



# The effect of dietary taurine on grey mullet larval performance at different stages of development

Sub task 13.1.1 Examine the effect of DHA/EPA/ArA ratio and Tau on larval and juvenile performance during rotifer and Artemia feeding.

Task 19.5 Testing the improved grey mullet larval rearing protocol in a commercial hatchery

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# Taurine



- Taurine is beta amino-sulfonic acid widely distributed in animal tissues
- 1-1.5% of copepod dry weight.
- **rotifers deficient in this nutrient.**
- Critical to brain, eyes, heart, bile salt synthesis and muscle tissue function
- All marine larvae are carnivorous and likely lack cysteine sulfinate decarboxylase (CSD)-key enzyme in taurine synthesis.
- Must be provided in the diet.



# Experimental design 1

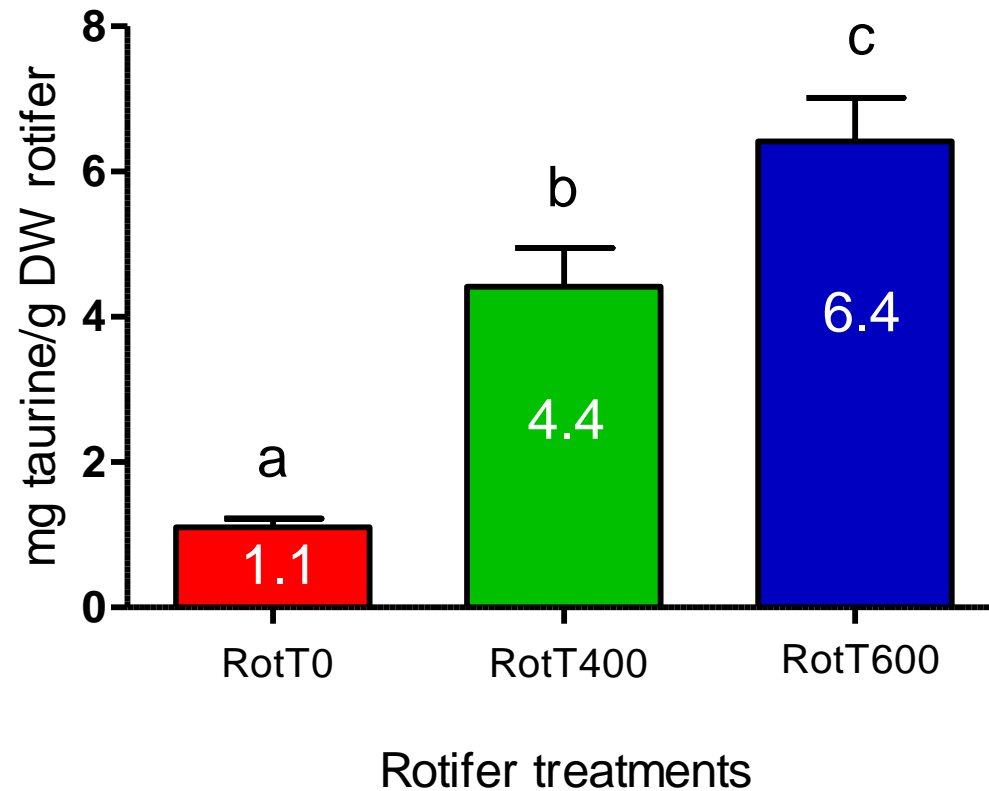
## A. Effect of Rotifer taurine (2-14 dph)

- Eighteen 400 l tanks stocked with mullet eggs (100 eggs/l) in flow-through system using sand filtered (10  $\mu\text{m}$ ), UV treated ambient sea water (40 ‰ )
- At 2 dph SW salinity is decreased 5 ‰/day to 25 ppt. and *Nannochloropsis* sp. added ( $0.5 \times 10^6$  cells/ml).
- All 3 rotifer treatments enriched with Red Pepper (Bernaqua, Belgium) together with one of three taurine levels (0, 400, 600 mg/l)
- Fed to 2-14 dph larvae allowing the testing of each taurine treatment in replicates of 6 tanks/treatment. 13-14 dph fed unenriched Artemia.





# Rotifer taurine content after enrichment in BFT experiment





# Experimental design 2

## B. Effect of Artemia taurine/ Rotifer and Artemia taurine (15-19 dph)

- Eighteen 400 l tanks were used to test 6 treatments in replicates of 3 tanks/treatment from 13-19 dph.

Treatment	Rotifers (mg taurine/l)	Artemia (mg taurine/l)
1 (T0-0)	0	0
2 (T0-400)	0	400
3 (T400-0)	400	0
4 (400-400)	400	400
5 (T600-0)	600	0
6 (T600-600)	600	600



\*not enough tanks to test T0-600  
\*RNA samples taken at 19 dph

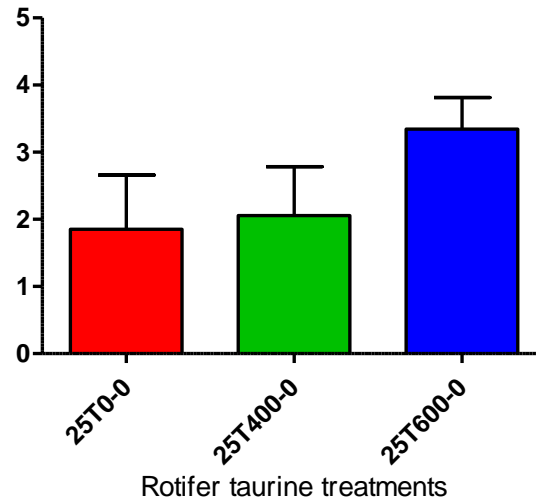
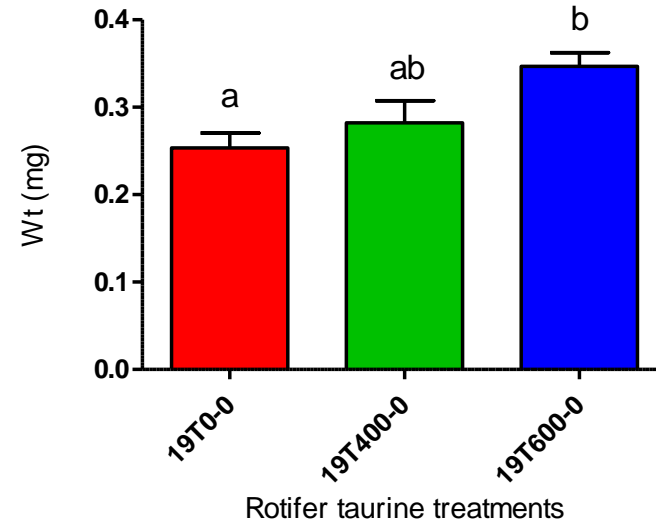
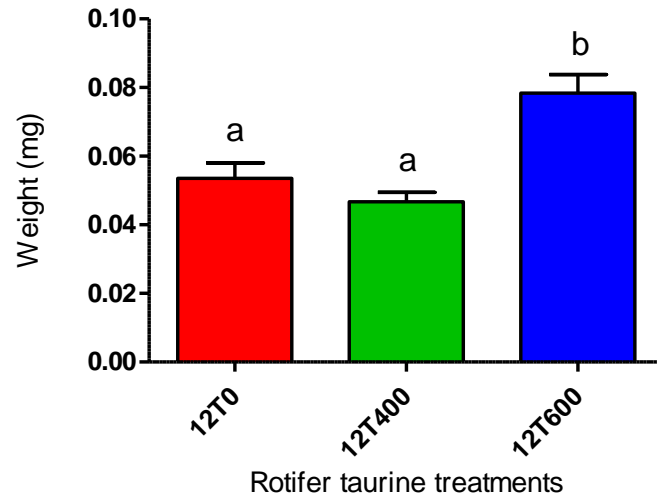


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Taurine supplementation during rotifer feeding  
(2-14 dph) on DW gain in fish larvae from 2-25  
dph



# The effect of rotifer taurine treatments (2-15 dph) on dry wt at (a) 12, (b) 19 and (c) 25 dph





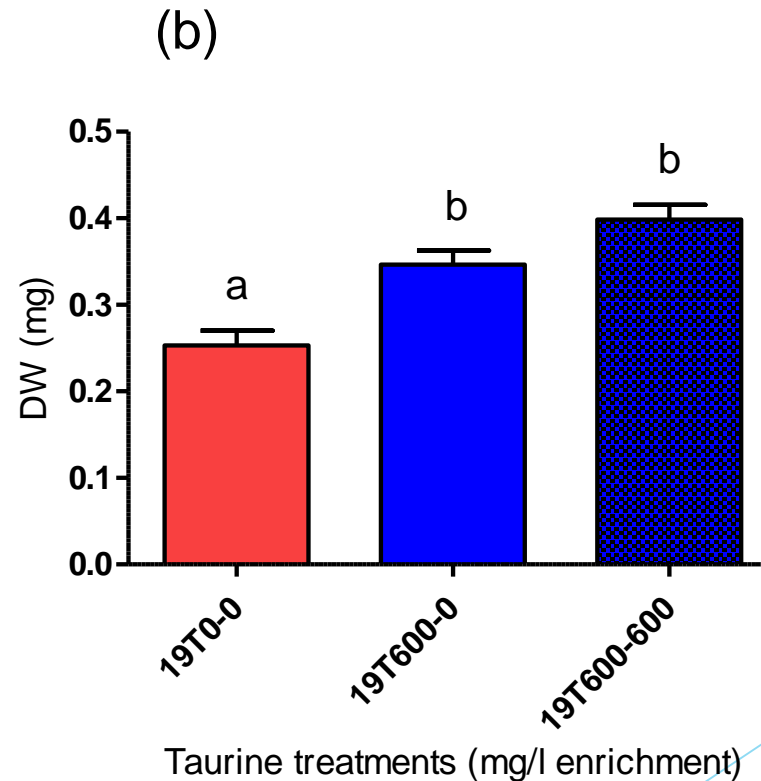
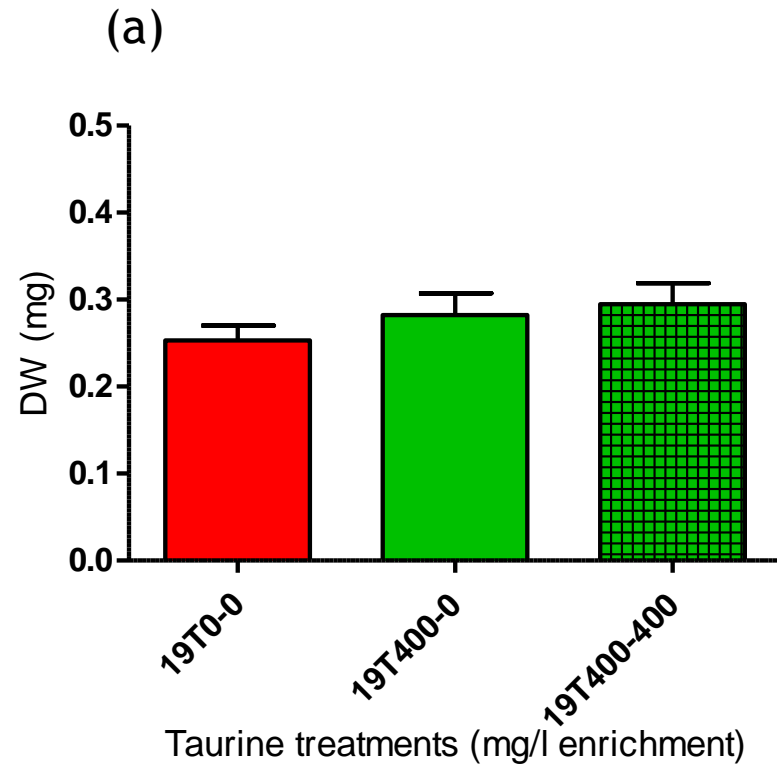
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Taurine supplementation during rotifer and Artemia feeding (12-19 dph) on DW gain in fish larvae from 2-25 dph



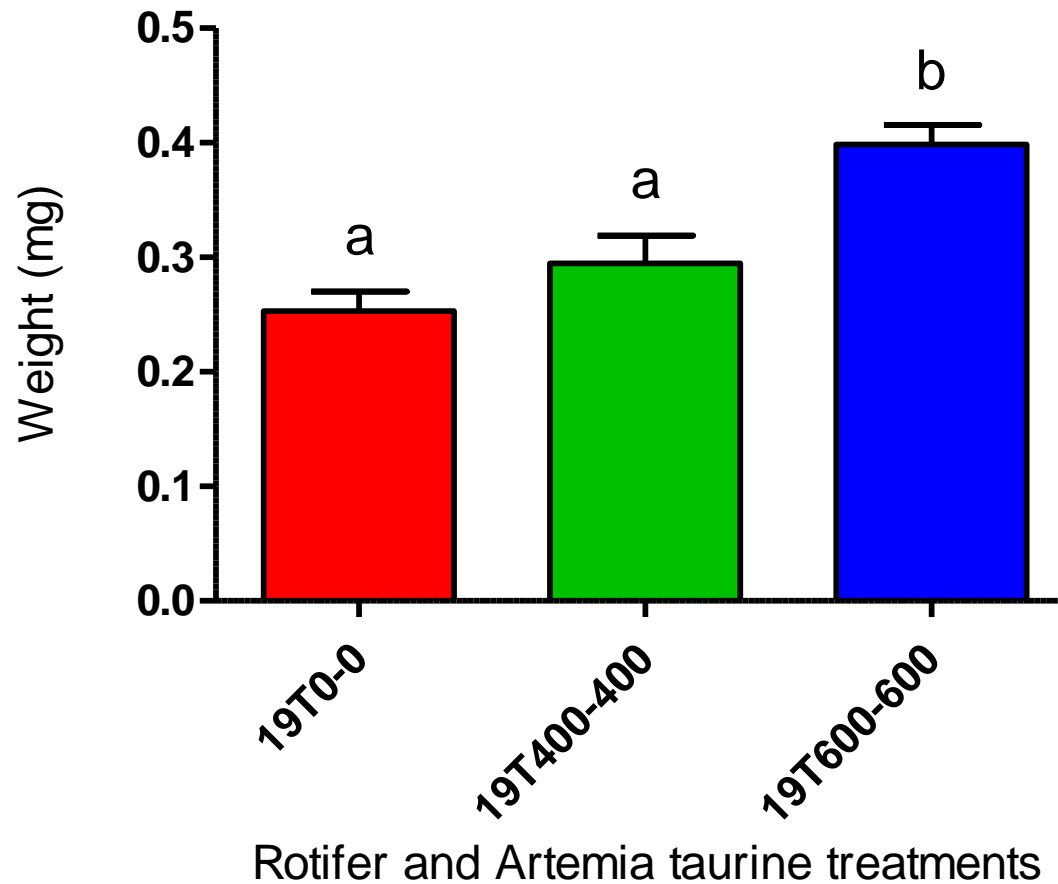


# The effect of (a) moderate (400 mg/l) and (b) high (600 mg/l) dietary taurine during rotifer feeding alone or in both rotifer and Artemia feeding on 19 dph mullet larvae



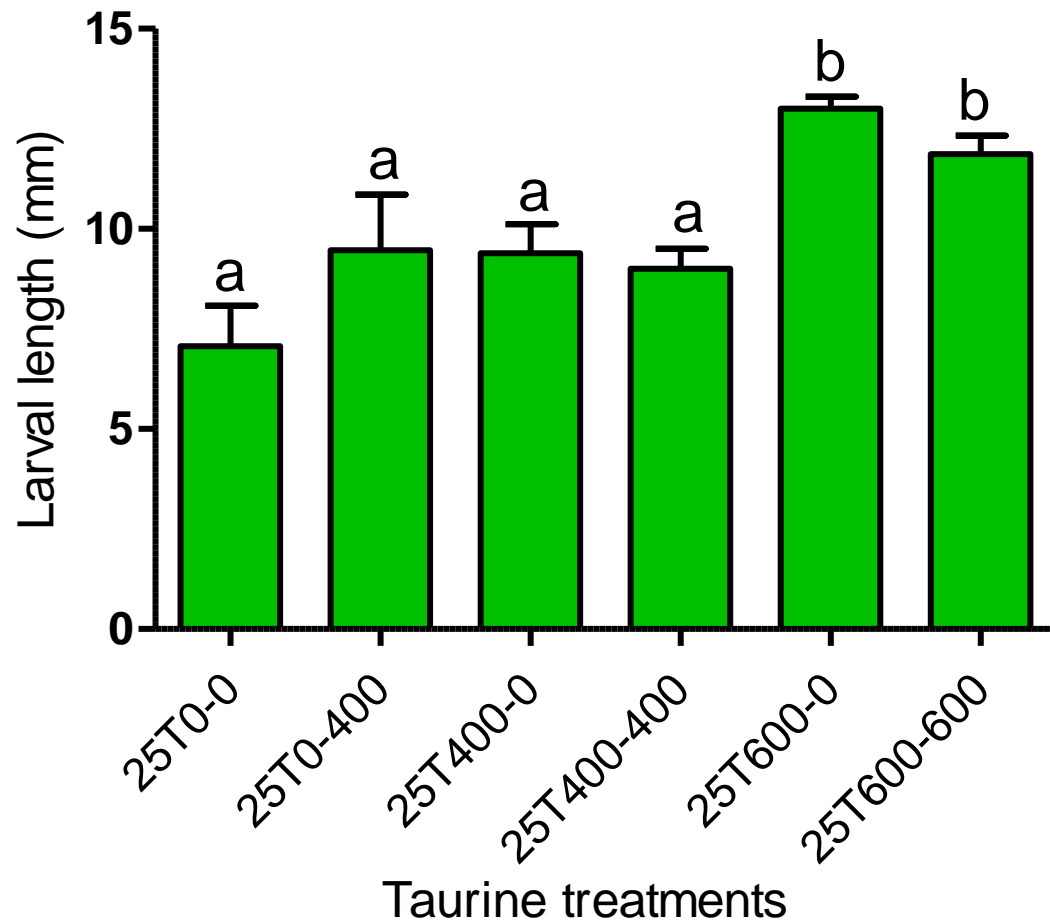


# The effect of rotifer and Artemia taurine treatments on dry weigh in 19 dph larvae



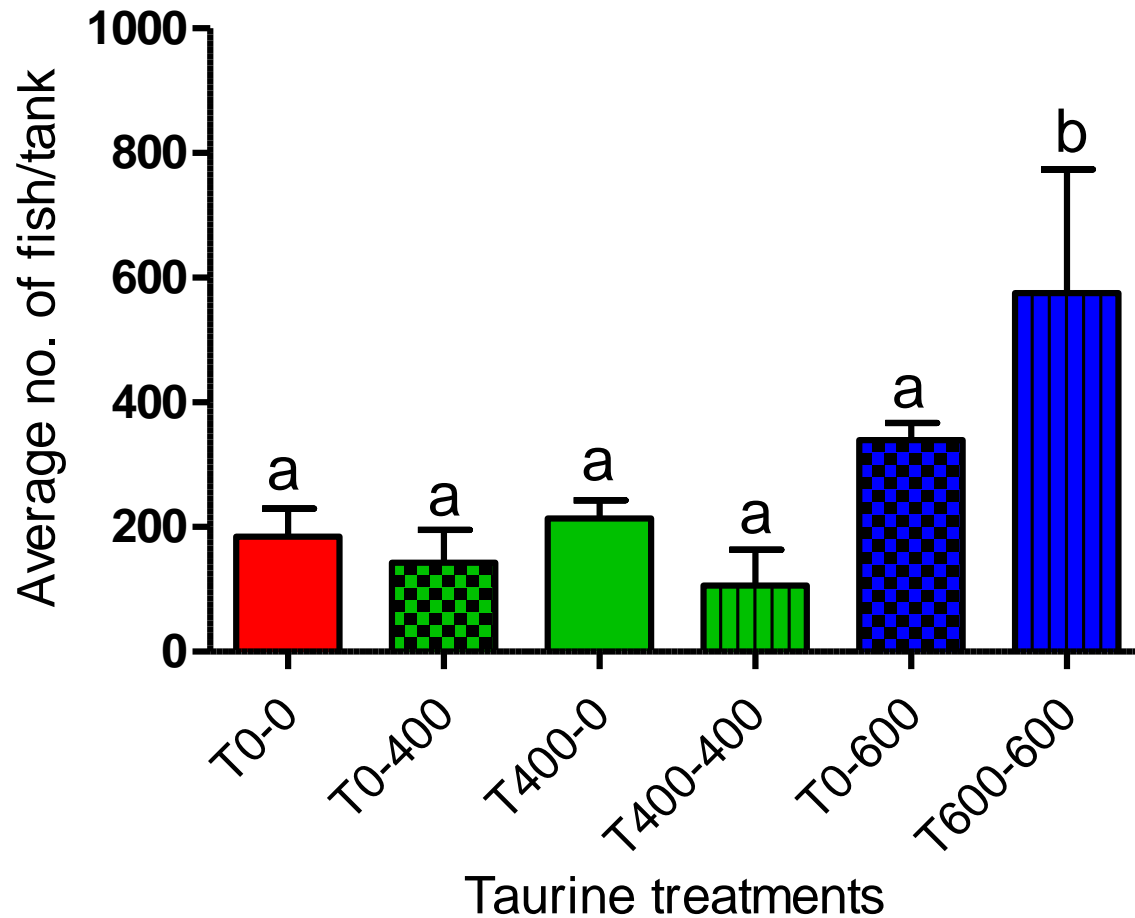


# Larval length as a function of taurine treatments at 25 dph





# Survival at 25 dph in larvae fed taurine (0, 400, 600 mg/l) in rotifers and/or Artemia





# All treatments fed identically

## 19-37 dph

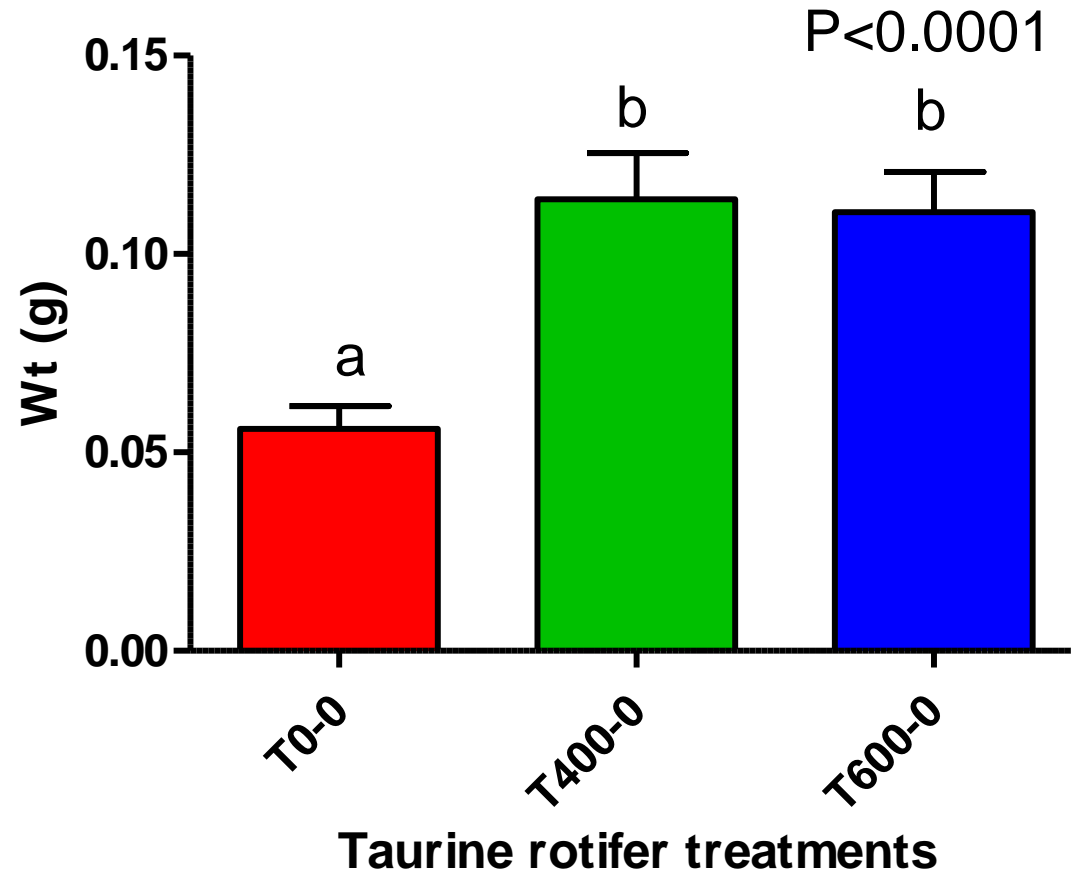
- Fed enriched Artemia (Red Pepper) and mixture of prepared diets in equal amounts:
  - powder ulva, Caviar (Bernaqua, Belgium), Orange (Skretting, Norway), local starter feed (Raanan feeds, Israel)

## 38-44 dph (growth, survival, distribution)

- Only a mixture of prepared diets with increasing amounts of starter feed:
  - powder ulva, Caviar (Bernaqua, Belgium), Orange (Skretting, Norway), local starter feed (Raanan feeds)

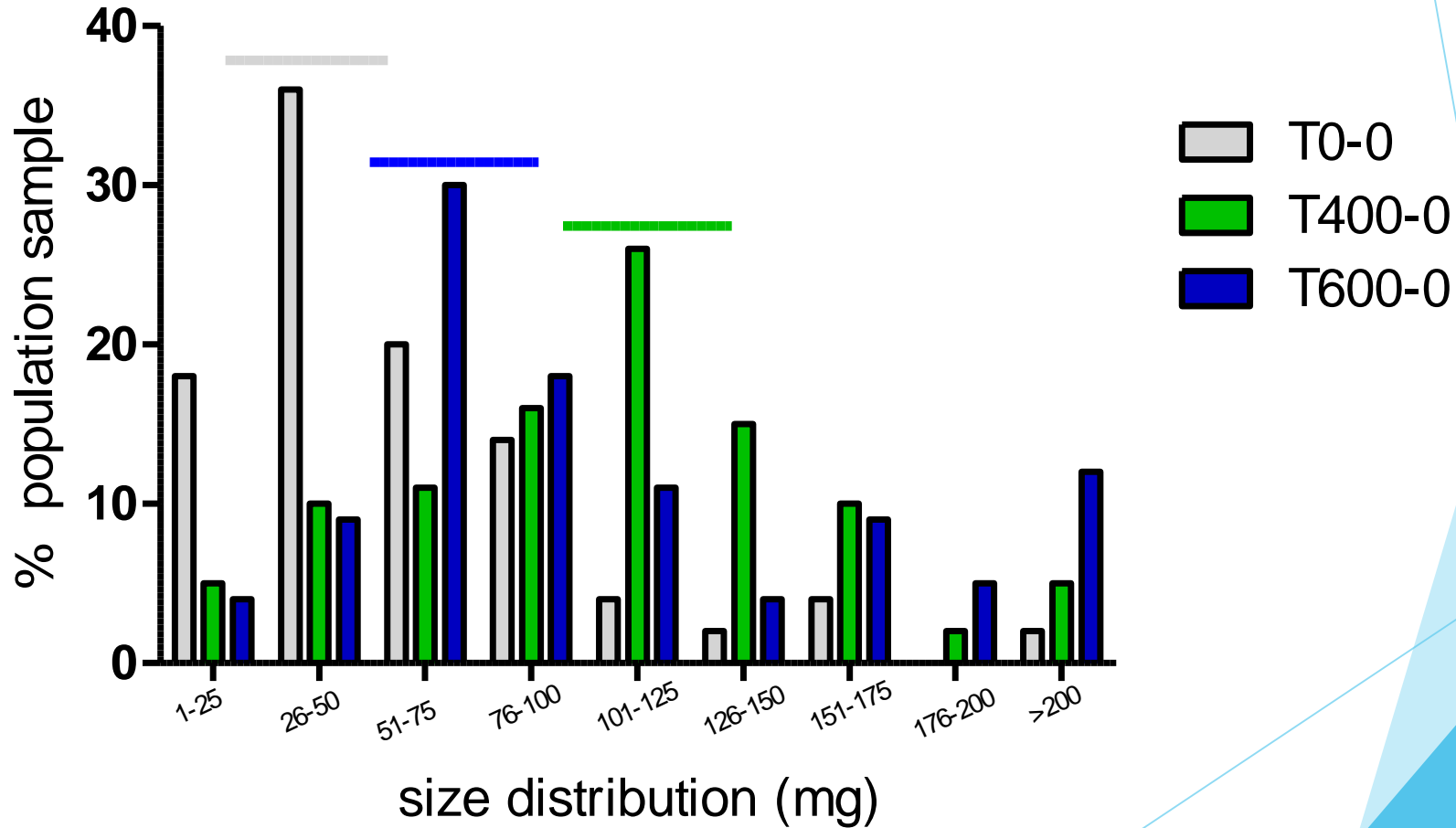


# The effect of rotifer taurine treatments (2-15 dph) during larval rearing on 44 dph juvenile wet weight





# The effect of rotifer taurine treatments (2-15 dph) during larval rearing on 44 dph juvenile wet wt distribution





# Experimental design 3



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## C. Nursery Experiment-on going

- To test if rotifer taurine treatments (T0-0, T400-0, T600-0) during larval rearing will continue to effect juvenile performance.
- Fish from the three treatments were stocked in nine 20 l containers (150 fish/container) floating in three 800 l tanks with one replicate from each treatment/tank. Average wet wt 50-100 mg/fish.
- All fish will be fed a gilthead sea bream 0.5 mm starter feed (Raanan feeds, Israel) until reaching 0.5-1.0 g wet wt.
- Weight gain, survival, fatty acids, proximate analyses





# Summary of results

- Significant ( $P < 0.05$ ) taurine dose dependent effect on DW during rotifer feeding (2-12 dph) through to the end of feeding non-aurine Artemia (19 dph).
- Significant ( $P < 0.05$ ) rotifer taurine dose dependent effect on length at 25 dph.
- Significant ( $P < 0.05$ ) rotifer taurine effect on wet wt was observed in 44 dph juveniles.
- Rotifer taurine fed to 2-15 dph larvae affected the size distribution in 44 dph juveniles.
- Diet supplementation during rotifer feeding influenced juvenile growth more than during Artemia feeding despite the much higher growth rate in the latter.
- Fish fed high taurine rotifers and Artemia (T600-600) were markedly ( $P < 0.05$ ) the largest fish produced from the study- **incorporated into protocol.**

Thanks for your attention

