$$\tau \, dr_1/dt = -r_1 + S(-\beta r_2 - \varphi \, a_1 + I_1)$$
$$\tau_a \, da_1/dt = -a_1 + f_a(r_1)$$

$$\tau \, dr_2/dt = -r_2 + S(-\beta r_1 - \varphi \, a_2 + I_2)$$
$$\tau_a \, da_2/dt = -a_2 + f_a(r_2)$$

$$\tau_a >> \tau , \quad S(u)=1/(1+\exp[(\theta-u)/k])$$