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OPTIMIZATION OF GROWTH CONDITIONS OF *LITOPENAEUS VANNAMEI* IN CLOSED AQUACULTURE SYSTEM

Prepared by: Jonas Lelys
Group : JNBI19
Scientific guide: dr. Nerijus Nika

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Relevance of the work topic

The production of Pacific white shrimp (*Litopenaeus vannamei*) accounts for more than 70% of global shrimp production and is the most economically important crop of shrimps in the world.

Fig. 1 Personal photo.

Fig. 2 Personal photo.

The aim and tasks of the work

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Work objective:

To evaluate the peculiarities of growth, stress tolerance and mortality of whiteleg shrimps in a closed aquaculture system by optimizing the breeding technology for sorting shrimps.

Tasks:

1. To determine the growth characteristics of *L. vannamei* shrimps in the recirculating aquaculture system.
2. To evaluate the effect of shrimp sorting on growth efficiency and mortality.
3. To evaluate the mortality of *L. vannamei* shrimps under the stress of procedures.

Results of work

- At the start of the experiment, the average body weight of shrimps was R1D 0.59 ± 0.11 g, R2D 0.58 ± 0.12 g, RM 0.35 ± 0.07 g and Kk 0.46 ± 0.14 g.
- At the end of the experiment, the mean body weight of shrimps was R1D 23.29 ± 4.25 g, R2D 24.29 ± 3.82 g, RM 23.13 ± 5.14 g and Kk 24.87 ± 4.75 g

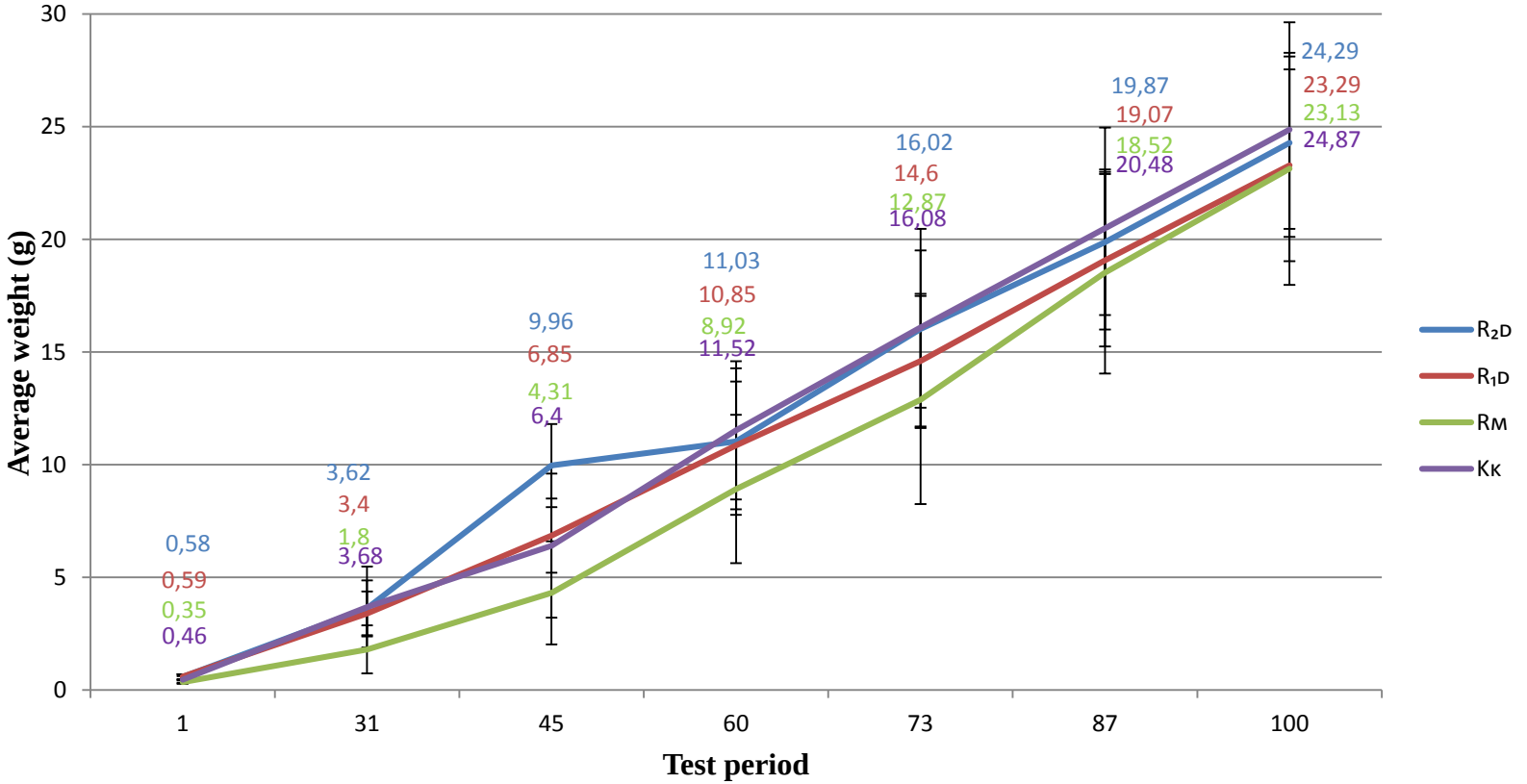

Fig. 3 Average weight change of shrimps over time.

Results of work

- The mean length of the shrimps at the beginning of the experiment was R1D 4.68 ± 0.30 cm, R2D 4.63 ± 0.25 cm, RM 4.13 ± 0.27 cm, and Kk 4.42 ± 0.35 cm.
- At the end of the experiment, the mean length was R1D 14.68 ± 0.90 cm, R2D 15.11 ± 0.74 cm, RM 14.67 ± 2.21 cm and Kk 15.07 ± 0.94 cm.

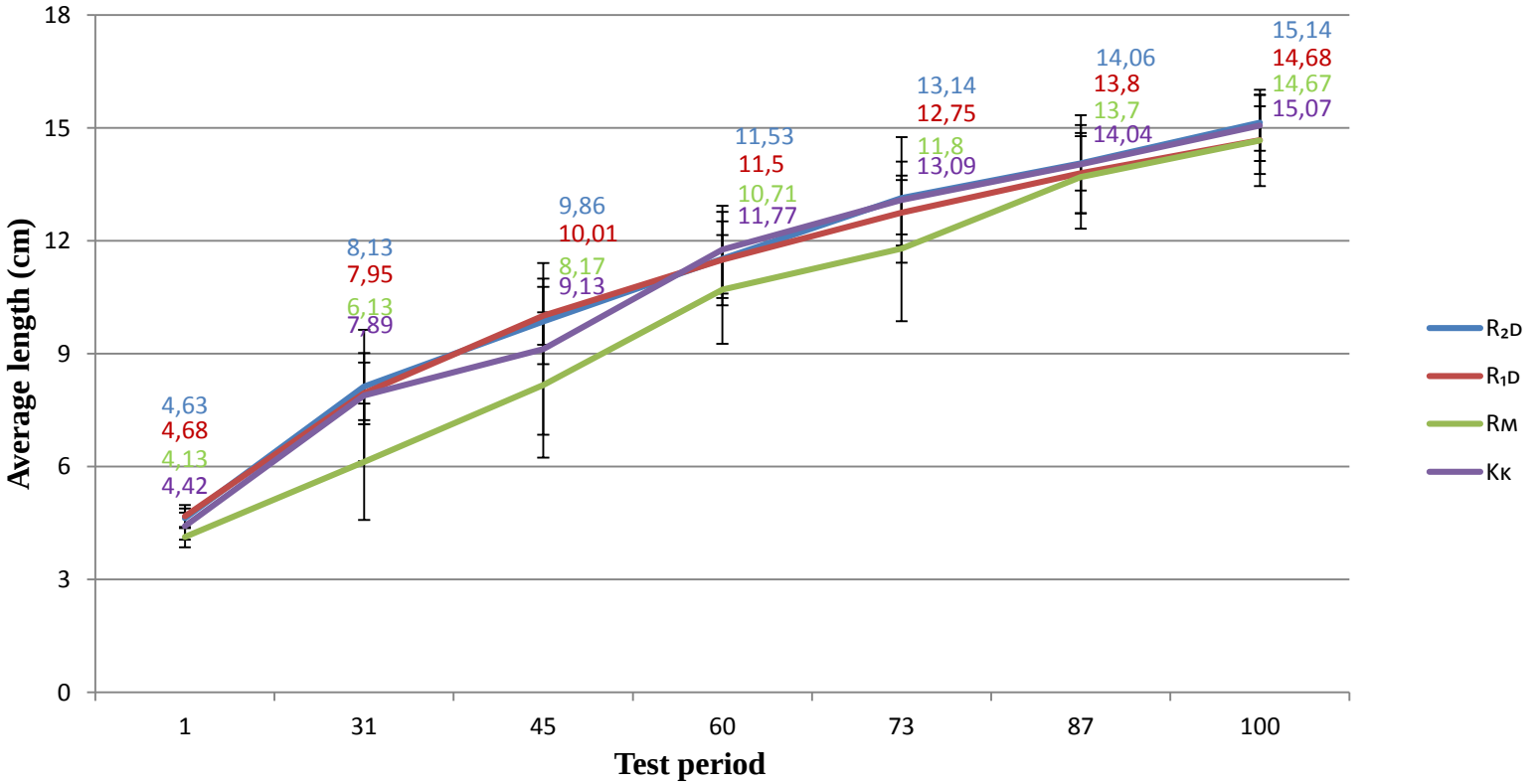

Fig. 4 Average length change of shrimps over time.

Results of work

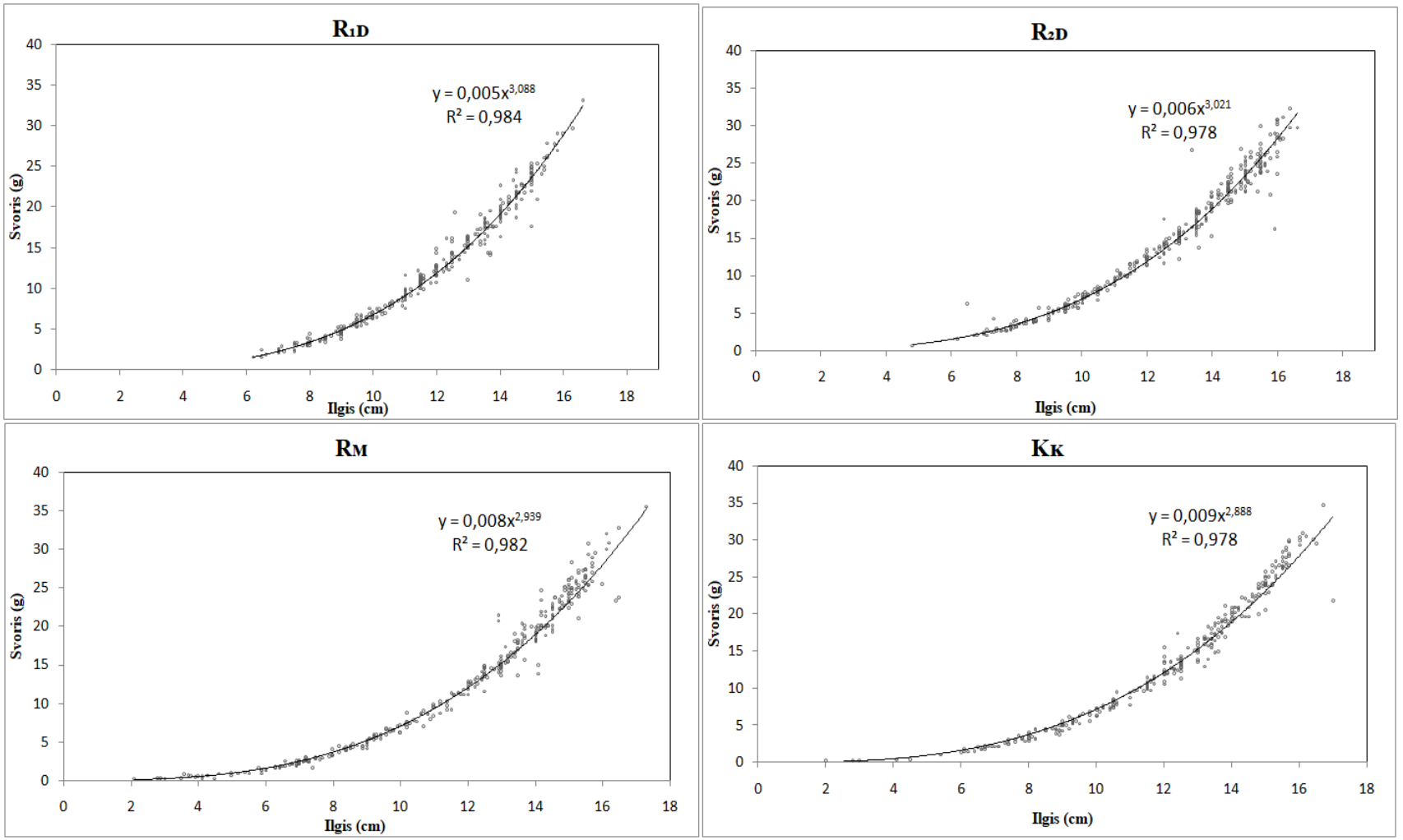

Fig. 5 Distribution of length to weight ratio of study groups.

Results of work

• Survival rates were assessed excluding shrimps that emerged from the pools. Survival rates were good in all groups except for the graded small RM group, which had a survival of only 41.7%.

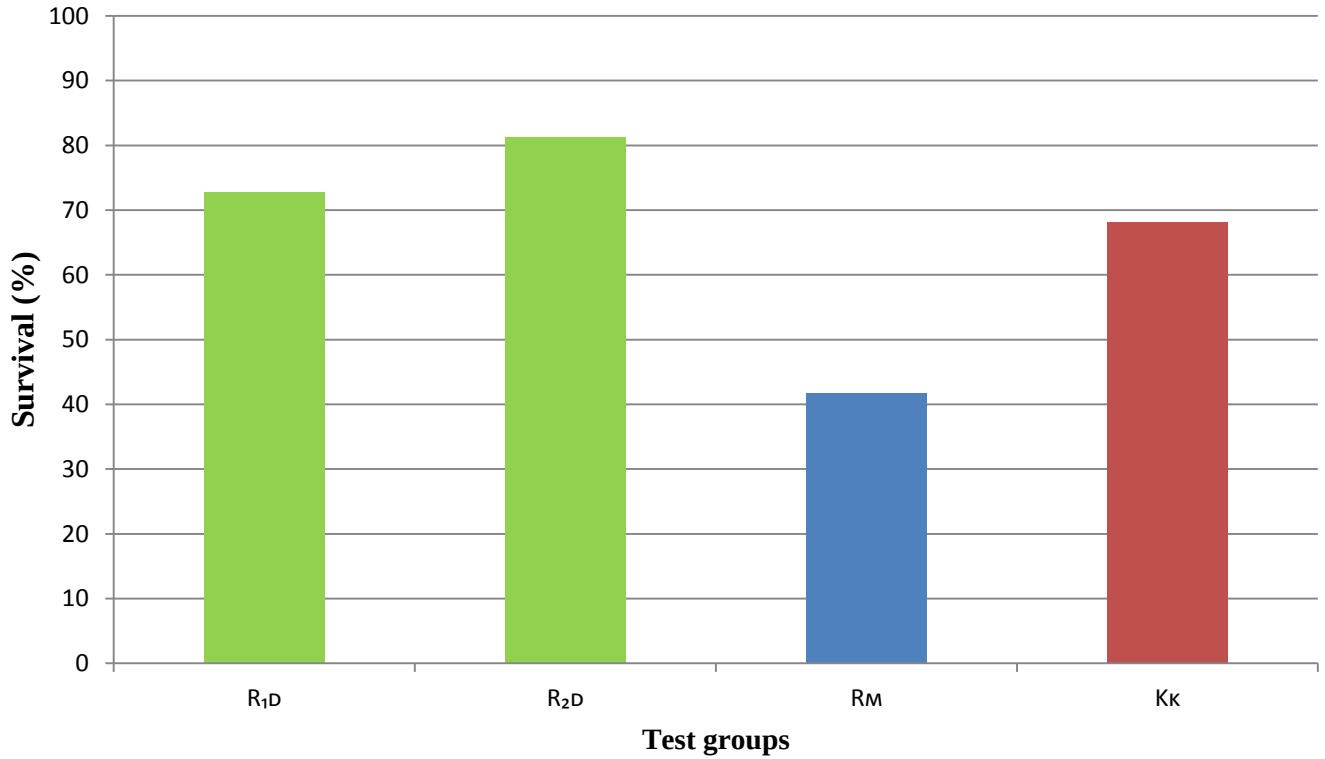

Fig. 6 Percentage survival of shrimp.

Results of work

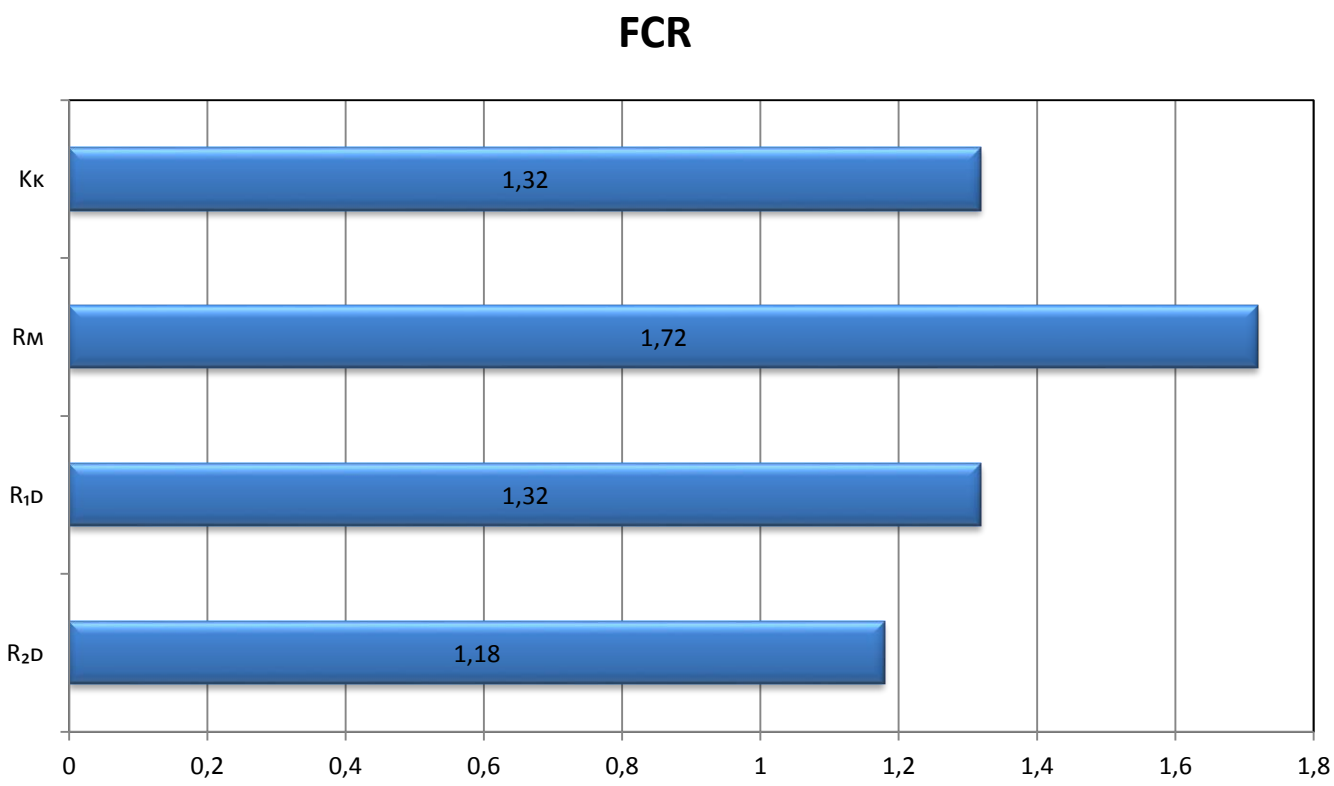

Fig. 7 Food conversion coefficient of the study groups.

Results of work

- Measurements show a significant amount of sudden-dying shrimp every two weeks during or shortly after the measurement procedures.

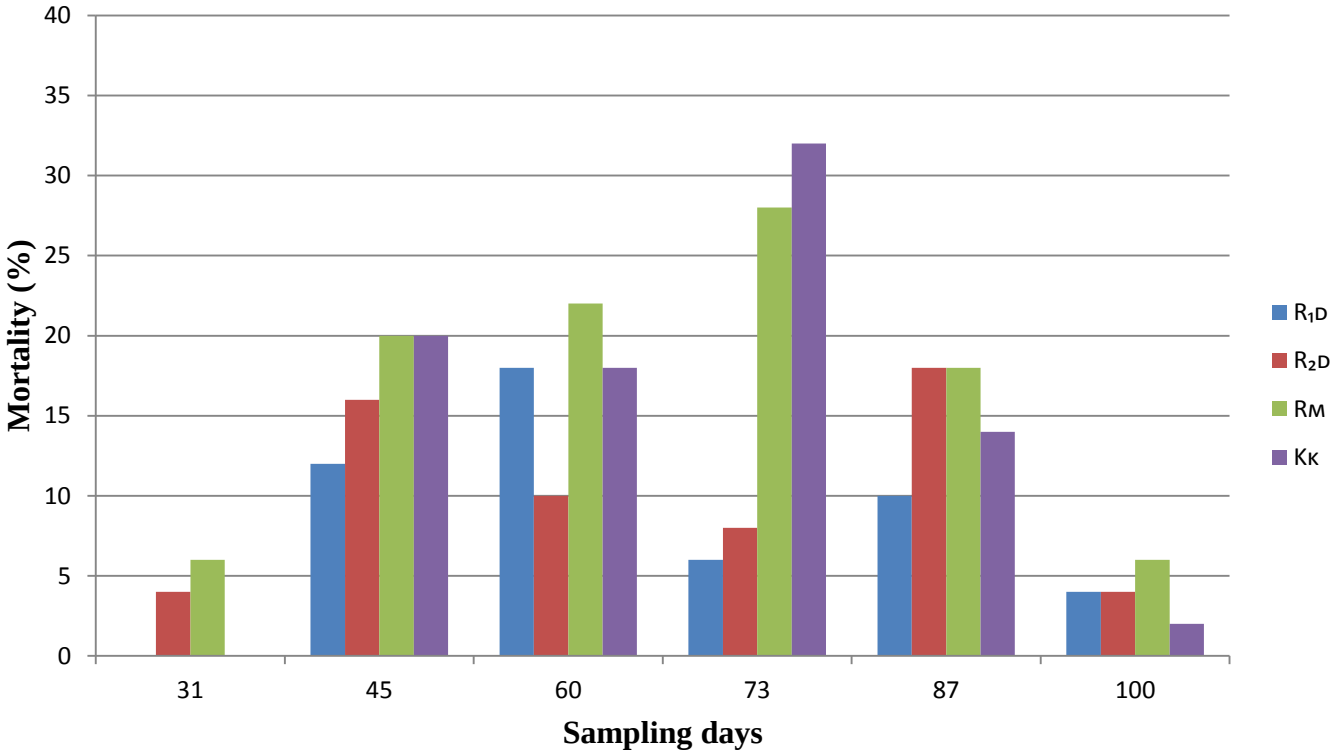

Fig. 8 Percentage of shrimps dead during measurement.

Results of work

Dead individuals did not differ significantly from group weight and length averages.

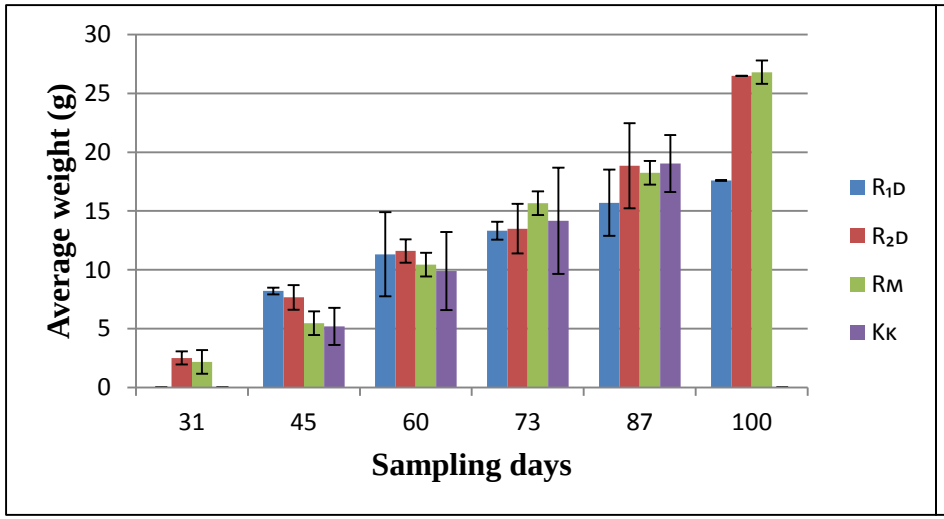

Fig. 9 Weight of shrimps dead at the time of measurement.

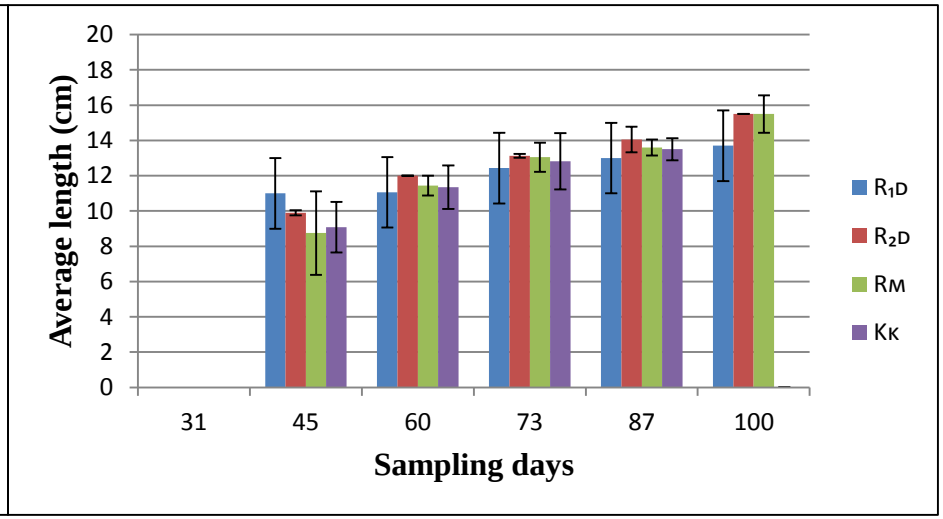

Fig. 10 Length of shrimps dead at the time of measurement.

Conclusions

1. In a closed aquaculture system, after the optimization of the technology, the weight gain of white shrimps per day was 0.29 ± 0.1 g. Within 129 days, the shrimp reached a weight of 24.00 ± 5.14 g and an absolute length of 15.00 ± 1.21 cm.
2. The sorting of shrimps did not have a clear positive effect on aquaculture production, the effect was complex. The growth rate, mean size at the end of the experiment ($p > 0.05$), mortality, and final biomass achieved in the control group were insignificantly lower than in the group of sorted large shrimps.
3. In the group of small sorted individuals, a high mortality rate of 59.3% was recorded. This led to a more intensive compensatory growth of the remaining shrimps and at the end of the experiment the mean weight and length of the shrimp were similar in all pools ($p > 0.05$). However, the total achieved biomass was 52.63% lower than in the control group, and the sorted large groups achieved 8.85 - 10.10% higher biomass than in the control group.

Conclusions

4. Unless the problem of high mortality in sorted small shrimps is resolved, the benefits of a complex juvenile sorting process in commercial-scale production remain questionable.
5. Significant mortality due to measurement procedures was found from 45 to 73 days of the experiment, with an average of 11.5 ± 5 and 13 ± 4.7 deaths in the sorted large shrimp groups, 22 ± 4.3 in the sorted small shrimp group and 21 ± 7,7 in the control unsorted shrimp group. Sensitivity to procedural stress was relatively insignificant up to 45 days of the experiment and after 73 days, when it averaged 4 ± 2 individuals. The highest mortality was on the 73rd day of the experiment in the control and sorted small shrimp groups of 30 ± 2.