Perevaryukha A. Yu. (Saint-Petersburg, Russia) **Population model of pest with stochastic transition to the outbreak phase.**

In [1] we considered a model with a stochastic component for specific scenario of northern cod collapse 1992. Now we propose modification of the computational model for psyllid pest *Cardiaspina albitextura* outbreak scenario in Australia forest [2] after accidental release of population state from the control factors control interval Ω_s. Survival of generations $R = N(T)$ from $N(0) = \lambda S, S \in \Omega_S$ on the interval $t \in [0, \dots \xi, \omega \dots, T]$ we describe the stages of ontogeny by a predictively redefined system:

$$\frac{dN}{dt} = \begin{cases} -(\alpha \bar{w}(\xi) N(t) + \bar{\Theta}(N(0))\beta)\, N(t), 0 < t < \xi \\ -(\alpha_1 N(\xi)/w(\omega) + \beta) N(t), \xi < t < \omega, \\ -(\alpha_2 N(t)) N(t - \varsigma), \omega < t < T \end{cases} \quad (1)$$

$[0, \xi], [\xi, \omega]$ — duration of stages. α, β — indicators of mortality rates. $\Theta(N(0)) = [1 + \exp\left(-\kappa N(0)^2\right)], \lim_{N(0)\to\infty} \Theta(N(0)) = 1$ function determines the threshold reduction in reproduction efficiency for $S < \mathcal{L}$. Let the region of a small group of individuals $\mathcal{L} \subset U_1 \in \Omega_S$, where reproduction is due to random factors that we take into account, complementing the discrete–continuous model by indirect interaction. We will connect $\bar{\Theta}(N(0), w) = \Theta(N(0)) \times w(t)$ with the index of calculating the conditional dimensional development from the ODE equation: $\dot{w}(t) = [G/(N^{2/3} + \sigma)] \times \gamma$, $w(0) = w_0$, γ — uniformly distributed random variable. Obtained on the basis of unimodal dependence $\psi(x) = \bigcup_{N(0)} N(T), N(0) \in \mathbb{Z}^+$ numerical solutions of the Cauchy problem (1) on the interval $t \in [0, T]$ iteration trajectory $x_{n+1} = \psi(x_n), x_0 < \mathcal{L}$ has the properties of a bounded stochastic perturbation. Instead of a threshold point: $\psi(x_*) = x_* < \max \psi(x), \forall x < x_* - \epsilon$:$\lim_{n\to\infty} \psi^n(x_*) = U_0, U_0 < \epsilon$ so we create an interval of probabilistic behaviour of a trajectory that admits an event: $x_0 < x_*, \psi^k(x_0) > \max \psi(x)$ simulating a outbreak situation from a small group — the trajectory comes to a stable regime $\psi^p(x_i) = \psi^{p+2}(x_i), x_i > \max \psi(x)$, where there is no stochasticity. The model (1) combines stochastic and deterministic behaviour in ranges that do not have a smooth boundary for allowable insect pest values Ω_S.

REFERENCES

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