Supplementary material

Supplementary material to the article "Ecological and evolutionary consequences of ontogenetic niche shifts in a predator-prey system"

1. Lotka-Volterra model

Lotka-Volterra model with ontogenetic niche shifts in the predator population. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - a_{NJ}JN - a_{NA}AN$$

$$\frac{dJ}{dt} = b_{NJ}a_{NJ}JN - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = b_{NA}a_{NA}AN + \gamma_{JA}J - \mu_A A$$

Figure 1. Schematic diagram of the model.

2. Parameterization

Parameterization of the model. The parameterization is based on the parameterization in Ebenman et al. (2005). The parameters are described in the following table:

Parameter	Description	Value
r	Intrinsic growth rate of prey	1
K	Carrying capacity of prey	1000
a_{NJ}	Attack rate of juveniles on prey	0.01
a_{NA}	Attack rate of adults on prey	0.01
a_{JA}	Attack rate of juveniles on adults	0.01
b_{NJ}	Conversion efficiency of prey into juveniles	0.1
b_{NA}	Conversion efficiency of prey into adults	0.1
μ_J	Mortality rate of juveniles	0.1
μ_A	Mortality rate of adults	0.1
γ_{JA}	Maturation rate of juveniles into adults	0.1

3. Prey-dependent Holling type II functional response

Prey-dependent Holling type II functional response. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 2. Schematic diagram of the model.

4. Prey-dependent Holling type II functional response with ontogenetic niche shifts

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 3. Schematic diagram of the model.

5. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 4. Schematic diagram of the model.

6. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 5. Schematic diagram of the model.

7. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 6. Schematic diagram of the model.

8. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 7. Schematic diagram of the model.

9. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 8. Schematic diagram of the model.

10. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 9. Schematic diagram of the model.

11. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 10. Schematic diagram of the model.

12. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 11. Schematic diagram of the model.

13. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 12. Schematic diagram of the model.

14. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 13. Schematic diagram of the model.

15. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 14. Schematic diagram of the model.

16. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 15. Schematic diagram of the model.

17. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 16. Schematic diagram of the model.

18. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 17. Schematic diagram of the model.

19. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 18. Schematic diagram of the model.

20. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 19. Schematic diagram of the model.

21. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 20. Schematic diagram of the model.

22. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 21. Schematic diagram of the model.

23. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 22. Schematic diagram of the model.

24. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 23. Schematic diagram of the model.

25. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_{NA}a_{NA}N} + \gamma_{JA}J - \mu_A A$$

Figure 24. Schematic diagram of the model.

26. Prey-dependent Holling type II functional response with ontogenetic niche shifts and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles

Prey-dependent Holling type II functional response with ontogenetic niche shifts in the predator population and predation on juveniles and adults and cannibalism and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults and predation on juveniles and adults. The model is based on the model in Ebenman et al. (2005). The model describes the dynamics of a population of prey (N) and a population of predators (P). The predator population is divided into two stages, juveniles (J) and adults (A). The prey population is assumed to have a carrying capacity (K). The model is described by the following equations:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - \frac{a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - \frac{a_{NA}AN}{1 + h_{NA}a_{NA}N}$$

$$\frac{dJ}{dt} = \frac{b_{NJ}a_{NJ}JN}{1 + h_{NJ}a_{NJ}N} - a_{JA}JA - \mu_J J - \gamma_{JA}J$$

$$\frac{dA}{dt} = \frac{b_{NA}a_{NA}AN}{1 + h_