**ATM model structure and user interface**

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**Purpose** **of document**:

R package ATM includes many different forms of documentation. This “ATM model structure and user interface” document is intended to complement these other resources by documenting and describing the model structure (all model equations and notation). However, I have not added much yet. Please see reference documentation for explanation of the user interface, and GitHub wiki for examples.

Table 1 – Explanation of parameters including symbol from Thorson et al. (2021) and see Appendices for full list, as well as the name in TMB code, and explanation for the action of that parameter

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| **Coefficient** | **Code** | **Explanation** |
|  | ln\_sigma\_l | Vector of coefficients, transformed to generate diffusion-rate parameters. In Thorson et al. (2021), ln\_sigma\_l was a one-length vector that was equal to constant log-diffusion rate |
|  | alpha\_logit\_ratio\_k | Vector of coefficients transformed to generate covariate-response coefficients that define the preference function |
|  | ln\_H\_input | Values are transformed to generate matrix representing geometric anisotropy |
|  | ln\_kappa | Decorrelation rate |
|  | ln\_sigma\_epsilon0 | Magnitude of spatial variation in initial time (representing net effect of processes prior to model start) |
|  | ln\_sigma\_epsilon | Magnitude of spatio-temporal variation in each interval, relative to prediction from previous one. |
|  | power\_prime | Tweedie power |
|  | ln\_phi | Tweedie variance scaling parameter, such that variance |
|  | ln\_CV |  |
|  | lambda | Fishing power ratio for fishery relative to survey |
|  | Beta\_t | Changes in overall abundance between time-intervals |
|  | ln\_d\_st | Log-numerical density at each location and time |