Table 5. The major parameters and input required to initialize and execute the multispecies class of Minimal Realistic Models (MRM), with notations of the major structural features.

			Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Model Class	Multispecies MRMs								
	Model	MS PROD			N				Variable, is a simulator, but typically 1963-2010; 30-50 yr runs
		Required Inputs							
		N_i	Biomass or abundance of each stock, i.	D		biomass or #	Survey data	N	
		S_{ij}	Spatial overlap between each pair of stocks, i and j.	S		unitless	Survey data	N	
		PelDem	Pelagic or demersal designation	S		unitless	Survey data	N	
		Required Parameters							
		r_i	Growth rate for each stock, i.	S		unitless	Survey data, age data, Assessment models	Y (if stochasticity used)	
		K_g	Carrying capacities for each guild, g.	S		biomass or #, usually mt	Survey data, Assessment models	N	
		K_s	System carrying capacity	S		biomass or #, usually mt	Survey data, Assessment models	N	
		α_{ij}	Predation interaction strength between each predator, j, and prey, i.	S		unitless	food habits data, Literature	N	
		β_{ig}	Between guild competition coefficients of each guild g on each individual stock i within a specific guild.	S		unitless	Food habits data, Literature	N	
		β_{ij}	Within guild competition coefficients between each pair of stocks I and j	S		unitless	Food habits data, Literature	N	

Table 5, continued. The major parameters and input required to initialize and execute the multispecies class of Minimal Realistic Models (MRM), with notations of the major structural features.

			Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Model Class	Multispecies MRMs								
	Model	MSYPR			N				In NEUS, usually 40+ yrs (1963-present)
		Required Inputs							
		R	Vector of Recruits	D		biomass or #	Survey data, age data	Y	
		SSB	Vector of Spawning Stock Biomass	D		biomass or #	Survey data, age data	Y	
		various	gear types	S		variable	Landings data, economic data	varies	
		Required Parameters							
		α_{ij}	scalar	S		unitless	derived	N	
		β_{ij}	Exponential modifier	S		unitless	derived	N	
		γ_{ij}	Exponential modifier for covariates	S		unitless	derived	N	
		various	interaction coefficient	S		rate, B per yr	derived	N	
		q, λ	Selectivity & Catchability	S		unitless	derived, survey data, landings data	N	
		$F_{xx\%}$	Fishing Mortality	S		unitless	derived	Y	

Table 5, continued. The major parameters and input required to initialize and execute the multispecies class of Minimal Realistic Models (MRM), with notations of the major structural features.

			Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Model Class	Multispecies MRMs								
	Model	MVTS-Gompertz			N				In NEUS, usually 40+ yrs (1963-present)
		Required Inputs							
		Abundance Estimates				Biomass	survey data	Y	
		Catch or Fishing Effort				Biomass or DAS	landings data	Y	
		Environmental Data				various	various	Y	
		Required Parameters							
		β_{ij}	elements of intercept vector			unitless	derived	N	
		α_{ij}	elements of transition matrix			unitless	derived	N	
		γ_{ij}	elements of covariate vector			unitless	derived	N	

Table 5, continued. The major parameters and input required to initialize and execute the multispecies class of Minimal Realistic Models (MRM), with notations of the major structural features.

			Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Model Class	Multispecies MRMs								
	Model	MS SPMW							
		Required Inputs			N				In NEUS, usually 40+ yrs (1963-present)
		B_i	Vector of biomass	D		Biomass (e.g. mt)	Survey data	Y	
		L_i	Vector of landings (or catch)	D		Biomass (e.g. mt)	Landings data	Y	
		various	covariates	D		variable	various	varies	
		Required Parameters							
		r (derives Fmsy)	exponential rate of growth	S		rate, B per yr	derived	Y	
		K (derives Bmsy)	carrying capacity	S		biomass	derived	Y	
		α_{ij}	Ecological interaction coefficient between each predator, j, and prey, i.	S		unitless	food habits data	N	
		optional βs	other tuning measures, associated with covariates	S		unitless	derived	varies	

Table 5, continued. The major parameters and input required to initialize and execute the EMs, with notations of the major structural features.

			Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Model Class	Multispecies MRMs								
	Model	MSVPA-X							
		Required Inputs			N				In NEUS, usually 40+ yrs (1963-present); 1973-2002 typical/latest
		$\mathbf{N}_{i,a}$	Matrix of N	D		#	Survey data, age data	Y	
		$\mathbf{B}_{i,a}$	Matrix of B	D		biomass	Survey data, age data	Y	
		$\mathbf{W}_{i,a}$	Wt-at-age	S		biomass	Survey data, age data	Y	
		$\mathbf{O}_{i,a}$	Age-at-matruity	S		year	Survey data, age data	Y	
		$\mathbf{L}_{i,a}$	Catch-at-age	D		biomass	Landings data, age data	Y	
		$C_{i,j,a}$	Consumption	D		biomass per yr	food habits data	Y	
		$\nu_{i,j,a}$	vulnerability/suitability	S		unitless	food habits data	N	
		S_i	Stomach contents	D		biomass	food habits data	Y	
		SO_{ij}	Spatial overlap between each pair of stocks, i and j.	S		unitless	Survey overlap matrix	N	
		AB	altnerate prey biomass	S		biomass	Survey data, process studies, NEUS FW Models	N	
		w_{ij}	pred/prey wt ratio	S		unitless	food habits data	N	
		various	covariates, usually in matrices at age	D		various	Oceanographic data, Climatological data	varies	

Table 5, continued. The major parameters and input required to initialize and execute the multispecies class of Minimal Realistic Models (MRM), with notations of the major structural features.

	Data description	Inputs Static (S) or Dynamic (D)	Spatially resolved (Y or N) [does not mean it is not done for different regions, but directly in the model]	units	Origin, source, or method for derivation of value	Variance incorporated (Y or N)	Timeframe for derivation of value
Required Parameters							
q, λ	Selectivity & Catchability	S		unitless	Survey data, model dervied	N	
g	Growth between ages; in some forms	S		unitless	Age data	Y	
F	Total Fishing Mortality	S		unitless	derived	Y	
M2	Total Predation Mortality	S		unitless	derived	Y	
M1	Total other Natural Mortality	S		unitless	derived/set	N	
$A_{i,j,a}$	Preference/prey selectivity	S		unitless	food habits data, Literature	N	
α_{ij}	consumption scalar	S		unitless	food habits data	N	
β_{ij}	Consumption Exponential modifier	S		unitless	food habits data	N	
$\eta_{ia,jb}$	size selectivity	S		unitless	food habits data	N	

note, there are other possible parameters depending upon the functional forms of the various submodels used, but these represent the major, consistently used ones across various applications of MSVPA and particularly MSVPA-X