In this case the equations are

$$\left.\begin{aligned}\frac{dx}{dt} &= -\kappa xy\\ \frac{dy}{dt} &= \kappa xy - ly\\ \frac{dz}{dt} &= ly\end{aligned}\right\} \tag{29}$$

and as before $x + y + z = \mathrm{N}$.

Thus

$$\frac{dz}{dt} = l(\mathrm{N} - x - z),$$

and $\dfrac{dx}{dz} = -\dfrac{\kappa}{l}x$, whence $\log\dfrac{x_0}{x} = \dfrac{\kappa}{l}z$, since we assume that z_0 is zero.

Thus

$$\frac{dz}{dt} = l\left(\mathrm{N} - x_0 e^{-\frac{\kappa}{l}z} - z\right).$$

Since it is impossible from this equation to obtain z as an explicit function of t, we may expand the exponential term in powers of $\dfrac{\kappa}{l}z$, and we shall assume that $\dfrac{\kappa}{l}z$ is small compared with unity.