

1 Data structures

The following is a list of the input data structures used in data file for Gmacs.

Table 1: Input data structures

Variable	Symbol	Type	Description
styr	t	int	Start year
endyr	t	int	End year
tstep	NA	double	time step
ndata		int	number of data groups
nsex	s	int	number of sexes
nshell	v	int	number of shell conditions
nmature	m	int	number of maturity states
nclass	l	int	number of size classes in the model
ndclass	l	int	number of size classes in the data
ncol		int	number of columns in N-matrix
class_link		matrix(1,nclass,1,2)	links between model and data size-classes.

Indexes For consistency the following indexes are used to describe the various model dimensions:

g index for group (sex, shell condition, maturity state),

h index for sex,

i index for year,

j index for season or month,

k index for fleet,

l index for length class,

m index for maturity state,

n index for shell condition,

Table 2: Statistical catch-at-length model used in Gmacs

Estimated parameters	
$\Theta = (M_0, \ln(\bar{R}), R_\alpha, R_\beta, \alpha_h, \beta_h, b_h)$	(T2.1)
$\sigma^2 = \rho/\vartheta^2, \quad \tau^2 = (1 - \rho)/\vartheta^2$	(T2.2)
Unobserved states	
$N_{g,t,l}, Z_{g,t,l}$	(T2.3)
Recruitment size distribution	
$\alpha = R_\alpha/R_\beta$	(T2.4)
$p(R_l) = \int_{x_l-0.5\Delta x}^{x_l+0.5\Delta x} \frac{x_l^{\alpha-1} e^{x_l/R_\beta}}{\Gamma(\alpha) x_l^\alpha} dx$	(T2.5)
Molt increment & size transition	
$a_{h,l} = \alpha_h + \beta_h x_l$	(T2.6)
$p(x_l, x_{l'})_h = \int_{x_l-0.5\Delta x}^{x_l+0.5\Delta x} \frac{x_l^{a_{h,l}-1} e^{x_l/b_h}}{\Gamma(a_{h,l}) x_l^{a_{h,l}}} dx$	(T2.7)
