Annex 7
to the Contract on the implementation and funding of fundamental and applied research project
(December 20, 2021 Council Decision No. 1-12-133, registry No. lzp-2021/1-0247)

Project Mid-term Scientific Report

Project title:
Ecological and socioeconomic thresholds as a basis for defining adaptive management triggers in Latvian pond aquaculture

1. Scientific Excellence

The threshold concept is commonly invoked as a necessary component of environmental assessment and, more broadly, land-use decision making. Although ecological thresholds can play an important role in environmental assessment, they are not a simple solution to complex socioecological decisions, nor do they ensure objective decision making (Johnson and Ray, 2021). In order to make preservation of the biological integrity of ecosystems, the preservation of key biological – ecological thresholds are suggested, they represent an operational, measurable entity inspired by contemporary trends in biological conservation, offering key indicators in design sustainability policies (Bithas, 2020).
Thresholds represent a broad continuum of transitions among stable states that vary greatly in duration, complexity, and potential for reversibility (Briske et al. 2006). Based on the topicality of threshold framework and according practical needs of Latvia pond aquaculture sector the following study hypothesis was proposed.

Hypothesis: *Latvia pond aquaculture threshold categories and components (triggers, feedback mechanisms and switch) can be identified by using interdisciplinary (environmental & socio-economic) field study and modeling for sustainability governance applying adaptive management principles and multi-actor approach.*

Schematic illustration of threshold progression from a pre-threshold state to residual pre-threshold properties that persist within the post-threshold state after a threshold has been exceeded on a site well visualizes the research hypothesis of our Project (see Figure 1)

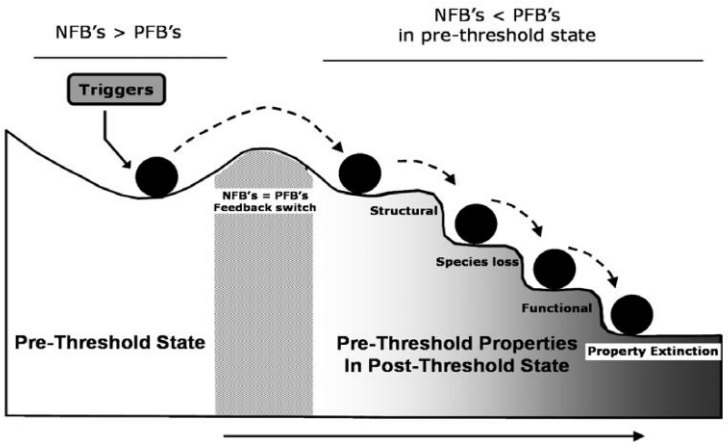

Figure 1 Four threshold categories identify critical ecological processes that contribute to the successive loss of residual pre-threshold properties, as indicated by increased shading from left to right, and identify ecological benchmarks that describe the extent of threshold progression and the potential for threshold reversal. A threshold is initially surpassed when feedbacks switch from negative (NFB) to positive (PFB) to exceed the resilience limits of the pre-threshold state (from Briske et al. 2006).

References:

- ✓ *Bithas K. 2020. A bioeconomic approach to sustainability with ecological thresholds as an operational indicator. Environmental and Sustainability Indicators 6, p. 1-7*
- ✓ *Briske D.D., Fuhlendorf S.D., Smeins F.E. 2006. A Unified Framework for Assessment and Application of Ecological Thresholds. Rangeland Ecol Manage 59(3): 225–236*
- ✓ *Johnson C.J., Ray J.C. 2021. The challenge and opportunity of applying ecological thresholds to environmental assessment decision making. In: Handbook of Cumulative Impact Assessment. Research Handbooks on Impact Assessment series. Ed. Blakley J.A.E., Franks D.M. Edward Elgar Publishing, Inc, p.140–157*

2. Impact

2.1. The project's scientific results

The scientific results planned in the project (*9 SCOPUS articles submitted or accepted at the end of the Project, including 3 for the Project's mid-term reporting period*) were exceeded more than three times for the Project's mid-term reporting period: **10** *SCOPUS* articles already published: seven of them **Q1-Q2**, two SCOPUS articles **Q4**; one Proceeding.

Original scientific articles published in journals indexed in the Web of Science Core Collection or SCOPUS databases, whose citation index reaches at least 50 percent of the industry average citation index (Q1, Q2)

1. **Čeirāns A., Pupins M.**, Kirjusina M., Gravele E., Mezaraupe L., **Nekrasova O.**, Tytar V., Marushchak O., Garkajs A., Petrov I., **Skute A.,** Georges J.-Y., Theissinger K. (**2023**): Top-down and bottom-up effects and relationships with local environmental factors in the water frog–helminth systems in Latvia. – *Scientific Reports*, 13: 8621. https://doi.org/10.1038/s41598-023-35780-7. ISSN 20452322**. Web of Science SCIE. SCOPUS**. **Quartile: Q1**.
2. Tytar V., **Nekrasova O., Pupins M., Skute A.**, Kirjusina M., Gravele E., Mezaraupe L., Marushchak O., **Čeirāns A.**, Kozynenko I., Kulikova A. (**2023**): Modelling the distribution of the chytrid fungus *Batrachochytrium dendrobatidis*, with special reference to Ukraine. – *Journal of Fungi*, 9(6): 607. ISSN 2309608X. https://doi.org/10.3390/jof9060607. H-Index 39. **Web of Science SCIE**. **SCOPUS. Quartile: Q1**.
3. **Pupins M., Nekrasova O.**, Tytar V., Garkajs A., Petrov I., Morozova A., Theissinger K., **Čeirāns A., Skute A.** Georges J.-Y. (**2023**): Geographically isolated wetlands as a reserve for the conservation of amphibian biodiversity at the edge of their range. – *Diversity*, 15 (3): 461. https://doi.org/10.3390/d15030461 ISSN 1424-2818. Science Citation Index Expanded – Web of Science (Clarivate Analytics); Zoological Record (Clarivate Analytics). Impact Factor: 1,407 (2021). CiteScore (SCOPUS) 1, 7 (2021), Scimago Hi 38. **SCOPUS. Quartile: Q1**.
4. **Pupins M.**, Martinez-Silvestre A., Arribas O., **Čeirāns A.**, Kirjusina M. (**2023**): First records of *Scinax ruber*, *Podarcis siculus*, *Podarcis ionicus* and its parasites in Latvia: fruits trade is an intercontinental alien herpetofauna and parasitofauna invasion vector into Europe. – *BioInvasions Records*, 12 (1): 321–329. DOI:10.3391/bir.2023.12.1.29 H-Index 19. **SCOPUS**. **Quartile: Q2**.
5. **Pupins M., Nekrasova O.**, Marushchak O., Tytar V., Theissinger K., **Čeirāns A., Skute A.**, Georges J.-Y. (**2023**): Potential threat of an invasive fish species for two native newts inhabiting wetlands of Europe vulnerable to climate change. – *Diversity*, 15 (2):201. https://doi.org/10.3390/d15020201. ISSN 1424-2818. Science Citation Index Expanded – Web of Science (Clarivate Analytics); Zoological Record (Clarivate Analytics). Impact

Factor: 1,407 (2021). CiteScore (SCOPUS) 1, 7 (2021), Scimago Hi 38. **SCOPUS. Quartile: Q1.**

6. Tytar V., **Nekrasova O.**, Marushchak O., **Pupins M., Skute A., Čeirāns A.**, Kozynenko I. (**2022**): The spread of the invasive locust digitate leafminer *Parectopa robiniella* Clemens, 1863 (Lepidoptera: Gracillariidae) in Europe, with special reference to Ukraine. – *Diversity*, 14(8): 605. https://doi.org/10.3390/d14080605. ISSN 1424-2818. Web of Science (Clarivate Analytics Science Citation Index Expanded; Impact Factor: 1,407 (2021). CiteScore (SCOPUS) 1, 7 (2021), Scimago Hi 38. **SCOPUS. Quartile: Q2.**
7. **Nekrasova O.**, Tytar V., **Pupins M., Čeirāns A.** (**2022**): Range expansion of the alien red-eared slider *Trachemys scripta* (Thunberg in Schoepff, 1792) (Reptilia, Testudines) in Eastern Europe, with special reference to Latvia and Ukraine. – *BioInvasions Records*, 11 (1): 287–295. https://doi.org/10.3391/bir.2022.11.1.29. **SCOPUS**. **Quartile: Q2**.

Original scientific articles published in journals or conference proceedings indexed in the Web of Science or SCOPUS databases

8. Tytar V., **Nekrasova O., Pupins M., Skute A**., Fedorenko L., **Čeirāns A**. (**2022**): Modelling the range expansion of pumpkinseed *Lepomis gibbosus* across Europe, with a special focus on Ukraine and Latvia. – *North-Western Journal of Zoology*, 18 (2): 143-150. Article No.: e221403. https://biozoojournals.ro/nwjz/content/v18n2.html. Web of Science (Clarivate Analytics) Science Citation Index Expanded. H-Index 19. ISSN: 1584-9074. 1843-5629. **SCOPUS. Quartile: Q4**.
9. **Pupins M.**, Telnov D., Matrozis R., **Čeirāns A.** (**2022**): First report of abnormal amplexus cases in Anura (Amphibia) from Latvia. – *Biharean Biologist*, 16 (1): 47-50. Article No.: e222302. P-ISSN: 1843-5637, E-ISSN: 2065-1155. H-Index 8. **SCOPUS. Quartile: Q4**.
10. Oreha J., Morozova A., Garkajs A., Kirjušina M., **Škute N.** (2023) Genetic Diversity and Population Structure of the European Eel (*Anguilla anguilla*) in Baltic Lakeland. Environment. Technology. Resources. Rezekne, Latvia, Proceedings of the 14th International Scientific and Practical Conference. Volume 1, 161-165; https://doi.org/10.17770/etr2023vol1.7297 **SCOPUS**

Conference materials - full text (except those indexed in SCOPUS and Web of Science Core Collection)

1. **Nekrasova O**., Marushchak O., **Pupins M.**, Tytar V., Georges J.-Y., Theissinger K., **Čeirāns A., Skute A.** (**2022**): Modeling the influence of invasive fish species *Perccottus glenii* (Dybowski, 1877) on the distribution of newts in Eastern Europe, exemplified by *Lissotriton vulgaris* (Linnaeus, 1758) and preserved *Triturus cristatus* (Laurenti, 1768), using a GIS approach. – *Biology and Life Sciences forum*. 7 pp. Proceedings of the The 2nd International Electronic Conference on Diversity (IECD 2022) New Insights into the Biodiversity of Plants, Animals and Microbes. 2022.03.15.-2022.03.31. MDPI, Basel, Switzerland. https://sciforum.net/paper/view/12440
2. Tytar V., **Nekrasova O.**, Kozinenko I., Marushchak O., **Pupins M., Skute A**. (**2022**): The spread of the invasive locust digitate leafminer *Parectopa robiniella* Clemens, 1863 (Lepidoptera: Gracillariidae): the Ukrainian context. – *Biology and Life Sciences forum*. 15(1), 4. Biol. Life Sci. Forum 2022, 15, 4. doi: 10.3390/IECD2022-12408. Proceedings of the The 2nd International Electronic Conference on Diversity (IECD 2022) - New Insights into the Biodiversity of Plants, Animals and Microbes. 2022.03.15.-2022.03.31. MDPI, Basel, Switzerland. https://doi.org/10.3390/IECD2022-12408

2.2. Opportunities for research development

While developing the study and based on the results of the project research, several project applications were prepared, which expand the opportunities for research development (see Figure 2).

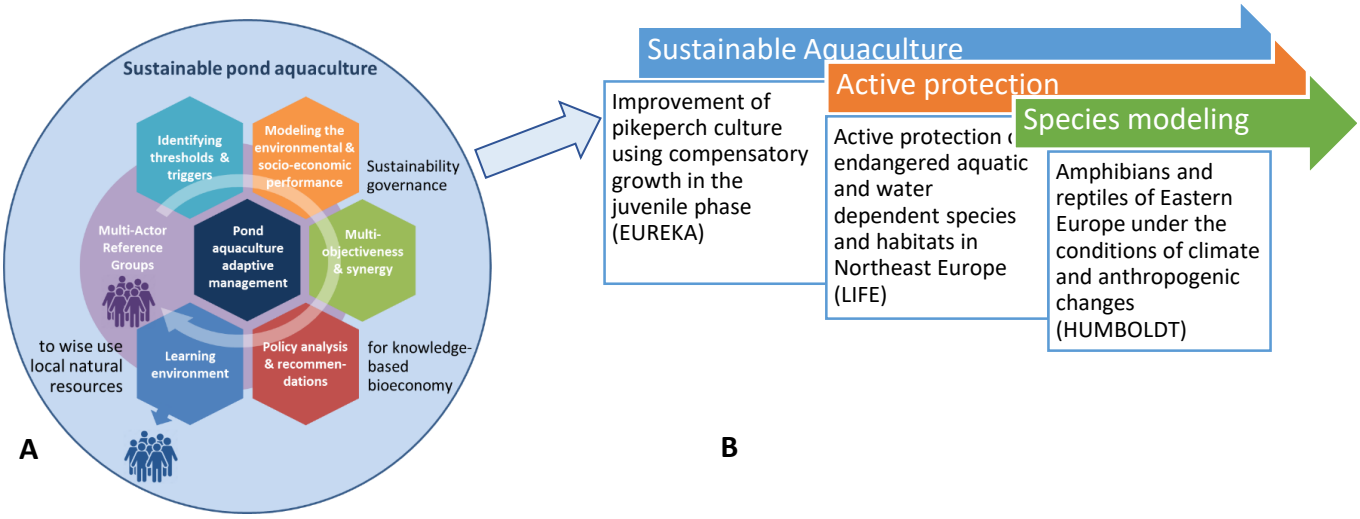

Figure 2 Project lzp-2021/1-0247 concept (**A**) and research development opportunities (**B**).

Developing the research opportunities, results and scientific cooperation of the Project, **3** research projects were developed and submitted in cooperation with French, German, Polish, Hungarian, Ukrainian and Lithuanian scientists from **9** institutions.

PROJECT PROPOSALS

1) EUREKA "Improvement of pikeperch culture using compensatory growth in the juvenile phase" Application number 2269 (acronym: OPTI-PERCH), 12.09.2022.

2) LIFE "Active protection of endangered aquatic and water dependent species and habitats in Northeast Europe" (acronym: LIFE-BalTur), Proposal number: 101102967; LIFE22-NAT-PL-LIFE-Wetlands-PL2022. 02.10.2022.

3) HUMBOLDT (Application for MSCA4Ukraine) Amphibians and reptiles of Eastern Europe under the conditions of climate and anthropogenic changes (chorological features, species distribution modeling and protection). 11.11.2022.

Research development (conducting and continuing joint research, developing new joint SCOPUS publications, submitting joint projects and advising new Latvian projects) is already underway and will continue with scientists from **9** institutions from **11** countries (see Table No. 1).

Table No. 1

No.	Collaborating institution/organization, country	Type of collaboration	Period
1.	**CNRS** Institut Pluridisciplinaire Hubert Curien IPHC UMR7178, **France**	Joint research and development of joint *SCOPUS* publications. Submission and implementation of the joint project EU Biodiversa EMYS-R. Scientific supervision and consultations of the project (No. lzp-2021/1-0247).	2022-2027 2021-2025 2021-2024

No.	Collaborating institution/organization, country	Type of collaboration	Period
2.	LOEWE Center for Translational Biodiversity Genomics (TBG), **Germany**	Joint research and development of joint *SCOPUS* publications. Submission and implementation of the joint project EU Biodiversa EMYS-R. Scientific supervision and consultations of the project (No. lzp-2021/1-0247).	2022-2027 2021-2025 2021-2024
3.	**UMR GESTE GEStion Territoriale de l'Eau et de l'environnement, France**	Submission and implementation of the joint project EU Biodiversa EMYS-R.	2021-2025
4.	Gdansk University Department of Socio-Economic Geography, **Poland**	Joint research and development of joint *SCOPUS* publications. Submission and implementation of the joint project EU Biodiversa EMYS-R.	2022-2025 2021-2025
5.	Network of Aquaculture Centres in Central and Eastern Europe (NACEE), **Bulgaria, Hungary, Lithuania, Moldova, Poland, Ukraine, Latvia**, **Estonia**.	Submission and implementation of joint projects. Scientific supervision and consultations of the project (No. lzp-2021/1-0247). International verification and dissemination of project results.	2022-2032 2022-2026 2022-2032
6.	Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv, **Ukraine**	Joint research and development of joint *SCOPUS* publications. Implementation of the joint project EU Biodiversa EMYS-R and other projects	2022-2032 2022-2025
7.	Collegium Civitas HIVE - Systems Collective Design Lab, **Poland**	Implementation of the joint project EU Biodiversa EMYS-R and other projects	2021-2026
8.	Institute of Marine Biology, National Academy of Science of Ukraine, Odessa, **Ukraine**	Submission and implementation of joint projects. Scientific supervision and consultations of the project (No. lzp-2021/1-0247).	2022-2025 2022-2025

2.3. Socio-economic impact of results

The socio-economic impact of the project results was expressed in cooperation with Latvia's largest aquaculture company A/S Nagli and participation in the *Network of Aquaculture Centers in Central and Eastern Europe* (NACEE). For an example of the dissemination of the socio-economic impact of the project results, using DU's participation in the network of Aquaculture centers in Central and Eastern Europe, see in Figure 3.

As part of the project, a teaching tool was prepared on the method of collecting green frogs for scientific and environmental research, in cooperation with the Latgale Ecological Society and foreign partners (see Table No. 2).

Table No. 2

No.	Collaborating institution/organization, country	Type of collaboration	Period
1.	A/S Nagli	The results of the project will be implemented and verified by realisation of the Project no. lzp-2021/1-0247. The planned socio-economic impact will be realized by involving a wide spectrum of interested parties (multi-actor approach).	2023-2027
2.	Network of Aquaculture Centres in Central and Eastern Europe (NACEE), **Bulgaria, Hungary, Lithuania, Moldova, Poland, Ukraine, Latvia**, **Estonia**.	The results of the project will be imported and verified using DU's participation in the network of Aquaculture Centers in Central and Eastern Europe.	2023-2028
3.	Schmalhausen Institute of Zoology, NAS of Ukraine, Kyiv, **Ukraine**; Center for Translational Biodiversity Genomics, TBG - Senckenberg Nature Research Institute, Frankfurt, **Germany;** Université de Strasbourg, CNRS, IPHC UMR 7178, F-67000 Strasbourg, **France**	Pupins M., Čeirāns A., Nekrasova O., Theissinger K., Georges J.-Y. (2022): Method of collecting green frogs for scientific and environmental studies by hand net catching. – Latgales ecological society, 11 pp. DOI: 10.13140/RG.2.2.11505.35682.,	

2.4. Publicity and communication

Publicity and communication activities of the project were carried out according to the plan, participating with reports in international scientific conferences in Latvia and abroad:

1. **Turkey, Antalia. Joint ESENIAS and DIAS Scientific Conference and ESENIAS Workshop. 2022.11.07.-2022.11.15.** Theissinger T., Jean-Yves Georges J.-Y., Pupins M., Nekrasova O., Tytar V., Marushchak O., Čeirāns A., Skute A.: Prospects for the distribution of the North American species signal crayfish *Pacifastacus leniusculus* in Europe.
2. **Latvia, Daugavpils. International Conference on Biodiversity Research. 2022.10.20.** Grāvele E., Pupins M., Vasylenko V., Mickevičius S., Kirjušina M.: The helminthfauna study of *Rana temporaria* Linnaeus, 1758 in Latvia. 2) Skute N., Skute A., Nekrasova O., Tytar V., Pupins M., Čeirāns A., Marushchak O., Kvach Y., Zamorov V., Kirjusina M.: Status, triggers and prospects of the invasion of Chinese sleeper (*Perccottus glenii*) in Latvia.

3. **Czech Republic, Prague. 6th European Congress of Conservation Biology. Biodiversity crisis in a changing world. 2022.08.22.-2022.08.26.** Pupins M., Nekrasova O., Tytar V., Marushchak O., Georges J.-Y., Theissinger K., Čeirāns A., Skute A.: Aquaculture of Asian fish species *Ctenopharyngodon idella*: prospects for adaptation in Eastern Europe in the context of climate change.

4. **Germany, Berlin. 36th Congress of the International Society of Limnology. 2022.08.07.-2022.08.10.** Georges J.-Y., Pupins M., Nekrasova O., Tytar V., Skute A., Čeirāns A., Petrov I., Theissinger K.: Distribution trends of invasive Asian carps (*Hypophthalmichthys molitrix* and *Aristichthys nobilis*) in Europe in the context of climate change.

5. **Portucal, Lisbon. IUBMB-FEBS-PABMB Congress. 2022.07.09.-2022.07.14.** Umbrasko I., Batjuka A., Petjukevics A., Pupins M., Škute N.: Evaluation of microbiome of free-living and Zoo turtles by immunological methods and Raman spectroscopy.

6. **Czech Republic, Hluboka nad Vltavou. 23th International Symposium of Association of Astacology**. **2022.06.20.-2022.06.25.** Georges J.-Y., Kuhn I., Combroux I., Francesconi C., Grac C., Graf L., Lemonnier G., Meka J., Pardonnet S., Pupins M., Schmidt I., Skute A., Theissinger K.: When reintroduction turns to invasion: a fable about turtles and crayfish.

7. **Belgium, Oostende. 22nd International Conference on Aquatic Invasive Species. 2022.04.18.-2022.04.22.** Nekrasova O., Pupins M., Marushchak O., Tytar V., Martinez-Silvestre A., Georges J.-Y., Theissinger K., Čeirāns A., Skute A.: Prospects for the invasion of six exotic aquatic turtles' species recorded in Eastern Europe: bioclimatic thresholds.

8. **Switzerland, Basel. MDPI Diversity. The 2nd International Electronic Conference on Diversity (IECD 2022) - New Insights into the Biodiversity of Plants, Animals and Microbes. 2022.03.15.-2022.03.31.**

    1) Nekrasova O., Marushchak O., Pupins M., Tytar V., Georges J.-Y., Theissinger K., Čeirāns A., Skute A. (2022): Modeling the influence of invasive fish species *Perccottus glenii* (Dybowski, 1877) on the distribution of newts in Eastern Europe, exemplified by *Lissotriton vulgaris* (Linnaeus, 1758) and preserved *Triturus cristatus* (Laurenti, 1768), using a GIS approach.

    2) Tytar V., Nekrasova O., KozynenkoI., Marushchak O., Pupins M., Skute A. (2022): The spread of the invasive locust digitate leafminer *Parectopa robiniella* Clemens, 1863 (Lepidoptera: Gracillariidae): The Ukrainian context.

9. **Latvia, Rēzekne. 14th International Scientific Practical Conference "Environment. Technology. Resources". June 15 – 16, 2023.** Oreha J., Morozova A., Garkajs A., Kirjušina M., Kostousov V., Škute N., Genetic diversity and population structure of the European Eel (*Anguilla anguilla*) in Baltic Lakeland.

10. **Latvia, Riga. 80th International Scientific Conference of University of Latvia. Section: Innovative and Applied Research in Biology. 2022.02.18.** Boikova E., Eņģele L., Evarte Bundure G., Grandāns G., Pupiņš M., Valainis U.: Augšdaugavas aizsargājamo ainavu apvidus floras un faunas daudzveidība, savdabība un teritorijas apsaimniekošanas ieteikumi.

11. **Lithuania, Kaunas. VIII Baltic Genetics Congress. March 22-24, 2023.** Oreha J., Morozova A., Garkajs A., Kirjušina M., Kostousov V., Škute N., European Eel (*Anguilla anguilla*) Mitochondrial DNA Diversity in Part of Baltic Lakeland.

Table No. 3

No.	Activity (e.g. an interview in the media)	Description (in collaboration with whom, target audience if any, website, etc.)	Period/date
1.	Publication of the project and results on the DU website	The activity was carried out in cooperation with Daugavpils University administration and specialists, www.du.lv target audience: pond aquaculture specialists, scientists, students, society.	2022.
2.	Workshop for the leading aquaculture specialists of Latvia's largest pond farm A/S Nagli	The activity was carried out in cooperation with the administration of pond farming A/S Nagli, target audience: leading specialists	14.10.2022.
3.	Publicity of the project's innovative ecological studies and their results by integrating them into the "General Ecology" lecture course for students of the Bachelor of Environmental Science program	3 lectures, 3 seminars. The activity was carried out in cooperation with the administration of Daugavpils University and the lecturers of the target course, target audience: students of the environmental science bachelor's program	2022 September-December
4.	Publicity of the socio-economic results of the project by integrating them into the lecture course "Applied biology and bioeconomy I: Maintenance and protection of natural living resources" for students of the Master's program in Biology	1 lecture, 2 practical works. The activity was carried out in cooperation with the administration of Daugavpils University and the lecturers of the target course, target audience: students of the Biology Master's program	2022 October-December
5.	Publicity of the project and innovative research methods by integrating them into the lecture course "Field Research Methodology" for students of the Master's Program in Biology	2 lectures, 1 practical work. The activity was carried out in cooperation with the administration of Daugavpils University and the lecturers of the target course, target audience: students of the Biology Master's program	2022 October-December
6.	Publicity of the project and its innovative methods in aquaculture by integrating them into the lecture course "Applied Biology and Bioeconomy I: Maintenance and Protection of Natural Living Resources" for students of the Master's	1 lectures, 1 practical work. The activity was carried out in cooperation with the administration of Daugavpils University and the lecturers of the target course, target audience: 14 students of the Biology Master's program from Malaysia and the Philippines	2022 October-November

No.	Activity (e.g. an interview in the media)	Description (in collaboration with whom, target audience if any, website, etc.)	Period/date
	Program in Biology from Malaysia and the Philippines		
7.	Project launch press release: Project goals and methods	The activity was carried out in cooperation with the administration of Daugavpils University and reserchers, https://du.lv/project/ekologiskie-un-socialekonomiskie-slieksni-ka-pamats-lai-definetu-adaptivas-parvaldibas-trigerus-latvijas-diku-akvakultura/ target audience: mass media, society, specialists	09.01.2022

2.5. Contribution to the capacity building of the project's scientific steam, including the students, as well as to the improvement of the study environment

The project has a significant contribution to building the capacity of the Project's scientific group, including students, as well as improving the study environment. The scientific group of the Project increased its scientific qualification and research capacity by publishing **10** SCOPUS articles in journals (including **seven** in **Q1-Q2**) and developing innovative research methods, which were learned by all Project participants.

A significant improvement of the study environment was provided by the integration of the innovative research methods and results of the Project in the Daugavpils University study courses: *Basics of Aquaculture, Hydroecology, Environmental Impact Assessment, Methods of Environmental Monitoring, Field research methodology* and active participation of students in the implementation of the Project.

Table No. 4

Doctoral, master's or bachelor's theses supervised or advised by the principal investigator or the lead participants within the framework of this project (if the thesis is defended, indicate it in the last column of the table, specifying the date and the promotional council)

No.	Author	Title	Supervisor and consultant	Defense
1.	Ņikita Bašmakovs	Using echosounding methods to determine quantities of fish in lake Svente	Artūrs Škute	Bachelor's thesis, 08/06/2022, at the meeting of the final examination commission for DU bachelor's theses
2.	Viktorija Adamoviča	Using the bioindication method in assessing biological diversity in pond ecosystems	Artūrs Škute	Bachelor's thesis, 05/06/2023, at the meeting of the final examination commission for DU bachelor's theses
3.	Anastasija Čerkesa	Genetic structure of perch (*Perca fluviatilis* (L.)) population in the Daugava River near Plavinas city	Nataļja Škute, Artūrs Škute	Master's thesis, 05/06/2023, at the DU master's theses final examination committee meeting

3. Implementation

The project implementation schedule is shown in table No. 5

T0. Project management.
Activities:
A0.1. Scientific supervising of the project will ensure proper progress of the entire project (see Figure 3).
A0.2. Administrative management will ensure proper financial administration, the budget management and monitoring, and the preparation of financial statements.
A0.3. Knowledge Management Plan for the whole project.

T1. Multi-actor approach.
Activities:
A1.1. Multi-Actor Reference Groups (MARG) establishement.
A1.2. Involvement of MARG

T2. Threshold components.
Activities:
A2.1. Identification of threshold triggers.
A2.2. Evaluation of threshold feedback mechanisms.
A2.3. Determination of threshold feedback switch.

T3. Modelling & synergy.
Activities:
A3.1. Opportunities modelling.
A3.2. Threats modelling.

T4. Policy recommendations.
Activities:
A4.1. Policy analysis.
A4.2. Policy recommendations.

T5. Communication and dissemination.
Activities:
A5.1. Dissemination of Project implementation and results.
A5.2. Learning environment and materials

Table No. 5 Project Gantt chart (activities already implemented are marked with a darker color)

Years	2022.				2023.				2024.			
Quarter / Activity	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.
A0.1.												
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Mid-term Report

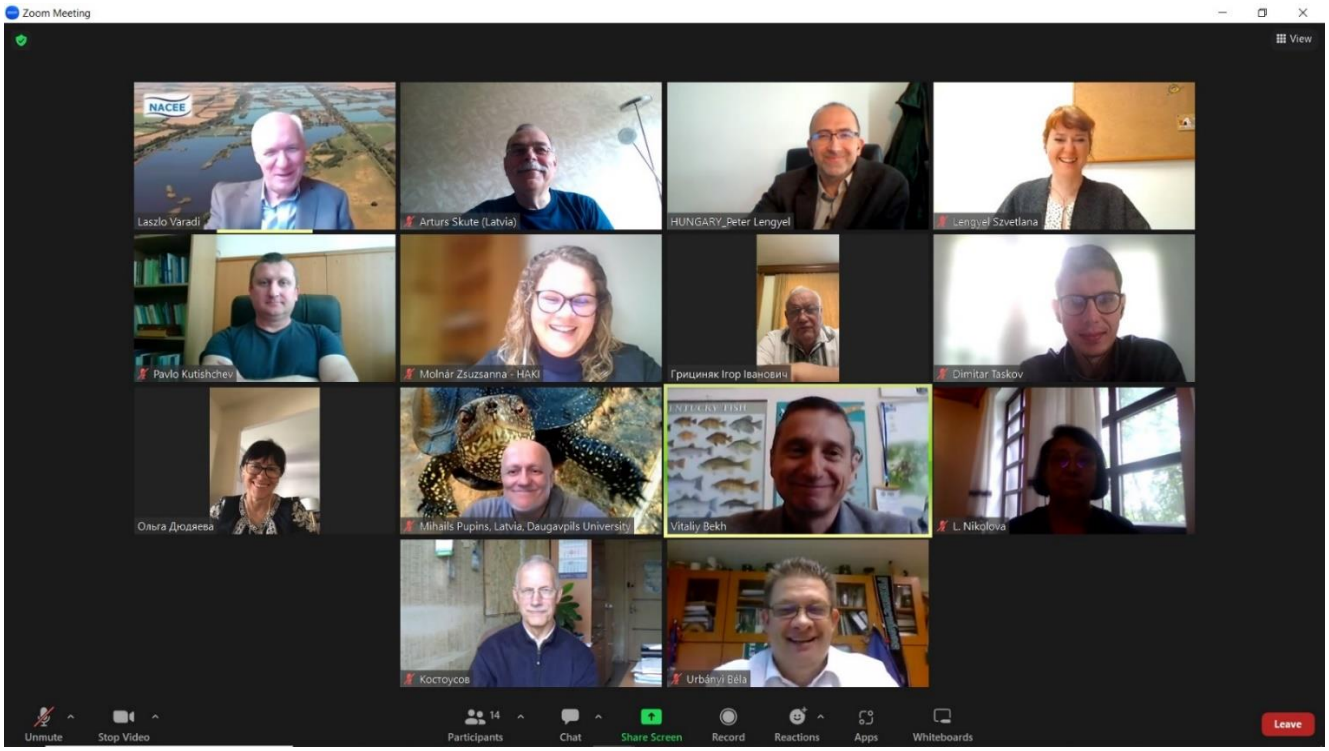

Figure 3 Scientific supervising of the project and dissemination of the socio-economic impact of the project results through DU participation in the network of Aquaculture Centers in Central and Eastern Europe – **NACEE**, (Bulgaria, Hungary, Lithuania, Moldova, Poland, Ukraine, Latvia, Estonia, etc.)