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MONITORING OF THE DESNA RIVER WITHIN CHERNIGIV REGION

The problem of rational use of fresh water, in particular surface water, is extremely relevant for Ukraine. The main causes of surface water pollution in Ukraine include: discharge of untreated and insufficiently treated municipal and industrial wastewater directly into water bodies and through the city sewage system; entry of pollutants into water bodies in the process of surface water runoff from built-up areas and agricultural land; erosion of soils in the water intake area. The consequence of this is the deterioration of the quality of surface water and hydrochemical indicators of rivers in particular. The introduction of new agricultural crop production technologies is associated with the widespread use of pesticides and mineral fertilizers. The consequence of this is an increase in the flow of biogenic elements into water bodies, as well as accompanying heavy metals and pesticide degradation residues. The full-scale invasion of Ukraine and military operations had a significant negative impact on water quality, so monitoring the state of the region's rivers, in particular the Desna River, is an urgent issue.

Monitoring of the Desna River is a complex system of observations of qualitative and quantitative chemical indicators of water, biological components (plants, animals, microorganisms) of the environment, which allow to assess changes in the state of these objects and the processes occurring in them under the influence of anthropogenic activity.

The purpose of the work: to analyse the dynamics of fluctuations of individual hydrochemical parameters of the Desna River in the Chernihiv region.

According to the Water Code of Ukraine, the Desna belongs to the large rivers. Within the territory of Ukraine, the Desna basin covers an area of 34.2 thousand km2 (Chernihiv region

- 71.0%, Sumy region - 26.6%, and Kyiv region - 2.4%), with an area of the water intake basin of 88.9 thousand km2. On the territory of the region, the length of the Desna River is 534 km, within the borders of Ukraine it is 575 km (Report, 2022). About 22% of the surface runoff of the Dnipro River and about 15% of the runoff of all rivers of Ukraine is formed in the Desna basin. The Desna River is one of the few rivers in Ukraine that has a high natural intensity of channel reshaping. Due to meandering (winding of the riverbed) and water erosion, there is constant erosion and destruction of the river banks, which causes the threat of the destruction of residential and commercial objects on the territory of settlements, agricultural lands, transport communications. In some sections of the river, there is a tendency to break through meanders, as a result of which the natural straightening of the channel may occur, which is accompanied by the loss of valuable coastal lands (Passport, 2022).

Numerous studies of the hydrochemical indicators of the Desna River and its tributaries (Snov, Sudost, Seim, Oster, Stryzhen, Bilous) from 2012 to 2022 showed (Kryvopysha, 2016; Papernyk, 2017; Zhydenko, 2019) that the main and permanent water pollutants are metals, in particular total iron and manganese, the concentration of which constantly exceeded the threshold limit value (TLV) of ecological and fishery standards. In addition, some indicators of water quality in the fence section above the city of Chernihiv significantly change in the negative direction, in comparison with the data obtained in the section of the fence below the city of Chernihiv. This indicates the pollution of the Desna River due to the water of its tributaries Bilous and Stryzhen (Kryvopysha, 2016; Zhydenko, 2019; Papernyk, 2022).

Since 2019, European approaches to water monitoring have been introduced in Ukraine in accordance with the requirements of the Water Framework Directive. Resolution No. 758 of the Cabinet of Ministers of Ukraine dated September 19, 2018 approved the new Procedure for state water monitoring. In accordance with the updated orders of the Ministry of Environment dated January 9, 2024 No. 37 "On approval of the State Water Monitoring Program", State Water Agency dated January 12, 2024 No. 7 "On the implementation of the Procedure for State Water Monitoring", BMWR (basin management of water resources) of Desniansk district in 2024 is implementing state water monitoring programs in the part of diagnostic and operational monitoring of MSW (masses of surface water) of the Dnipro River basin, the Upper Dnipro subbasins and the Desna River (desna-buvr.gov.ua, 2024).

For February 2024, the analysis of the hydrochemical indicators of the Desna River (within the city limits in the reaches above and below the discharge) showed the following: the content of dissolved oxygen at the level of 7.2-6.8 mgO_2/dm^3, the increased content of total iron 0.46-0.50 mg/dm^3 (with a norm of 0.3 mg/dm3 (to meet the drinking, household and other needs of the population), and 0.1 mg/dm^3 (environmental and fishery standards)). Also, in February 2024, manganese was detected in the surface waters of Desna in the range from 0.04 mg/dm^3 to 0.10 mg/dm^3 (at the norm of 0.1 mg/dm^3 (to meet the drinking, household and other needs of the population) and 0.01 mg/dm^3 (environmental and fishery standards)). This means that for the first standard, the manganese content is on the limit, but for the second standard, it is 4-10 times higher. The content of other pollutants that were determined did not exceed the value of the maximum permissible concentrations. In other bodies of surface water of the Desna River within the city limits (above outlet No. 1, the entrance to the drainage channel, and below the discharge channel of the "Teplokomunenergo" company), the following data were obtained: dissolved oxygen content at the level of 5.60-5.81-5,70 mgO_2/dm^3 and increased total iron content of 0.472-0.481-0.477 mg/dm^3, according to the structures. The explanation why rapid oxidation of Fe (II) to Fe (III) does not occur at a high oxygen content in water is the presence of humic substances (HS), primarily fulvic acids (Zhezherya, 2022). Surface, soil and drainage waters of Chernihiv and Novgorod-Siversky Polyssia contain an increased concentration of

these natural organic acids. These waters belong to the humid zone, the main source of which are the soils and peat bogs of marshy and forested areas. Due to the increased amount of HS in the water, especially against the background of the elevated air temperature, a sharp increase in the amount of manganese in the water can occur against the background of the increased oxygen regime (Passport, 2022). In July 2024, an exceedance of the TLV of ecological and fisheries standards was recorded for manganese in the range from 0.050 mg/dm3 to 0.10 mg/dm^3, total iron in the range from 0.02 mg/dm^3 to 0.21 mg/dm^3, BSK5 12 .06 mgO_2/dm^3 (norm - 3 mgO_2/dm^3), COD (chemical oxygen demand) 34.0 mgO_2/dm^3 (norm - 30 mgO_2/dm^3). In other bodies of surface water of the Desna River within the city limits (above discharge No. 1, the entrance to the drainage channel and below the discharge channel of the enterprise) the following was obtained: the content of dissolved oxygen at the level of 7.04-7.08-7.03 mgO_2/dm^3 and exceeding the total iron content of 0.323-0.328-0.320 mg/dm^3. In addition, an excess of BOD_5 (biological oxygen demand) at the level of 3.69-3.65 mgO_2/dm^3 was recorded in the structures above outlet No. 1 and the entrance to the drainage channel.

Thus, in summer, when the air and water temperature of the Desna River increases (with a sufficient amount of oxygen), the following is recorded: an excess of manganese and iron content of total, biological and chemical oxygen consumption. A possible explanation for this is the indicators of these parameters, which were recorded at the observation point of the Stryzhen River (Chernihiv), as a tributary of the Desna River, which affected its hydrochemical indicators.

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СУЧАСНІ МЕТОДИЧНІ ПІДХОДИ ДО ОЦІНКИ ТОКСИЧНОСТІ ТА ІДЕНТИФІКАЦІЇ КЛАСУ ЗАБРУДНЮЮЧИХ РЕЧОВИН, ЩО ПОТРАПЛЯЮТЬ У ВОДНІ ОБ'ЄКТИ ВНАСЛІДОК ВОЄННИХ ДІЙ

Дослідження виконано за підтримки Національного фонду наукових досліджень України — Проєкт 2023.04/0045 «Розробка уніфікованої тест-системи для оцінки токсичності та ідентифікації класу забруднюючих речовин, що потрапляють у водні об'єкти внаслідок воєнних дій».

В Україні нараховується понад 70 тис. річок та понад 20 тис. озер, які розташовані у дев'яти районах річкових басейнів. Загарбницька війна РФ проти України здійснює потужний та багатогранний вплив на водні ресурси та гідроекосистеми. Вже є багато свідчень про цілеспрямовані впливи воєнних дій на водні ресурси України, звітів міжнародних організацій, які розглядають наслідки цих впливів на інфраструктуру, водне господарство, якість води як ресурсу (Afanasyev, 2023).

Метою даної роботи був аналіз сучасних підходів щодо визначення класу забруднювачів, що спричиняють токсичність води і донних відкладів, за їх фізико-хімічними властивостями (фаза визначення), а також оцінка перспективи застосування цих підходів для виявлення чинників токсичності, пов'язаних з військовою активністю і воєнними діями.

Внаслідок військової активності, окрім частих випадків потрапляння у ґрунт та поверхневі води широкого спектру нафтопродуктів, також спостерігається надходження в навколишнє середовище значної кількості стійких хімічних сполук, які використовуються як військові вибухові речовини і боєприпаси, що може виступати небезпечним джерелом забруднення водних екосистем. Показано, що території, пов'язані з розташуванням військових об'єктів і проведенням воєнних (бойових) дій, потерпають від значного забруднення важкими металами (плюмбум, стибій, уран), а також органічними речовинами (динітротолуол, тринітротолуол, гексоген та інші) (Jergovic et al, 2010, Idzelis et al, 2006). Такі сполуки, як правило, не підлягають, або є стійкими до біологічного розкладання, довгий час залишаються біодоступними, становлячи ризик негативних наслідків для наземних та водних екосистем через їхню високу токсичність (Lima et al, 2011).

Оцінити комплексний вплив різноманітних забруднюючих речовин за рівнем токсичності дозволяє біотестування. Головні переваги цього підходу – простота та доступність прийомів їх постановки, висока чутливість тест-організмів до мінімальних концентрацій токсичних агентів, порівняно висока швидкість виконання, відсутність потреби у дорогих реактивах та устаткуванні. Інформативність біотестування може бути значно розширена і посилена за допомогою поєднання тестів на токсичність з виконанням певних процедур зі зразками води і донних відкладів, спрямованих на зниження біодоступності забруднювачів, що чинять токсичну дію. Виявилось, що цей