



7th ESENIAS Workshop with Scientific Conference

*Networking and Regional Cooperation
Towards Invasive Alien Species Prevention
and Management in Europe*

28–30 March 2017
SOFIA, BULGARIA

Book of Abstracts

Sofia, Bulgaria
2017

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**Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences**

**East and South European Network for Invasive
Alien Species (ESENIAS)**

**Sofia, Bulgaria
2017**

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Networking and Regional Cooperation Towards Invasive Alien Species Prevention and Management in Europe

Book of Abstracts

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28 March 2017

Meeting venue:

Conference Hall of the Bulgarian Academy of Sciences
1 Fifteen November Street, Sofia 1000, Bulgaria

<http://www.bas.bg/contacts>

08:00 – 09:30 **Registration**

09:30 – 10:00 **Opening**

Ms Mariela Nacheva, Deputy Minister,
Ministry of Environment and Water of Bulgaria
Assoc. Prof. Dr. Anna Ganeva, Director, IBER-BAS
Prof. Dr. Ahmet Uludağ, ESENIAS

Keynote presentation 1

10:00 – 10:30 **Teodora Trichkova, Rumen Tomov, Ahmet Uludağ, Vladimir Vladimirov, Florian Ballnus, Harald Kutzenberger, Gábor Guti, Csaba Csuzdi** – Invasive alien species networking and regional cooperation in Europe: ESENIAS and DIAS; The role of ESENIAS-TOOLS project

Keynote presentation 2

10:30 – 11:00 **Eugenio Gervasini, Ana Cristina Cardoso, Konstantinos Tsiamis, Fabio D'Amico, Ivan Deriu, Ioana Matei** – European Alien Species Information Network (EASIN): Supporting scientific research and European policies on biodiversity

11:00 – 11:30 **Coffee**

Keynote presentation 3

11:30 – 12:00 **Argyro Zenetos** – Who is who among marine alien species in the ESENIAS region

Session 1: ESENIAS-TOOLS project results

Chairs: Teodora Trichkova, Rumen Tomov

12:00 – 12:15 **David Finger, Ingi Jónsson, Vaiva Cypaitė, Nadja Ognjanova-Rumenova, Jón Ólafsson, Vesela Evtimova, Teodora Trichkova** – Monitoring of the diatom *Didymosphenia geminata* in the subarctic and in alpine areas of southern Europe

12:15 – 12:30 **Ahmet Uludağ, Necmi Aksoy, Zubeyde Filiz Arslan, Ayşe Yazlık, Ilhan Uremis, Efecan Yazmış, Tiziana Cossu, Quentin Groom, Jan Pergl, Petr Pyšek, Giuseppe Brundu** – Alien flora of Turkey: Current list and beyond

12.30 – 12:45 **Marius Skolka** – The invasive alien species in Romania: Current status

12.45 – 13:00 **Paraskevi Karachle, Argyro Zenetos, Nicholas Jason Xentidis** – The ESENIAS countries' marine Alien Species experts: an updated inventory

13:00 – 14:00 **Lunch break**

Keynote presentation 4

14:00 – 14:30 **Andrei Orlinski** – Pest Risk Analysis, phytosanitary measures against invasive alien species and the role of biological control

Session 2: Invasive alien species prevention and management

Chairs: F. Güler Ekmekçi, Sven Bacher

14:30 – 14:45 **Alberto Inghilesi, Elena Tricarico** – LIFE ASAP 'Alien Species Awareness Program': Tackling alien species in Italy, *As Soon As Possible*

14:45 – 15:00 **Nildeniz Top, Lorenzo Vilizzi, Ali Serhan Tarkan, F. Güler Ekmekçi, Paul Stebbing, Gordon Copp** – Identification of invasiveness potential of freshwater fishes in Turkey by the Aquatic Species Invasiveness Screening Kit (AS-ISK)

15:00 – 15:15 **Nejc Jogan** – Could we analyze the IAS spread dynamics patterns from the available data?

15:15 – 15:30 **Ioannis Giovos, Nikolaos Doumpas, Ioannis Ioannou, Georgia Sarafidou, Demi Marmara, Vangelis Paravas** – Is Alien to you... Share it!!! A Citizen Science Project on alien species in Greece

15:30 – 16:00 **Coffee break**

Keynote presentation 5

16:00 – 16:30 **Tomas Gorner** - Current state of NOBANIS project; Invasive species in the Czech Republic

Session 3: The Danube River as invasive alien species corridor

Chairs: Sonja Desnica, Marius Skolka

16:30 – 16:45 **Borys Aleksandrov** – Recent state of invasive alien species in Ukrainian part of the Danube Delta (presented by **Yuriy Kvach**)

16:45 – 17:00 **Gábor Guti** – Alien fish species in the Hungarian section of the Danube River: Historical overview

17:00 – 17:15 **Marina Piria, Zoran Marčić, Goran Jakšić, Sven Horvatić, Davor Zanella** – Has the racer goby *Babka gymnotrachelus* (Kessler, 1857) failed to invade the Croatian tributaries of the Danube River?

17:15 – 17:30 **Alice Cardeccia, Zdravko Hubenov, Milcho Todorov, Ivan Botev, Dimitar Kozuharov, Lyubomir Kenderov, Teodora Trichkova** – *Dreissena polymorpha* in the Bulgarian inland water bodies, population structure and relation to environmental parameters

17:30 – 17:45 **Angela Curtean-Bănăduc, Teodora Trichkova, Doru Bănăduc** – Trophic features related to the explosive spread of the invasive alien species *Pseudorasbora parva* (Schlegel, 1842) in the Romanian-Danubian basin

Topic 1: Invasive alien species traits and trends, vectors and pathways of introduction

17:45 – 18:00 **Bilal Öztürk, Banu Bitlis, Alper Doğan, Neslihan Türkçü** – Contribution to the knowledge of alien marine molluscs along the Turkish coast, with a new record of *Varicopeza pauxilla* (A. Adams, 1855) from the Mediterranean Sea

29 March 2017

Meeting venue:

Park Hotel Moskva

25 Nezabravka Street, Sofia 1113, Bulgaria

Conference Hall 'Kiev'

Keynote presentations 6 and 7

Chairs: Cristina Preda, Ahmet Uludağ

09:00 – 09:30 **Steve Adkins, Ali Ahsan Bajwa, Boyang Shi** - The global threat from *Parthenium hysterophorus* L.: A warning from 'down under'

09:30 – 10:00 **Sven Bacher** - Comparing impacts of alien species: why and how?

10:00 – 10:30 **Coffee break**

Conference Hall 'Kiev'

Session 4: Invasive alien species traits and trends, vectors and pathways of introduction

Chairs: Argyro Zenetos, Doru Banaduc

10:30 – 10:45 **Gianna Servello, Fabio Crocetta, Argyro Zenetos** - Non-indigenous species: further findings and range expansion in the Italian marine and brackish waters by 2017

10:45 – 11:00 **Ali İşmen, İsmail Burak Daban, Mukadder Arslan İhsanoğlu** - Recent status of invasive fish species in the North Aegean Sea

11:00 – 11:15 **Onur Gönülal, Melike Idil Öz** – The alien species in northern Aegean Sea and a new locality of *Penaeus aztecus* Ives, 1891

11:15 – 11:30 **Sezginer Tunçer, M. Levent Artüz, Umur Önal, Cansu Funda, Umut Uyan** - *Thysanozoon brocchii* (Risso, 1818) (Platyhelminthes: Polycladida): First record for Turkish coastal waters, from the Sea of Marmara

11:30 - 11:45 **Yuriy Kvach, Yuliya Kutsokon** - The non-indigenous fishes in the fauna of Ukraine: A potentia ad actum

11.45 – 12:00 **Edit Vardhami, Shpresa Harasani** - Invasive fishes in the fresh waters in Albania

12:00 – 12:15 **Maria Stoumboudi, Roberta Barbieri, Eleni Kalogianni** - First report of an established rainbow trout population in Greece

12:15 – 12:30 Discussions

12:30 – 14:00 **Lunch break**

Session 5: Invasive alien species traits and trends, vectors and pathways of introduction (Cont.)

Chairs: Marina Piria, David Finger

- 14:00 – 14:15 **Ingi Runar Jónsson, Gunnar Steinn Jónsson, Jón S. Ólafsson, Sigurdur Már Einarsson, Thorolfur Antonsson** - The colonising pattern of the diatom *Didymosphenia geminata* in Iceland
- 14:15 – 14:30 **Nadja Ognjanova-Rumenova, Ivan Botev, Vesela Evtimova, Teodora Trichkova** - Epilithic diatom assemblages from the Seven Rila Lakes, Bulgaria: Long-term dynamics and potential threats
- 14:30 – 14:45 **Dimitar Kozuharov, Rumen Kalchev, Mihaela Beshkova, Marieta Stanachkova, Lyubomir Kenderov, Vasil Vasilev, Teodora Trichkova** - Presence of the alien species *Craspedacusta sowerbii* in some Bulgarian reservoirs
- 14:45 – 15:00 **Marian Tudor, Marius Skolka** - Testing the ecological plasticity and invasiveness potential of *Neocaridina davidi* Kubo, 1938 (Crustacea, Decapoda, Atyidae)
- 15:00 – 15:15 **Naime Arslan, Cansev Akkan-Kökçü, Deniz Mercan, Deniz Anil Odabaşı** - Non-indigenous and Ponto-Caspian limnofauna (Gastropoda and Clitellata) of Lake Sapanca, Turkey
- 15:15 - 15:30 **Naime Arslan, Seval Kökmen-Aras, Deniz Mercan** - An indigenous species, *Dreissena polymorpha*, in Lake Büyük Akgöl as an invader

15:30 – 16:00 **Coffee break**

Session 6: Invasive alien species traits and trends, vectors and pathways of introduction (Cont.)

Chairs: Mirjana Lenhardt, Yuriy Kvach

- 16:00 – 16:15 **Deniz İnnal** – Parasites of non-indigenous fish species in the inland waters of Turkey
- 16:15 – 16:30 **Sezginer Tunçer, Ahmet Öktener** – First occurrence of *Peroderma cylindricum* (Heller, 1865) in Turkish waters
- 16:30 – 16:45 **Deniz İnnal, Daniela Giannetto** – Age and growth of non indigenous Redbelly tilapia *Coptodon zillii* (Cichlidae) in the Pınarbaşı Spring Creek (Burdur, Turkey)
- 16:45 – 17:00 **Baran Yoğurtçuoğlu, F. Güler Ekmekçi** – Variation in life history and feeding ecology of the invasive Eastern Mosquitofish *Gambusia holbrooki* in a groundwater-dependent wetland in Turkey
- 17:00 – 17:15 **Lale Gençoğlu, Şerife Gülsün Kırankaya, Baran Yoğurtçuoğlu, F. Güler Ekmekçi** – Feeding properties of translocated marine fish sand smelt, *Atherina boyeri* Risso, 1810, in a freshwater reservoir

Conference Hall 5 (Parallel sessions)

Chairs: Paulina Anastasiu, Vladimir Vladimirov

Session 7: Invasive alien species traits and trends, vectors and pathways of introduction (Cont.)

- 10:30 – 10:45 **Eugenia Nagodă, Petronela Comănescu, Gavril Negrean, Sanda Lițescu, Paulina Anastasiu** - Is Bucharest a hot spot of alien plant species in Romania?
- 10:45 – 11:00 **Shahid Farooq, Huseyin Onen, Cumali Ozaslan** - Deficit distribution data on invasive plant species: The untold story of plant invasion in Turkey
- 11:00 – 11:15 **Necmi Aksoy, Ahmet Uludağ** - Alien flora of Düzce Province (Turkey)
- 11:15 – 11:30 **Cumali Ozaslan, Huseyin Onen, Shahid Farooq, Halil Erdem, Sonnur Tad** - Experimental insights for niche expansion potential of Common Ragweed

Session 8: Invasive alien species impact, prevention and management

- 11:30 - 11:45 **Anja Kalinić, Dragica Obratov-Petković, Jelena Tomičević-Dubljević, Vida Stojšić, Ivana Bjedov** - Invasive alien plants as a key threat factor for the floristic diversity in 'Deliblato Sand' Special Nature Reserve
- 11:45 – 12:00 **Huseyin Onen, Shahid Farooq, Cumali Ozaslan** - Do management efforts and vegetation succession affect the naturalisation success and vegetation dynamics of Common Ragweed in Turkey?
- 12:00 – 12:15 **Snježana Hrnčić, Sanja Radonjić, Tatjana Perović** - An impact of alien horticultural pests on urban landscape in the southern part of Montenegro

12:15 – 12:30 Discussions

12:30 – 14:00 **Lunch break**

Chairs: Stanislava Lazarevska, Marian Tudor

Session 9: Invasive alien species traits and trends, vectors and pathways of introduction (Cont.)

- 14:00 – 14:15 **Milka Glavendekić** - Expansion of pelargonium butterfly *Cacyreus marshalli* Butler (Lepidoptera: Lycaenidae) in the Balkan Peninsula
- 14:15 – 14:30 **Sanja Radonjić, Snježana Hrnčić** - New alien arthropod pests on agricultural crops in Montenegro
- 14:30 – 14:45 **Sezginer Tunçer, Batuhan Yaman Yakin, Kerim Çiçek, C. Varol Tok** - Does Italian wall lizard, *Podarcis siculus*, expand its distribution to Northeastern Anatolia?

Session 10: Invasive alien species impact

14:45 – 15:00 **Sevilay Kılıç, Meliha Merve Hiz** - Dermatological problems due to invasive alien species in Turkey

15:00 – 15:15 **Sibel Oymak, Meliha Merve Hiz, Basak Buyuk** - Exotic animal and plant trade as pathway for introduction of invading alien species and threat to public health

15:15 – 15:30 **Sibel Oymak, Başak Büyük, Meliha Merve Hiz, Hatice Coban, Metin Otkun** – Settlement and reproduction of parrots in Istanbul and health implications

15:30 – 16:00 **Coffee break**

Session 11: Invasive alien species impact, prevention and management (Cont.)

Chairs: Sanja Radonjić, Nikolay Simov

16:00 – 16:15 **Roxana Ciceoi, Marin Dumbrava, Ionut Ovidiu Jerca, Ionela Dobrin** - Qualitative and quantitative analysis of damages on maize crops produced by the invasive stink bugs *Halyomorpha halys* and *Nezara viridula*

16:15 – 16:30 **Milka Glavendekić, Danimir Mandić** - Monitoring of *Cydalima perspectalis* (Walker) (Lepidoptera: Crambidae) supported by Education and Citizen Science

16:30 – 16:45 **Teodora B. Toshova, Dimitar I. Velchev, Vasiliy D. Abaev, Plamen K. Kalushkov, Edit Orgován, Zsófia Lohonyai, Miklós Tóth, Sándor Koczor** - Detection of some Coleoptera species in coloured sticky traps in maize crops in Bulgaria

16:45 – 17:00 **Teodora B. Toshova, Dimitar I. Velchev, Vasiliy D. Abaev, Daniela Y. Atanasova, Miklós Tóth** - Detection and monitoring of *Diabrotica virgifera virgifera* LeConte, 1858, by KLP+ traps with dual (pheromone and floral) lures in Bulgaria

17:00 – 17:15 **Zubeyde Filiz Arslan, Ahmet Uludağ, Halil Kutuk, Khawar Jabran** - Insects may act as potential biological control agents for alien ornamental plants in Turkey

17:15 – 18:15 **Poster Session**

19:00 Conference dinner

30 March 2017

Meeting venue:

Park Hotel Moskva

25 Nezabravka Street, Sofia 1113, Bulgaria

Conference Hall 'Kiev'

Chairs: Edit Vardhami, Dan Cogălniceanu

Keynote presentations 8 and 9

09:00 – 09:30 **Teodora Trichkova, Milcho Todorov, Kostadin Ignatov, Ivan Botev, Momir Paunović, Dan Cogălniceanu** – Pilot-study on invasive alien species in the Danube Region with a smartphone application developed by the EC JRC

09:30 – 10:00 **Paulina Anastasiu, Laurentiu Rozyłowicz, Cristina Preda, Doru Bănăduc, Dan Cogălniceanu** – Invasive alien species of Union Concern in Romania

10:00 – 10:30 Coffee break

Session 12: Invasive alien species prevention and management (Cont.)

Chairs: Edit Vardhami, Dan Cogălniceanu

10:30– 10:45 **Alberto Francesco Inghilesi, Elena Tricarico** - Management of freshwater invasive species in Central Italy: The experience of LIFE and Aquainvad-ED projects

10:45 – 11:00 **Hacer Sağlam, Ertuğ Düzgüneş** - Pros and cons of the invasive Rapa whelk in the Black Sea region of Turkey

11:00 – 11:15 **Ertuğ Düzgüneş, Hacer Sağlam** - The management of Rapa whelk harvesting in Turkey

11:15 – 11:30 **Rumen Tomov** – Analysis and management of pathways of introduction and spread of invasive alien species in South-East Europe

11:30 – 12:30 **Poster Session**

12:30 – 14:00 Lunch break

14:00 – 15:30 **Joint ESENIAS and DIAS Meeting**

15:30 – 16:00 Coffee break

16:00 – 17:00 **Joint ESENIAS and DIAS Meeting (Cont.)**

POSTERS

Topics 1 and 2: Invasive alien species traits and trends; Vectors and pathways of introduction

- P1.01: Ana Tošić, Vera Nikolić, Dubravka Škraba Jurlina, Predrag Simonović** - Revealing introgression of allochthonous brown trout (*Salmo cf. trutta* L.) in Eastern Serbia populations using molecular markers
- P1.02: Antoaneta Petrova, Irina Gerasimova** - On a naturalised population of *Larix decidua* in the Rhodope Mountains
- P1.03: Antoaneta Petrova, Vladimir Vladimirov, Alexandar Tashev** - The Maritime pine (*Pinus pinaster*) – a naturalised alien on the Bulgarian Black Sea Coast with a high impact on the sand dune habitats
- P1.04: Antoaneta Petrova, Zhivko Barzov** - *Oenothera laciniata* (Onagraceae) a new alien species to the Bulgarian flora
- P1.05: Blagoj Nikolov, Bojan Simovski, Ivan Minchev** - *Ailanthus altissima* in the region of Malesh in FYR Macedonia
- P1.06: Boris Assyov** - *Mycena seynii* (Mycenaceae, Agaricales) in Bulgaria
- P1.07: Constantina Chireceanu, Andrei Teodoru, Andrei Chiriloaie** - First record of oak lace bug *Corythucha arcuata* (Say, 1832) in Romania
- P1.08: Elina Yankova-Tsvetkova, Petka Yurukova-Grancharova, Vladimir Vladimirov** - On the embryology of two invasive alien species of *Solidago* (Asteraceae) in Bulgaria
- P1.09: Elitsa Popova, Diana Zlatanova** - An update on the distribution of the alien raccoon dog (*Nyctereutes procyonoides*, Gray) on the Balkans
- P1.10: Florina Stănescu, Tibor Sos, Ciprian Samoilă, Dan Cogălniceanu** - *Trachemys scripta* in the East and South European Region. A review of the invasion extent
- P1.11: Hacer Sağlam, Ertuğ Düzgüneş** - Introduction pathways of invasive alien species in the Black Sea coast of Turkey
- P1.12: Ina Aneva, Peter Zhelev, Stoyan Stoyanov** - Alien species as a part of plant composition in the periphery of agricultural fields
- P1.13: Jakov Dulčić, Branko Dragičević, Pero Tutman** - Status of non-indigenous fish species in the eastern Adriatic Sea: A short review
- P1.14: Katia Trencheva** - A review of alien scale insects (Hemiptera: Coccoidea) in Bulgaria
- P1.15: Lale Gençoğlu, Şerife Gülsün Kırankaya, Kayıhan Karaçor, Meryem Çam, F. Güler Ekmekçi** - Differentiations in kidney histology of invasive freshwater populations of marine fish sand smelt
- P1.16: Ligita Baležentienė** - Ecophysiological adaptation of southern escapes in Lithuania
- P1.17: Lyubomir Kenderov, Teodora Trichkova, Krešimir Žganec** – New records of translocated *Pontogammarus robustoides* (Amphipoda, Perecarida) and *Limnomysis benedeni* (Mysida) in the Aegean Sea basin in Bulgaria
- P1.18: Lyubomir Kenderov, Krešimir Žganec, Teodora Trichkova** – First finding of *Dikerogammarus villosus* (Amphipoda, Perecarida) in Bulgarian inland waters
- P1.19: Marija S. Marković, Danijela S. Nikolić, Vesna P. Stankov-Jovanović, Biljana M. Nikolić, Slavisa M. Stamenković, Ljubinko B. Rakonjac** - Colonising plants in fire-affected habitats in Vidlič Mountain

- P1.20: Mario Langourov, Nikolay Simov** - New data on the expansion of *Geranium bronze* (Lepidoptera, Lycaenidae) in the eastern part of the Balkan Peninsula, with some biological notes
- P1.21: Marzio Zapparoli, Giuseppe Mazza, Alberto Francesco Inghilesi** - Alien invertebrates' introductions into Italy: An overview
- P1.22: Milcho Todorov, Alice Cardeccia, Zdravko Hubenov, Lyubomir Kenderov, Dimitar Kozuharov, Marian Kenderov Ivan Botev, Teodora Trichkova** - Range expansion of the alien mussels *Corbicula fluminea* and *Sinanodonta woodiana* (Mollusca: Corbiculidae and Unionidae) in Bulgaria
- P1.23: Nedko Nedyalkov, Yordan Koshev** - Natural history of two alien rodents: *Rattus rattus* and *Rattus norvegicus* (Muridae, Mammalia) in Bulgaria
- P1.24: Nikolay Simov, Denis Gradinarov** - New invasive alien assassin bug species (Heteroptera, Reduviidae) for the Balkan Peninsula
- P1.25: Nikolay Simov, Snejana Grozeva, Mario Langourov, Georgi Georgiev, Plamen Mirchev, Margarita Georgieva** - New data on the expansion of invasive alien lace bug species (Heteroptera, Tingidae) in the Balkan Peninsula
- P1.26: Nikolay Zafirov** - Invasive alien pathogenic fungi on coniferous forest tree species in Bulgaria
- P1.27: Pero Tutman, Jakov Dulčić, Branko Dragičević** - The invasive blue crab *Callinectes sapidus* Rathbun, 1896 (Crustacea: Portunidae): A permanent resident or just provisional visitor across the eastern Adriatic Sea, Croatia?
- P1.28: Petya Ivanova, Antoaneta Trayanova, K. Stefanova, E. Stefanova, V. Raykov** - Recent status of some zooplankton, benthic and fish alien species along the Bulgarian Black Sea coast
- P1.29: Ruben Iosif, Dan Cogălniceanu, Dorel Ureche** - Rapid spread of Amur sleeper (*Perccottus glenii*) in North-Eastern Romania
- P1.30: Rumén Tomov, Dimitar Semerdzhiev** - Occurrence of the Harlequin ladybird *Harmonia axyridis* (Coleoptera: Coccinellidae) in the agro-biocenosis of Bulgaria
- P1.31: Sasho Trajanovski, Teodora Trichkova, Konstantin Zdraveski, Biljana B. Gjoreska, Marina Talevska, Sonja Trajanovska** - Alien species in the upper watershed of ancient Lake Ohrid
- P5.32: Sezginer Tunçer** - A new occurrence of the American blue crab, *Callinectes sapidus* in coastal lagoon, vicinity of Yeniköy Harbour from Çanakkale Boğazi (Dardanelles, Turkey)
- P1.33: Stanislava Lazarevska, Jovan Petrov, Mile Postolovski, Sterije Naceski, Vesna Krsteska** - *Ceroplastes japonicus* Green: A new pest insect in Republic of Macedonia
- P1.34: Stefan Petrov, Galya Petrova, Vladimir Vladimirov** - Genetic variability of the alien species *Opuntia humifusa* (Cactaceae) within its locality in Harmanli District, South Bulgaria
- P1.35: Tatjana D. Jakšić, Mirjana M. Smiljić, Vesna P. Stankov-Jovanović, Slaviša M. Stamenković, Olivera M. Papović, Predrag S. Vasić, Marija S. Marković** - Activity of catalase in invasive plants from tailing pond of the Trepča lead and zinc mine
- P1.36: Tihomir Stefanov, Pencho Pandakov, Teodora Trichkova** - Recent expansion of the ruffe *Gymnocephalus cernua* (Pisces: Perciade) outside its native range in Bulgaria
- P1.37: Vlada Peneva, Stela Lazarova, Milka Elshishka** - Alien nematode species in ESENIAS countries

- P1.38: Vladimir V. Neimorovets, Valeriy I. Shchurov, Alexander S. Bondarenko, Mikhail M. Skvortsov, Fedor V. Konstantinov** – First documented outbreak and new data on the distribution of *Corythucha arcuata* Say (Heteroptera: Tingidae) in Russia
- P1.39: Vladimir Vladimirov, Malina Delcheva** - *Ammannia coccinea* (Lythraceae) – a new alien plant species in Bulgaria
- P1.40: Yordan Koshev, Nedko Nedyalkov** - Alien mammal species of Bulgaria
- P1.41: Yordan Koshev, Nedko Nedyalkov** – Range expansion of three alien mammal species: the coypu (*Myocastor coypus*), the muskrat (*Ondatra zibethicus*), and the raccoon dog (*Nyctereutes procyonoides*) in Bulgaria
- P1.42: Zafer Cemal Özkan, Sefa Akbulut** - Biological and ecological traits of some invasive alien plant species in the Black Sea region of Turkey

Topic 3: The Danube River as invasive alien species corridor

- P3.01: Ana Andjelkovic, Milica Živković, Dušanka Cvijanović, Dragana Marisavljević, Danijela Pavlović, Snežana Radulović** - Riparian area of the Danube (Serbia) as an invasive alien plant species corridor
- P3.02: Galia Georgieva, Yordan Uzunov, Mila Ihtimanska, Stefan Kazakov, Pencho Ivanov, Lyubomir Kenderov, Maria Kerakova, Emilia Varadinova** - New data about the distribution of the alien species *Branchiura sowerbyi* Beddard, 1892 (Oligochaeta: Tubificidae) in Bulgaria
- P3.03: Eliza Uzunova, Kostadin Ignatov, Dimitri Dashinov, Elena Tasheva, Teodora Trichkova** - Morphometric and meristic variations in non-native whitefish *Coregonus mareanoides* (Polyakov, 1874) from Iskar Reservoir, Danube River basin, Bulgaria
- P3.04: Stefan Skorić, Branislav Mičković, Dušan Nikolić, Aleksandar Hegediš, Gorčin Cvijanović** - Seasonal weight-length relationship of Amur sleeper (*Perccottus glenii* Dubowski, 1877) in the Danube River drainage channel
- P3.05: Vesela Evtimova, Violeta Tyufekchieva, Galia Georgieva, Desislava Stoyanova, Ivailo Dedov, Maria Kerakova, Rabia Soufi, Stefan Stoichev, Yanka Vidinova** - Importance of river type and presence of non-indigenous species for benthic communities of tributaries of the Lower Danube River

Topic 4: Invasive alien species impact

- P4.01: Başak Büyük, Sibel Oymak, Merve Meliha Hız, Metin Otkun** - Invasive Lessepsian fishes and their public health effects
- P4.02: Ertuğ Düzgüneş, Hacer Sağlam, Naciye Erdoğan Sağlam** - Impacts of the invasive species in the Black Sea
- P4.03: Konstanin Zdraveski, Teodora Trichkova, Sasho Trajanovski** - Economic impacts of the aquatic invasive alien species within the ESENIAS region: Need for development of cost estimation
- P4.04: Michaela Beshkova, Detelina Belkinova, Roumen Kalchev, Hristina Kalcheva, Rumen Mladenov, Plamen Stojanov** - Phytoplankton qualitative and quantitative

characteristics: Comparison of Bulgarian reservoirs infested and non-infested by *Dreissena polymorpha* (Mollusca: Bivalvia)

- P4.05: Nigar Alkan, Hacer Sağlam, Ertuğ Düzgüneş** - A review of metals in *Rapana venosa* (Rapa whelk) in the Black Sea
- P4.06: Roxana Ciceoi, Cătălin Gutue, Minodora Gutue, Ioan Roșca** - The current status of pests associated to urban vegetation in Bucharest area

Topic 5: Invasive alien species prevention and management

- P5.01: Alberto Francesco Inghilesi, Karolis Kazlauskis, Sandra Vigišová, Jiri Skuhrovec, Helen E. Roy** - Engaging people in biodiversity surveys: developing a European ladybird mobile app
- P5.02: Alkan Öztekin, İsmail Burak Daban** - Determining of the technical properties of trotlines using fisheries of invasive *Atherina boyeri*
- P5.03: Ana-Cristina Fătu, Ana-Maria Andrei** - Laboratory test of three isolates of *Beauveria bassiana* (Bals.) Vuill. against larvae of invasive sawfly *Aproceros leucopoda* Takeuki
- P5.04: Chiara Aglietti, Luisa Ghelardini, Paolo Capretti, Alberto Santini, Nicola Luchi** - Portable LAMP (Loop mediated isothermal AMPLification): New molecular assays to detect invasive plant pathogens
- P5.05: Ekaterina Kozuharova, Adam Matkowski, Dorota Woźniak, Rumiana Simeonova, Zheko Naychov, Niko Benbassat, Vladimir Kochmarov, Atanas G. Atanasov** - 'Invasive alien species' or unlimited resources of plant substances for medicinal use?
- P5.06: Marga Grădilă** - Management of some dicotyledonous invasive weeds in rape crops in southern Romania
- P5.07: Mirjana Lenhardt, Ladislav Pekarik, Stefan Skorić, Marija Smederevac-Lalić, Aleksandar Hegediš, Milica Jaćimović, Vesna Djikanović** - Influence of the diel period and different sampling methods on catch of gobiids at four locations in the inshore part of the Danube River
- P5.08: René Eschen, Andrea Vannini** - Global Warning: A COST Action about tree nurseries as early warning system against alien pests
- P5.09: Roxana Ciceoi, Minodora Gutue, Elena Stefania Mardare** - Citizen-generated data on invasive alien pests in Romania: Trends and challenges
- P5.10: Roumiana Todorova** - Risk management against invasive disease-transmissible mosquitoes in EU
- P5.11: Traian Manole, Constantina Chireceanu, Andrei Teodoru** - The current status of *Diabrotica virgifera virgifera* LeConte in Romania

KEYNOTE PRESENTATIONS

The global threat from *Parthenium hysterophorus* L.: A warning from 'down under'

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Biological invasions are one of the principal drivers of restructuring and break down of ecosystem function. Invasive plant species not only change the dynamics of species composition and biodiversity but also hamper the ecosystem's competence and productivity in those areas that have been invaded. Parthenium weed (*Parthenium hysterophorus* L.), a well-known noxious invasive species, has invaded diverse climatic and biogeographic regions in more than 44 countries across five continents. Efforts are under way to minimize the parthenium weed-induced human health, environmental, agricultural and economic impacts. However, insufficient information regarding its invasion mechanism and interference with ecosystem stability is available. It is hard to devise effective management strategies without understanding the invasion process. Here, certain aspects of the mechanism of parthenium weed invasion will be presented. Some important conclusions are that certain morphological traits, a unique reproductive biology, the lack of natural enemies in its introduced range are all likely to be involved. Tolerance to abiotic stresses, its ability to grow in a wide range of edaphic conditions and an allelopathic potential of the weed against crop, other weed and pasture species, may also be responsible for its invasion success. Genetic diversity found among different populations of parthenium weed, is also a strong contributor towards its success. Rising temperatures and atmospheric carbon dioxide concentrations and changing rainfall patterns, all within the present day climate change prediction range, will be more favourable for parthenium weed growth, its reproductive output, and therefore its future spread and abundance are likely to increase. Such an understanding of the core phenomena regulating the invasion biology and future spread has a practical consequence for its management. A better understanding of the interaction of physiological processes, ecological functions, and genetic makeup within a range of environments may help improve the management strategies used for parthenium weed in Australia and in other invaded locations.

Key words: Invasive plant species, parthenium weed, biological invasion, seed biology, allelopathy, climate change, management.

Invasive alien species of Union concern in Romania

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In July 2016, the European Union (EU, Union) adopted a list of 37 invasive alien species that are subject to the restrictions and measures set out in the EU Regulation 1143/2014. As such, all member states are required to implement cost-effective measures to eradicate these species. A first step towards achieving this goal in Romania is to gather information about the presence of the invasive alien species of EU concern in this country and evaluate their distribution, pathways of introduction, and invasiveness. The List of EU concern contains seven invertebrate species, of which six are aquatic, represented by crustaceans, and one is a terrestrial insect. The presence of two of those invertebrate species, namely *Orconectes limosus* and *Eriocheir sinensis*, has previously been recorded in Romania in natural and semi-natural habitats. However, their status needs to be updated and current distribution, as well as potential impact, need to be assessed. Among the fish species listed by EU, *Pseudorasbora parva*, is widespread in Romania in the last decades, while *Perccottus glenii* is in a constant trend of increasing its distribution. For both of them the potential impact should be assessed. *Lithobates (Rana) catesbeianus* (Amphibia) has not been recorded in Romania. The only reptile species on the EU list, *Trachemys scripta*, is present in Romania, but the distribution is limited due to its inability to breed. None of the alien bird species of Union concern have been reported in Romania, but their presence should be carefully monitored due to the rapid expansion of their range in Europe. Nine mammalian invasive alien species are of Union concern, of which only *Myocastor coypus* is present in Romania. *Procyon lotor* might soon become an invader as it is already present in neighbouring countries. As regards invasive alien plant species, 14 are included in the list of Union concern, but only two have so far been recorded in Romania: *Cabomba caroliniana* and *Heracleum sosnowskyi*. Both of them are considered naturalised. For each of them only one location has been reported, but the data are very old and need to be updated.

Key words: Alien species, Romania, distribution, invasiveness, Union list.

Comparing impacts of alien species: why and how?

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Alien species can cause a broad range of significant changes to recipient ecosystems; however, their impacts vary greatly across species and the ecosystems into which they are introduced. There is therefore a critical need for a standardised method to evaluate, compare, and eventually predict the magnitudes of these different impacts.

I will demonstrate a straightforward system for classifying alien species according to the magnitude of their environmental impacts (Environmental Impact Classification of Alien Taxa EICAT), based on the mechanisms of impact used to code species in the International Union for Conservation of Nature (IUCN) Global Invasive Species Database. The EICAT system uses five semi-quantitative scenarios describing impacts under each mechanism to assign species to different levels of impact – ranging from Minimal Concern to Massive – with assignment corresponding to the highest level of deleterious impact associated with any of the mechanisms. The scheme also includes categories for species that are Not Evaluated, have No Alien Population, or are Data Deficient, and a method for assigning uncertainty to all the classifications. EICAT is applicable at different levels of ecological complexity and different spatial and temporal scales, and embraces existing impact metrics.

Apart from environmental impacts, many alien taxa are also known to cause socio-economic impacts by affecting the different constituents of human well-being (security; material and immaterial goods for a good life; health; social, spiritual and cultural relations; freedom of choice and action). Attempts to quantify socio-economic impacts in monetary terms are unlikely to provide a useful basis for comparing impacts of alien taxa because they are enormously difficult and may ignore important aspects of human well-being. In the second part of my talk, I propose a novel standardised system based on the capability approach from welfare economics for classifying alien taxa in terms of the magnitude of their impacts on human well-being (Socio-Economic Impact Classification of Alien Taxa SEICAT). The core characteristic of this approach is its focus on how alien taxa change people's activities. Like in EICAT, impacts are assigned to one of five impact levels, from Minimal Concern to Massive, according to semi-quantitative scenarios of impact descriptions. Classification of a taxon is according to the highest level of deleterious impact caused by it through effects on any constituent of human well-being. SEICAT provides a consistent procedure for translating the broad range of impact types and measures into ranked levels of socio-economic impact, assigns alien taxa on the basis of best available evidence of their most severe documented deleterious impacts, and is applicable across taxa and at a range of spatial scales.

Both EICAT and SEICAT are designed to align closely with the Red List and could therefore be readily integrated into international practices and policies. In fact, EICAT was recently adopted by the IUCN.

Key words: Impact assessment, environmental impacts, socio-economic impacts, comparing impacts, EICAT, SEICAT.

European Alien Species Information Network (EASIN): Supporting scientific research and European policies on biodiversity

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Sharing scientific knowledge and international cooperation are crucial to address the growing threat posed by alien species (AS). This is the aim of the European Alien Species Information Network (EASIN), an online platform which aggregates, integrates and harmonises spatial occurrences of AS in Europe, from a network of global and European databases and scientific literature, assisting the European Commission and EU Member States in the implementation of European policies on biodiversity. EASIN is the official information system for the implementation of the EU Regulation 1143/2014 on Invasive Alien Species (IAS). The core of the system is the EASIN Catalogue, and includes more than 14,000 AS recorded in Europe, covering all taxa and habitats. For each taxon, EASIN gathers information on taxonomy, first introduction in Europe, habitat, pathways, impact, synonyms and common names. An Editorial Board guarantees the high quality of the EASIN data, and contributes to the update and review of the Catalogue via a forum-like platform. The information gathered in EASIN is freely available through a widget framework, providing user-friendly web tools for tailored queries, analysis and mapping, following international standards. The ownership of the data remains with its source, properly cited and linked in the EASIN geodatabase. EASIN datasets have been used for assessments of pathways and gateways of alien invasions, contributing to the fulfillment of the relevant targets set by the Convention on Biological Diversity and by European policies. EASIN contributed also to a pan-European review on highly invasive marine AS. In addition, EASIN is developing activities under the concept of citizen science, including the launch of a Smartphone application "Invasive Alien Species Europe", which allows the reporting of IAS of Union concern Europe wide, supplementing official surveillance systems.

Key words: Invasive alien species, alien invasions, EASIN, EU Regulation 1143/2014, biodiversity, citizen science.

Current state of NOBANIS project

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The project NOBANIS (North European and Baltic Network on Invasive Alien Species) is one of the European databases on invasive alien species (IAS). The project is an initiative of the North, Central and partially the West European countries. At present, 20 countries and autonomous areas are involved in this project. Nowadays, due to the lack of funds, the NOBANIS database runs in „standby mode“. In October 2016, the Icelandic Institute of Natural History took over the NOBANIS secretariat. The secretariat keeps NOBANIS webpage more up-to-date by posting different information on invasive alien species (conferences, species alerts). Actual information and changes in the database are managed by particular countries. Each member state updates its data (excel sheets) but the whole NOBANIS database is not visible on the webpage. Fact sheets on invasive alien species have still been created. Currently, *Orconoctes limosus* and *Dikerogammarus villosus* fact sheets are in revision phase. A meeting of the steering committee is planned to be organised this year, most probably during the EMAPI meeting in Lisbon (September 2017).

Key words: NOBANIS, invasive species, database.

Invasive species in the Czech Republic

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Invasive species are not clearly incorporated in any legislation of the Czech Republic. Most of the legislation refers to non-native or harmful species. Their release into the wild is regulated by the Act on the Nature and Landscape Protection, which includes general protection and special protection in protected areas, both regulating intentional dispersion of non-indigenous species. Invasive harmful species are listed and regulated by the Phytosanitary Care Act and several other phytosanitary decrees. The State Phytosanitary Administration published Brief characteristics of regulated invasive plant species, listing 13 regulated invasive alien species and recommended methods of eradication. Draft amendment of the Act on the Nature and Landscape Protection will be submitted by the end of this year. It will reflect the EU Regulation on invasive alien species. National list of invasive alien species is not prepared.

The alien species in the Czech Republic include 1454 plants and 595 animals. Of them, 174 species are classified as invasive (61 plants and 113 animals). The best-known invasive alien species include the giant hogweed, knotweeds, Himalayan balsam, non-native crayfish species, raccoon dog, and the American mink. Black, grey and watch lists of alien species were published in 2016. There is no systematic mapping system for invasive species. Distribution maps are available in the Species Occurrence Database managed by the Nature Conservation Agency. These maps show only individual records registered there. Anyone can be involved in the mapping through the mobile app BioLog. Eradication activities funded by various sources (LIFE+, OPE, national funds) are mainly focused on mostly broadened plant species. Early warning system was launched in 2014 (<http://invaznidruhy.nature.cz>, in Czech only). The first rapid response connected with the warning system will be realised in April 2017 – eradication of marbled crayfish from urban pond in Prague.

Key words: Invasive species, Czech Republic, legislation, mapping, eradication.

Pest Risk Analysis, phytosanitary measures against invasive alien species and the role of biological control

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The increase in the international movement of plants and plant products results in an increasing number of introductions of new pests to the importing countries. In Europe the European and Mediterranean Plant Protection Organization (EPPO), is coordinating work to prevent introduction and spread of regulated (quarantine and non-quarantine) pests. To decide whether a pest should be classified as a regulated pest, Pest Risk Analysis (PRA) is performed according to internationally approved schemes. The main stages of PRA are (1) initiation, (2) risk assessment (for probability of entry, spread and establishment of a pest, and potential economic and environmental impact associated) and (3) risk management to select phytosanitary measures (in the exporting country, in transit, at the point of entry, etc.) to prevent entry and spread of the pest. The important damage from non-indigenous (alien) pests often arises from the absence of their natural enemies in the new invaded areas. Therefore, a logical and environmentally-friendly measure in case of introduction of non-indigenous pests is the intentional introduction of natural enemies from the pest's origin. Before the import and release of these biological control agents (BCAs) they should be assessed for the risk of negative non-target effects. The EPPO Panel on BCAs decided that PRA is not appropriate to assess BCAs: (1) the use of Pest Risk Analysis creates the assumption that BCAs are pests and therefore damages the image of biocontrol, (2) the BCA assessment should be comparative risk/benefit (environmental benefit coming from reduction of invasive pest populations and from replacement/reduction of pesticide treatments), (3) some parts of existing PRA schemes (assessment of probability of entry, risk management, etc.) are not applicable to BCAs. The Panel is now developing an EPPO Standard ('Decision-support scheme for import and release of non-indigenous invertebrate biological control agents of plant pests') specific to BCAs.

Key words: European and Mediterranean Plant Protection Organization, Pest Risk Analysis, regulated pests, phytosanitary measures, biological control agent.

Invasive alien species networking and regional cooperation in Europe: ESENIAS and DIAS; The role of ESENIAS-TOOLS project

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Networking and cooperation on invasive alien species (IAS) in different scales is crucial for the prevention and management of IAS and can facilitate the implementation of existing IAS instruments, such as the EU Regulation 1143/2014 on the prevention and management of the introduction and spread of IAS. There are several joint regional initiatives in Europe. The East and South European Network for Invasive Alien Species (ESENIAS) was established in 2011 to facilitate solving IAS issues in the Balkan countries. Currently, 12 member countries and three invited countries have been involved in the ESENIAS activities: exchange and sharing of IAS information, capacity building, research, policy development and harmonisation. In 2014 the Danube Region Invasive Alien Species Network (DIAS) was established within the frames of Priority Area 06 of the European Union Strategy for the Danube Region, International Association of Danube Research (IAD), and ESENIAS. Countries from the Upper, Middle and Lower Danube River basin, as well as adjacent Black Sea region participate in the network. DIAS strategy and work plan have been under development. Since 2015 a joint project: *East and South European Network for Invasive Alien Species – A tool to support the management of alien species in Bulgaria* (ESENIAS-TOOLS) has been implemented. The project is funded by the Financial Mechanism of the European Economic Area 2009-2014, and aims at networking and development of IAS tools (harmonisation of definitions and standards, listing and prioritisation of alien species, data collection, database development, education) within the frame of ESENIAS to support the management of alien species in Bulgaria and in the overall region. Eleven partner institutions (environmental agencies, universities, research institutions) from eight countries (Bulgaria, Greece, Croatia, Serbia, Romania, Turkey, Iceland and FYR Macedonia) participate in the project. The work on the project is organised in 10 working groups and four bilateral case studies (Bulgaria – Italy, Iceland – Bulgaria, FYR Macedonia – Bulgaria, and Romania – Bulgaria). The main outcomes and results of the ESENIAS-TOOLS project are presented: 1) joint standardised and harmonised methods for data collection, analysis, database use, dissemination and further outreach; 2) technical infrastructure for the network, including a geo-referenced database; 3) data on alien species from the ESENIAS countries collected and entered into the database; 4) common lists of alien species and priority species for the ESENIAS region; 5) information sharing and dissemination of results with other networks and open services, publication of results.

Key words: Networking, invasive alien species, East and South Europe, ESENIAS-TOOLS project.

Pilot-study on invasive alien species in the Danube Region with a smartphone application developed by the EC JRC

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Citizen science based monitoring and surveillance has been increasingly being used in the area of invasive alien species (IAS). Sufficient high quality information on alien species occurrence and distribution is a prerequisite for the efficient prevention, early detection, rapid response, and management of biological invasions. New technologies such as smartphone application software (apps) are developed and used to involve citizens in the reporting of IAS in Europe. The European Commission's Joint Research Centre (JRC) has developed an app on Invasive Alien Species in Europe, which aim is to enable the general public (amateurs and professionals) to receive and share information about IAS in Europe and to complement to collection of data in the frame of the European Alien Species Information Network (EASIN).

Here we present our project: *Pilot-study (data collection) on invasive alien species in the Danube Region with a smartphone application developed by the JRC*. The purpose of this project is to test the practical use of this smartphone application developed by JRC, within the frame of the Danube Region Invasive Alien Species network (DIAS), in order to contribute to the environmental monitoring and early warning of IAS in the Danube River basin. This will help to carry out early practical tests, provide feedback about the feasibility and possible challenges when intending to use the app for early warning or monitoring purposes, and provide input to ongoing data validation mechanisms. Thus the project will support the implementation of the aims of the DIAS Strategy and relevant EC policies.

The study has been conducted in three countries in the Lower Danube Region – Bulgaria, Romania and Serbia, which allows a broader coverage of sites and groups of stakeholders, as well as comparison of results. There are nine species out of the 37 species of Union concern present in the three countries, some of them with restricted distribution. The participants in the testing are selected based on their professional expertise and occupation, groups of interests, and motivation. They include scientists and students in the areas of biology, ecology, agriculture and forestry, representatives of environmental administration, non-professional groups and associations, as well as local business. Considering the necessity of training and coordination, the testing of the smartphone application is divided in two stages: information campaigns and field testing. A questionnaire has been developed to collect feedback from participants. Here we present several information and field testing campaigns conducted in Bulgaria and preliminary results from the testing.

Key words: Citizen science, EC JRC smartphone app, IAS of EU concern, Danube Region.

Who is who among marine alien species in the ESENIAS region

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Using the HCMR/ European Environment Agency (EEA) off line database (stored in EASIN), a list of Marine Alien Species (MAS) for the ESENIAS area has been prepared, and then critically reviewed (updated and validated) by experts from Bulgaria, Romania, Greece, Albania, Montenegro, Slovenia, and Italy. As a result, 399 changes were noticed for the Mediterranean and 67 changes for the Black Sea in the period from August 2015 to March 2017. In addition to the updated nomenclature following WoRMS, and 16 new records of MAS published during the study period, the changes included:

a) removal of erroneously reported species, e.g. misidentifications, ghost records, such as Foraminifera in the Adriatic: *Archaias angulatus* (Fichtel & Moll, 1798) for Slovenia/Croatia; Mollusca: *Centrocardita akabana* (Sturany, 1899), *Cellana rota* (Gmelin, 1791), and *Murex forskoehlii* Röding, 1798, for Greece; Fish:: *Siganus rivulatus* Forsskål & Niebuhr, 1775 for Albania;

b) removal of MAS records that are not present in the wild, such as *Crassostrea gigas* (Thunberg, 1793) for Montenegro; and *Pinctada margaritifera* (Linnaeus, 1758) for Italy – both introduced for aquaculture;

c) removal of molluscan records that were based on empty shells, such as: *Anadara granosa* (Linnaeus, 1758); *Circe scripta* (Linnaeus, 1758); *Conus inscriptus* Reeve, 1843; and *Nassarius stolatus* (Gmelin, 1791); all four in the Saronikos Gulf, Greece;

d) removal of the species that expand their range, such as: *Zenopsis conchifer* (Lowe, 1852) and *Gymnothorax moringa* (Cuvier, 1829) in Italy;

e) removal of freshwater species such as *Umbra krameri* Walbaum, 1792; *Pseudorasbora parva* Temmnick & Schlegel, 1846; *Lepomis gibbosus* (Linnaeus, 1758); and *Gambusia holbrooki* Girard, 1859; all reported for the Black Sea;

f) addition of six pseudo-indigenous species, which were considered as natives till now.

For the ESENIAS area after these changes, 642 species were classified as true MAS, 73 as cryptogenic, 34 as questionable, while 48 species were excluded from the list. The highest number of the MAS (more than 400) is reported for Turkey, followed by Italy (253) and Greece (204), whereas for the other Adriatic and Black Sea countries the respective number is under 40 each (e.g. 27 for Bulgaria).

The invasive and potentially invasive MAS and their distribution in ESENIAS countries have also been identified. For ten of them, fact sheets have been prepared, with mapping their distribution in detail.

Key words: Marine alien species list, database, ESENIAS area, prioritisation.

PRESENTATIONS

TOPIC 1: INVASIVE ALIEN SPECIES TRAITS AND TRENDS

Invasive alien species introductions and spread, biological and ecological characteristics; characteristics of recipient environment; invasive alien species and climate change

Alien flora of Düzce Province, Turkey

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Our work is the first attempt to prepare a complete list of alien vascular flora of Düzce Province, Turkey. The alien plants were mainly taken from the Flora of Düzce, combined with a field survey and the records of DUOF Herbarium. The number of alien plant taxa is 128, which equals to 9.57% of the flora of Düzce. These include 105 Angiosperms and 23 Gymnosperms, belonging to 57 families. The families richest in alien species are *Cupressaceae* and *Rosaceae* (10.15%), *Asteraceae* (7.81%), *Pinaceae* (7.03%), and *Fabaceae* (3.9%). Phanerophytes are the most abundant life form (55.06%). There are 26 archeophyte taxa in the list. Most of the non-native taxa originate from Asia (41.40%) and the Americas (37.5%). The casual, naturalised and planted taxa have almost the same share. Many of the species are woody plants, which are planted and cultivated for the purposes of forestry, gardening or agriculture.

Key words: Alien flora, Düzce, Turkey.

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Non-indigenous and Ponto-Caspian limnofauna (Gastropoda and Clitellata) of Lake Sapanca, Turkey

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Many Ponto-Caspian invertebrate species have been introduced to new areas in Europe, Baltic Sea and North America. In Turkey, the Ponto-Caspian and Asian fauna have spread in the inland and brackish waters and lagoons following different patterns and in different geological periods. Lake Sapanca is located on a tectonic hole in the Marmara region in the north-western part of Turkey. Except for a few studies, there has been no detailed information about the non-indigenous and Ponto-Caspian species in the Lake.

With the aim to determine the macrozoobenthic fauna of Lake Sapanca, samples were collected seasonally from nine stations, in the period from June 2011 to December 2013. As a result of the present study, 20 Clitellata and 13 Gastropoda species were identified, among them the following non-indigenous species, which originate from the Ponto-Caspian area: *Potamothrix hammoniensis*, *Potamothrix heuscheri*, *Lithoglyphus naticoides*, *Fagotia esperi* and *Borysthenia naticina*. Previous records and recent distribution of these species both in Europe and Turkey have been examined and the dispersion patterns have been discussed for the territory of Turkey. The presence of the species, originated from the Ponto-Caspian area suggests that the main routes of migration may be the rivers flowing into the Black Sea, since Turkey is a country that covers a wide area of the coastline and the drainage basin of the Black Sea. In addition, recently a subspecies (*Potamothrix alatus hazaricus*) originated from the Ponto-Caspian area has been found in Eastern Anatolia, which is separated by the Anatolian diagonals from Central Anatolia.

Key words: Ponto-Caspian, non-indigenous, Gastropoda, Clitellata, Lake Sapanca.

An indigenous species, *Dreissena polymorpha*, in Lake Büyük Akgöl as an invader

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Although *Dreissena polymorpha* is considered as indigenous species to Turkey, it is one of the species with the highest negative impact in freshwater ecosystems because of its fouling activities. The first record of *Dreissena* species in Turkey was from 1897 by DSİ. Later, the species was recorded in Bursa and its surrounding freshwaters in 1936. In the last decade, *D. polymorpha* that is considered an invasive alien species in Europe has been reported to spread in many freshwater systems of Turkey.

In this study, the population density of *D. polymorpha* and other macrozoobenthic invertebrates in Lake Büyük Akgöl was examined in 2009, 2012 and 2014. In 2009, the macrozoobenthic fauna consisted of Gastropoda (53.4%), Bivalvia (26.8%), Oligochaeta (12.6%), Chironomidae (5.9%), and other taxonomic groups (Trichoptera, Ceratopogonidae, Ephemeroptera, Odonata, Chaoboridae and Hirudinea, 1.04%). During the research period in 2009, the dominant taxa were as follows: *Viviparus viviparus* (16.85%) and *Lymnea stagnalis* (12.8%) from Gastropoda, *D. polymorpha* (19.6%) from Bivalvia, *Potamothrix hammoniensis* (8.37%) from Oligochaeta, and *Procladius (Holotanypus) sp.* (1.39%) and *Chironomus (Comptach) tentans* (1.27%) from Chironomidae. After three years, Bivalvia and Oligochaeta populations were found to increase (38.2% and 15.3% respectively), while the other groups (especially Gastropoda and Chironomidae; 41.4 and 4.5%, respectively) were found to decrease. The relative abundance of *D. polymorpha* was detected as 32.4%. The results from the last survey completed in 2014 showed that the population density of *D. polymorpha* continued to increase (34.8%, but less than the previous one), while the other invertebrate groups decreased. Since the beginning of the study, *D. polymorpha* has occupied various benthic habitats of Lake Büyük Akgöl and continued to spread. Furthermore, the present study results showed that with the increase in population density of *D. polymorpha*, the benthic invertebrate communities change in terms of taxonomical composition and relative abundance of functional groups.

Key words: *Dreissena polymorpha*, Lake Büyük Akgöl, macrozoobenthos.

Trophic features related to the explosive spread of the invasive alien species *Pseudorasbora parva* (Schlegel, 1842) in the Romanian-Danubian basin

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The topmouth gudgeon, *Pseudorasbora parva*, is one of the two fish species included in the List of invasive alien species of European Union concern, to the EU Regulation 1143/2014 on Invasive Alien Species. The species has been unintentionally introduced in the Romanian-Danubian basin and its speed of range expansion is one of the highest among the ichthyofauna in the Lower Danube River. The aim of our study was to analyse some trophic features of *P. parva* in the Romanian-Danubian basin, in order to identify these features that allow the achievement of high expansion rate, establishment success, and high population densities of this species. Our research results revealed: broad ecological niches; a high degree of trophic niches overlapping; macroinvertebrate group with high relative abundance in the trophic supply and high weight in the analysed individuals; and a high number of macroinvertebrate groups present in the trophic supply used as food by the species. These trophic features ensure a high competitiveness of the alien *P. parva* compared to native fish species.

Key words: Invasive alien species, topmouth gudgeon, trophic parameters, the Danube River.

Deficit distribution data on invasive plant species: The untold story of plant invasion in Turkey

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Undue invasion of exotic plant species is not only a nuisance, but also ecological, economic and social issue. Invasion Science, although witnessed remarkable progress worldwide, is still poorly developed in Turkey. The recorded exotic plant species are left unaddressed, and therefore, they can naturalise rapidly in the country. This study was designed to figure out the distribution data availability of 50 different invasive alien plants as covered in "Invasive Plants Catalogue of Turkey". Additionally, 10 different worst weeds (native) in the country were searched for their distribution data. We mainly used Global Biodiversity Information Facility (<http://www.gbif.org/>) to extract the occurrence records of these plants. ModestR tool (<http://www.ipez.es/modestr/>) was used to extract the records of all invasive and native plant species at three levels: i) world, ii) Europe, and iii) Turkey. The occurrence records on invasive plants at the world level varied from 0 (*Erigeron annuus*) to 86 026 (*Conyza canadensis*), while for Turkey, ranged from 0 (no record found for 35 out of 50 plant species) to 12 records only (*Amaranthus retroflexus*). Similarly, no record was found at European level for 12 species, while low to massive (few to several hundred records) occurrences were noted for the other 38 plant species. The occurrence records of native plant species on global level were observed between 11 522 (*Sorghum halepense*) and 422 882 (*Plantago lanceolata*). The records in Turkey varied from 4 (*Fumaria officinalis*) to 3526 (*Avena sterilis*). The occurrence records for Europe varied from moderate to massive. It is evident from the results that invasive/exotic plants are ruthlessly ignored in the country (no occurrence data), which could create severe challenges in future. Therefore, an effective information system, which reports data on occurrence, identifies potential spread areas and recommends preventive measures against invasive/exotic species is urgently needed in the country. We conclude that the biological invasion story of Turkey is still untold. However, it needs to be reported for avoiding possible massive losses in future.

Key words: Invasive alien plants, Turkey, distribution data, Global Biodiversity Information Facility.

Feeding properties of translocated marine fish sand smelt, *Atherina boyeri* Risso, 1810, in a freshwater reservoir

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Atherina boyeri is an euryhaline marine fish naturally distributed in the Mediterranean, Black and Caspian seas and eastern Atlantic Ocean. The species was translocated into freshwater environments in Turkey during the last decades. It has rapidly spread through the main freshwater basins in Anatolia and became a dominant fish in many freshwater reservoirs. This species possesses many traits, such as: broad salinity tolerance, early sexual maturity, high reproductive capacity, and short life-span, which enables it to invade the inland waters successfully. Although there is limited information on the feeding habits of *A. boyeri* in freshwater environments, it can mostly probably alter the food-chain of lakes and reservoirs where it has been introduced.

The present study aimed to reveal the feeding habits of an invasive freshwater population of *A. boyeri*. The fish specimens were collected monthly between April 2008 and March 2009 from Hirfanlı Reservoir, using a trawl net with 4 mm mesh size. All fish specimens were preserved in 4% formaldehyde solution. Prey items were determined under a binocular microscope to the lowest possible taxon. The organisms were identified from 1 ml subsamples with triple replicate counted on a Sedgewick-Rafter counting cell. Vacuity index (%VI), percentage of abundance (%N), volumetric percentage (%V), the index of relative importance (IRI) and its percentage (%IRI) were calculated. Seasonal changes in feeding intensity were determined.

The proportion of empty guts was maximum in winter. The results revealed that sand smelt mainly selected larger zooplankton, such as adult copepods and cladocerans, and avoided rotiferans. Fish eggs and larvae were also found in the gut contents. Larger individuals have cannibalistic behaviour as they consumed larvae of sand smelt and other fish species. Through its selective predation, *A. boyeri* may adversely affect the native fish fauna and zooplankton. The feeding habits of *A.boyeri* seem to facilitate its invasion in freshwater environments.

Key words: Sand smelt, feeding, zooplankton, invasive, Hirfanlı Reservoir, Turkey.

Expansion of pelargonium butterfly *Cacyreus marshalli* Butler (Lepidoptera: Lycaenidae) in the Balkan Peninsula

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Pelargonium plants belong to the most commonly cultivated ornamentals in public green and private gardens. The most popular cultivars are *Pelargonium zonale* and *P. peltatum*. Pelargonium butterfly (*Cacyreus marshalli*) (Lepidoptera: Lycaenidae) is a regulated species in EU, hence this species is on the EPPO A2 list of quarantine organisms. It originates from South Africa and was introduced to Europe in 1978. In Slovenia, the species was first recorded in Gorjansko village on the Kras Plateau in the autumn of 2008. In the territory of Croatia, it was first observed on the island of Mali Losinj in 2009. Until 2014, the distribution of pelargonium butterfly was confirmed in 50 localities in Primorje, Istria, Dalmatia and the inland territory. Based on literature, the species has been recorded only in the Sub-Mediterranean and Eu-Mediterranean areas in Croatia. In Bulgaria, close to Greece border, the pelargonium butterfly was recorded in August 2014.

In 2016, this species expanded southwards. Namely, it was observed in the town of Neum (Bosnia and Herzegovina) in June. In mid-August, the pelargonium butterfly was recorded in the town of Trebinje and the village of Tuli, also in Bosnia and Herzegovina. In Montenegro, the first symptoms of damage on pelargonium plants were observed in June 2016. Detailed inspection in July and August confirmed the presence of all developmental stages of the pelargonium butterfly in the broad territory of the municipality of Herceg Novi. In February 2017, damaged plants were found in the town of Kotor. This is an evidence that the pelargonium butterfly is expanding its range southwards along the Adriatic coast.

The import of plants for planting from Italy was probably the pathway of the pelargonium butterfly introduction. During January 2017, the weather along the Adriatic coast was extremely cold, and outdoor pelargonium plants were frozen. It is likely that the import of pelargonium plants in coastal part of Montenegro and in Bosnia and Herzegovina could increase in the spring of 2017. The pest is not regulated in both countries. It would be recommended to authorities to regulate this pest and keep on the monitoring of the expansion of this alien species. This would be a preventive measure to keep safe the native flora of *Pelargonium* species.

Key words: Pelargonium butterfly, *Cacyreus marshalli*, alien species, *Pelargonium* spp., pathway of introduction, plants for planting.

The alien species in northern Aegean Sea and a new locality of *Penaeus aztecus* Ives, 1891

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The aim of this work is to present the alien species in northern Aegean Sea. The study is based on the relevant literature referring to the coasts of Turkey and Greece. We compiled the list according to the four zoogeographical areas in northern Aegean Sea. Our paper reports a total of 92 alien species in the studied area. Phytobenthos is represented by the highest number of species (24 species), followed by Polychaeta (23 species) and Mollusca (23 species). We also report Saroz Bay as a new distribution area of *Penaeus aztecus*, with İzmir Bay being the northernmost location known to date for this species. The number of alien species in the Aegean Sea is decreasing significantly northwards. The area is the main pathway of alien immigrants related to the route of ships towards Peiraias, the biggest port in Greece and İzmir where the second major port of Turkey is located. Selected alien species and their impact on the socioeconomics are also discussed here.

Key words: Northern Aegean Sea, alien species, *Penaeus aztecus*.

Management of freshwater invasive species in Central Italy: The experience of LIFE and Aquainvad-ED projects

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Aquatic Invasive Species (AIS) are increasing due to the synergistic effects of climate change and habitat destruction. They heavily affect biodiversity and human health, and cause loss of ecosystem services. Particularly, with the new EU Regulation 1143/2014 on invasive alien species their control and management have now become of primary concern.

Here, we present our research and management experience in Central Italy within the LIFE NAT/IT/094 "SOS Tuscan Wetlands" and the Marie Curie Aquainvad-ED (H2020-MSCA-ITN-2014-ETN-642197) projects.

LIFE SOS Tuscan Wetlands aims at reversing the current trend towards radical biodiversity loss and population decline of species of conservation concern in Northern Tuscany wetlands. Since 2014, we have been conducting monitoring and control campaigns to control the red swamp crayfish, *Procambarus clarkii*, in a lake and a marshland belonging to two different Sites of Community Importance, training and involving local volunteers in the activities.

Management as well as ecological and socio-economic impacts are, otherwise, the main focus of research activities of two Early Stage Researchers working at University of Florence within the Aquainvad-ED project. This project, involving an international consortium (UK, Spain, Italy) composed by scientists and professionals from three universities, one technological institute, two governmental agencies, one NGO, and five SMEs working in fundamental and applied aspects of AIS, aims at exploiting novel tools combined with the power of crowd data sourcing (citizen science) to develop innovative methods for early detection, control and management of AIS. Activities target *P. clarkii*, the American bullfrog, *Lithobates catesbeianus*, and the channel catfish, *Ictalurus punctatus*.

Results from both projects, including those from lab experiments and field works, are discussed and indications to help mitigating the impact of target AIS are given.

Key words: Alien, biological invasions, impacts, control.

Parasites of non-indigenous fish species in the inland waters of Turkey

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Introduction of alien freshwater fish is one of the main threats to the survival and genetic integrity of native fish fauna around the world. In this context, one of the most persistent risks is the transmission of the associated pathogens and parasites to new hosts in the area of receipt. By now, the parasites of alien fish species have rarely been investigated and there is limited information about them in the habitats of introduction in Turkey. At the same time, some alien parasitic species, such as *Schyzocotyle acheilognathi*, have already widespread distribution. Some of them have recently been found on native fish species. This paper provides a review of the current knowledge on parasites in alien fish species that inhabit the Turkish freshwater bodies.

Key words: Alien fish, invasive species, native host, parasite, Turkey.

Age and growth of the non-indigenous Redbelly tilapia, *Coptodon zillii* (Cichlidae), in the Pınarbaşı Spring Creek (Burdur, Turkey)

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The Redbelly tilapia, *Coptodon zillii*, is a non-indigenous species in Turkey that has established several populations. Such population, almost certainly originated from the ponds of the aquarium industry in the area of Burdur, exists in Pınarbaşı Spring Creek (Burdur-Turkey).

This study aims to investigate the population structure and some growth parameters of *C. zillii* in Pınarbaşı Spring Creek. In this context, we have ascertained the population density, age and sex composition, the growth in length and weight, along with the length-weight relationship, and then compared these parameters with those reported for other populations. During the study period (from November 2013 to June 2016), we caught by electrofishing six fish species: *C. zillii*, *Oreochromis niloticus*, *Oxynoemacheilus anatolicus*, *Gambusia holbrooki*, *Carassius gibelio*, and *Clarias* sp., among which only *O. anatolicus* was native to the area. Among all the species *C. zillii* had the highest density, with a total catch of 155 specimens. These specimens ranged from 2.4 to 20.5 cm in size and from 0.16 to 166.1 g in total weight. The number of the immatures was 80, of the remaining 44 were females and 31 males, accounting for the overall sex ratio 0.7:1. The age of the caught specimens ranged from 0 to 4 years. The length-weight relationship for all individuals was described by the parameters: $a = 0.0078$ and $b = 3.354$.

Key words: Tilapia, alien, aquarium species, acclimatised populations.

Recent status of invasive fish species in the North Aegean Sea

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In this study, the invasive fish species in the North Aegean Sea are reviewed with precise locality information. This review was prepared under the guidance of studies, which were conducted in the North Aegean Sea, including both Turkish and Greek sections. The Aegean Sea offers a unique opportunity for Lessepsian migrant species. The Aegean Sea is divided into two sections, with a provisional zoogeographical separation line from Euboa Island to Chios-İzmir Bay. Due to diversified abiotic conditions (sea water temperature, salinity), the North and South Aegean Sea differ from each other in terms of the variety of lessepsian migrant species. The inflow of the less saline and less temperate Black Sea water (salinity <30) from the Dardanelles may be the main factor affecting the spread of the invasive species. A total of 58 and 42 invasive fish species were reported from Turkey and Greece, respectively, with a great majority of them reported from the South Aegean Sea. However, the invasive species are beginning to spread towards the north due to global warming. The examination on the Turkish coast of the Aegean Sea found 11 invasive fish species. These species were: *Liza haematocheilus*, *Lagocephalus spadiceus*, *Lagocephalus sceleratus*, *Siganus luridus*, *Siganus rivulatus*, *Etrumeus sadina*, *Saurida undosquamis*, *Stephanolepis diaspros*, *Upeneus moluccensis*, *Pomadasys stridens*, and *Champsodon vorax*. The majority of these species were Lessepsian migrants. The euryhaline species *L. haematocheilus* entered the Marmara and North Aegean Seas from the Black Sea. On the other hand, a total of 6 invasive fish species were reported from the North Aegean coast of Greece. These were: *Liza haematocheilus*, *Lagocephalus sceleratus*, *Stephanolepis diaspros*, *Fistularia commersonii*, *Siganus luridus*, and *Tylosurus crocodilus*. A part of the species mentioned above has not yet become established in the northern Aegean Sea; their biomass is very low in comparison to total abundance. At the same time, some of the invasive species reported from the South Aegean Sea are increasingly spreading to the north. Systematic and continuous monitoring is necessary to improve our understanding of the expansion of the invasive species.

Key words: North Aegean Sea, invasive, fish, Turkey, Greece.

Could we analyse the IAS spread dynamics patterns from the available data?

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Slovenia, with its area of 20 000 km², high spatial diversity and relatively abundant floristic data was used as a test area to study the IAS spread dynamics patterns. Thirty plant taxa (at the level of species or aggregate) recognised as invasive in different phases of spread and their field records (totally 4190 records from the mid-19th century on) per quadrant (35 km² grid cell) annually served as input data matrix. The distribution patterns for each taxon were produced for 4 periods: before 1920, between 1920 and 1950, between 1950 and 1980, and after 1980, in order to observe some spread dynamics. In addition, the patterns were compared by multivariate analyses. However, the interpretation of results was more difficult than expected due to the following reasons: a) the majority of the studied taxa are escapes from cultivation with several potential centres of garden origin; b) the floristic field research before 1980 appears to have neglected these taxa; c) there is no overall systematic mapping activity and big gaps existed in temporal and spatial scale; d) beside the spontaneous spread, there was random long-distance spread because of several human activities, such as: mechanical mowing along roads, transfers of cultivated plants' seeds, relocation of heavy machinery, as well as deliberate spread (e.g. by bee-keepers); and e) speed of spread in some taxa is so high that it is almost impossible to keep their distribution maps updated. For these and other reasons the putative sub-spontaneous spread patterns are blurred, and we still remain at the level of static interpretation of certain stage distribution patterns with some biogeographic factors as altitude, meso-climatic conditions, geology, and landscape diversity.

Key words: Invasive alien plants, spread dynamics pattern, Slovenia.

The colonising pattern of the diatom *Didymosphenia geminata* in Iceland

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The diatom species *Didymosphenia geminata* is frequently found in cold, oligotrophic fresh waters in the Northern Hemisphere and is native to mountainous areas of Europe, Asia and North America. It was first reported in Icelandic rivers in 1994, showed a rapid colonisation within river systems and became a nuisance in many of them. According to local farmers, the diatom was first noticed two years earlier and its abundance increased in subsequent years. In a survey carried out in 1997, it appeared that the diatom was in the stage of expanding its distribution in the country. A second nation-wide survey in 2006 revealed that *D. geminata* had spread across Iceland and was present throughout the island. The nuisance appearance of *D. geminata* in many of the rivers it colonised in Iceland in the 1990s is now abating. In some rivers it is no longer apparent and in others less apparent than initially. No records are available of earlier presence of the species in Iceland. Within river systems, the diatom usually colonised first the lower reaches and then it spread upstream. In the presentation we will introduce results on the succession pattern of *D. geminata*.

Key words: *Didymosphenia geminata*, Iceland, diatom, algae.

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Invasive alien plants as a key threat factor for the floristic diversity in 'Deliblato Sand' Special Nature Reserve

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Invasive alien plants are one of the most important drivers of global change in biodiversity and ecosystem services, and present a global issue. They often appear to have a negative impact on biodiversity or on human health, and cause serious economic losses. Therefore, the early detection of the invasive alien species and the ability to track their spread are critically important. The subject of this study is the floristic diversity of the 'Deliblato Sand' Special Nature Reserve and its threats. Our field investigations, the interviews with experts from the Institute for Nature Conservation of Vojvodina province and consultations with the Vojvodinašume public company, which is responsible for management of the protected area, show that the invasive alien plants are a key threat factor to the floristic diversity in this area. We also analyse the ecology and biology of the invasive alien species, including their life forms, origin of the species, level of invasiveness and mechanisms of spreading. Consequently, some measures of controlling the invasive alien plants, along with preventive actions for protection and enhancement of the endangered habitats are recommended.

Key words: Floristic diversity, 'Deliblato Sand' Special Nature Reserve, invasive alien plants, protecting measures.

Presence of the alien species *Craspedacusta sowerbii* in some Bulgarian reservoirs

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The freshwater hydrozoa *Craspedacusta sowerbii* is considered of East Asian origin, but at present has already a global distribution. The species has been found in fresh waters on almost every continent. The species appearance is sporadic and unpredictable from year to year. *C. sowerbii* may cause serious ecological problems to the pelagic communities of the infested water bodies. It is a predator on zooplankton and may cause shift in the diet of the zooplankton feeding fish. The decrease in the zooplankton quantities can influence negatively on the self-purification processes in the water bodies. The species was recorded for the first time in Bulgaria in 1991 in Ivailovgrad Reservoirs located along the Arda River, Aegean Sea basin. In 2003, it was observed in Kardzhali Reservoir on the same river. The aim of our study was to collect and analyse data on the current distribution of *C. sowerbii* in stagnant water bodies in Bulgaria, using field survey data and other available sources. The sampling was conducted in reservoirs and sand-pit lakes in all water basins of Bulgaria, in the period 2009-2016. Qualitative and quantitative samples were collected, using standard and experimental methods and plankton nets.

The species is reported from five reservoirs. One of them (Studen Kladenets Reservoir) is located on the Arda River, Aegean Sea basin, while the others are from the Danube River basin, in the northwest Bulgaria. Two of the reservoirs are used for drinking water supply (Iskar and Srechenska Bara), some of them are used for aquaculture (e.g. Drenovets Reservoir), and the rest for irrigation and power generation. Possible pathways and vectors for the introduction of the species, as well as potential impacts and threats of its further spread to other reservoirs and natural and artificial water bodies in the country are discussed.

Key words: *Craspedacusta sowerbii*, alien species, abundance, reservoirs, sand-pit lakes.

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The non-indigenous fishes in the fauna of Ukraine: A potentia ad actum

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Ukraine is one example of a country, for which the issue of non-native species is of high importance. Therefore, summaries about the distribution of native and non-native fish over time are strongly demanded, particularly, due to the introductions of many species from this country to other parts of the world. Our present review is restricted to the scientific publications started in the 1920-1930s in order to evaluate which species are native for a particular region. Later, from the 1940s to 1960s, documentation on the 'improvement' of fauna and their production were widely provided. These activities, which included the purposeful introduction of non-indigenous species, resulted in considerable changes in aquatic biodiversity. The list of non-indigenous fish species recorded in Ukraine consists of 27 species (unsuccessful introductions and occasional findings are not included). Eight of them have been deliberately introduced and stocked commercially, with their spawning in nature not confirmed yet. The list of fishes with successfully established populations includes 19 species, eight of which, due to their continued range expansion and negative influence on the native fauna, may be considered invasive. The remaining species of the list are restricted in their distribution and form localised populations. Both neolimnic and Mediterranean fish species were not regarded as non-indigenous as they have a status of 'native' in the major Ukrainian rivers, coastal waters, or in the water bodies adjacent to the Black Sea. This review demonstrates the major gaps in the research on the distribution and status of native and non-native fish in the Ukraine, which may have some essential consequences for the proper management of the biodiversity and aquatic invasive alien species in the country.

Key words: Fauna of Ukraine, ichthyofauna, invasive alien species, Mediterraneanisation, purposeful introduction, range expansion.

Is Bucharest a hot spot of alien plant species in Romania?

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It is well documented that cities are major hot spots of alien species. Bucharest, the capital city of Romania, is likely to be no exception. To verify this hypothesis, we evaluated the published data and our own data collected in the field over the last few years. An alien plant list, which includes around 220 species, has been compiled for Bucharest based on bibliographical resources. We investigated the presence of the plants on this list, and confirmed that around 75% of them are present in Bucharest, while another 25% are probably extinct. Among the species confirmed, 43 are invasive. Some are widespread and locally very abundant: *Acer negundo*, *Ailanthus altissima*, *Ambrosia artemisiifolia*, *Amorpha fruticosa*, *Eleusine indica*, *Panicum capillare*, *Phytolacca americana*, and *Veronica persica*. Moreover, among the over 700 alien plant species recorded at a national level, 57 have been first reported from Bucharest as being casual or naturalised. The oldest record is of *Clematis viticella* (1880), a species, which has not been confirmed by the recent field research. For the last 10 years, 15 new alien species have been reported from Bucharest. The most recent one is *Symphytotrichum squamatum* (2016). Three of the most widespread invasive alien species in Romania were first reported from Bucharest: *Ailanthus altissima*, *Amorpha fruticosa*, and *Panicum capillare*. Numerous exotic naturalised plants have been reported from 'D. Brandza' Botanic Garden, but during our research we could not find those generally annual plants. Although many of the alien plant species reported from Bucharest have not spread to other places in the country, the high percentage and abundance of some of them point to the fact that Bucharest can be considered as a hot spot for these species. Further studies are required to assess the impact of alien plant species and to establish measures to eradicate them or mitigate their impact.

Key words: Alien species, plants, invasive, Bucharest, hot spot.

Epilithic diatom assemblages from the Seven Rila Lakes, Bulgaria: Long-term dynamics and potential threats

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Long-term ecological studies that have started at the beginning of the 2000s in the cirque of the Seven Rila Lakes, Rila National Park, are further developed and improved and changes in physical, chemical and biological characteristics are used as environmental change indicators (climate change, increase in N deposition, acid/base and trophic status variations). The aim is to compare previous results for the same lake group with the current study. First, we had results from the paleolimnological studies of the sediment for reconstructing recent environmental changes (last ~250 years). Diatom analyses were conducted to get more detailed information about the characteristics of the lakes and the development, which could help to understand the underlying climate mechanisms. Second, epilithic diatom assemblages were studied in all seven lakes. The database has been initiated with data collected in 2000-2001. A total of 45 new epilithic samples were collected in July, October 2015 and July 2016. More than 200 diatom taxa were found. The highest number of taxa observed per sample was 61. The Shannon-Wiener Diversity Index varied between 2.70 and 4.50. The composition of the diatom communities in the studied lakes showed relationships between species diversity and the main chemical variables (pH, alkalinity and conductivity). The Red List status is available for more of 80% of the taxa. One new to science species was discovered and described (*Genkalia boreoalpina* Wojtal, C.E. Wetzel, Ector, Ognjanova–Rumenova et Buczkó); the ultrastructure of one species of the genus *Navicula* Bory sensu lato was documented in detail and was transferred to the genus *Boreozonacola* Lange-Bertalot, Kulikovskiy & Witkowski. Single specimens of *Didymosphenia geminata*, a diatom species considered invasive in some European countries, such as Iceland, was recorded in both study periods. The potential threats to epilithic diatom assemblages in the Seven Rila Lakes, such as introduction of alien species, habitat change and climate change are discussed. Prevention measures and regular monitoring are recommended to ensure early detection of alien species.

Key words: Diatoms, diversity assessment, threats, Seven Rila Lakes, Bulgaria.

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Experimental insights for niche expansion potential of Common ragweed

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Marginal habitats are characterised by unsuitable ecological conditions for the growth and establishment of exotic plants. Niche distribution models (NDMs) accurately predict the invasion range of exotic plants. However, these models ignore the adverse ecological conditions that prevail in the new habitats, which lead to overestimating or underestimating the suitable ecological niches. We experimentally tested the potential for niche expansion of Common ragweed (*Ambrosia artemisiifolia*) in Turkey. This was made by testing its germination under adverse ecological conditions (heavy metal stress). Both germination and seedling growth of the species were studied at five different levels (0, 2.5, 5, 10 and 20 ppm) of seven trace metals: boron (B), cadmium (Cd), lead (Pb), nickel (Ni), arsenic (As), chromium (Cr), and vanadium (V). The germination was not affected by any level of the tested metals. On the contrary, lower levels of boron even stimulated the start of germination. The metals had no negative effect also on the early seedling growth of the species. In fact, lower levels of some metals increased plant height and width, whereas the higher levels caused slight reduction in both height and width. Similarly, the biomass production was improved with increased levels of the tested metals, excepting Cr and V, which led to slight decrease in that production. Chlorophyll contents remained unchanged under all tested levels of the metals. Our results show that the species has extensive adaptive and tolerance potential to heavy metals, likewise to drought and salinity. Therefore, the plant has extensive niche expansion potential even under unfavourable ecological conditions. The integration of these results in NDMs may significantly improve the reliability of those models. The results on metal accumulation will provide insights into the tolerance mechanism of the species and its potential uses in phytoremediation.

Key words: *Ambrosia artemisiifolia*, marginal sites, invasion potential, germination, seedling growth.

Acknowledgements: This study was funded by the Scientific and Technological Council of Turkey under grant number 113 O 790.

Contribution to the knowledge of alien marine molluscs along the Turkish coast, with a new record of *Varicopeza pauxilla* (A. Adams, 1855) from the Mediterranean Sea

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The Mediterranean Sea is one of the hot-spot areas in the world regarding alien species with nearly 1000 alien species reported until now. Alien species in the Mediterranean are dominated by molluscs and polychaetes. According to a checklist published in 2014, out of 1065 mollusc species distributed along the Turkish coast, 118 species were alien. They dominated along the Turkish Levantine coast with 111 species, with lower numbers in the Turkish Aegean coast (38 species), Sea of Marmara (9 species) and Black Sea (4 species). After 2014, six species have been added to the alien mollusc fauna of the Turkish Levantine coast: *Lodderia novemcarinata*, *Eratoena sulcifera*, *Zafra obesula*, *Z. pumilla*, *Retusa desgenetti*, and *Martesia striata*, two species to the Aegean coast of Turkey: *Leucotina natalensis* and *Pyrunculus fourieri*, and one bivalve species to the alien mollusc fauna of the Sea of Marmara: *Arcuatula senhousia*. In the present study a new record is being reported: *Varicopeza pauxilla* (Gastropoda: Cerithiidae) from İskenderun Bay (Levantine coast of Turkey), with a type locality Burias (Philippines). Twelve specimens were encountered in August 2016 in mud materials sampled at depths between 18 and 50 m. This species occurs mostly in fine sandy-muddy bottoms with depth range varying between 11- 686 m, and has a large distribution in the Indo-West Pacific. It is also known from the Red Sea (Gulf of Aqaba). To suggest by which way the species entered into the Mediterranean Sea, more records would be needed. The probable pathway of introduction might be either shipping or the Suez Canal.

Key words: Alien molluscs, Mediterranean Sea, Turkish coast, *Varicopeza pauxilla*, new record.

The invasive alien species in Romania: Current status

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Recently, the invasive alien species has become a permanent issue, especially in the context of the increase in the biological invasions due to the global trade and climate changes. The communities of the native species in certain areas suffer from consistent remodelling as a result of the spreading and establishment of non-indigenous species. Although the impacts of these species are more evident in the areas with strong anthropogenic influence, such as harbours and human settlements, some alien species also form self-sustaining populations in natural habitats, often including Natura 2000 protected areas.

This paper provides an overview of the dispersal and population status of some alien species in South-East Romania in the last three years. Our findings show, among other, the strong dynamics of the invasive alien species in recent years, more specifically, in the region of Dobrogea in South-East Romania, including Counties of Constanta and Tulcea. Some marine animals, for example, the flatback mud crab, *Eurypanopaeus depressus* (Decapoda, Brachiura), freshwater species, such as the bryozoan *Pectinatella magnifica* (Bryozoa, Plumatellida), insects, e.g. citrus flatid planthopper, *Metcalfa pruinosa* (Hemiptera, Flatidae), and Asian tiger mosquito, *Aedes albopictus* (Diptera, Culicidae), are striking examples of alien species that have recently established populations not only in the zones with high human impact, but also in natural protected areas of the marine littoral, the Danube River and floodplain, the Danube Delta, and of the inlands.

Key words: Invasive alien species, South-East Romania.

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First report of an established rainbow trout population in Greece

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The rainbow trout, *Oncorhynchus mykiss*, although widely introduced and farmed all over the world, has only a few populations established in nature, outside its native range. In Greece, no self-sustaining populations of rainbow trout have been recorded to date. At the same time, the occurrence of the species is reported for at least 10 aquatic systems. These findings are possibly related to deliberate stocking or to some escapees from nearby farms. In the present study, the first established rainbow trout population in Greece is reported. This population was found at an altitude of 430 m, in a creek fed by freshwater springs near the village of Spili that is located at the foot of Vorizi Mountain, 30 km of Rethymnon town on the island of Crete. We made two surveying trips at Spili creek: in October 2012, when rainbow trouts of various sizes, ranging from 5 cm to 30 cm in total length, were electrofished, and in March 2014, at a riffle-pool section of the creek (35°12'45.40"N, 24°31'57.80"E). There are no autochthonous freshwater fish species in the streams of Crete, excepting for the peri-Mediterranean freshwater blenny, *Salaria fluviatilis*, and no rainbow trout farms exist in the vicinity of Spili. According to some locals from the village, the population in the creek originated from a single massive introduction of juveniles from a trout farm in the Peloponnese to Spili's famous Venetian fountain in the mid-1980s. Therefore, we suggest that rainbow trout reproduce naturally in this creek, which is most probably favoured by all-year cool water and lack of competition by other fish species, and has adjusted their diet to the local conditions. Further research is needed to clarify the exact reasons for this apparently successful establishment of a rainbow trout population.

Key words: *Oncorhynchus mykiss*, established population, Crete, Greece.

Testing the ecological plasticity and invasiveness potential of *Neocaridina davidi* Kubo, 1938 (Crustacea, Decapoda, Atyidae)

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In the past 20 years, the increasing interest in exotic species of freshwater shrimps has led to intensive importation and captive breeding of freshwater crustacean species for the aquarium trade. Among them, *Neocaridina davidi* has proven a high invasiveness potential and wild populations have already been reported in Germany (the Gillbach stream in North Rhine-Westphalia).

Over the past three years we have conducted laboratory experiments aimed at elucidating the problems of the ecological plasticity of *N. davidi*, and at testing the possibility of the successful adaptation of this species to the paramarine lakes from Constanța county (south-eastern Romania), in case of accidental or deliberate introduction. The results highlight that this species of freshwater shrimp is able to adapt and reproduce successfully in the conditions typical for the Siutghiol Lake, Tașaul Lake and Tăbăcărie Lake. The species has proven to tolerate low levels of dissolved oxygen, large variations in temperature and can utilise the trophic niche represented by debris from the mentioned lakes. Considering the fact that *N. davidi* is widely present in the aquarium trade in all the countries of the Danube River Basin, the possibility of developing of feral populations is very high and might affect native aquatic invertebrates by competitive interactions.

Key words: *Neocaridina davidi*, Danube River basin, invasive alien species.

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First occurrence of *Peroderma cylindricum* (Heller, 1865) in Turkish waters

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Up to date, five species of parasitic crustaceans from family Pennellidae have been reported in the marine habitats of Turkey: *Pennella instructa*, *Pennella filosa*, *Lernaelophus sultanus*, and *Peniculus fistula*. Our aim was to study further the fish parasitic fauna from this country.

On 01.06.2015, totally 300 specimens of sardina, *Sardina pilchardus* (Pisces; Gadidae), were collected by local gears from Saros Bay, North Aegean Sea (latitude 40°22'11" N, longitude 26°19'16" E) off Turkish coast. The found parasites were fixed in 70% ethanol. Specimens were later cleared in lactic acid and the appendages of copepods - dissected. The drawings of appendages were carried with the aid of camera lucida, while the a camera attached to the microscope was used for pictures.

We found pennellid crustaceans on the kidneys of the hosts. The infestation prevalence was 1.6%. The mentioned parasitic copepods were identified as *Peroderma cylindricum* Heller, 1865 (Copepoda: Pennellidae). This is the first report of that species on the sardina from Turkey.

Key words: Peroderma, Pennellidae, Saros Bay, Aegean Sea, Turkey.

Does Italian wall lizard, *Podarcis siculus*, expand its distribution to Northeastern Anatolia?

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Italian wall lizard, *Podarcis siculus*, is native to Italy including the islands of Sicily and Sardinia, to southern Switzerland and southern France, and to the northwestern Balkan Peninsula. However, the species is known for colonising and adapting successfully to different places outside its natural range. It has been introduced to Spain, Turkey, and the United States. Thus, isolated or introduced populations are known from Corsica, the Iberian Peninsula and Menorca, Northwestern Turkey, the United States and probably Libyan and Tunisia.

In Turkey, the species was reported from some islands in the Marmara Sea, İstanbul (the European, 1936, and Asian parts, 1944), Bursa (2000), Kaz Dağları (2008), Zonguldak (2013), Gelibolu (2014, 2015), and Samsun (2015). The presence of this lizard in coastline Turkish cities is possible evidence of its accidental introduction by humans. Our study investigated the potential distribution of the species and factors that influenced it. This was implemented by modelling the ecological niche. The spreading of *P. siculus* to the north-east part of Turkey and the impact of this lizard on native species were also discussed.

Key words: Lacertidae, *Podarcis siculus*, wall lizards, invasive species, Turkey.

***Thysanozoon brocchii* (Risso, 1818) (Platyhelminthes: Polycladida):
First record for Turkish coastal waters, from the Sea of Marmara**

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The carpet flat worm (*Thysanozoon brocchii*) is a polyclad flatworm of the family Pseudocerotidae – one of the most diverse families within the suborder Cotylea, with almost 200 species, mostly known from tropical and subtropical waters, in the Indo-Pacific region and in the Mediterranean and the Red Sea. This species is considered cosmopolitan; however, there have been no reports on its finding in the Turkish coastal waters so far.

On 31 July 2015, two specimens of *T. brocchii* were caught during a MAREM (Marmara Environmental Monitoring) survey, at a depth of 46 m (station Algarna 7, 40° 26.567' N / 027° 04.250' E 40° 26.233' N / 027° 03.633' E) and 33 m (station Algarna 8, 40° 27.067' N / 026° 51.500' E 40° 26.950' N / 026° 50.583' E), in the Sea of Marmara.

The obtained specimens of *T. brocchii* were quite similar morphologically, flattened and oval in shape, with typical dorsal papillae covering the body. The length, thickness and density of the conical papillae, decrease from the sides of the median line towards the margins. No papillae exist in the area between eyes and the bases of tentacles. The pharynx is at 3.8 mm and the ventral sucker at 13.9 mm from the anterior margin. Dorsally, the body was of light yellowish-brown colour and semitransparent in the margins, with similar colouration on the ventral side. The specimens were 36 mm long by 25 mm wide, while the wet weight was 9 and 11 g, respectively.

This finding of *T. brocchii* in the Sea of Marmara is the first record of this polyclad flatworm in the Turkish coastal waters.

Key words: Polycladida, *Thysanozoon brocchii*, the Sea of Marmara, Turkish coastal waters.

Alien flora of Turkey: Current list and beyond

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The alien flora of Turkey has not been investigated in detail so far, although some materials on the topic have been published. A high number of alien and invasive alien species was expected to be included in the rich flora of Turkey, owing to climatic, edaphic, topographic, and geological diversity throughout the country. In this work we prepared and deposited to GBIF (doi: 10.15468/7j1dof) a list of alien flora within the frame of an international collaborative study. The list includes 328 species: 309 angiosperms, 17 gymnosperms and two ferns; the number of archeophytes is 60. Asteraceae, Poaceae and Solanaceae are the families with the highest number of naturalised species. The life forms of taxa are as follows: annuals (29.8%) and biennials/perennials (25.6%), as well as trees (22.3%), shrubs (13.4%), vines (6.4%), and aquatic plants (2.5%). The Americas and Asia are main sources of alien species in the flora of Turkey. The main pathway of introduction is intentional introduction. The next steps in the research of the alien plants are their prioritisation and risk assessments, which require more taxonomic, biogeographic, ecologic and impact studies. This work is also a contribution to the studies in South and East Europe and may help to understand and prevent the spread of alien plants in the region.

Key words: Flora, alien plants, Turkey, South and East Europe

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Variation in life history and feeding ecology of the invasive Eastern Mosquitofish *Gambusia holbrooki* in a groundwater-dependent wetland in Turkey

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The eastern mosquitofish *Gambusia holbrooki* has been considered as one of the worst invasive vertebrates in the world with an impact on the ecosystem functions and biodiversity. It was introduced in Turkey in the 1930s for the purpose of malaria control and has now spread throughout the country. In the present study, variations in life history and feeding ecology of *G. holbrooki* were investigated in Acıgöl, a groundwater-dependent wetland - the only area where the critically endangered *Aphanius transgrediens* occurs.

Between September 2013 and September 2014, fish were sampled from three sites with different sizes, physicochemical indices of the water and fish density, as follows: Site 1 – small, with stable indices and the highest intraspecific density; Site 2 - large, with stable indices and lower intraspecific density; and Site 3 – large, variable indices and the lowest intraspecific density. Scale reading showed two age groups in males and three – in females. The reproduction period appears to be from April to September. More embryos and heavier gonads, signs of increased reproductive investment, were found in specimens at Site 3. The overall ratio of fertilised eggs, as well as the absolute and relative fecundity, were the lowest at Site 1. The species exhibited two different trophic positions as plant-based omnivory and animal-based omnivory. It fed mainly on insects, particularly dipteran adults and larvae, as well as on zooplankton at Sites 2 and 3. However, it fed chiefly on vegetative sources and occasionally on others at Site 1. Significant temporal and ontogenetic differences in feeding were also determined. The highest diet diversity and broadest trophic niche were found at Site 2.

Key words: Non-native fish, biodiversity, feeding strategy, Acıgöl, *Gambusia*, *Aphanius transgrediens*.

TOPIC 2: VECTORS AND PATHWAYS FOR INVASIVE ALIEN SPECIES INTRODUCTIONS

Trade, transport, horticulture,
aquaculture, agriculture, forestry,
hunting, etc.

Non-indigenous species: further findings and range expansion in the Italian marine and brackish waters by 2017

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A comprehensive bibliographic study on the introduced marine biota in Italian waters was carried out in 2016-2017. Both indexed publications and grey literature were examined. Acquired data was investigated and taxonomically updated following on-line sources and recommendations of about 27 experts that were contacted. All data were reviewed from their original source. For each species the year of the first finding; alien status (alien, cryptogenic, debatable); establishment success (established, casual, unknown); and most plausible introduction pathways were noted. In comparing the last update of Italian non-indigenous species (NIS) (2013), that counted 176 species, 16 species are now considered as not aliens while 95 aliens (plus 48 cryptogenic and 18 debatable) were added. With the new records, the inventory of alien marine species of Italy now includes a total of 255 species (plus 59 cryptogenic and 39 debatable). In particular, the alien species are represented by 62 macroalgae, 165 invertebrates, 20 vertebrates (fishes), 1 bacterium, 3 protozoans, 3 cercozoa and 1 myzozoo. Among the latest records worth mentioning are: the jellyfishes *Aurelia solida* and *Rhopilema nomadica*, the crustacean *Charybdis feriata*, the fishes *Oplegnathus fasciatus*, *Siganus rivulatus* and *Zebrasoma xanthurum*, the brown shrimp *Penaeus aztecus*, and the amphipod *Grandidierella japonica*. Since 2010, the establishment success of many Italian NIS has changed: 24 species previously reported as casual are now considered as established. With regards to their pathway/vector of introduction, Transport-Stowaway and Transport-Contaminant seemed to be the major vectors in Italy: 140 species (55% of the total) appear to have been introduced by vessels, 51 NIS (20%) through aquaculture activities; 21 NIS (8%) as Unaided (spreading of introduced species in other regions, i.e. fishes and invertebrates); 10 NIS (4%) as Escapees from aquaculture confinements especially invertebrates and fishes. Finally, 4 species (2%) appear to have been released from Aquaria.

Key words: Alien species, Italy, Mediterranean, check list.

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Analysis and management of pathways of introduction and spread of invasive alien species in South-East Europe

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Invasive alien species (IAS) are one of the major threats to biodiversity and ecosystem services. It is well recognised that preventing the introduction of IAS is generally more cost-effective than measures taken following their introduction and establishment in a new location. Understanding the pathways, by which organisms are moved internationally, and implementing of enhanced pathway management measures are key approaches for reducing or eliminating the risks of introduction of IAS. The need to identify and manage IAS pathways is explicitly addressed in the Convention on Biological Diversity (CBD) Guiding Principles. The Aichi target 9 of the CBD highlights the importance to ensure a special focus on the management of the introduction pathways of alien species. The analysis of pathways of IAS presented at the 12th CBD COP, showed that the pathways that seem to be of the highest priority at the global level may not be of priority at the local level, and vice-versa. Therefore, a regional approach in IAS pathway analysis is needed. The aim of this paper is to assess the available knowledge and activities conducted in relation to IAS pathway analysis in South-East Europe.

An overview of IAS pathways and related tools, such as: EU legislation and guidelines, networks and projects, key reference tools and papers for identification, prioritisation and management, is presented. Key regional issues and constraints concerning IAS pathway analysis and management are outlined: (1) big inconsistencies among taxonomic groups and countries; (2) reduced border control within EU countries in the region that facilitates the spreading of already established organisms elsewhere in Europe; (3) presence of non-EU member countries in the region with no obligations to follow the EU IAS and Plant health regulations; (4) unintentional introductions and natural spreading from neighbouring countries; and (5) global warming, facilitating the spreading of some alien species. The identified major regional knowledge and policy gaps are discussed.

Key words: Invasive, alien, the Balkans, review, regional approach.

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TOPIC 3: THE DANUBE RIVER AS INVASIVE ALIEN SPECIES CORRIDOR

Priority species for the Danube Region,
impact on threatened species, specificity
of biological invasions in Lower, Middle
and Upper Danube River sections

Recent state of invasive alien species in Ukrainian part of the Danube Delta

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The total number of non-indigenous species in the Ukrainian part of the Danube Delta in present time is 115 species: 17 phytoplanktonic species, 54 higher plants, 31 invertebrates, 11 fish, one reptile, and one mammal species. According to investigations of the Danube Delta Biosphere reserve in the Ukrainian part, 1560 species have been registered: 68 fungi, 525 algae and 967 higher vascular plants. Among them, 54 alien species of plants were found. Among the 17 alien species of phytoplankton, nine were Bacillariophyta, three Dinophyta, one Cryptophyta, three Chlorophyta, and one Cyanophyta. Sunberry or wonderberry, *Solanum retroflexum*, is an example of recently recorded (2011) and widely distributed alien species. Among the 31 recorded alien invertebrates (or 5.7% of the total number of invertebrate species), seven are zooplanktonic species and 24 are zoobenthic. The systematic structure of the alien invertebrates is: 13 species of Mollusca; eight Arthropoda; two Annelida; two Ctenophora; two Tentaculata; two Bryozoa; one Coelenterata; and one species of Radiolaria. The bivalve mollusks *Mya arenaria* and *Anadara kagoshimensis* have been fully naturalised since more than 30 years ago and have become key species of relevant biocenoses. The species with the highest abundance among alien species is the freshwater mollusk *Corbicula fluminea* (up to 200 ind. m⁻²). Among the last findings of alien invertebrates in the Danube Delta area were the bryozoans *Lophopodella cartleri* (that was registered in 2010) and *Pectinatella magnifica* (found in 2014). By the end of 2014, in the Ukrainian part of the Danube Delta 106 fish species have been registered, of which 11 are alien. The alien vertebrates in the Ukrainian Danube Delta are the wall lizard *Podarcis muralis* (registered in 2012) and the golden jackal *Canis aureus* (found in 2009).

Key words: Non-indigenous species, Black Sea, Danube Delta.

***Dreissena polymorpha* in the Bulgarian inland water bodies, population structure and relation to environmental parameters**

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Dreissena polymorpha (Pallas, 1771), commonly known as zebra mussel, is listed among the 100 European worst invaders and is able to cause ecological and economic impact. It is native to the Ponto-Caspian region and is considered as a native species in some parts of Bulgaria, where it was first reported for the Danube River and the Black Sea coastal lakes and river estuaries. The invasive range of *D. polymorpha* in Bulgaria is not limited to the river catchments directly connected with its considered native range, the species has been also translocated into many of the Aegean Sea river basins. The main aim of our work was the analysis of the population structure of *D. polymorpha* in different sites in Bulgaria, in order to evaluate the establishment status of this species in terms of population density and reproductive capability. Our second aim was the identification of environmental variables and conditions, characterising invaded sites and allowing the achievement of high population densities.

A total of 45 water bodies were included in the study. They are located in the three Bulgarian main river basins: 21 water bodies in the Danube River basin; 12 in the Black Sea river basin; and 12 in the Aegean Sea basin. Data and samples collected during previous studies were used for 20 water bodies, while survey data collected during the current study (2014 and 2015) were used for 25 water bodies. The samples were sorted and counted in order to evaluate the abundance of *D. polymorpha* and to analyse the population structure and the recruitment capability in the sites.

The results show that *D. polymorpha* occurred in 27 out of the 45 studied water bodies. Shabla-Ezerets and Durankulak Lakes, as well as Mandra Reservoir have been considered as part of the native range of zebra mussel in Bulgaria. Out of the 24 invaded sites recorded in this study four are new records for Bulgaria: the former sand-pit lakes in Sofia region - Krivina, Katina, Dolni Bogrov, and Chelopechene lakes. The total abundance varied in a wide range among different reservoirs (from 158 to 60 179 ind. m⁻²). In almost all studied infested water bodies, the zebra mussel has well-established populations with high reproductive potential. The species was not found in water bodies with high values of dissolved oxygen, water temperature and located at high altitudes. Sites with high abundance of the zebra mussel populations had high values of Secchi disk transparency.

Key words: *Dreissena polymorpha*, translocated species, population structure, environmental conditions.

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Alien fish species in the Hungarian section of the Danube River: Historical overview

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During the last centuries, presence of 29 alien fish species has been reported along the Hungarian section of the Danube River and its tributaries. There are several reasons for their arrivals. Fishery has a long tradition in the region and intentional introduction of non-native fish species for this occupation started in the beginning of the 20th century. Pond fish husbandry activity began to develop widely at the same time. This resulted in unintentional stocking of some alien fish species mixed with commercial fish, as well as in occurrence of escaped individuals of farmed non-native fish species. Private stocking of ornamental alien species by aquarists dates back to the 19th century, but it became more common at the end of the 20th century.

The Hungarian section of the river is in the central area of the Danube basin and it is a part of the main aquatic invasion corridor linking the Black and the North Seas via the Rhine-Main-Danube River canal. Furthermore, it is an important spreading route for the Ponto-Caspian species. Especially in the recent decades, some fish species from the Lower Danube River – Black Sea region appeared and their spontaneous spread to the Middle Danube River can be assumed through passive spreading along with transportation during commercial shipping operations.

The paper reviews the historical emergence and present state of the alien fish species in the Hungarian section of the Danube River, and provides information about the ecological risks of their presence.

Key words: DIAS, invasive non-native fish, introduction pathway, risk assessment, black list, grey list, white list.

Has the racer goby *Babka gymnotrachelus* (Kessler, 1857) failed to invade the Croatian tributaries of the Danube River?

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In the Croatian tributaries of the Danube River, three Ponto Caspian gobies: the bighead goby *Ponticola kessleri*, the monkey goby *Neogobius fluviatilis*, and the round goby *Neogobius melanostomus*, have recently expanded their ranges. The species reported last in the Croatian Danube River tributaries was the racer goby *Babka gymnotrachelus*, which was found in the Drava River, in 2011. During recent years of intensive monitoring and inventory programmes in the Croatian inland waters, no changes in the racer goby's population density or range expansion were recorded. In this paper we present: (i) the distribution of the racer goby in the Danube River basin of Croatia; (ii) past and recent records; and (iii) the habitat preferences. Furthermore, a critical discussion on the possibilities of future expansion of the racer goby in the Danube River tributaries in Croatia is given.

Key words: Gobiidae, alien species, Danube River, distribution, habitat, future expansion.

TOPIC 4: INVASIVE ALIEN SPECIES IMPACT

Environmental impact, impact on ecosystem services, socioeconomic impact and impact on human health; pests and pathogens

Qualitative and quantitative analysis of the damages on maize produced by the invasive stink bugs *Halyomorpha halys* and *Nezara viridula*

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The brown marmorated stink bug, *Halyomorpha halys*, and the southern green stink bug, *Nezara viridula*, are two alien polyphagous species in Europe. They cause huge damages on many crops, including field maize. *Halyomorpha halys* was first recorded in Europe in 2004, in Lichtenstein, and had a silent spreading until 2014, when severe damages started to alarm the EU authorities. *Nezara viridula* seems to have silently spread around the world in the last 250 years, while the first report in Europe date from 1998, from Italy. The stink bugs rest on the maize ears and feed through the husk, by penetrating with their rostrum each kernel and sucking its content, leaving the maize kernels discoloured, shrunken, and mottled. The attack starts early, at the milk stage (R3) of the kernels, and continues till their maturity. Some species of *Fusarium* may develop on the wounds, which mycotoxins are dangerous for human and animal health. By now, there has been no studies to determine the economic threshold or the density of bugs that cause yield losses in maize.

In 2016, we made observations on different hybrids of maize on fields in southern Romania. The results revealed a high percentage of attacked kernels, mostly on the upper third part of the cob. Here, we present the morpho-anatomical and chemical changes of those kernels. In addition, we give interpretation of the influence of the irrigation system on the population structure of the stink bugs and propose a framing for the poorly studied economic impact of stink bugs feeding on maize.

Key words: Invasive pests, *Halyomorpha halys*, *Nezara viridula*, maize, morpho-anatomical changes, population structure.

An impact of alien horticultural pests on urban landscape in the southern part of Montenegro

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Ornamental trees, shrubs and flowers as a regular part of the urban greenery, public and private gardens, yards, and terraces are of huge importance for modern life, affecting the quality of human life and functioning. Therefore, the market for ornamentals is very wide and dynamic, which usually results in interceptions and introduction of alien pests in the importing countries. There are numerous harmful biotic organisms that cause serious negative consequences on ornamental plants, resulting in disruption of health status and aesthetic appearance.

The very intensive construction works followed by large imports of ornamental plants in the last 15 years have markedly changed traditional appearance of the landscape, particularly in the southern part of Montenegro. This resulted in detection of new alien species some of which showed drastic impact on the landscape and huge economic damages.

During this period, 17 new alien insect species have been recorded: *Metcalfa pruinosa* Say – the citrus flatid planthopper; *Phylloxera quercus* Boy de Fons. – oak phylloxera (2003); *Monarthropalpus buxi* Lab. – boxwood leaf miner; *Bemisia tabaci* Gennadius – the tobacco whitefly; *Luperomorpha xanthodera* Fairmaire – flea beetle; *Frankliniella occidentalis* Pergande – the western flower thrips (2008); *Acizzia jamatonica* Kuwayama (2009) – the jumping plant-lice; *Epichoristodes acerbella* Walker – South African carnation tortrix; *Glycaspis brimblecombei* Moore – the red gum lerp psyllid; *Rhynchophorus ferrugineus* Oliver – red palm weevil (2012); *Leptocybe invasa* Fisher & La Salle – the blue-gum chalcid; *Ophelimus maskelli* Ashmed – eucalyptus gall wasp (2013); *Cydalima perspectalis* Walker – the box tree moth; *Opogona sacchari* Bojer – the banana moth (2014); *Aleurocanthus spiniferus* Quaintance – orange spiny whitefly; *Macrohomotoma gladiata* Kuwayama – jumping plant-lice; and *Cacyreus marshalli* Butler – the geranium bronze (2016).

Among these pests, the red palm weevil *R. ferrugineus* showed not only a high rate of spread, but also caused the most serious damages, particularly destroying the Canary island date palm *Phoenix canariensis*. Considering the large number of infested palms irretrievably damaged and consequently cut down, this resulted in dramatic changes of the Montenegro seacoast landscape.

Key words: Montenegro, alien species, ornamentals, landscape.

Settlement and reproduction of parrots in Istanbul and health implications

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Invasive alien species are known as one of the most important reasons for the disappearance of many bird species. The aim of this paper was to present the settlement and health risks of parrots as invasive alien species in Istanbul. Obtaining and feeding of parrots have been started to increase in Istanbul from the middle of the 1980s, and it was reported that parrots began to live as clusters over time in different districts of the city. On the other hand, according to the studies published in 1987 and 1990, *Salmonella typhimurium* and *Candida albicans* were found in Istanbul. Owing to their strong structure and aggressive behaviour, the invasive alien bird species can enter into nesting and food competition with many native birds in Istanbul, especially magpies and woodpeckers. The habitats of some native animal species can be destroyed. Various infectious agents, microorganisms and vectors may be transported with these invasive alien species and this may result in risks for plant, animal and human health. Two studies performed at the end of the 1980s also highlighted the risk of emerging infectious diseases that could threaten public health. Urgent measures are recommended to control the spread of invasive alien species, the hazards and health problems they cause, and to protect the public health.

Key words: Invasive alien species, parrots, Istanbul, public health.

Exotic animal and plant trade as pathway for introduction of invading alien species and threat to public health

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International trade with exotic animals and plants is one of the most important pathway and source for introduction of invasive alien species. Recent studies have shown that the number of invasive animal and plant species have increased with the development of international trade. Especially in developing countries, such as Turkey, there is a rapidly increased demand for introducing continuously exotic animals and ornamental plants in big cities. People are trying to get exotic animals out of cheap and easy ways without any health and safety concerns. As a result, allergic, dermatological and respiratory diseases and various zoonotic diseases triggered by exotic animals in childhood or sensitive individuals are the most important public health consequences of this situation. The trade with ornamental plants have also increased and international trade has accelerated with the development of electronic commerce in recent years. Growing ornamental plants are an important threat to plant biodiversity and are considered to be the most important transit route in plant invasions in the world. Increasingly, more exotic plants such as cactuses, orchids are offered for sale every day in the markets. Because it is relatively inexpensive and easy to maintain, it is becoming more common nowadays at home and work environments. Introduced into natural environment intentionally or unintentionally the exotic animal and plant species may adopt successfully overcoming the environmental challenges and become established. Exotic animal and plant trade is also triggering the spread of invasive species in agricultural areas and leading to more intensive use of crop protection products. Uncontrolled and unregistered animal and plant sales can lead to dissemination of false information and beliefs in the society, which can also increase the pesticide applications to unhealthy and unsafe conditions.

Although we need studies to investigate the cause-and-effect relationship in order to understand accurately the global health problems caused by invasive alien species, it is inevitable that the harm caused by invasive alien species to the plant-animal-environmental health chain also affects the health of society. This study aims to evaluate the risks that the invasive alien species introduced by exotic animal and plant trade might cause in terms of public health. The organisation of regular training programs for exotic animal and plant breeding, risk perception, health and safety, and invasive alien species, according to different risk groups in the communities are recommended.

Key words: Exotic animal, exotic plant, invasive alien species, public health.

New alien arthropod pests on agricultural crops in Montenegro

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The introduction of alien species as a dynamic process results in yearly detection of new species in many countries. The increased mobility and human interactions are the key drivers in the spread of alien species worldwide. Montenegro is a net importer of food products and the trade in plant material may be considered as intensive in the country. This, along with the diverse relief and climate, and various agricultural products, creates favorable conditions for interception, introduction and establishment of new alien species. Here, we present an overview of new alien arthropod pests recorded in the last decade on agriculture crops in Montenegro. The majority of species were discovered accidentally during our visits, both in the open field and at greenhouses.

In the period 2006-2016, 15 alien phytophagous species were found, among which insects are the most numerous. The new species found for the first time in Montenegro are presented chronologically as follows: *Polyphagotarsonemus latus* – the broad mite and *Liriomyza bryoniae* – the agromyzid leaf miner (2006); *Aphis illinoisensis* – the grapevine aphid, *Scaphoideus titanus* – the American grapevine leafhopper, and *Frankliniella occidentalis* – the western flower thrips (2008); *Luperomorpha xanthodera* – flea beetle, *Tetranychus cinnabarinus* – the carmine spidermite (2009); and *Tuta absoluta* – the South American tomato moth (2010); *Bemisia tabaci* – the tobacco whitefly (2011); *Liriomyza trifolii* – American serpentine leafminer and *Aleuroclava aucubae* – aucuba whitefly (2012); *Drosophila suzukii* – the spotted-wing drosophila, *Aleurocanthus spiniferus* – orange spiny whitefly, and *Rhagoletis cingulata* – the eastern cherry fruit fly (2013); and *Phthorimea operculella* – potato tuber moth (2015).

All the listed species, excepting *A. aucubae*, *R. cingulata*, and *P. operculella*, are considered established; however, some of them do not seem to be of economic importance so far. We also discuss the spreading of the newly recorded species and their potential environmental impact, as well as phytosanitary measures.

Key words: Alien arthropod pests, agricultural crops, Montenegro.

Pros and cons of the invasive Rapa whelk in the Black Sea region of Turkey

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Rapa whelk is one of the most important invasive alien species in the Black Sea. After its introduction and full adaptation to the coastal ecosystem, this species reached a high abundance. This species started to be caught by dredges and have provided high income for the small scale fisheries in this region since the 1980s. Many whelk-processing plants appeared and registration of fishing boats increased in the Black Sea. The whelk-processing plants contributed to the reduction of unemployment in this region. There is no domestic consumption of the Rapa whelk in Turkey, and all the production is exported as frozen meat to Asian countries. The dredges used to harvest the species are harmful to the bottom habitats and decreased the biodiversity due to high by-catch. The Rapa whelks have intensive predatory impact on the local mussels in the Black Sea. Because of the lack of predation and competition by other species in the Black Sea, the Rapa whelk has caused a significant damage to the native benthos. In this paper, we present both positive and negative impacts of this species in the Black Sea region of Turkey.

Key words: *Rapana venosa*, impacts, Black Sea.

TOPIC 5: INVASIVE ALIEN SPECIES PREVENTION AND MANAGEMENT

Early detection and rapid eradication, surveillance systems; risk assessment and horizon scanning; control measures; restoration of damaged ecosystems; education, citizen science, strategies, policy and legislation; IAS networks and information systems, databases, data planning and management

Insects may act as potential biological control agents for alien ornamental plants in Turkey

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Ornamental plant species have been introduced outside their natural range due to their florist elegance. Some of them could cause negative impact on biodiversity through competition with native flora and have a potential to become invasive. A list of alien plants of Turkey has been published recently at GBIF website but studies about the invasive potential of these plants in Turkey have not been conducted yet, although several studies/PRA's in other countries or regions provide information for possible spread of aliens in Turkey.

The aim of this study is the assessment of possibilities for biological control of alien plants in Turkey. An inventory of potential biological control agents of 56 ornamental plant species in Turkey (19 trees, 13 shrubs, 10 herbs, seven aquatic, six climbers and one succulent plant) and their invasive capacity was made on the basis of published data in national and international literature sources.

As a result, a list of 128 species, potential natural enemies on the targeted ornamental plants, has been created. 23 of them are established in the released areas. 47 of these species have been recorded in Turkey, but their impact on the plants has not been studied in detail. Some of the potential agents are: *Ophiomyia maura* (Agromyzidae) for *Solidago canadensis* and *Euseius stipulatus* (Phytoseiidae) for *Carpobrotus edulis*. It is concluded that such potential agents can be used in Turkey for control of alien ornamental plants after risk analysis for safe release of the beneficial insects.

Key words: Insects, biological control, ornamental plants, alien plants, Turkey.

The management of Rapa whelk harvesting in Turkey

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Rapa whelk, *Rapana venosa*, is considered responsible for the collapse of mussel and oyster stocks in the Black Sea after the 1940s. This whelk, after its fast adaptation to the Black Sea ecosystem, has formed dynamic stocks along the Turkish Black Sea coast since 1969. The population of this species spread gradually toward the 1970s and its stock increased extremely in the coastal benthic habitats in the 1980s. The harvesting of the rapa whelk in Turkey started in 1985, due to the demand on the Asian markets, and several processing plants were constructed for preparing whelks for export as frozen meat.

The positive economic results from harvesting *R. venosa* are frustrated by some negative ecological side effects of the destructive practices of collecting with dredges and beam trawls. For that reason, the official landings are misreported to some extent. Since the products from this whelk are export-oriented, the real value of catches could be estimated by official export data instead.

In Turkey, the Ministry of Food, Agriculture and Livestock (MFAL) enforced some restrictions to the harvesting of rapa whelk, namely: a) collection by scuba diving is permitted in the western part, while dredges (with a mesh size of 40 mm as minimum) are allowed for using in the eastern part of the Turkish Black Sea coast; b) the harvesting by dredges is permitted only between 1 May and 30 August; c) collection at night is banned; and d) restriction of the area of harvesting with 500 m far from the coast. As may be seen, all the measures provided in the harvesting regulations of Turkey aims to protect the habitats and biodiversity, ensuring at the same time sustainable earnings of the harvesters. However, there remains ongoing conflict of interests between the parties concerned.

Key words: Rapa whelk, *Rapana venosa*, Black Sea, catch, technical measures, management.

Monitoring of the diatom *Didymosphenia geminata* in the subarctic and in alpine areas of southern Europe

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In recent decades invasive alien species (IAS) have been spreading across Europe. Although the perceptions of IAS are divergent among researchers there is a general consent that IAS endanger the diversity of native biota and hence should be monitored to initiate appropriate counter measures in drastic cases. Anthropogenic activities and climate change are the main cause for the enhanced spreading of alien species to new environments. In this presentation we will present preliminary results from two aquatic case studies, one located in subarctic Iceland (the River Elliðaár) and one in the high mountains of Bulgaria (the Seven Rila Lakes), focusing on the freshwater diatom *Didymosphenia geminata*. The diatom is a single-celled algae whose natural habitat is cold fresh water environments with low nutrient content, i.e. mountainous areas in Europe, Asia and North America. In the last decades, *D. geminata* has been observed in new areas, e.g. Iceland, North America and New Zealand. Within the ESENIAS-TOOLS project four field trips were conducted to identify the existence of this species in the two study sites and compare current abundance to previous observations. The first records of *D. geminata* in the River Elliðaár were in 1994 in the lower reaches of the river. In the following years the diatom gradually colonised upstream and observations from 1994-1997 revealed a relative abundance of *D. geminata* between 0.1% and 4.2%. Subsequently, several samplings along the River Elliðaár between April and October 1997 revealed a relative abundance of *D. geminata* of 0.5% and 0.7% on average at the downstream and upstream stations, respectively. In 2015 the relative abundance of *D. geminata* in River Elliðaár was between 1.7% and 5.2% and was higher in November than in July. This is interesting as in 2015 *D. geminata* was not as visible by bare eyes at the riverbed as it was in the mid-nineties. The preliminary results from the Rila Mountains, including both fossil and recent records, confirm that in 2001 one single occurrence of *D. geminata* was determined in Bliznaka Lake, the largest of the Seven Rila Lakes and located at lower altitude. In the samples from 2015 only one single *D. geminata* was observed in the epilithic sample from Detelinata Lake. Preliminary results from the River Elliðaár indicate a high abundance of *D. geminata* along all sampling locations, confirming the invasive proliferation described in previous studies. In the Seven Rila Lakes our results suggest a native distribution of *D. geminata*. The upscaling of the preliminary results from the River Elliðaár and the Rila Mountains can help us to formulate general conclusions about the spreading of this invasive species. Furthermore, this bilateral cooperation can be further extended to other countries and hence contribute to a better management of invasive alien species in Europe.

Key words: *Didymosphenia geminata*, invasive species, Iceland, Bulgaria.

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'Is Alien to you...Share it!!!' A Citizen Science Project on alien species in Greece

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The Greek sea waters are among the most affected Mediterranean waters by alien species (AS) and invasive alien species (IAS). There is a constant inflow of new AS to Eastern Mediterranean Sea and consecutively to Greek waters. Contemporary research studies have focused on introduction pathways, current distribution and expansion of AS in Greece. However, the extensive Greek coastline (~15,000 km) and the relevant high cost of the field surveys make almost impossible the monitoring of the expansion and distribution of AS and IAS. On the other hand, the citizen scientists are reported in the literature as capable of providing valuable information on such species, which may serve to complement the findings of the field surveys.

Since March 2016, iSea, a Greek environmental non-Governmental Organization for the Preservation of the Aquatic Ecosystems, has launched a citizen science project titled 'Is it Alien to you...Share it!!!'. Its aim is the collection and use of non-expert reports in order to assess the occurrence, distribution and potential expansion of AS and IAS in Greece. To date, 90 records on 37 different species of AS and IAS have been received and recorded in the project's database. These records are accompanied by photographs, 68 from Greece and 22 from Cyprus. The database has been completed with 12 reports on AS and IAS in Greece, which were retrieved from the local press. Most records from Greece refer to *Sepioteuthis lessoniana* (13.75%, N=11), *Lagocephalus sceleratus* (11.25%, N=9), and *Callinectes sapidus* (7.5%, N=6). The Dodecanese Islands in the south-east part of the Aegean Sea are a Greek hotspot with 46.25% (N=37) of the total records, followed by the Ionian Sea (15.00%, N=12). Furthermore, six reports, accompanied by photographs, of the invasive species *Pterois miles* in Greece have also been received, along with the data about other rare invasive species, such as *Charybdis hellerii* and *Dendostrea folium*. The project of iSea envisions forming local and regional networks of professional and recreational fishers and divers, in order to increase the inflow of information on AS and IAS, and to identify means mitigating the possible negative impact of these species.

Key words: Marine alien species, marine invasive alien species, Greece, seas, citizen science.

Monitoring of *Cydalima perspectalis* (Walker) (Lepidoptera: Crambidae) supported by Education and Citizen Science

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The knowledge about biology and management of the invasive alien species is important to professionals and hobby gardeners, since the majority of the invasive alien insects are introduced with trade and transport of trees and shrubs cultivated for ornamental purposes. The box-tree moth, *Cydalima perspectalis* (Walker) (Lepidoptera: Crambidae), was reported for the first time in Serbia in 2014, and since then it has expanded its range very fast. For raising awareness about *C. perspectalis*, training of phytosanitary inspectors, landscape architects, teachers in secondary vocational education, scientists involved in official visual inspections of nurseries, and professionals working in horticulture industry has been organised. Since 2014, the education courses have been attended by more than 400 professionals. In addition, a leaflet about *C. perspectalis* and symptoms of the damages on box tree was published. The leaflet contained a request to citizens for sending information about the presence of the pest. The public's attitude towards plant health of box tree was positive and almost all the respondents sent information about infestation and developmental stages of *C. perspectalis*. The records from citizen scientists were reliable in the majority of cases due to the fact that the most of respondents attended the courses organised by the Ministry of Agriculture and Environmental Protection of Serbia, the Faculty of Forestry at the University of Belgrade, the Society of Landscape Horticulture of Serbia, Chamber of Engineers of Serbia, and Chamber of Commerce of Serbia. Presentations of the pests were available on the web sites of the Ministry and of the Faculty of Forestry. Thus, a system of information steadily available for citizens all over the country was established.

The respondents were motivated to gain knowledge about the invasive alien species and the pathways of their introduction and management. The educational technology contributes significantly to the system of early detection, facilitating education and lifelong learning, and raising public awareness about the pest.

Key words: *Cydalima perspectalis*, alien species, box tree, pathway of introduction, educational technology.

LIFE ASAP 'Alien Species Awareness Program': Tackling alien species in Italy, As Soon As Possible

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More than 3000 alien species are reported for Italy, often intentionally introduced; 15% of them are considered invasive and responsible for several environmental and socio-economic impacts. The EU regulation 1143/2014, which came into force on 1 January 2015, adopts the hierarchical approach for managing the species included in the list of Union concern. For these species, ban of trade, ownership or transport, early detection and rapid removal, as well as identification of main pathways of introduction are foreseen. In Italy, 22 of the 37 species of Union concern are already present. In order to make this new regulation effective in Italy, the entire society should be informed about the problems caused by invasive alien species, support the action undertaken to mitigate their impact, and adopt more responsible behaviours. Many studies pointed out that policymakers, managers, scientists, professionals, stakeholders and the wide public do not generally have enough awareness of biological invasion.

The Life GIE/IT/001039 (2016-2020) ASAP (Alien Species Awareness Program), co-funded by the European Commission, aims to fill this gap, with the main objective of reducing the introduction of invasive alien species and mitigate their impacts by raising the awareness of Italian citizens. The Italian National Institute for Environmental Protection and Research promoted this project together with Legambiente ONLUS, Regione Lazio, Federparchi, NEMO srl, University of Cagliari and UNICITY SPA. Many actors, variously involved in the management of alien species, will be targeted by the actions of this project, with meetings, seminars, workshops and other formative/informative events. The adoption of voluntary code of conducts, as well as good practices will be encouraged, especially among hunters, anglers, horticultural operators, pet retailers, and professionals (e.g. green architects, agronomists and vets). Finally, guidelines for the management of invasive alien species in National Parks will be promoted.

Key words: Management, information, guidelines, code of conduct, good practices.

The ESENIAS countries' marine Alien Species experts: an updated inventory

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National experts and networks, engaged in the study of Alien species (AS) are important data providers to higher level networks, such as ESENIAS, and may act as vehicles in the implementation of European Union policies as Marine Strategy Framework Directive. Considering that citizen-scientists (CS) are recognised all the more as key players in reporting AS, expert networks are essential for the validation of data provided by CS. Yet, there is a lack of national experts' networks available and with respect to ESENIAS countries such networks exist only in Greece and Italy.

In order to fill in the gap in the marine sector, in the frame of the ESENIAS-TOOLS project, information on AS experts for the ESENIAS countries was gathered and analysed. To achieve this goal, information from existing national databases, AS-related scientific publications and micro-scale existing contacts between experts were used. Overall, 228 experts were identified, with the vast majority being recorded in Italy and Greece (78 and 70 experts, respectively). Most of these experts are employed at Universities and Research Centres (130 and 81 experts, respectively). Museum curators, administration employees and experts from Non-Governmental Organisations and other related disciplines (e.g. shell collectors) are also included in the list. Ecology, Biology and Taxonomy are the most highly represented areas of expertise, while Impacts and Pathways of AS introduction are issues studied to a lesser extent. Experts working on Genetics, Risk Assessment and Conservation are very few. Finally, Fish, Phytobenthos and Mollusca are the most frequently reported favourable taxonomic groups of expertise, while 43 experts were identified to work on a wide range of marine taxa.

All available information, including contact information, area of expertise and taxonomic group of expertise will be uploaded on the ESENIAS webpage, in order to create a basis for use from both experts and CS, and so as to be refined and expanded in the future.

Key words: Alien Species, marine experts, networks.

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Dermatological problems due to invasive alien species in Turkey

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Allergens are microorganisms or molecules of plant and animal origin, which can trigger the human immune system and cause tissue inflammation and organ dysfunction. The allergies have steadily increased worldwide, causing a decrease in quality of life, increase in morbidity and mortality, and considerable economic losses. The invasive alien species may cause allergic sensitisation reactions after introduction into a new region, thus having negative impact on both human health and economy.

Ambrosia artemisiifolia is an invasive herb in agricultural areas, which may cause rhinitis, oculorhinitis, asthma and skin irritations in Turkey and the ESENIAS area. *Sorghum halepense* is known as Johnson grass. It is native plant to Turkey but considered invasive because of its economic burden on cotton production. *S. halepense* may also cause grass allergy reactions. *Lymantria dispar* is an insect whose egg masses may trigger allergic reactions.

In ÇOMU Hospital, 15% of all applied patients are recurred from allergy. Medical history is the most important trick for diagnosis and effective treatment of allergy. The allergens are determined by skin prick test but the most common allergens are applied in test procedure. The invasive alien species cannot be determined by skin prick test. Therefore, the dermatologists must be informed about them and focus on the allergen history to achieve an effective treatment. With this study we aim to present the invasive alien species in Turkey, which may cause dermatologic problems, and illustrate with our clinical data, in order to emphasize the importance of the knowledge on invasive alien species to diagnosis and effective treatment of allergies.

Key words: Invasive alien species, rhinitis, allergens, oculorhinitis, asthma, skin irritations.

Do management efforts and vegetation succession affect the naturalisation success and vegetation dynamics of Common Ragweed in Turkey?

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Common ragweed (*Ambrosia artemisiifolia*) has readily invaded diverse habitats in a considerable portion of Turkey following its first introduction in 1998. Unfortunately, no serious efforts have been made to develop effective management plan against the species. Occasional mowing along roadsides, aimed at cleaning them, has been observed throughout the country. Therefore, in this study we investigated how mowing, tillage, land use and vegetation succession affect the naturalisation success and vegetation dynamics of the species. The ultimate goal was to gather the preliminary observations which could be used to manage the species. Several ragweed populations in the Black Sea and Thrace regions were studied for four consecutive years and the vegetation dynamics in ragweed was noted in three consecutive seasons. We noted that mowing at inadequate time (early or late in the season) accelerates the naturalisation and population dynamics in the following year, whereas density at intact sites or sites mown at suitable time (mowing that do not allow the plants to set seeds) appeared to be either constant or somewhat decreased. The mowed plants developed secondary branches and produced more seeds compared with intact plants. Mowing at inadequate time, particularly after seed set, facilitates seed dispersal to neighbouring fields, as well as transportation of seeds to long distances with rain water. Some land use types, e.g. fallow period during ragweed season, are another driver accelerating the naturalisation success and vegetation dynamics of the species. The succession of perennial vegetation affected negatively the dynamics of the ragweed, with significantly reducing or eliminating the species at the sites during the third season. Those sites became dominated by perennial vegetation (*Artemisia vulgaris*, *Rubus* spp., *Lotus corniculatus*, *Medicago sativa*, etc.). Among the various species, *Lotus corniculatus* was the most competitive and produced an effective soil cover, thus ceasing the growth of ragweed. Our conclusion from these preliminary observations is that the competitive crops and optimised mowing regimes may be used to control the invader. The soil covering with some competitive species, such as *L. corniculatus*, could be a possible option for management of ragweed. However, detailed analysis of the collected data is needed in order to provide valuable insights into the management of this species in the country.

Key words: Common ragweed, vegetation succession, competitive vegetation, management, Turkey.

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Identification of invasiveness potential of freshwater fishes in Turkey by the Aquatic Species Invasiveness Screening Kit (AS-ISK)

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Simplified and rapid risk screening tools providing a faster and cost effective way to identify high and low risk species are progressively preferred by agencies and environmental managers. Despite some effort for implementing the risk-screening tools for some non-native and translocated freshwater fish species world-wide, there is still little information especially regarding the latter. Amongst the available decision-support tools, the Fish Invasiveness Screening Kit (FISK) has been extensively used, but was recently upgraded to the new generic tool, the Aquatic Species Invasiveness Screening Kit (AS-ISK), which is applicable to any aquatic species and complies with the minimum requirements for risk tools under the new EC Invasive Alien Species Regulation. Because of its unique zoogeography and rich endemic/native fauna Turkey is highly susceptible to non-native species' introductions and translocations.

The aim of the present study was to re-assess species previously screened using FISK and to assess additional non-native and translocated fish species in order to inform non-native species policy and management regarding fishes in Turkey. Based on independent evaluations of 64 species by three assessors, a basic score threshold of 28 was achieved, which reliably distinguished between potentially invasive (high risk) and potentially non-invasive (medium to low risk) fishes. Of the 64 species assessed, only one was ranked as 'low risk', 40 were categorised as 'medium risk', and the remaining 23 as 'high risk' of which five were translocated. Non-native species currently not present in Turkey, but that pose a high risk of being invasive, were *Ameiurus melas*, *Ameiurus nebulosus*, *Hemiculter leucisculus*, *Hypophthalmichthys molitrix*, *Micropterus salmoides*, *Perccottus glenii*, *Pimephales promelas*; whereas, the highest scoring translocated species were *Cyprinus carpio*, *Esox lucius* and *Silurus glanis*. When the potential effects of climate change on the assessments were considered, risk scores increased for some (sub)tropical fishes of which two are translocated species.

Key words: FISK, Anatolia, Thrace, non-native, introduced species.

Detection of some Coleoptera species in coloured sticky traps in maize crops in Bulgaria

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The coloured sticky traps are useful for detection, monitoring and capturing of different insect groups. In order to study the presence of Auchenorrhyncha species and the trapping efficiency of white, blue, red, orange, yellow and fluorescent yellow and transparent (control) sticky traps (Csalomon[®], Hungary) in Bulgaria, parallel tests were performed in maize crops in Knezha between 5 June and 23 September 2014, and in Sofia between 2 July and 17 September 2014 (six replicates in each trial). Apart from the numerous Auchenorrhyncha species captured in traps, several species belonging to coleopteran families Coccinellidae, Chrysomelidae, and Elateridae were found. Among them, two non-native species – the Western corn rootworm, *Diabrotica virgifera virgifera*, and the multicoloured Asian lady beetle, *Harmonia axyridis*, were detected. Coccinellidae was the most numerous family with eight species in Knezha and five species in Sofia. In both maize crops, the most abundant were *Propylea quatuordecimpunctata* and *H. axyridis*, and captures of these species were registered during the whole period of the study in all traps tested. In Knezha, where the captures of *P. quatuordecimpunctata* and *H. axyridis* were more numerous, it was also found that fluorescent yellow colour was highly attractive to *P. quatuordecimpunctata*, while *H. axyridis* showed no preference among transparent, fluorescent yellow, yellow, orange, blue and white traps. At the same site, captures of *D. v. virgifera* were registered in all types of traps with the exception of red traps in the period from end of July to middle of September. A single specimen of the pest was registered in a fluorescent trap in Sofia at the end of August – beginning of September. The click beetle *Agriotes ustulatus* was registered only in Knezha, where adults started capturing in the second half of June until the second half of August. The highest captures of *A. ustulatus* were registered in the fluorescent yellow traps followed by catches in the white traps.

Key words: Coloured traps, maize, Coleoptera species, Bulgaria, *Harmonia axyridis*, *Propylea quatuordecimpunctata*, *Diabrotica virgifera virgifera*, *Agriotes ustulatus*.

Detection and monitoring of *Diabrotica virgifera virgifera* LeConte, 1858, by KLP+ traps with dual (pheromone and floral) lures in Bulgaria

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The potential of KLP+ traps baited with dual (pheromone and floral) lures (Csalomon[®], Plant Protection Institute, CAR HAS, Budapest, Hungary) as a new tool for detection and monitoring of the Western corn rootworm, *Diabrotica virgifera virgifera*, was tested in 2015 and 2016 in Bulgaria. Four locations were chosen: 1) Knezha (northwestern Bulgaria), five replicates from 17 June to 30 September 2015; and five replicates from 12 July to 30 September 2016; 2) Lozitsa village (north-central Bulgaria), two replicates from 24 July to 30 September 2015; Sofia (western Bulgaria), four replicates from 24 June to 28 September 2015; and Plovdiv (southern Bulgaria), two replicates from 8 July to 30 September 2016. Traps were inspected 1-3 times per week depending on pest abundance. *D. v. virgifera* was recorded in Knezha, Lozitsa and Sofia. The traps showed very high efficiency at different population densities of the species. During our investigation, captures of *D. v. virgifera* adults were detected from the middle of July until the middle of September. The highest abundance of adults was recorded at the end of July – beginning of August in Knezha, end of July in Lozitsa, and in August in Sofia.

Key words: *Diabrotica virgifera virgifera*, KLP+ traps, dual (pheromone and floral) lures, monitoring, Bulgaria.

POSTERS

TOPIC 1: INVASIVE ALIEN SPECIES TRAITS AND TRENDS

Invasive alien species introductions and spread, biological and ecological characteristics; characteristics of recipient environment; invasive alien species and climate change

Alien plant species in the periphery of agricultural fields

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Here we present results of an extensive survey conducted in representative agricultural areas in Northern and Southern Bulgaria. Particular attention was given to field borders between the agricultural land and adjacent territories. The study was performed in September–October 2016. The methodological approach included a field survey of all insect-pollinated plant species, irrespective of their phase of development, i.e., including also plants, which had terminated their vegetation in the period of survey. In total, there were 4597 records of 374 plant species in 272 experimental plots. The adventive species were 21 and were recorded in 64% of all experimental plots. A total of 18 insect-pollinating and three wind-pollinating species were identified. Three of them belong to the category of most dangerous invasive alien species, threatening the European biodiversity. The results indicate that alien species in the agricultural land and its peripheral parts, including field borders, still represent relatively small percent of the species composition, but may become a threat under specific environmental conditions.

Key words: Agricultural field borders, hedgerow, alien species.

Acknowledgements: The studies were performed within the framework of the Project MeteoCosMap.

***Mycena seynii* (Mycenaceae, Agaricales) in Bulgaria**

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Mycena seynii is restricted to the cones of the Mediterranean pines *Pinus halepensis*, *P. pinaster*, and *P. pinea*. This species is recorded for the first time from Bulgaria. The Bulgarian collection originates from artificial stands of the non-native species *P. halepensis* and *P. pinea*, and *M. seynii* seems to be introduced to Bulgaria with their culture. Detailed description and illustrations of the finding are provided, along with a comparison with some materials of the species from its natural range in Greece. The distribution in Europe is also summarised and briefly discussed, with emphasis on certain cases of introduction with exotic pine trees.

Key words: Alien fungi, Basidiomycota, *Mycena* section *Rubromarginatae*, *Mycena seynesii*, strobilicolous fungi.

Ecophysiological adaptation of southern escapes in Lithuania

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Worldwide invaders *Fallopia sachalinensis*, *Heracleum sosnowskyi* and *Rumex confertus* have successfully spread throughout natural and semi-natural habitats of Lithuania. It is strongly recommended to take measures to prevent their introduction and spread to new areas, or to control the established populations. Different hypotheses are proposed for explaining the spread of invasive plant species beyond their natural habitats. The ability of the invasive plants to colonise new environments is related to the resource availability at physiological levels, e.g. photosynthesis. Therefore, the assessment of chlorophyll fluorescence as an investigation of photosynthesis can give more detailed information for understanding the adaptation of the invasive plants to new environment.

The main aim of our study was to measure the parameters of chlorophyll fluorescence in some invasive plant species in order to identify certain traits that may explain their success in invading new territories.

The fluorescence of chlorophyll *a* was measured *in situ* at different growth stages during the vegetation period of the invasive plant species studied in 10 replications using a light-adapted pulse-amplitude modulation method. The structural and functional characteristics of the photosynthetic apparatus, including the fluorescence yield in the light (F_s , the index of photosynthetic excitation in light) and maximal fluorescence during the light flash (F_m , the index of efficiency of PSII) were recorded in and used to determine the quantum yield of electron transport (Y). The highest means of F_s and F_m in the investigated species were found significantly ($p < 0.000$), in the light-adapted leaves of *H. sosnowskyi* (412.7 and 399.32 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively) and *F. sachalinensis* (399.32 and 1726.90 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively). Accordingly, the derivative means of the effective quantum yield (Y) and electron quanta absorbed and distributed to PSII (ETR) were also maximal in *H. sosnowskyi* (0.8 and 38.1 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively) and *F. sachalinensis* (0.76 and 38.36 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively). The basic parameters of fluorescence show successful photosynthetic adaptation and may explain the rapid spread of the examined invasive plant species throughout Lithuania.

Key words: Invasive plant species, fluorescence, photosynthesis.

First record of oak lace bug *Corythucha arcuata* (Say, 1832) in Romania

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The oak lace bug *Corythucha arcuata* (Tingidae, Heteroptera), an American lace bug of oak species, was detected on Romanian territory in 2016 - in the southern part of the country, in urban area of Bucharest city, and in rural area of Moara Domnească village (Ilfov County), 15 km away from Bucharest. From summer to autumn 2016, numerous eggs, nymphs and adults of the oak lace bug were detected on the lower surface of the leaves, and typical symptoms of discolouration were observed on the upper leaf surface of the oaks *Quercus cerris* and *Q. robur*. From July to November 2016, large amounts of adults (1513 specimens) were captured on yellow sticky traps used in field survey for early detection of invasive alien species. The traps were placed in apple and walnut orchards, on Chinese date trees and grapevine, as well as on different hawthorn trees in Bucharest. In the neighborhood of the places where the traps were installed, there were oaks (natural hosts of the insect), grown for various purposes (ornamental, street alignment, yards for houses). This is the first record of oak lace bug *Corythucha arcuata* in Romania.

Key words: Field survey, non-native insect species, American oak lace bug.

Status of non-indigenous fish species in the eastern Adriatic Sea: A short review

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During the past few decades, various factors, such as climate change, anthropogenic activity and Lessepsian migration have altered the composition of Adriatic ichthyofauna. Extensive investigations carried out in recent decades have found many species, previously not recorded or reported for the Adriatic Sea. Among these, there is a significant number of non-indigenous species, the presence of which may be attributed to the processes of bioinvasion and tropicalisation. The majority of the fish species introduced by humans (by the mariculture, shipping activities, aquarium releases, etc.) are represented by single findings, and for many of them there is no evidence of established populations. Three of the totally 14 Lessepsian migrants documented for the Adriatic Sea, namely the fish species: *Fistularia commersonii*, *Siganus luridus*, and *Lagocephalus sceleratus* appear to be successful invaders, especially in the southern part of the sea. The impact of successful colonizers on the native communities is unknown yet. However, the relatively fast pace of the invasions make us believe that their effects may become relevant in the near future.

Key words: Alien fish species, invasion, Lessepsian migrants, Adriatic Sea.

Differentiations in kidney histology of invasive freshwater populations of marine fish sand smelt

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Kidneys have important role in osmoregulation of teleost fish. The marine fish sand smelt (*Atherina boyeri*) is native to coastal and estuarine waters in the Mediterranean, Black, Azov and Caspian Sea basins. However, this euryhaline species has been accidentally or illegally introduced into freshwater environments in Turkey. It was firstly recorded in Lake İznik but its introduction time and purpose are unclear. At present, it has resident populations in many freshwater lakes and reservoirs in Anatolia and it is considered as a successful invasive fish for inland waters. Osmoregulation performance seems to play important role for adaptation success of this invasive species in freshwater environments.

The aim of the present study was to assess the histological differentiations in kidney structure of natural (marine, brackishwater) and translocated invasive (freshwater) populations of *A. boyeri*. Fish samples were obtained from 11 different locations, including Black Sea, Mediterranean, Sea of Marmara, Aegean Sea, Köyceğiz Lagoon, Hirfanlı and Aslantaş reservoirs, as well as İznik and Eğirdir lakes. Kidneys of ten fish samples from each location were removed, then, histological slides of the kidneys were prepared and dyed with Hematoxylin & Eosin. The whole kidney sections were observed for each individual fish, the number of glomeruli were counted, and diameters of glomeruli were measured. According to the results, number and diameters of glomeruli ranged between 1-8 and 11.61-54.46 µm in the sea, 1-5 and 16.03-41.26 µm in the lagoon, 1-6 and 24.18-137.74 µm in the freshwater samples, respectively. According to the results of correlation analysis, a negative correlation was found between glomeruli size and salinity. Glomerular development and habitat of fish are highly correlated in the euryhaline species. The results have suggested that the low salinity has caused an increase in the diameters of glomeruli; thus, kidneys can filtrate bigger quantities of water. This difference in the size of glomeruli between the freshwater and sea populations of sand smelt can affect osmoregulation efficiency and thus, facilitate its adaptation to different environments with various salinity; by this adaptation, the sand smelt may invade new freshwater habitats in Anatolia.

Key words: *Atherina boyeri*, osmoregulation, kidney histology, glomerulus size.

Rapid spread of Amur sleeper (*Perccottus glenii*) in North-Eastern Romania

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In 2001, the Amur sleeper (*Perccottus glenii*), an Asian invasive fish, was recorded for the first time in Romania, in the upper part of the Siret River basin. By using electro-fishing in 98 locations, we monitored the expansion of its range downstream the main river and along its tributaries. Both lotic and associated lentic aquatic habitats were sampled and the density of the Amur sleeper was estimated according to the sampled area. Then we evaluated differences in the relative density among three types of invaded habitats (river-side ponds, quasi-stagnant river, and flowing river), and fit a logistic regression model to determine the presence of the species against habitat covariates. The Amur sleeper was found in 32 out of the 98 locations sampled. Its altitudinal span was between 43 and 320 m, while the water indices were as follows: pH ranged from 7.4 to 9.1, O₂ – from 1.4 to 14.6 mg/l, and conductivity – from 396 to 1331 μS/cm. The logistic regression did not show any covariate that may account for the species presence. The number of caught individuals at the different sites was between 1 and 127. It was found that the relative density significantly differed between habitats ($H(2)=19.46$, $p<0.01$), with a mean value (\pm sd) of 0.22 ± 0.33 ind./m² for quasi-stagnant river, 0.12 ± 0.19 ind./m² for river-side ponds, and 0.01 ± 0.05 ind./m² for flowing river. In the fifteen years since 2001, the species has expanded with 258 km its range downstream the main river (an average of 17.2 km/year). However, the species has invaded the tributaries only accidentally ($n=4$), and only close to their confluence (average distance from the confluence mean value \pm sd = 1.7 ± 1.8 km). We conclude that the species has successfully colonised the meanders and side ponds of the main river, while failing in spreading upstream the tributaries. In our opinion, systematic stratified sampling is required in order to understand the environmental determinants of invasion risk and explain the avoidance of tributaries in this species.

Key words: Range expansion, invasive species, river-side ponds, *Perccottus glenii*.

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Recent state of selected alien marine species in Varna Bay, Bulgarian Black Sea coast

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In marine ecosystems, the alien species may become invasive and displace natives, causing loss of native genotypes. Successful invasions also modify the habitats, change community structure, affect food-web properties and ecosystem processes, impede the provision of ecosystem services, impact human health, and cause substantial economic losses. An issue for the non-native species management is that, once a marine organism has been introduced to its new environment, it is nearly impossible to eradicate it, particularly if it has been established in the area.

The aim of this study was to assess the recent state and ecosystem role of several selected alien species in Varna Bay off the Bulgarian Black Sea coast.

Investigations were carried out during 2015-2016 under the ESENIAS-TOOLS project. Here, we present and analyse the seasonal dynamics of six non-indigenous species: four zooplanktonic species (*Acartia tonsa*, *Oithona davisae*, *Mnemiopsis leidyi*, *Beroe ovata*), one zoobenthic (*Rapana venosa*), and one fish (*Liza haematocheila*). The two alien copepod species played a significant role in the mesozooplankton community composition, with average of 25% and maximum of 62% abundance share in spring-summer (for *A. tonsa*) and summer-autumn (for *O. davisae*) season. Large aggregates of the Ctenophora species *M. leidyi* formed 'hot spots' along the coast during summer with maximum abundance (516 ind.m⁻²) in September 2015, followed by high densities of *B. ovata* (107 ind.m⁻²) in October 2015. The rapa whelk (*R. venosa*) was collected by diving and by dredging at different depths and sediment types. Each individual was measured and weighted, and the sex of each rapa whelk was identified. The average values of the shell length and total weight were the lowest at shallow rocky bottom (5.89 cm and 22.27 g, respectively), and the highest at depth of 21 m, on silty sediments (6.84 cm and 55.13 g, respectively). Males showed higher values of all size-weight variables when compared to females. The length-weight relationships were calculated using the equation $W=aL^b$. The Fulton's condition factor ranged from 5.97 to 6.37. The alien fish species so-iuy mullet (*L. haematocheila*) was identified on the basis of morphological and morphometric parameters in the study area. The collected data show that recently the species has become rare at the Bulgarian Black Sea coast.

Key words: Alien species, Copepoda and Ctenophora species, rapa whelk, so-iuy mullet, Black Sea.

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Activity of catalase in invasive plants from tailing pond of the Trepča lead and zinc mine

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The invasive plants that grow at contaminated sites are capable of adapting to the extreme environmental conditions through changes in morphology and/or physiology. Studying these mechanisms of adjustment could allow adequate estimations of the species that may be used for remediation. Our study involved Žitkovac – the abandoned tailing pond of the Trepča mining metallurgy chemical company, which is one of the largest lead, zinc and silver mines in the Balkans.

The activity of the enzyme catalase (EC 1.11.16, H₂O₂ oxidoreductase) was determined in two invasive alien plant species from Žitkovac abandoned tailing pond. The same two species from the uncontaminated area near the town of Niš were used as a control. The catalase activity was assessed in the root and above-ground parts of *Erigeron canadensis* and in the wood branches and leaves of *Robinia pseudoacacia*. The activity was measured by the gasometric method and expressed as ml of oxygen. It was found that the catalase activity in the root of *E. canadensis* in the samples from the tailing pond was higher (10.38 ml O₂) than that in the control samples (8.14 ml O₂), while the activity in the experimental samples (7.85 ml O₂) in the above-ground parts was lower than that in the control samples (8.81 ml O₂). The catalase activity in the wood branches of *R. pseudoacacia* was increased in the experimental samples (10.19 ml O₂) compared to the control samples (8.14 ml O₂), and decreased in the experimental samples of the leaves (8.24 ml O₂) compared to the control samples (9.31 ml O₂). The significant increase in the catalase activity in the roots and wood branches of the tested plants may be a consequence of the stress caused by the specific environmental conditions in the Žitkovac tailing pond of the Trepča lead and zinc mine.

Key words: Tailing pond, catalase, *Erigeron canadensis*, *Robinia pseudoacacia*.

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New records of translocated *Pontogammarus robustoides* (Amphipoda, Perecarida) and *Limnomysis benedeni* (Mysida) in the Aegean Sea basin in Bulgaria

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New data on the distribution of two translocated perecarid species: *Pontogammarus robustoides* Sars, 1894, and *Limnomysis benedeni* Czerniavsky, 1882, in the Aegean Sea basin in Bulgaria are presented. These two species are native to the Ponto-Caspian region, including the Lower Danube River. Recently, they have spread upstream the Danube River and introduced to some West European river basins. In Bulgaria, currently the species are found in some inland waters (rivers, reservoirs) outside of the Black Sea and the Danube River basins.

Pontogammarus robustoides was first recorded in the Aegean Sea basin in 2006. It was found in the Mochuritsa River (200 m upstream of its confluence with the Tundzha River). Since then, the species spread along the whole middle and lower reaches of the Tundzha River. The native perecarid species in the Tundzha River basin (all the Bulgarian sector) are *Gammarus arduus* G. Karaman, 1975, and *G. komareki* Schäferna, 1922. At present, these two species retreat from its natural range, while *P. robustoides* has become the dominant macrozoobenthos species. *L. benedeni* was firstly reported for the Aegean Sea basin, in the Tundzha River near the town of Sliven, in 2009. In 2010 and later in 2016, we found it in Zhrebchevo Reservoir, Tundzha River basin, near the town of Gurkovo. The results show that the abundance of the species in 2016 increased compared to that in 2010.

Key words: Translocated species, *L. benedeni*, *P. robustoides*, Aegean Sea basin.

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First finding of *Dikerogammarus villosus* (Amphipoda, Perecarida) in Bulgarian inland waters

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We report the first finding of the amphipod species *Dikerogammarus villosus* Sowinsky, 1894, in Bulgarian inland waters. The native range of this amphipod is the Ponto-Caspian region, including the Lower Danube River. The so-called 'killer shrimp' has been considered as one of the most aggressive invasive alien species in Central and Western Europe.

This species was recorded in 2011 and then again in 2016 in Gorni Dabnik Reservoir (near the town of Pleven), which is located about 30 km far from the Danube River. This reservoir is part of a large canal irrigation system and receives water from the nearest Vit River. The native amphipod species found in the river is *Gammarus balcanicus* Schäferna, 1922. This species has been registered as an active migrant through the Vit River canal system, including Gorni Dabnik Reservoir. On the other hand, *D. villosus* has not yet been found out of the reservoir. Therefore, the introduction of *D. villosus* to the reservoir did not happen by natural movement of the species upstream of the Vit River. Most probably *D. villosus* was transferred directly to the reservoir with the help of humans and their activities, such as fish stocking, fishing, and transfer of recreational fishing and boat equipment.

Key words: First record, killer shrimp, Vit River reservoir and canal system, human activities.

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Alien mammal species of Bulgaria

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There are no accurate data on the alien mammal species present in Bulgaria. Reliable information about the current status of species bred in captivity, semi-captivity or in the wild is missing as well. The compilation of an accurate database is rather difficult due to the taxonomy of the species, their paleohistory, identification of the various non-native species, etc. There are not reliable data for the period before 1990, when many species of alien mammals were introduced in Bulgaria, primarily for hunting and fur-farming. Details about the sites of introduction, the origin and the number of the specimens introduced, the establishment success, etc., are not available.

We made a review of available data on the alien mammal species in the scientific and popular literature. Available published information indicates that 25 species have been introduced in Bulgaria since 1900. The main part of the alien mammals consists of game species, such as *Dama dama*, *Bison bonasus*, *Capra ibex*, and *Ovis ammon*. There are also reports about the introduction of the American mink (*Mustela vison*), the coypu (*Myocastor coypus*), the raccoon dog (*Nyctereutes procyonoides*), and the muskrat (*Ondatra zibethicus*). Two rat species, the black rat (*Rattus rattus*) and brown rat (*Rattus norvegicus*), penetrated into Bulgaria in ancient times. Among the alien mammal species, the brown rat had the highest negative impact on the natural ecosystems and humans. There are also reports about the negative impact of the coypu, muskrat and raccoon dog. Keeping exotic mammals as pets in Bulgaria has become popular in recent years. Some of those animals have been released accidentally in nature as in the case of the American grey squirrel (*Sciurus carolinensis*).

Key words: Alien species, mammals, database, checklist, Bulgaria.

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Range expansion of three alien mammal species: the coypu (*Myocastor coypus*), the muskrat (*Ondatra zibethicus*), and the raccoon dog (*Nyctereutes procyonoides*) in Bulgaria

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In this study, we report on changes in the distribution of three alien mammal species in Bulgaria. The data have been summarised from field surveys, available literature, existing databases of the Executive Forest Agency and Union of Hunters and Anglers in Bulgaria, questionnaires completed by experts and hunters, and other sources.

The first individuals of the coypu (*Myocastor coypus*) were released in southern Bulgaria near the town of Burgas in 1953. Consequently, the species spread quickly in the Thrace valley, along the rivers within the Aegean Sea basin. There are 40 records of the species, most of them from southeastern Bulgaria. The recent data show that the coypu is expanding its range in northeastern Bulgaria, including the Danube lakes.

The first specimens of the muskrat (*Ondatra zibethicus*) were released in Srebarna Lake in northern Bulgaria in 1956. Later, the species naturally spread along the Danube River and in the adjacent water bodies. There are 22 records of the species in Bulgaria. Recently, the species expanded its range to the south. Its presence was reported near the town of Yambol, and confirmed from the hunting statistics in the region of Burgas.

The raccoon dog (*Nyctereutes procyonoides*) probably came from the Danube Delta. The first observation of the species was reported from Shabla Lake, northeastern Bulgaria, in 1968. Subsequently, it was reported in the Orehovitsa (Pleven region), Petarch, Chelopechene, and Vitinya. There are 55 records of the species in Bulgaria. The species further expanded its range to southern Bulgaria in the Thrace valley, the Chaya River (Western Rhodopes), etc.

The analysis of the available data show a range expansion of all the three species in Bulgaria.

Key words: Invasive alien species, pathways of introduction, enlargement area, distribution, Bulgaria.

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New data on the expansion of Geranium Bronze (*Lepidoptera*, *Lycaenidae*) in the eastern part of the Balkan Peninsula, with some biological notes

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Geranium Bronze, *Cacyreus marshalli* Butler, 1898, is indigenous to southern Africa. The species was introduced to Europe with *Pelargonium*-cultivars in Mallorca (Balearic Islands), in 1988, and reached the European mainland in 1993. The first records for the Balkan Peninsula are from Slovenia and Croatia (2009), and from Greece (2010). In Bulgaria Geranium Bronze was recorded for the first time in 2014, from two localities in the southern Struma River Valley. Since then the species has rapidly spread in the southeastern part of the Balkan Peninsula, especially in the Mediterranean area. Recently, the species has spread on almost all the Greece territory, becoming a serious problem for the cultivated *Pelargonium*-plants in urban areas. With our study we present new data on the distribution of the species in Bulgaria and Greece and new data on biology of the species (development stages, feeding).

Key words: *Cacyreus marshalli*, invasive alien species, distribution, biology, the Balkan Peninsula.

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***Ceroplastes japonicus* Green: A new pest insect in Republic of Macedonia**

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The Japanese wax scale, *Ceroplastes japonicus* Green, is native to eastern Asia (China, Japan, Korea). The species has been introduced in Europe and widespread mainly in the Mediterranean countries. The scale is polyphagous and economically important with regard to fruits (citrus, persimmon, apple, stone fruits) and ornamentals in urban environments. The pest causes direct feeding damages on the infested plant organs and indirect damages with the secreted honeydew. The honeydew serves as a substrate for the black sooty molds, which screen the light from the leaves and impair the gas exchange and photosynthesis.

Ceroplastes japonicus was detected for the first time in the Republic of Macedonia in February 2016, on branches of persimmon (*Diospyros kaki* L., Ebenaceae), in orchards and individual trees in the yards of the town of Valandovo (N 41°19'1", E 22°33'40"). During the summer, autumn and winter of the same year, the scale was detected on leaves, twigs, braches and fruits of persimmon in southern part of the country, in Valandovo and Dojran (N 41°10'45.12", E 22°43'28.92").

Key words: *Ceroplastes japonicus*, Japanese wax scale, persimmon, R. Macedonia.

Colonising plants in fire-affected habitats in Vidlič Mountain

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Fires cause changes in environmental conditions and appearance of invasive alien plants, which endanger the native flora. We studied the presence of invasive alien plants in fire-affected habitats on Vidlič Mountain during a period of three years after the fire.

For the first post-fire phase, we identified two annual plants, common indicators of disturbed habitats, and their attempts to colonise distinctly eroded slopes of the oak forest zone. During the first year after the fire, burned dry grasslands and rocky ground on nutrient-rich and disturbed sites, at lower altitudes, were initially colonised by *Centaurea calcitrapa*, termophilous and typical for strongly disturbed, nutrient-rich habitats in the vicinity of the villages. In the same period, the significant presence of *Sideritis montana* was registered on distinctly skeletal soil at less disturbed habitats, at higher altitudes. The presence of *Cuscuta epithymum* was limited. The species *Syringa vulgaris* was recorded in the first year at some places in fire-affected oak forests, while *Dasypyrum villosum* showed tendency of spreading in the second and third year after the fire.

In the fire-affected beech forests, the environmental conditions were altered to a greater extent, which makes the restoration of pre-invasion conditions more difficult. In the first three years after the fire, *Centaurea bieberetsinii* was recorded. Two plants recorded in the fire-affected beech forests are considered as potentially invasive alien plants: *Veronica persica* appeared only in the first year after the fire, while *Erigeron annuus* occurred only in the third year after the fire.

The presence of colonising plants in fire-affected habitats creates conditions that facilitate the establishment of new species and thus recovering of the previous community or even the entire ecosystem.

Key words: Fire, environmental conditions, Vidlič, invasive alien plants.

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Natural history of two alien rodents: *Rattus rattus* and *Rattus norvegicus* (Muridae, Mammalia) in Bulgaria

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Rats are widespread around the world and usually associated with negative impact on human health (zoonosis), animal health, agriculture, and human infrastructure. They are blamed for disappearing of many native and endemic species (reptiles, birds, and mammals) from the islands around the world, while their ecology and impact on mainland is less studied. Both rat species present in Bulgaria (*Rattus rattus* and *Rattus norvegicus*) are listed among the most dangerous alien species in the country.

We made a review of all available information about these species in Bulgaria, in particular, possible pathways for introduction, distribution, ecology and impact on the native species and ecosystems. Maps of the distribution of the species were prepared and presented. The results show that *R. rattus* is widespread and numerous in the southern part of the country, while *R. norvegicus* is widespread throughout all country. *R. norvegicus* has probably a negative impact on the population of the endangered endemic rodents as the Romanian hamster (*Mesocricetus newtoni*).

Key words: Rats, distribution, impact, alien mammals, Bulgaria.

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First documented outbreak and new data on the distribution of *Corythucha arcuata* Say (Heteroptera: Tingidae) in Russia

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The invasive alien oak lace bug, *Corythucha arcuata* (Say, 1832) arrived in Russia in 2015 and was initially found in the city park of Krasnodar. Extensive sampling efforts performed by the Krasnodar Centre of Forest Health combined with comparison of satellite images of the oak forests allowed to reveal the dynamics of spatial spread of the invading species in the Northwestern Caucasus during 2015 and 2016. The aim of our study was to make a review and present new data on the distribution of this species in Russia.

Starting from Mid-July 2016 this species has actively spread over the forest zone of Northwestern Caucasus giving local outbreaks and causing chlorotic discolouration of *Quercus* leaves. Since November 2016, *C. arcuata* has rapidly spread in the Northwestern Caucasus, reaching Temryuk in the west, Slavyansk-na-Kubani and Tbilisskaya in the north, Khanskaya (Republic of Adygea) and Chernigovskoe (Krasnodar Territory) in the east. The localities of *C. arcuata* in the Republic of Adygea and the Krasnodar Territory were assessed as the most distant localities of occurrence within its introduced range. The species is currently spread over an area of more than 19 000 km², most of which occupied by natural forests. The area of oak woods damaged by the oak lace bug in 2016 was also alarmingly high, up to 3340 km² in the Krasnodar Territory and 20 km² in the Republic of Adygea. The observed damages were density dependent and caused by mass feeding on leaves, inducing chlorotic discolouration, desiccation and reduced photosynthetic activity.

The localisation of damaged oak forests suggests that *C. arcuata* most likely entered Krasnodar Territory through the ports of Taman Peninsula, in particular, Taman and Kavkaz ports, and subsequently spread along the main motorways and railway lines. Within less than two years this invasive alien species spread over 250–270 km from Kerch Strait west to Tbilisskaya and Khanskaya.

Key words: Invasive alien species, new record, Caucasus, oak, pest.

***Ailanthus altissima* in the region of Malesh in FYR Macedonia**

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There was no written documentation when, where and how the invasive alien plant species *Ailanthus altissima* was introduced to the Malesh Region in FYR Macedonia, yet only assumptions for the early 20th century as a species suitable for erosion control, and in certain urban areas for ornamental purposes. This article represents the first research on this species in the mentioned region. Most of the research activities were conducted in 2016 during the preparation of a MSc thesis titled: 'Predicting the potential distribution of invasive species *A. altissima* due to climate change in the Bregalnica Region'.

At all sites of *A. altissima* in the Malesh Region, GPS coordinates were taken. Basic bio-ecological features of the highest individual trees were noted, and core samples for determining the age were taken for laboratory analyses. All collected data were imported in an attribute database to be displayed on a map using QGIS software, thus giving us a detailed picture of the current distribution of the species in this region.

The principal findings show that the Municipality of Pehchevo has a larger area covered with *A. altissima* than the Municipality of Berovo, both settled on the Maleshevo Mountains. The invasive alien plant was found in urban and peri-urban areas, as a part of the ruderal vegetation (pioneer species), along main roads, introduced as an ornamental species, afforested for erosion control or planted by mistake by local population instead of other species (*Juglans* sp.). The largest specimen (with DBH of about 51 cm, a height of 15 m, and age of about 65 years) was found in the village of Pancharevo. The species appear to thrive up to the elevations of about 1000 m a.s.l.

Key words: *Ailanthus altissima*, invasive alien plant species, Malesh.

Biological and ecological traits of some invasive alien plant species in the Black Sea region of Turkey

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Invasive and alien plant species are an important threat to natural habitats. These species, which may show a tendency to naturalisation, could have devastating effects on the natural food chains. Invasive alien plant species usually have different phenology than native species, e.g. their vegetation period is longer than that of native species. This is because of their high ecological tolerance. Furthermore, the invasive alien plants develop many strategies to survive. Their development is often rapid and they grow to maturity at early ages. Many of the invasive alien plant species have the ability of vegetative reproduction with stolon, rhizomes, and shoots rooted at the soil. These species tend to be mostly pollinated by the wind. Fruits are carried by the wind, water and birds to reach very wide spreading areas. Owing to this feature, colonies can be built in places far from natural habitats. When naturalised, the invasive alien species may cause extermination of the wild plant species present in the region. They can not just have negative effect on certain species, but can destroy the whole community. Naturalised invasive species tend to alter the normal succession stages of the ecosystem, in which they are located, and impact the ecosystem in the long run. In this study, we have compiled information about the origin, biological and ecological characteristics of some invasive plant species that are spread commonly in the Black Sea region of Turkey. These plants are *Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Clematis vitalba*, *Conyza canadensis*, *Echinochloa crus-galli*, *Microstegium vimineum*, *Polygonum persicaria*, *Sicyos angulatus*, and *Xanthium spinosum*.

Key words: Invasive plants, alien plants, Black Sea region.

Genetic variability of the alien species *Opuntia humifusa* (Cactaceae) within its locality in Harmanli District, South Bulgaria

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Opuntia humifusa (Cactaceae) is a native American species and one of the most successful invaders to the Bulgarian flora. It was introduced as an ornamental plant in the 1930s, and nowadays it occurs in several localities in seven out of 20 floristic regions across the country. Considering the lack of information on the genetic diversity and population structure of *O. humifusa* in Bulgaria, an investigation on the genetic variability of several individuals from one of the largest population of the species in the vicinities of Harmanli town, South Bulgaria was carried out. Genomic DNA was successfully extracted, Inter-simple sequence repeat (ISSR)-PCR was performed and molecular variation was estimated by comparison of generated agarose gel-based banding patterns. Our results indicated a presence of variation between the investigated individuals. Further studies, including a wider sampling and more comprehensive molecular screening, would allow us to understand the impact of this alien species on the native plant diversity in its invaded localities in Bulgaria.

Key words: *Opuntia humifusa*, ISSR, genetic variation, Bulgaria.

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***Oenothera laciniata* (Onagraceae), a new alien species to the Bulgarian flora**

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A new alien species – *Oenothera laciniata* (Onagraceae), is reported from the Black Sea Coast floristic region. It was found in inland sand dune habitats independently by both authors, in the period 2014–2016. The article provides a brief morphological description of the species, comments on the distinguishing characters, as well as data about its phenology, distribution and populations.

Key words: Bulgaria, new alien species, *Oenothera laciniata*.

On a naturalised population of *Larix decidua* in the Rhodope Mountains, Bulgaria

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The European Larch (*Larix decidua*) is grown as ornamental or timber tree in many parts of the world. In Bulgaria, it was planted first at the end of the 19th century as ornamental in Sofia, the town of Samokov and at other places. The records for afforestation of small plots or planting of single trees date back to the beginning of the past century. By 1980 some pure stands or mixed plantations were established in many forestry departments.

We report here a naturalised population in the Rhodope Mountains, near the village of Vodni Pad, Devin municipality. The parent individuals were planted as ornamental trees in the yard of a frontier post about 55 years ago. Successful seed reproduction was observed with a progeny of different ages (1 to approximately 20), with the oldest ones producing strobili and seeds for already 3 to 6 years.

Key words: *Larix decidua*, naturalised alien, Bulgaria.

The Maritime pine (*Pinus pinaster*) – a naturalised alien on the Bulgarian Black Sea Coast with a high impact on the sand dune habitats

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The Maritime pine (*Pinus pinaster*, Pinaceae) is a fast growing tree, well adapted to sandy soils. It is native to the Western Mediterranean and a part of the Western Atlantic Coast. The wood is used for construction works and furniture. Also, it is used for production of turpentine and rosin. Therefore, it was planted widely for timber production, reforestation of degraded soils and stabilisation of dunes in many areas of the world, which have Mediterranean climate characteristics (East Mediterranean, South Africa, Australia, and parts of North and South America). Nowadays, it is considered highly invasive in most of these areas.

In Bulgaria, *P. pinaster* was planted in areas in South Bulgaria and on the Black Sea Coast mostly during the period 1960–1985. Some parts of the plantations are on dune habitats. During the past two decades successful reproduction has been observed in some of the plantations. Here, we report data about the naturalisation of the Maritime pine both in the Northern and Southern Black Sea Coast floristic subregions. The scale of the local spread, the high invasion success and the impact on the natural vegetation are quite obvious and problematic in two particular areas. These are the coastal dune habitats in the Kamchiyski Pyasatsi area, which borders Kamchia Reserve (Natura 2000 site BG0000161 Kamchia), and the inland dunes in and near Pobiti Kamani Protected Site (Natura 2000 site BG0000132 Pobiti Kamani), especially in the area west of the town of Beloslav.

Key words: Alien species, Bulgarian flora, forest plantations, *Pinus*, Pinaceae.

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An update on the distribution of the alien raccoon dog (*Nyctereutes procyonoides*, Gray) on the Balkans

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The raccoon dog (*Nyctereutes procyonoides*) has been spreading throughout Europe since its introduction to the Western parts of Russia in the beginning of the 20th century. Currently, it has become one of the most successfully established alien carnivores on the continent. Official accounts for the distribution range of the species in Europe are often inaccurate due to scarce data, especially regarding the Balkan Peninsula. We conducted a literature search (both peer-reviewed articles and grey literature) to identify records of the raccoon dog on the Balkans. All of these records were classified as either documented (captured individuals, photographs, tracks or other confirmed evidence) or observations (observations or killed individuals) without reliable proof. Observation records are not considered hard evidence, but may be used to guide future research in these areas. We identified more than 60 records, including unlisted by the published sources, from central and western Bulgaria, southern Serbia, FYR Macedonia and Bosnia and Herzegovina (currently the last two are not included in the distribution map). Two documented records in the northern parts of Greece suggest that the distribution of the raccoon dog is expanding towards the Southern parts of Europe. In general, most of the locations of observed raccoon dogs on the Balkans are either along the Danube River, which is a major corridor for the species introduction, or along the Danube tributaries, which might represent secondary introduction pathways. This is in accordance with the habitat preferences observed in other parts of its range. Focused and extensive research is needed to identify the precise status of the raccoon dog's spread on the Balkans, pathways of its introduction and its overall impact. Hunters and other local stakeholders should be trained to recognise the species and signs of its presence in order to improve the reliability of the data provided by them.

Key words: Raccoon dog, distribution, the Balkans, invasion.

New invasive alien assassin bug species (Heteroptera, Reduviidae) for the Balkan Peninsula

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The invasive alien North American assassin bug *Zelus renardii* is reported for the first time for natural habitats in the Balkan Peninsula (Greece). Another alien species, the thread-legged bug *Empicoris tabellarius* is reported for the first time in Bulgaria and the Balkan Peninsula (Black Sea Coast). Its role as a potential invasive alien species for Europe is briefly discussed.

Key words: Invasive alien species, Reduviidae, the Balkans, new records.

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New data on the expansion of invasive alien lace bug species (Heteroptera, Tingidae) in the Balkan Peninsula

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In the last two years, a huge amount of data on the distribution and biology of three invasive alien lace bug species in the Balkan Peninsula has been collected within the ESENIAS-TOOLS project. *Corythucha ciliata* is reported for the first time for the Macedonian fauna. *Corythucha arcuata* was found for the first time in Bulgaria and the Balkan Peninsula in Plovdiv in July 2012 on *Quercus robur*. Four years after the first record, the species spread almost all of the country, infesting more than a half of *Quercus* species in Bulgaria and also *Castanea sativa* in urban and natural habitats. In regions with mass infestation, some of the bugs were recorded on herbs and shrubs, different from the typical hosts. The expected dispersal mechanism as stowaways was confirmed. The oak lace bug feeds on oak and causes desiccation and premature leaf-fall, and it is now becoming a serious problem for the oak and sweet chestnut forests in several Bulgarian regions. *Stephanitis pyrioides* is reported for the first time in natural habitats in Greece on new host plants. Some taxonomical issues with recently described *Stephanitis* species are briefly discussed.

Key words: Invasive species, Tingidae, the Balkans, new records.

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***Trachemys scripta* in the East and South European Region. A review of the invasion extent**

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The Common Slider (*Trachemys scripta*) is a turtle species listed among the worse 100 invasive alien species in the world, according to a ranking performed by the Invasive Species Specialist Group. Native to North America, it entered Europe through pet-trade during the 1970s and became rapidly one of the most popular pets. Wild populations outside its native range consist mainly of abandoned specimens and, in several countries with Mediterranean climate, they are also able to breed in the wild. Being an adaptable and long-lived species, wild populations can persist for long periods even without breeding, and can easily interfere with native turtle species as competitors for basking sites and food, and act as vectors for parasites and pathogens. We present a review of the distribution and population status (e.g. breeding in the wild) of *T. scripta* across East and Southern Europe (i.e. 14 countries), based on scientific literature, field data and citizen science. We gathered over 130 distribution records from 11 countries, dating since 1990 up to present. There is hard evidence that the species is able to breed in the wild in five of the 11 countries where it is present; while data, which indicate possible breeding in the wild was found for three other countries. The impact of *T. scripta* in relation to native turtles is not thoroughly understood, but studies up to present have shown that it has the potential to displace native turtle populations. From this point, more complex chain-reactions can be expected to alter the balance of aquatic ecosystem services in the invaded areas.

Key words: Common Slider, turtle, alien, invasive, distribution.

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Recent expansion of the ruffe, *Gymnocephalus cernua* (Pisces: Percidae) outside its native range in Bulgaria

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The ruffe *Gymnocephalus cernua* (Linnaeus, 1758) is distributed throughout much of Europe, except certain areas in the north and south, as well as in the north parts of Asia. It is also introduced into many areas in Europe and North America where it is expanding rapidly. In most of the cases the vectors of these introductions are not well known. In Bulgaria, *G. cernua* occurs originally in the Danube River, its adjacent marshlands and lower reaches of some of its tributaries. It has been reported that the species was introduced unintentionally together with commercial fish species in some reservoirs in Bulgaria, belonging to the Danube River catchment. Recently, the species has been reported from several reservoirs and rivers in the Aegean Sea basin.

One of the tasks of the ESENIAS-TOOLS project is the collection and analysis of data on alien and translocated fish species (e.g. pathways of introduction, status, establishment success, distribution, and impact), using published and all other available sources as well as field surveys. Therefore, the aim of our study was to collect data on recent distribution and population status of *G. cernua* in Bulgaria, including its native, as well as introduced range. The study included a review of existing information and analysis of material from field sampling. The material was collected in the period 2013-2016. The sampling was conducted in the entire Bulgarian stretch of the Danube River and in rivers and standing water bodies within all river basins in Bulgaria.

Our results confirmed some of the reported localities of *G. cernua* and at the same time showed a range expansion of the species in the inland waters of Bulgaria. We recorded it in four new reservoirs in the Danube River basins (Rabisha, Kula, Hristo Smirnenski and Gorni Dabnik), and in two new reservoirs in the Aegean Sea basin (Rozov Kladenets and Pchelina). The percentage of the species in the catches was comparatively low and did not exceed 10%. Additional data, collected from fishermen indicated the presence of the species in six new localities in the Danube River basin and eight localities (reservoirs and rivers) in the Aegean Sea basin. On the other hand, the results from our survey in the Danube River, which is considered the native range of *G. cernua*, showed that the species has become extremely rare and with a very low percentage (<0.1%) in the catches. The potential pathways and vectors of introduction and spread of the species in the inland waters of Bulgaria are discussed.

Key words: Translocated fish species, ruffe, distribution, abundance.

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Range expansion of alien mussels *Corbicula fluminea* and *Sinanodonta woodiana* (Mollusca: Corbiculidae and Unionidae) in Bulgaria

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Two alien mussel species *Corbicula fluminea* and *Sinanodonta woodiana* are known to occur in Bulgaria. The Asian clam *C. fluminea* was first reported from the Danube River in 2001, while the Chinese pond mussel *S. woodiana* from the same river in 2006. Since then the two species have largely expanded their range, reaching high densities in the entire Bulgarian stretch of the Danube River, from Vrav (836 rkm) to Vetren (395 rkm). They also spread rapidly upstream of the Danube tributaries. Until 2012, *C. fluminea* was recorded at 74 sites, while *S. woodiana* at 20 sites. The aim of our present work was to study the distribution of the two alien mussels in Bulgaria in the period from 2013 to 2016. Qualitative and quantitative samples were collected during field surveys in the entire stretch of the Danube River, in the Danube tributaries, and inland rivers, lakes and reservoirs in all water basins of Bulgaria. All available published and unpublished data on the occurrence of the two species were reviewed and used in the study.

During the study period, *C. fluminea* was recorded at 96 localities, of which 61 in the Danube River, 31 in the Danube tributaries and four in standing waters. 27 of the localities are newly reported, among them six newly invaded rivers and four standing water basins. For the first time the mussel is reported from two reservoirs in the Aegean Sea basin. The Asian clam extended its range considerably upstream of the Danube tributaries: from 25 km (Vit and Rusenski Lom rivers) to 70 km (Yantra River).

The Chinese pond mussel *S. woodiana* was recorded at 46 localities, of which 34 in the Danube River, 11 in the Danube tributaries and two in standing waters. The species was found in seven new rivers, tributaries of the Danube River. It is reported for the first time in standing inland water body (reservoir near Vidin) and for the first time in a water body from the Aegean Sea basin in Bulgaria (reservoir near Stara Zagora). The Chinese pond mussel also extended its range upstream of the Danube tributaries, reaching up to 80 km upstream (Yantra River). Possible pathways and vectors of introduction and spread of the mussels in the Bulgarian water bodies are discussed.

Key words: Invasive alien mussels, occurrence, Danube River basin, Aegean Sea basin, Bulgaria.

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Occurrence of the Harlequin ladybird *Harmonia axyridis* (Coleoptera: Coccinellidae) in the agro-biocenosis of Bulgaria

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The multi-coloured Asian lady beetle, or harlequin ladybird, *Harmonia axyridis* (Coleoptera: Coccinellidae) has spread in Europe at a very fast rate, occupying different habitats. It is regarded as a species that may have strong negative effects on biodiversity. *Harmonia axyridis* was first observed in Sofia in 2008 and its rapid spreading in Bulgaria was observed in 2009. During the period 2010-2011, the species has spread all over Bulgaria, and is now regarded as established in this country at altitudes lower than 1450 m. Till now, more than 50 arthropod species have been detected as a prey of this ladybird in Bulgaria, and it is a dominant species in the coccinellid complex mainly on broadleaved trees heavily infested by aphids. The aim of this study was the assessment of the role of *H. axyridis* as competitor in the coccinellid complex in the agro-biocenosis of Bulgaria.

As a result of the survey conducted during the period 2014-2016, *H. axyridis* was detected as part of the predator complex of aphids mainly on orchard tree species *Prunus* spp. *Malus* spp., and *Pyrus* spp. The adults of *H. axyridis* were observed on many field crops as well, but its larvae were detected only in plantations of sunflower, corn, wheat, and alfalfa heavily infested by aphids. The food web and relative abundance of *H. axyridis* in the coccinellid complex on the surveyed plant species in Bulgaria are presented and discussed.

Key words: *Harmonia axyridis*, alien, biocontrol, orchards, field crops, aphids.

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Revealing introgression of allochthonous brown trout (*Salmo cf. trutta* L.) in Eastern Serbia populations using molecular markers

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Control Region (CR) of mitochondrial DNA (mtDNA), together with lactate dehydrogenase (LDH) gene, are good molecular markers used in brown trout species complex (*Salmo cf. trutta*) for resolving phylogenetic and population genetic problems. During the last two decades, plenty of brown trout populations in Serbia were analysed, using CR mtDNA. Of five main CR haplogroups (Atlantic, Marmoratus, Adriatic, Danubian and Mediterranean) initially proposed in literature, three were detected in Serbia (Adriatic, Danubian and Atlantic), with the Danubian (Da) as the most common, and Atlantic (At) considered allochthonous. So far, the individuals of the Atlantic haplogroup have been reported for the rivers Gradac, Brankovačka, Jerma, Brnjica, Dobrinjska, Porečka, Vratna, and in the Danube River main riverbed. In order to detect interbreeding between individuals of Danubian and Atlantic haplogroups, a nuclear LDH gene was used, since mtDNA expresses only maternal inheritance. Two alleles of LDH gene are present in brown trout populations, of which LDH-C*90 is common for At mtDNA haplogroup, while LDH-C*100 for Da mtDNA haplogroup. Two specimens from the Danube River main riverbed were heterozygous and homozygous for the LDH-C*90 characteristic for the At mtDNA haplogroup. Analysis of the Vratna River samples showed presence of the At haplotype in three of ten individuals, with one heterozygote for LDH marker (LDH-C*90/ LDH-C*100). These facts indicate that individuals of the two lineages interbreed.

Key words: Control region, lactate dehydrogenase, allochthonous lineages, biodiversity.

Alien species in the upper watershed of ancient Lake Ohrid

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Ancient lakes have been recognised as evolutionary theaters and hotspots of biodiversity and endemism. Their long-term isolation has enabled continuous evolution through the process of speciation of numerous species, nowadays coexisting in a 'perfect' homeostasis. Therefore, these aquatic ecosystems have been recently marked as extremely vulnerable to the introduction and impact of the invasive alien species. Lake Ohrid is a typical example of an ancient lake, which has been exposed to the negative impact of alien species, a process getting increasingly emphasised in the last two decades. Lake Ohrid is a part of the River Drim basin, which comprises also Lake Skadar and a system of rivers as Black Drim, White Drim and Buna River, which enables the active introduction of non-native species in the lake and its immediate catchment area. However, unlike the native and endemic species communities in the lake, a little has been done concerning the presence of the alien species either in Lake Ohrid, or in its catchment.

The main goal of our research was to assess the status of alien species in the upper watershed of Lake Ohrid, with a special focus on the River Drim and River Sateska. The investigations were undertaken in the spring of 2016. Four biotic components were included in the research: epilithic diatom algae, macrophyte vegetation, benthic invertebrates and fish. Samples were collected at 21 sites.

The results indicate the presence of four alien species: *Elodea canadensis*, *Physella acuta*, *Gammarus roeseli*, and *Pseudorasbora parva*. The habitat characteristics and the ecological status of the sampling sites were also assessed for depicting the general conditions presumably emphasising the introduction and establishment success of the alien species.

Key words: Lake Ohrid, upper watershed, alien species, habitats, ecological status.

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A review of alien scale insects (Hemiptera: Coccoidea) in Bulgaria

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The increased trade interactions among countries and the import of plants, cut blossoms and bonsai has created great potential for the introduction of non-native scale insects. The aim of this study was to provide, based on literature sources, information on the alien species of scale insects in Bulgaria, including the date of the first finding, validation source, zoogeographic area of origin, and host plants. According to these sources, Bulgarian scale insect fauna currently consists of 147 species, of which 34 of alien origin. The majority of Bulgarian non-native species of scale insects belong to the family Diaspididae, mostly recorded on ornamentals, whereas other families, such as Asterolecaniidae, Cerococcidae, Kermesidae, Matsucoccidae, Monophlebidae, Putoidae, and Ortheziidae are poorly represented.

Key words: Alien scale insects, Bulgaria.

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A new finding of the American blue crab, *Callinectes sapidus*, in the coastal lagoon of Yeniköy Harbour from Çanakkale Boğazı (Dardanelles, Turkey)

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Callinectes sapidus is an invasive and commercially important species that was found for the first time in the Dardanelles in 2008. Recently, this species has highly increased in numbers near the coast of the Dardanelles and in the lagoon of southern Yeniköy Harbour, North Aegean Coast (39°53'51'' N, 26°09'36'' E). In our study, on 07 July 2016, we captured living specimens of the crab by pinter nets and nets, and then transferred them to the laboratory. Identification was based on the abdomen morphology and colouration. The individuals were also measured and weighted. Their width varied between 110 and 165 mm, while the wet weight ranged from 160 to 260 g. This report may contribute to the knowledge on some biometric characters and population dynamics of the blue crab.

Key words: Blue crab, *Callinectes sapidus*, Çanakkale Boğazı, North Aegean coast.

The invasive blue crab *Callinectes sapidus* Rathbun, 1896 (Crustacea: Portunidae): A permanent resident or just provisional visitor across the eastern Adriatic Sea, Croatia?

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The blue crab, *Callinectes sapidus*, is an euryhaline and eurythermal invasive alien species in Europe. Probably brought by ballast waters, it has widely invaded European Atlantic coast and several areas of the Mediterranean. However, it shows an unstable population status and unpredictable scenario of spread across the Croatian coast. The aim of this study was to clarify the current invasion status of that species by investigating population trends along the Croatian coast.

After the first record in the Neretva River delta in 2004, the blue crab has been periodically, but rarely recorded across different regions of the Croatian coast. The information from the personal communications with the local fishermen contained evidence that the population in the Neretva River delta is distinguished for periods of instability followed by intervals of rapid colonisation and dispersal. Thus, after the first record, there was an increase in abundance during 2004-2006, then decrease in 2006-2008, another increase in 2008-2010, and new reduction in numbers during 2011-2014. Over the periods of abundance, local fishermen reported catches of 40-50 specimens in a gillnet per night between July and September. Such high numbers of the species might have negative impact on the regional biodiversity and economics due to the decrease in the populations of the native crab *Carcinus aestuarii*, tearing the fishery nets and damaging the caught fish. The periodical high abundance of the blue crab, along with the findings of ovigerous females and juveniles, indicate evidence of an established population. However, the other reports of the crab were only occasional and from distant areas, which make unclear the way of spreading in this species. In any case, the possibly successful colonisation may lead to a significant change in the composition of the native fauna. Therefore, the further monitoring of the population and dispersal of the blue crab would be useful in order to provide additional information about the population structure and dynamics of the species in the Adriatic waters off the Croatian coast.

Key words: Invasive alien crab, Croatian Adriatic coast, ecological impact, established populations, dispersal.

***Ammannia coccinea* (Lythraceae) – a new alien plant species in Bulgaria**

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Ammannia coccinea (Lythraceae), a species native to North America, is reported here for the first time as an alien plant for Bulgaria. It was recorded in 2016 in rice fields in Central Bulgaria, in the Thracian Lowland floristic region. *A. coccinea* grows in damp to wet places at the margins of the rice fields. We provide a brief morphological description based on the material collected from the Bulgarian localities. The characters that distinguish the species from the other two species recorded so far in Bulgaria *A. verticillata* and *A. auriculata*, are also specified. The invasiveness and spreading potential of the species are discussed on the grounds of our personal observations and data from the literature.

Key words: Alien species, Bulgarian flora, rice fields, non-native species, weeds in rice fields.

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On the embryology of two invasive alien species of *Solidago* (Asteraceae) in Bulgaria

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An embryological study of two invasive alien species in Bulgaria – *Solidago canadensis* and *Solidago gigantea* (Asteraceae), was carried out. Both taxa are native to North America. The features of the reproductive structures and processes were examined in order to estimate which traits may facilitate the invasiveness of these species. We found that seeds in the Bulgarian localities of both species are formed exclusively by sexual means. The successful sexual reproduction is ensured by the high amount of viable pollen (up to 75%), almost stable embryological structures, normally running processes in the male and female generative sphere, multicellular antipodal complex and antipodal haustoria (in *S. gigantea*), as well as the simultaneous formation of mature embryos in the florets of the capitulum. In addition, both species are long-lived herbaceous perennials and reproduce asexually through underground rhizomes.

During the study, some degenerations were found, mainly in the male and female generative sphere of *S. gigantea*, e.g. degenerated mature embryo sacs and embryos in the florets of all studied capitula. These degenerations may influence to some extent the effectiveness of the sexual reproduction of this species. On the contrary, it was observed that in *S. canadensis*, the sexual reproduction is possibly more effective than that in *S. gigantea*, whereas the vegetative one (clonal growth) probably has a smaller role in the invasiveness of the former species. Obviously, the long-distance dispersal of both species is achieved by seeds, but once established, the individuals reproduce asexually and form large clones.

Key words: Alien plants, invasive species, *Solidago canadensis*, *Solidago gigantea*, male and female gametophyte, reproductive system.

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Invasive alien pathogenic fungi on coniferous forest tree species in Bulgaria

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Bulgaria is one of the European countries with the richest biodiversity, mainly due to the various environmental conditions. At the same time, these conditions create favourable prerequisites for distribution of many invasive alien species in the country through the main pathways – trade, tourism and transport. In this study, we investigate the invasive alien pathogenic fungi on coniferous forest tree species in Bulgaria. The distribution, biological characteristics and ecological requirements of these pathogenic fungi are presented here.

The most important invasive alien fungi found on Bulgarian coniferous tree species, were *Mycosphaerella* spp, which affected the needles of several native pines. Some widespread or with restricted distribution fungal pathogens were also found on the needles of coniferous species introduced in the country, e.g. Douglas fir and European larch. In addition, we describe certain invasive alien species that occur on the shoots, twigs and branches of both native and introduced coniferous species.

Several native fungal species for Bulgaria are also considered as they are invasive in many other European countries and pose a serious risk for the health condition of the coniferous forests.

Key words: Coniferous tree species, health condition, invasive alien species, pathogenic fungi.

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Alien invertebrates' introductions into Italy: An overview

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Italy is known to be the richest EU country for alien terrestrial invertebrate species reported. Despite a long tradition in entomological studies across the country, the number of alien invertebrates cited in literature is probably underestimated due to the incompleteness of data collection and possible bias towards some taxonomic group.

Here we present an overview of alien terrestrial invertebrates in Italy, which covers the period from the late 18th century to December 2016, based on the information collected from the scientific and grey literature. This database is constantly keeping updated under an agreement between the Italian Zoological Union (UZI) and the Italian National Institute for Environmental Protection and Research (ISPRA). For each species, in addition to the taxonomic overview and references examined, other information is provided, which includes: the invaded regions, year of introduction, status (i.e. allochthonous, cryptogenic or unknown), occurrence (i.e. extinct or eradicated, occasionally present, established, etc.), invasivity (i.e. invasive or not, unknown), type of introduction (i.e. intentional or unintentional), and pathways of introduction (i.e. release in nature, escape, contaminant, stowaway and their subcategories).

Arthropods are the most represented taxa (ca 94%), with insects in particular being more than 1300 species reported. Among them, Coleoptera (ca 35%) is the most represented order, followed by Homoptera and Hymenoptera (both around 20-22%). The temporal trend in introduction is similar to that reported in Roques et al. (2010) for arthropod introductions in Europe. The increase in numbers is mainly due to the phytophagous species. We also discuss some introductions in the last three years, with a particular focus on Coleoptera.

Indeed, we remark how constantly updated inventories of species assessing the alldiversity for a specific area, with a wide taxonomical coverage, are crucial in order to forecast the most likely invader species, used pathways and vulnerable ecosystems or habitats.

Key words: Database, insect, mollusc, arthropods, pathway.

TOPIC 2: VECTORS AND PATHWAYS FOR INVASIVE ALIEN SPECIES INTRODUCTIONS

Trade, transport, horticulture,
aquaculture, agriculture, forestry,
hunting, etc.

Alien nematode species in ESENIAS countries

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An overview based on the literature sources about alien nematode species that occur in the ESENIAS countries is provided. The list of alien nematodes contains nematode species, such as: *Globodera rostochiensis*, *G. pallida*, *Cryphodera brinkmani*, *Meloidogyne ethiopica*, *M. mali*, *Aphelenchoides bessey*, *Longidorus asiaticus*, and *Xiphinema rivesi*. Also presented is an alert list of species which introduction to South-Eastern Europe is probable. We also review possible pathways and sources of introduction of the soil nematodes. In this regard, we consider the following most probable ways of introducing alien nematodes into the ESENIAS countries: 1) By infested soil and growing media, plants for planting, bulbs and tubers from countries where these nematode species occur; 2) Through soil attached to the machinery, tools, footwear, or plant products; 3) Through the movements of insect vectors (e.g. *Monoctonus galloprovincialis*, a dispersal vector of *Bursaphelenchus xylophilus* in Europe); 4) By international trade in wood and wooden products, and in host plants, which is regarded to be the main pathway for the expansion of *Bursaphelenchus* species; and 5) Through invaded seed, propagative stock, and plant debris, which is possibly the primary way of dispersal in *A. besseyi*.

Key words: Alien nematodes, East and South Europe, alert list, pathways of introduction.

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Introduction pathways of invasive alien species in the Black Sea coast of Turkey

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The main introduction pathways for invasive alien species in the Black Sea have been shipping and aquaculture. Four invasive alien species in the Black Sea: Rapa whelk (*Rapana venosa*), comb jellies (*Mnemiopsis leidyi* and *Beroe ovata*), and blood cockle (*Anadara inaequalis*), were unintentionally transported by ballast water of ships. Only one, the pacific mullet (*Mugil soiuy*), was introduced accidentally from the broken cages located in the Azov Sea. In the Turkish coastal waters, Rapa whelk (*R. venosa*) was introduced in 1960, while the others were introduced later: *M. leidyi* in 1982, *A. inaequalis* in 1984, *M. soiuy* in 1989, and *B. ovata* in 1997. Later, in order to prevent introduction of alien species, the International Maritime Organization (IMO) Ballast Water Management Convention was ratified. The convention requires radical measures, such as providing safer locations to ballast water exchange and chemical or mechanical treatment after collecting at the designated ports. This paper reviews the introduction pathways of invasive alien species to the Turkish coast of the Black Sea and measures taken by the Turkish government to reduce ballast water impact regarding invasion of the alien species.

Key words: Invasive alien species, ballast water, measures, Black Sea.

TOPIC 3: THE DANUBE RIVER AS INVASIVE ALIEN SPECIES CORRIDOR

Priority species for the Danube Region,
impact on threatened species, specificity
of biological invasions in Lower, Middle
and Upper Danube River sections

Riparian area of the Danube River (Serbia) as an invasive alien plant species corridor

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Invasive alien species are a globally recognised problem, owing to the negative impact of those species on ecosystems and biodiversity. The rising interest in research on riparian ecosystems has coincided with the increase in the number and scale of studies pertaining to the issue of biological invasions as a whole. As studies have indicated that river corridors enable the spread of invasive alien species, a number of research activities have recently been focused on invasive riparian plants and their distribution patterns. The aim of our research was to analyse and determine the degree of alien plant species invasion in the riparian areas of rivers and canals in Serbia. Over the course of four consecutive years (2013–2016), a total of 230 field sites in riparian areas of 37 rivers and six major canals of the Danube-Tisa-Danube hydrosystem in Serbia, including 20 sites along the Danube River (between Bačko Novo Selo and the Golubac fortress), were studied. The field sites were selected based on the frequent occurrence of invasive taxa at the site (e.g. over 50% of the total cover). The results have shown the presence of 20 invasive alien plant species, 55% of which are highly invasive, 25% less invasive and 20% potentially invasive in the territory of Serbia. The total number of documented invasive aliens per field site varied between 4 and 11. The most abundant of the registered invasive aliens was *Amorpha fruticosa*, recorded in 19 field sites, followed by *Aster lanceolatus*, and *Echinochloa crus-galli*, registered in 15 field sites each. The least represented invasive aliens were *Helianthus tuberosus*, *Solidago canadensis* and *Xanthium spinosum*, each of them recorded in one field site along the Danube River.

Key words: Invasive alien plants, riparian areas, corridor, Danube River.

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Importance of river type and presence of non-indigenous species for benthic communities of tributaries of the Lower Danube River

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The Danube River is one of the main corridors for the introduction of alien species in Europe. At higher risk are the adjacent water bodies in the lower section of the main river, i.e. its tributaries. A two-year study (2014-2015) on macroinvertebrate communities was conducted at selected sites in tributaries of the Bulgarian section of the Lower Danube River, including large lowland rivers R-E3 (national type R7) and medium-sized lowland rivers R-E2 (national type R8). This study was part of the official intercalibration exercise for the categorisation of rivers through the use of Biological Quality Elements. As a result 42 sites in the tributaries of the Bulgarian section of the Danube River were sampled and selected parameters, metrics and methods for analyses of benthic macroinvertebrates (together with phytobenthos, macrophytes and fishes) were studied. The objective of this study was to test the importance of two factors for macrozoobenthic assemblages: river type and presence of non-indigenous species. We recorded a total of four alien species (*Branchiura sowerbyi*, *Corbicula fluminea*, *Orconectes limosus* and *Haitia acuta*) and a translocated one (*Viviparus acerosus*). At 23 of the sampling sites we found at least one of the above mentioned species. We then compared benthic invertebrate communities among the two river types and from sites with and without non-indigenous species. Our results revealed significant differences in benthic communities between river types. The presence/ absence of alien species affected macroinvertebrate communities in large lowland tributaries of the Danube River.

Key words: River types, alien species, benthic macroinvertebrates, community structure, Danube River, Bulgaria.

New data about the distribution of the alien species *Branchiura sowerbyi* Beddard, 1892 (Oligochaeta: Tubificidae) in Bulgaria

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The tubificid species *Branchiura sowerbyi* originates from South-East Asia and nowadays is widespread in Europe and North America. In South-East Europe the species has been registered in Croatia, Serbia, Greece and Bulgaria. There is still no data from Romania and Turkey. In Bulgaria, the first finding of this non-indigenous species was in 1964 in a fish pond on the Belene Island (576-560 rkm) in the Danube River. During the last 55 years the species has spread rapidly upstream of nearly all the Danube tributaries and now is a part of the oligochete community in almost all river basins in Bulgaria. The aim of this study was to report about locations in water bodies from different ecotypes and to identify the Danube River as a main possible way of distribution along with the human impact. Results are based on published and new data obtained within the last 5 years. This work shows the prevalence of *B. sowerbyi* in Bulgaria and outlines the need for further studies on its distribution in other Balkan countries, as well as on assessment of the rates of spread and the invasion status of this alien species.

Key words: *Branchiura sowerbyi*, alien species, aquatic oligochets, Danube River, inland water bodies, Bulgaria.

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Seasonal weight-length relationship of Amur sleeper (*Percottus glenii* Dubowski, 1877) in the Danube River drainage channel

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The Amur sleeper (*Percottus glenii*), an indigenous species to the Russian Far East, northern China and the northern part of Korean Peninsula, has been considered an invasive alien species to European waters, where it may have negative impact on eggs and larvae of native fish species, on aquatic macroinvertebrate and larval amphibians. There were a few findings of the Amur sleeper specimens in Serbia during 2001-2003. The first record of established population was from the Danube River flood plain zone (1139 river km) in 2005. Our study includes 85 specimens collected in the Danube River drainage channel near Veliko Gradište (Serbia), in 2015-2016. The body length of specimens range from 35.78 mm to 140.68 mm, while the body weight range from 0.5 g to 40 g. Based on scale analyses, specimens have been determined at age of 0+, 1+ and 2+. The length-weight analysis does not show any differences between the regression slopes of samples from the two seasons.

Key words: Introduced species, *Percottus glenii*, Danube River, age structure, regression coefficient.

Morphometric and meristic variations in non-native whitefish *Coregonus mareanoides* (Polyakov, 1874) from Iskar Reservoir, Danube River basin, Bulgaria

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The peipsi whitefish (*Coregonus mareanoides*) is a non-native species for the Bulgarian ichthyofauna. In the 1980s the species was introduced from Russia to some reservoirs in Bulgaria, among them the Iskar Reservoir. Our recent studies confirmed that *C. mareanoides* established self-sustaining population in this reservoir. However, there are no any data about morphological characteristics of the established population. The aim of the present study is to describe the morphometry and meristics variations (15 meristic and 27 plastic characters) in the peipsi whitefish from the Iskar Reservoir. Samples were collected during the winter-spring period in 2015-2016, using gill nets placed in different parts of the reservoir. A total of 54 individuals with a total length in the range from 31.6 cm to 51.9 cm, and a body weight in the range from 289 kg to 1569 kg were studied. The results were compared with fish from native range - Peipsi Lake (Estonian and Russian parts). Significant differences were found in 10 plastic characters (head height and length, eye diameter, preorbital distance, maximum body height, postdorsal distance, height of anal and dorsal fins, distance between pectoral and ventral fins and pectoral and anal fins) and three meristic characters (number of branched and unbranched dorsal fin rays and branched anal fin rays). We assume that the identified phenotypic differences are most likely a result of the adaptation of this species to the new environmental conditions in the Iskar Reservoir.

Key words: Alien species, *Coregonus maraenoides*, morphometry, Iskar Reservoir, Bulgaria.

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TOPIC 4: INVASIVE ALIEN SPECIES IMPACT

Environmental impact, impact on ecosystem services, socioeconomic impact and impact on human health; pests and pathogens

A review of metals in rapa whelk (*Rapana venosa*) in the Black Sea

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The rapa whelk (*Rapana venosa*), which is native to the Northeast Pacific, is one of the dominant alien benthic invertebrate species along the Black Sea coast. This species was introduced to many countries in Europe and America in larval form by ballast waters and attached to the hull surface of ships. At present, the impact of the rapa whelk in the Black Sea and the Mediterranean has reached its maximum in ecologic and economic terms. On the other hand, the species provides new income to local fishermen as an export material for the Japanese market. The rapa whelks are capable of accumulating metals from the environment and they are also a useful bio-monitor of metal pollution at habitats they live. There are many studies concerning metal concentrations in rapa whelk tissue. The results obtained have shown that the metal concentrations in *R. venosa* have regional differences and their values are below the permissible levels defined by the European Commission Regulation and Local Food Codex accepted for cadmium (Cd) and arsenic (As). Our study illustrates the negative impact but also the benefits of invasive alien species as rapa whelk. To protect the ecological balance and biodiversity of the Black Sea, prevention against introduction of alien species and reduction of pollution are necessary.

Key words: Invasive alien species, marine environment, rapa whelk, metal concentrations.

Phytoplankton qualitative and quantitative characteristics: Comparison of Bulgarian reservoirs infested and non-infested by *Dreissena polymorpha* (Mollusca: Bivalvia)

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The total numerical abundance of phytoplankton, expressed both in individuals and cells per unit volume, the total biomass, number of species and species diversity, as well as the abundance of the major taxonomic groups were assessed in 18 Bulgarian reservoirs sampled in the summer and autumn of 2016. Eight of those reservoirs have been infested by the zebra mussel, *Dreissena polymorpha*. The main taxonomic groups in the phytoplankton of both the infested and non-infested reservoirs were investigated through partial principal component analyses (PCA) and redundancy analyses (RDA). The presence/absence of *D. polymorpha* may explain the statistically significant part of the spatial variation in the mentioned taxonomic groups ($P=0.005$). It has also been found that all variables of the abundance (the number of individuals, cells, species and biomass) have statistically significant higher values in the non-infested reservoirs. The seasonal variation in the phytoplankton taxonomic structure was considerably lower than the spatial variation among all reservoirs studied.

Key words: Phytoplankton, *Dreissena polymorpha*, freshwater reservoirs.

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Invasive Lessepsian fishes and their public health effects

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The invasive puffer fishes (*Lagocephalus spadiceus* and *Lagocephalus sceleratus*), which are particularly important in terms of seafood, constitute a major public health problem in the countries of the Mediterranean coast because of their tetrodotoxin (TTX). Since 2000, the puffer fish species of the Tetraodontidae family have started spreading from the tropical Indo-West Pacific ocean, through the Suez Canal to the Mediterranean and have reached the coasts of Israel, Lebanon, Turkey, Greece, Cyprus, Egypt, West Spain, Libya, and Tunisia. Both species are considered invasive from the Mediterranean Sea to the Aegean Sea, the Gallipoli coasts and the Marmara Sea in Turkey. In this article, the reproduction, toxic effects, invasiveness, and public health impacts of the puffer fishes are studied and discussed.

The tetrodotoxin, which can be lethal to humans after consumption, causes paralysis on the nervous system and respiratory system because it is resistant to heat, cooking conditions and neurotoxic. TTX is found especially in the skin and visceral organs of the fish, being concentrated mainly in the liver and overt tissues. This toxin binds to the sodium channels of the cell membrane in contractile tissues, such as muscle and nerve tissue, and inhibits sodium ion transport. Despite the fact that many of the effects are dose-dependent, there is no effective treatment and an antidote against this toxin. Hospitalisation due to food poisoning and fatal poisoning cases are reported in many countries. In particular, poisoning cases can be increased because the awareness of the poison secreted by the fish is inadequate in the society and detoxification methods are not considered. In addition to health problems, the fishes can cause important economic problems to the fishery sector due to the related financial losses. The puffer fishes can cause damages to fish nets because of their strength, sharp teeth and aggressive behaviour. They may also threaten the breeding grounds of smaller fishes.

Awareness raising campaigns should be undertaken at local and national level, in order to inform about the risks of fishing, consuming, poisoning and lethal health problems related to puffer fishes. The training should focus on target groups that live in the coastal areas, depend on fisheries and consume fish more frequently. Scientific studies on the reproductive conditions of fish, toxin production, secretion mechanisms, and detoxification methods are also needed. The Turkish Ministry of Food, Agriculture and Livestock has made necessary announcements together with fishing prohibition and warned the fishing industry and zones to be careful about the danger that may arise from these fish species which are prohibited to be marketed in many countries. It would be useful also for local authorities to organise information campaigns with fisheries specialists, food engineers and public health experts.

Key words: Invasive species, Lessepsian migrant, tetrodotoxin, public health.

The current status of pests associated to urban vegetation in Bucharest area

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The pests on urban vegetation cause substantial aesthetic, economic and biodiversity damages. They weaken the plants till their complete destruction, thus destroying additionally the urban areas, already damaged by human intense activity. The number of urban pests has drastically increased recently due to the climatic changes, such as excessive droughts alternating with heavy rainfalls. The massive imports of ornamental plants because of the continuously increasing surface used for urban landscape, as small parks, private gardens, and vertical walls, also contribute to the increased number of pests.

In the last five years, in Bucharest parks and private ornamental gardens, we detected 46 pest species on urban vegetation, among them: *Cameraria ohridella* on chestnut, *Cydalima perspectalis* Walker on *Buxus* spp., *Unaspis euonymi* Comstok on *Euonymus* sp., *Corythucha ciliata* Say and *Phyllonorycter platani* Staudinger on ash, *Halyomorpha halys* (Stal), as well as *Hyphantria cunea* Drury, and *Metcalfa pruinosa* Say on many other ornamental species. We present data on geographic location of each species, their impact on the landscape, and different issues and challenges in applying control measures.

Key words: Pests, ornamental plants, urban areas, Romania.

Impacts of the invasive alien species in the Black Sea

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The fragile ecosystem of the Black Sea has been under the threat of invasive alien species since the second half of the 20th century. Recently, due to the increased maritime transportation and climate change, the speed of introduction and impact of invasive alien species on the Black Sea ecosystem has increased significantly. In spite of the measures taken by the International Maritime Organisation to reduce transportation of new species by ships, these efforts could not be effective as it is targeted. Warming of the seas provide suitable conditions for any non-native species migrating to the new regions. The Black Sea has a natural barrier in the entrance of the Bosphorus and only a few species can enter unaided. Successful introductions of new species either naturally or by maritime activities, have caused radical changes in the biodiversity by either high predation or food competition. This has resulted in radical declines in the total seafood production. On the other hand, invasive alien species may be the direct and indirect reason for economic and social losses. An example of indirect impact on the ecosystem is harvesting of the alien species Rapa whelk (*Rapana venosa*) by dredges. This method is one of the most important habitat destruction methods in the Eastern Black Sea coast where trawling is forbidden in order to protect the narrow continental shelf in that area. The impacts by invasive alien species can be higher in the Black Sea in comparison to the other regional seas and the oceans due to less trophic level in the food web, conflicting interests of other sectors active in the Black Sea, pollution, high fishing pressures and urbanisation (landfills, road constructions and construction of dams and hydroelectric power plants).

In this presentation we reveal the impacts of the following invasive alien species: comb jellyfish species (*Mnemiopsis leidyi* and *Beroe ovata*), rapa whelk (*Rapana venosa*), blood cockle (*Anadara cornea*), Pacific mullet (*Mugil so-iuy*), baby clam (*Chamelea gallina*), soft-shell clam (*Mya arenaria*), mudsnail (*Potamopyrgus jenkinsi*), barnacle (*Balanus improvises*) and common starfish (*Asterias rubens*). Our results are based on the studies and observations from the Black Sea coast of Turkey

Key words: Invasive species, impact, ecosystem, climate change, Black Sea.

Economic impacts of the aquatic invasive alien species within the ESENIAS region: Need for development of cost estimation

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Invasive alien species are an increasing threat in the ESENIAS region, resulting in biodiversity loss, changes in the existing ecosystems and negative effects on the economic enterprises, including: agriculture, forestry, fisheries, power production, and international trade. Although costs for prevention and mitigation of the negative effects of invasive alien species are not understood sufficiently and/or are not documented, the estimates of such expenses range from millions to billions of Euros every year. The aim of the present study was to make a review of published sources on the economic costs related to aquatic invasive alien species in the ESENIAS countries as a first step in the development of cost estimation on aquatic invasive alien species, considering their negative impact, benefits, and costs for prevention and control.

This review includes studies on fish, invertebrates and plants. Although there are some theoretical studies dealing with those topics, there are quite a few empirical studies related to the economic costs on the aquatic invasive species in the region. The results showed that the costs related to the aquatic invasive alien species in the region range from several hundreds of thousands of Euros a year to tens of millions of Euros a year. Therefore, it is evident that a systematic approach for development of a constant method of estimation of such costs is required. The literature also points out the necessity of governmental intervention in solving issues related to aquatic invasive alien species and their control. Nevertheless, to what extent and what form of intervention would be appropriate is highly dependable on specific issues in the region and on the invasive alien species in question. Thus, optimal policy seems to be as unique as the individual species or ecosystems it is determined to control and protect.

Key words: Aquatic invasive alien species, costs, ESENIAS, literature review, estimation.

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TOPIC 5: INVASIVE ALIEN SPECIES PREVENTION AND MANAGEMENT

Early detection and rapid eradication, surveillance systems; risk assessment and horizon scanning; control measures; restoration of damaged ecosystems; education, citizen science, strategies, policy and legislation; IAS networks and information systems, databases, data planning and management

Portable LAMP (Loop mediated isothermal AMplification): New molecular assays to detect invasive plant pathogens

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Plant health emergencies due to invasive quarantine pathogens are increasing in Europe and in other countries. The threat that these pathogens could represent for natural forest ecosystems and urban environments is mainly connected with their possible spread into new areas without susceptible hosts and ecological suitable conditions. Here they could cause huge ecosystem changes and biodiversity losses. In order to contain, prevent and manage environmental and economic damages that these pathogens may cause some specific and sensitive diagnostic tools are necessary. It is recognised that effective plans for both early warning and rapid response are a crucial element of any policy aimed at reducing the impacts of biological invasions or preventing the establishment of pathogens, such as the invasive species. Hence, advantages might be gained by moving testing closer to the site of sampling, thereby reducing delays. PCR-based methods are to date favoured for their high sensitivity and specificity, but they require a well-equipped laboratory for analysing the samples. For this purpose, certain diagnostic assays based on LAMP (Loop mediated isothermal amplification) were developed and optimised on the portable instrument Genie II (Optigene, UK). The assays, based on specific target DNA regions, enable recognising target pathogens with high specificity and sensitivity. Indeed, these assays have shown the ability to distinguish each pathogen with a characteristic melting temperature and to detect DNA in a quantity as low as 0.128 pg/μl. These results equal to those obtained with the qPCR compared diagnostic assays. Using this method for detecting quarantine pathogens, both on symptomatic and asymptomatic samples, could help in checking imported and exported live plants for planting, thus limiting the uncontrolled spread of invasive pathogens. Furthermore, the great simplicity, sensitivity and specificity, high speed (only 30 min) and the minimum equipment required make the assay ideal for its application in the field and for routine plant testing both in cities and forests.

Key words: Early detection, molecular diagnosis, invasive quarantine plant pathogens detection.

Citizen-generated data on invasive alien pests in Romania: Trends and challenges

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The global trade is generally considered the main source of introducing invasive alien species (IAS) throughout the world, while the climate changes possibly increase the chances of establishment of those species. The disparate efforts of member states to monitor the IAS cannot guarantee the success of the EU eradication and control measures. The validated geo-referenced records should help the professionals and speed up the early warning and management schemes. In this context, raising public awareness about the IAS is essential, and the advance in taking responsibility of the citizens is demonstrated by their willingness to cooperate with the scientists and assist them in resolving this issue.

Recently citizen science initiatives have expanded and several smartphone software applications (apps), such as: IAS Europe app, IASTracker app, That's Invasive app, and AGIIR-INRA app have been released in Europe. Romania has a very low response in citizen-generated data (CGD) on IAS. The reports on few of the most important CGD open platforms show no records from Romania. The IAS mobile applications, unlike the agricultural mobile applications (used by farmers) have not been used in Romania so far. The current paper analyses the situation with citizen-generated data on the invasive alien pests and addresses the challenges in implementing the IAS-related applications by Romanians.

Key words: Invasive alien species, invasive alien pests, IAP, IAS apps, Romania, analysis.

Global Warning: A COST Action about tree nurseries as early warning system against alien pests

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The international trade in live plants is an important pathway for the introduction of invasive pests and pathogens of woody species. Many introduced pests and diseases were unknown, or not known to be harmful, and were not regulated before they invaded. This indicates that the current system to identify harmful species does not provide sufficient protection from invasions by alien pests and pathogens. Potentially harmful organisms for regulation can be identified by monitoring trees planted in regions that export plants. The effective implementation of this novel method requires the exchange of the results of monitoring efforts and international collaboration. COST Action 'Global Warning' (FP1401) aims to establish a global network of scientists and regulators in countries where sentinel nurseries could be established from seed, or where there are botanical gardens or arboreta with exotic trees, to develop common protocols for the monitoring and identification of pests, and to explore ways to regulate the establishment of such nurseries and the use of data collected through them. The Action will also collate detailed information about the international live plant trade and the environmental value of woody plants in Europe. Other outputs of the Action will include articles in peer-reviewed journals and an open-access field guide for the identification of the most likely causal agents of damage observed on woody plants.

Key words: Potentially invasive alien species, forest pests and pathogens, international trade in live plants, early warning system.

Management of some dicotyledonous invasive weeds in rape crops in southern Romania

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The importance of winter rape crop has increased considerably in recent years because it provides the raw material for industry, representing a renewable alternative to fossil energy sources. One of the main problems is the weeds in oilseed rape crops. Their spectrum has a specific characteristic and it is in a process of constant alterations. Our observations were made on the rape crops in southern Romania in 2015–2016. We inferred from the research that some weed species classified as “ephemeral”, such as the genus *Veronica* spp, could become aggressive and dominant species in the rape crops. We also found that *Galium aparine*, with its much higher density in the rape crops, has become more damaging. In this context, the control of these species is strongly needed. Moreover, it is necessary because of the high cost of production correlated with decreased productivity, and because of its growth in dense rows that don't allow mechanical works. This paper presents data on the management of three aggressive weed species: the alien *Veronica persica*, and the native *Veronica hederifolia* and *Galium aparine*, by combining agro-technical measures with means for plant protection.

Key words: Invasive species, rape crops, weeds, herbicides, agro-technical measures, management.

Laboratory test of three isolates of *Beauveria bassiana* (Bals.) Vuill. against larvae of invasive sawfly *Aproceros leucopoda* Takeuki

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The invasive sawfly *Aproceros leucopoda* Takeuki (Hymenoptera: Argidae) is an important defoliator pest of elm trees in Romania. The susceptibility of *A. leucopoda* larvae to three isolates of the entomopathogenic fungus *Beauveria bassiana* (Bblt, BbAl1/10 and BbS1.07), with different origins in terms of insect host, was evaluated. The bioassay was performed by exposing field collected larvae to fungal liquid culture, consisting of 6×10^9 propagules/ml, sprayed on leaves. Mortality was recorded every 2-3 days in a period of 11 days. No significant differences between mortalities caused by the isolates Bblt and BbAl1/10 were detected. The insects were highly susceptible to the isolates Bblt and BbAl1/10, with mortality rates of 97.4 % and 75.6%, respectively. The values of the median lethal time (LT_{50}) were 3.9 and 3.7 days, respectively. The sensibility of *A. leucopoda* larvae to the fungal isolate BbS1.07 was very low.

Key words: Entomopathogenic fungus, *Beauveria bassiana*, *Aproceros leucopoda*, virulence.

Engaging people in biodiversity surveys: Developing a European ladybird mobile app

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The involvement of volunteers in the scientific process, often collecting data through citizen science initiatives, has rapidly increased in popularity with increasing participation across Europe.

Ladybirds (Coleoptera, Coccinellidae) are mainly beneficial predators, often used as biological control agents. For this main reason, some species have been introduced all over the world, sometimes showing invasive traits, as for the *Harmonia axyridis*, one of the most successful invaders globally. As conspicuous coccinellids are widespread charismatic insects that can be recognised relatively easily, they are popular species with the public and therefore excellent target species for citizen science projects. On the strengths of the citizen science survey on ladybirds in the UK (www.ladybird-survey.org) we have developed a smartphone App for European ladybird recording and identification. The main aim of the App is to engage people in providing their sightings of ladybird while gaining an appreciation of the diversity and value of these insects.

For the prototype of the App, we have assembled a database of conspicuous ladybird species, including the development of check lists of species for the UK, Slovakia, Czech Republic, Italy, Belgium and Portugal (excluding inconspicuous species) by checking updated literature and consulting local experts. Specific morphological features (e.g. size, main colour, pronotum pattern, habitat) and country-based ranking of probability of occurrence were provided as app filters to enable the users to reduce the number of likely species in the process of recording. Also, numerous species profile descriptions within the App identify other key features, e.g. pattern colour and spot on elytra or food habits.

This project is the first collaborative approach involving recording of ladybirds through citizen science across Europe. The success of the app will depend on the engagement of the general public though we anticipate excellent participation because of both the popularity of ladybirds and the usability of the app.

Key words: Citizen science, monitoring, biodiversity, insects, Coccinellidae.

Influence of the diel period and different sampling methods on catch of gobiids at four locations in the inshore part of the Danube River

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Some recent data show that five gobiid species have spread outside their native range and expanded their distribution area in Serbia along the rivers Danube, Tisza, Sava, and Velika Morava. These are: monkey goby *Neogobius fluviatilis*, racer goby *Neogobius gymnotrachelus*, bighead goby *Neogobius kessleri*, round goby *Neogobius melanostomus*, and tubenose goby *Proterorhinus semilunaris*.

The aim of this study was to compare the efficiency of two different methods for fish sampling, as well as to assess influence of the diel period on catch of gobiids in the Serbian stretch of the Danube River. During October 2012 and September 2013, the sampling was performed by electrofishing and beach seining in four riverside locations of the Danube River, as follows: at Novi Sad (river km 1257), Belgrade (river km 1173), Tekija (river km 956), and Prahovo (river km 862), with the water depth being of up to 120 cm. At each location, the sampling was performed at 17:30, 18:30, 19:30 and 20:30.

A total of 551 gobies were caught. The highest number of specimens (238) was registered at Tekija, followed by the sites at Belgrade (192) and Prahovo (109), and only 12 specimens caught at Novi Sad. The catch of the round goby and monkey goby was more efficient by beach seining than by electrofishing, while the catch of the tubenose goby was more efficient by electrofishing. Both methods had similar efficiency in terms of the catch of the bighead goby and racer goby. The species diversity and the number of caught specimens were the highest at 18:30. All five species were recorded at the sites of Belgrade, Tekija and Prahovo, while only the monkey goby and racer goby were caught at Novi Sad. The methods used in this study showed good efficiency in catch of gobiids, especially at dusk. Despite the difficulty in using these methods in certain habitats, we assume that they could be highly relevant in the regular monitoring of gobiids along the inshore parts of the rivers.

Key words: Invasive fish, allochthonous, five gobiid species, distribution area.

'Invasive alien species' or unlimited resources of plant substances for medicinal use?

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The high tolerance to various habitat conditions and potent ability of propagation in a number of alien plant species promote their aggressive invasive behaviour. In addition, they not only outcompete local plant species but also suppress the development of their seeds. There may be no suitable herbivores in the newly invaded areas to control the alien plants; therefore humans remain the only effective enemy of them. On the other side, a growing body of scientific literature points to the therapeutic potential of chemical constituents in some invasive alien species, such as *Amorpha fruticosa* (Fabaceae), *Ailanthus altissima* (Simaroubaceae), *Dittrichia graveolens*, and *Erigeron canadensis* (Asteraceae). These plants contain different active compounds that have antidiabetic, anti-inflammatory, analgesic and anti-spasmodic effects, and show astringent, anti-tumor, antimicrobial and antiviral activities. The osteoclast inhibitory, wound healing and hepatoprotective effects, along with the antioxidant and acetylcholinesterase inhibition properties are also well documented for the mentioned compounds.

Due to the wide spread of the invasive alien species, they can provide abundant and cheap resources of plant chemical constituents, which can be used for therapeutic purposes. Additionally, exploitation of the biomass for medicinal use might contribute to relieving the destructive impact of these species on natural habitats.

Key words: *Amorpha fruticosa*, *Ailanthus altissima*, *Dittrichia graveolens*, *Erigeron canadensis*, biologically active compounds, pharmacological activity, management.

The current status of *Diabrotica virgifera virgifera* LeConte in Romania

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The Western corn rootworm, *Diabrotica virgifera virgifera*, is an alien species that originates from Mexico and Guatemala, where it feed mainly on host plants of the family Poaceae, which are wildspread and with high diversity in the area. From there the species spread into the temperate zones of the North America.

In 1992, this species was first recorded in Europe near Belgrade Airport. In 1996, the species was found in Nadlac, Romania, on the Hungarian border. According to the information by the Central Laboratory for Phytosanitary Quarantine, Bucharest, in 2003 the Western corn rootworm was already present in 22 Romanian counties: Arad, Timis, Caras Severin, Mehedinti, Bihor, Satu Mare, Salaj, Hunedoara, Cluj, Alba, Sibiu, Gorj, Dolj, Valcea, Olt, Bistrita Nasaud, Mures, Harghita, Maramures, Arges, Brasov, and Prahova.

The aim of this study was to make an exhaustive review of all the published literature on this invasive species in Romania. Based on both this review and the original research of the authors, information on the current distribution, host plants, invasion trends, damages, monitoring activities and control of the species is presented.

Key words: *Diabrotica virgifera virgifera* LeConte, current status, control.

Determining of the technical properties of trotlines using fisheries of invasive *Atherina boyeri*

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The purpose of this study is to emphasize the importance of an invasive fish species in terms of regional fisheries and economy. The fishery of the invasive big scale sand smelt (*Atherina boyeri* Risso, 1810) is highly important for the North Aegean coast of Turkey. Since it has been used as bait in fishery of bluefish (*Pomatomus saltatrix*) and consumed as food, species-specific fishing method is developed. For the fisheries of this species in the area, trotlines are used. In order to collect data about the technical properties of these trotlines, a questionnaire was prepared and conducted in 49 fishing ports from Gökçeada, Bozcaada, Saros Bay, Dardanelles to Edremit Bay. A total of 1085 fishermen participated in the questionnaire. According to the results, 138 fishermen have used trotlines equipped for fishing of *Atherina boyeri*. The technical properties of the trotlines are summarised from the questionnaire responses. The thickness of the mainline is usually 0.15 mm, with a range from 0.12 mm to 0.18 mm. The thickness of the gangion lines is usually of 0.10 mm, with a range from 0.10 mm to 0.12 mm. The gangion lines are attached to the mainline at intervals with a range from 15 to 20 cm. The hooks comprise conventional nickel straight hooks and mostly of 10, 11, 12, 13, 14 hook sizes. Due to the thinner mainline, a maximum of 5-10 hooks are used in order to prevent the break off the mainline. From 60 to 100 g lead is used as a sinker. The preferred colours of the feathers are: white, yellow, orange, green, and mixed coloured. This study shows that some invasive fish species may be beneficial to the fishery of the region, as well as not being harmful to the existing ecosystem.

Key words: Trotline, North Aegean Sea, *Atherina boyeri*, big scale sand smelt.

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Risk management against invasive disease-transmissible mosquitoes in the EU

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The invasive species *Aedes aegypti* and *Aedes albopictus* are the most important mosquitoes for Europe and Bulgaria in terms of disease control. The Asian tiger mosquito, *Aedes albopictus*, firstly appeared in Albania (1979), and then in the EU countries (from 1990 to 2016), including Bulgaria (2011). This species transmits viruses of yellow fever, dengue, chikungunya, Usutu, and Zika. On the other hand, the yellow fever mosquito, *Aedes aegypti*, has been present historically in Europe. It transmits the viruses of yellow fever, dengue, chikungunya, Zika, Venezuelan equine encephalitis, and West Nile fever (WNV), the last agent (WNV) being an enveloped ssRNA flavivirus. The WNV infections in EU increased between 2011 and 2016.

In this study, we present the distribution of both species across Europe and the spreading of the diseases transmitted by them. The strategies of controlling the vectors, including the reduction and replacement of mosquito populations, as well as some new genetic-based strategies for preventing transmitted arbovirus infections, are also described here.

The strategies of controlling *Aedes aegypti* are based on the strong urban preference in this species and its ecology. *Aedes albopictus* is difficult to be controlled due to its adaptation, close contacts, and reproductive biology. There is no vaccines or prophylaxis against the most of the transmitted diseases. The prevention is to avoid biting by using insect repellents, eliminating the water pools and laid eggs, and applying insecticides. Some recent tools include the introduction of predators into the habitats of the larvae, irradiated or genetically-modified sterile male mosquitoes, or bacteria of the genus *Wolbachia* to inhibit the virus replication.

The risk management of the further invasions is important for preventing vector-borne diseases. Control of populations is needed because of the mosquito expansion in coastal regions and lowland rivers to the north as a result of globalisation and climate change. The European Centre for Disease Prevention and Control (ECDC) and the European Food Safety Authority (EFSA) fund European-wide monitoring and mapping activities for invasive mosquito species and potential mosquito vectors.

Key words: Invasive mosquitoes, disease-transmission, risk management, viral vector, prevention.

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