, while the occurrence of diatoms was 43.6%. *Cyanophyta* (*Lyngbya spp.*, *Oscillatoria spp.* & *Microcystis spp.*)

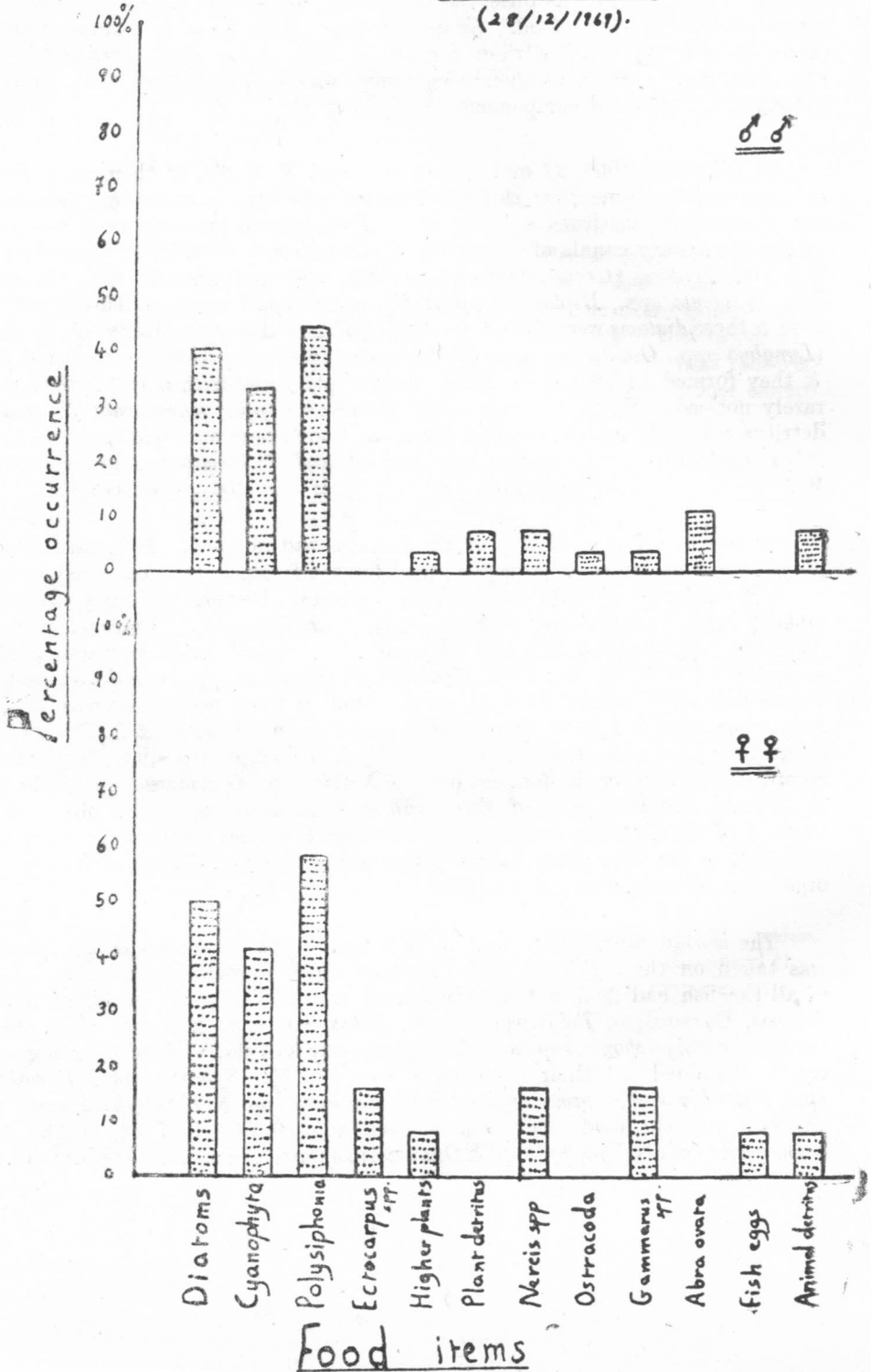
occurred in 35.9% & they composed 14.08% of the food. Other items of plant origin as *Ectocarpus* spp., higher plant tissue & plant detritus were rarely noticed, their occurrence was 5.15%. The percentage composition of each of *Ectocarpus* spp. & higher plant tissue was 2.96%, while it was 1.48% for plant detritus. *Nereis* spp. was observed in 10.3% of the alimentary tracts & it composed 6.67% of the food. *Gammarus* spp., *Abra ovata* & animal detritus occurred in 7.7% & all of them formed 10.36% of the diet. *Ostracods* & Sole eggs were rarely seen, as their occurrence was 2.57% & they made up only 1.48% of all the food components (figs. I & II).

In December 1969, 27 males were collected & 55.6% of them were found to have empty alimentary canals. *Polysiphonia* spp., diatoms & *Cyanophyta* were important constituents of the diet. *Polysiphonia* spp. occurred in 44.5% of the alimentary canals of the males & it composed 46.32% of the food (fig. I & II). Diatoms (*Grammatophora* spp., *Nitzschia* spp., *Synedra* spp., *Cocconeis* spp., *Navicula* spp., *Diploneis* spp. & *Gyrosigma* spp.) made up 16.05% of the food & these diatoms were found in 40.8% of the digestive tracts. *Cyanophyta* (*Lyngbya* spp., *Oscillatoria* spp. & *Microcystis* spp.) were with occurrence 33.3% & they formed 12.7% of the food. Higher plant tissue & plant detritus were rarely noticed. *Nereis* spp., *ostracods*, *Gammarus* spp., *Abra ovata* & animal detritus were only additional food items, as their occurrence was less than 12%. *Abra ovata*, *Nereis* spp., animal detritus, *ostracods* & *Gammarus* spp. composed 9.87%, 6.17%, 2.54%, 1.27%, & 1.27% of the diet respectively

It was found that 41.7% of the females had no food. *Polysiphonia* spp. played the most important part as food for the females, as it occurred in 58.4% & it made up 42.64% of the food contents. Diatoms including *Grammatophora* spp., *Synedra* spp., *Nitzschia* spp., *Gyrosigma* spp., *Cocconeis* spp. & *Navicula* spp. were found in half the number of the alimentary tracts & they composed 12.95% of the diet. *Cyanophyta* (*Lyngbya* spp., *Oscillatoria* spp. & *Microcystis* spp.) formed 16.66% of the food & their occurrence was 41.7%. *Ectocarpus* spp. & higher plant tissue occurred in 16.66% & 8.33% of the alimentary canals & they composed 7.4% & 5.55% of the diet. The animal components eaten by the females include *Nereis* spp., *Gammarus* spp., Sole eggs & animal detritus. Both of *Nereis* spp. & *Gammarus* spp. were observed in 16.66% of the digestive tracts, while Sole eggs & animal detritus were only seen in 8.33% of the alimentary canals. The percentage composition of all the food organisms of animal origin was found to be 14.8%.

The second sample including 60 Bolti specimens (34 males & 26 females), was taken on the 27th. and 28th. January 1970. It was observed that 53.3% of all the fish had food in their alimentary tracts. The plant constituents were diatoms, *Cyanophyta*, *Polysiphonia* spp., *Ectocarpus* spp. & higher plant tissue. Diatoms & *Polysiphonia* spp. were found in nearly half the number of the digestive tracts examined, as their occurrence was 48.3%. *Synedra* spp., *Gyrosigma* spp., *Nitzschia* spp., *Grammatophora* spp., *Navicula* spp. & *Lycmophora* spp. formed 14.4% of the food, while *Polysiphonia* spp. composed 17.7% of the diet. *Cyanophyta* mainly *Lyngbya* spp. & *Oscillatoria* spp. were observed to occur in 41.7%

Fig. I. Percentage occurrence of various
food items in the guts of *T. zilli*
of different sexes.
(28/12/1969).



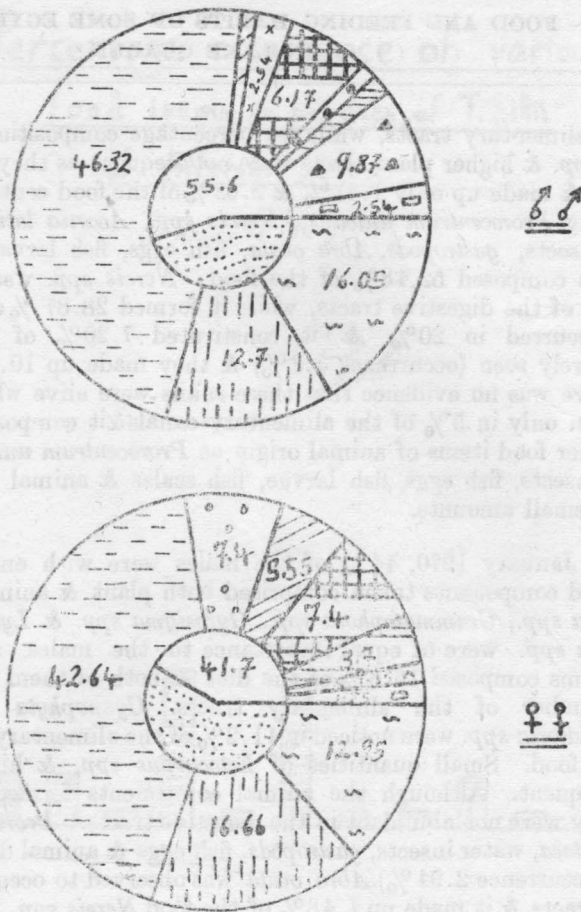


Fig. II. Percentage composition of food of *T. zillii* of different sexes.
(28/12/1969)

	Diatoms.		Nereis spp.
	Cyanophyta.		Ostracoda.
	Polysiphonia spp.		Gammarus spp.
	Ectocarpus spp.		Abra ovata.
	Higher plant tissue.		Fish eggs & larvae.
	Plant detritus.		Animal detritus.
	Full guts.		Empty guts.

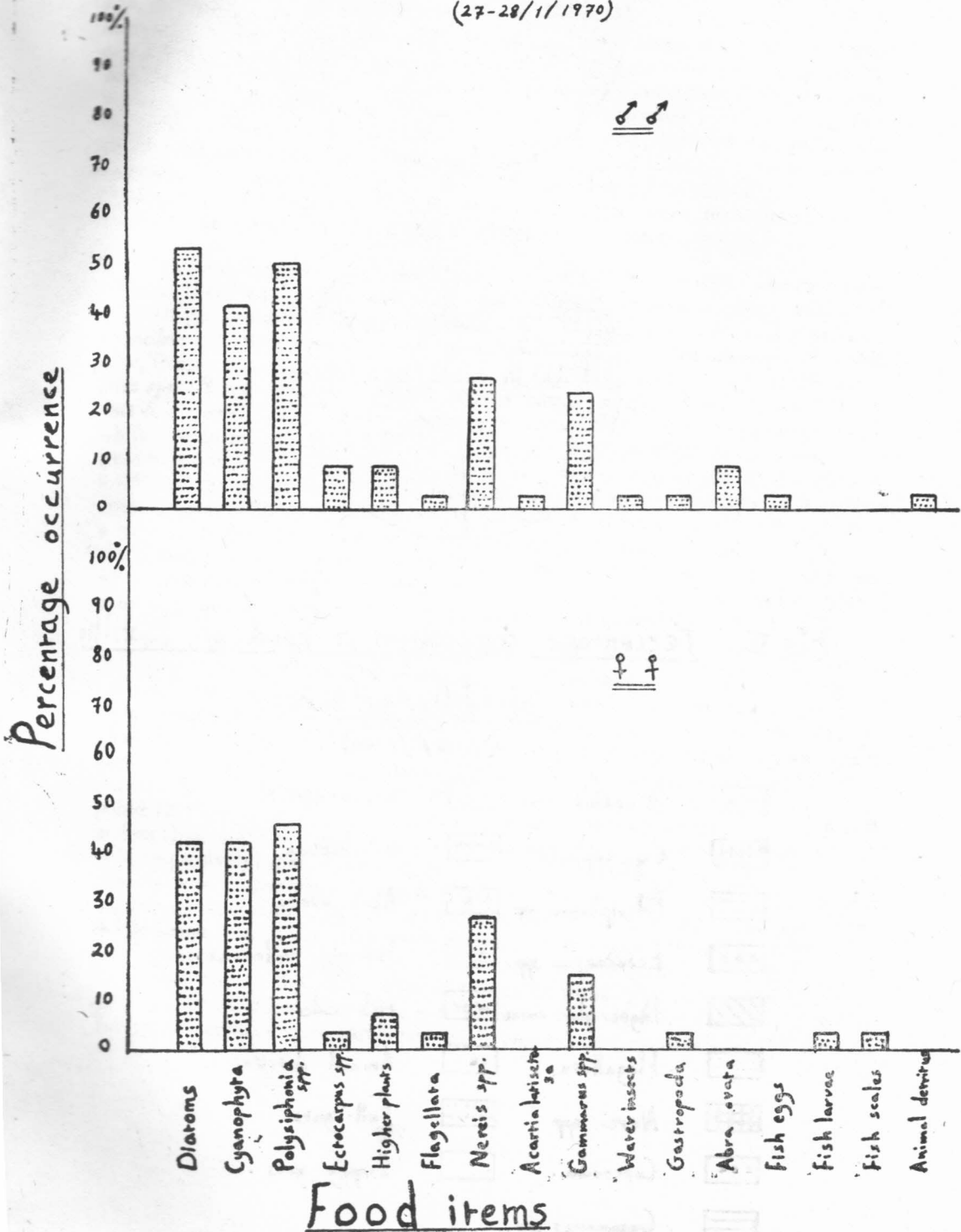
of the alimentary tracts, while its percentage composition was 11.49%. *Ectocarpus* spp. & higher plant tissue were not frequent as they occurred in 6.67% & 8.35% & made up only 1.31% & 2.62% of the food contents. Animal material including *Prorocentrum unicans*, *Nereis* spp., *Acartia latisetosa*, *Gammarus* spp., water insects, *gastropods*, *Abra ovata*, fish eggs, fish larvae, fish scales & animal detritus composed 52.48% of the food. *Nereis* spp. was found in nearly one-quarter of the digestive tracts, while it formed 28.87% of the diet. *Gammarus* spp. occurred in 20% & it constituted 7.20% of the food. *Gastropods* were rarely seen (occurrence 3.2%) & they made up 10.5% of the total food, but there was no evidence that these snails were alive when taken. *Abra ovata* was seen only in 5% of the alimentary canals & it composed 2.95% of the food. The other food items of animal origin as *Prorocentrum unicans*, *Acartia latisetosa*, water insects, fish eggs, fish larvae, fish scales & animal detritus were present but in small amounts.

In January 1970, 44% of the males were with empty alimentary canals. The food components taken comprised both plant & animal organisms. *Diatoms* (*Synedra* spp., *Grammatophora* spp., *Gyrosigma* spp. & *Lyngbya* spp.) & *Polysiphonia* spp. were of equal importance to the males, as each of these two food items composed 16.6% of the diet & both of them occurred in nearly half the number of the alimentary tracts. *Cyanophyta* chiefly *Lyngbya* spp. & *Oscillatoria* spp. were noticed in 41.2% of the alimentary canals & formed 9.4% of the food. Small quantities of *Ectocarpus* spp. & higher plant tissue were not frequent. Although the animal components formed 53.14% of the diet, yet they were not abundant in the digestive tracts. *Prorocentrum unicans*, *Acartia latisetosa*, water insects, *gastropods*, fish eggs & animal detritus were very rarely seen (occurrence 2.94%). *Abra ovata* was observed to occur in 8.8% of the alimentary tracts & it made up 4.48% of the food. *Nereis* spp. & *Gammarus* spp. were found in nearly one-quarter of the alimentary canals & they formed 27.96% & 9.4% of the diet (figs. III & IV).

The total number of the females examined during January 1970 was 26 & half of them was found to be with empty alimentary tracts. The plant components comprised *diatoms*, *Cyanophyta*, *Polysiphonia* spp., *Ectocarpus* spp., & higher plant tissue. *Polysiphonia* spp. was an important food item as it composed 19.28% of the diet & its occurrence was 46.1%. *Diatoms* (*Synedra* spp., *Nitzschia* spp., *Gyrosigma* spp., *Grammatophora* spp. & *Navicula* spp.) & *Cyanophyta* (*Lyngbya* spp. & *Oscillatoria* spp.) were nearly of equal importance to the females, as their occurrence was 42.4%. *Diatoms* & *Cyanophyta* formed 11.3% & 14.5% of the diet. *Ectocarpus* spp. & higher plant tissue were unimportant items as they were observed in 2.85% & 7.7% of the alimentary tracts & they composed 0.81% & 2.42% of the food. It was observed that the food items of animal origin formed 51.95% of the diet, but they were not abundant. *Nereis* spp. & *Gammarus* spp. occurred only in 27% & 15.4% and they made up 31.42% & 12.9% of the food. The occurrence of *Prorocentrum unicans*, *gastropods*, fish larvae, fish scales was only 3.85%, while others as *Acartia latisetosa*, water insects, *Abra ovata*, fish eggs & animal detritus completely disappeared from the alimentary canals (figs. III & IV).

Fig. III. Percentage occurrence of various food items in the guts of *T. zillii* of different sexes.

(27-28/1/1970)



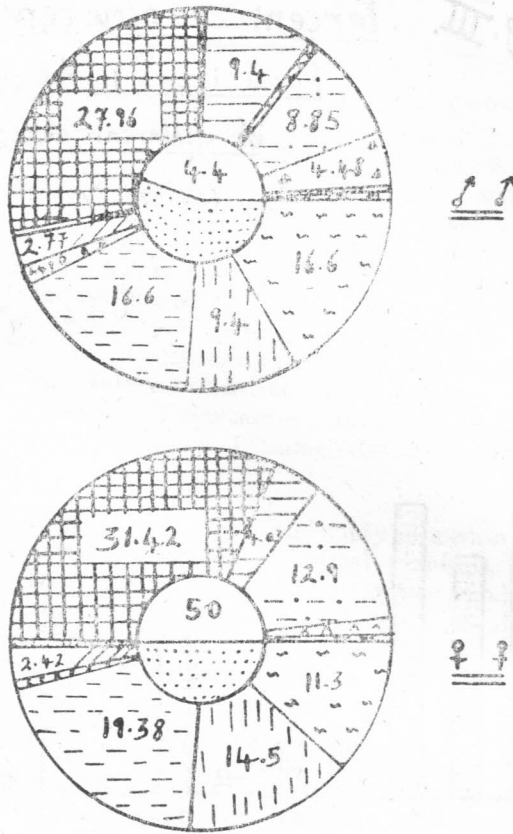


Fig. V. Percentage composition of food of T. zillii
of different sexes.
(27-28/1/1970).

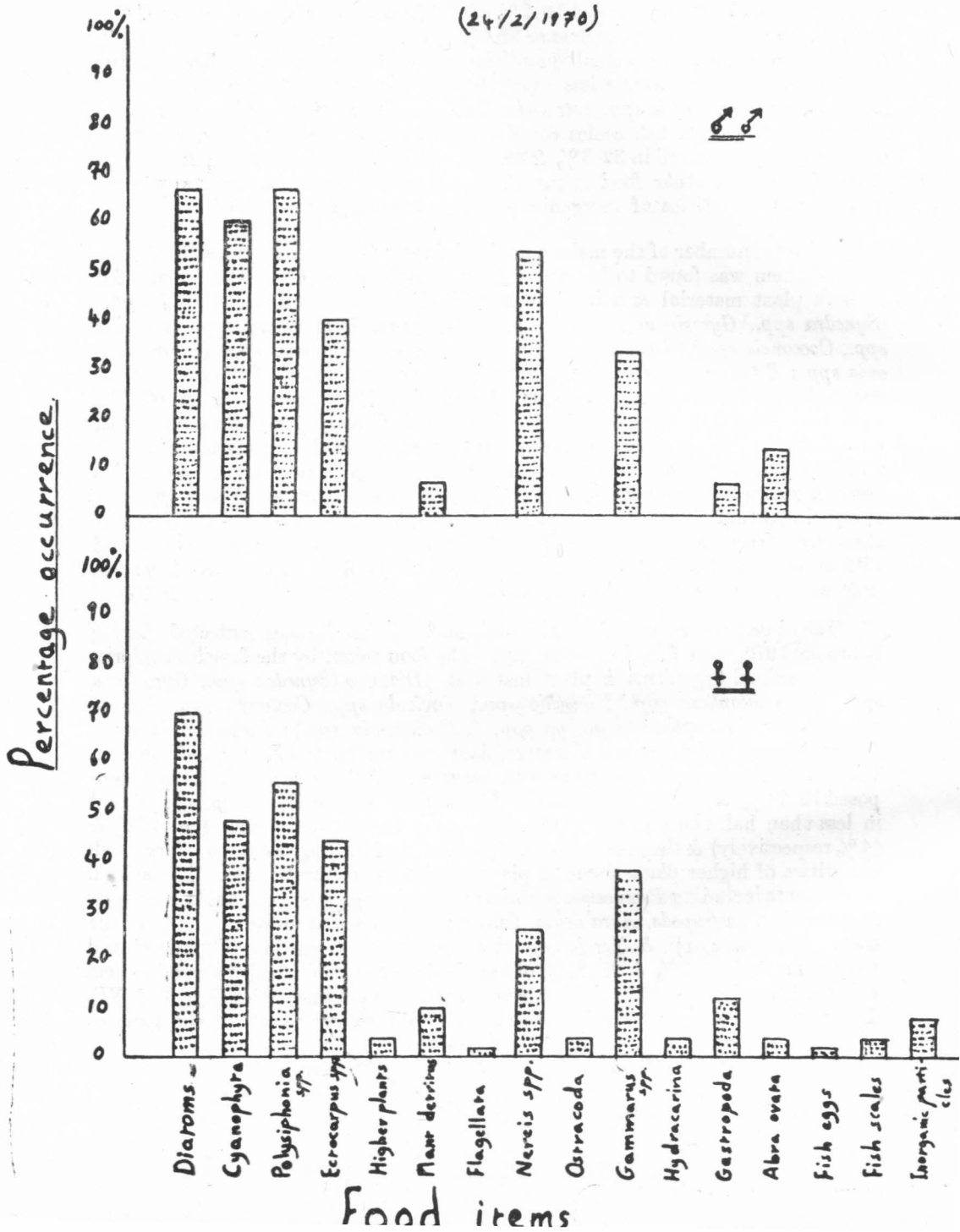
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| | Diatoms. | | Water insects. |
| | Cyanophyta | | Gastropoda |
| | Polysiphonia spp | | Abra ovata |
| | Ectocarpus spp. | | Fish eggs + larvae. |
| | Higher plant tissue | | Fish scales. |
| | Flagellata. | | Animal detritus |
| | Nereis spp | | Full guts |
| | Copepoda. | | Empty guts. |
| | Gammarus spp. | | |

The third sample was taken on the 24th February 1970 & it was found that 66.1% of the digestive tracts contained food. The diet taken by fish of this sample comprised both plant material & animal organisms. Diatoms were the most common food as they occurred in 69.3% of the alimentary tracts. *Synedra* spp., *Gyrosigma* spp., *Grammatophora* spp., *Nitzschia* spp., *Lycophora* spp., *Cocconeis* spp. & *Navicula* spp. composed 12.6% of the diet. Cyanophyta mainly *Lyngbya* spp. & *Oscillatoria* spp. were observed to occur in nearly half the number of the alimentary canals & they formed 10.2% of the food. *Polysiphonia* spp. & *Ectocarpus* spp. were found with occurrence 58.5% & 43.1% and they made up 18.2% & 7.32% of the diet. Very small quantities of higher plant tissue & plant detritus were rarely seen (occurrence less than 10%). The animal food including *Procentrum unicans*, *Nereis* spp., ostracods, *Gammarus* spp., *Hydracarina*, gastropods, *Abra ovata*, fish eggs, fish scales composed 48.13% of the diet. *Nereis* spp. & *Gammarus* spp. occurred in 32.3% & 36.9% and they formed 25.33% & 13.28% of the food. The other food items of animal origin were occasionally seen. Insignificant quantities of inorganic particles were rarely observed.

The total number of the males examined during February 1970 was 15 & one-third of them was found to be with empty alimentary canals. These males fed on both plant material & animal organisms. The plant food including diatoms (*Synedra* spp., *Gyrosigma* spp., *Grammatophora* spp., *Lycophora* spp., *Nitzschia* spp., *Cocconeis* spp.); Cyanophyta (*Lyngbya* spp. & *Oscillatoria* spp.); *Polysiphonia* spp.; *Ectocarpus* spp. & plant detritus composed 45.98% of the diet. Diatoms & *Polysiphonia* spp. were of equal abundance as their occurrence was 66.7%, while they formed 13.14% & 16.05% of the food. Cyanophyta & *Ectocarpus* spp. were found in 60% & 39.9% of the alimentary canals & they made up 9.49% & 6.57% of the diet. The animal components (*Nereis* spp., *Gammarus* spp., *Abra ovata* & gastropods) constituted 54.02% of the food contents. *Nereis* spp. was a very important food item as it occurred in more than half the number of the alimentary tracts & it composed 27.22% of the diet. *Gammarus* spp. was found with occurrence 33.2% & it made up 13.14% of the food. *Abra ovata* & gastropods were not frequent & they were seen in small quantities (figs. V & VI).

The digestive tracts of nearly one-third of the females collected during February 1970, were found to be empty. The food taken by the females comprised both animal organisms & plant material. Diatoms (*Synedra* spp., *Gyrosigma* spp., *Grammatophora* spp., *Nitzschia* spp., *Navicula* spp., *Cocconeis* spp., *Lycophora* spp.); Cyanophyta (*Lyngbya* spp. & *Oscillatoria* spp.); *Polysiphonia* spp.; *Ectocarpus* spp.; higher plant tissue & plant detritus formed 52.45% of the diet. Diatoms & *Polysiphonia* spp. were with occurrence 70% & 56%, while they composed 13.71% & 18.8% of the food. Cyanophyta & *Ectocarpus* spp. were found in less than half the number of the alimentary canals (their occurrence 48% & 44% respectively) & they made up 10.4% & 7.54% of the food contents. Very small quantities of higher plant tissue & plant detritus were rarely seen. The animal components including *Procentrum unicans*, *Nereis* spp., ostracods, *Gammarus* spp., *Hydracarina*, gastropods, *Abra ovata*, fish eggs & fish scales formed 46.44% of the diet. *Gammarus* spp. & *Nereis* spp. were observed to occur in 38% & 26% and they composed 13.3% & 21.85% of the food; while other food items of animal origin occurred in less than 13% & were found in small quantities (figs. V & VI). Inorganic particles were rarely noticed in the alimentary canals of the females.

Fig. V. Percentage occurrence of various food items in the gurs of *T. zilli* of different sexes



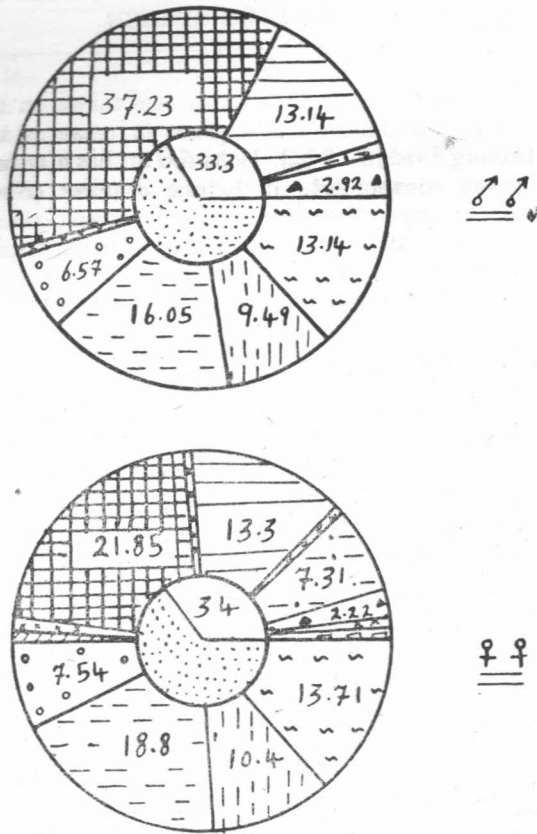


Fig. VI. Percentage composition of food of T. zillii
of different sexes
 (24/2/1970)

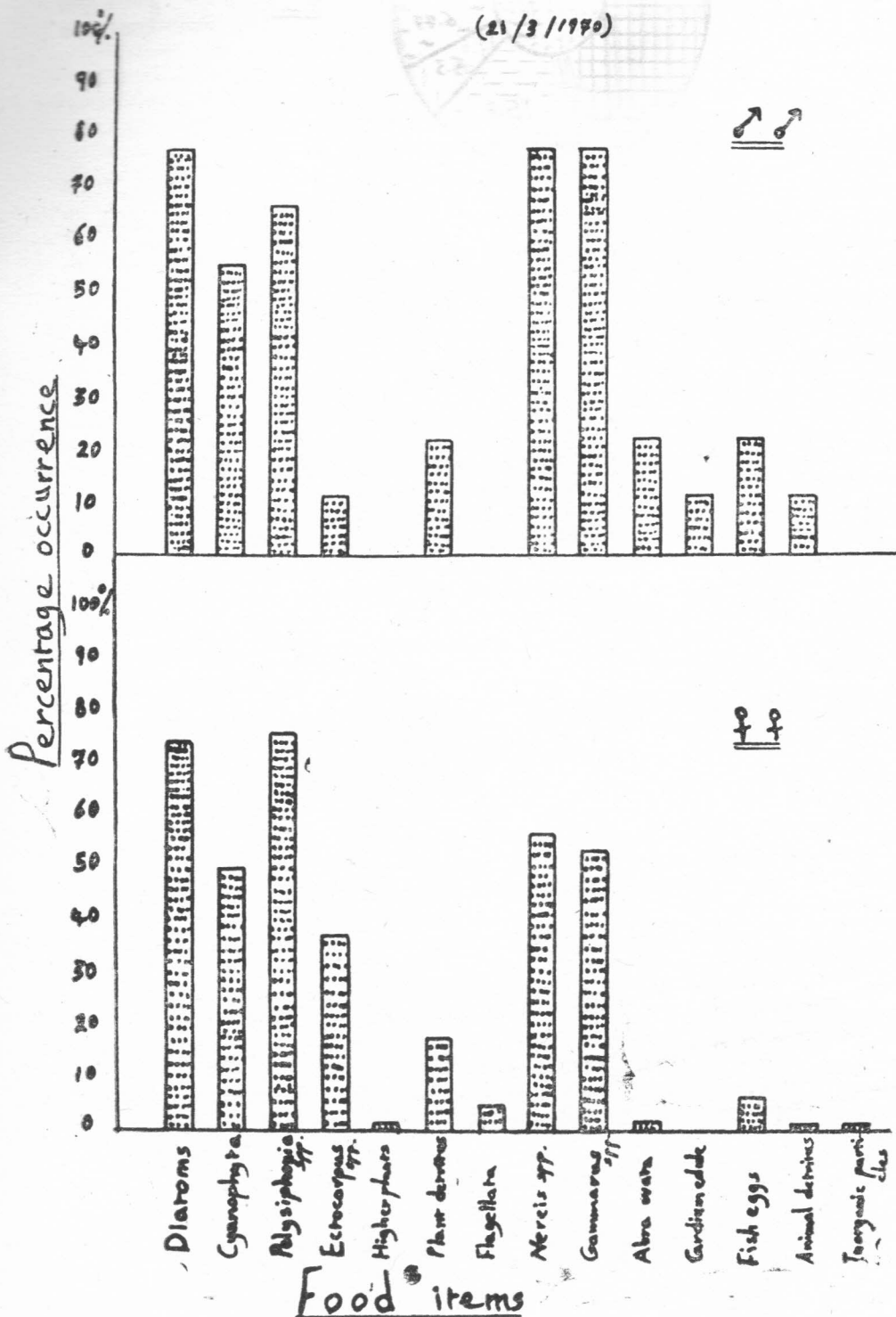
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|--|--------------------|--|-----------------------------|
| | Diatoms. | | Gammarus spp. |
| | Cyanophyta. | | Hydracarina. |
| | Polysiphonia spp. | | Gastropoda. |
| | Ectocarpus spp. | | Abra ovata. |
| | Higherplant tissue | | Fish eggs, larvae & scales. |
| | Plant detritus. | | Inorganic particles |
| | Flagellata. | | Full guts. |
| | Nereis spp. | | Empty guts. |
| | Ostracoda. | | |

The fourth sample (71 Bolti specimens) was taken on the 21st March 1970. It was noticed that, there was a great increase in the percentage of alimentary tracts containing food (87.3%). Bolti fed on both animal organisms & plant material. The plant components including diatoms (*Synedra* spp., *Grammatophora* spp., *Gyrosigma* spp., *Nitzschia* spp., *Cocconeis* spp., *Coscinodiscus* spp., *Lycophora* spp., *Navicula* spp.); Cyanophyta (*Lyngbya* spp., *Oscillatoria* spp.); *Polysiphonia* spp.; *Ectocarpus* spp.; higher plant tissue & plant detritus formed 32.81% of the food contents. Diatoms & *Polysiphonia* spp. were of equal abundance (occurrence was 74.7%) & they made up 8.21% & 12.9% of the diet. Cyanophyta & *Ectocarpus* spp. were observed to occur in 50.7% & 33.8% of the alimentary canals & they composed 5.79% & 3.22% of the food. Insignificant quantities of higher plant tissue & plant detritus were occasionally seen. The animal components (*Prorocentrum unicans*, *Nereis* spp., *Gammarus* spp., *Abra ovata*, *Cardium edule*, fish eggs & animal detritus) constituted 67.66% of the diet. *Nereis* spp. & *Gammarus* spp. were the most important food items as they made up 47.38% & 17.25% of the food & they occurred in more than half the number of the digestive tracts. The percentage occurrence of other food items of animal origin & inorganic particles was less than 10.

None of the males caught during March 1970 was found to be with empty alimentary canals. The males ingested plant material as well as animal organisms. The plant components including diatoms (*Synedra* spp., *Gyrosigma* spp., *Grammatophora* spp. & *Nitzschia* spp.); Cyanophyta (*Lyngbya* spp., & *Oscillatoria* spp.); *Polysiphonia* spp.; *Ectocarpus* spp. & Plant detritus formed 30.12% of the food. Diatoms & *Polysiphonia* spp. were dominant as they occurred in 77.7% & 66.6%, but they made up only 6.77% & 15.8% of the food contents. Cyanophyta were found with occurrence 55.5% but they composed 5.3% of the diet. *Ectocarpus* spp. & plant detritus were observed to occur in 11.1% & 22.2% of the digestive tracts & they constituted only 0.75% & 1.5% of the food. The animal components (*Nereis* spp., *Gammarus* spp., *Abra ovata*, *Cardium edule*, fish eggs & animal detritus) formed 69.88% of the food. *Nereis* spp. & *Gammarus* spp. were very important items as they occurred in 77.7% & they composed 57.11% & 7.52% of the diet. *Abra ovata*, *Cardium edule*, fish eggs & animal detritus made up 5.25% of the food contents & they were found in less than one-quarter of the digestive tracts (figs. VII & VIII).

It was found that only 14.5% of the females collected during March 1970 were with empty alimentary canals. The females ate both plant & animal material. Diatoms (*Synedra* spp., *Grammatophora* spp., *Nitzschia* spp., *Gyrosigma* spp., *Cocconeis* spp., *Coscinodiscus* spp., *Lycophora* spp. & *Navicula* spp.) formed only 8.55% of the food contents; while they occurred in 74.3%. *Polysiphonia* spp.; & Cyanophyta (chiefly *Lyngbya* spp. & *Oscillatoria* spp.) made up 12.32% & 5.92% of the diet & they were found in 75.8% & 50% of the digestive tracts. *Ectocarpus* spp. was observed with occurrence 37.15% & it composed 3.78% of the food. Insignificant quantities of higher plant tissue & plant detritus were not frequent in the alimentary canals. All the plant food including diatoms, Cyanophyta, *Polysiphonia* spp., *Ectocarpus* spp., higher plant tissue &

Fig. VII. Percentage occurrence of various
Food items in the guts of T. zilli
of different sexes



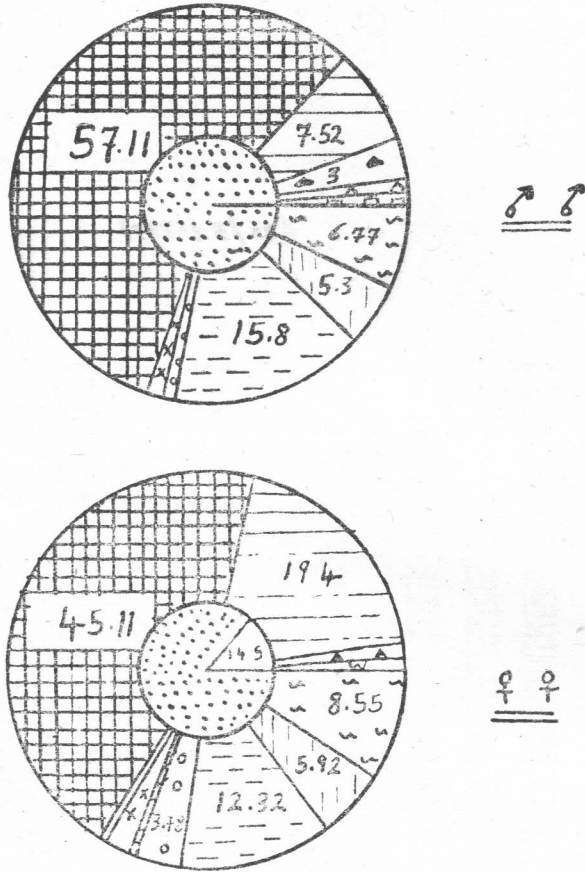

















Fig. VIII Percentage composition of food of *T. zillii*
of different sexes.
(21/3/1970)

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|---|---------------------|---|---------------------|
|  | Diatoms. |  | Gammarus spp. |
|  | Cyanophyta. |  | Bivalvia |
|  | Polysiphonia spp. |  | Fish eggs. |
|  | Ectocarpus spp. |  | Animal detritus. |
|  | Higher plant tissue |  | Inorganic particles |
|  | Plant detritus |  | Full guts. |
|  | Flagellata. |  | Empty guts. |
|  | Nereis spp. | | |

plant detritus made up only 33.01%; while the animal components (*Prorocentrum unicans*, *Nereis spp.*, *Gammarus spp.*, *Abra ovata*, fish eggs and animal detritus) formed 66.81%. Of the animal material, *Nereis spp.* and *Gammarus spp.* were important as they occurred in more than half the number of the alimentary canals and they constituted 45.11% 19.4% of the diet.

DISCUSSION

In December 1969, the percentage of fish with empty alimentary canals were 35.6% & 41.7% for the males & females respectively. Bolti of different sexes fed on plants & animals. The plant components were the most important food items for Bolti of both sexes as they composed 78.88% & 85.20% of the food contents of males & females respectively. With the exception of plant detritus, the plant material including *Polysiphonia spp.*, diatoms, *Cyanophyta*, *Ectocarpus spp.* & higher plant tissue were more frequent in the alimentary tracts of the females than in that of the males (fig. I). The percentage composition of *Polysiphonia spp.* & diatoms were larger in case of the males than in that of the females (fig. II). *Cyanophyta* and higher plant tissue formed 16.66% & 5.55% of the diet of the females, while they composed only 12.7% & 1.27% of the food of the males. *Ectocarpus spp.* was with occurrence 16.66% in case of the females & it formed 7.4% of its diet but it was not found at all in the alimentary canals of the males. Insignificant quantities of plant detritus were rarely seen in the digestive tracts of the males & it completely disappeared from that of the females. Animal organisms made up 21.12% & 14.8% of the food of males & females respectively. *Ostracods* & *Abra ovata* were absent from the alimentary canals of the females. Other food items of animal origin as *Nereis spp.*, *Gammarus spp.* & animal detritus were not frequent in the alimentary tracts of both the males & females. Fish eggs disappeared from the digestive tracts of the males.

In January 1970, half the number of the females had food; while 44% of the males were with empty alimentary canals. As in December 1969, both plant material & animal organisms occurred in the alimentary tracts of Bolti of different sexes. Plant components particularly diatoms, *Cyanophyta* & *Polysiphonia spp.* were more frequent in case of the males & females (fig. III). *Polysiphonia spp.* made up 19.38% & 16.6% of the diet of females & males. Diatoms formed 16.6% & 11.3% of the food of males & females while *Cyanophyta* composed 14.5% & 9.4% of the food of females & males. Insignificant quantities of *Ectocarpus spp.* & higher plant tissue were occasionally seen in case of Bolti of different sexes. As a matter of fact, the plant food composed 46.86% & 48.41% of the males & females diet. The animal components including *Nereis spp.*, *Gammarus spp.*, *Prorocentrum unicans*, *Gastropoda* & others formed 53.14% & 51.95% of the males & females food, but they were not frequent as their occurrence was less than 27% (fig. III). Of the animal food, *Nereis spp.* & *gastropods* were very important items as they composed 31.42% & 12.9% of the females food & 27.96% and 8.85% of that of the males. *Acartia latisetosa*, water insects, *Abra ovata*, fish eggs & animal detritus were not found in the whole guts of the females, while fish larvae & fish scales disappeared from the alimentary canals of the males (fig. I).

In February 1970, the percentage of fish with empty digestive tracts decreased and reached nearly one-third of the males & females. As in December 1969 & January 1970, Bolti of different sexes fed on both plant material & food organisms. The plant components composed 45.98 % & 52.45 % of the males & females diet respectively. Using the occurrence & the points methods, it was found that, *diatoms*, *Cyanophyta*, *Polysiphonia spp.*, *Ectocarpus spp.* & plant detritus were nearly of equal importance for both the males & females. Small quantities of higher plant tissue were occasionally seen in the alimentary canals of the females, but these were not found in case of the males. Animal material including *Nereis spp.*, *Gammarus spp.*, etc. formed 54.02 % & 47.55 % of the males & females diet. It is clear that, of the animal food, *Nereis spp.* & *Gammarus spp.* were the most important items (figs. V & VI). *Nereis spp.* was more important for the males than for the females, as its percentage occurrence was 53.4 % & 26 % and its percentage composition was 37.23 % & 21.85 % for the males and females respectively. *Gammarus spp.* was nearly of equal importance for Bolti males & females (figs. V & VI). Insignificant quantities of *Prorocentrum unicans*, *ostracods*, *Hydracarina*, fish eggs, fish scales were rarely found in case of the females, but they were absent from the alimentary canals of the males. *Gastropods* & *Abra ovata* occurred in less than 15 % of the digestive tracts of Bolti of different sexes. Very small quantities of inorganic particles were occasionally seen in case of the females.

During March 1970, the percentage of fish which had food in their alimentary tracts increased & reached 85.5 % & 100 % for the females & males respectively. As it was found during December, January & February, *T. zillii* of different sexes fed on plants & animals. It is clear that, the food of animal origin especially *Nereis spp.* & *Gammarus spp.* played the most important part as food for Bolti of different sexes. *Nereis spp.* formed 57.11 % & 45.11 % of the diet of the males and females. As in February, *Nereis spp.* was found to be more important for the males than for the females (figs. VI, VII & VIII). *Gammarus spp.* was more abundant in case of the males than in that of the females, but it composed 7.52 % and 19.4 % of the males & females food respectively. Other food items of animal origin were rarely seen. As a matter of fact, all the animal organisms made up 69.88 % & 66.81 % of the diet of males & females. Plant material including *Polysiphonia spp.*, *diatoms*, *Cyanophyta* & plant detritus constituted nearly one-third of the food of Bolti of different sexes. Using the occurrence & points methods it was found that *Polysiphonia spp.*, *diatoms*, *Cyanophyta* were nearly of equal importance for both the males & females. As in February, it was noticed that very small quantities of inorganic particles were rarely seen in the digestive tracts of the females.

The plant components recorded from the alimentary canals of *T. zillii* were: *diatoms* (*Coscinodiscus spp.*, *Grammatophora spp.*, *Lycmophora spp.*, *Synedra spp.*, *Cocconeis spp.*, *Navicula spp.*, *Diploneis spp.*, *Gyrosigma spp.*, *Nitzschia spp.*); *Cyanophyta* (*Microcystis spp.*, *Oscillatoria spp.*, *Lyngbya spp.*); *Polysiphonia spp.*; *Ectocarpus spp.*; higher plant tissue & plant detritus.

Animal organisms including *Prorocentrum unicans*, *Nereis* spp., ostracods, *Acartia latisetosa*, *Gammarus* spp., water insects, *Hydracarina*, gastropods, *Abra ovalis*, *Cardium edule*, fish eggs, fish larvae, fish scales & animal detritus occurred in the Bolti digestive tracts.

Insignificant quantities of inorganic particles were rarely seen in the alimentary canals of Bolti females during February & March.

It is of interest to mention that, in December 1969, the plant material were the most important food items as they composed 78.88 % & 85.20 % of the diet of males & females respectively. But, we found that in March 1970, the picture was reversed, as *T. zillii* fed mainly on animal components (*Nereis* spp., *Gammarus* spp. & others) which made up 69.88 % & 66.81 % of the food of males & females respectively; while the plant material formed only 30.12 % & 33.02 % of the diet of males & females. In spite of the fact that the percentage of plant & animal food were nearly the same for both the males & females during January & February, yet the plant items were more frequent in the alimentary tracts of Bolti of both sexes than the animal components.

The present study indicates that the plant food was more important for both the males & females during December, January & February; while in March the animal components formed the major part of food for Bolti. As a matter of fact, during the four months period from December 1969 to March 1970, both the males and females took about the same food items, but with a slight difference in proportion. Also, it was found that *T. zillii* of both sexes fed on plant material as well as on food of animal origin & this agrees with the findings of previous investigators working at Lake Quarun, who claimed that *T. zillii* is omnivorous, eating both, plant & animal material (Naguib, 1961 & Abdel-Malek, 1971).

It is noteworthy to mention, that the percentage of fish with empty alimentary canals (males & females) decreased gradually from December 1969 to March 1970. So, in December 55.6 % & 41.7% of the males & females alimentary tracts were empty while during March all the males had food in their alimentary canals & only 14.5 % of the females were found to be with empty digestive tracts.

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