„Apdraudētas sugas Latvijā: uzlabotas zināšanas un kapacitāte, informācijas aprite un izpratne"
(Projekta Nr. LIFE19 GIE/LV/000857)

Seminārs "Abinieku un rāpuļu aizsardzība"

2023. gada 14. decembris

Rīgas Nacionālais zooloģiskais dārzs, Meža prospekts 1, Rīga

Invazīvās abinieku un rāpuļu sugas – esošie un nākotnes invazīvie izaicinājumi herpetofaunas saglabāšanai Latvijā

14.12.2023.

15:25 – 15:55

Mihails Pupiņš

Daugavpils Universitāte

Latgales zoodārzs

Latgales zoodārzs

Dzīvnieku aizsardzības likums

18) **zooloģiskais dārzs** – pastāvīga vieta, kur savvaļas sugu dzīvnieki tiek turēti izstādīšanai publikas apskatei sezonas vai vairāk dienas gadā, sugas saglabāšanas, pavairošanas, reintrodukcijas, pētniecības un sabiedrības izglītošanas nolūkā.

Ministru kabineta noteikumi Nr.1033

Rīgā 2010.gada 9.novembrī (prot. Nr.59 10.§)

Prasības savvaļas sugu dzīvnieku turēšanai zooloģiskajā dārzā un prasības zooloģiskā dārza izveidošanai un reģistrācijai

Zinātne

4.3.1. [illegible] par dzīvnieku sugām un informācijas apmaiņa attiecībā uz sugu saglabāšanu [illegible] aizsardzību, populāciju atjaunošanu vai sugu reintrodukciju;

Dabas aizsardzība

4.3.3. piedalīšanās savvaļas dzīvnieku (īpaši apdraudēto dzīvnieku sugu) saglabāšanas un reintrodukcijas programmās un vairošanā nebrīvē;

Ekoloģiskā audzināšana

4.3. [illegible] pasākumi, kas veicina sabiedrības vides izglītību un ekoloģiskās apziņas veidošanu, kā [illegible] informāciju par eksponētajām dzīvnieku sugām un to dabisko dzīves vidi;

Latgales zoodārza nolikums

II. Iestādes darbības mērķis funkcijas, uzdevumi un tiesības

7. Iestādes darbības mērķis ir sabiedrības izglītošana vides un ekoloģiskās kultūras jomā, faunas sugu eksponēšana, zookultūra, izpēte un dabas aizsardzība.

IAS

International Coauthorship 2021-2[illegible]
40 universities, 20 countries

Daugavpils University
Latgales Zoo
Labor of Nature Conservation

IAS Ecology, distribution

Nature conservation
IAS Practical actions

IAS removing, safe biotopes

Science
IAS Research

DU LZD

Ecological education
IAS Prevention

IAS Modelling and Recommendations

IAS Profilakses Stratēģija LZD-DU

IZPĒTE

IAS lauka pētījumi
- IAS pirmie ziņojumi
- IAS izplatība un skaits (monitorings)
- HAS sensitīvo populāciju stāvoklis
- IAS Ekoloģija un etoloģija
- *+ Paraugu ņemšana*

IAS laboratorijas pētījumi
- IAS DNS analīze (izcelsme, ekoloģijā)
- IAS parazīti

IAS matemātiskie pētījumi
- IAS modelēšana (bioklimatiskā, saistošo sugu utt. 20-30-100 g.)

IZSTRĀDE

IAS plānu izstrāde
- IAS apkarošanas rekomendāciju izstrāde
- HAS Sugas aizsardzības plānu izstrāde (anti-IAS integrācija)

IAS plānošana
- Biotopu anti- IAS optimizācijas plānu izstrāde
- Anti-IAS darbu tehnisko specifikāciju izstrāde

IZPILDE

In-Situ
- Biotopu anti-IAS optimizācija
- IAS izķeršana dabā

Ex-situ
- Nevajadzīgo IAS pieņemšana
- IAS savākšana no īpašniekiem
- IAS patversme
- HAS zookultūra populāciju uzlabošanai

IZPLATĪŠANA UN IZGLĪTOŠANA

Zinātniskā verifikācija
Zinātniskie raksti (Q!-Q2>50%)
Zinātniskās konferences (EU, World)
Zinātniskie tikli (EU, World)

Speciālistu apmācība
Biologu apmācība (Lauka pētījumi)
Biologu apmācība (Bioekonomika)
Integrācija biologu citos kursos
Mācību papildus līdzekļi

Informācija specialistiem
Sugu aizsardzības plāni (Eo Bb)
IAS rekomendācijas
Projektu IAS dokumentācija
Projektu atskaites

Informācija publikai
IAS brošūras
Web-saiti un sociālie tikli
Mass-media (radio, TV, avīzes)
Stendi un QR-stendi
IT MI mobilā aplikācija

Native species

Human Introduction to new territories (?)

Alien species

Does not find its ecological niche

Finds its ecological niche

Invading ecological niches

Extinction

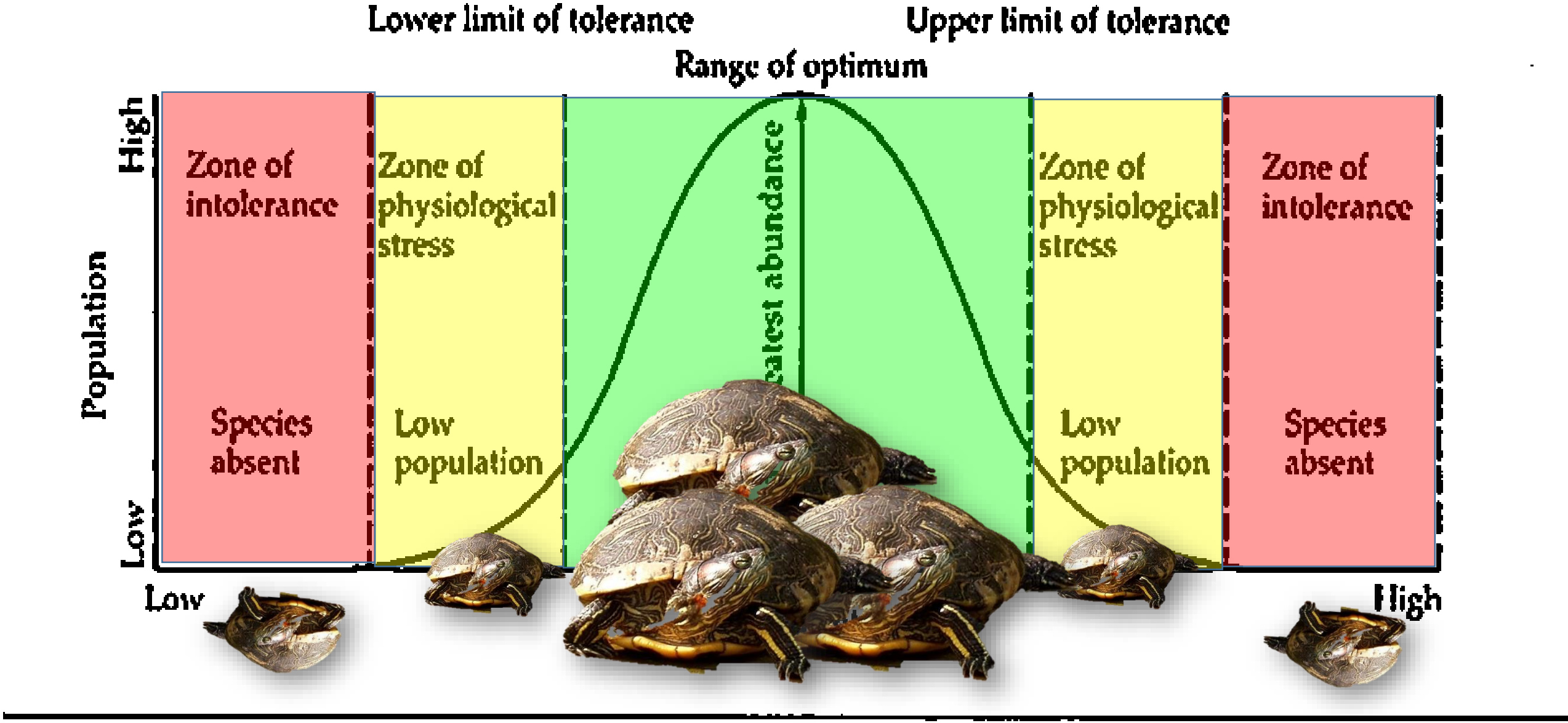
Dormant invasion

ACTIVE INVASION

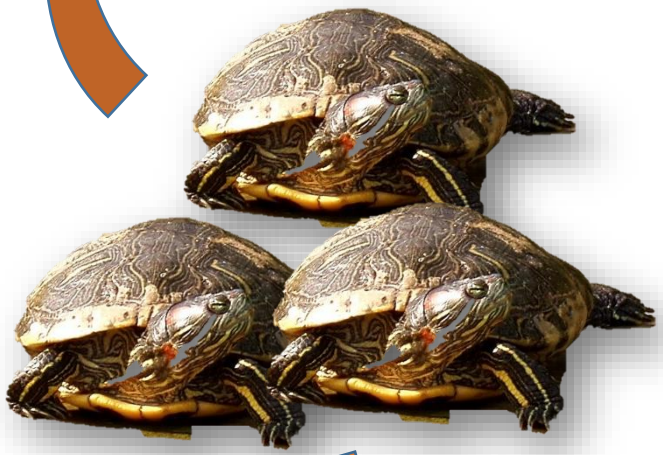
Non-established species

Established species

INVASIVE SPECIES

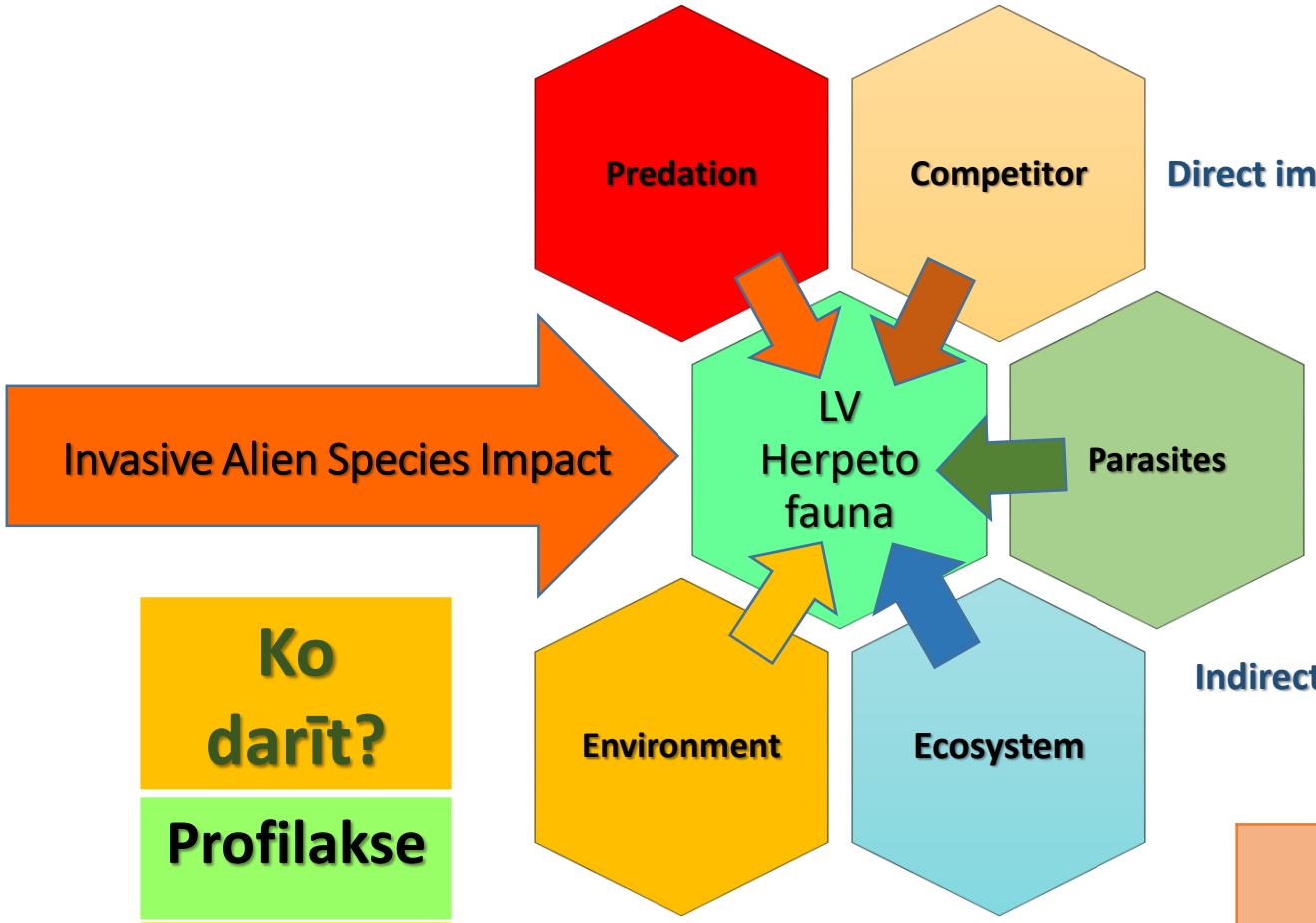


■ **FIGURE 7.2** Organismal distribution along a physical gradient. (*Modified from Cox, Healey, and Moore 1976.*)



+C in winter after 40 years

Invasive Alien Species Impact



Ko darīt?

Profilakse

Pirms

Laikā

Pēc

IAS	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snakes
Predation					
Competition					
Parasites					
Ecosystem					
Environment					

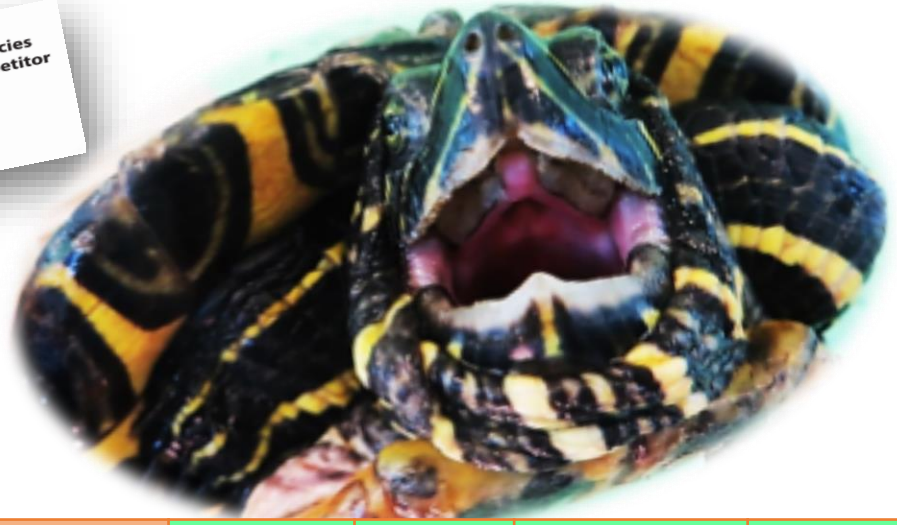
Trachemys scripta

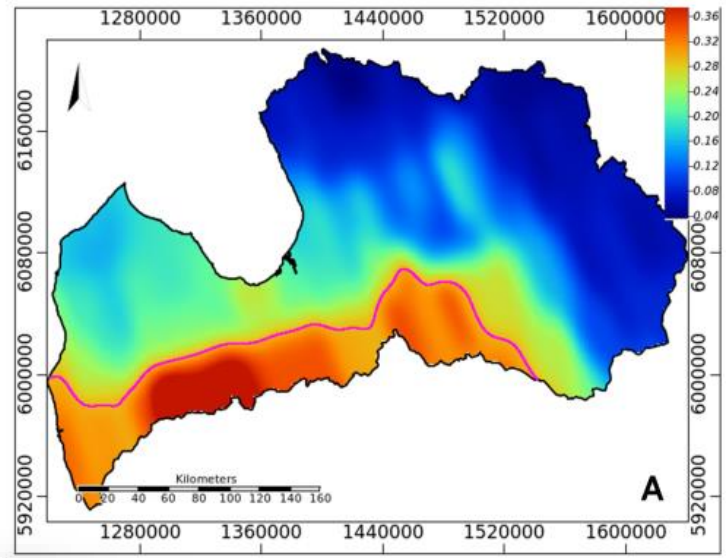
Acta Universitatis Latviensis, 2007, Vol. 723, Biology, pp. 37–46

First report on recording of the invasive species *Trachemys scripta elegans*, a potential competitor of *Emys orbicularis* in Latvia

Mihails Pupins*

Daugavpils University, p.k. 61, Daugavpils LV-5401, Latvia

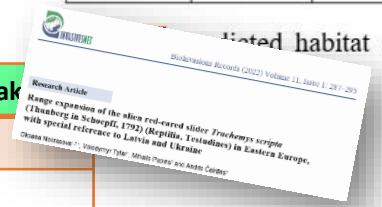




...liated habitat suitability for the red-eared slider.

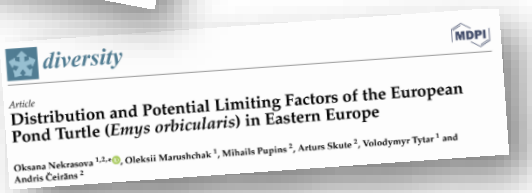
LATGALES ZOODĀRZS - MITRĀJS

Trachemys scripta	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snak
Predation	***	***	*	*	**
Competition	***	**	***		***
Parasites	?	?	***	**	***
Ecosystem	**	**	**	*	**
Environment	*	*	***	*	**



Research Article

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



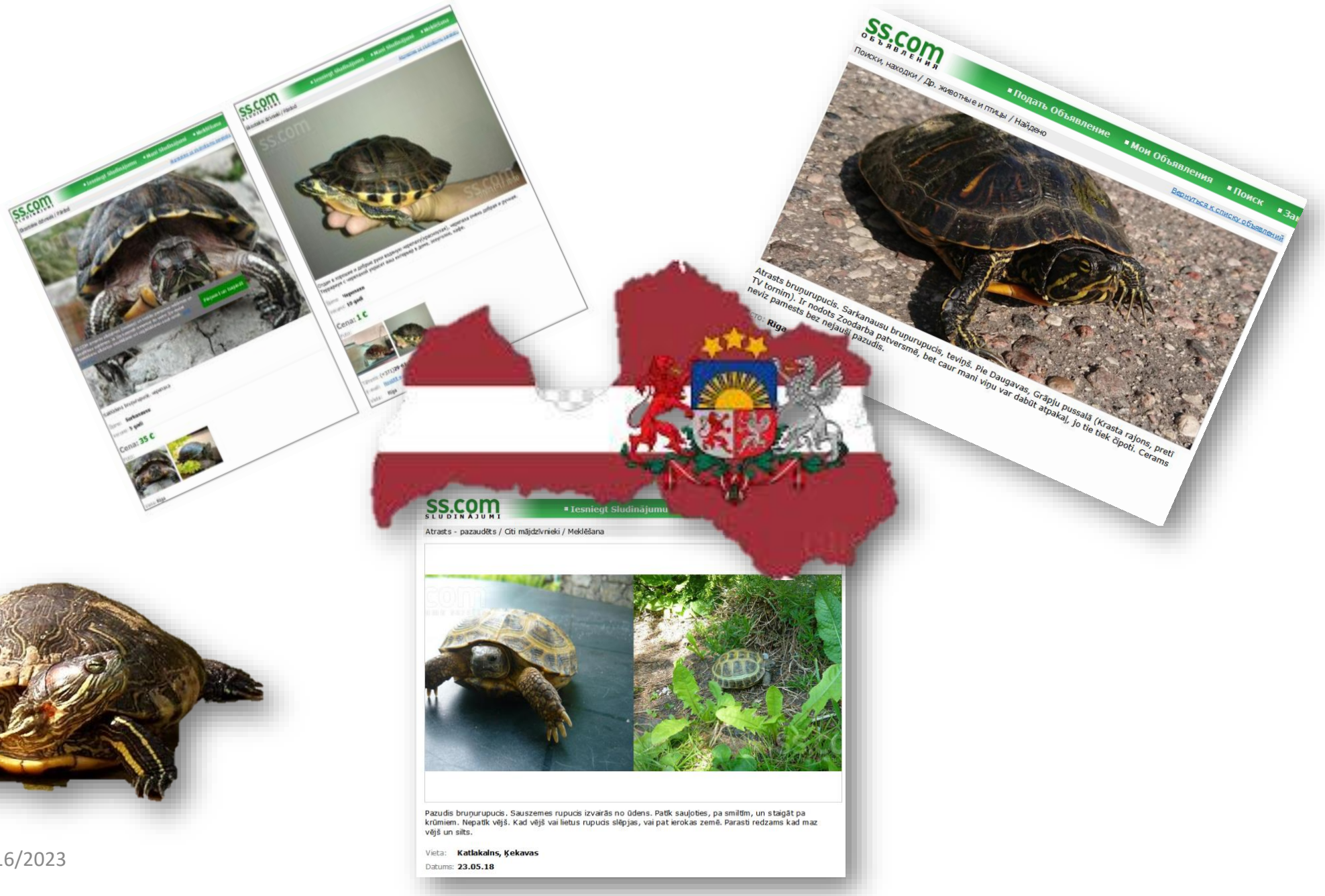
diversity

MDPI

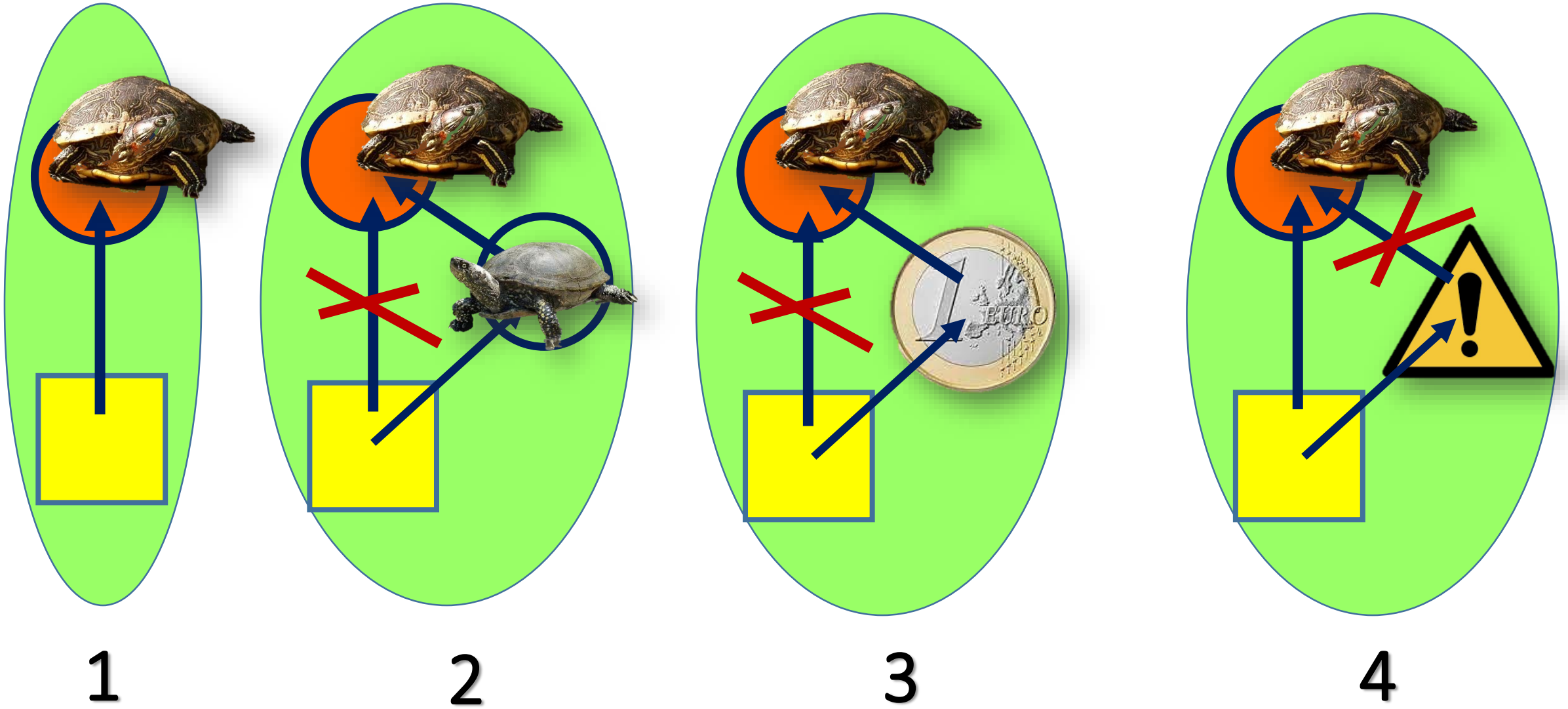
Article

Distribution and Potential Limiting Factors of the European Pond Turtle (*Emys orbicularis*) in Eastern Europe

Oksana Nekrasova [1,2,*], Oleksii Marushchak [1], Mihails Pupins [2], Arturs Skute [2], Volodymyr Tytar [1] and Andris Čeirāns [2]


ss.com
Cena: 35 €
Cena: 1 €
ss.com
ОБЪЯВЛЕНИЯ
Подать Объявление
Мои Объявления
Поиск
Поиски, находки / Др. животные и птицы / Найдено
Вернуться к списку объявлений
Atrasts bruņurupucis. Sarkanausu bruņurupucis, teviņš. Pie Daugavas, Grāpju pussalā (Krasta rajons, pretī TV tornim). Ir nodots Zoodarba patversmē, bet caur manī viņu var dabūt atpakaļ, jo tie tiek čipoti. Ceram nevīz pamests bez nejaušī pazudis.
ss.com
SLUDINĀJUMI
Iesniegt Sludinājumu
Atrasts - pazaudēts / Citi mājdzīvnieki / Meklēšana
Pazudis bruņurupucis. Sauszemes rupucis izvairās no ūdens. Patīk saulloties, pa smiltīm, un staigāt pa krūmiem. Nepatīk vējš. Kad vējš vai lietus rupucis slēpjas, vai pat ierokas zemē. Parasti redzams kad maz vējš un silts.
Vieta: Katlakalns, Ķekavas
Datums: 23.05.18

Anti-IAS apmācība un motivācija



Other IAS Turtles 7+3=10 (11)

1.att. Eiropas purva bruņurupucis
Emys orbicularis

Author Brian Gratwicke

2.att. Loggerheda bruņurupucis *Caretta caretta*

3.att. Ķīnas mīkstādainais bruņurupucis
Pelodiscus sinensis

4.att. Vidusāzijas bruņurupucis
Testudo horsfieldi

5.att. Hermana bruņurupucis
Testudo hermanni gercegovina

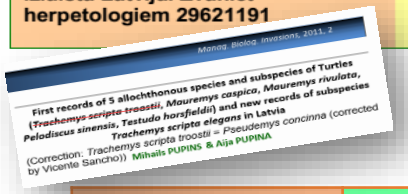
6.att. Sarkanausu bruņurupucis
Trachemys scripta elegans

7.att. Camberlenda bruņurupucis
Trachemys scripta troostii

8.att. Balkānu bruņurupucis
Mauremys rivulata

9.att. Kaspijas bruņurupucis
Mauremys caspica

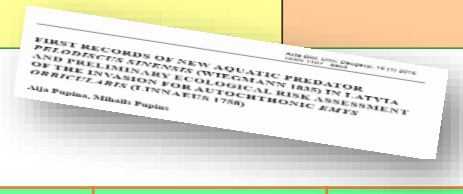
Atslēgas jautājumi Atbildiet uz jautājumiem JĀ, vai NĒ un sekojiet bultiņām	Bruņurupuču sugu nosaukumi
Uz priekšējām kājām ir **1 nags** NĒ JĀ →	**Loggerheda bruņurupucis** *Caretta caretta* (Latvijas suga) 2.att.
Uz priekšējām kājām ir **3 nagi** NĒ JĀ →	**Ķīnas mīkstādainais bruņurupucis** *Pelodiscus sinensis* (3.att.)
Kājas ir **bez pleznām** NĒ JĀ → Uz priekšējām kājām ir **4** nagi NĒ Jā →	**Vidusāzijas bruņurupucis** *Testudo horsfieldi* (4.att.)
	Hermana bruņurupucis (5.att.) *Testudo hermanni gercegovina*
Uz galvas sāniem **divi gareniski** plankumi NĒ JĀ → Plankumi ir **sarkani** vai **oranži** NĒ Jā →	**Sarkanausu bruņurupucis** (6.att.) *Trachemys scripta elegans*
	Camberlenda bruņurupucis *Trachemys scripta troostii* (7.att.)
Uz priekšējām kājām dzelteni **apaļīgi plankumi** NĒ JĀ →	**Eiropas purva bruņurupucis** *Emys orbicularis* (Latvijas suga, LIFE-HerpetoLatvia suga) (1.att.)
Uz kakla **dzeltenīgas svītras** NĒ JĀ → Vēderbruņas **melnas** NĒ Jā →	**Balkānu bruņurupucis** (8.att.) *Mauremys rivulata*
	Kaspijas bruņurupucis *Mauremys caspica* (9.att.)
Agrāk nezināma suga, nelegāli izlaista Latvijā. Zvaniet herpetologiem 29621191	



First records of 5 allochthonous species and subspecies of Turtles (*Trachemys scripta troostii*, *Mauremys caspica*, *Mauremys rivulata*, *Pelodiscus sinensis*, *Testudo horsfieldi*) and new records of subspecies *Trachemys scripta elegans* in Latvia

(Correction: Trachemys scripta troostii = Pseudemys concinna (corrected by Vicente Sancho))

Mihails PUPINS & Aija PUPINA



FIRST RECORDS OF NEW AQUATIC PREDATOR *PELODISCUS SINENSIS* (WIEGMANN 1835) IN LATVIA AND PRELIMINARY ECOLOGICAL RISK ASSESSMENT OF THE INVASION FOR AUTOCHTHONIC FAUNA *ORBICELLARIS* (LINNAEUS 1758)

Aija Pupina, Mihails Pupins

Other IAS turtles	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snakes
Predation (water)	***	***	*	*	**
Competition	***	**	***		***
Parasites	?	?	***	**	***
Ecosystem	**	**	**	*	**
Environment	*	*	***	*	**

Fruit invasion IAS and IAS parasites

BioInvasions Records (2023) Volume 12, Issue 1: 321–329

Rapid Communication

First records of *Scinax ruber*, *Podarcis siculus*, *Podarcis ionicus* and their parasites in Latvia: fruit trade is an intercontinental alien herpetofauna and parasitofauna invasion vector into Europe

Mihails Pupins[1,*], Albert Martinez-Silvestre[2], Oscar Arribas[3], Andris Čeirāns[1] and Muza Kirjusina[1]

Expanding the trade of tropical fruits in an increasingly globalized world increases the likelihood of unintentional importation of viable herpetofauna and their parasites from other countries and even continents, since the conditions for growing and transportation of fruits (humidity, temperature) can often be tolerated by exotic amphibians and reptiles. Here we describe our findings of two reptiles, *Podarcis siculus campestris* and *P. ionicus* (formerly *P. tauricus ionicus*), and an amphibian, *Scinax ruber*, in boxes of tropical fruits in Daugavpils city, Latvia, European Union. In our parasitological survey of *S. ruber*, we found two groups of endoparasites: nematoda (*Physaloptera* sp.) and trematoda (*Travtrema* aff. *stenocotyle* mtc.). In *P. ionicus* intestine we found acanthocephalan *Centrorhynchus* sp. larvae. All these parasites were detected in Latvia for the first time. The estimated minimal direct distance of the trans-oceanic relocation of *S. ruber* and its parasites from its natural distribution centre in Suriname to its finding place in Latvia exceeds 10 600 km.

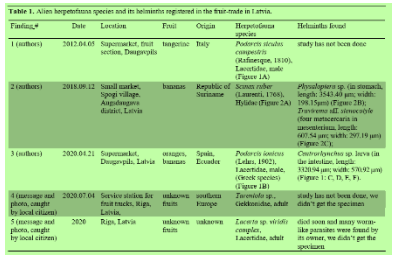


Table 1. Alien herpetofauna species and its helminths registered in the fruit-trade in Latvia.

Finding,*	Date	Location	Fruit	Origin	Herpetofauna species	Helminths found
1 (authors)	2012.04.05	Supermarket, fruit section, Daugavpils	tangerine	Italy	*Podarcis siculus campestris* (Kolleseppe, 1810), Lacertidae, male (Figure 1A)	study has not been done
2 (authors)	2018.09.12	Small market, Spogi village, Augšdaugava district, Latvia	bananas	Republic of Suriname	*Scinax ruber* (Laurenti, 1768), Hylidae (Figure 2A)	*Physaloptera* sp. (in stomach, length: 3543.40 µm; width: 598.15µm) (Figure 2B); *Travtrema* aff. *stenocotyle* (four metacercaria in uncoat cercaria, length: 607.54 µm; width: 297.19 µm) (Figure 2C);
3 (authors)	2020.04.21	Supermarket, Daugavpils, Latvia	oranges, bananas	Spain, Ecuador	*Podarcis ionicus* (Cedra, 1992), Lacertidae, male, (Greek species) (Figure 1B)	*Centrorhynchus* sp. larva (in the intestine; length: 3320.94 µm; width: 570.92 µm) (Figure 1: C, D, E, F).
4 (message and photo, caught by local citizen)	2020.07.04	Service station for fruit trucks, Riga, Latvia.	unknown fruits	southern Europe	*Tarentola* sp., Gekkonidae, adult	study has not been done, we didn't get the specimen
5 (message and photo, caught by local citizen)	2020	Riga, Latvia	unknown fruits	unknown	*Lacerta* sp. *viridis* complex, Lacertidae, adult	died soon and many worm-like parasites were found by its owner, we didn't get the specimen

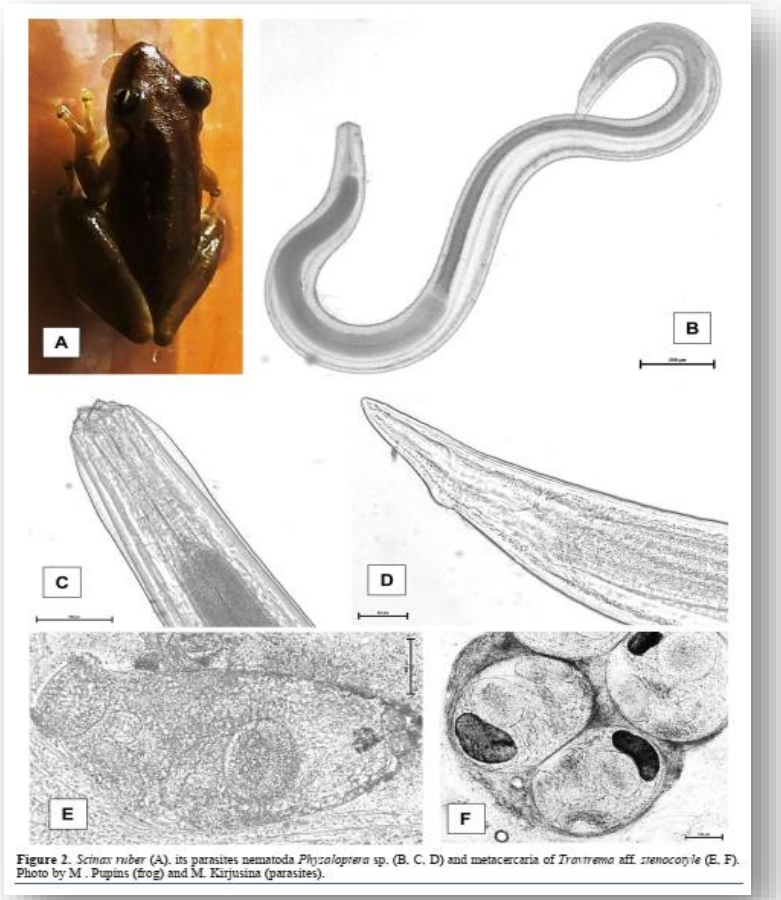


Figure 2. *Scinax ruber* (A). its parasites nematoda *Physaloptera* sp. (B. C. D) and metacercaria of *Travtrema* aff. *stenocotyle* (E. F). Photo by M . Pupins (frog) and M. Kirjusina (parasites).

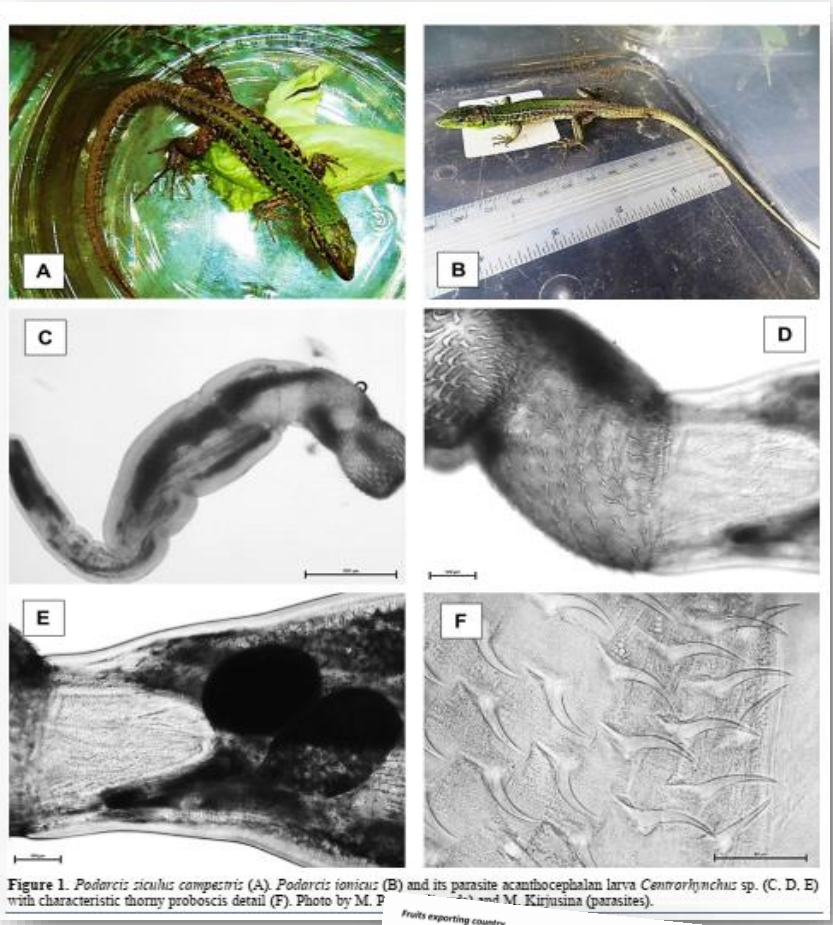


Figure 1. *Podarcis siculus campestris* (A). *Podarcis ionicus* (B) and its parasite acanthocephalan larva *Centrorhynchus* sp. (C. D. E) with characteristic thorny proboscis detail (F). Photo by M. P... and M. Kirjusina (parasites).

Fruit invasions	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snakes
Predation					
Competition		*		*	
Parasites	**	***		***	**
Ecosystem	*	*	*	*	*
Environment					

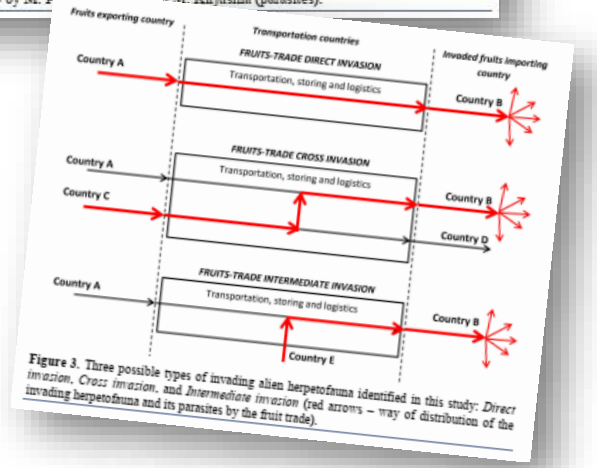


Figure 3. Three possible types of invading alien herpetofauna identified in this study: *Direct invasion*, *Cross invasion*, and *Intermediate invasion* (red arrows – way of distribution of the invading herpetofauna and its parasites by the fruit trade).

Batrachochytrium dendrobatidis

BDEE 2021

sciforum

Conference Proceedings Paper

Identifying Environmental Refuges ("Coldspots") from Infection by Batrachochytrium Dendrobatidis of Amphibians in Eastern Europe

Volodymyr Tytar[1], Oksana Nekrasova[1,2], Mihails Pupins[3], Arturs Skute[3], Oleksii Marushchak[1], Andris Čeirāns[3], Iryna Kozynenko[1]

Abstract: Amphibians are the most threatened group of vertebrates. While habitat loss poses the greatest threat to amphibians, a spreading fungal disease caused by *Batrachochytrium dendrobatidis* Longcore, Pessier & D.K. Nichols 1999 (Bd) is seriously affecting an increasing number of species. Although Bd is widely prevalent, there are identifiable heterogeneities in the pathogen's distribution that are linked to environmental parameters. Our objective was to identify conditions that affect the geographic distribution of this pathogen using species distribution models (SDMs) with a special focus on Eastern Europe. SDMs can help identify hotspots for future outbreaks of Bd but perhaps more importantly identify locations that may be environmental refuges ("coldspots") from infection. In general, climate is considered a major factor driving amphibian disease dynamics, but temperature in particular has received increased attention. Here, 42 environmental raster layers containing data on climate, soil, and human impact were used. The mean annual temperature range (or 'continentality') was found to have the strongest constraint on the geographic distribution of this pathogen. The modeling allowed to distinguish presumable locations that may be environmental refuges from infection and set up a framework to guide future search (sampling) of chytridiomycosis in Eastern Europe.

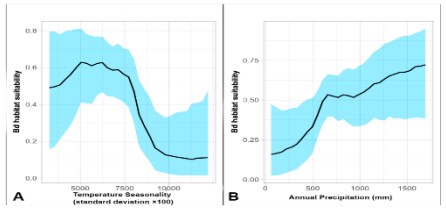


Figure 1. Bd habitat suitability response curves (1.0 corresponds to full association of Bd with x-axis metric: (**A**) partial response curve for Temperature Seasonality (SD × 100); (**B**) partial response curve for Annual Precipitation (mm). Response = habitat suitability.

Table 1. Groups of intercorrelated variables from the considered environmental datasets.

Groups of Intercorrelated Variables from the WorldClim v.2 Dataset at a Cutoff of 0.7	
Cluster Group	**Bioclimatic Variables (Codes)**
1.	Temperature Seasonality (bio4) *, Temperature Annual Range (bio7)
2.	Annual Precipitation (bio12) *, Precipitation of Wettest Month (bio13)
3.	Annual Mean Temperature (bio1), Isothermality (bio3), Min. Temperature of Coldest Month (bio6) *
4.	Mean Diurnal Range (bio2), Max. Temperature of Warmest Month (bio5) *
5.	Precipitation of Driest Month (bio14), Precipitation Seasonality (bio15) *
*—Selected variable	

Groups of Intercorrelated Land Cover Variables from the EarthEnv Dataset at a Cutoff of 0.7	
Cluster Group	**Land Cover Variables**
1.	Evergreen/Deciduous Needleleaf Trees *
2.	Evergreen Broadleaf Trees *
3.	Deciduous Broadleaf Trees *
4.	Mixed/Other Trees *, Snow/Ice
5.	Shrubs *
6.	Herbaceous Vegetation, Cultivated and Managed Vegetation *
7.	Regularly Flooded Vegetation *
8.	Urban/Built-up *
9.	Barren *
10.	Open Water *

Influential predictors as assessed by the BART algorithm were pooled and subjected to a selection procedure using the R program 'Boruta'. In the end, the algorithm selected the following variables: Annual Precipitation, Max. Temperature of Warmest Month, Continentality, Gravel content, Organic carbon, PET seasonality, Evergreen/Deciduous Needleleaf Trees, Open Water, Deciduous Broadleaf Trees, Cultivated and Managed Vegetation, and Urban/Built-up. Interestingly, roughly half of these were land cover variables from the EarthEnv dataset. The final BART algorithm with the combined metrics resulted in two top predictors: Continentality and Cultivated and Managed Vegetation. The corresponding SDM (Figure 6) showed a pattern of greater Bd habitat suitability to the west and south of the area modeled.

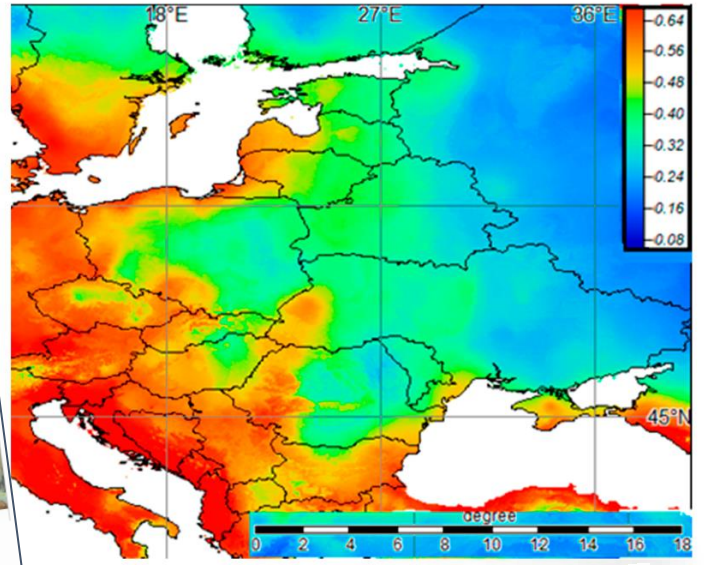
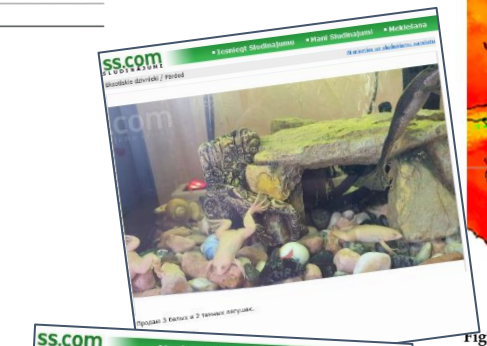
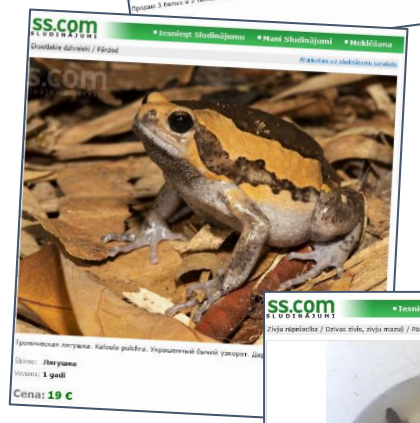
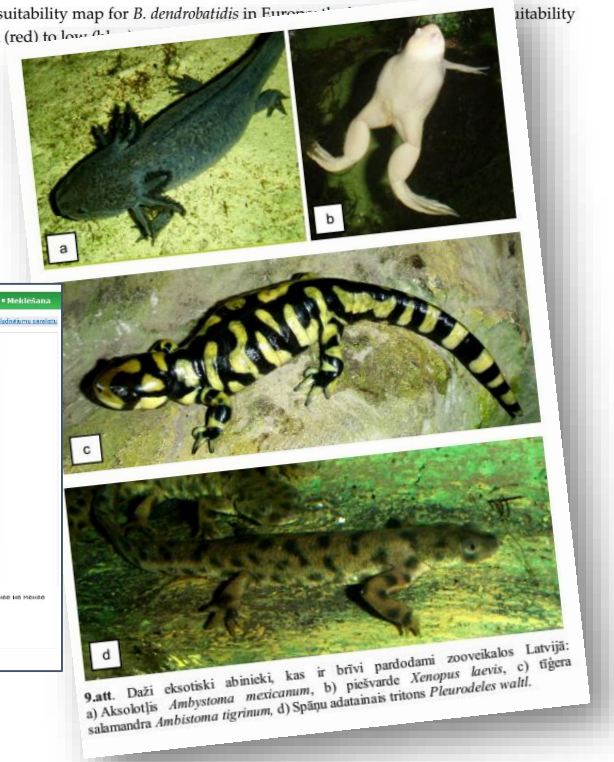


Figure 6. Habitat suitability map for *B. dendrobatidis* in Euro… …itability ranging from high (red) to low (…





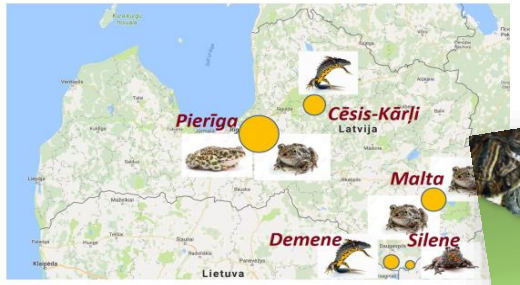


9.att. Daži eksotiski abinieki, kas ir brīvi pardodami zooveikalos Latvijā: a) Aksolotļis *Ambystoma mexicanum*, b) piešvarde *Xenopus laevis*, c) tīģera salamandra *Ambistoma tigrinum*, d) Spāņu adatainais tritons *Pleurodeles waltl*.

Batrachochytrium dendrobatidis	**LV Caudata**	**LV Anura**	**LV E.orbicularis**	**LV Lizards**	**LV Snakes**
Predation					
Competition	*		*		*
Parasites	**	***			
Ecosystem					
Environment					

Perccottus glenii

Fig. 7. The photo from the popular Latvian trade web-site with subadult and young adult of *Perccottus glenii* for sale with length of 5 – 10 cm. 30 *Perccottus glenii* ready for selling are seen on the photo (www.ss.lv).



3.1.attēls.
Parauglaukumu vietas (apļa izmērs proporcionāls parauglaukuma platībai) un pētītās aizsargājamo abinieku sugas (attēlos no kreisās – zaļais krupis (*Bufotes viridis*), brūnais varžk (*Pelobates fuscus*), lielais tritons (*Triturus cristatus*), sarkanvēdera ugunskrupis (*Bombina bombina*

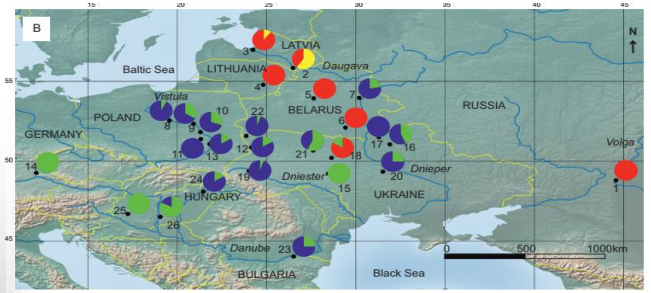
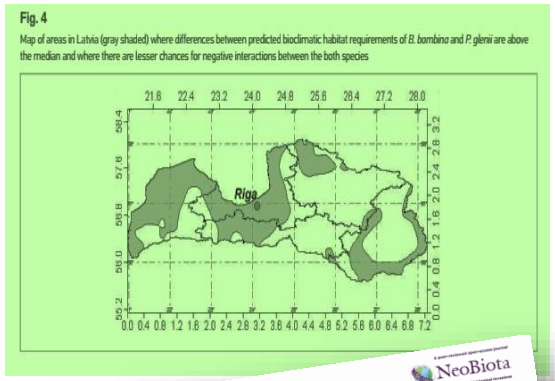
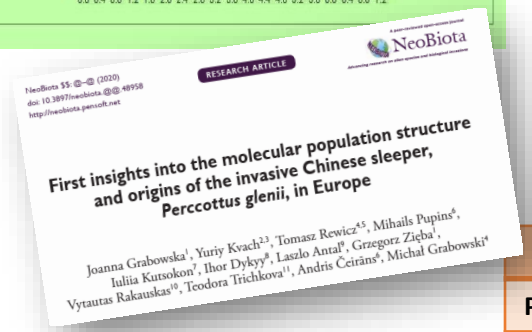


Figure 1. A history of the expansion of the Chinese sleeper in Europe (the earliest introduction is indicated and highlighted in white) in relation to the location of sampling sites (sites in close geographic proximity pooled for demographic analyses and assigned the same number) **B** distribution and proportional abundance of Chinese sleeper cytochrome b haplogroups in the study area. Haplogroup I (yellow), haplogroup II (red), haplogroup III (subgroup IIIa – green; subgroup IIIb – blue).



adult individual from the population in Pond Universit
Daugavpils, Latvia



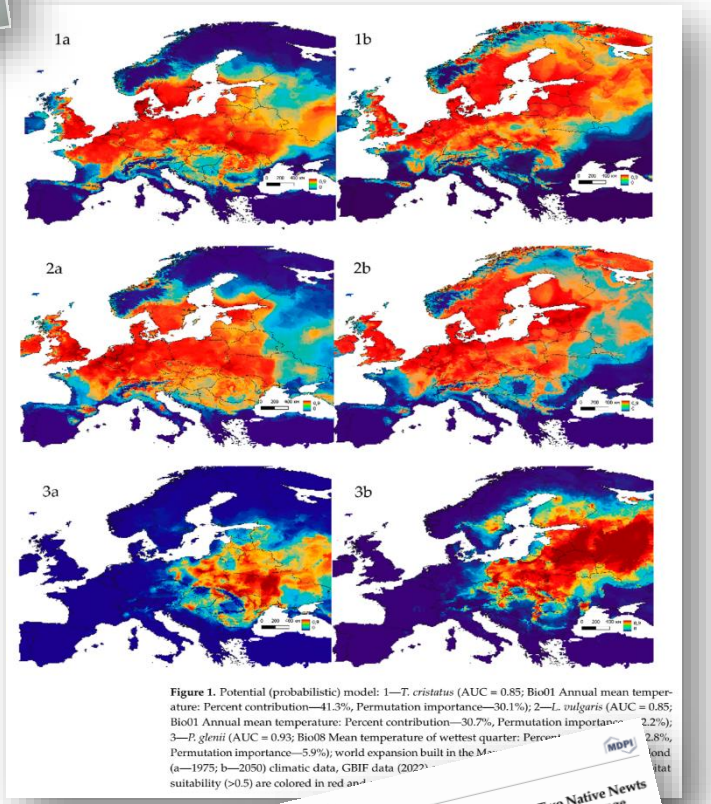


Figure 1. Potential (probabilistic) model: 1—*T. cristatus* (AUC = 0.85; Bio01 Annual mean temperature: Percent contribution—41.3%, Permutation importance—30.1%); 2—*L. vulgaris* (AUC = 0.85; Bio01 Annual mean temperature: Percent contribution—30.7%, Permutation importance—2.2%); 3—*P. glenii* (AUC = 0.93; Bio08 Mean temperature of wettest quarter: Percent—2.8%, Permutation importance—5.9%); world expansion built in the M— (a—1975; b—2050) climatic data, GBIF data (202— suitability (>0.5) are colored in red and—

Perccottus glenii	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snakes
Predation	***	***			*
Competition	***		*** (resource)		**
Parasites	?	?	***		**
Ecosystem	**	**	**		**
Environment	*	*	*		

Waiting for freshwater IAS new Gobiidae

Fig. 3. Monkey goby (*Neogobius fluviatilis*) from the Bug River, Vistula River basin, Poland. Photograph by Yuriy Kvach.

Fig. 5. Round goby (*Neogobius melanostomus*). A. An individual from the Unterwarnow, Baltic Sea, Germany (non-native range) in aquarium. Photograph by Yuriy Kvach. B. An individual in the natural invidonment near the Snake Island, Black Sea, Ukraine. Photograph by Sergey Snigirov.

Fig. 7. Gorlap goby (*Ponticola gorlap*) from the Volga delta, Russia. Photograph by Yuriy Kvach.

Fig. 9. Bighead goby (*Ponticola kessleri*) from the Dniester Estuary, North-

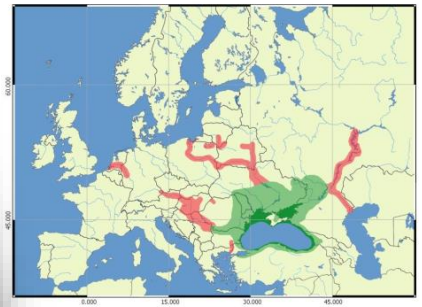
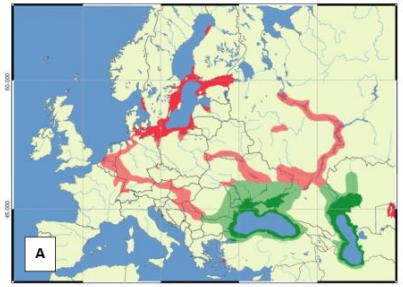


Fig. 4. The range map of the monkey goby (*Neogobius fluviatilis*) expansion. Green – native range, Red – non-native range (dark color – in the sea; light color – in the inland waters).



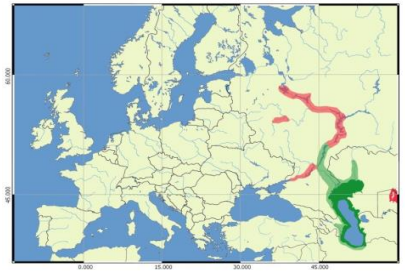


Fig. 8. The range map of the gorlap goby (*Ponticola gorlap*) expansion. Green – native range, Red – non-native range (dark color – in the see; light color – in the inland waters).

Fig. 10. The range map of the bighead goby (*Ponticola kessleri*) expansion. Green – native range, Red – non-native range (dark color – in the see; light color – in the inland waters).

Fig. 11. Racer goby (*Babka gymnotrachelus*) from the Bug River, Vistula River basin, Poland. Photograph by Yuriy Kvach.

Fig. 12. The range map of the racer goby (*Babka gymnotrachelus*) expansion. Green – native range, Red – non-native range (dark color – in the see; light color – in the inland waters).

Fig. 13. Western tubenose goby (*Proterorhinus semilunaris*) from the Danube delta, Ukraine. Photograph by Yuriy Kvach.

Fig. 15. Caspian tubenose goby (*Proterorhinus semipellucidus*) from the Lower Volga, Russia. Photograph by Yuriy Kvach.

Fig. 16. The range map of the Caspian tubenose goby (*Proterorhinus semipellucidus*) expansion. Green – native range, Red – non-native range (dark color – in the lakes open waters; light color – in the other inland waters).

The monograph consists of the comprehensive overview of the expansion of the Ponto-Caspian gobiids (Gobiiformes: Gobiidae) and North America, both in fresh and brackish waters.

The detailed review of the Ponto-Caspian gobiids showing invasions consists the information concerning the expansion of 7 fish species: monkey goby (*Neogobius fluviatilis*), round goby (*Neogobius melanostomus*), gorlap goby (*Ponticola gorlap*), bighead goby (*Ponticola kessleri*), racer goby (*Babka gymnotrachelus*), western tubenose goby (*Proterorhinus semilunaris*), and Caspian tubenose goby (*Proterorhinus semipellucidus*).

The data are supported by range maps and the annex table, where first findings are documented for each particular water basin.

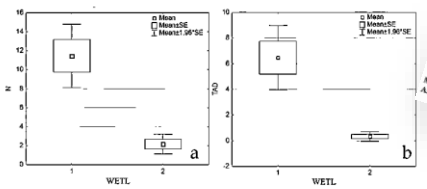
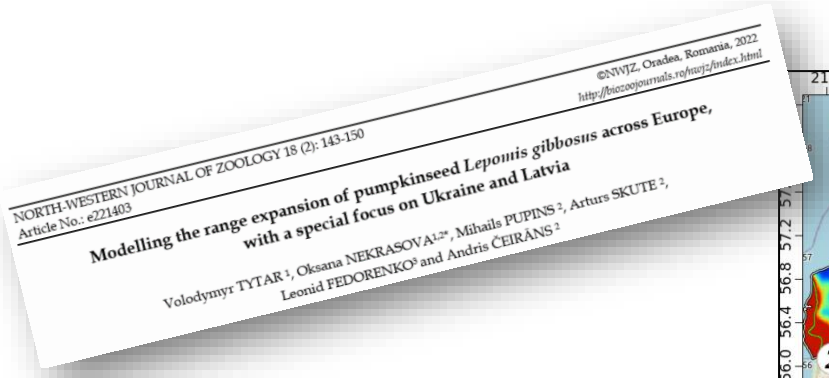


Figure 5. The number of amphibian individuals counted in Silene Nature Park, South East of Latvia, in 2022 using method 2.2.3 (the number of amphibian (all) - "N", mean/pond, (a)), and the number of amphibian larvae ("TAD", mean/pond, (b)) caught using traps, depending on wetland isolation ("wetl"): 1—geographically isolated wetlands (GIW); 2—non-isolated ponds (nGIW).

Probable freshwater new IAS Lepomis gibbosus etc.

Table 1. The relative importance of 18 environmental variables from the Near-global environmental information for freshwater ecosystems based on feature selection using the 'Boruta' algorithm

Variable name	Variable explanation	Mean importance (%)
hydro_7	Upstream Temperature Annual Range	17.51
hydro_6	Minimum Upstream Temperature of Coldest Month	16.69
hydro_9	Mean Upstream Temperature of Driest Quarter	16.68
tmin9	Minimum monthly air temperature for September (average)	16.40
lc_max3	Deciduous broadleaf trees (maximum)	15.48
lc_max4	Mixed/other trees (maximum)	12.70
soil_max10	Probability of occurrence (0-100%) of R horizon (maximum)	12.53
lc_av3	Deciduous broadleaf trees (average)	12.37
hydro_19	Upstream Precipitation of Coldest Quarter	12.33
hydro_14	Upstream Precipitation of Driest Month	11.80
soil_av2	Soil pH in H2O (average)	11.70
soil_min7	Cation exchange capacity (minimum)	11.69
slope_range	Slope range	11.66
soil_min1	Soil organic carbon (minimum)	11.49
prec_9	Sum of monthly precipitation September	11.47
hydro_2	Mean Upstream Diurnal Range	11.32
lc_max9	Urban/built-up (maximum)	11.13
tmax6	Maximum monthly air temperature for June (average)	10.73



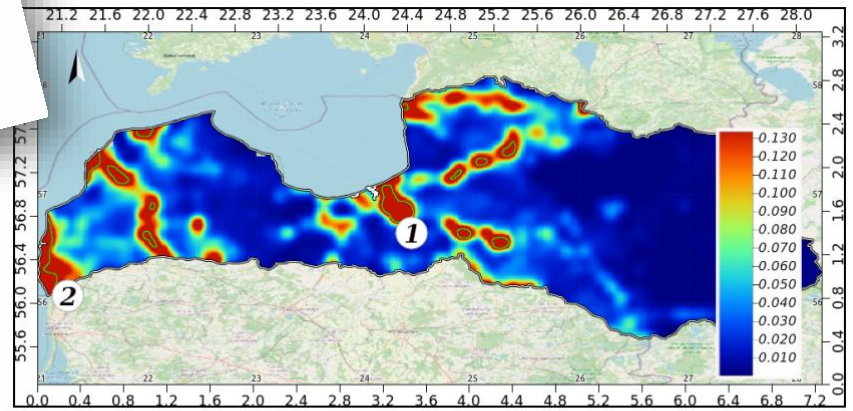


Figure 6. Map of predicted habitat suitability for the pumpkinseed in Latvia based on the combination of selected predictors from the Near-global environmental information for freshwater ecosystems; the legend shows habitat suitability ranging from rel... (red) to low (blue); areas suggested for legal introduction: 1 - Lower Daugava, 2 - Kurzeme Province.

According to the models for Latvia, chances here for the spontaneous invasion of *L. gibbosus* are low: moderately suitable for the species areas (where predicted habitat suitability >0.3) occupy only 3% of the country. Even more, there are no clear geographical corridors that could facilitate such expansion other than brackish waters along the Baltic coast, which in theory, could pave the way to the north. In this respect, the seaside of Kurzeme Province could probably accommodate the species, especially if warmer temperatures will appear together with climate change. If introduced, legally or not, or by accident, the Lower Daugava next to Riga would likely be the most suitable place for the fish.

Lepomis gibbosus	LV Caudata	LV Anura	LV E.orbicularis	LV Lizards	LV Snakes
Predation	***	***	?		*
Competition	***	**	***		**
Parasites	?	?	?		?
Ecosystem	**	**	*		*
Environment	*	*	*		

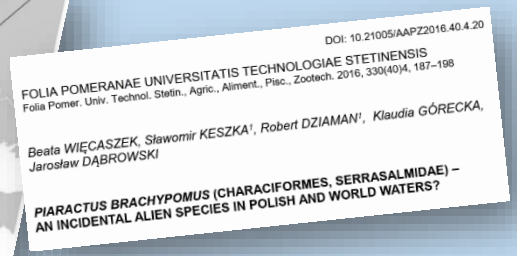


Fig. 3. *Phasianus colchicus* female, Ainavas, Kalkunes parish, Daugavpils district; 2015.03.27.

EREM 74/4
Journal of Environmental Research, Engineering and Management
Vol. 74 / No. 4 / 2018
pp. 79–89
DOI 10.5755/j01.erem.74.4.21093
© Kaunas University of Technology

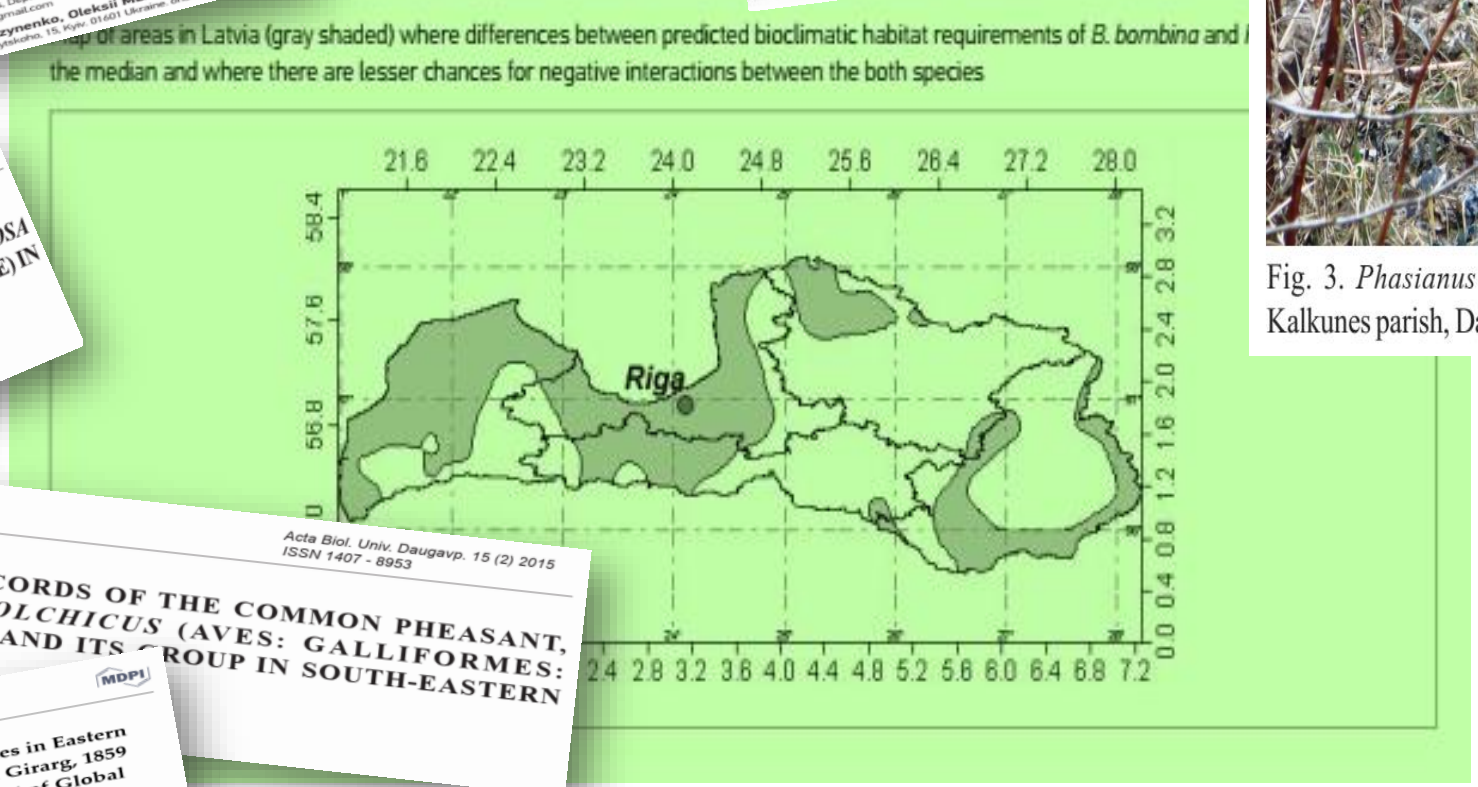
Species Distribution Modelling: *Bombina bombina* (Linnaeus, 1761) and its Important Invasive Threat *Perccottus glenii* (Dybowski, 1877) in Latvia under Global Climate Change

Received 2018/06 Accepted after revision 2018/11

http://dx.doi.org/10.5755/j01.erem.74.4.21093

Species Distribution Modelling: *Bombina bombina* (Linnaeus, 1761) and its Important Invasive Threat *Perccottus glenii* (Dybowski, 1877) in Latvia under Global Climate Change

Aija Pupina, Mihails Pupins
Daugavpils University, Institute of Life Sciences and Technologies, Department of Ecology
Parades Street 1A, Daugavpils, LV5400, Latvia, mihails.pupins@gmail.com
Oksana Nekrasova, Volodymyr Tytar, Iryna Kozynenko, Oleksii Marushchak
Schmalhausen Institute of Zoology NAS of Ukraine, vul. Khmel'nyts'kogho, 15, Kyiv, 01601 Ukraine, oneks22@gmail.com



Acta Biol. Univ. Daugavp. 12 (2) 2012
ISSN 1407 - 8953

FIRST RECORDS OF EUROPEAN MANTID *MANTIS RELIGIOSA* (LINNAEUS, 1758) (INSECTA: DICTYOPTERA, MANTIDAE) IN LATVIA

Mihails Pupiņš, Mārtiņš Kalniņš, Aija Pupiņa, Ieva Jaundaldere

Acta Biol. Univ. Daugavp. 15 (2) 2015
ISSN 1407 - 8953

THE FIRST RECORDS OF THE COMMON PHEASANT, *PHASIANUS COLCHICUS* (AVES: GALLIFORMES: PHASIANIDAE), AND ITS GROUP IN SOUTH-EASTERN LATVIA

Mihails Pu

MDPI
proceedings
Proceedings

Distribution of Viviparous American Fish Species in Eastern Europe on the Example of Gambusia Holbrooki Girarg, 1859 and Poecilia Reticulata Peters, 1859 in the Context of Global Climate Change †

Oksana Nekrasova [1], Volodymyr Tytar [1], Mihails Pupins [2], Andris Čeirāns [2], Oleksii Marushchak [1,*] and Arturs Skute [2]

Anti-IAS Projekts EMYS-R 2022. – 2025.

Full title of the project: A SOCIO-ECOLOGICAL EVALUATION OF WETLANDS RESTORATION AND REINTRODUCTION PROGRAMS IN FAVOR OF THE EMBLEMATIC EUROPEAN POND TURTLE AND ASSOCIATED BIODIVERSITY: A PAN-EUROPEAN APPROACH (EMYS-R).

Proposal Nr. BiodivRestore-324.
Source for funding: BiodivRestore.
Partners: France (Coordinator), Germany, Poland.
Project duratin: 2022.-2025.

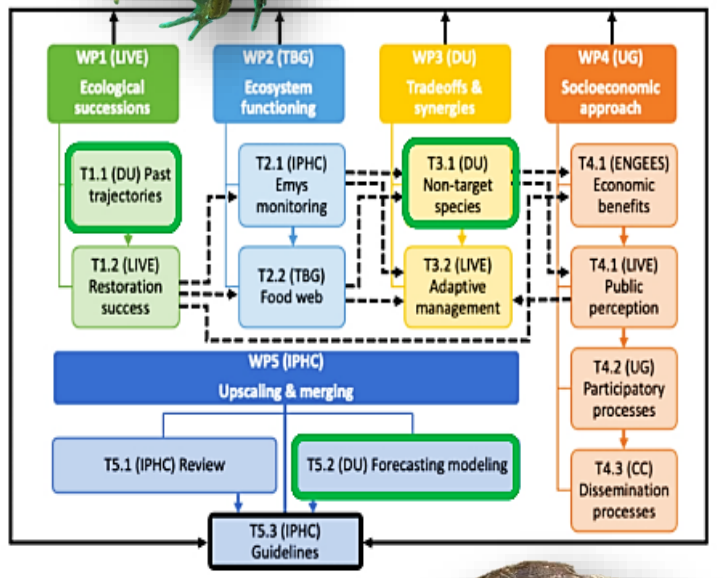
Goal of the project: EMYS-R aims at 1) investigate the ecological processes improving wetland restoration and Emys reintroduction based on a) a focus on habitat recovery after restoration using biocenotic indices; b) a focus on Emys by monitoring reintroduced populations and their impact on other species using state-of-the-art biologging and eDNA. 2) assess tradeoffs and synergies between targets, benefits and policies, with a) an ecological focus on nontarget species (threatened amphibians and invasive crayfish); b) a socio-economic focus on value benefits of restoration, people's perception of restored nature, citizen science and deliberative processes involved in multi-stakeholder decision settings related to nature conservation. 3) ultimately produce guidelines for optimal wetland restoration protocols in favor of Emys reintroduction and people engagement in nature conservation based on a) our integrative approach, b) a review of past and current results, and c) a new model forecasting near future distribution and abundance of Emys at the European scale.

LV coordinator

- WP1. Task1.1. Wetland past ecological trajectories (DU)
- WP3. Task3.1. Non-target species assessment (DU)
- WP5. Task5.2. Forecasting long term success of EU funded projects (DU).

Public outreach LV

- LV stakeholdrs, DU students, visitors of Latgales Zoo, LV mass media



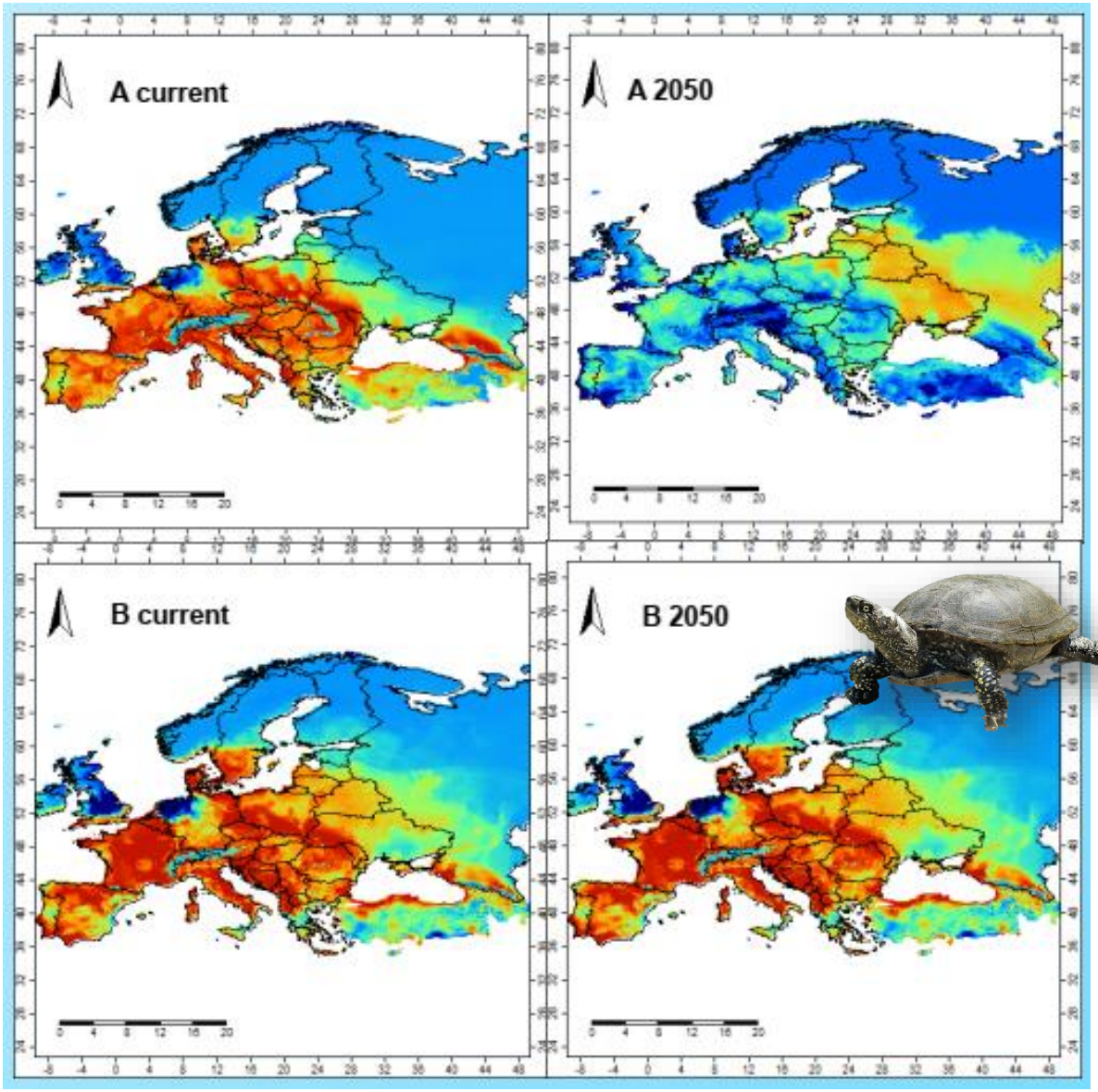


Figure 1. As a result of Multiple Regression Analysis, the following models were created: A - area of intersection of current promising habitats of all 8 species of turtles; B - area of promising habitat for *E. orbicularis*, without 7 species of invasive aquatic turtles (current and 2050).

Amphibian Biology

Edited by

Harold Heatwole
and
John W. Wilkinson

Volume 11

Status of Conservation and Decline of Amphibians:
Eastern Hemisphere

Part 5

NORTHERN EUROPE

65 Decline and conservation of amphibians in Latvia

Aija Pupina, Mihails Pupins, Andris Ceirans and Agnese Pupina

Invasive predators are dangerous for amphibians in Latvia, one of which is a fish, the Chinese sleeper (*Perccottus glenii*) (Figure 65.8). Having become established in small, warm bodies of water, which are the main habitats used by amphibians for reproduction in Latvia, this species can fully destroy or seriously damage the larvae of amphibians (Pupins and Pupina 2012a). *Perccottus glenii* was found by the authors in catchment basins of almost every large river and in many lakes of Latvia (Pupins and Pupina 2012b); it was found in the territories of many populations of *Bombina bombina* and *Triturus cristatus*, and continues to extend its distribution (Pupina and Pupins 2014; Pupina *et al.* 2015).

Dangerous new predators for adult amphibians in Latvia are invasive mammals that are becoming widespread in the country: the raccoon dog (*Nyctereutes procyonoides*) (29,200 individuals registered in 2014), the American mink (*Neovison vison*) (23,200 individuals registered in 2014), and probably the muskrat (*Ondatra zibethicus*) (5,500 individuals registered in 2014) (NeoGeo.lv 2014).

diversity

Article

Distribution and Potential Limiting Factors of the European Pond Turtle (*Emys orbicularis*) in Eastern Europe

Oksana Nekrasova [1,2,*], Oleksii Marushchak [1], Mihails Pupins [2], Arturs Skute [2], Volodymyr Tytar [1] and Andris Čeirāns [2]

Abstract: In order to use an integrated approach for studying the influence of risk factors on the distribution of the native turtle species *E. orbicularis* and accompanying invasive species (*T. scripta* and *N. procyonoides*) in the northeast of their range, we used GIS modelling and a database (GAEZ, human footprint, CliMond) of 55 preselected variables, which represent a system of bioclimatic and anthropogenic factors. The main variables that influenced the results were factors related to temperature. There was a high correlation ($r = 0.6$) between the species distribution model's habitat suitability for *E. orbicularis* and the corresponding "human footprint" values within the European part of the species' natural range. Its unpretentiousness towards anthropogenic factors would likely help the further expansion of its range in eastern Europe, because the areas with the highest habitat suitability ($r > 0.7$) were projected to increase 3.3-fold. When comparing the *E. orbicularis* model to those obtained for *N. procyonoides* and *T. scripta*, we concluded that *N. procyonoides* could be dangerous because it occupies similar habitats (the degree of correlation is reasonably high in the north of their range ($r = 0.5$) in Latvia). An expansion of the range of *Trachemys scripta* is also possible in the future within the northern territories. Therefore, when developing the turtles' protection algorithms, it is also necessary to take into account the influence of invasive species.

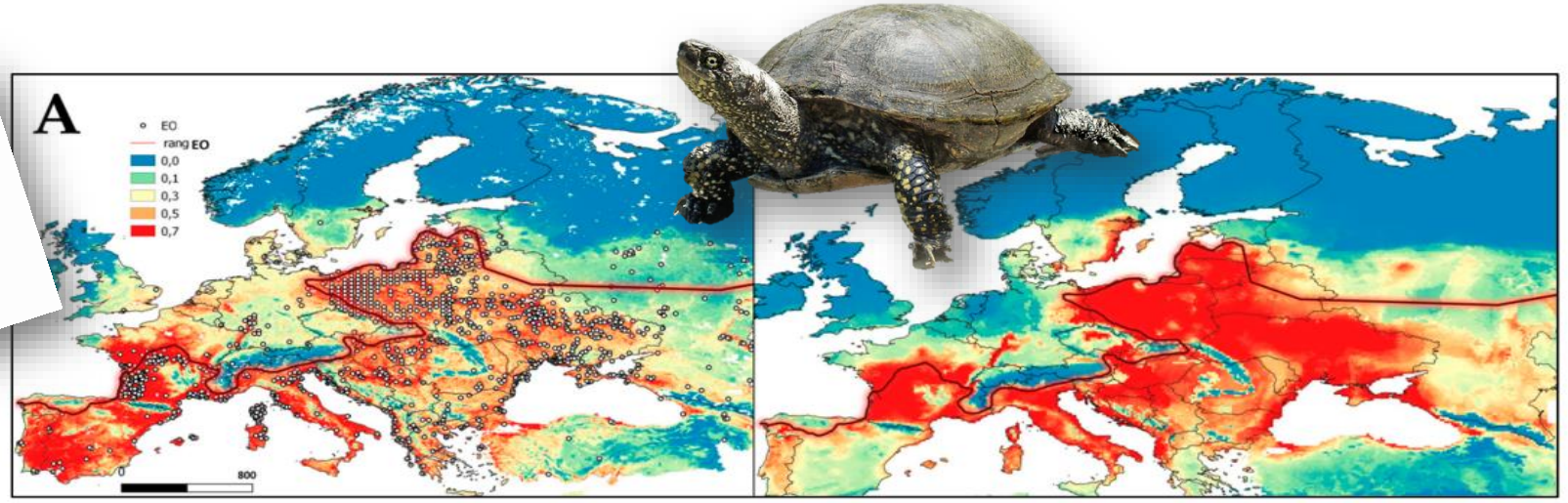


Figure 2. Potential (probabilistic) model of *E. orbicularis* expansion built in the Maxent program based on dataset: (**A**) GAEZ, current; (**B**) CliMond, 2090 dataset), GBIF data (2021). Areas with the highest habitat suitability (>0.5) are colored in red, and areas with the lowest (<0.1) in blue. The red line displays the current northern distribution border of native populations according to Fritz and Laufer (2007) [11,32].

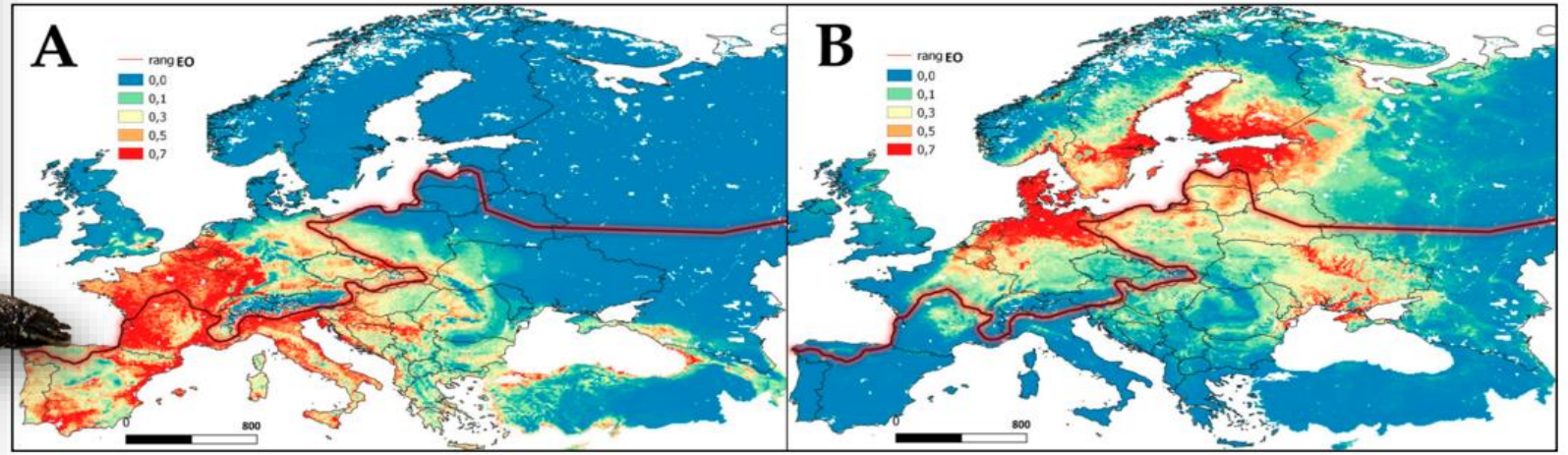


Figure 4. Potential (probabilistic) model for species expansion built in the Maxent program based on CliMond, 2090 dataset and GBIF data: (**A**) *T. scripta*; (**B**) *N. procyonoides*. Areas with the highest habitat suitability (>0.5) are colored in red and areas with the lowest (<0.1) in blue.

Full title of the project: LATGALES ZOO/MITRĀJA BIODAUDZVEIDĪBAS IT-GIDA MOBILĀS APLIKĀCIJAS UN QR-STENDU IZSTRĀDE

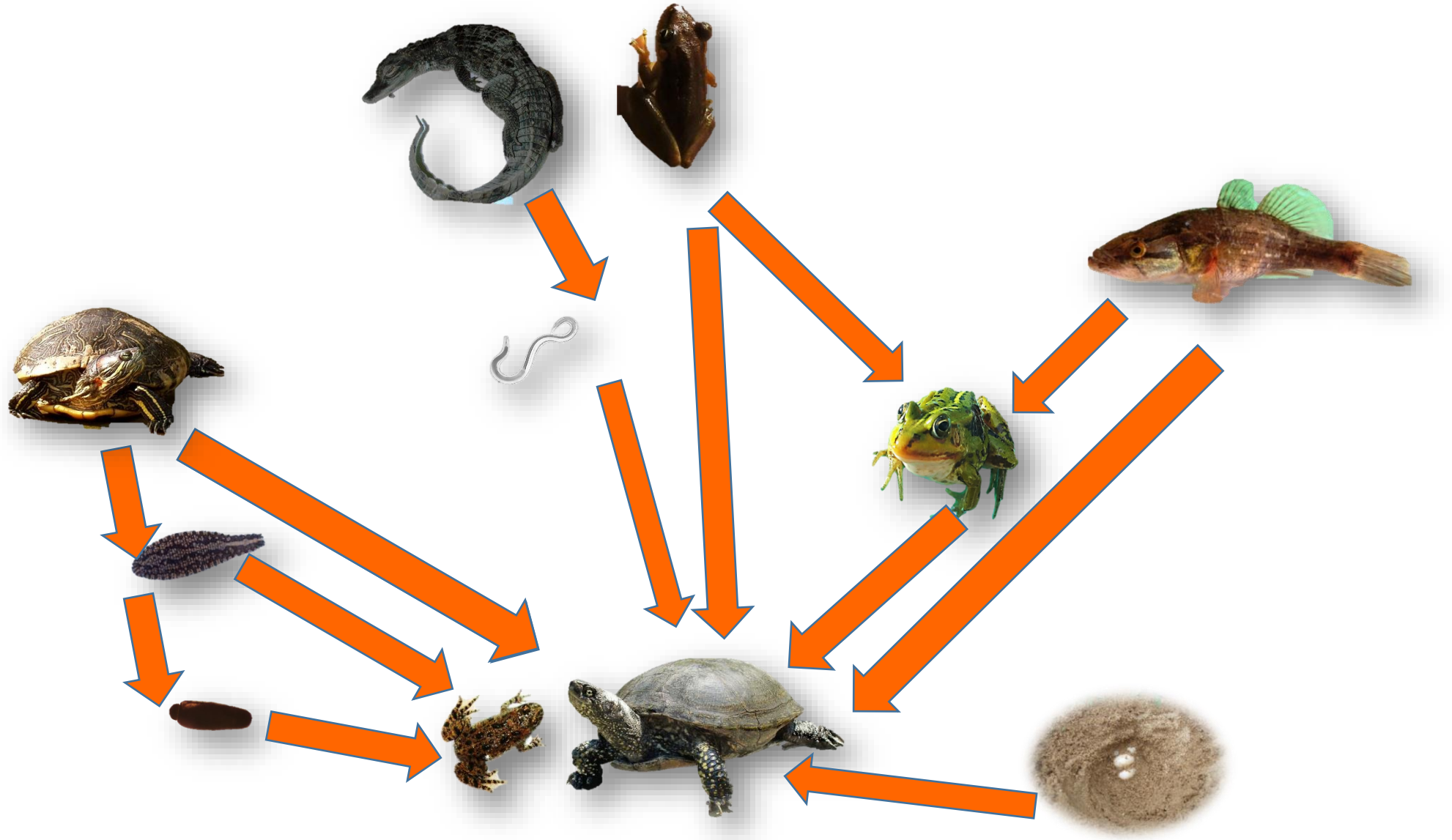
Projekta Nr. 1-08/74/2023.
Finansē: Valsts reģionālās attīstības aģentūra,
Latvijas vides aizsardzības fonda administrācijā
Partneris: Dabas aizsardzības pārvalde.
Projekta laiks: 2022.-2023.

Projekta būtība: Robežojoties ar Latgales zoodārzu (LZ, Daugavpilī) un atbilstoši Sugu un biotopu ekspertu izstrādātajam apsaimniekošanas Plānam tiek veidots parks "*Latgales mitrāja biodaudzveidība*" (LMP), kam galvenā ieeja ir no LZ teritorijas un kas veido ar LZ vienotu vides apziņas veicināšanas, dabas aizsardzības un ekoloģiskās izglītošanas kompleksu "Latgales Zoo/Mitrāja Biodaudzveidība" (LZ/MB). Šeit notiks zoodārza un parka apmeklētāju, skolēnu, dabas draugu, pilsētnieku un tūristu, un citu mērķa grupu ekskursijas, tematiskās nodarbības skolēniem un pilsoņzinātnes aktivitātes u.c. pasākumi.

Lai efektīvi un ar modernām tehnoloģijām izmantot LZ/MB kompleksa iespējas sabiedrības mērķgrupu (skolēni, tūristi, dabas draugi, pilsētnieki, cilvēki ar ierobežotām iespējām, attālināti u.c.) vides apziņas veicināšanai un ekoloģiskai izglītošanai, samazināt dabas aizsardzības riskus parka mitrāja biodaudzveidībai no apmeklētāju iespējamas nelabvēlīgas ietekmes (traucēšana putniem ligzdošanās laikā; plānotiem izlaišanai LMP dabā purva bruņurupučiem; abiniekiem vairošanas laikā; citām sensitīvām sugām; invazīvo sugu izlaišanas riski u.c.),

Projektā tiek piedāvāts izstrādāt LZ/MB IT-interaktīvo vides apziņas un ekoloģiskās izglītošanas **4D vidi Latgales Mitrāja Biodaudzveidība**, kas iekļauj **IT-MI gida ģeolokācijas interaktīvo mobilo aplikāciju un 4 QR-stendu kompleksu** ar interaktīvo vides apziņu veicinošo, ekoloģiski izglītojošo, pilsoņzinātnes un dabas aizsardzības saturu, saistītus caur ģeolokāciju ar reālo Latgales mitrāja biodaudzveidību un integrētus ar Latvijas un pasaules ekoloģiskiem servisiem (WikipediaLV, WikipediaEng, OZOLS, Youtube, Dabas aizsardzības pārvaldes mājaslapas dokumenti u.c.)

IAS ietekme uz HAS LV



DAUGAVPILS UNIVERSITĀTE

Paldies par sadarbību!

The research was partly founded by the BiodivERsA and Water JPI project "A socio-ecological evaluation of wetlands restoration and reintroduction programs in favor of the emblematic European pond turtle and associated biodiversity: a pan-European approach" and by the project "Ecological and socioeconomic thresholds as a basis for defining adaptive management triggers in Latvian pond aquaculture" (lzp-2021/1-0247). We thank project No. 16-00-F02201-000002 for providing laboratories for the research.