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The system of deterministic equations describing the processes of microplastic pollution influence in shallow water on the growth rate and development of a commercial fish population has the form:

$$(P_i)'_t + div(\mathbf{u}P_i) = \mu_i \Delta P_i + \varphi_i, i \in \overline{1,7},$$

where P_i is the concentration of i-th component: 1, 2 are phytoplankton (Chlorella vulgaris Beijer green algae and its metabolite), 3 is the biogenic substance, 4 is the zooplankton, 5 is the commercial fish (Abramis brama bream), 6, 7 are micro- and nanoplastics; $\mathbf{u}$ is the vector of water flow velocity; μ_i are diffusion coefficients; φ_i is a chemical and biological source [1].

The theorem. Let the equation of the considered system at $i = 5$ taking into account the environment fluctuations have the form: $\dot{P}_5 = (\alpha_5 - \beta_5 + y(t))P_5$, $m(t) = P_5^0 \exp\{(\alpha_5 - \beta_5)t\}$, $\sigma^2(t) = P_5^0 \exp\{2(\alpha_5 - \beta_5)t\}(\exp\{\sigma^2 t\} - 1)$, α_5, β_5 are growth rate and mortality of commercial fish; $\gamma = \alpha_5 - \beta_5$, P_5^0 is the concentration of P_5 at initial time; $m(t)$, $\sigma^2(t)$ are mathematical expectation and variance of fluctuations $y(t)$. Then, the probability of degeneration of Abramis brama increases over time at $\gamma < \sigma^2$, tending to unity in the limit – the population is probabilistically unstable, i.e. a sufficiently prolonged exposure to disturbances (penetration and ingestion of micro- and nanoplastics particles by fish) can most likely lead to its death. The probability of degeneration decreases at $\gamma > \sigma^2$ and tends to zero at $t \to \infty$ – the population is stable in this sense.

СПИСОК ЛИТЕРАТУРЫ

[1] A. Yu. Perevaryukha, “Models of population process with delay and the scenario for adaptive resistance to invasion”, *Computer Research and Modeling*, **14** **(1)** (2022), 147–161. DOI:10.20537/2076-7633-2022-14-1-147-161.

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