ISSN 2709-9210
Journal of Service, Innovation and Sustainable Development
Vol. 3 (2022) No. 2, pp. 113-130
DOI:10.33168/SISD.2022.0208

Possible Development of Aquaculture in the Baltic Sea – Survey Analysis Results

Biruta Sloka, Zaiga Ozolina

Faculty of Business, Management and Economics, University of Latvia, Aspazijas bulv. 5, Riga, LV-1050, Latvia

biruta.sloka@lu.lv

Abstract. Aquaculture development is important for countries located near the sea, including Baltic Sea Region countries. The aim of the research is to evaluate the possible importance of several aspects for the development of the national economy based on an expert survey where was analysed expert ratings on which marine aquaculture field has the chance to develop in the next 10 years. Research methods applied: analysis of scientific publications, previously conducted research results, and statistical analysis of expert survey results. Experts were from the Baltic Sea Region counties. For data analysis there were used indicators of descriptive statistics; comparing the equality of arithmetic means for two independent groups using t–test and comparing the equality of arithmetic means for more than two groups by using analysis of variance – ANOVA, correlation analysis. Results of the research have indicated that among the analysed aspects, the most important are mussel farming and marine product processing. There were no statistically significant differences in expert ratings by their field of employment and by expert gender. There was a statistically strong correlation between expert ratings on what extent fisheries affect regional employment of the coast and mussel farming and expert ratings on what extent fisheries affect regional employment of the coast and the development of wind parks.

Keywords: Aquaculture; mussel farming; marine product processing; marine aquaculture; wind parks; wave parks.

1. Introduction

The development of aquaculture is of great importance for countries located near the sea, including Baltic Sea Region countries. The research aims to evaluate the possible importance of several aspects for the development of the national economy based on an expert survey that analysed expert ratings on which marine aquaculture field has the chance to develop in the next ten years. Limited land space for food production and healthy seafood are strong motivators for seafood development, where researchers have many aspects to investigate on the scientific level. Mussel production is important as mussels also perform an environmental cleaning function: cleaning seawater.

Research methods applied in the current research paper: analysis of scientific publications, analysis of previously conducted research results, and statistical analysis of expert survey results. Experts were from the Baltic Sea Region counties. For survey data analysis there were used indicators of descriptive statistics: were indicators of central tendency or location - arithmetic mean, mode, median; indicators of dispersion - range, standard deviation, and standard error of mean; testing of statistical hypotheses by comparing means on equality of arithmetic means for two groups using t–test and comparing means on equality of arithmetic means for more than two groups by using analysis of variance – ANOVA; it was applied correlation analysis to evaluate the strength of relationships between the analysed variables to check the importance of influence on employability in coastal areas.

The ratings by experts were made on a rating scale of 1-10 to get a deeper view of expert views and have the possibility to perform a deeper statistical analysis of the expert views.

2. Literature Review

The development of national economies and several aspects influencing the growth and stability of the economy are analysed by many researchers worldwide, stressing several important factors influencing mussel production (Laxe et al., 2016; Liu & Xing, 2019) where are also indicated other essential aspects of aquaculture development: algae farming, marine aquaculture, mussel farming, marine product processing, wind parks, wave parks. Mussel farming significantly influences the environment – as sea and ocean water cleaners (Srisunont et al., 2022; Moriki et al., 2020; Martínez-García et al., 2019) where mussels support environment improvement by cleaning the water. Those aspects are taking more and more important in the situation of climate change situation and its influence on several activities related to mussel farming and the development of marine aquaculture. Researchers stressing the importance of aquaculture development aspects (Rehman et al., 2019; Camelo-Guarín et al., 2021) where experience and promising findings, as well as rised problematic issues from several countries around the globe, are analysed, challenges, problems with the possible solutions and strategies and good

examples are investigated.

Scientists are suggesting taking into account "green economy" development aspects, offering also different models combining hydrodynamic and bio-economic models (Konstantinou & Kombiadou, 2020; Lozova & Sloka, 2022; Maaz et al., 2022) as well as the importance of many economic development factors including corporate social responsibility (Davidavičienė et al., 2022; Davidavičienė et al., 2021), the growing importance of social networks (Davidavičienė, & Davidavičius, 2022; Raudeliūnienė et al., 2018) and other aspects including nuances in the successful commercialization of this specific field. Deep analysis of experience and research findings in different countries are on the researchers' agenda with the development of practical recommendations (Tamburini et al., 2020; Charalambous & Violaris, 2021) taking into account mussel farming life-cycle requirements influencing mussel production and realization aspects.

Researchers have tested and recommended different models (Lehto et al., 2020; Burinskienė, 2022; Kedong et al., 2022) for possible practical application in real business. The production of marine products can influence the trade balance (Jamei et al., 2020) with a big influence on the national economy and foreign direct investment. Financing sources for respective field development, as well as finding innovative solutions taking into account climate changes, including global warming, are on the investigation agenda for researchers (Des et al., 2020; Swamy & Munusamy, 2016; Raudeliūnienė et al., 2021) pointing essential issues to be noticed and considered. Several aspects of realisation of mussel products and related products are under investigation by many researchers in different interdisciplinary fields (Bashir et al., 2019; Raudeliuniene et al., 2020) as there is not only one field issue but becoming a more and more multidisciplinary and multidimensional issue.

Researchers from China have evaluated the extensive experience of high-quality marine economy development (Zhao et al., 2019), where the conclusions could be beneficial for other countries in the organization of marine products production and finding new ways and tools for more efficient marine production realization. Other researchers group from China have investigated innovations' role in China's marine industrial agglomeration (Xu et al., 2022). Questions on different perspectives on economic development are raised by researchers (Wiliam et al., 2022 a; Wiliam et al., 2022 b) in using smart approaches by scientists in economic development, including the development of new and innovative ways of mussel farming. For production organization realization important is the respective organization knowledge management (Raudeliuniene & Szarucki, 2019; Baris Bingol et al., 2008) to make the most effective decisions in initiating and implementing commercial activities, including marine culture development and mussel production and realization where are several specific approaches in mussel production and processing are required.

3. Research Methodology

Research methods applied in the current study were analysis of scientific publications on aquaculture development aspects, recent scientific findings on mussel farming, including aspects of mussels as sear water/ocean water cleaners, researchers' views and suggestions on marine product processing, research findings on marine aquaculture development aspects, scientific analysis on the development of wind parks, research result analysis on actual topics in wave parks, analysis of previously conducted research results and statistical analysis of expert survey results. Experts invited to participate in the survey and give ratings were from the Baltic Sea Region counties. Survey data were analysed using indicators of descriptive statistics indicating measures of central tendency or location and indicators of dispersion or variability; testing statistical hypotheses on comparing arithmetic means using t–test and analysis of variance – ANOVA, correlation analysis for analyzing relationships of analysed variables. For expert rating, a survey was used, where most of the questions with a rating scale of 1-10, where 1 – a little chance and 10 – a very big chance.

4. Results

Expert survey results on ratings on several aspects "Which of marine aquaculture field has the chance to develop in the next ten years"? On possible development of algae farming, marine aquaculture, mussel farming, marine product processing, wind parks, and wave parks. The results of expert ratings are included in Table 1.

Table 1: Main statistical indicators on aspects of expert ratings on the question "Which of marine aquaculture field has the chance to develop in the next ten years"?

Statistical indicators		**Algae farming**	**Marine aquaculture**	**Mussel farming**	**Marine product processing**	**Wind parks**	**Wave parks**
N	Valid	74	74	74	73	73	74
	Missing	14	14	14	15	15	14
Mean		4,93	5,11	6,96	6,92	3,96	5,50
Standard Error of Mean		0,34	0,32	0,26	0,29	0,28	0,31
Median		4,5	4,5	7,5	7	4	6
Mode		3	3	8	10	1	3
Standard Deviation		2,96	2,79	2,21	2,43	2,40	2,68
Range		9	9	9	9	9	9
Minimum		1	1	1	1	1	1
Maximum		10	10	10	10	10	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Data from the expert survey results indicate that the highest averages of ratings by experts are for mussel farming (the arithmetic mean of the ratings was 6, 96), half of the experts gave ratings 7 or less, and half of the experts gave ratings 8 or more (characterised by median). The most often used rating by experts was 8 – characterized by mode.

In expert ratings for mussel farming, there was the lowest variability of expert ratings, although experts used the whole rating scale. Very close expert ratings were for marine product processing, where the most often given rating by experts (mode) was the highest possible rating, and it was 10. The lowest rating by experts was for wind parks, where the most often given rating by experts (mode) was the lowest possible rating, and it was 1. The main statistical indicators of descriptive statistics on algae farming of expert ratings by current employment field are included in Table 2.

Table 2: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of algae farming

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	6,00	0,78	17	3,22	6	9	1	10
Regional administration – municipalities, regional institutions	5,06	0,53	17	2,19	5	9	1	10
State administration - government, ministries	4,43	0,61	23	2,92	3	9	1	10
Fisheries, including fishing, shellfish farming, or aquaculture	3,40	1,21	5	2,70	3	7	1	8
Total	4,95	0,36	62	2,85	5	9	1	10-

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on the possible development of algae farming in the next ten years seem to be very different by expert occupation, with the highest ratings by specialists in professional, scientific, and technical services and lower ratings by specialists in fisheries, including fishing, shellfish farming, or aquaculture. The main statistical indicators of expert ratings by the current expert employment field on possible development in the next ten years of marine aquaculture are included in Table 3.

Table 3: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of marine aquaculture

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	5,71	0,75	17	3,08	5	8	2	10
Regional administration – municipalities, regional institutions	5,65	0,63	17	2,60	6	9	1	10
State administration - government, ministries	4,65	0,52	23	2,50	4	9	1	10
Fisheries, including fishing, shellfish farming, or aquaculture	4,00	1,23	5	2,74	4	7	1	8
Total	5,16	0,34	62	2,71	5	9	1	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on the possible development of marine aquaculture in the next ten years seem to be very different by expert occupation. The highest ratings were by specialists in professional, scientific, and technical services, where the arithmetic mean of the expert ratings was 5,71 with a median of 5, and lower ratings by specialists in fisheries, including fishing, shellfish farming, or aquaculture, where the arithmetic mean of the expert ratings were 4, the same value was median. Leading statistical indicators of expert ratings by the current expert employment field on possible development in the next ten years of mussel farming are included in Table 4.

Expert ratings on the possible development of mussel farming in the next ten years seem to be very different by expert occupation, with the highest ratings by experts from fisheries, including fishing (arithmetic mean of the ratings was 7, 20 and median was 8), shellfish farming or aquaculture and state administration - government, ministries (arithmetic mean of the ratings were 7,17 and median was 8). All ratings by experts are very high – it indicates that this field could have good future development. Leading statistical indicators of expert ratings by the current expert employment field on possible development in the next ten years of marine product processing are included in Table 5.

Table 4: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of mussel farming

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	6,75	0,69	16	2,77	8	9	1	10
Regional administration – municipalities, regional institutions	6,65	0,41	17	1,69	7	7	3	10
State administration - government, ministries	7,17	0,43	24	2,12	8	9	1	10
Fisheries, including fishing, shellfish farming, or aquaculture	7,20	0,86	5	1,92	8	5	4	9
Total	6,92	0,27	62	2,15	7	9	1	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey, a rating scale of 1-10, where 1- little chance; 10-very big chance

Table 5: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of marine product processing

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	8,00	0,52	16	2,10	9	6	4	10
Regional administration – municipalities, regional institutions	5,88	0,61	17	2,52	5	9	1	10
State administration - government, ministries	6,57	0,48	23	2,31	7	8	2	10
Fisheries, including fishing, shellfish farming, or aquaculture	7,40	1,08	5	2,41	8	6	4	10
Total	6,82	0,31	61	2,41	7	9	1	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on the possible development of marine product processing in the next ten years seem to be very different by expert occupation, with the highest ratings

by experts from professional, scientific, and technical services, where the lowest rating by experts was 4. All ratings by experts are relatively high – it indicates that this field could have good future development. All experts recognized that in all occupation groups of experts, the averages of ratings were relatively high. The main statistical indicators of expert ratings by the current expert employment field on possible development in the next ten years of wind parks are included in Table 6.

Table 6: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of wind parks

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	4,18	0,72	17	2,98	3	8	1	9
Regional administration – municipalities, regional institutions	4,06	0,57	17	2,36	4	8	1	9
State administration - government, ministries	3,48	0,44	23	2,11	3	9	1	10
Fisheries, including fishing, shellfish farming, or aquaculture	5,20	0,49	5	1,10	5	3	4	7
Total	3,97	0,30	62	2,39	3	9	1	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on the possible development of wind parks in the next ten years seem to be very different by expert occupation, with the highest ratings by experts from fisheries, including fishing, shellfish farming, or aquaculture. The highest rating by experts was 7. The arithmetic mean of ratings was 5,2, and the median was 5; expert ratings in this occupation group were alike as the indicators of variability or dispersion were the lowest. All ratings by experts are relatively low, indicating that this field could not have good future development. The main statistical indicators of expert ratings by the current expert employment field on possible outcomes in the next ten years of wave parks are included in Table 7.

Table 7: Main statistical indicators of expert ratings by current expert employment field on possible development in the next ten years of wave parks

Current employment field	Mean	Standard Error of Mean	N	Standard Deviation	Median	Range	Minimum	Maximum
Professional, scientific and technical services	5,65	0,63	17	2,60	6	9	1	10
Regional administration – municipalities, regional institutions	5,94	0,75	17	3,09	6	9	1	10
State administration - government, ministries	5,30	0,47	23	2,25	5	8	1	9
Fisheries, incl. fishing, shellfish farming or aquaculture	6,00	1,52	5	3,39	7	8	2	10
Total	5,63	0,33	62	2,63	6	9	1	10

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on possible development of wave parks in next ten years seem to be very different by expert occupation, with the highest ratings by experts from fisheries, including fishing, shellfish farming, or aquaculture. The arithmetic mean of the ratings in this expert group was 6, and the median was 7. Still, this expert group views experts had the most comprehensive variety as the indicators of variability were the highest among the analysed aspects. All ratings by experts on the possible development of wave parks in the next ten years were relatively low – it indicates that this field could not have good future development. The lowest arithmetic mean on expert ratings for the development of wave parks was by state administration representatives from government and ministries (arithmetic mean of expert ratings was 5, 3, the median was 5 – it means that half of the experts from this group gave ratings 5 or less and half of the experts from this group gave ratings 5 or more. In this group, the variability of the ratings was the lowest – which means that expert views were alike.

To compare the average ratings of experts by their expert groups, the statistical hypothesis was tested on equality of means for more than two groups using analysis of variance – ANOVA. Main statistical indicators of ANOVA of expert ratings by current expert employment field on possible development in next ten years of respective marine aquaculture field (on the possible development of aquaculture and/or mussel farming and/or marine product processing and/or marine aquaculture and/or wind parks and/or wave parks – as all of them were also noticed in theoretical scientific publications analysis) are included in Table 8.

Table 8: Main statistical indicators of ANOVA of expert ratings by current expert employment field on possible development in next ten years of respective marine aquaculture field

Aquaculture field	Sum of Squares	Value of Sum of Squares	df	Mean Square	F	Sig.
Algae farming	Between Groups	37,06	3	12,35	1,56	0,209
	Within Groups	459,79	58	7,93		
	Total	496,86	61			
Marine aquaculture	Between Groups	21,76	3	7,25	0,99	0,406
	Within Groups	426,63	58	7,36		
	Total	448,39	61			
Mussel farming	Between Groups	3,58	3	1,19	0,29	0,862
	Within Groups	279,02	58	4,81		
	Total	282,60	61			
Marine product processing	Between Groups	40,40	3	13,47	2,49	0,070
	Within Groups	308,62	57	5,41		
	Total	349,02	60			
Wind parks	Between Groups	13,99	3	4,66	0,81	0,494
	Within Groups	333,95	58	5,76		
	Total	347,94	61			
Wave parks	Between Groups	4,78	3	1,59	0,22	0,881
	Within Groups	417,69	58	7,20		
	Total	422,47	61			

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Expert ratings on ANOVA on the difference of ratings by occupation indicate no statistically significant difference in ratings. Leading statistical indicators of ANOVA of expert ratings by current expert gender on possible development in the next ten years of respective marine aquaculture field are included in Table 9.

Results indicated that the ratings for analysed aspects differ by expert gender. Still, it is essential to evaluate – are those differences in ratings are statistically significant: it was tested by t-test. Results of t–test on equality of arithmetic means are included in Table 10.

Table 9: Main statistical indicators of expert ratings by expert gender on possible development in the next ten years of respective marine aquaculture field

	Gender	N	Mean	Standard Deviation	Standard Error Mean
Algae farming	Female	44	4,95	2,87	0,43
	Male	23	4,83	3,03	0,63
Marine aquaculture	Female	44	5,16	2,75	0,42
	Male	23	5,00	2,78	0,58
Mussel farming	Female	45	6,78	2,29	0,34
	Male	22	7,45	1,77	0,38
Marine product processing	Female	44	6,93	2,43	0,37
	Male	22	7,00	2,33	0,50
Wind parks	Female	44	4,16	2,52	0,38
	Male	23	3,43	2,02	0,42
Wave parks	Female	44	5,66	2,77	0,42
	Male	23	5,22	2,49	0,59

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Table 10: Main statistical indicators testing hypothesis on equality of means with t-test of expert ratings by expert gender on possible development in next ten years of respective marine aquaculture field

Analysed aspects	**Assumption of Variances**	**Levene's Test for Equality of Variances**		**t-test for Equality of Means**				
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Standard Error Difference**
Algae farming	Equal variances assumed	0,04	0,845	0,17	65	0,865	0,13	0,75
	Equal variances not assumed			0,17	42,72	0,867	0,13	0,77
Marine aquaculture	Equal variances assumed	0,00	0,999	0,22	65	0,824	0,16	0,71
	Equal variances not assumed			0,22	44,37	0,824	0,159	0,71
Mussel farming	Equal variances assumed	1,37	0,245	-1,22	65	0,227	-0,677	0,55
	Equal variances not assumed			-1,33	52,64	0,188	-0,677	0,51
Marine product processing	Equal variances assumed	0,14	0,717	-0,11	64	0,913	-0,068	0,63
	Equal variances not assumed			-0,11	43,65	0,912	-0,068	0,62
Wind parks	Equal variances assumed	2,53	0,117	1,19	65	0,238	0,724	0,61
	Equal variances not assumed			1,28	54,14	0,207	0,724	0,57
Wave parks	Equal variances assumed	0,20	0,658	0,64	65	0,524	0,442	0,69
	Equal variances not assumed			0,66	49,22	0,510	0,442	0,67

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Data of analysis indicate that there is no statistically significant difference in expert ratings of expert ratings by expert gender. It is essential to find the possible correlation between the analysed factors and possibilities for regional employment on the coast – results are included in Table 11.

Table 11: Main statistical indicators of correlation analysis of expert ratings on possible development in the next ten years of respective marine aquaculture field and extent fisheries affect regional employment of the sea coast

Analysed aspects	Indicators of correlation analysis	To what extent do you think fisheries affect regional employment of the coast
To what extent do you think fisheries affect regional employment of the coast	Pearson Correlation	1
	Sig. (2-tailed)	
	N	75
Algae farming	Pearson Correlation	0,100
	Sig. (2-tailed)	0,398
	N	74
Marine aquaculture	Pearson Correlation	0,063
	Sig. (2-tailed)	0,596
	N	74
Mussel farming	Pearson Correlation	0,433**
	Sig. (2-tailed)	0,000
	N	74
Marine product processing	Pearson Correlation	0,214
	Sig. (2-tailed)	0,069
	N	73
Wind parks	Pearson Correlation	0,515**
	Sig. (2-tailed)	0,000
	N	73
Wave parks	Pearson Correlation	0,158
	Sig. (2-tailed)	0,177
	N	74

***. Correlation is significant at the 0.01 level (2-tailed)*

**. Correlation is significant at the 0.05 level (2-tailed)*

Source: Authors' calculations based on Zaiga Ozolina conducted the expert survey rating scale 1-10, where 1- little chance; 10-very big chance

Results indicated a statistically strong correlation (sig. 0.01) between expert ratings on what extent fisheries affect regional employment of the coast and mussel farming and expert ratings on what extent fisheries affect regional employment of the coast

and the development of wind parks. Those results confirm the findings in theoretical analysis.

5. Conclusions

The results of expert analysis of aquaculture development and marine product processing aspects are valuable results for further decision-making by policymakers as well as entrepreneurs to develop mussel farming and wind park development as they have great importance for possible employability in coastal regions, which often suffer by lack of places for employment.

Results of the research have indicated that among the analysed aspects, the most important are mussel farming and marine product processing. There were no statistically significant differences in expert ratings by their field of employment and by expert gender.

It was found that there is a statistically strong correlation between expert ratings on what extent fisheries affect regional employment of the coast and mussel farming, as well as expert ratings on what extent fisheries affect regional employment of the coast and the development of wind parks.

References

Baris Bingol, E., Colak, H., Hampikyan, H. & Muratoglu, K. (2008). The microbiological quality of stuffed mussels (Midye Dolma) sold in Istanbul. *British Food Journal*, 110(11), 1079-1087.

Bashir, K.M.I., Kim, J.-S., Mohibbullah, M., Sohn, J.H. & Choi, J.-S. (2019). Strategies for improving the competitiveness of Korean seafood companies in the overseas halal food market. *Journal of Islamic Marketing*, 10(2), 606-632.

Burinskienė, A. (2022). The application of business models in trading companies, *Journal of Service, Innovation and Sustainable Developmen*t, 3(1), 14-30.

Camelo-Guarín, S., Molinet, C. & Soto, D. (2021). Recommendations for implementing integrated multitrophic aquaculture in commercial farms at the landscape scale in southern Chile. *Aquaculture*, 544,737116.

Charalambous, C. & Violaris, J. (2021). Support for environmental, social and economic tourism industry development in Cyprus, *Worldwide Hospitality and Tourism Themes*, 13(6), 719-730.

Davidavičienė, V. & Davidavičius, S. (2022). Impact of activities in social networks on customer loyalty, *Journal of Logistics, Informatics and Service Science*, 9(2), 183-195.

Davidavičienė, V. & Raudeliūnienė, J. (2021). Corporate social entrepreneurship practice: Lithuanian case analysis, *Journal of System and Management Sciences*, 21(4). 218-231.

Davidavičienė, V. & Raudeliūnienė, J. (2022). Corporate social entrepreneurship practice: Lithuanian case study in public and private organizations, *Journal of System and Management Sciences*, 12(4). 349-364.

Des, M., Gómez-Gesteira, M., deCastro, M., Gómez-Gesteira, L. & Sousa, M.C. (2020). How can ocean warming at the NW Iberian Peninsula affect mussel aquaculture? *Science of the Total Environment*, 709, 136117

Jamei, N.H., Nurmakhanova, M., Mustafa, S., Egbulonu, A. & Hadidan, W. (2020). The long run relationship between fish production, marine trade balance and foreign

direct investment: An empirical study of Omani economy. *Maritime Business Review*, 5(3), 271-280.

Kedong, Y., Liu, Z., Zhang, C., Huang, S., Li, J., Lv, L., Su, X. & Zhang, R. (2022). Analysis and forecast of marine economy development in China, *Marine Economics and Management*, 5(1), 1-33.

Konstantinou, Z.I. & Kombiadou, K. (2020). Rethinking suspended mussel-farming modelling: Combining hydrodynamic and bio-economic models to support integrated aquaculture management. *Aquaculture*, 523, 735179.

Laxe, G. F., Palmero, M. F. & Dopico, C. D. (2016). Liberalization and tariff dismantling: Effects on the competitiveness of mussel cultivation industry in Spain, *British Food Journal*, 118(2), 250-271.

Lehto, X., Davari, D. & Park, S. (2020). Transforming the guest–host relationship: a convivial tourism approach, *International Journal of Tourism Cities*, 6(4), 1069-1088.

Liu, D. & Xing, W. (2019). Analysis of China's coastal zone management reform based on land-sea integration, *Marine Economics and Management*, 2(1), 39-49.

Lozova, L. & Sloka, B. (2022). Management Aspects of the "Green Economy" in the Production of Construction Materials in Latvia within the Requirements of the European Union in the Context of Reducing CO_2 Emissions. *Journal of Service, Innovation and Sustainable Developmen*t, 3(1), 31-40.

Maaz, M.A.M., Ahmad, R. & Abad, A. (2022). Antecedents and consequences of green supply chain management practices: a study of Indian food processing industry. *Benchmarking: An International Journal*, 29(7), 2045-2073.

Martínez-García, C., González-Fonteboa, B., Carro-López, D. & Martínez-Abella, F. (2019). Impact of mussel shell aggregates on air lime mortars. Pore structure and carbonation, *Journal of Cleaner Production*, 215, 650-668.

Moriki, A., Antoniou, A., Savvidis, Y., Papadimitriou, C.A. & Stoilas, V.O. (2019). Nutrient Limitation in a Coastal System Influenced by Mussel Farming, River Outflow and On-shore Circulation of Waters, *Environmental Processes*, 6(4), 1019-1029.

Raudeliuniene, J., Albats, E. & Kordab, M. (2020). Impact of information technologies and social networks on knowledge management processes in Middle

Eastern audit and consulting companies. *Journal of Knowledge Management*, 25(4), 871-898.

Raudeliūnienė, J., Davidavičienė, V., Meidutė-Kavaliauskienė, I. & Radeckytė, V. (2021). Women's leadership success factors in the Baltic states. *International Journal of Learning and Change*, 13(2), 171-189.

Raudeliuniene, J., Davidavičiene, V., Tvaronavičiene, M. & Jonuška, L. (2018). Evaluation of Advertising Campaigns on Social Media Networks. *Sustainability*, 10(4), 973.

Raudeliuniene, J. & Szarucki, M. (2019). An integrated approach to assessing an organization's knowledge potential. *Engineering Economics*, 30(1), 69-80.

Rehman, A., Deyuan, Z., Hena, S. & Chandio, A.A. (2019). Do fisheries and aquaculture production have dominant roles within the economic growth of Pakistan? A long-run and short-run investigation, *British Food Journal*, 121(8), 1926-1935.

Srisunont, C., Srisunont, T., Intarachart, A. & Babel, S. (2022). Influence of climate on seawater quality and green mussel production. *Scientia Marina*, 86(1), e027.

Swamy, V. & Munusamy, D. (2016). Analyzing the agricultural value chain financing: approaches and tools in India. *Agricultural Finance Review*, 76(2), 211-232.

Tamburini, E., Turolla, E., Fano, E.A. & Castaldelli, G. (2020). Sustainability of Mussel (Mytilus galloprovincialis) farming in the Po River delta, northern Italy, based on a life cycle assessment approach, *Sustainability*, 12(9), 3814.

Xu, S., Yue, Q. & Lu, B. (2022). Grey correlation analysis on the synergistic development between innovation-driven strategy and marine industrial agglomeration: based on China's coastal provinces. *Grey Systems: Theory and Application*, 12(1), 269-289.

Wiliam, A., Arief, M., Bandur, A. & Tjhin, V.U. (2022). are farmers ready to switch using precision agriculture, *Journal of System and Management Sciences*, 12(4). 349-364.

Wiliam, A., Arief, M., Bandur, A. & Tjhin, V.U. (2022). Farmers' intention as mediator: Does government social power predict real use behavior of smart farming technology? *Journal of Logistics, Informatics and Service Science*, 9(3), 328-346.

Zhao, A., Guan, H. & Sun, Z. (2019). Understanding high-quality development of marine economy in China: A literature review. *Marine Economics and Management*, 2(2), 124-130.