

Carp culture for Sudan ponds and reservoirs

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PRODUCTION of fish for food, particularly in Western Sudan, is the main aim of fish culture in our country. It is a relatively recent development and is still on a small scale.

In 1953/54 a fish farm was established about six miles south of Khartoum at "Shagarra" (Gordon's Tree) on the White Nile. Water is pumped from the river to artificial ponds. There are seven ponds of 1.6 ha. each, eight measuring 55×21.5 m, six of 25×12 m, 12 of 12×6 m and four of 15×8 m.

Although Equatoria Province is the only other region where ponds have been established, use is being made of rain water reservoirs (haffirs) in the semi-desert provinces of Kordofan and Darfur (Western Sudan). These are set up to provide fresh water for people in the arid parts of the provinces.

The reservoirs range in surface area from four to about 30 ha. Smaller reservoirs ($75 \times 40 \times 20$ m) north of Malakal in the Upper Nile Province are fed by rain water but communicate through a channel with a dead arm of the Nile. Fish culture can be done in the canals of the Gezira which range from eight to more than 20 metres wide and are 0.50 to 0.75 m deep.

The main indigenous species reared in the ponds and the haffirs is *Tilapia nilotica*, the rivers being the only source for collection of its seed. Feeding has until recently been based on natural productivity in the ponds, but the use of fertilizers for artificial feeding is now being investigated at the Shagarra farm.

Suitable feeds

It has been found that broad beans (*Vicia faba* L.) are suitable as feed for *T. nilotica* (Bishai 1962). With a combination of superphosphate and poultry manure, production increased and the species reached a length of 32 cm in six months (George 1969-70); similar results were reported by Mishrigi (1970-72).

In monosex culture, it was observed that the weight of male *T. nilotica* was treble that of the females and about four times that of the mixed stocks (George 1972). But, because water in the haffirs is required for drinking, fish production in them cannot be increased by artificial feeding or by fertilisation. Monosex culture is also a problem in such large bodies of water which need high rates of stocking and readily available seed. A dependable source of seed is a pre-requisite of any large-scale use of the haffirs.

Huet (1959) suggested the introduction of the herbivorous *Tilapia melanopleura* from the Congo; George (1970) suggested introducing *Cyprinus carpio* with a view to finding suitable alternative water bodies to the haffirs in Western Sudan. Introduction of the phytophagous Chinese grass carp has also been recommended (George 1973) because it feeds on weeds which it converts into fish flesh without artificial feeding or fertilisation. These fish could help to keep the haffirs clear of unwanted plant growth.

In addition, because the grass carp cannot reproduce in confined waters but only through hypophysation, stocking can be controlled.

In view of the possibilities for this species, government permission was given this year to introduce into the Sudan both the common carp and the grass carp. We shall be conducting experiments to study their culture possibilities in Sudanese pond waters and their compatibility with indigenous cultivable fish.