



Annotation of the materials under Art. 65 of PRASPU

of chief assistant professor Vesela Slavcheva Yancheva, PhD

**Department of "Ecology and environmental conservation",
Faculty of Biology,
University of Plovdiv "Paisii Hilendarski"**

for her participation in a contest for the occupation of the academic position
"Associate professor", announced in the State Gazette, Issue 32 from 9.04.2024

Higher education field:

4. Natural sciences, mathematics and informatics

Professional field:

4.3. Biological sciences

Scientific specialty:

Ecology and ecosystem conservation

**Compliance with the conditions for the occupation of the academic
position "associate professor" under Art. 65 of the Regulations for the**

Development of the Academic Staff of Plovdiv University "Paisii Hilendarski"

Since 2014, I have been an assistant in the Department of Ecology and environmental conservation at the Faculty of Biology of Plovdiv University. I obtained my PhD degree in May 2014, and from November 2014 until now I have been working in the same department.

In regards with my participation in the contest for the academic position of "associate professor" in the field of higher education 4. Natural sciences, mathematics and informatics, professional direction 4.3. Biological Sciences (Ecology and ecosystem conservation), announced in the State Gazette no. 32 of 04/09/2024, I present a total of 47 scientific works that have not been submitted in the procedures for acquiring my PhD degree

In accordance with the minimum national requirements of the ZRASRB and the Regulations for the implementation of the ZRASRB, the attached scientific works are classified as follows:

- Scientific papers for indicator B4 – **7 (Q2 - 2 papers; Q3 – 4 papers; Q4 - 1 paper).**
- Scientific papers for indicator G7 – **38 (Q1- 3 papers; Q2- 4 papers; Q3 – 5 papers; Q4 – 26 papers).**
- Textbooks – **2.**
- Study guides – **2.**

The scientific works are published in English, with the exception of 2 textbooks and 2 study guides, which are published in Bulgarian.

All scientific works are published in co-authorship, and in **18** of them I am the first author – **in 2 papers according to indicator B and in 16 papers according to indicator G.**

Total number of citations in world databases (Scopus) – **323 citations.**

Total number of citations in secondary databases (outside Scopus / Web of Science) – **61 citations.**

Abstract annotation of scientific papers of

**Chief assistant professor Vesela Slavcheva Yancheva, PhD to
indicator B4
in accordance with the minimum national requirements of the
ZRASRB and the Regulations for the implementation of the ZRASRB**

Indicator B.4. - Scientific publications that are referenced and indexed in world-famous databases with scientific information, other than those presented for the scientific-educational degree "PhD" - 11, of which 7 give points.

1. Petrova S., Nikolov B., Yancheva V., Velcheva I. 2011. Biotesting of contaminated waters from Topolnitsa River Basin. - Proceeding of the 50th Anniversary Conference "Biological Sciences for Better Future", University of Plovdiv "Paisii Hilendarski", 273-282. 0 т.

ABSTRACT: Plants have the tendency to absorb toxic and non-toxic elements from the soil and water and accumulate them into their tissues and organs, where they impact directly or indirectly on the growth and metabolism. A bio-test was conducted for determining the influence of some heavy metals in the waters from the catchment of Topolnitsa River on the seed germination and growth of selected plants species. A certain negative influence was registered on the studied physiological processes.

2. Yancheva V.*, Petrova S., Velcheva I., Georgieva E. 2011. A review of ecological status of Topolnitsa River catchment area and Topolnitsa Dam. - Proceeding of the 50th Anniversary Conference "Biological Sciences for Better Future", University of Plovdiv "Paisii Hilendarski", 267-280. 0 т.

ABSTRACT: The region (air, soils and waters) where the Topolnitsa River and the Topolnitsa Dam are located has been contaminated for many years. The main sources of contamination are the copper mines, metallurgy plants, non-ferrous smelters and mine tailings that have been left after the metals of interest such as: lead, zinc, copper, silver, gold and others have been extracted from the mineral rocks that contained them. The water of the river and the dam, which has been polluted for several decades with heavy metals, is used for drinking, watering agricultural lands and fishing. However, the data on the levels of pollution of the environment and the effects of these metals is very old or limited. Therefore, it is crucial that a full investigation and monitoring programs are carried out.

3. Stoyanova S., Georgieva E., Velcheva I., Yancheva V. 2012. Effects of the insecticide "Actara 25 WG" on the glycconeogenesis in the liver of common carp (*Cyprinus carpio*

L.). - Journal of Bioscience and Biotechnology, 1(3): 249-254. eISSN: 1314-6246, indexed in Web of Science **OT**

ABSTRACT: The main goal of the present work is to study the effects of the new neonicotinoid insecticide „Actara 25 WG“ on the intensity of expression of glycogen in the liver of common carp (*Cyprinus carpio* L.) by using PAS-reaction on cryosections. Common carp is an economically important fish species, which is widely used as a bioindicator for the health of freshwater basins since it could also survive at very contaminated sites. We have used 6.6 mg/L, 10 mg/L and 20 mg/L of the test chemical under laboratory conditions. The results demonstrated that the intensity of staining of the PAS-reaction is directly proportional to the increasing concentration of the insecticide. In addition, this indicates that the amount of glycogen in hepatocytes also increased. Conglomerates of accumulated glycogen in certain hepatocytes were found at the highest concentration of the insecticide. Therefore, we consider that under the influence of „Actara 25 WG“ the process of glycogenesis in the liver of the studied fish accelerates.

4. Georgieva E., Atanasova P., Velcheva I., Stoyanova S., Yancheva V.* 2013. Histochemical effects of “Verita WG” on glycogen and lipid storage in common carp (*Cyprinus carpio* L.) liver. - *Ecologia Balkanica, 5(2): 91-97. eISSN: 1313-9940, indexed in Web of Science* **OT**

ABSTRACT: We aimed in the present work is to study the effects of fosetyl-Al and fenamidone based fungicide (“Verita WG”) on glycogen storage and expression of lipid droplets in common carp (*Cyprinus carpio*, L.) liver. Concentrations of the test chemical were 30 mg/L, 38 mg/L and 50 mg/L under laboratory conditions. We used PAS-reaction for detection of glycogen storage and Sudan III staining for detection of lipid droplets in common carp hepatocytes. Hence, we found that the amount of glycogen and the fat storage in the liver increased proportionally with the increased fungicide concentrations. We also found conglomerates of accumulated glycogen in certain hepatocytes at all used concentrations. Overall, the results demonstrated enhanced glycogenesis and fat accumulation in the common carp liver, exposed to the test chemical.

5. Stoyanova S., Yancheva V.*, Velcheva I., Atanasova P., Georgieva E. 2014. Hypoglycaemic effects of glyphosate based herbicide on common carp (*Cyprinus carpio*, L.) and bighead carp (*Aristichthys nobilis*, Rich.) liver. - *Proceedings - Seminar of ecology with international participation, dedicated to 70 years USB: 88-89, 24-25 April Sofia, IBER, Bulgaria, ISBN: 979-853-476-132-4* **OT.**

ABSTRACT: In the present work the main objective was to study the impact of a glyphosate based herbicide on glycogen storage in common carp (*C. carpio*) and bighead carp (*A. nobillis*) liver using PAS-reaction on cryosections. We used different concentrations of the test herbicide in laboratory conditions for 96 hours. Results showed glycogen storage depletion in the liver of both fish species with increasing

the herbicide concentration. We observed a clearer tendency towards glycogen depletion in the bighead carp liver which indicated a higher sensitivity to glyphosate.

6. Yancheva V.*, Georgieva E., Velcheva I., Iliev I., Vasileva T., Petrova S., Stoyanova S. 2014. Biomarkers in European perch (*Perca fluviatilis*) liver from a metal-contaminated dam lake. - **Biologia**, 69(11): 1615-1624. eISSN: 1336-9563, Q3, sjr 0.319, 0.82 Impact Factor, indexed in Web of Science and Scopus 15 т.

ABSTRACT: The present study was carried out in three seasons – spring, summer and autumn in Topolnitsa Dam Lake (Bulgaria) which has been subjected to continuous contamination with trace metals due to copper extraction in the area. We investigated the trace metal levels in surface water and liver samples of European perch (*Perca fluviatilis* L.). We also linked the metal levels we determined with the various histological and biochemical changes which we observed. Lesions in the liver parenchyma were found to be degenerative and necrotic, as well as, they were presented as hyperemia which consequently leads to disturbances in the hepatic blood circulation. Activities of the hepatic enzymes lactate dehydrogenase (LDH), alanine aminotransferase (ALAT) and aspartate aminotransferase (ASAT) were found to be significantly elevated, particularly in summer. Therefore, based on our results we could recommend that the investigated tissue and cell alterations may be successfully applied as reliable biomarkers for monitoring polluted with a mixture of trace metals freshwater ecosystems.

7. Yancheva V.*, Stoyanova S., Velcheva I., Petrova S., Georgieva E. 2014. Metal bioaccumulation in common carp and rudd from the Topolnitsa reservoir, Bulgaria. - **Archives of Industrial Hygiene and Toxicology**, 65(1): 57-66. eISSN: 18486312, Q3, sjr 0.354, 1.14 Impact Factor <https://doi:10.2478/10004-1254-65-2014-2451>, indexed in Web of Science and Scopus 15 т.

ABSTRACT: Concentrations of arsenic (As), cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb), and zinc (Zn) were determined in water samples and five fish organs (gills, liver, kidney, spleen, and muscle) of common carp (*Cyprinus carpio* L.) and common rudd (*Scardinius erythrophthalmus* L.) from the Topolnitsa reservoir (Bulgaria) in three seasons (spring, summer, and autumn). This water ecosystem is located in a copper mining and metallurgical region. Water metal concentrations were significantly higher in the summer than in the spring ($p < 0.05$). Moreover, As, Cd, Cu, and Zn concentrations were higher than the national limits. Qualitative factors “element” and “fish organ” had a stronger influence on metal bioaccumulation than the factors “season” and “fish species”. In fish, the highest metal levels were detected in the liver, spleen, kidney and gills, and the lowest in the dorsal muscle. Tissue levels were higher in the summer, but in general they were similar between the two Cyprinid fish. Fish muscles had the lowest metal levels at all times, but As and Pb exceeded the national and international standards. Therefore, we would not recommend fish

consumption from Topolnitsa, as continuous metal contamination of the reservoir may seem to present human health risk.

8. **Georgieva E., Stoyanova S., Velcheva I., Yancheva V*.** 2014. Histopathological alterations in common carp (*Cyprinus carpio* L.) gills caused by thiamethoxam. - **Brazilian Archives of Biology and Technology**, 57(6): 991-996. eISSN: 1678-4324, Q2, sjr 0.26, 0.74 Impact Factor <https://dx.doi.org/10.1590/S1516-8913201402582>, indexed in Web of Science and Scopus **20 т.**

ABSTRACT: This work aimed to study the effect of new neonicotinoid thiamethoxam on the histological structure of common carp (*Cyprinus carpio*, L.) gills. Three experimental groups of fish were treated with 6.6, 10 and 20 mg/l thiamethoxam in laboratory conditions. Results showed different histological changes in the gill epithelium, which included lamellar lifting, edema, proliferation of the glandular cells and epithelium, covering the gill filament, fusion and degenerative alterations. The blood circulatory system showed mainly vasodilatation. All thiamethoxam concentrations activated compensatory-adaptive mechanisms, which caused pathological changes in the gills. Moreover, there was a tendency towards the enhancement of the gill histological changes, whose degree of expression was proportional to the increasing thiamethoxam concentrations.

9. **Georgieva E., Stoyanova S., Velcheva I., Vasileva T., Bivolarski V., Iliev I., Yancheva V.*** 2014. Metal effects on histological and biochemical parameters of common rudd (*Scardinius erythrophthalmus* L.). - **Archives of Polish Fisheries**, 22: 197-206. eISSN: 20836139, Q4, sjr 0.218, <https://doi.org/10.2478/aopf-2014-002>, indexed Web of Science and Scopus **12 т.**

ABSTRACT: The present study aimed to evaluate the current contamination status of Topolnitsa Reservoir, which is located in a region with intensive copper mining. The reservoir has been continually contaminated with metals over the last few decades. As, Cd, Cu, Ni, Pb, and Zn concentrations were measured in surface water samples and in the liver of common rudd, *Scardinius erythrophthalmus* (L.), in three different seasons: spring, summer, and autumn. The morphological structure of the fish liver was examined and the hepatic LDH, ALAT, and ASAT activities were measured. In general, metal concentrations in the water varied, but As and Cu were present in all three seasons at levels higher than the maximum permissible levels set by law. The metal concentrations in the fish liver were significantly higher than in the water. Histological alterations were classified as degenerative changes (granular, vacuolar, hydropic, and fatty degeneration), necrotic changes (necrobiosis) – karyopyknosis, karyorehsis, and karyolyzis, and necrosis); and changes in blood vessels (hyperemia in sinusoids and major blood vessels). Higher LDH, ALAT, and ASAT activities in fish livers were measured in comparison to reference fish. In addition, the ALAT activity in the livers of *S. erythrophthalmus* from Topolnitsa Reservoir was significantly higher in the summer. Overall, it can be concluded that the metal-contaminated

waters of Topolnitsa Reservoir lead to negative changes in the common rudd tissues at the cellular level including impaired structure and enhanced enzymatic activity in the fish liver.

10. Georgieva E., Yancheva V.*, Velcheva I., Becheva M., Stoyanova S. 2015. Histological alterations under metal exposure in gills of European perch (*Perca fluviatilis* L.) from Topolnitsa Reservoir (Bulgaria). - **Archives of Biological Sciences**, 67(2): 729-737. eISSN: 1821-4339, Q2, sjr 0.238, 0.51 Impact Factor, <https://doi.org/10.2298/ABS141020034G>, indexed in Web of Science and Scopus 20 T.

ABSTRACT: Topolnitsa Reservoir is located in a region of Bulgaria rich in copper mines where intensive mining has been ongoing for several decades. General data on the ecological status of the reservoir and the effects of metal on fish is relatively scarce. The first aim of the study was to measure the concentrations of six metals (As, Cd, Cu, Ni, Pb and Zn) in water samples and in the gills of European perch (*Perca fluviatilis* Linnaeus, 1785.). The second objective was to examine gill structure and determine the severity of histological alteration as a result of metal exposure. Surface water and fish gill samples were collected in spring, summer and autumn in 2012 and metal and histological analyses were performed. Metal concentrations in the water samples varied, but only Cu concentrations were determined in all three seasons and they were higher than the maximum permissible levels. The concentrations of metals in the gills were significantly higher ($P < 0.05$) than in the water. Examination of gill structure revealed the presence of proliferative and degenerative changes, as well as changes in the blood vessels. Histological lesions were similar in their severity in all three seasons. This study provides the first information about metal effects on the morphology of European perch gills from Topolnitsa Reservoir. It can be concluded that the metal contamination of the Topolnitsa Reservoir and fish is chronic and that it can negatively affect the structure and function of fish gills. As metals display a tendency to accumulate in fish gills, their effects are expected to become more severe with time, as they affect gill functions.

11. Stoyanova S., Yancheva V.*, Velcheva I., Uchikova E., Georgieva E. 2015. Histological alterations in common carp (*Cyprinus carpio* Linnaeus, 1758) gills as potential biomarkers for fungicide contamination. - **Brazilian Archives of Biology and Technology**, 58(5): 757-764. eISSN: 1678-4324, Q2, sjr 0.248, 0.74 Impact Factor <http://dx.doi.org/10.1590/S1516-89132015050151>, indexed in Web of Science and Scopus 20 T.

ABSTRACT: The present study aimed to investigate the histological alterations in common carp gills caused by a fosetyl-Al and fenamidone based fungicide tested in laboratory conditions at 30, 38 and 50 mg/L concentration. In general, all the tested concentrations activated compensatory-adaptive mechanisms, which caused pathological changes in the fish gills. Results showed different histological alterations in the gill structure,

which included lamellar lifting, edema, proliferation of the glandular cells and epithelium, covering the gill filament, fusion and degenerative alterations. Blood circulatory system showed vasodilatation of the secondary lamellae and aneurysms. Overall, there was enhancement of the gill histological changes, which was dose-dependent, i.e., proportional to the increasing fungicide concentrations. Thus, based on the results, it was concluded that the histological alterations in common carp gills could be applied as possible biomarkers in risk assessment and monitoring programs for pesticide contamination of aquatic ecosystems.

12. Stoyanova S., Yancheva V.*, Iliev I., Vasileva T., Bivolarski V., Velcheva I., Georgieva E. 2015. Glyphosate induces morphological and enzymatic changes in common carp (*Cyprinus carpio* L.) liver. - **Bulgarian Journal of Agricultural Science**, 21(2): 409-412. eISSN 2534-983X, Q3, sjr 0.229, indexed in Web of Science and Scopus **15 r**.

ABSTRACT: The main aim of the present study was to investigate the effects of glyphosate based herbicide on histological and biochemical parameters of common carp (*Cyprinus carpio* L.) liver. We used 20 mg/l, 40 mg/l and 72 mg/l of the test chemical under laboratory conditions. Histological lesions which we observed in the liver parenchyma were degenerative and necrotic. Degenerative alterations were as follows: granular, balloon and fatty degeneration. Necrotic alterations in the fish liver were associated with presence of karyopyknosis and karyolysis, respectively. Histological alterations in the liver blood vessels were associated with lymphocyte proliferation and hyperemia. In addition, the degree of histopathological alterations in the liver was increased proportionally to the increasing glyphosate concentrations. We also measured the activity of the hepatic enzymes lactate dehydrogenase (LDH), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT). We determined that the enzymatic activity of LDH in the exposed fish liver was significantly increased compared to the control group ($P < 0.05$). Moreover, the enzymatic activity of ASAT and ALAT in the exposed fish liver was decreased compared to the control.

**Abstract annotation of scientific papers of
Chief assistant professor Vesela Slavcheva Yancheva, PhD to
indicator G7
in accordance with the minimum national requirements of the
ZRASRB and the Regulations for the implementation of the ZRASRB**

Indicator G - Scientific publication that are referenced and indexed in world-renowned databases of scientific information.

Indicator G.7 - Scientific publication that are referenced and indexed in world-famous databases with scientific information other than those presented for the scientific-educational degree "PhD" - 58, of which 38 give points.

1. Yancheva V.*, Velcheva I., Stoyanova S., Georgieva E. 2015. Fish in ecotoxicological studies. - *Ecologia Balkanica*, 7(1): 149-169. eISSN: 1313-9940, indexed in Web of Science **0 T**.

ABSTRACT: Water contamination (heavy metals, pesticides, POPs, etc.) is a serious environmental issue which has been raising lots of attention in the last decades because it can destroy aquatic ecosystems and hence, reduce biodiversity. In the field of ecotoxicology it is of main interest to investigate what the effects of organic and inorganic toxicants on different biological organization (cell, tissue, organism, population) are. Thus, many authors use different test organisms and particularly, fish. In the current study we aimed to present collected data from the last years which describe why fish is an appropriate species in terms of ecotoxicological research.

2. Stoyanova S., Yancheva V.*, Velcheva I., Georgieva E. 2015. Thiamethoxam causes histochemical changes in the liver of *Aristichthys nobilis* Rich., 1845. - *Journal of Bioscience and Biotechnology*, 4(3): 321-325. eISSN: 1314-6246, indexed in Web of Science **0 T**.

ABSTRACT: In the present study, we aimed to investigate the effects of the neonicotinoid insecticide thiamethoxam on the hepatic glycogen in bighead carp (*Aristichthys. nobilis* Rich.). Fish were exposed to 6.6 mg/L, 10 mg/L and 20 mg/L of the insecticide under laboratory conditions for 96 hours. The PAS-reaction was applied to liver cryostat sections in order to indicate the amount of glycogen. The results showed that the hepatic glycogen amount increased with increasing the insecticide concentrations. On the other hand, we observed glycogen conglomerates in certain hepatocytes. Hence, our results demonstrated an enhanced process of glycogenesis in the fish liver under the influence of thiamethoxam.

3. Todorova K., Velcheva I., Yancheva V., Stoyanova S., Petrova S., Georgieva E. 2015. Effects of nickel and its combination with other heavy metals (Cd, Pb, Zn) on common carp (*Cyprinus carpio* Linnaeus, 1785). - *Trakia Journal of Sciences*, 13, Supplement 2: 324-328. eISSN: 1313-3551, indexed in Web of Science **0 T**.

ABSTRACT: We aimed to study *ex-situ* the effects of acute toxicity test with Ni²⁺, Ni+Cd, Ni+Pb and Ni+Zn on behavior, survival and oxygen consumption of common carp, *Cyprinus carpio* L. Behavioral effects were more pronounced in fish exposed to 0.2 mg/l Ni²⁺, 0.3 mg/l Ni²⁺ and 0.45 mg/l Ni²⁺. Common stress reactions, such as anxiety, jumps and quick movements, and also accelerated movements of the fish gill covers were observed. Fish behavior from the lower Ni²⁺ concentrations (0.05 and 0.1 mg/l Ni²⁺) and from the test combinations of Ni+Cd, Ni+Pb and Ni+Zn was quite different. In general, during the first hours of the experiment the fish were anxious, but after 48 hours they started to be lethargic,

which was expressed in their slow movements. Fish survival was 90% under intoxication with 0.2 mg/l Ni²⁺ and combination of Ni+Pb. In the rest of the tested heavy metal concentrations it was 100%. Data on the respiration intensity rate and oxygen consumption of fish exposed to 0.2 mg/l Ni²⁺, 0.3 mg/l Ni²⁺, Ni+Pb and Ni+Cd were lower in comparison with the control group. This result indicated that the Ni²⁺ ions impacted the fish respiratory system. Depending on their toxic effect the descending row of the studied heavy metals could be presented as follows: Ni²⁺ > Ni+Pb > Ni+Cd > Ni+Zn. Overall, such experiments could be successfully applied in environmental monitoring and risk assessment programs for metal-contaminated aquatic ecosystems and toxic effects on fish.

4. **Georgiev D., Petrova S., Gecheva G., Velcheva I., Tsekov A., Yancheva V., Nikolov B., Stoyanova S., Valcheva E., Mollov I.** 2015. Freshwater habitats in Plovdiv town and its surroundings and their importance for the biodiversity. - **Journal of Bioscience and Biotechnology, 4(2): 139-148.** eISSN: 1314-6246, indexed in Web of Science **0 т.**

ABSTRACT: The current synopsis reviews the types of aquatic habitats, that are located in the city of Plovdiv and analyses their importance for the biodiversity. Studies of the biodiversity in urban landscapes are of particular importance because they are still scarce. Several plant and animal groups are studied in the city of Plovdiv – mosses, mollusks, fish, amphibians, reptiles, birds and mammals. Their distribution among habitats is presented, as well as specific threats and conservation problems.

5. **Yancheva V.*, Velcheva I., Stoyanova S., Georgieva E.** 2016. Histological biomarkers in fish as a tool in ecological risk assessment and monitoring programs: a review. - **Applied Ecology and Environmental Research, 14(1): 47-75.** eISSN:1785-0037, **Q4, sjr 0.301, 0.34 Impact Factor** http://dx.doi.org/10.15666/aer/1401_047075, indexed in Web of Science and Scopus **12 т.**

ABSTRACT: Water contamination, both in freshwater and marine ecosystems, has been a serious environmental problem all over the world in the last few decades. One of the most common anthropogenic pollutants, which enter the water bodies are metals and metalloids with no biological functions (As, Cd, Hg, Ni and Pb), pesticides and other persistent organic pollutants such as PAHs, PCBs, tributyl tins, dioxins, etc. Most of these pollutants tend to accumulate in biota, biomagnify in the food chains and they are also difficult to break down to less harmful substances. In order to better understand the negative effects on living organisms, and particularly fish, biomarkers at different levels (cell, tissue, organism and population) are applied. In addition, the biomarkers at tissue level such as histological alterations in different fish organs give valuable information about the xenobiotic impact. Thus, they are recommended as useful biomarkers in eco-toxicological research, risk assessment and monitoring programs. In the present paper we aimed to review the use of histological alterations in fish organs such as gills, liver and kidney in ecotoxicological studies, based on collected scientific data from the late 1960's until today.

6. Yancheva V.*, Velcheva I., Stoyanova S., Iliev I., Vasileva T., Bivolarski V., Uchikova E., Georgieva E. 2016. Toxicity of two organophosphorous pesticides on bighead carp (*Aristichthys nobilis* Richardson, 1845) liver. - **Applied Ecology and Environmental Research**, 14(1): 397-410. eISSN:1785-0037, Q3, sjr 0.301, 0.34 Impact Factor http://dx.doi.org/10.15666/aeer/1401_397410, indexed in Web of Science and Scopus 15 r.

ABSTRACT: In the present work two different pesticides, a herbicide and a fungicide were used in order to study their toxic effects on bighead carp (*Aristichthys nobilis* Rich.). We investigated the fish liver as a main detoxification organ and observed its morphological structure. In addition, we also measured the hepatic enzymatic activity of LDH, ALAT and ASAT. The histological lesions were degenerative and necrotic changes, as well as changes in the circulatory system. The degenerative changes included granular, balloon, fatty and hyaline degeneration. The necrotic changes included necrobiosis and necrosis, and the changes in the circulatory system – hyperemia and lymphocyte proliferation, respectively. The levels of LDH, ALAT and ASAT were altered compared to the control. Thus, we can conclude that both selected pesticides have a negative impact on the fish liver function. However, the fungicide exposure led to more pronounced histological alterations.

7. Yancheva V.*, Stoyanova S., Velcheva I., Georgieva E. 2016. Assessment of gill histological responses in common carp (*Cyprinus carpio* L.) and common rudd (*Scardinius erythrophthalmus* L.) from Topolnitsa reservoir, Bulgaria. - **Acta Zoologica Bulgarica**, 68(1): 103-109. eISSN: 2603-3798, Q3, sjr 0.307, 0.48 Impact Factor, indexed in Web of Science and Scopus 15 r.

ABSTRACT: Concentrations of six metals (As, Cd, Cu, Ni, Pb and Zn) were measured in surface waters of Topolnitsa Reservoir, Bulgaria, located in a region with intensive copper mining. The process of metal bioaccumulation in gills of two cyprinid fish species: common carp (*Cyprinus carpio* L.) and common rudd (*Scardinius erythrophthalmus* L.), was studied in spring, summer and autumn. Higher metal concentrations in both water and fish gill samples in summer were detected. Furthermore, histological alterations in the gill surface tissues of both fish species and the degree of expression of lesions were determined in the three seasons. Mostly proliferative and degenerative changes in gill epithelium were observed. Changes in the blood circulatory system were presented as vasodilatation in the central venous sinus and secondary lamellae, as well as aneurysms. Overall, the extent and severity of lesions were more expressed in gills of the common carp gills than of in the common rudd. This is likely because the carp is a benthic feeder and more often has contacted with the sediments where the metal concentrations were times higher than in the water. In addition, the histological alterations were more severe in summer in both fish species, which could be linked to the higher concentrations of metals in the water and gills in this season.

8. Yancheva V.*, Mollov I., Velcheva I., Georgieva E., Stoyanova S. 2016. Heavy metal effects on the lysosomal membrane stability and respiratory rate in Chinese Pond mussel (*Sinanodonta woodiana*) under *ex situ* exposure: Preliminary data. - **Biharean Biologist**, 10(1): 55-57. eISSN: 2065-1155, Q3, sjr 0.164, indexed in Web of Science 15 T.

ABSTRACT: The Chinese pond mussel (*Sinanodonta woodiana*) is a unionid mussel, which is known to accumulate heavy metals, making it useful for biomonitoring. The current preliminary research aimed to study the lysosomal membrane stability in hemocytes of *Sinanodonta woodiana* by applying the neutral red retention assay (NRR), as well as changes in the respiratory rate under acute metal exposure. The mussels were treated with different concentrations of Ni and Pb in laboratory conditions for 72 h. After the 72nd h exposure to Ni and Pb the lysosomes retained the dye between 30 to 60 minutes in the mussels exposed to the higher concentrations. The respiratory rate was measured at the 24th and 72nd hour and it increased in a dose-dependent manner. We can conclude that the acute metal exposure, including all metal concentrations below the allowable concentrations, lead to destabilization of the lysosomal membrane stability and changes in the respiratory rate.

9. Stoyanova S., Yancheva V.*, Iliev I., Vasileva T., Bivolarski V., Velcheva I., Georgieva E. 2016. Biochemical, histological and histochemical changes in *Aristichthys nobilis* Rich. liver exposed to thiamethoxam. - **Periodicum Biologorum**, 118(1): 29-36. eISSN: 0031-5362, Q4, sjr 0.119, 0.21 Impact Factor <https://doi.10.18054/pb.2016.118.1.2828>, indexed Web of Science and Scopus 12 T.

ABSTRACT: The aim of the present study was to investigate the effects of the insecticide thiamethoxam on some biochemical, histological and histochemical parameters of bighead carp liver (*Aristichthys nobilis*), which is an economically important fish species for aquaculture. Different increasing concentrations of 6.6 mg l⁻¹, 10 mg l⁻¹ and 20 mg l⁻¹ of the test chemical under laboratory conditions were tested for their toxicity on fish for 96 h. The hepatic activity of the enzymes lactate dehydrogenase (LDH), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) were measured. In addition, the hepatic histological structure was observed for alterations, as well as the lipid content was observed by histochemical staining. It was determined that the enzymatic activity of the exposed fish was increased compared to the control group (p<0.05). Furthermore, the enzymatic activity was increased proportionally to the increasing thiamethoxam concentrations. The histological lesions, which were observed in the liver parenchyma, were degenerative and necrotic. The degenerative alterations were as follows: granular, balloon and fatty degeneration. The necrotic alterations in the fish liver were associated with presence of karyopyknosis, karyorrhexis and karyolysis, respectively. The histological alterations in the liver blood vessels were hyperemia and lymphocyte proliferation. Along with the established histological changes in the liver parenchyma, we found presence of fatty

degeneration in the hepatocytes using Sudan III staining on cryostat sections. Our study shows that there is a relation between the concentration of the insecticide and biochemical changes, as well the severity of expression of the histological and histochemical alterations in the bighead carp liver. Overall, such experiments could be successfully applied in research and monitoring programs to study the effects of pesticides on fish.

10. Yancheva V.*, Mollov I., Velcheva I., Georgieva E., Stoyanova S. 2016. Effects of cadmium (Cd) on the lysosomal membrane stability and respiratory rate of two freshwater mollusks under ex situ exposure: preliminary data. - **South-Western Journal of Horticulture, Biology and Environment**, 7(1): 27-34. eISSN: 2068-7958, Q4, sjr 0.17, indexed in Scopus **12 T**.

ABSTRACT: The aim in the present study was to give some preliminary data on the effects of Cd, which is considered as priority toxic substance in surface waters according to Directive 2008/105/EO (2008) on the lysosomal membrane stability and respiration rate in two invasive and resilient to changes in the surrounding media freshwater mollusks – Chinese pond mussel (*Synanodonta woodiana*) and zebra mussel (*Dreissena polymorpha*) in laboratory conditions for 72 hours. Significant decrease in the lysosomal destabilization indices with lower retention time and increase in the respiration rate index were observed in the treated with Cd mussels, compared with the control. In general, the tested species proved to be sensitive to Cd exposure in terms of the two studied biomarkers.

11. Yancheva V.*, Mollov I., Velcheva I., Stoyanova S., Georgieva E. 2016. Cadmium (Cd) affects the gill structure and respiration rate of common carp (*Cyprinus carpio* L.). - **Zoonotes**, 97: 1-4. eISSN: 1313-9916, indexed in Web of Science **0 T**.

ABSTRACT: The main purpose of the present study was to provide some preliminary data on the effects of Cd, which is considered as priority toxic substance in surface waters according to Directive 2008/105/EO on the gill structure and respiration rate of common carp (*Cyprinus carpio* L.) under ex situ conditions. We observed significant histological changes, which were grouped as proliferative and degenerative ones, as well as increase in the respiration rate index in the treated with Cd fish, compared with the control. In general, the tested fish species proved to be sensitive to Cd exposure in terms of the studied parameters.

12. Georgieva E., Yancheva V.*, Velcheva I., Iliev I., Vasileva T., Bivolarski V., Becheva M., Stoyanova S. 2016. Histological and biochemical changes in common carp (*Cyprinus carpio* L.) liver under metal exposure. - **North-Western Journal of Zoology**, 12(2): 261-270. eISSN: 1843-5629, Q2, sjr 0.412, 0.69 Impact Factor, indexed in Web of Science and Scopus **20 T**.

ABSTRACT: In the present study our major aim was to evaluate the up-to-date contamination status of the Topolnitsa reservoir. It is located in a region with intensive

copper mining, which has been constantly contaminated with metals in the last few decades. Thus, we measured As, Cd, Cu, Ni, Pb, and Zn concentrations in surface water samples, as well as, in liver of common carp in three different seasons – spring, summer, and autumn 2013. Furthermore, we also studied the carp response to the water quality by observing its hepatic morphological structure and measuring some biochemical parameters (LDH, ALAT, and ASAT activity). In general, metal concentrations in the water varied, but As, Cu and Ni were present in all the three seasons. Cu concentrations were above the maximum permissible levels set by law. Metal concentrations in the liver were significantly higher than in the water ($p < 0.05$). In addition, we observed severe hepatic histological alterations, which included degenerative changes – granular degeneration, vacuolar degeneration, hydropic degeneration, and fatty degeneration; necrotic changes (necrobiosis) – karyopyknosis, karyorrhexis and karyolysis, and necrosis; and changes in the blood vessels – hyperemia in sinusoids and major blood vessels. We found that LDH activity was inhibited in the common carp liver from the Topolnitsa reservoir compared to the reference fish, but ALAT and ASAT activity was significantly increased compared to the reference. Based on our findings we consider that the metal-contaminated waters of the Topolnitsa reservoir lead to negative changes at tissue and cellular level in the fish organism, which include altered structure and impaired functions of the liver

13. Yancheva V.*, Mollov I., Georgieva E., Stoyanova S., Tsvetanova V., Velcheva I. 2017. *Ex situ* effects of chlorpyrifos on the lysosomal membrane stability and respiration rate in Zebra mussel (*Dreissena polymorpha* Pallas, 1771). - **Acta Zoologica Bulgarica, Supplement 8: 85-90.** eISSN: 2603-3798, Q4, sjr 0.217, 0.53 Impact Factor, indexed in Web of Science and Scopus **12 t.**

ABSTRACT: The present study examines the lysosomal membrane stability in haemocytes of Zebra mussel (*Dreissena polymorpha*) by applying the neutral red retention assay (NRR) as well as the respiration rate and survival under acute pesticide exposure. The mussels were treated with different concentrations of chlorpyrifos in laboratory conditions for a total acute exposure period of 72 hours. The pesticide concentrations were prepared as 50 and 30% of the maximum permissible level (100%) set by the national and EU legislation. We found that destabilization of the lysosomal membrane stability occurred at all tested concentrations and the respiration rate was time- and dose-dependent. Overall, we consider that the results from such experiments can be successfully applied in risk assessment, monitoring programs and water policy, and the use of pesticides such as chlorpyrifos should be controlled very cautiously in plant protection and agriculture.

14. Stoyanova S., Velcheva I., Yancheva V.*, Mollov I., Georgieva E. 2017. Biomarkers for *ex situ* Ni and Pb exposure in common carp (*Cyprinus carpio* L.). - **Acta Zoologica Bulgarica, Supplement 8: 163-168.** eISSN: 2603-3798, Q4, sjr 0.217, 0.53 Impact Factor, indexed in Web of Science and Scopus **12 t.**

ABSTRACT: This work aimed to study the effects of heavy metal exposure on the respiration rate and histological structure of common carp (*Cyprinus carpio* L.) gills. Fish were treated with different soluble concentrations of Ni and Pb in laboratory conditions for a total acute period of 72 hours. The metal concentrations were prepared as 75, 50 and 25% of the maximum permissible levels (100%) set by law. The results showed a higher index of respiration rate in the fish from all experimental tanks for both metals, compared to the control in the beginning of the experiment, but there was no pattern of increase or decrease in relation to the metal concentrations. After 72 hours of exposure we observed the same pattern, but in addition the respiration rate of the fish in the tanks treated with Pb showed an increase in a dose-dependent manner. We also observed different histological changes in the gill epithelium, which included proliferative and degenerative changes, as well as changes in the circulatory system. In addition, the degenerative changes were more pronounced in the fish, treated with Pb concentrations, and the blood circulatory system showed mainly vasodilatation, which caused pathological changes in the gills. In sum, we can conclude that Ni and Pb have severe effects on the respiration rate and gill histology of common carp, even at concentrations, which were lower than the allowable ones.

15. Yancheva V.*, Mollov I., Velcheva I., Stoyanova S., Todorova K., Georgieva E. 2017. Lysosomal membrane stability and respiration rate in zebra mussel (*Dreissena polymorpha* Pallas, 1771) as biomarkers for *ex situ* heavy metal exposure. - **Periodicum Biologorum**, 119(4): 229-237. eISSN: 1849-0964, Q4, sjr 0.156, 0.21 Impact Factor <https://doi.10.18054/pb.v119i4.4715>, indexed in Web of Science and Scopus 12 T.

PE3HOME: In the current study we aimed to investigate the lysosomal membrane stability in haemocytes of the invasive mollusk zebra mussel (*Dreissena polymorpha* Pallas, 1771) by applying the neutral red retention assay (NRRRA), as well as changes in the respiration rate and survival under acute heavy metal exposure. The mussels were treated with different decreasing concentrations of nickel (Ni) and lead (Pb) in laboratory conditions for a total acute period of 72 hours. These metals are considered as priority substances in surface waters according to Directive 2013/39/EU of the European parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy. The metal concentrations were prepared as 75, 50 and 25 % of the maximum allowable concentrations (100% MAC) set by law. In sum, after 24 and 72 h we found that the lysosomes in the mussels exposed to all Ni and Pb concentrations, including the ones below the MAC (75 and 50 % from MAC) retained the dye shorter than the accepted minimum of 90 min. In addition, the respiration rate increased in a dose-dependent manner. Overall, we can conclude that the acute metal exposure lead to destabilization of the lysosomal membrane stability and changes in the respiration rate of zebra mussel, therefore altered physiological functions. We consider that such experiments could be successfully applied in risk assessment and monitoring programs on metal-

contaminated aquatic systems, and the obtained results could be used in the field of water policy, respectively.

16. Stoyanova S., Yancheva V.*, Velcheva I., Mollov I., Todorova K., Tomov S., Tsvetanova V., Georgieva E. 2018. Glyphosate-based herbicide alters the histological structure of gills of two economically important cyprinid species (common carp, *Cyprinus carpio* and bighead carp, *Aristichthys nobilis*). - **Applied Ecology and Environmental Research**, 16(3): 2295-2305. eISSN: 1785-0037, Q4, sjr 0.224, 0.34 Impact Factor http://dx.doi.org/10.15666/aeer/1603_22952305, indexed in Web of Science and Scopus 12 T.

ABSTRACT: The present study primarily aims to investigate the histopathological effects which a glyphosate based herbicide could cause on the gills of two economically important Cyprinid fish (common carp and bighead carp), and to determine which species is more sensitive in terms of glyphosate contamination. The pesticide concentrations tested in laboratory conditions were decreasing (72 mg/l, 40 mg/l and 20 mg/l) and prepared by dilution of the stock solution of the commercial product used in plant protection. The experiment was short-term of 96 h. In general, the herbicide caused different pathological alterations in the fish gills, such as lamellar lifting, edema, proliferation of the glandular cells and epithelium, covering the gill filament, fusion, vasodilatation of the secondary lamellae and aneurysms. In addition, we observed a tendency towards the enhancement of the gill histological changes which degree of expression was proportional to the increasing pesticide concentrations. However, bighead carp was more sensitive compared to common carp when it comes to the tested chemical and the alterations in the gill histological structure were more pronounced.

17. Yancheva V.*, Stoyanova S., Georgieva E., Velcheva I. 2018. Mussels in ecotoxicological studies – are they better than fish?. - **Ecologia Balkanica**, 10(1): 57-84. eISSN: 1314-0213, Q4, sjr 0.103, indexed in Web of Science and Scopus 12 T.

ABSTRACT: EU Member states are required to apply the EU Water Framework and its Daughter Directives in order to achieve Good Environmental Status (GES) for all 11 qualitative descriptors by 2015 in all water bodies for a list of priority and specific pollutants. Therefore, environmental indicators and biological-effect techniques have to be carefully selected for the management of chemicals in the aquatic environment and for developing an integrated framework. The most commonly applied biological-effect tools are measures of the biochemical and physiological state of selected organisms, such as mussels or fish. The present article provides basic information on the EU Water Directive, the essence of biomarkers, and outlines why mussels may be the better choice of indicators in toxicological research and monitoring programs in order to study the impact of contaminants in water ecosystems.

18. Yancheva V.*, Georgieva E., Stoyanova S., Tsvetanova V., Todorova K., Mollov I., Velcheva I. 2018. Short and long-term toxicity of cadmium (Cd) and polyaromatic hydrocarbons (PAHs) on zebra mussel (*Dreissena polymorpha* Pallas, 1771). - *Acta Zoologica Bulgarica*, 70(4): 557-564. eISSN: 2603-3798, Q4, sjr 0.19, 0.53 Impact Factor, indexed in Web of Science and Scopus 12 т.

ABSTRACT: This study was designed to examine the possible negative effects, which cadmium (Cd) and polyaromatic hydrocarbons (PAHs) could have on the lysosomal membrane stability in haemocytes of the invasive mollusk zebra mussel (*Dreissena polymorpha*) by applying the neutral red retention assay (NRRRA). The mussels were exposed to different concentrations of Cd and PAHs in laboratory conditions for 96 hours (acute exposure) and 31 days (chronic exposure). These are considered as priority substances in surface waters according to Directive 2008/105/EC. We found lysosomal membrane destabilisation in all mussels treated with Cd and PAHs, including concentrations, which were lower than the allowable ones. In addition, we determined a trend of lower retention time in the mussels treated with Cd as compared to the ones treated with PAHs, although these differences were not significant ($p > 0.05$). Our results confirmed that the neutral red retention assay could be used as a cheap, fast and reliable biomarker for Cd and PAHs effects on freshwater mollusks and that zebra mussel could be suggested as a freshwater bioindicator for water contamination. However, further studies are required in order to better understand the negative effects of Cd and PAHs on this bivalve species.

20. Todorova K., Velcheva I., Yancheva V., Stoyanova S., Dimitrova P., Tomov S., Georgieva E. 2019. Interactions of Pb with other heavy metals (Cd, Ni and Zn) and toxic effects on gills histological structure of common carp (*Cyprinus carpio* Linnaeus, 1775). - *Acta Zoologica Bulgarica*, 71(1): 95-102. eISSN: 2603-3798, Q4, sjr 0.19, 0.53 Impact Factor, indexed in Web of Science and Scopus 12 т.

ABSTRACT: We performed a laboratory experiment in order to study the toxic effects of five different concentrations of single lead (Pb) and its interactions with other heavy metals, cadmium (Cd), nickel (Ni) and zinc (Zn), on the gills of common carp (*Cyprinus carpio* Linnaeus, 1775). Cadmium, Ni and Pb are considered as priority polluting substances in surface waters. A short-term experiment (96 h) in laboratory conditions was performed. The fish were treated with decreasing concentrations of single Pb as well as with its combination with Cd, Ni and Zn. Then we examined the fish gill histological changes and the degree of expression of each histological alteration. Several alterations were observed, i.e. lamellar epithelium lifting, edema, proliferation of the stratified epithelium and cartilage tissue, fusion and degeneration in the gill epithelium as well as vasodilatation and aneurysms in the gill blood circulatory system. The alterations were more pronounced for the single Pb-exposed groups than for its combination with the other tested heavy metals. Overall, the study has contributed to clarify the toxicity of single Pb as well as its mixtures (Pb²⁺+Cd²⁺,

Pb²⁺+Ni²⁺ and Ni²⁺+Zn²⁺) and the interactions between the metals on the commercially important freshwater common carp.

19. Yancheva V.*, Georgieva E., Velcheva I., Atanassova P., Stoyanova S. 2019. Histochemical alterations in liver of common carp, *Cyprinus carpio* (Linnaeus, 1785) after glyphosate exposure: Preliminary study. - **Zoonotes**, **1:4**. eISSN: 1313-9916, indexed in Web of Science **0 т.**

ABSTRACT: The main aim of the present study was to compare the toxicological effects of a fosetyl-Al and fenamidone based fungicide and a glyphosate based herbicide on the liver lipid accumulation in bighead carp (*Hypophthalmichthys nobilis* Richardson, 1845) in a short-term laboratory conditions (96 hours). A histochemical method with Sudan III staining was applied. We used 30 mg/L, 38 mg/L and 50 mg/L concentrations fungicide, representing 50, 40, 30 times dilution and 20 mg/L, 40 mg/L and 72 mg/L representing 70, 40, 20 times dilution of the fungicide, respectively. These concentrations were considered as real applicable pesticide concentrations in plant protection practices. Overall, we established a different degree of lipid accumulation in the fish liver. In terms to the histochemical alterations, we found that the fungicide had a more sever effect compared to the herbicide.

22. Stoyanova S., Georgieva E., Velcheva I., Atanassova P., Yancheva V*. 2019. Lipid accumulation in *Cyprinus carpio* (Linnaeus, 1785) liver induced by thiamethoxam. - **Zoonotes**, **1:4**. eISSN: 1313-9916, indexed in Web of Science **0 т.**

ABSTRACT: The aim of the present study is to investigate the effects of a thiamethoxam based insecticide on the expression of lipid droplets in common carp, *Cyprinus carpio* (Linnaeus, 1785) liver. The selected concentrations of the test pesticide were 6.6 mg/L, 10 mg/L and 20 mg/L under laboratory conditions for an acute period of 96 h. The Sudan III staining method was applied for detection of fatty degeneration in the fish hepatocytes. Overall, we found that the fat storage in the liver cells increased proportionally with the increased pesticide concentrations. The results demonstrated fat accumulation in the fish liver which in addition, could be used as an easy to perform and relatively inexpensive biological tool for studying the effects of pesticide contamination on fish.

23. Yancheva V.*, Velcheva I., Georgieva E., Mollov I., Stoyanova S. 2019. Chlorpyrifos induced changes on the physiology of common carp (*Cyprinus carpio* Linnaeus, 1785): a laboratory exposure study. - **Applied Ecology and Environmental Research**, **17(2): 5139-5157**. eISSN: 1785-0037, **Q4**, **sjr 0.229, 0.34 Impact Factor** http://dx.doi.org/10.15666/aeer/1702_51395157, indexed in Web of Science and Scopus **12 т.**

ABSTRACT: The present study was designed to study the effects of the pesticide chlorpyrifos (CPF) on the physiology of the economically important fish species common carp (*Cyprinus carpio* Linnaeus, 1785) by applying a biomarker approach. This pesticide is

considered as a priority substance in surface waters according to Directive 2013/39/EU of the European Parliament and of the Council. The fish were treated with decreasing concentrations of CPF for 72 hours (acute exposure) and the histological structure of gills and respiration rate were examined. In sum, we found pronounced alterations in the gill structure and changes in the respiration rate index, regardless of the applied pesticide concentrations which indicates its negative effects on non-target aquatic species such as common carp. The results from such studies could be incorporated in the legislation to prevent water contamination in areas with intensive agricultural practices by applying biomarkers, and an update could also be initiated on the maximum permissible concentrations of CPF in surface waters.

24. Stoyanova R., Tomov S., Georgieva E., Atanassova P., Dechev I., Yancheva V., Petrova S., Stoyanova S. 2019. Influence of exogenous factors on the maturation levels of spermatozoa chromatin in sub/infertile men treated with nutritional supplement PAPA®. - *Ecologia Balkanica*, **11(1): 179-189**. eISSN: 1314-0213, Q4, sjr 0.134, indexed in Web of Science and Scopus **12 T**.

ABSTRACT: Changes in the hereditary information during the nucleus maturation of the sperm cells can occur under the influence of exogenous or endogenous factors. Exogenous factors could be linked with unfavorable working environment or bad habits. In the recent years nutritional supplements have been used for male infertility treatment. In addition, they can improve the morpho-physiological status of the sperm. The present study aims to investigate the effect of nutritional supplement PAPA on the spermatozoa chromatin maturity level by using an Aniline Blue staining test (aniline blue staining - AB) in sub/infertile men exposed to exogenous factors.. A group of men (n = 88) was examined after their written agreement and a completed questionnaire. The tested group with established diagnoses of asthenoteratozoospermia, oligoasthenoteratozoospermia, asthenoteratozoospermia with hypovolemia, oligoasthenoteratozoospermia with hypovolemia took orally PAPA® supplement for three months. All patients were tested for DNA damage by an AB test twice before and after the treatment. The patients in the tested group were divided based on the type of harmful work environment (I-IV) and harmful habits (smoking I-III). The results showed that after the treatment with a nutritional supplement PAPA®, the levels of condensation or maturity of sperm chromatin increased by 16.11%. In addition, connections between the effect of treatment and the conditions of the harmful working environment, as well as the amount of received tobacco by the smokers were found. A better effect of the treatment in the tested group with the absence of harmful working environment and non-smokers was found. Therefore, the lowest treatment efficacy was found in the patients who are chronically exposed to occupationally harmful environment, associated with increased body and scrotal temperature (seated workers in factories, ect., drivers, welders, bakers, founders, heavy physical labour workers). On the other hand, a negative connection between the smoked cigarettes per day and the effect of

the food supplement in the tested group of men with harmful habits, such as smoking was established.

25. Yancheva V.*, Velcheva I., Georgieva E., Stoyanova S. 2019. Periodic Acid - Schiff (PAS) reaction in fish liver exposed to fungicide contamination: A possible histochemical biomarker. - *Ecologia Balkanica*, **11(1): 1-10**. eISSN: 1314-0213, **Q4, sjr 0.134**, indexed in Web of Science and Scopus **12 т.**

ABSTRACT: The present work aimed to study the negative effects of fungicide contamination on the liver of *Hypophthalmichthys nobilis* (Richardson, 1845) by applying the Periodic acid – Schiff reaction (PAS). The fish were treated with increasing and real applicable pesticide concentrations in agriculture prepared according to the guidelines of the producer for a total acute period of 96 hours. Overall, we found that the intensity of the PAS staining increased proportionally with the increasing of the tested fungicide. Based on the obtained results, we consider that the PAS-staining could be successfully applied as a biomarker in toxicological research. In addition, as fungicide studies are in general less compared to the other pesticide groups, we also consider that these results could be used in future risk assessment and monitoring programs, as well as better agricultural activities.

26. Stoyanova S., Georgieva E., Velcheva I., Yancheva V.* 2019. Histochemical alterations in bighead carp (*Hypophthalmichthys nobilis* Richardson, 1845) liver under two pesticides exposure: A comparative study. - *Ecologia Balkanica*, **11(2): 63-71**. eISSN: 1314-0213, **Q4, sjr 0.134**, indexed in Web of Science and Scopus **12 т.**

ASBTRACT: The main aim of the present study was to compare the toxicological effects of a fosetyl-Al and fenamidone based fungicide and a glyphosate based herbicide on the liver lipid accumulation in bighead carp (*Hypophthalmichthys nobilis* Richardson, 1845) in a short-term laboratory conditions (96 hours). A histochemical method with Sudan III staining was applied. We used 30 mg/L, 38 mg/L and 50 mg/L concentrations fungicide, representing 50, 40, 30 times dilution and 20 mg/L, 40 mg/L and 72 mg/L representing 70, 40, 20 times dilution of the fungicide, respectively. These concentrations were considered as real applicable pesticide concentrations in plant protection practices. Overall, we established a different degree of lipid accumulation in the fish liver. In terms to the histochemical alterations, we found that the fungicide had a more sever effect compared to the herbicide.

27. Yancheva V.*, Velcheva I., Georgieva E., Stoyanova S. 2019. Bioaccumulation of polyaromatic hydrocarbons (PAHs) and cadmium (Cd) and its toxic effects on zebra mussel *Dreissena polymorpha* (Pallas, 1771) (Bivalvia: Dreissenidae). - *Acta Zoologica Bulgarica*, **71(4): 567-574**. eISSN: 2603-3798, **Q4, sjr 0.211, 0.53 Impact Factor**, indexed in Web of Scopus and Scopus **12 т.**

ABSTRACT: The possible negative effects of polyaromatic hydrocarbons (PAHs) and cadmium (Cd) on the lysosomal membrane stability (LMS) in haemocytes of the invasive

mollusc zebra mussel (*Dreissena polymorpha*) were studied by applying the neutral red retention time assay (NRRT). In addition, the process of bioaccumulation of PAHs and Cd in the gills of zebra mussel was examined and the bioaccumulation factor (BFA) was calculated. The mussels were exposed to different concentrations of Cd and PAHs in laboratory conditions for 96 hours (acute exposure) and 31 days (chronic exposure). We found higher toxicant concentrations at the 24th h as well as on the 31st day compared to the other tested time periods. These results were linked with the faster lysosomal membrane destabilisation in all mussels treated with Cd and PAHs in the beginning of the experiment.

28. Stoyanova S., Nyeste K., Georgieva E., Uchikov P., Velcheva I., Yancheva V.* 2020.

Toxicological impact of a neonicotinoid insecticide and an organophosphorus fungicide on bighead carp (*Hypophthalmichthys nobilis* Richardson, 1845) gills: a comparative study. - **North-Western Journal of Zoology**, 16(1): 64-73. eISSN: 1843-5629, Q3, sjr 0.28, 0.69 Impact Factor, indexed in Scopus 15 T.

ABSTRACT: The main aim of the present study was to compare the toxicological effects of a fosetyl-Al and fenamidone based fungicide and a thiamethoxam based insecticide on the gill histological structure of bighead carp (*Hypophthalmichthys nobilis* Richardson, 1845) in a short-term laboratory conditions (96 hours). We used of the insecticide 6.6 mg L⁻¹, 10 mg L⁻¹ and 20 mg L⁻¹ representing 30, 20, 10 times dilution, and of the fungicide – 30 mg L⁻¹, 38 mg L⁻¹ and 50 mg L⁻¹ representing 50, 40, 30 times dilution, respectively. These concentrations were considered as real applicable pesticide concentrations in plant protection practices. Overall, we found pronounced alterations in the gill histological structure such as proliferative and regressive, as well as changes in the circulatory system in the fish treated with both pesticides. The histopathological alterations indicated the negative effects of the applied chemicals on non-target aquatic species such as bighead carp. In addition, we found that, in terms of the histological lesions and tested fish species, the fungicide had more severe effects compared to the insecticide.

29. Yancheva V.*, Georgieva E., Stoyanova S., Velcheva I., Somogyi D., Nyeste K., Laszlo A.

2020. A histopathological study on the Caucasian dwarf goby from an anthropogenically loaded site in Hungary using multiple tissues analyses. - **Acta Zoologica Sweden**, 101(4): 431-446. eISSN: 1463-6395, Q3, sjr 0.414, 1.012 Impact Factor <https://doi.org/10.1111/azo.12310>, indexed in Web of Science and Scopus 15 T.

ABSTRACT: The present study aimed to investigate for the first time the health status of the Caucasian dwarf goby *Knipowitschia caucasica* (Berg, 1916, Teleostei: Gobiidae) from an anthropogenically loaded site in Hungary using histopathological analyses on multiple tissues. For that purpose, fish were collected from the public beach at Tiszafüred near the River Tisza. Gills, liver and kidney were subjected to histopathological analyses, and the results showed different alterations in each organ, which also differed in their extent and

severity. In addition, we also found lesions in the reproductive organs of both, male and female fish which, overall, we hypothesized could be due to untreated municipal wastewaters, most likely contaminated with endocrine-disrupting chemicals. The multi-organ histopathological analyses of Caucasian dwarf gobies revealed different lesions, prevalence and severity in each target organ, as follows: liver>gills>kidney>gonad (testes and ovaries). These histopathological lesions can be assessed as good indicators of contamination by endocrine-disrupting chemicals of freshwater ecosystems.

30. Stoyanova S., Mollov I., Velcheva I., Georgieva E., Yancheva V.* 2020. Cadmium and polyaromatic hydrocarbons exposure changes the condition indices in zebra mussel, *Dreissena polymorpha* (Pallas, 1771): a case study. - **Acta Zoologica Bulgaria, Supplement 15, 141-146.** eISSN: 2603-3798, **Q4, sjr 0.237, 0.53 Impact Factor**, indexed in Web of Science and Scopus **12 T.**

ABSTRACT: Cadmium (Cd) and polyaromatic hydrocarbons (PAHs) are priority pollutants in surface waters according to Directive 2013/39/EC. They are toxic, persistent and tend to accumulate in high concentrations in aquatic organisms. In the present study, zebra mussel *Dreissena polymorpha* was confirmed as a bioindicator for contaminated freshwater ecosystems. We aimed to study the effects of short-term (96 h) and long-term (31 days) exposure to Cd and PAHs on the Condition index (CI) and Soft Tissue Wet Ratio (STWR) in zebra mussel. Overall, we found alterations in both CI and STWR (as compared to the control group) at all tested concentrations, including the one below the allowable concentration according to the EU legislation. These results demonstrated the toxicity of both contaminants. Furthermore, we confirmed that the studied condition indices could be successfully applied as biomarkers as they are fast and low-cost in future monitoring and risk assessment of polluted freshwater ecosystems.

29. Yancheva V.*, Velcheva I., Iliev I., Vasileva T., Bivolarski V., Georgieva E., Stoyanova S. 2020. Histochemical and biochemical alterations in zebra mussel, *Dreissena polymorpha* (Pallas, 1771) after cadmium and polyaromatic hydrocarbons exposure. - **Acta Zoologica Bulgaria, Supplement 15, 155-164.** eISSN: 2603-3798, **Q4, sjr 0.237, 0.53 Impact Factor**, indexed in Web of Science and Scopus **12 T.**

ABSTRACT: The present study was developed to examine the possible harmful effects, which cadmium (Cd) and polyaromatic hydrocarbons (PAHs) could cause to the gills and digestive gland of the zebra mussel *Dreissena polymorpha* (Pallas, 1771). For this purpose, we explored for the first time their histochemical and biochemical alterations by applying the Periodic-Schiff staining method (PAS) and analysing the catalase (CAT) and cholinesterase (ChE) activity. The mussels were exposed to different concentrations of Cd and PAHs in laboratory conditions for 96 hours (acute exposure) and 31 days (chronic exposure). These are considered as priority substances in surface waters according to Directive 2013/39/EU. Moreover, the enzymatic measurements are included as biomarkers

for biota in the EU Water Framework Directive, the Marine Strategy Framework Directive and in the mussel component of the International Council for the Exploration of the Sea/Oslo-Paris convention for the Protection of the Marine Environment of the NorthEast Atlantic (ICES/OSPAR) integrated monitoring framework. Based on our results, we also proposed the PAS reaction as an easy, fast, low-cost and trustworthy biological tool, which could be used for biota in monitoring programs. Overall, we found alterations both in the gill structure and enzymatic activity in the digestive gland at all tested concentrations, including the one below the allowable concentration according to the EU legislation. These results confirmed the toxicity of Cd and PAHs. Furthermore, Cd was more toxic compared to PAHs in terms of the studied parameters.

30. Stoyanova S., Mollov I., Velcheva I., Georgieva E., Yancheva V.* 2020. Cadmium and polyaromatic hydrocarbons exposure changes the condition indices in zebra mussel, *Dreissena polymorpha* (Pallas, 1771): a case study. - **Acta Zoologica Bulgaria, Supplement 15, 141-146.** eISSN: 2603-3798, **Q4, sjr 0.237, 0.53 Impact Factor**, indexed in Web of Science and Scopus **12 T.**

ABSTRACT: Cadmium (Cd) and polyaromatic hydrocarbons (PAHs) are priority pollutants in surface waters according to Directive 2013/39/EC. They are toxic, persistent and tend to accumulate in high concentrations in aquatic organisms. In the present study, zebra mussel *Dreissena polymorpha* was confirmed as a bioindicator for contaminated freshwater ecosystems. We aimed to study the effects of short-term (96 h) and long-term (31 days) exposure to Cd and PAHs on the Condition index (CI) and Soft Tissue Wet Ratio (STWR) in zebra mussel. Overall, we found alterations in both CI and STWR (as compared to the control group) at all tested concentrations, including the one below the allowable concentration according to the EU legislation. These results demonstrated the toxicity of both contaminants. Furthermore, we confirmed that the studied condition indices could be successfully applied as biomarkers as they are fast and low-cost in future monitoring and risk assessment of polluted freshwater ecosystems.

31. Yancheva V.*, Velcheva I., Iliev I., Vasileva T., Bivolarski V., Georgieva E., Stoyanova S. 2020. Histochemical and biochemical alterations in zebra mussel, *Dreissena polymorpha* (Pallas, 1771) after cadmium and polyaromatic hydrocarbons exposure. - **Acta Zoologica Bulgaria, Supplement 15, 155-164.** eISSN: 2603-3798, **Q4, sjr 0.237, 0.53 Impact Factor**, indexed in Web of Science and Scopus **12 T.**

ABSTRACT: The present study was developed to examine the possible harmful effects, which cadmium (Cd) and polyaromatic hydrocarbons (PAHs) could cause to the gills and digestive gland of the zebra mussel *Dreissena polymorpha* (Pallas, 1771). For this purpose, we explored for the first time their histochemical and biochemical alterations by applying the Periodic-Schiff staining method (PAS) and analysing the catalase (CAT) and cholinesterase (ChE) activity. The mussels were exposed to different concentrations of Cd

and PAHs in laboratory conditions for 96 hours (acute exposure) and 31 days (chronic exposure). These are considered as priority substances in surface waters according to Directive 2013/39/EU. Moreover, the enzymatic measurements are included as biomarkers for biota in the EU Water Framework Directive, the Marine Strategy Framework Directive and in the mussel component of the International Council for the Exploration of the Sea/Oslo-Paris convention for the Protection of the Marine Environment of the North-East Atlantic (ICES/OSPAR) integrated monitoring framework. Based on our results, we also proposed the PAS reaction as an easy, fast, low-cost and trustworthy biological tool, which could be used for biota in monitoring programs. Overall, we found alterations both in the gill structure and enzymatic activity in the digestive gland at all tested concentrations, including the one below the allowable concentration according to the EU legislation. These results confirmed the toxicity of Cd and PAHs. Furthermore, Cd was more toxic compared to PAHs in terms of the studied parameters.

32. Stoyanova S., Georgieva E., Velcheva I., Iliev I., Vasileva T., Bivolarski V., Tomov S., Nyeste K., Antal L., Yancheva V.* 2020. Multi-biomarker assessment in common carp (*Cyprinus carpio*, Linnaeus 1758) liver after acute chlorpyrifos exposure. - **Water**, **12**, 1837. ISSN: 2073-4441, **Q2**, **sjr 0.718**, **2.069 Impact Factor** <https://doi.10.3390/w12061837>, indexed Web of Science and Scopus **20 T**.

ABSTRACT: The excessive use of pesticides at different stages of crop production can pose a great danger to the aquatic environment, and particularly to fish. The purpose of the present work was to assess the negative effects of chlorpyrifos (CPF) on the liver histological architecture and the activities of marker enzymes in common carp (*Cyprinus carpio* Linnaeus, 1758), by applying a multi-biomarker technique. The tested insecticide is categorized as a priority pollutant in surface waters in terms of Directive 2013/39/EU. The carps were exposed to different and environmentally relevant CPF concentrations for 72 h (a short-term acute experiment). The results showed that the tested insecticide alters the liver histological structure, causing degenerative lesions, such as granular and vacuolar degeneration; necrobiotic alterations and necrosis, as well as changes in the circulatory system. In addition, CPF induces changes in the enzymatic activity of lactate dehydrogenase (LDH), aspartate aminotransferase (ASAT), alanine aminotransferase (ALAT), cholinesterase (ChE), glutathione peroxidase (GPx) and catalase (CAT). The results from such experimental set ups could be successfully used in the legislation related to the protection of water bodies from contamination, in areas with intensive application of plant protection products used in agricultural practices, and also in implementing the Water Frame Directive by using multi-biomarker approaches.

33. Gecheva G., Yancheva V., Velcheva I. Georgieva E., Stoyanova S., Arnaudova D., Stefanova Violeta, Georgieva D., Genina V., Todorova B., Mollov I. 2020. Integrated monitoring

with moss-bag and mussel transplants in reservoirs. - **Water**, **12**, **1800**. ISSN: 2073-4441, Q2, sjr 0.718, 2.069 Impact Factor <https://doi.10.3390/w12061800>, indexed in Web of Science and Scopus **20 T**.

ABSTRACT: For the first time, transplants with moss-bags and mussels together were applied to study the water quality in standing water bodies. The tested species: *Fontinalis antipyretica* Hedw. and *Sinanodonta woodiana* (Lea, 1834) were collected from unpolluted sites and analyzed to obtain background levels. Then, the moss and mussels were left in cages for a period of 30 days in three reservoirs where both are not present naturally. Two of the reservoirs suffer from old industrial contamination and one is affected by untreated wastes. Twenty-four compounds were studied, among them trace elements Al, As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn and organic priority substances: six polybrominated diphenyl ethers (PBDEs) congeners and short-chain chlorinated parans (SCCPs). The trace element accumulation was significant after the exposition period in all studied stations. PBDEs and SCCPs were also accumulated up to two times more in the moss tissues. PBDEs in the mussels exceeded the environmental quality standard (EQS). The applied combined transplants, and especially the moss-bags, revealed severe contamination with heavy metals not detected by the water samples. The moss and the mussel followed a different model of trace element and PBDEs accumulation. The SCCPs levels were alarmingly high in all plant samples. The study confirmed PBDEs and SCCPs as bioaccumulative compounds and suggested that an EQS for SCCPs in biota needs to be established.

34. Yancheva V.*, Stoyanova S., Velcheva I., Georgieva E. 2020. Fish as indicators for environmental monitoring and health risk assessment regarding aquatic contamination with pesticides. - **International Journal of Zoology and Animal Biology**, **3(1)**, ISSN: 2639-216X, <https://10.23880/izab-16000210> **0 T**.

ABSTRACT: The proximity of water basins to anthropogenic sources of pollution affecting the state of nature also determines the need to study the ecosystems existing there. Fish are used as reliable indicators of pollution of the aquatic environment. Changes in the fish body make it possible to determine the toxicity of the contaminated water and the potential danger posed by anthropogenic substances that have entered it. In this regards, biomarkers are important assessment tools as they provide specific information on the biological effects of a particular toxicant. They can be used for monitoring purposes, as well as to clarify the link between the effects on the organism and the concentration of the contaminant in health risk assessment.

35. Yancheva V.*, Mollov I., Stoyanova S., Todorova B., Velcheva I., Georgieva E. 2021. Toxic pesticides effects on the respiration rate in *Dreissena polymorpha* (Pallas, 1771). - **Zoonotes**, **173: 1-4**. eISSN: 1313-9916, indexed in Web of Science and Scopus **0 T**.

ABSTRACT: With the present experiment we aimed to study the possible negative effects of two commonly used insecticides – cypermethrin (CYP) and chlorpyrifos (CPF) on the respiration rate of zebra mussel (*Dreissena polymorpha* Pallas, 1771) after 96 hours and 30 days. We found that both chemicals altered the respiration process; however CYP was determined to be more toxic regarding this particular biological measurement.

36. Georgieva E., Velcheva I., Stoyanova S., Yancheva V.*, Vladikov V. 2021. Ecological and economic considerations for water resources as water capitals /the case of fish toxicology in the “Vita plus” project/. - Knowledge – International Journal, 45(3): 549-554. eISSN: 2545-4439 0 т.

ABSTRACT: This paper is focused on presenting some ecological and economic aspects related to reconsider water resources as water capitals, in the forthcoming concept of introducing bioeconomy in the new EU sets of strategies, policies, and regulations. Financing of this paper is provided by the “Vita Plus” project (2021-2022) – a transdisciplinary project, executed by researchers of the University of Plovdiv. The object of this paper is to conduct a research and demonstrate through the “Vita Plus” project complex methods of detecting toxicity in waters. Furthermore, the focus of the paper is to provide an adequate model for measuring toxicity levels of waters by conducting reliable toxicology research on fishes from polluted waters. We aimed to set a reliable laboratory practice, which may be utilized to deliver comparable indicators, as prescribed by EU policies and regulations in the forthcoming programming period 2021-2027, as there will be a general shift towards circular economy of no to minimum waste in nature.

37. Georgieva E., Yancheva V., Stoyanova S., Velcheva I., Iliev I., Vasileva T., Bivolarski V., Petkova E., László B., Nyeste K., László L. 2021. Which is more toxic? Evaluation of the short-term toxic effects of chlorpyrifos and cypermethrin on selected biomarkers in common carp (*Cyprinus carpio*, Linnaeus 1758). – *Toxics*, 9(6), 124. eISSN: 2305-6304, Q1 , sjr 0.8, 4.14 Impact Factor <https://doi.org/10.3390/toxics9060125>, indexed in Web of Science and Scopus 25 т.

ABSTRACT: The general aim of this study was to investigate the negative short-term effects of different concentrations of chlorpyrifos (CPF) and cypermethrin (CYP), based on the EU legislation (MAC-EQS) in common carp (*Cyprinus carpio* Linnaeus, 1758) under laboratory conditions and to compare their toxicity. The fish were exposed to the pesticides for 96 h and then different histological and biochemical biomarkers were investigated in the gills and liver, and bioaccumulation analyses were conducted. The chemical studies showed increased pesticide concentrations in the gills as the first site for pollutants compared to the liver at the 96th hour. In addition, the histological analyses showed severe alterations in the gills and liver after exposure to both tested pesticides. In the gills, we found mainly intense proliferative and, to a lesser extent, degenerative changes and alterations in the circulatory system, such as necrosis and vasodilation. In the liver, regressive and progressive lesions, as

well as circulatory disturbances and inflammation, were observed. The regressive lesions showed a higher degree of expression compared to the other changes. Furthermore, we found altered enzymatic activities—catalase, glutathione reductase, and glutathione peroxidase—in the liver, compared to the control. Overall, both tested pesticides impacted the studied biomarkers in common carp, even at concentrations lower than those permitted by law. However, the results of the comparative analysis showed a relatively higher toxicity of CYP compared to CPF in the fish. Still, questions persist as to whether the observed changes are adaptive or entirely destructive. To avoid any danger or risk, these pesticides must be applied cautiously, especially near water bodies.

38. Georgieva E., Velcheva I., Yancheva V., Stoyanova S., Vasileva T., Bivolarski V., Todorova B., Iliev I. 2021. A review on multi-biomarkers in fish for the assessment on aquatic ecosystem contamination with organic pollutants. – *Ecologia Balkanica*, **13(2): 321-330**. eISSN: 1313-9940, Q4, sjr 0.144, indexed in Web of Science and Scopus **12 T**.

ABSTRACT: The aim of the current review is to identify the most suitable biomarkers for evaluating chemical stress due to organic contamination in aquatic environments, as well as possible ways to reduce or limit this contamination. To safeguard the environmental status, the European Union has implemented the Water Framework Directive (WFD; 2000/60/EC) and the Marine Strategy Framework Directive (MSFD; 2008/56/EC) legislations, which encourage the use of biological tools to detect the quality of aquatic systems. Therefore, monitoring of sentinel fish species is widely used to assess the level of health status. Fishes have been found to be good biomonitors of water pollution because they occupy different trophic levels; they are of different sizes and ages and in comparison with invertebrates, are also more sensitive to different toxicants, including persistent organic pollutants, such as pesticides. Biomarkers are defined as responses to any exposure evidenced in histological, physiological, biochemical, genetic and behavioral modification. The application of multi-biomarker approach is necessary in the development of a protocol for the aquatic assessment of organic pollutants. This protocol can be applied in risk assessment and water monitoring programs in order to provide an adequate legal basis for the presence of organic pollutants in aquatic ecosystems and biological responses under concentrations equal or lower to those permitted under the European and Bulgarian legislation.

39. Yancheva V.*, Stoyanova S., Todorova B., Georgieva E., Velcheva I. 2022. Ingestion of plastics in the European bass (*Dicentrarchus labrax* Linnaeus, 1758): first known observation in the city of Plovdiv, Bulgaria. – *Zoonotes*, **191: 1-4**. eISSN: 1313-9916, indexed in Web of Science **0 T**.

ABSTRACT: The European bass (*Dicentrarchus labrax* Linnaeus, 1758) is well known throughout much of the Mediterranean and coastal Europe, and has also long been valued as

a food fish in France, Italy and Spain. In Bulgaria most of this economically important fish species is imported from Greece as a neighboring country where it is reared extensively in aquaculture. Furthermore, it can come from Turkey, Spain and Portugal as they are one of main growers of this fish species in Europe. Sea bass is, on average, the second most expensive North-East Atlantic commercial catch, fished by fleets also from the United Kingdom, the Netherlands and Belgium. In addition, in Bulgaria it is most commonly found in the supermarkets ready to cook as fish fillets, but it also can be purchased whole from small neighborhood markets where its origin is in most cases from the wild, but not aquaculture.

40. Yancheva V.*, Stoyanova S., Todorova B., Georgieva E., Velcheva I. 2022. Zebra mussel (*Dreissena polymorpha* Pallas, 1771): the invasive bioindicator for freshwater quality? – *Zoonotes*, 197: 1-4. eISSN: 1313-9916, indexed in Web of Science **0 T.**

ABSTRACT: In this short review we aim to discuss the advantages and disadvantages of using zebra mussel (*Dreissena polymorpha* Pallas, 1771) for the purposes of freshwater monitoring.

41. Yancheva V.*, Stoyanova S., Todorova B., Georgieva E., Velcheva I. 2022. Common carp (*Cyprinus carpio* Linnaeus, 1785): a species equally important for aquaculture and aquatic toxicology. – *Zoonotes*, 199: 1-3. eISSN: 1313-9916, indexed in Web of Science **0 T.**

ABSTRACT: Our main goal in this short review is to present the pros of using common carp (*Cyprinus caprio* Linnaeus, 1785) for the purposes in both, aquaculture and aquatic toxicology.

42. Georgieva E., Antal L., Stoyanova S., Arnaudova D., Velcheva I., Iliev I., Vasileva T., Bivolarski V., Mitkovska V., Chassovnikarova T., Todorova B., Uzochukwu I.E., Nyeste K., Yancheva V.* 2022. Biomarkers for pollution in caged mussels from three reservoirs in Bulgaria: a pilot study. – *Heliyon*, 8(3): e09069. eISSN: 2405-8440, **Q1, sjr 0.55, 3.7 Impact Factor <https://doi.org/10.1016/j.heliyon.2022.e09069>, indexed in Web of Science and Scopus **25 T.****

ABSTRACT: The mussel-watch concept was firstly proposed in 1975, which was later adopted by several international monitoring programs worldwide. However, for the very first time, a field experiment with caged mussels was performed in three reservoirs in Bulgaria to follow the harmful effects of sub-chronic pollution (30 days) of metals, trace, and macro-elements, as well as some organic toxicants, such as polybrominated diphenyl ethers and chlorinated paraffins. Therefore, we studied the biometric indices, histochemical lesions in the gills, biochemical changes in the digestive glands (antioxidant defense enzymes, such as catalase, glutathione reductase, and glutathione peroxidase; metabolic enzymes, such as lactate dehydrogenase, alanine aminotransferase, and aspartate aminotransferase, and the neurotransmitter cholinesterase), in addition to the DNA damage in the Chinese pond

mussel, *Sinanodonta woodiana* (Lea, 1834) in Kardzhali, Studen Kladenets and Zhrebchevo reservoirs in Bulgaria. Significant correlation trends between the pollution levels, which we reported before, and the biomarker responses were established in the current paper. Overall, we found that both tested organs were susceptible to pollution-induced oxidative stress. The different alterations in the selected biomarkers in the caged mussels compared to the reference group were linked to the different kinds and levels of water pollution in the reservoirs, and also to the simultaneously conducted bioaccumulation studies.

43. Yancheva V.*, Georgieva E., Velcheva I., Iliev I., Stoyanova S., Vasileva T., Bivolarski V., Todorova-Bambaldokova D., Zulkipli N., Antal L., Nyeste K. 2022. Assessment of the exposure of two pesticides on common carp (*Cyprinus carpio* Linnaeus, 1758): Are the prolonged biomarker responses adaptive or destructive? - **Comparative Biochemistry and Physiology, Part C**, 261: 109446. eISSN: 1878-1659, Q2, sjr 0.721, 4.2 Impact Factor <https://doi.org/10.1016/j.cbpc.2022.109446>, indexed in Web of Science and Scopus 20 т.

ABSTRACT: Chlorpyrifos (CPF) and cypermethrin (CYP) are two insecticides that have a proven negative effect on non-target aquatic organisms when they enter the surface waters. However, literature on the comparative effects of these pesticides on important aquaculture fish species, such as common carp (*Cyprinus carpio* Linnaeus, 1758) is not yet scientifically detailed, especially over the long-term. The idea of conducting a long-term exposure is to find out how the observed biomarkers would change compared to the short-term exposure. In the natural environment, toxicants are not present alone, but in combination. By monitoring the long-term impact of individual substances, the state of aquatic ecosystems exposed to various toxicants could be predicted. Thus, this study aimed to evaluate the toxicity of different concentrations of CYP (0.0002, 0.0003, and 0.0006 µg/L) and CPF (0.03, 0.05, and 0.10 µg/L) in 50-L glass tanks on *C. carpio*, exposed for 30 days under laboratory conditions. A set of histological and biochemical biomarkers in the gills and liver were applied with the chemical analyses of water and fish organs. Furthermore, the condition and hepatosomatic index were calculated to assess the physiological status of the treated carps. The behavioral responses were also monitored, and the respiration rate was analyzed. The results suggest that CYP had a more prominent effect on the histological structure of fish organs, biochemical responses of anti-oxidant enzymes, behavior, and respiration rate compared to the effect of CPF. In addition, the results also indicate that the liver is more susceptible to chronic and chemically induced cellular stress compared to the gills, with overall destructive changes in the histological biomarkers rather than adaptive. Regardless of the scenario, our results provide novel insights into pesticide exposure and the possible biological impacts on economically important freshwater fish, exposed to lower CYP and CPF concentrations, based on the EU legislation (maximum allowable concentrations, MAC-EQS).

44. Georgieva E., Stoyanova R., Yancheva V*, Velcheva I., Petrova S., Stoyanova S., Tomov S. 2022. Is there a correlation between impaired sperm quality and overweight/obesity?: A Review. - *Acta Morphologica et Anthropologica*, 29(3-4): 120-127. eISSN: 2535-0811, indexed in Web of Science **0 T.**

ABSTRACT: Obesity is associated with significant disturbance in the hormonal status that can affect the reproductive system. In recent decades, an increasing interest in related to the association between high BMI levels, obesity and decreased sperm quality, which could also lead to a decrease in male reproductive potential. The aim of the present work is to identify the basic mechanisms of impaired sperm quality due to overweight and obesity. Sedentary lifestyle and work, as well as age of men are defined as possible ways to elevated BMI levels. Both inflammation and oxidative stress (as related pathophysiological processes) are considered as basic mechanisms, which could be found in the pathogenesis of male infertility caused by high BMI levels and obesity.

45. Kovacheva E., Georgieva E., Velcheva I., Iliev I., Vasileva T., Bivolarski V., Nikolova M., Todorova B., Todorova-Bambaldokova D., Yancheva V*, Tomov S. 2022. Histochemical and biochemical changes in common carp (*Cyprinus carpio* Linnaeus, 1785) liver after cypermethrin and chlorpyrifos exposure. - *Ecologia Balkanica*, 14(2): 123-141. eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus **12 T.**

ABSTRACT: Nowadays pollution of aquatic ecosystems with pesticides causes acute and chronic poisoning of fish, leading to serious damage to vital organs, such as the liver. Common carp (*Cyprinus carpio* Linnaeus, 1758) is a popular edible fish favored for culture due to its rapid growth, hardiness and reproduction in confined waters. The purpose of the present study was to investigate the negative effects of cypermethrin (CYP) and chlorpyrifos (CPF), based on their maximum allowable concentrations (Directive 2013/39/EU) on histochemical and biochemical biomarkers in the liver of common carp. The histochemical analysis included Periodic acid-Schiff staining (PAS reaction) and Sudan Black B staining, while in the biochemical study different hepatic enzyme activities such as lactate dehydrogenase (LDH), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT). The negative effects of the tested pesticides on fish were expressed with liver changes in the amount of glycogen and lipids, and enzyme changes of LDH, ASAT and ALAT, caused by the acute and chronic exposure to cypermethrin and chlorpyrifos under laboratory conditions. The results from such experimental set ups could be used in the legislation of protection water bodies from contamination, in areas near intensive application of plant protection products and also in implementing the Directive 2013/39/EU and Water Frame Directive by using multi-biomarker approaches.

46. Kovacheva E., Georgieva E., Velcheva I., Nikolova M., Atanassova P., Todorova B., Todorova-Bambaldokova D., Yancheva V*, Stoyanova S., Tomov, S. 2022. Acute

histopathological changes in common carp (*Cyprinus carpio* Linnaeus, 1785) gills: pirimiphos-methyl, 2, 4-dichlorophenoxyacetic acid and propamocarb hydrochloride effects. – **Ecologia Balkanica**, 14(2): 143-159. eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus 12 T.

ABSTRACT: A number of characteristics make fish excellent experimental models in toxicological research, especially for the contamination of aquatic systems. The main aim of the present study was to investigate the negative effects of different classes of pesticides (insecticide, herbicide and fungicide), based on their LC50 on the gills histological architecture of common carp (*Cyprinus carpio* Linnaeus, 1758). The effects of the tested pesticides on fish gills were expressed with histopathological alterations, such as proliferative, degenerative and changes in the circulatory system. Based on our results, the test insecticide showed higher toxicity with more severe irreversible necrotic changes in common carp gills compared to the herbicide and fungicide exposure. The identified histopathological changes in the fish gills can be successfully applied as reliable biomarkers for monitoring the degree of negative effects on the organisms due to the pesticide toxicity. The results from such experiments could be applied in the legislation in order to protect the water bodies from pesticide contamination, in areas with intensive application of plant protection products used in agricultural practices.

47. Todorova B., Todorova-Bambaldokova D., Stoyanova S., Georgieva E., Velcheva I., Yancheva, V.* 2023. Microplastic pollution – are there potential toxic threats for aquatic animals in Bulgaria? – **Zoonotes**, 212: 1-4. eISSN: 1313-9916, indexed in Web of Science - and Scopus 0 T.

ABSTRACT: Microplastic (MPs) pollution and its negative effects is a growing, yet poorly studied problem in Bulgaria. In the present review we aimed to summarize the available data on MPs contamination of surface waters and sediments, and its impact on aquatic animals in Bulgaria.

48. Yancheva V.*, Todorova B., Todorova-Bambaldokova D., Georgieva E., Velcheva I., Stoyanova S. 2023. Chronic toxicity of microplastics has lethal effects on common carp (*Cyprinus carpio* Linnaeus, 1785). – **Zoonotes**, 216: 1-4. eISSN: 1313-9916, indexed in Web of Science and Scopus 0 T.

ABSTRACT: The 21st century has seen the realization that people have overused plastic. Unfortunately, plastic pollution is a widespread environmental problem in many of the world's rivers and seas. Plastic litter is well distributed in shallow as well as in deep-waters, and therefore it is inevitably present in the world's ocean which is in turn the final sink of plastic debris of all sizes, alongside other various anthropogenic toxicants (for example, heavy metals and persistent organic pollutants). The negative effects of microplastics (MPs) which are produced by the breakdown of larger plastic debris on

aquatic organisms, including both freshwater and marine fish have been already well documented. However, there is a gap in the knowledge from studies conducted in the field or under laboratory conditions in Bulgaria.

49. Yancheva V.*, Velcheva I., Georgieva E., Stoyanova S., Todorova B., Antal L., Nyeste K. 2023. Are *Mytilus* species suitable bioindicators for assessing aquatic pollution along the Black Sea Coast? A review. - **Ecologia Balkanica**, 15(1): 49-76. eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus 12 т.

ABSTRACT: This review aims to summarize the possibility of using mussels (*Mytilus spp.*) as bioindicators to assess aquatic pollution in the Black Sea in Bulgaria. In addition, the main responsive biomarkers that could be applied to study the negative effects of different toxicants on these species in terms of using the Marine Strategy Framework Directive and implementation of environmental quality standards (EQS) in marine biota are also discussed. A specific reference is made to plastic pollution, transplant mussel caging, and mussel watch programs - their application, challenges, and future perspectives in Bulgaria..

50. Georgieva E., Stoyanova S., Mehmedov T. Tomov S., Velcheva, I., Yancheva V.* 2023. Main factors causing male infertility: A review. – **Ecologia Balkanica**, 15(1): 95-108. eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus 12 т.

ABSTRACT: Human infertility affects millions of people of reproductive age worldwide and impacts their families and communities. Approximately half of the cases of childless couples are due to problems with male fertility (male factor). In this review, a complex of factors that affect the quality of male fertility is presented. Particular attention is paid to the main factors in the organism representing endogenous factors and to the influence of the professional environment and lifestyle, which represent the exogenous factors. In regard to the exogenous factors, it is important to establish the effect of different environmental factors, such as air pollution, presence of various contaminants, such as chemicals, pesticides, and heavy metals, radiation, etc. The exogenous factors also include lifestyle features such as intake of alcohol, smoking, drugs, hazards in the professional working environment, social and psychological aspects, etc. Moreover, with reference to the impact of harmful effects in the professional work environment, the negative factors could be the increased levels of the radiation fund, temperature fluctuations, dustiness, immobility and sitting in the same place for a long time, etc. Obesity and dietary disorders are also associated with the expression of the male factor. In conclusion, it is suggested that for the definition and implementation of adequate and correct treatment of the problems with male fertility, the whole complex of factors should be considered in order to achieve the best results in the procedures associated with in vitro fertilization (IVF).

51. Georgieva E., Kovacheva E., Yancheva V*., Velcheva I., Hrishev P., Atanassova P., Tomov S., Stoyanova S. 2023. Pesticides induce fatty degeneration in liver of *Cyprinus carpio*

(Linnaeus 1758) after acute exposure. - *Ecologia Balkanica*, 15(2): 77-82. eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus 12 т.

ABSTRACT: In the present study, results are presented regarding the negative effects of different concentrations of three classes of pesticides - an insecticide, herbicide and fungicide on one relatively uncommon, but reliable histochemical biomarker in the field of fish toxicology – lipid accumulation in the liver of common carp under laboratory conditions.

52. Yancheva V.*, Velcheva I, Georgieva E., Todorova B., Nyeste K., Antal L., Stoyanova S. 2023. Exposure to polybrominated diphenyl ethers impairs the health condition of Zebra Mussel, *Dreissena polymorpha* (Pallas, 1771). - *Zoonotes*, 226: 1-4. eISSN: 1313-9916, indexed in Web of Science and Scopus 0 т.

ABSTRACT: The present pilot laboratory study (96 hours and 30 days) aimed to provide for the first time the possible adverse effects of different concentrations of PBDEs congeners (PBDE 28, PBDE 47, PBDE 99, PBDE 100, PBDE 153, PBDE 154), based on Water Framework Directive 2000/60/EC (WFD) in zebra mussels (*Dreissena polymorpha* Pallas, 1771). Thus, we calculated different condition factors based on the mussel's weight and length to determine the possible adverse effects of acute and subchronic exposure to PBDEs under laboratory conditions..

53. Tokmakov D., Asenov S., Lubomirov S., Stoyanova S., Yancheva V.*, Petrova S., Nikolov B., Georgieva E., Popov R. 2023. Development and Research of an IoT WSN For Measuring Fine Dust Particles PM10 and PM2.5. - 31st National Conference with International Participation (TELECOM), Sofia, Bulgaria, pp. 1-5, doi: 10.1109/TELECOM59629.2023.10409689, indexed in Scopus 0 т.

PE3HOME: This paper introduces a successfully developed and tested cutting-edge IoT real-time air quality monitoring system tailored for Smart Cities. The system is distinguished by its low energy consumption and relies on the combined use of LoRaWAN and GPRS wireless communication technologies. Its versatility allows for deployment uses both indoors and outdoors. Key components of the system include a single-chip microcontroller, air pollution sensors capable of measuring NO₂, CO, PM1, PM10, and PM2.5 levels, as well as Long-Range (LoRa) and GSM modems. To ensure a sustainable power supply, a photovoltaic and a battery is integrated into the system. Additionally, the system features a graphical interface for presenting the collected information. The utilization of these technologies bestows the fine particulate matter measurement system with several notable advantages. These include cost-effectiveness, long-range communication capabilities, extensive coverage, prolonged device battery life, and straightforward operation. Overall, this system represents a significant advancement in real-time air quality monitoring, aligning perfectly with the objectives of Smart Cities and IoT-driven urban development.

54. Kadreva N., Penkova N., Atanassova P., Georgieva E., Stoyanova S., Yancheva V.* 2023. Factors influencing osteogenesis. - *Biomedical Reviews*, 34: 133-138. eISSN: 1314-1929, <http://dx.doi.org/10.14748/bmr.v34.9621> 0 т.

ABSTRACT: The process of osteogenesis includes the well-coordinated proliferation and differentiation of osteogenic cells. It is known that mesenchymal stem cells are the progenitor cells in this process. They differentiate into osteoblasts and give rise to new bone formation. Osteogenesis happens not only as a normal process during embryonal development but also as result of some diseases, traumatic injury, and fractures. The mechanisms of physiological and pathological processes of ossification are similar. However, the factors participating have not yet been studied in detail. The involvement of genetic mechanisms, cell growth factors, pharmacological substances, biochemical pathways and nutrients are reported committing to osteogenic differentiation at multiple levels. In conclusion, osteogenesis is a complex process and a modern approach to the influencing factors is needed.

55. Yancheva V.*, Velcheva I., Georgieva E., Stoyanova S., Todorova B., Nyeste K., Antal L. 2024. Physiological measurements of the Mediterranean mussel (*Mytilus galloprovincialis* Lamarck, 1819) from the Bulgarian Black Sea as biomarkers for multi-stressor environment. - *Zoonotes*, 238: 1-4. eISSN: 1313-9916, indexed in Web of Science and Scopus 0 т.

ABSTRACT: Wild and farmed mussels from the Bulgarian Black Sea were collected to study and compare the survival rates (stress on stress response) as a biomarker for multi-stressor environment. In sum, the survival time indicated that the farmed mussels were more tolerant to stress, even though they had a similar size and lived in similar conditions. Further research needs to be done to clarify why.

56. Petrova S., Nikolov B., Tokmakov D., Lyubomirov S., Popov R., Asenov S., Velcheva I., Yancheva V.*, Georgieva E., Stoyanova S. 2024. Sustainable development of rural areas in protected territory – a case study from Strandzha, Bulgaria. – *Ecologia Balkanica*, 16(1): 49-57, eISSN: 1314-0213, Q4, sjr 0.137, indexed in Web of Science and Scopus 12 т.

ABSTRACT: Sustainable development is based on three pillars: sustainable economic growth, social well-being and environment protection. Sustainable rural development is regarded as a multidimensional concept including an equitable and balanced development within a rural area, an increased level of social cohesion and equitability, as well as the assuming of responsibility for using natural resources and revealing at environmental protection. The studied region is located into the Strandzha Mtn - the only Bulgarian territory included in the five priority territories for conservation in Central and Eastern Europe. We have identified some core problems that should be addressed aiming to achieve the sustainable development of this area. Some of them are as follows: the absence of developing

projects and focus on the development of individual villages, the lack of willingness of local people to cooperate, local resources are not effectively used and the local community is not adequately involved.

57. Yancheva V., Velcheva I., Georgieva E., Stoyanova S., Todorova B., Nyeste K., Antal L. 2024. Stress on stress response in wild and farmed Mediterranean mussels (*Mytilus galloprovincialis* Lamarck, 1819) from Sozopol, Black Sea (Bulgaria). - **Zoonotes**, 241: 1-4. eISSN: 1313-9916, indexed in Web of Science and Scopus **0 T**.

ABSTRACT: As a continuation of our previous research, wild and farmed mussels from the town of Sozopol, located on the Southern Bulgarian Black Sea coast, were collected to assess and compare the survival rates (stress on stress response, SoS) as a biomarker for the multi-stressor environment. This time we aimed to investigate further if there could be any seasonal differences. Overall, the mussels collected in April had a longer survival time than those collected at the end of January 2024. However, the survival time of wild and farmed mussels had a shorter survival rate in the air than in other studies. The answer to the question “Why is that?” persists.

58. Nyeste K., Zulkipli N., Uzochukwu I.E., Somogyi D., Nagy L., Czeglédi I., Harangi S., Baranyai E., Simon E., Nagy S.A., Velcheva I., Yancheva V., Antal L. 2024. Assessment of trace and macroelement accumulation in cyprinid juveniles as bioindicators of aquatic pollution: Effects of diets and habitat preferences. – **Scientific Reports**, eISSN: 2045-2322, **Q1 (D1), sjr. 0.9, 4.6 Impact Factor, in press**, indexed in Web of Science and Scopus **25 T**.

PE3HOME: Juveniles of three cyprinids with various diets and habitat preferences were collected from the Szamos River (Hungary) during a period of pollution in November 2013: the *herbivorous, benthic nase (Chondrostoma nasus)*, the *benthivorous, benthic barbel (Barbus barbus)*, and the omnivorous, pelagic chub (*Squalius cephalus*). Our study aimed to assess the accumulation of these elements across species with varying diets and habitat preferences, as well as their potential role in biomonitoring efforts. The Ca, K, Mg, Na, Cd, Cr, Cu, Fe, Mn, Pb, Sr, and Zn concentration was analyzed in muscle, gills, and liver using MP-AES. The muscle and gill concentrations of Cr, Cu, Fe, and Zn increased with trophic level. At the same time, several differences were found among the trace element patterns related to habitat preferences. The trace elements, including Cd, Pb, and Zn, which exceeded threshold concentrations in the water, exhibited higher accumulations mainly in the muscle and gills of the pelagic chub. Furthermore, the elevated concentrations of trace elements in sediments (Cr, Cu, Mn) demonstrated higher accumulation in the benthic nase and barbel. Our findings show habitat preference as a key factor in juvenile bioindicator capability, advocating for the simultaneous use of pelagic and benthic juveniles to assess water and sediment pollution status.

59. Hrishev P., Atanassova P., Georgieva K., Yancheva V., Stoyanova S., Velcheva I., Georgieva E. 2024. Effects of submaximal training on ghrelin in female and male rats with dietary-induced metabolic syndrome. - *Acta Zoologica Bulgarica*, eISSN: 2603-3798, Q4, sjr 0.22, 0.48 Impact Factor, in press, indexed in Web of Science and Scopus, 12 т.

РЕЗЮМЕ: Ghrelin is a hormone that stimulates appetite and its serum levels are inversely proportional to body weight. Decreased ghrelin levels correlate with obesity, insulin resistance and elevated blood pressure, which are components of the metabolic syndrome (MetS). The effect of physical exercise is studied mainly after an already induced MetS, the results are contradictory and it is not clear what the effect of exercise on ghrelin concentration is. There are no data for gender comparisons of changes in ghrelin due to submaximal training. In this study, we aimed to determine the effect of submaximal training on serum ghrelin concentrations during the dietary induction of MetS in female and male rats. Dietary-manipulated female and male Wistar rats (n = 32) were used. They were divided into four groups: male and female sedentary (MD and FD) and male and female trained on treadmill (MDT and FDT). For 16 weeks, the four groups received high-fat high-carbohydrate (HFHC) food and both MDT and FDT simultaneously with the diet were subjected to submaximal training (70-75% VO₂max). At the end of the experiment, mixed blood was collected and ghrelin concentrations were measured. The submaximal training and gender had a significant main effect on ghrelin levels, as trained dietary-manipulated rats had higher serum concentrations compared to the sedentary (p < 0.05) and males had higher concentrations compared to females (p < 0.05). Overall, applied for 16 weeks, simultaneously with the combined HFHC diet, the submaximal training had a positive effect, lowering the serum ghrelin concentration. Sexual dimorphism, characterised by higher ghrelin in male rats, was also found..

60. Vasileva P., Popova T., Stoyanov I., Staykova T., Ivanova E., Stoyanova S., Velcheva I., Yancheva V*, Georgieva, E. 2024. Mutagenic potential of pesticides Actellic, Rival, Aminopielik and polybrominated diphenyl ethers in common carp (*Cyprinus carpio* Linnaeus, 1785). - *Acta Zoologica Bulgarica*, eISSN: 2603-3798 Q4, sjr 0.22, 0.44 Impact Factor, in press, indexed in Web of Science and Scopus 12 т.

РЕЗЮМЕ: Настоящото изследване има за цел да проучи в лабораторни условия потенциалния мутагенен ефект ефекти на пестицидите Actellic (пиримифос-метил), Rival (пропамокарб хидрохлорид), и Aminopielik (2,4-дихлорфеноксиоцетна киселина), както и органичните замърсители полибромирани дифенил етери (PBDEs), в обикновения шаран, *Cyprinus carpio*, който беше избран като тестов организъм. Рибите бяха изложени на две тестови концентрации на токсичните вещества, както следва Actellic (1 µl, 6 µl), Rival (3 µl, 6 µl) и Aminopielik (4 µl, 8 µl) и PBDE според максимално допустимите им концентрации (МДК) във води от 0,14 µg/l и в биота от 0,0085 µg/kg. Микронуклеарният анализ беше приложен за оценка на

увреждане на геномната ДНК в еритроцитите на рибите. Резултатите показаха формирането на микроядра и други ядрени аномалии в еритроцитите на рибите, като лобирани и назъбени ядра, и др. в експонираната риба в сравнение с контролната група. Най-високата проценти еритроцити с увреждане на ДНК са наблюдавани след третирането с Rival (6 µl) и Aminopielik (8 µl). Експозицията на Actellic (1 µl) и PBDEs също разкри мутагенни ефекти, но при по-ниски нива.

**Abstract annotation of textbooks and study guides of
chief assistant professor Vesela Slavcheva Yancheva, PhD to
indicator E19 and E20 in accordance with the minimum national
requirements of the ZRASRB and the Regulations for the implementation
of the ZRASRB**

Indicator E.19. - A published university textbook or a textbook that is used in the university network

1. Velcheva I., Yancheva V. 2023. **Ecological Toxicology**. Plovdiv University Press. ISBN: 978-619-202-848-0, pp. 157. (in Bulgarian)

ABSTRACT. This textbook was developed in accordance with the curriculum of the discipline "Ecological toxicology", included in the bachelor's program of the specialty "Ecology and ecosystem conservation" and the specialty "Pharmaceutical biotechnologies" at the Faculty of Biology of Plovdiv University, as well as in the bachelor's program of the specialty "Biology" where this subject is elective. The textbook presents a historical background on toxicology and the use of poisons, the characteristics of the main processes and terms in environmental toxicology and transport of toxicants in the environment. Special attention is paid to the classification of different types of toxicants – inorganic and organic, bioindicator species and the most used biomarkers, and examples from the authors' practice in the field of aquatic toxicology are also given. The textbook can be used by all students studying environmental specialties in other universities of the country, as well as by specialists in the field of environmental toxicology.

2. Georgiev D., Velcheva I., Gecheva G., Petrova S., Yancheva V., Mollov I. 2023. **Water pollution and its impact on ecosystems – Second edition**. Plovdiv University Press. ISBN: 978-619-202-883-1, pp. 175. (in Bulgarian)

ABSTRACT. This textbook was developed in accordance with the curriculum for the discipline "Water Pollution", included in the bachelor's program of the specialty "Ecology and environmental conservation" at the Faculty of Biology of Plovdiv University. The textbook presents the characteristics of water as a living environment and natural resource, the types of pollution and the impact it has on aquatic ecosystems. Special attention is paid

to current Bulgarian legislation and water monitoring in Bulgaria. The textbook is intended for students from the Faculty of Biology. It can also be used by all students studying environmental majors in other universities of the country, as well as by specialists in the field of water ecology.

Indicator E.20. - A published study guide that is used in the university network

1. Mollov I., Yancheva V., Gecheva G., Georgiev D., Todorova B. 2023. **The Ecologist Profession: Getting Started - A Guide for students, PhD students and young scientists to environmental research.** Plovdiv University Press. ISBN: 978-619-202-884-8, pp. 90. (in Bulgarian)
[https://www.researchgate.net/publication/373485244_PROFESIA_EKOLOG_PRVI_STPKI - Rkovodstvo za studenti doktoranti i mladi uceni za naucno-izsledovatelska rabota v oblastta na ekologiat](https://www.researchgate.net/publication/373485244_PROFESIA_EKOLOG_PRVI_STPKI_-_Rkovodstvo_za_studentsi_doktoranti_i_mladi_uceni_za_naucno-izsledovatelska_rabota_v_oblastta_na_ekologiat)

ABSTRACT. Ecology is a modern, fundamental, biological science that ranks among the most relevant in recent decades. Its main task is the study of the structure and function of nature, and due to the wide scope of ecological research, many and diverse methods are applied in it. This guide has as its main educational goal, to provide in-depth knowledge to students, PhD students and young scientists, how to: organize and conduct their field research or laboratory experiment, shape their thesis, dissertation or first scientific publication, participate in scientific conferences, to take part in expert groups regarding the preparation of environmental assessments in accordance with European and Bulgarian legislation related to the implementation of various plans, programs and projects and the impact they are expected to have on the environment. Special attention is paid to the acquisition of skills related to: searching and reading original scientific works, how to cite scientific literature, how to select the best journal when publishing the results. Information is provided on various NGOs where one can participate in volunteer actions and projects or carry out an internship, as well as the opportunities offered by the "Erasmus+" program with mobilities for training or practice. In addition, since it is an electronic edition, one can take advantage of all the conveniences of this format, such as active hyperlinks, to external sites, videos, etc., given in each chapter for additional information. This guide would be particularly useful for undergraduate and graduate students studying ecology, as well as PhD students and young scientists studying and working in the field of ecology. This guide also summarizes the authors' experience gained in their professional career, and we hope that others will find it useful in planning their own research or in reading and evaluating the work of other scholars. The guide is aimed at people who consider ecology as a career. However, we hope that anyone with some field or theoretical knowledge of ecology might also find something of interest.

2. Georgiev D, Gecheva G., Yancheva V., Todorova B. 2023. **A guide to the sustainable management of parks and environmental prevention disasters in populated areas.** ZooNotes, Supplement 13, pp. 40. (in Bulgarian) http://www.zoonotes.bio.uni-plovdiv.bg/Supplements/ZooNotes_Suppl_13_%D0%A0%D1%8A%D0%BA%D0%BE%D0%B2%D0%BE%D0%B4%D1%81%D1%82%D0%B2%D0%BE.pdf

ABSTRACT. This guide was developed to support the work of employees in public and private structures dealing with parks and green areas in urban areas. It can also be used by biologists and nature lovers. The information presented in the guide is organized in the form of reports, for which each author bears his own responsibility for the data presented. All authors are members of the Department of Ecology and environmental conservation at the Faculty of Biology of Plovdiv University. At the end of each report, the literature used is indicated, and two approaches are adopted depending on the author's preferences: citing the sources in the text or only at the end of the publication. The chapters (reports) are arranged chronologically, presenting the features of abiotic, biotic and anthropogenic factors of the environment in parks and green areas. Environmentally friendly approaches to reduce the loss of biodiversity in settlements, sustainable use of natural resources in them and last but not least - preservation of human health and property are indicated.

**Created: Chief assistant professor Vesela Yancheva, PhD
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