Wikiprint Book

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8.10 Apply forcing function (consumer)

Forcing functions represent physical or other environmental parameters that may influence trophic interactions. These forcing functions can be used to modify the Q/B ratio of the consumer groups in the model (see Linking mediation and time forcing functions to trophic interaction rates?), or to directly influence primary production (see Primary production in Ecosim?).

To apply a forcing function to trophic flows (i.e., predator-prey interactions), use the *Apply FF (consumer)* form (*Time dynamic (Ecosim) > Input > Apply FF (consumer)*)'. To apply a forcing function to primary productivity directly, use the Apply FF (primary producer) form. Before using either *Apply FF* form, you must first define at least one seasonal or long-term forcing function instructions for using the Forcing function form.

The *Apply FF (consumer)* form consists of a grid representing predator (*j*) / prey (*i*) interactions (Figure 8.18). Predators are represented in columns with prey in rows. Predator/prey interactions, as defined in the Diet composition are indicated by white cells.

To apply a long-term forcing or seasonal function, select the *i,j* cell representing the predator/prey interaction to which you wish to apply the function. This will open the *Apply forcing and mediation functions* dialogue box (Figure 8.19). The affected prey and predator group will be displayed at the top of the form.

Next, select the parameter to which the forcing multiplier (represented by the forcing function) is to be applied using the radio buttons at the bottom of the dialogue box. There are four possible options:

i. Multiply overall predator rate of effective search ($a_{i,j}$), for example to represent time-varying turbidity changes that affect predator search efficiency or mediation effects of algal biomass on search efficiency.
ii. Multiply vulnerability exchange rate ($v_{i,j}$), for example to represent increased movement rates of prey into vulnerable behavioural state at times when water mixing rates are higher;
iii. Multiply area of foraging arenas (divide $a_{i,j}$ by multiplier), for example to represent increase in habitat area available for juvenile fish refuges;
iv. Multiply area (divide $a_{i,j}$) and also multiply $v_{i,j}$, for example to represent increase in safe foraging habitat available to a predator that feeds on prey that become available in foraging arenas through passive drift/mixing processes such that increasing area used by predator results in higher proportion of total prey population being available in foraging areas at any moment.

The selected modifier will be shown in the window *Applied shape functions* window (Figure 8.19).

Next, select the desired forcing or seasonal shape from the *Available shape functions* window at the left of the dialogue box by clicking the green arrow. This will move the shape function into the Applied shape functions window. You can remove a shape from this window by clicking the remove button immediately below the green arrow. Note that a common form is used to apply Mediation and Seasonal/Forcing? functions. Do not select a mediation function.

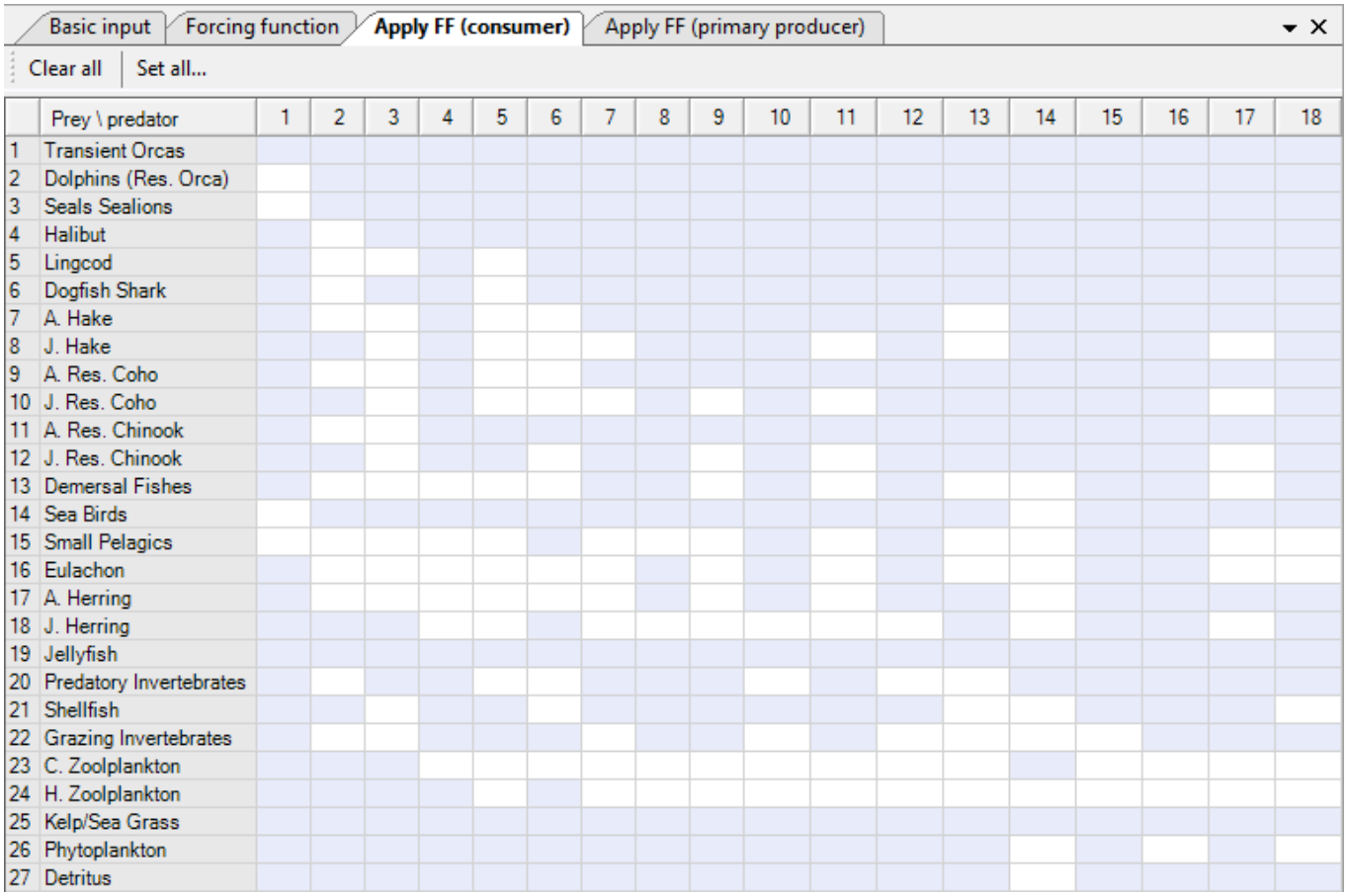
Finally, click *OK*. You should see the number of the forcing or seasonal function you selected in the predator/prey cell (preceded by ?F?).

Note that you can apply up to five seasonal, long-term forcing and/or mediation functions to each predator-prey interaction.

Clear all

You can clear all applied seasonal, forcing and/or mediation functions from the predator-prey grid by selecting *Clear all* from the top of the form.

To apply a forcing function to the interactions between a particular predator and all of its prey species, click on the number of the predator at the top of the form. When the *Apply forcing and mediation functions* dialogue box opens you will see a message at the top of the box reflecting that all the prey are affected.



	Prey \ predator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Transient Orcas																		
2	Dolphins (Res. Orca)																		
3	Seals Sealions																		
4	Halibut																		
5	Lingcod																		
6	Dogfish Shark																		
7	A. Hake																		
8	J. Hake																		
9	A. Res. Coho																		
10	J. Res. Coho																		
11	A. Res. Chinook																		
12	J. Res. Chinook																		
13	Demersal Fishes																		
14	Sea Birds																		
15	Small Pelagics																		
16	Eulachon																		
17	A. Herring																		
18	J. Herring																		
19	Jellyfish																		
20	Predatory Invertebrates																		
21	Shellfish																		
22	Grazing Invertebrates																		
23	C. Zoolplankton																		
24	H. Zoolplankton																		
25	Kelp/Sea Grass																		
26	Phytoplankton																		
27	Detritus																		

Figure 8.18 The *Apply FF (consumer)* form'

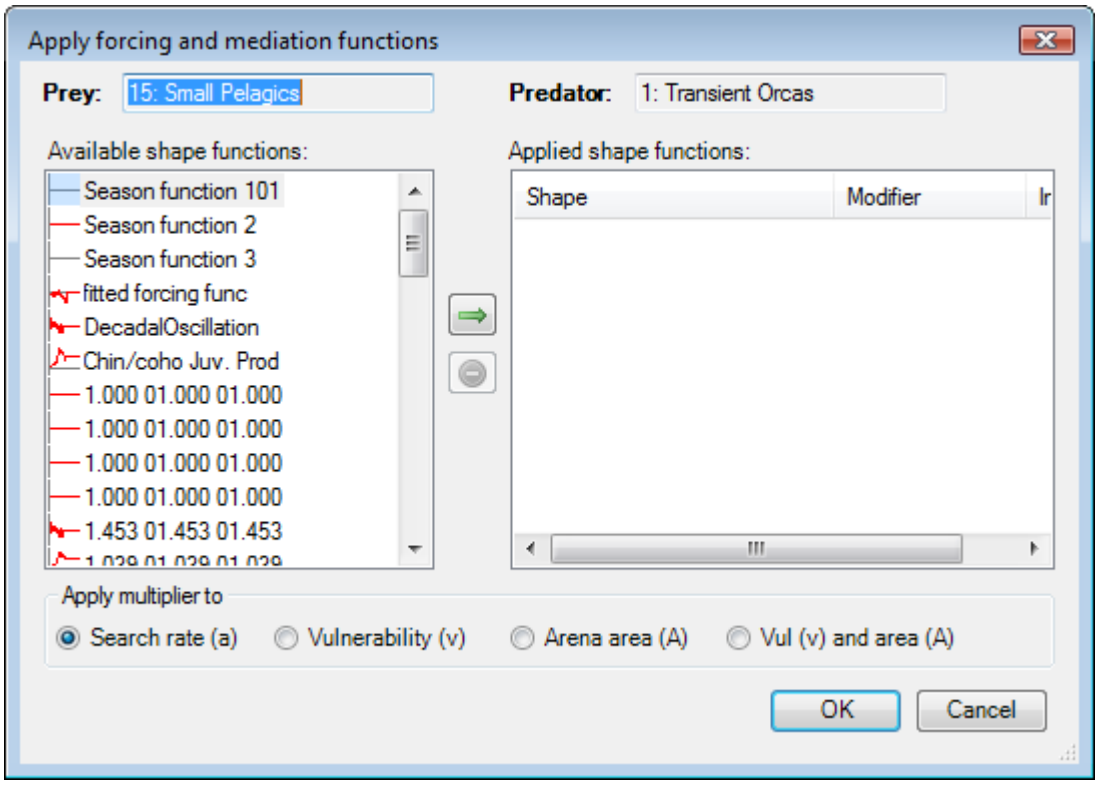


Figure 8.19 The ***Apply forcing and mediation functions*** dialogue box. Select only Forcing shapes.'