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Aquaculture indicators of young *Cherax Quadricarinatus* under various feeding plans

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Abstract. Aquaculture of crustaceans is one of the main sources of valuable food protein, which cannot be replaced by other animal or vegetable proteins due to its properties. The use of nutritious and balanced feeds in feeding crayfish helps to increase productivity and at the same time obtain ecologically clean and safe products. The research aims to determine the effect of feeding the developed Decapoda fodder. It has been established that feeding Decapoda food contributes to a more intense increase in the size of crayfish. In particular, the increase in length was 1.1±0.1 cm for the period from 90 to 120 days of cultivation and 1.2±0.1 cm for the period from 120 to 150 days. When using Decapoda food, the increase in length of crayfish during the first month of rearing was 1.8 times greater than that of crayfish fed Ancistrus menu. In the growing period from 120 to 150 days, the increase in the length of crayfish in the experimental group was 2.0 times greater, compared with crayfish in the control group for the same period. When crayfish were fed with Decapoda, the intensity of body weight gain was, on average, 1.4 times stronger, compared to control group crabs. At the same time, the survival rate in this group was 74%, which is a 20% higher number of live specimens compared to the control group of crayfish. The results of the study can be used in the development of a technological scheme for the reproduction and cultivation of crayfish

Keywords: Ancistrus menu; aquaculture; Decapoda food; length gain; survival; weight

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INTRODUCTION

Aquaculture of crustaceans is one of the main sources of valuable food protein, which cannot be replaced by other animal or vegetable proteins due to its properties. Research on the use of fodder of various origins for economically profitable and intensive reproduction and cultivation of *Cherax quadricarinatus* is relevant.

Y. Cheng & S. Wu (2019), and D. Rigg *et al.* (2020), note that, following dietary norms, a person should consume from 60 to 120 g of complete protein daily. M. Kukhtyn *et al.* (2020), in their studies, note that crustacean aquaculture is a necessary source of valuable food protein, which cannot be replaced by other animal or vegetable proteins due to its properties. According to C. Jones and C. Valverde (2020), over the past twenty years, Australian red-clawed crayfish have been introduced to many countries and successful aquaculture sectors of this species have been created.

K. Crandall and S. Grave (2017) and Y. Sun *et al.* (2023) note that *Cherax quadricarinatus* is an optimal species for growing in aquaculture for several reasons. Scientists note its advantages, in particular, due to its relatively simple life cycle, unpretentiousness to the conditions of keeping, high resistance, and ability to consume a wide range of fodder. The results of a study (Shehata *et al.,* 2020), which examined the digestibility of different feeds in freshwater crayfish, show that Australian red claw crayfish digest plant ingredients more efficiently than animal ingredients.

Evaluating the influence of nutritional requirements, in particular protein, on spawning rate and quality of roe (Shehata *et al.,* 2022) found that the recommended content of crude protein in the feed ration for sexually mature females of *Cherax quadricarinatus* is at least 32%. It was also established (Shehata *et al.,* 2022) that the fatty acid composition of the hepatopancreas and muscles of *Cherax quadricarinatus* is significantly influenced by dietary supplements used for feeding, the content of vitamin E, Haematococcus pluvialis, and yeast extract. According to researchers (Díaz *et al.,* 2017), feed digestibility in *Cherax quadricarinatus* depends on many factors, including housing conditions, sex, body size, type of feed, season, and stage of development.

S. Shyamal *et al.* (2018) and Y. Sun *et al.* (2023) investigated the gender difference has a significant effect due to the difference in energy used for reproduction; females may invest 20-25% of their pre-breeding mass in gonads, while males invest only 3-9%. Several scientists (Nanda *et al.,* 2021; Vecchioni *et al.,* 2022), note that the composition of feeds used in the process of growing crustaceans includes such components as attractants, enzyme lysates (hydrolysates), growth stimulants, protectors from toxins, lipids, vitamins, amino acid preparations, minerals, pigments, antioxidants. In the feeding process, balanced feed mixtures are used (in terms of essential fatty acids, vitamins, and essential minerals).

P. Haubrock *et al.* (2021) and S. Hou *et al.* (2021) determined that with age, the need for red crab proteins decreases. Young need 31 to 34%, and individuals weighing more than 50 g need 25.6%. Lipids are also an important component of the diet that affects the growth, development, and health of crayfish. Unlike protein, the need for lipids does not change with age. Carbohydrates perform an energy function, participate in the formation of steroids and fatty acids, and also contribute to glycogen accumulation and chitin synthesis.

Y. Méndez-Martínez *et al.* (2021) prove that, as a delicacy, decapod crustaceans are traditionally valued on the domestic and world markets. N. Hrynevych *et al.* (2022) claim that intensive cultivation of Australian crayfish, Rosenberg's shrimp *Macrobrachium rosenbergii* in artificially created conditions is a promising direction of aquaculture development, which is at the stage of development in Ukraine.

Therefore, considering the value of the meat of Australian crayfish, a promising direction of aquaculture research is the development of feed mixtures, the consumption of which contributed to the maximum conversion of fodder. Furthermore, it increased the biological value of the obtained meat. The research aims to determine the effect of feeding the developed feed Decapodafood on crayfish in aquaculture.

MATERIALS AND METHODS

The research was carried out in the educational-scientific aquarium-basin complex of the Department of Ichthyology and Zoology of the Bila Tserkva National Agrarian University (Fig. 1). The object was the grown juveniles of the Australian red-clawed crayfish *Cherax quadricarinatus* (Von Martens, 1868) at the age of 90 days after hatching. The individuals were placed in three identical aquariums, technically equipped (aquarium pump Atman AT-203; filter element; thermoregulator Atman AT (300W); water thermometer Hailea HL-02F; shelter), with a volume of 200 dm^3. The experiment was conducted for 60 days at a planting density of 50 specimens/m^2. The water temperature was in the range of 27-28°C. The main hydrochemical indicators met the requirements for keeping and growing decapod crayfish (Decapoda) (Hrynevych *et al.,* 2022). Duration of the experiment – 60 days.

Figure 1. *Juveniles of the Australian red-clawed crayfish Cherax quadricarinatus in the aquarium of the Department of Ichthyology and Zoology*

For the experiment, 3 groups of crayfish were formed. Fifty individuals were planted in each experimental aquarium. Firstly, crayfish were fed the aquarium *Ancistrus menu* (control). The nutritional value per 100 g of feed is shown in Table 1, the composition of the second *Decapodafood* feed developed by authors is given in Table 2, the third contains *Ancistrus menu* feed and *Decapodafood* in a ratio of 50:50. The nutritional value per 100 g of *Ancistrus menu* fodder is presented in Table 1. The nutritional value per 100 g of *Decapodafood* is presented in Table 2.

Table 1. *Nutritional value per 100 g of Ancistrus menu fodder*

Indicator	Quantity, g
Raw protein	21.0
Raw fat	5.0
Cellulose	10.0
Ash (ash substances)	13.0
Calcium	3.0
Phosphorus	0.70

Source: *compiled by the authors*

Table 2. *Nutritional value per 100 g of Decapodafood*

Indicator	Quantity, g
White	37.0
Fats	23.5
Cellulose	10.0
Calcium	4.5
Phosphorus	0.8

Source: *compiled by the authors*

Crayfish were fed twice a day, at 08:00 and 20:00. Feed rationing was carried out depending on water temperature, average weight of individuals and total biomass in the tank. Before the experiment, each individual was weighed, and the total body length was measured. The obtained results were subjected to statistical processing using Statistica 10⩽ Edition programs. The difference was considered probable at $p \leqslant 0.05$.

The Ethical Committee approved the use of animals in this study of the Bila Tserkva National Agrarian University on the treatment of animals in research and the educational process (protocol No. 9 of October 1, 2020) following the Law of Ukraine "On the Protection of Animals from Cruelty" (2006) and Directive 2010/63/EC of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes (2010).

RESULTS AND DISCUSSION

The obtained data confirm the importance of different types of feed for the feeding of Australian red-clawed crayfish. Figures 2-4 show the main fish breeding indicators of young Australian red-clawed crayfish *Cherax quadricarinatus* under the condition of feeding different fodder during 60 days of rearing. It was established (Fig. 2) that when feeding crayfish with control aquarium

food (Ancistrus menu) from 90 to 120 days, the length of crayfish increased to 6.8±0.2 cm, i.e., by 0.6 cm on average. During the next 30 days during cultivation, the length of crayfish increased to 7.4±0.2 cm, however, in the total increase, the increase in length was, as in the previous month, 0.6±0.1 cm.

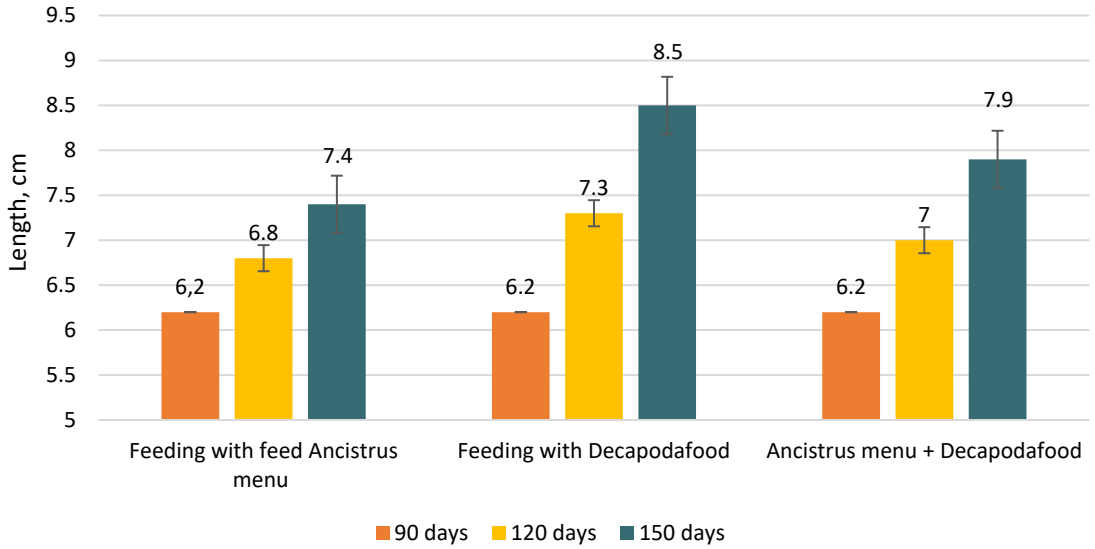

Figure 2. *Length of juveniles of the Australian red-clawed crayfish Cherax quadricarinatus during 60 days of rearing, n=150*

Figure 3. *Measurement of the growth in length of the Australian red claw crayfish*

In the second experimental group of crayfish fed the developed *Decapodafood*, was noted a more intensive growth of young Australian red claw crayfish compared to the control group of crayfish. In particular, during the first month of cultivation, the length of crayfish increased to 7.3±0.2 cm, and during the second – to 8.5±0.2 cm. Accordingly, the increase in length was 1.1±0.1 cm for the period from 90 to 120 days and 1.2±0.1 cm for the second period from 120 to 150 days. When feeding *Decapodafood*, the increase in length of crayfish was 1.8 times ($p \leq 0.05$) greater during the first month of rearing than in crayfish fed *Ancistrus menu*. In the growing period from 120 to 150 days, the increase in the length of crayfish in the experimental group was 2.0 times ($p \leq 0.05$) greater, compared with crayfish in the control group for the same period.

In the third experimental group, crayfish were fed *Ancistrus menu* and Decapoda food in a ratio of 50:50. The intensity of body length growth was lower than when feeding *Decapoda food* but higher than when feeding *Ancistrus menu*. In particular, the increase in length of crayfish during the first 30 days of feeding was 0.8±0.1 cm, and during the next 30 days 0.9±0.1 cm. Thus, the increase in the body length of crayfish in this experimental group was greater than in the control when crayfish were fed *Ancistrus menu* feed by 1.3 and 1.5 times ($p \leq 0.05$).

Thus, this study shows that feeding *Decapoda food*, which in its composition contains 1.8 times more protein substances and 4.6 times fatter, contributes to a more intense increase in the size of crayfish. In studies (Liu *et al.,* 2018) it is reported that for intensive

cultivation of crayfish, it is necessary to select a recipe composition of feed that will allow to use their biological growth potential as much as possible.

During the determination of the mass of the young of the Australian red-clawed crayfish *Cherax quadricarinatus* in the period from 90 to 150 days of cultivation (Fig. 4), similar changes were found, concerning body length. That is, the mass of crayfish that were fed *Decapodafood* was the most intensively gained. In particular, in the control group of crayfish (fed with *Ancistrus menu* feed), during the period from 90 to 120 days, body weight increased by an average of 1.0 g and amounted to 6.1±0.1 g, and during the period from 120 to 150 days, the weight increased, on average by 1.2 g.

When feeding crabs with *Decapoda food*, the intensity of body weight gain was, on average, 1.4 times ($p \leq 0.05$) stronger, compared to crabs of the control group. On the 150th day of cultivation in this experimental group of crayfish, the weight was 8.1±0.2 g, which is 0.8±0.1 g more than in the control group of crayfish. During the mixed feeding of Australian crayfish with *Ancistrus menu* and *Decapoda food*, the intensity of body weight gain was intermediate between the control group and the experimental group fed the developed feed. In particular, at the end of the experiment (150 days), the weight of the crayfish was 7.7±0.2 g, which is 0.4 g more than in the control and 0.4 g less, compared to the crayfish in the experiment, which were fed with *Decapoda food*.

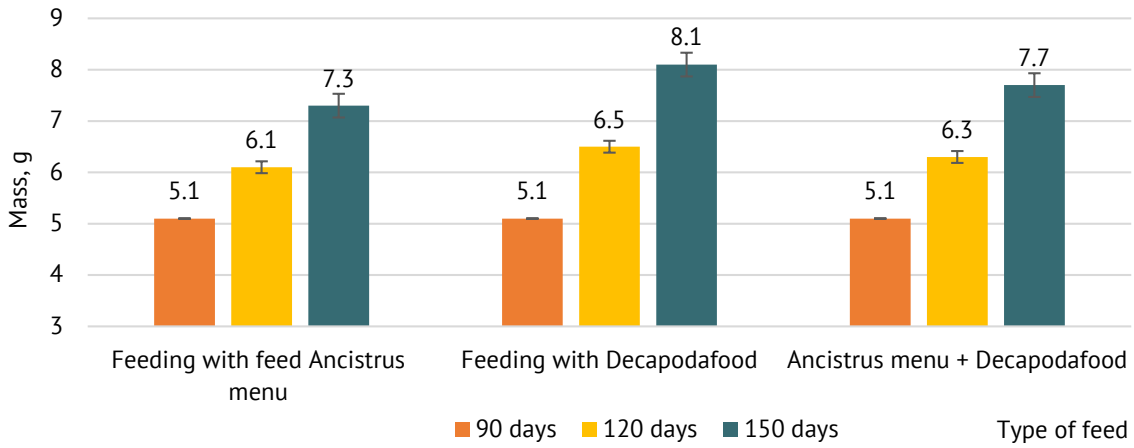

Figure 4. *Weight of juveniles of the Australian red-clawed crayfish Cherax quadricarinatus during 60 days of rearing, n=150*

Therefore, the study indicates that feeding the young crayfish *Cherax quadricarinatus* with *Decapoda food* leads to a faster metabolism since the intensity of weight gain is higher than when feeding the *Ancistrus menu*. This gives reason to believe that providing young crayfish with protein and biologically nutritious feed significantly intensifies the growth and development of Australian red-clawed crayfish in aquaculture conditions. An important indicator that affects the economic efficiency of crayfish cultivation in artificial conditions is survival. After all, researchers (Boyd *et al.*, 2022) indicate that cannibalism is intensively manifested among crayfish during cultivation in aquaculture conditions. Therefore, survival during the period of cultivation of Australian red claw crayfish was determined (Fig. 5).

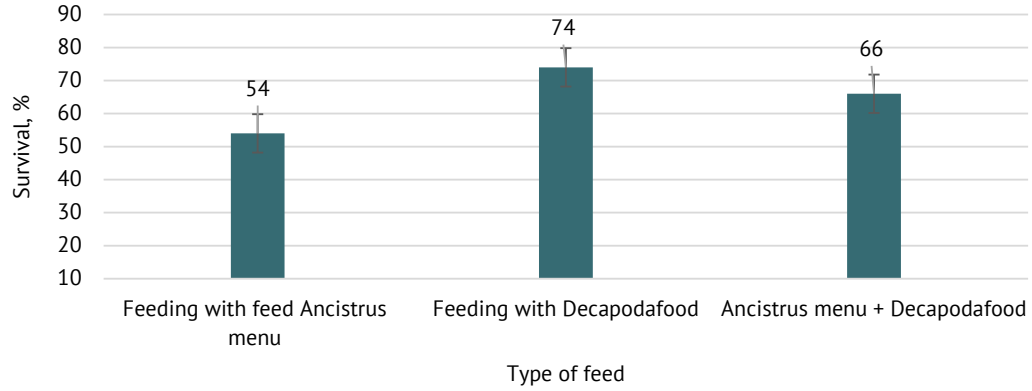

Figure 5. *Survival of juveniles of the Australian red-clawed crayfish Cherax quadricarinatus during 60 days of cultivation under different feeding, n=150*

The largest number of crayfish at the end of the experiment in the group fed with *Decapoda food* was observed. In particular, the survival rate in this group was 74%, which is 20% more live specimens compared to the control group of crayfish and 8% more than the experimental group fed mixed feed. The highest survival among crayfish fed *Decapoda food* can be explained by the presence of a significant amount of easily digestible proteins (37%) and mineral substances, in particular organic origin of calcium and phosphorus salts (5%). The manifestations of cannibalism among young crayfish are decreasing as this phenomenon most significantly reduces the survival of crayfish (Stumpf *et al.,* 2019) under the condition of protein starvation and an insufficient amount of minerals in the diet.

Table 3 and Figure 6 present the scoring scale developed for evaluating the colour of *Cherax quadricarinatus* when fed with different types of fodder.

The material of Table 3, simplified for visual perception, is presented in Figure 6

Table 3. *Cherax quadricarinatus colour grading scale for feeding different types of fodder*

Indicator		**Mark**	**Differentiation**	**Colour**
Background of maintenance (colour of pools, soil of the aquarium)	**Feeding**			
Light	Feeding with boiled cereals	**1**	A	
	Feeding with boiled cereals + and oak leaves (90:10)		B	
	Feeding with boiled cereals + Javanese moss (90:10)		C	
Light	Feed for aquarium fish Ancistrus menu	**2**	A	
50:50	Feed for aquarium fish Ancistrus menu + oak leaves (90:10)		B	
Dark	Feed for aquarium fish Ancistrus menu + Javanese moss (90:10)		C	
Dark	Feed for aquarium fish Ancistrus menu	**3**	A	
	Feed for aquarium fish and crustaceans (various manufacturers)		B	
	Feed for aquarium fish and crustaceans (various manufacturers) + oak leaves (90:10)		C	
Dark	Feed for aquarium fish and crustaceans (various manufacturers) + Javanese moss (90:10)	**4**	A	
	Ancistrus menu + *Decapoda food* (50:50)		B	
	Ancistrus menu + Decapoda food + oak leaves (40:50:10)		C	
Dark	*Decapoda food* + oak leaves *(90:10)*	**5**	A	
	Decapoda food		B	
	Decapoda food + live feed (90:10)		C	

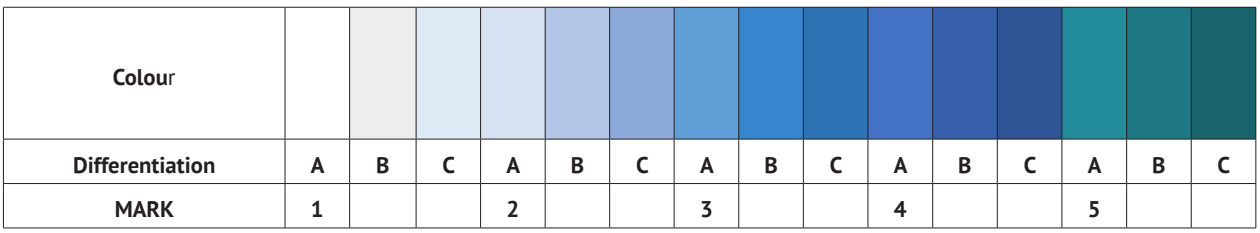

Figure 6. *Scoring scale for evaluating the colouration of Cherax quadricarinatus when feeding different types of feed (compiled by the authors)*

Table 4 shows the colour of the Australian red-clawed crayfish *Cherax quadricarinatus* (Von Martens, 1868), determined by the point scale for feeding food: *Ancistrus menu, Decapoda food, Decapoda food + Ancistrus menu.*

Table 4. *The colouration of the Australian red-clawed crayfish Cherax quadricarinatus was determined using a point scale*

Type of feed	Colour at the end of the experiment
Ancistrus menu	
Decapoda food	
Decapoda food + Ancistrus menu	

Source: *compiled by the authors*

Analysing the data of *Ancistrus menu* feeding of crayfish, the predominance of light colour of the exoskeleton is noted, which is caused by the lack of carotenoids in the composition of the feed and corresponds to point 3 of the differentiation scale – A. Feeding *Decapodafood* contributes to a rich green colour. According to the scoring scale developed by us, it corresponds to a score of 5, differentiation – B.

Feeding the *Decapoda food + Ancistrus menu* combination to the crayfish also gave a dark colour, corresponding to 4 points, differentiation – B. The combination of food is not effective since the two types during the experiment, the crayfish preferred *Decapoda food*.

Currently, Ukraine does not have a sufficient selection of high-quality and balanced fodder for feeding young Australian red-clawed crayfish. Manufacturers of commercial feed in most cases do not want to disclose its composition and nutritional value (Nightingale *et al.,* 2021). Therefore, the obtained data are consistent with the results (Méndez-Martínez *et al.,* 2021), which used feed based on protein components of plant-based protein components, obtained better results than when feeding conventional vegetable feed. Studies (Qian *et al.,* 2021) found that Australian crayfish were on diets containing five different sources of plant-based protein. The weight gain and specific growth rate were significantly reduced (6.7±0.1 g) compared to the author's studies.

CONCLUSIONS

In the conclusion, the authors indicated the efficiency of using Decapodafood feed. The results are an increase in body length and weight. When crayfish were fed with Decapodafood, the increase in length was 1.1±0.1 cm for the period from 90 to 120 days of cultivation and 1.2±0.1 cm for the period from 120 to 150 days. At the same time, the increase in length of crayfish was 1.8 times greater during the first month of cultivation than in crayfish fed with Ancistrus. In the period of cultivation from 120 to 150 days, the increase in length of crayfish was 2.0 times greater, compared with crayfish in the control group for the same period.

When crabs were fed Decapoda food, the intensity of body weight gain was, on average, 1.4 times stronger, compared to the control group crabs. On the 150th day of cultivation in the experimental group of crayfish, the weight was 8.1±0.2 g, which is 0.8±0.1 g more than in the control group of crayfish. At the same time, the survival rate in this group was 74%, which is 20% more than the number of live specimens compared to the control group of crayfish.

Therefore, studies indicate the possibility of rearing juvenile Australian red-clawed crayfish under artificial conditions with high growth rates, efficient use of provided feed, and low levels of cannibalism. The perspective of further research is to determine the physicochemical composition of the meat of the red-clawed crayfish Cherax quadricarinatus using Decapoda food.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Boyd, C.E., McNevin, A.A., & Davis, R.P. (2022). The contribution of fisheries and aquaculture to the global protein supply. *Food Security,* 14, 805-827. doi: 10.1007/s12571-021-01246-9.

[2] Cheng, Y., & Wu, S. (2019). Effect of dietary astaxanthin on the growth performance and nonspecific immunity of red swamp *crayfish Procambarus clarkii. Aquaculture,* 512, article number 734341. doi: 10.1016/j.aquaculture.2019.734341.

[3] Crandall, K.A., & Grave, S.D. (2017). An updated classification of the freshwater crayfishes *(Decapoda: Astacidea)* of the world, with a complete species list. *Journal of Crustacean Biology,* 37(5), 615-653. doi: 10.1093/jcbiol/rux070.

[4] Díaz, F.C., Tropea, C., Stumpf, L., & López Greco, L-S. (2017). Effect of food restriction on female reproductive performance in the redclaw crayfish *Cherax quadricarinatus (Parastacidae, Decapoda). Aquaculture Research,* 48(8), 4228-4237. doi: 10.1111/are.13244.

[5] Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes. (2010). Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:276:0033:0079:En:PDF.
[6] Haubrock, P.J., Oficialdegui, F.J., Zeng, Y., Patoka, J., Yeo, D.C.J., & Kouba, A. (2021). The redclaw crayfish: A prominent aquaculture species with invasive potential in tropical and subtropical biodiversity hotspots. *Reviews in Aquaculture,* 13(3), 1488-1530. doi: 10.1111/raq.12531.
[7] Hou, S., Li, J., Zhang, Y., Huang, J., Wu, X., & Cheng, Y. (2021). Effects of fish meal replacement with protein mixtures on growth, gonad development and amino acid composition of pre-adult red swamp crayfish, *Procambarus clarkii* (Girard, 1852) *(Decapoda, Cambaridae). Crustaceana,* 94(10), 1161-1186. doi: 10.1163/15685403-bja10150.
[8] Hrynevych, N.E., Zharchynska, V.S., Svitelskyi, M.M., Khomiak, O.A., & Sliusarenko, A.O. (2022). Promising object of aquaculture of crustaceans *Cherax quadricarinatus* (Von Martens, 1868): Biology, technology (review). *Aquatic Bioresources and Aquaculture,* 1, 47-62. doi: 10.32851/wba.2022.1.4.
[9] Jones, C.M., & Valverde, C. (2020). Development of mass production hatchery technology for the red claw crayfish *Cherax quadricarinatus*. *Freshwater Crayfish,* 25(1), 1-6. doi: 10.5869/fc.2020.v25-1.001.
[10] Kukhtyn, M., Salata, V., Berhilevych, O., Malimon, Z., Tsvihun, A., Gutyj, B., & Horiuk, Y. (2020). Evaluation of storage methods of beef by microbiological and chemical indicators. *Potravinarstvo Slovak Journal of Food Sciences*, 14, 602-611. doi: 10.5219/1381.
[11] Law of Ukraine No. 27 "On the Protection of Animals from Cruelty". (2006, February). Retrieved from https://zakon.rada.gov.ua/laws/show/3447-15#Text.
[12] Liu, C., Meng, F., Tang, X., Shi, Y., Wang, A., Gu, Z., & Pan, Z. (2018). Comparison of nonvolatile taste active compounds of wild and cultured mud crab *Scylla paramamosain*. *Fisheries Science*, 84, 897-907. doi: 10.1007/s12562-018-1227-0.
[13] Méndez-Martínez, Y., Ceseña, C.E., Luna-González, A., García-Guerrero, M.U., Martinez-Porchas, M., Campa-Cordova, A.I., & Cortés-Jacinto, E. (2021). Effects of different dietary protein energy ratios on growth, carcass amino acid and fatty acid profile of male and female *Cherax quadricarinatus* (von Martens, 1868) pre-adults. *Aquaculture Nutrition,* 27, 2481-2496. doi: 10.1111/anu.13379.
[14] Nanda, P.K., Das, A.K., Dandapat, P., Dhar, P., Bandyopadhyay, S., Dib, A.L., Lorenzo, J.M., & Gagaoua, M. (2021). Nutritional aspects, flavour profile and health benefits of crab meat based novel food products and valorisation of processing waste to wealth: A review. *Trends in Food Science & Technology,* 112, 252-267. doi: 10.1016/j.tifs.2021.03.059.
[15] Nightingale, J., Jones, G., McCabe, G., & Stebbing, P. (2021). Effects of different diet types on growth and survival of white-clawed crayfish *Austropotamobius pallipes* in Hatcheries. *Frontiers in Ecology and Evolution,* 9, article number 607100. doi: 10.3389/fevo.2021.607100.
[16] Qian, D., Yang, X., Xu, C., Chen, C., Jia, Y., Gu, Z., & Li, E. (2021). Growth and health status of the red claw crayfish, Cherax quadricarinatus, fed diets with four typical plant protein sources as a replacement for fish meal. *Aquaculture Nutrition,* 27(3), 795-806. doi: 10.1111/anu.13224.
[17] Rigg, D.M., Seymour, J.E., Courtney, R.L., & Jones, C.M. (2020). A review of juvenile Redclaw crayfish *Cherax quadricarinatus* (von Martens, 1868) aquaculture: Global production practices and innovation. *Freshwater Crayfish,* 25(1), 13-30. doi: 10.5869/fc.2020.v25-1.013.
[18] Shehata, A.I., Alhoshy, M., Wang, T., Mohsin, M., Wang, J., Wang, X., Han, T., Wang, Y., & Zhang, Z. (2022). Dietary supplementations modulate the physiological parameters, fatty acids profile and the growth of red claw crayfish *(Cherax quadricarinatus). Journal of Animal Physiology and Animal Nutrition,* 107(1), 308-328. doi: 10.1111/jpn.13704.
[19] Shehata, A.I., Wang, T., Habib, Y.J., Wang, J., Fayed, W.M., & Zhang, Z. (2020). The combined effect of vitamin E, arachidonic acid, *Haemtococcus pluvialis*, nucleotides and yeast extract on growth and ovarian development of crayfish *(Cherax quadricarinatus)* by the orthogonal array design. *Aquaculture Nutrition,* 26(6), 2007-2022. doi: 10.1111/anu.13142.
[20] Shyamal, S., Das, S., Guruacharya, A., Mykles, D.L., & Durica, D.S. (2018). Transcriptomic analysis of crustacean molting gland (Y-organ) regulation via the mTOR signaling pathway. *Scientific Reports,* 8, article number 7307. doi: 10.1038/s41598-018-25368-x.
[21] Stumpf, L., Sarmiento Cárdenas, P.N., Timpanaro, S., & López Greco, L. (2019). Feasibility of compensatory growth in early juveniles of "red claw" crayfish *Cherax quadricarinatus* under high density conditions. *Aquaculture,* 510, 302-310. doi: 10.1016/j.aquaculture.2019.05.053.
[22] Sun, Y., Shan, X., Li, D., Liu, X., Han, Z., Qin, J., Guan, B., Tan, L., Zheng, J., Wei, M., & Jia, Y. (2023). Analysis of the differences in muscle nutrition among individuals of different sexes in redclaw crayfish, *Cherax quadricarinatus*. *Metabolites,* 13(2), article number 190. doi: 10.3390/metabo13020190.
[23] Vecchioni, L., Marrone, F., Chirco, P., Arizza, V., Tricarico, E., & Arculeo, M. (2022). An update of the known distribution and status of *Cherax spp.* in Italy *(Crustacea, Parastacidae). BioInvasions Records*, 11(4), 1045-1055. doi: 10.3391/bir.2022.11.4.22.

Показники аквакультури молоді *Cherax Quadricarinatus* за різних схем годівлі

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Анотація. Аквакультура ракоподібних є одним з основних джерел цінного харчового білка, який за своїми властивостями не може бути замінений іншими білками тваринного або рослинного походження. Використання поживних та збалансованих кормів у годівлі раків сприяє підвищенню продуктивності та отриманню екологічно чистої та безпечної продукції. Метою дослідження є визначення ефекту від згодовування розробленого комбікорму для декаподів. Встановлено, що згодовування корму Decapoda сприяє більш інтенсивному збільшенню розмірів раків. Зокрема, приріст довжини становив 1,1±0,1 см за період з 90 по 120 добу вирощування та 1,2±0,1 см за період з 120 по 150 добу. При використанні корму Decapoda приріст довжини рачків протягом першого місяця вирощування був у 1,8 рази більшим, ніж у рачків, яких годували кормом Ancistrus menu. У період вирощування від 120 до 150 днів приріст довжини раків у дослідній групі був у 2,0 рази більшим, порівняно з раками контрольної групи за той самий період. При згодовуванні ракам Декаподи інтенсивність приросту маси тіла була в середньому в 1,4 рази вищою, порівняно з крабами контрольної групи. При цьому виживання в цій групі становило 74 %, що на 20 % перевищує кількість живих особин порівняно з контрольною групою раків. Результати дослідження можуть бути використані при розробці технологічної схеми відтворення та вирощування раків

Ключові слова: Ancistrus menu; аквакультура; корм Decapoda; приріст довжини; виживання; маса