

STUDIES ON NUTRITION AND DEVELOPMENT OF  
DIGESTIVE FUNCTION IN TROPICAL SPORT FISH  
*TOR TAMBROIDES* (BLEEKER) FRY

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DOCTOR OF PHILOSOPHY  
UNIVERSITI PUTRA MALAYSIA

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*"FINDINGS OF MY RESEARCH COULD BE FOR THE BEST OF WISHES  
HOPE PEOPLE WILL GET THE QUALITY OF FISHES  
I DONT KNOW THE EXACT TIME OR PLACE  
BUT I PRAY IT'S GOOD FOR MY MARRIAGE"*

By

**AHMED JALAL KHAN CHOWDHURY**

*THIS THESIS DEDICATED TO MY*

*PARENTS*

*WIFE LUNA AND SON GHALEB*

**Thesis Submitted in Fulfilment of the Requirements for the Degree of  
Doctor of Philosophy in the Faculty of Science and Technology  
Universiti Putra Malaysia**

**May 2000**

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*"FINDINGS OF MY RESEARCH CONVE Y FOR THE BEST OF WISHES  
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I DON'T KNOW THE EXACT TIME OR PLACE  
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**Author**

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Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the Degree of Doctor of Philosophy.

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**Chairman : Prof. Dr. Hj. Mohd. Azmi Bin Ambak**

**Faculty: Faculty of Science and Technology**

Malaysian mahseer *Tor tambroides* locally known as "Kelah" is a well known sport fish in Malaysia and recent catch statistics indicated that this highly valued species have declined and can be considered as endangered. In order to facilitate restocking programme, a study on nutrition was conducted at UPM, Terengganu.

Eight experiments were carried out to determine the feeding frequency, stocking density, optimal protein level and additives, digestibility, development of enzymes, carotenoids and replacement of live foods of *T. tambroides* fry (mean SL 6.0 mm-10.0 mm and weighing 0.06-0.08 g).

*T. tambroides* fish fed three times per day showed a significant increase in weight. Fish stocked at 4.0 g/100 l water (~ 50 ind./100 l) showed significantly higher absolute growth (ABG) and specific growth rate (SGR), survival, food conversion ratio (FCR) and protein efficiency ratio (PER) compared to other treatments. Six isocaloric formulated diets with protein levels ranging from 30% to 55% with increments of 5% were fed to fish. The values of ABG, SGR, survival, FCR and PER indicated that 45% protein diet produced maximum growth.

The apparent digestibility coefficients of three potential feed ingredients has been determined subsequent to their processing into pelleted feed for fish using a reference diet and test composed of 70% reference diet and 30% test ingredients. The study showed that fish meal and soybean meal were the most digestible components with references to nutritive contents. *Spirulina*, enzyme and vitamin were incorporated at the rate of 0.05%, 0.10% and 0.20% in 45% protein diets respectively.

The incorporation of 0.10% *Spirulina* in the diet showed significantly higher ( $P < 0.05$ ) values of ABG, SGR, FCR, PER and protein gain. The development of proteolytic enzymes showed that enzyme and *Spirulina* exhibited significantly higher values than those of vitamin and the control diet. The amount of **P**-carotene was significantly higher in fish fed on diet containing 0.10% *Spirulina*.

In the replacement of live feed, this study showed that the treatment with *Moina* and artificial diet incorporated with *Spirulina* for 14 days resulted in significantly higher ABG and SGR ( $P < 0.05$ ).

Thus, the study indicated that *T. tambroides* could be grown in hatcheries and subsequently released to enhance the wild stocks in lakes and rivers. In addition, these results together with other recent trends of using additives suggest a new approach in the use of *Spirulina* and enzymes in fish feed