

A NOTE ON THE FOOD OF YOUNG BLUE GILL SUNFISH, *LEPOMIS MACROCHIRUS*, IN KENYA COLONY.

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INTRODUCTION.

The American Blue Gill Sunfish, *Lepomis macrochirus* (Centrarchidæ), was first introduced into Kenya Colony in 1940 by the Game Department. The original stock was brought up from South Africa, to which country they had been imported previously from America, and the introduction was undertaken in order to provide a sporting and edible fish suitable for cultivation in dams in Kenya. These Blue Gills have since bred well, and are being distributed to various part of the Colony.

Like their near relatives among the Percidæ, Blue Gills in their native country of North America are known to be mainly carnivorous, but their food in Kenya Colony has hitherto not been determined. Examinations of the types of food eaten by any introduced species of fish are however, valuable in so far as they provide an indication of where such non-indigenous fish will take their place in the ecology of the other indigenous animals present in the waters.

In several instances, these Blue Gills have been placed in dams already stocked with the indigenous Athi River "Carp," *Tilapia nigra*, which in the past has been the species most used for stocking dams in Kenya. The question of a possible food competition thus arises. Stomach examinations of *T. nigra* from a few waters have shown that this species, like many of the other cichlid fish widely distributed in East and Central Africa, is almost exclusively vegetarian; their staple foods are algal, though at certain seasons they may be caught readily on rod and line baited with a worm, or on trout flies.

In December, 1944, Mr. H. Copley of the Kenya Game Department, kindly gave me 12 fingerling Blue Gills (3-4 inches in length) with which to stock a small dam in the grounds of the Veterinary Laboratory at Kabete. These were liberated in this dam on 12/12/44.

During dry seasons this dam is not more than half-an-acre in extent, the deepest portion being about 3½ feet. The water has become progressively more turbid during the last few years, because the dam is used for watering stock. At the time of writing (22/1/46) it is impossible to see through the water for more than an inch or so. The bottom is composed of a thick chocolate-coloured mud which is very fluid in places. Aquatic vegetation is very scanty; there are two small beds of floating *Nymphaea*, and the western edge is fringed with a small bed of emergent *Typha* and *Cyperaceae* sp. reeds.

The aquatic fauna is likewise scanty. There is a sparse plankton fauna of Cladocera and Copepoda, with occasional Hydracarina. Among aquatic insects, only *Dytiscus* and chironomid larvæ are at all abundant, though aquatic Hemiptera such as notonectids are also present, together with a few surface-dwelling Hydrometridæ. In sheltered spots among the reeds, where there is no disturbance by cattle, there is a fairly rich microflora and microfauna of protozoa, rotifers and algæ. The Clawed Frog *Xenopus* is seasonally abundant.

In January, 1938, the dam was stocked with a few *Tilapia nigra* which have since multiplied greatly. The average size of these is about 2-3 ozs. only, though the biggest reach ¾-lb. A short time prior to introducing the Blue Gills, about 200 *Tilapia* were trapped out to destock the dam and improve the growth rate. The stomachs of some of these *Tilapia* were examined and all contained vegetable matter only, mainly euglenids.

In January, 1946, it became apparent that the dam might dry up completely before the long rains set in. Orthodox fishing for Blue Gills had proved fruitless, and it was decided to net the pond and remove whatever head of fish might still be present to dams elsewhere, to prevent losing the whole lot during the drought period.

Accordingly, on 13/1/46, the pond was netted by four hauls with a 100 yard, 1 inch mesh seine. This resulted in the capture of about 80 lbs. of *Tilapia* of all sizes, and 54 young Blue Gills about 3-4 inches long.

Of these Blue Gills, 24 died within twenty-four hours of capture before they could be transferred elsewhere. After slitting the abdominal wall, these dead fish were preserved in 5% formalin, and at a later date they were dissected, the stomachs being cut out for examination of the food contents.

The stomach contents were washed on to a slide, sorted under a low-power binocular microscope and assessed according to Frost's (1943) modification of the method used by Swynnerton and Worthington (1940). In this method, points are allocated according to the frequency and bulk of the various food organisms present in the stomach, having regard to the fullness of the gut. It is in effect an assessment of bulk, and has been found in nearly 300 stomach examinations from Kenya Rainbow Trout to give a very satisfactory estimate on a percentage basis (van Someren, unpublished results).

In this study no attempt has been made to give other than a very generalised classification of the food present. Such a classification is sufficiently informative for all practical purposes and the food material, which has been preserved, will allow of a more detailed study of species later when more is known about the freshwater invertebrates of East Africa.

RESULTS.

Table I summarises the results obtained, and it will be seen that Blue Gills of this age (about 6-9 months) are exclusively carnivorous ; no vegetable matter was found in any of the stomachs.

TABLE I. Food of 24 young Blue Gill Sunfish at Kabete, 13/1/46.

<i>Food animal.</i>	<i>No. of points.</i>	<i>% proportions.</i>	<i>% of stomachs in which occurring.</i>
<i>Cladocera</i>	43	34.0	87.5
<i>Copepoda</i>	32	25.3	75.0
<i>Hemiptera</i> (sub-aquatic)	31	24.7	54.0
<i>Ostracoda</i>	12	9.6	46.0
Chironomid larvæ	5	4.0	8.3
<i>Hydracarina</i>	2	1.6	8.3
<i>Nematoda</i> (free-living)	1	0.8	4.2
Total	126	100.0	

Average size of fish 8.1 cms.
 Range of size of fish 6.1-9.6 cms.

The main food of this age-class in the Kabete dam at this time of the year is cladoceran and copepod animals (water fleas), these two types being found in greatest bulk in the greatest percentage of the stomachs examined. Cladocera are more commonly eaten than copepods, perhaps because they may be more common in the water ; these Cladocera are all of the one species, characterised by a slightly sculptured carapace with a very long posterior spine. The Copepoda are of at least two free-swimming species.

Aquatic Hemiptera of various types (corixid, notonectid, and micronectid "water boatmen") are a close second to copepods as an article of diet, but are grazed upon by fewer fish. Blue Gills feeding upon these hemipterans are those mainly of the longer length-groups; this might be expected because such hemipterans are larger animals than water fleas.

Small ostracods (another type of water flea), come fourth on the list, but are much more scanty in the stomachs than the first three types of food animals. Chironomid (midge) larvae, and hydracarine water mites are present in two stomachs only in small numbers, and one stomach contains a small free-living nematode worm.

The interesting feature of these results is that most of the food taken consists of midwater and planktonic animals. No stomachs contained any aerial or terrestrial food animals, and bottom-dwellers such as midge larvae, nematodes and to a large extent the ostracods, are taken in very small quantities only. The water mites may be planktonic, but are scanty in the pond. Midge larvae are however very numerous in the bottom mud and it would appear that the feeding habits of Blue Gills of this age are selective; the fish choose mainly the midwater food available, and are not "bottom-grubbers" to any extent as are their relatives among the Cyprinidæ and Cichlidæ.

It is evident also that such Blue Gills are not in any way directly competitive for food with the *Tilapia* in such a dam, and there is no doubt that the two species should thrive together in the same water, as long as physical overcrowding does not occur.

More information is, however, still required on the food of adult Blue Gills in this Colony before it can be shown that they are not, for example, directly predatory upon *Tilapia* fry. That they are carnivorous fish, should also be a warning that if Blue Gills are accidentally or deliberately introduced into any of the rivers stocked with trout in this Colony, they may cause an upset in the present food supply in these rivers if they are able to establish themselves. Every precaution should be taken to ensure that this does not happen except as a controllable experiment.

REFERENCES.

- Frost, W. E., 1943. The Natural History of the Minnow, *Phoxinus phoxinus*. *J. Anim. Ecol.*, 12 (2), 139-162.
- Swynnerton, G. H. and Worthington, E. B., 1940. Note on the Food of Fish in Haweswater (Westmorland). *J. Anim. Ecol.*, 9 (2), 183-187.

CORRIGENDUM.

Vol. 18, Nos. 1 and 2, p. 84, Line 17: "Two mole-rats, *Otomys* . . ." should read "Two Groove-toothed Rats, *Otomys* . . ." Line 19: "A Groove-toothed Rat, *Tachyoryctes rex*" should read "A mole-rat, *Tachyoryctes rex*."