(1) Diatoms and desmids (30 per cent.) *Cosmarium, Closterium, Fragilaria, Melosira, Navicula, Nitzschia, Pinnularia, Suriella,* and *Synedra*). (2) Insect life, including mosquito larvæ (25 per cent.). (3) Crustaceans (20 per cent.) *Copepods, Daphnids* and *Cypris.* (4) Algæ (15 per cent.) (*Anabœna, cladophora, Oscillatoria, Pediastrum* and *Spirogyra.* (5) Rotifers (5 per cent.) Larval forms (3 per cent.). (7) Miscellaneous matter such as sand particles (2 per cent.).

Under artificial conditions it feeds on prawn pulp, oil-cake, mosquito larvæ, cooked rice and egg-yolk.

The breeding habits and development of the species have been detailed by Stoye[5] and Purser.[6] The variations from their observations are indicated below. Maturity is attained when 0·7 inch in size by the male and when 1 inch by the female. The ovarian egg is 1·0 to 1·66 mm. in diameter, whereas the fertilised egg is full of oil-globules and measures 2·0 mm. in diameter. The embryo lies curved over the yolk-sac when 4 mm. in size, showing 8 somites, black eyes and the fin buds. Pigmentation commences when 5 mm. in length, and the mouth cleft appears when 6 mm. in size. The young are released in broods of 5 to 7 at intervals of 3 weeks. At the time of birth the young is 10 mm. long. The yolk-sac is completely absorbed by the third day. Cannibalism is not observed in the Millions; and it lives in harmony with *Gambusia affinis* (B. & G.), *Oryzias melastigma* (McCl.) and *Aplocheilus blochii* (Arnold). While its enemies in its native waters are the fishes, *Crenicichla saxatilis* and *Rivulus harti,* the common frog, *Rana hexadactyla,* is found to feed on it in Madras.

The Millions are successfully used for anti-malarial purpose in other parts of the world. In Madras it is observed to be only of moderate utility, the rate of larval consumption being only 20 to 80 per day. The species may, however, become a useful addition to the indigenous larvicides.

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* Published with the kind permission of the Director of Industries and Commerce, Madras.

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THE RADII OF SCALES OF *HILSA ILISHA* (HAMILTON) AS AN INDEX OF GROWTH AND AGE*

SEVERAL explanations on the function and significance of the radii of fish scales have been given by various workers including Raj,[1] on the basis of the mode of disposition of the radii. In *Hilsa ilisha* (Hamilton) occurring in the deltaic area of the Godavari, the radii are arranged transversely. A study of these radii of the scales of the pectoral region of 1,110 specimens has revealed that the number of radii represent the body length of the fish in inches.

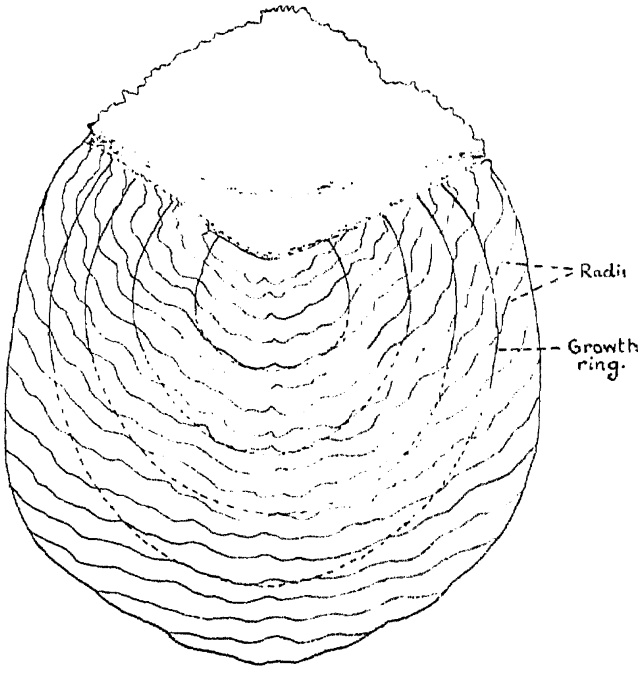

FIG. 1. Diagram of scale of Hilsa, 18·2" in body length

According to Hora[2] and Raj,[3] the maximum length attained by Hilsa during the first year of its life is 9 inches. And according to Job[4] Hilsa grows at the rate of one inch per month and attains a marketable size and about a foot at the end of the first year. Basing on these observations, the age of the fish can also be roughly determined by counting the number of radii.

The following table indicates the relationship between the body length, number of radii and probable age of *Hilsa ilisha.*

No. of specimens examined	Length of body in inches	No. of radii on scale	Probable age in months
87	9·8–10·5	10	10
114	10·7–11·4	11	11
112	11·5–12·4	12	12
121	12·5–13·4	13	13
127	13·5–14·5	14	14
114	14·6–15·5	15	15
98	15·6–16·4	16	16
117	16·5–17·5	17	17
79	17·6–18·4	18	18
88	18·4–19·4	19	19
39	19·5–20·4	20	20
14	20·5–20·8	21	21

It, however, remains to be ascertained if the fish continues to grow in length and to add to the number of the radii until its natural death. The largest Hilsa so far recorded by the authors is a female spawner, 20·8 inches in body length. It is likely that the fish does not escape the fisherman who comb the river

system with destructive gears; and to this extent further investigation is a stalemate.

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* Communicated with the kind permission of the Director of Industries and Commerce, Madras.

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MICROFLORA IN BUTTER

THE importance of micro-organisms, especially moulds of the Penicillium and Odium groups, in fat hydrolysis and development of high acidity in butter leading to the production of a high acid ghee is well known.[1,2] In the course of the studies on the microbiological deterioration of market butter, the authors have observed significant differences between *desi* and creamery butters in regard to the numbers as well as species of microflora present in them. The *desi* butter samples were all reported to be prepared from boiled, soured milk and one to two weeks old, while the creamery butter samples were made from pasteurised cream and 24 to 48 hours old. The average fungal and bacterial counts obtained in different samples of butter are given in Table I. Yeasts and moulds were counted on potato-dextrose agar (Difco). Total and differential counts of bacteria were made on China blue agar and coliforms counted on McConkey's agar. Nile blue sulphate agar was employed for enumerating lipolytic organisms, but the results were not satisfactory.

TABLE I

Counts of fungi and bacteria in butter (log. averages of 10 samples each)

Type of butter	Yeast and mould count per ml.	Bacterial count per ml.			
		Total	Acid producers	Proteolytes	Coniforms
Desi butter	4,915	198,500	31,030	20,180	425
Creamery butter—					
(*a*) Salted	618	1,820,000	515,200	73,500	19,000
(*b*) Unsalted	274	2,071,000	846,500	72,850	48,820

The types of bacteria, yeasts and moulds occurring in the above samples of butter were isolated and classified on the basis of their cultural and biochemical characteristics. Of the bacterial types found in *desi* butter samples, more than 40 per cent. were lactobacilli (mostly resembling either *L. acidophilus* or *L. casei* species), 20 per cent. mere micrococci and the rest included coliforms, aerobic spore-formers (either *B. albolactis* or *B. subtilis*) and streptococci. In creamery butter, coliform organisms (*A. œrogenes* I, Intermediate and an unidentified strain occurring predominantly) constituted more than 50 per cent. of the bacterial flora; 30 per cent. were streptococci (ether *Str. lactic aromaticus* or *Str. paracitrovorous* strains); 10 per cent. were micrococci (mostly *M. caseolyticus* types); and the rest included species of Microbacterium, Achromobacter, Pseudomonas (greenish fluorescence), Serratia (red pigment) and aerobic spore-formers.

The difference in the type and number of organisms between the two butters is mainly due to the acid environment of *desi* butter,[3] which inhibits bacterial growth but favours development of the contaminating yeasts and moulds. For the same reason the highly acid-tolerant lactobacilli, derived from the starters or utensils, form the predominating bacterial types but they are not considered to possess any influence on fat. Except for the lactose-fermenting spore-former (*B. albolactis*) the other species of bacteria are ordinary contaminants having little effect on the spoilage of *desi butter*. The present work, therefore, confirms the previous observations[1,2] that fungi play a major role in the deterioration of *desi* butter. The description of the important types of yeasts and moulds found in butter and their characteristics will be dealt with in a separate note.

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INSTITUTION OF CHEMISTS, INDIA

WHILE highly appreciating the sentiments expressed by Prof. Findlay, it may be pertinent to mention, in this connection, that the Institution of Chemists (India), which was established as early as 1928, has from its very inception been actively engaged in furthering the interests and fostering the healthy development of the profession of Chemistry in this country. It has at present more than 450 members on its rolls, distributed throughout the Indian Union, and has two Branches in the industrial areas of Bihar (Patna) and the United Provinces (Kanpur). The Institution just now has before it a scheme for launching a drive for the further extension of its activities, and its Council is considering a re-orientation of its membership with this object in view.

It may further be mentioned that the Institution has also two organs, a quarterly Journal of its own and another, the Industrial and News Edition, published under the joint auspices of the Institution of Chemists (India), and the Indian Chemical Society.

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