# Equation setup

* : time. At the moment I’m just using and in a before-and-after setup, but I think you should be able to extend this to time *series*.
* , : Total energy at ,
* , : Total number of individuals at ,
* : Average energy at , ;
* : Change in total energy as the ratio
* : Change in total individuals as
* : Change in average energy as .
  + Tells us how the size spectrum is shifting.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *dE* | *de* | *dN* <1 | *dN* = 1 | *dN* >1 | Dominant signal |
| *dE* <1 | *de* <1 | Large species **must** decline  **If** small species decline, they must decline proportionately less than large species. They may increase or remain the same | Large species **must** decline Small species **must** increase | Large species **must** decline  Small species **must** increase | Overall resource declines, the weight of which falls on large species.  Possible loss of resources used by large species, but not accessible to small species. |
| *de* = 1 | Entire community declines without changing structurally. |  |  | Overall resource declines, no size bias. |
| *de* >1 | Small species **must** decline  **If** large species decline, they must decline proportionately less than small species. They may increase or remain the same |  |  | Overall resource declines, the weight of which falls on small species. |
| *dE* = 1 | *de* <1 |  |  | Large species decline and small species increase to complete compensation. | Resource base remains the same *amount* but changes *form* such that it is more accessible to small species. [PORTAL] |
| *de* = 1 |  | Entire community is stable. |  | Any change in resources or species is orthogonal to size. |
| *de* >1 | Small species decline and large species increase to complete compensation. |  |  | Resource base remains the same *amount* but changes *form* such that it is more accessible to large species. |
| *dE* >1 | *de* <1 |  |  | Small species **must** increase  **If** large species increase, must increase proportionally less than small species. They may decline or remain the same. | Resources become more abundant, disproportionately to small species.  Possible increase in resources available only to small species. |
| *de* = 1 |  |  | Entire community amplifies without changing structurally. | Overall resource increase, no size bias. |
| *de* >1 | Small species **must** decline  Large species **must** increase | Small species **must** decline  Large species **must** increase | Large species **must** increase  **If** small species increase, must increase proportionally less than large species. They may decrease or remain the same. | Resources become more abundant, disproportionately to large species. |
| Advantage shift | To small |  |  |  |  |
| No shift |  |
| To large |  |