SUMMARY

The present study was conducted to determine the efficacy of selected steroid hormones, viz., 17α-methyltestosterone (MT), diethylstilbestrol (DES), 17β-estradiol (ES) and thyroid hormone (T3), and to find out their optimum dosages, which elicit maximum anabolic effect in the fry of the mullet Liza parsia. As a part of the study, the interaction of selected dosages of T3 + MT was also examined to find out if growth promotion could be achieved through a combination of hormones. Through another experiment the protein-sparing effect of MT was also studied with a view to improving the dietary protein utilization and reduce the protein levels in the diet without affecting the performance of the fish. Besides this, estrone and MT were administered intramuscularly to adult immature mullets to see the changes in the ovary, if any, associated with these exogenous hormones.

The duration of the feeding experiments ranged between 45 and 60 days and injection experiments 30 days depending upon the objectives of the study. All the feeding experiments were conducted in the laboratory selecting a randomized block design with three replicates for each treatment. Isocaloric and isonitrogenous compounded diets were used for most of the experiments except for the protein
- sparing experiment. Compounded diets were prepared from locally available feed ingredients like, fish meal, groundnut oil-cake (lipid-free), tapioca, rice bran, corn oil and cod liver oil. Vitamin and mineral premixes were added in appropriate quantities as recommended by John Halver for fish. Graded levels of hormones were used for determining the optimum hormone requirement in the diet. Fish were fed on a restricted ration of 7% of the body weight twice a day.

Environmental parameters (salinity, ammonia, pH, and dissolved oxygen contents of water) were monitored regularly, and most of them were found to be within normal range.

Sampling of the animals for obtaining growth data were carried out at regular intervals and based on this, feeding rates were adjusted.

Response parameters considered included specific growth rate, condition factor, survival rate, food conversion ratio, digestibility coefficient, gross food conversion efficiency, protein efficiency ratio and proximate composition of the fish.

Standard procedures were followed for biochemical
analysis. Data were processed with suitable statistical procedures.

To find out the optimum levels of MT two experiments were conducted. The first experiment was conducted for 60 days with dietary MT doses ranging from 0 to 60 mg with an interval of 10 mg. Based on the findings of this experiment, another experiment, using 0 mg, 2 mg, 4 mg, 6 mg, 8 mg, 10 mg and 15 mg doses, was conducted for 45 days to find out the optimum dietary levels of MT.

Heavy mortalities in the fish groups receiving diets with MT levels above 40 mg compelled the discontinuance of the treatments after 40 days and the remaining fish groups were reared up to 60 days. The response of the fish fry to the dietary doses of MT was found to be dose-dependent. MT doses exceeding 10 mg/kg diet induced poor growth in *Liza parsia*. Moderate gains in weight over control was found from 2 to 8 mg MT and, therefore, doses from 2 to 8 mg seems to be anabolic, whereas MT doses above 10 mg results in a negative growth. Diets containing MT levels exceeding 30 mg has deleterious effect on the fish and induce heavy mortalities. The survival, growth, digestibility, conversion efficiency, protein efficiency ratio, food conversion rate and body
composition indicate that 2 mg is the optimum dietary level of MT for the fry of the mullet _Liza parsia_. There is also no advantage by using more than 2 mg MT in the diet. MT doses exceeding 10 mg/kg diet has a growth depressing effect on the fish fry.

Since diethylstilbestrol (DES) gave contradictory results in teleosts, one experiment was performed for sixty days to find out the efficacy of this steroid. In this experiment dietary levels of DES ranged between 0 to 1.8 mg, with an interval of 0.3.

The response achieved by the fish suggest that DES is not a anabolic steroid for the fish fry, within the dosages tested during this experiment. Only marginal weight gain was observed in the fish groups receiving 0.3 mg/kg DES; above this level weight gain was found to decrease steadily as dosages increased, indicating the growth depressing effect of DES. Further DES is known to be a carcinogenic steroid and hence not recommended in the diet of _L.parsia_.

To determine the anabolic effect of 17β - estradiol one experiment was conducted for sixty days using graded levels of this hormone, viz., 0 mg, 1 mg, 2 mg, 4 mg, 6 mg, 8 mg and
The results revealed that relatively low dosages up to 4 mg/kg, promote growth and improve the feed and protein conversion efficiency in *L. parsia*.

One set of experiments was conducted to test the efficacy of thyroid hormone (T3) and also to study the synergetic effect of MT and T3, if any. In this experiment, selected levels of individual hormones T3 (0 mg, 3 mg, 6 mg and 9 mg/kg) and MT (0 mg, 2 mg and 4 mg/kg) and their mixtures (3 mg T3 + 2 mg MT, 6 mg T3 + 2 mg MT, 9 mg T3 + 2 mg MT, 3 mg T3 + 4 mg MT, 6 mg T3 + 4 mg MT and 9 mg T3 + 4 mg MT per kg diet) were fed to *Liza parsia* fry for 45 days. A hormone-free control diet was also kept.

Among the individual hormone dosages 2 mg MT showed the best anabolic effect, and of the T3 dosages, 3 mg/kg showed moderate response. Based on the survival and growth indices, the dose of 9 mg T3 + 2 mg MT proved to be the most effective in promoting growth during the first 30 days of rearing. However, at the termination of the experiment, after 45 days, the concentration of 2 mg MT/kg gave superior growth than all other treatments. Therefore, for the short rearing periods the combination of 9 mg T3 + 2 mg MT is more effective, while for the longer duration 2 mg MT is the best
anabolic agent for *Liza parsia*.

After noting the efficacy of MT at the dosage of 2 mg/kg diet, one experiment was performed for sixty days, to observe the protein sparing action of this hormone for the gold-spot mullet fry, if any. Compounded diets, with protein levels of 35%, 30% and 25%, and for each protein level three different MT dosages (1 mg, 2 mg and 3 mg), were prepared and fed to the fish.

Results obtained for growth, food conversion, digestibility, protein utilization and body contents showed that the diets containing 30% protein with 1 mg, 2 mg and 3 mg levels of MT, are better than the 35% and 25% diets. However, the dose of 30% protein + 2 mg MT/kg gave the best results, thus showing that dietary protein could be better utilized and that significant savings can be made in the protein content of the diet by incorporating MT at optimum levels in *Liza parsia*.

Two experiments were conducted to study the changes in the ovary associated with the injections of MT and estrone. Adult immature fish were used to test the efficacy of these steroid hormones through injections. The experimental fish were fed on a isocaloric compounded diet containing 35%
protein during the experimental period.

A total of ten injections were given intramuscularly to each of the fish at the rate of 1 injection/3 days, and the doses were 0, 0.5, 1.0 and 1.5 mg MT/kg and 0, 1, 2 and 3 mg estrone/kg body weight.

Histological observations indicate that both the hormones have induced the ovary development. All the MT treated fish and the fish injected with 1 mg and 2 mg estrone were observed in central nucleolus stage of development. The 3 mg estrone treated ovary was in perinucleolus stage as compared to the oogonia stage of control ovary. The results suggest that estrone at a dosage of 3 mg/kg has significant positive influence on ovarian maturation in L. parsia.