

DISTRIBUTION AND FEEDING ECOLOGY OF THE AFRICAN TILAPIA *Oreochromis mossambicus* (TELEOSTEI, PERCIFORMES, CICHLIDAE) IN SURINAME (SOUTH AMERICA) WITH COMMENTS ON THE TILAPIA-KWIKWI (*Hoplosternum littorale*) (TELEOSTEI, SILURIFORMES, CALLICHTHYIDAE) INTERACTION

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ABSTRACT— The geographical distribution of the African Tilapia *Oreochromis mossambicus* in Suriname is restricted to a narrow strip of land along the Atlantic coast. Within the coastal plain, *O. mossambicus* occurs in brackish lagoons, oligohaline canals, and shell-sand pit lakes. Physico-chemical characteristics and phytoplankton composition of representative Tilapia water bodies are described. Blue-green algae and fine flocculent detritus are dominant food items in the diet of the Tilapia, while Rotifera and microcrustacea are also important in the diet of larvae and juveniles. Intraspecific diet overlap among ontogenetic stages of the Tilapia did not differ significantly from 1, which means that these diets showed complete overlap. Interspecific diet overlap between the Tilapia and the indigenous armoured catfish *Hoplosternum littorale* were moderate or low. The results are discussed in relation to recent developments in the Surinamese fisheries and aquaculture sector.

Key words: *Oreochromis mossambicus*, *Hoplosternum littorale*, distribution, diet overlap, competition, Suriname.

Distribuição e Dieta da Tilápia Africana *Oreochromis mossambicus* (Teleostei, Perciformes, Cichlidae) no Suriname (América do Sul) e Aspectos Sobre a Interação entre a Tilápia e o "Kwikwi" (*Hoplosternum littorale*) (Teleostei, Siluriformes, Callichthyidae) (Peixe-Gato Indígena).

RESUMO — A distribuição geográfica da tilápia africana *Oreochromis mossambicus* no Suriname está limitada a uma pequena faixa de terra ao longo da costa Atlântica. Dentro desta área, *O. mossambicus* ocorre em lagoas de baixa profundidade, canais oligohalinos e em lagos arenosos. As características físico-químicas e a composição em fitoplâncton do meio aquático onde a tilápia ocorre são descritos. As algas azul-verde e detritos finos e floculentos são os alimentos dominantes na dieta da tilápia, enquanto que os rotíferos e os microcrustáceos são também importantes na dieta de larvas e juvenis. A sobreposição intraespecífica da dieta dentro dos estados ontogenéticos da tilápia não difere significativamente de 1, o que significa que essas dietas mostraram uma sobreposição completa. A sobreposição interespecífica da dieta entre a tilápia e o peixe-gato indígena *Hoplosternum littorale* foi moderada ou baixa. Os resultados são discutidos em relação aos recentes desenvolvimentos nos setores da pesca e aquicultura do Suriname.

Palavras-chave: *Oreochromis mossambicus*, *Hoplosternum littorale*, distribuição, sobreposição de dietas, competição, Suriname.

INTRODUCTION

In 1955 the Fisheries Department of the Ministry of Agriculture introduced the African Tilapia *Oreochromis mossambicus*

(Peters, 1852) in Suriname for aquaculture and for stocking natural water bodies (LIJDING, 1958). The culture of *O. mossambicus* has never been a commercial success in Suriname, but populations

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stocked in brackish coastal plain waters expanded rapidly. However, until recently the Tilapia was not fully accepted by the Surinamese people as a food fish and major fisheries on this species only developed in the 1980's, e.g., the fisheries of the Bigi Pan lagoon (RESIDA, 1985). Three recent developments in the freshwater fisheries and aquaculture sector prompted the present investigations into the ecology and distribution of established populations of *O. mossambicus* in Suriname: 1) the collapse of the Tilapia fisheries at Bigi Pan, possibly related with a change in water quality from brackish to fresh, 2) the growing interest in the culture of the Red Tilapia (a hybrid of *O. mossambicus* x *O. hornorun*), and 3) the decline in the supply of the popular armoured catfish *Hoplosternum littorale* (Hancock, 1828) (OUBOTER & MOL, 1994) and the suspected negative impact of the Tilapia on this catfish.

The Bigi Pan fisheries are described by RESIDA (1985). In the main fishing season during the dry months of September to December approximately 100 fishermen may be active in the Bigi Pan area. Tilapia is one of the major species in the catch and the harvest of this species may amount to 60.000 Kg month⁻¹. In the 1990's fishermen increasingly began to disappear from the Bigi Pan area (pers. observations). Fishermen camps were deserted and the access canal to the lagoon silted up due to neglected maintenance. VAN DER LUGT (in prep) shows that the water of the Bigi Pan slowly changed from brackish to fresh over the last decade. This change in water quality may have had a negative impact on the Tilapia stocks. In

order to evaluate the effect of decreasing salinity on the Tilapia more data on the water quality of Tilapia water bodies in Suriname are needed.

Since the pioneering aquaculture trials with *O. mossambicus* in brackish water ponds at the Matapica plantation in 1956 and 1957 (LIJDING, 1958), interest in Tilapia culture rapidly declined. The main reason may have been the cold reception of the Tilapia by the Surinamese people who preferred local food fishes. The recent interest for the culture of Red Tilapia is probably incited by the potential of export of this fish and the deteriorating economy of the country. Information on the ecology of established *O. mossambicus* populations in Suriname may be useful to local entrepreneurs working with the Red Tilapia, a hybrid of *O. mossambicus* and the closely related *O. hornorun*.

After supplies of the very popular armoured catfish *H. littorale* (sur. soké kwikwi) dropped in 20 years to approximately one quarter of the pre-1970 period (OUBOTER & MOL, 1994), the introduced Tilapia was thought to have a negative impact on the Kwikwi stocks. Suspicion of a predatory behaviour of Tilapia towards young Kwikwi was probably based on the misinterpretation of the mouth-breeding habit of the Tilapia. However, both *H. littorale* (MOL, 1994) and *O. mossambicus* are limited in their distribution in Suriname to the young coastal plain and consequently asymmetric competitive interactions between the two species may have a negative impact on the *H. littorale* stocks. The ecology of *H. littorale* was studied by MOL (1993, 1994, in press a, in press b),

but data on *O. mossambicus* in Suriname are not available.

This paper describes the distribution of the Tilapia *O. mossambicus* in Suriname, the characteristics of its habitat, and the composition of its diet. The objective is to shed some light on the three Tilapia-related issues in the Surinamese fisheries and aquaculture sector outlined above.

MATERIALS & METHODS

Study area

Suriname is situated in the Neotropics between 2° and 6° North Latitude. The country can be divided into three zones (Fig. 1): in the north the flat coastal plain, to the south of it the savanna belt, and the hilly interior on the Precambrium Guiana Shield. The coastal plain is covered with swamps, swamp forests and mangrove forests. The tidal influence is strong. The savanna belt is characterized by savannas and savanna forests on often very poor podzolic soils. The creeks draining this area are stained black by dissolved humic substances. They may be classified as black waters (terminology of SIOLI, 1950). The interior covers three quarters of the country and is almost completely covered with tropical rainforest. Creeks and rivers draining the Guiana Shield principally carry clear water (HARIPERSAD-MAKHANLAL & OUBOTER, 1993).

Distribution

The distribution of *O. mossambicus* in Suriname was studied based on specimens present at the National Zoological Collection of the University of Suriname (NZCS), our own collection data, and in-

formation of the Fisheries Department of the Ministry of Agriculture.

Water quality

We tentatively classified the water bodies where Tilapia were found into three groups: 1) brackish lagoons, 2) brackish or oligohaline canals, and 3) shell-sand pit lakes. Water samples were taken from representative water bodies and physico-chemical parameters were measured in the laboratory following standard methods (APHA-AWWA, 1976). We only used data from the literature to supplement our analyses when the authors clearly stated that sampling and analysis followed APHA-AWWA directives.

Taking into account the importance of filamentous blue-green algae in the diet of Tilapias of the genus *Oreochromis* (MORIARTY, 1973; MORIARTY & MORIARTY, 1973; LOWE-McCONNELL, 1982; PHILIPPART & RUWET, 1982) we also collected samples of phytoplankton. Phytoplankton was studied with a Reichert Me FII inverted microscope and identified with keys in DESIKACHARY (1959), GRÖNBLAD (1945), HUBER-PESTALOZZI (1938-1963), PRESCOTT (1962), and WARD & WHIPPLE (1959).

Diet analysis

We collected "larvae" (actually young juveniles according to the terminology of BALON, 1985), juveniles and adults of *O. mossambicus* in an oligohaline canal (Boomskreek) and a shell-sand pit (Bakboord) near Paramaribo (Fig. 1). Lar-

