Data Set Citation

When using this data, please cite the data package

NCEAS 10022: Shurin: Comparing trophic structure across ecosystems , NCEAS 11981: Shurin: Comparing trophic structure across ecosystems (Extended) , National Center for Ecological Analysis and Synthesis , and Elser J. 2007. ***Global analysis of nitrogen and phosphorus limitation*** *nceas.347.3 (https://knb.ecoinformatics.org/knb/metacat/nceas.347.3/default)*

General Information

Title:	**Global analysis of nitrogen and phosphorus limitation**
Identifier:	autogen.2012062222520061343.1
Alternate Identifier:	ELSIE.NP
Abstract:	The cycles of the key nutrient elements nitrogen (N) and phosphorus (P) have been massively altered by anthropogenic activities to understand how photosynthetic production across diverse ecosystems is, or is not, limited by N and P. Via a large-scale meta- experimental enrichments, we show that P limitation is equally strong across these major habitats and that N and P limitation are both terrestrial and freshwater systems. Furthermore, simultaneous N and P enrichment produces strongly positive synergistic re environments. Thus, contrary to some prevailing paradigms, freshwater, marine and terrestrial ecosystems are surprisingly simila limitation.
Keywords:	None: ◦ nutrient resources None: ◦ nitrogen None: ◦ phophorus None: ◦ fertilization None: ◦ plant community None: ◦ bottom-up None: ◦ primary producer biomass None: ◦ experimental manipulation None:

	○ marine, terrestrial, freshwater ecosystems
Publication Date:	2007-10-01

Data Table, Image, and Other Data Details:

Metadata download	Ecological Metadata Language (EML) File

Data Table:

Name:	**np-analysis-dataset-out-for-datasharing.txt**
Description:	np analysis

Physical Structure Description:

Object Name:	np-analysis-dataset-out-for-datasharing.txt
Size:	348062 byte
Text Format:	Number of Header Lines: 1 Record Delimiter: #x0A Attribute Orientation: column Simple Delimited: Field Delimeter:

Number Of Records:	1062

Online Distribution Info:

ecogrid://knb/nceasadmin.910.2

Attribute(s) Info:

Name	Column Label	Definition	Type of Value	Measurement Type	Measurement Domain	Missing Value Code	Accuracy Report	Accuracy Assessmer
id_study		Initials of recorder & number (e.g., HLH001)		nominal	**Def** id			
system		categories: marine, terrestrial, freshwater		nominal	**Def** system			
strata		categories: pelagic, benthic, aboveground, belowground		nominal	**Def** strata			
habitat		agricultural; forest; herbaceous; tundra; shrubland; wetland; stream; lake; coral reef; coastal hard bottom; coastal soft bottom; oceanic (e.g. shrubland=savannah, categories: succesional woodland, desert scrub, oldfields {sometimes}) (e.g. herbaceous=grasslands,meadows, oldfields {sometimes}, rangeland)		nominal	**Def** habitat			
cat		categories: marine(BENTH HARD, BENTH SOFT, PELAGIC); freshwater(LAKE BENTHIC, LAKE PELAGIC,STREAM); terrestrial(HERBACEOUS,WETLAND,WOODY,TUNDRA)		nominal	**Def** categoreis			
tax_resp_class		categories: BIOMASS (standing stock), BIORATE (growth rate or increment), BIOPROD (productivity)		nominal	**Def** categories			
l.n.c		natural log response ratio effect size for nitrogen addition		ratio	**Unit** dimensionless **Precision** .000000001 **Type** real			
l.p.c		natural log response ratio effect size for phosphorus addition		ratio	**Unit** dimensionless **Precision** .000000001			

			Type real
l.int.c	natural log response ratio effect size for nitrogen + phosphorus addition	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
Date_entry	Date data are enterred (eg, 20050930 - YYYYMMDD)	datetime	**Format** YYYYMMDD **Precision** 1 day
author	Authors (last names; two or more use "&&" or "et al"	nominal	**Def** authors
pubyear	Publication year	datetime	**Format** YYYY **Precision** 1 year
citation	Journal name, volume, pages	nominal	**Def** Journal name, volume, pages
publication	Journal name - use existing syntax to enhance ability to search and sort	nominal	**Def** journal name
pubvol	Volume number of publication	nominal	**Def** Volume number
pages	pages of article	nominal	**Def** page numbers
hab_descrip	unique descriptor of habitat studied - e.g., rocky intertidal, swamp, rangeland, old field etc.	nominal	**Def** description of habitat
location	place name, country, site	nominal	**Def** location
latitud	latitude from -90 (S) to +90 (N)	ratio	**Unit** degree **Precision** .01 **Type** real
longitud	longitude from -180 (W) to +180 (E)	ratio	**Unit** degree **Precision** .01 **Type** real
elev	Elevation (m) Depth below sea level is negative	ratio	**Unit** meter **Precision** .1 **Type** real
n_avail	Ambient concentration of available nitrogen (micromol g-1 for terrestrial micromol l-1 aquatic)	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
n_total	Total N concentration (micromol g-1 for terrestrial micromol l-1 aquatic)	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
p_avail	Total P concentration (micromol g-1 for terrestrial micromol l-1 aquatic)	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
p_total	Total P concentration (micromol g-1 for terrestrial micromol l-1 aquatic)	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
c_total	Total C concentration (micromol g-1 for terrestrial micromol l-1 aquatic)	ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
pH	pH	ratio	**Unit** dimensionless

				Precision .1 Type real			
light		Mean daily irradiance (µmol photons m-2 s-1) [manipulated]	ratio	Unit dimensionless Precision .000000001 Type real			
temp		Mean temperature over experiment duration °C	ratio	Unit celsius Precision .1 Type real			
precip		Average annual rainfall, during experiment if possible (mm)	ratio	Unit dimensionless Precision .1 Type real			
npp		Net primary production (g m-2 yr-1)	ratio	Unit dimensionless Precision 1 Type whole			
npp_typ		1=Total; 2=Aboveground; 3=Belowground	nominal	Domain Info			
ab		Total autotroph measure (standing crop) (g C m-2)	ratio	Unit dimensionless Precision .000000001 Type real			
ab_unit		Max; min; mean; total	nominal	Def max or min or mean or total			
study_typ		Lab: field	nominal	Def Lab or field			
cons_man		Type of consumer manipulation: Exclosures; Enclosures (including most additions); Removal (e.g. pesticides, hand picking); Gradient (was Natural Variation); None; Multiple (if complex two or more of these)	nominal	Def manipulation types			
HA		1; 0 - Herbivore:Autotroph ratio in rough classes at community level; 1 = H:A much less than 1; 2 = H:A close to 1 (if you have to think about it too much, it is probably this); 3 = H:A larger than 1	ratio	Unit dimensionless Precision 1 Type whole			
fert		1; 0	ratio	Unit dimensionless Precision 1 Type real			
fdchlg_man		1; 2; 3 or 4 - highest level subject to manipulation (not measurement)	ratio	Unit dimensionless Precision 1 Type real			
num_nut_tmnt		number of manipulated unique nutrient *main* factors (factorial of main tmnts does not count)	ratio	Unit dimensionless Precision 1 Type real			
num_nut		total number of nutrients -- sum everything named ; osmocote ="21"	ratio	Unit dimensionless Precision 1 Type real			
duration		Duration of experiment in days	ratio	Unit dimensionless Precision .1 Type real			
fert_area		measurement area of the experimental unit : m² for fertilization manipulation	ratio	Unit squareMeter Precision .000000001			

				Type real
cons_area	Area of the experimental unit : m² for consumer manipulation		ratio	**Unit** squareMeter **Precision** .000000001 **Type** real
vol	Volume of the experimental unit : litre		ratio	**Unit** liter **Precision** .1 **Type** real
fert_unit	units of fertilization added		nominal	**Def** unit of measurement description
p_rate	rate of P addition		ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
n_rate	rate of N addition		ratio	**Unit** dimensionless **Precision** .000000001 **Type** real
meta_source	Name of database or meta-analysis that provided source data (e.g., Helmut periphyton database)		nominal	**Def** Database name
note_study	general description, notes, special conditions on study tagged with column name if relevant		nominal	**Def** notes

Involved Parties

Data Set Creators

Organization:	**NCEAS 10022: Shurin: Comparing trophic structure across ecosystems**

Organization:	**NCEAS 11981: Shurin: Comparing trophic structure across ecosystems (Extended)**

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Individual:	**Jonathan Shurin**
Individual:	**Jennifer Smith**

Metadata Providers

Individual:	**Daniel Gruner**

Data Set Characteristics

Geographic Region:

Geographic Description:	Meta-analysis of global data from seven continents.
Bounding Coordinates:	West: -180.0000 degrees East: 180.0000 degrees North: 90.0000 degrees South: -90.0000 degrees

Time Period:

Begin:	2005-04-01
End:	2007-11-01

Sampling, Processing and Quality Control Methods

Step by Step Procedures

Step 1:

Description:

Global analysis of nitrogen and phosphorus limitation: methods

Relevant studies were identified by searching titles and abstracts of publications returned from searches on ISI Web of Science using c words such as nitrogen, phosphorus, nutrient, enrichment, fertilization and bioassay. We also included studies summarized in previousl syntheses (DiTommaso & Aarssen 1989; Elser et al. 1990; Tanner et al. 1998; Downing et al. 1999b) and searched all subsequent pap syntheses. For studies that included additional manipulations (such as grazer exclusion), we included only treatment combinations usin controls (grazers at natural densities). Studies including such secondary manipulations were a small subset of our data. Studies were ir involved (minimally) independent manipulations of both N and P availability or (ideally) full factorial manipulations of N and P. (Some stu and P enrichment but did not apply, or report data from, both treatments in all individual experiments. Thus, the numbers of observation responses are not necessarily identical.) By including only studies that manipulated both N and P, we minimized potential biases induce focus on particular limiting nutrients thought to be most important in particular kinds of ecosystems. Furthermore, we analysed the data which all data were included and another in which only data from fully factorial experiments were included. The overall patterns were th approaches. Thus, we present the results for the more inclusive data set in order to increase the scope of habitats and experimental ap encompassed.

We included only studies that reported mean community-level biomass or production responses of autotrophs to nutrient enrichment. S responses were eliminated unless drawn from a mono-dominant community in the judgment of the original authors or, if several species were individually assayed for N and P response, an average across all species was taken for a given study. The preferred metric was b (terrestrial, wetland, benthic) or volume (pelagic). We also accepted proxy variables that are known to be correlated with standing bioma chlorophyll concentration (most common in phytoplankton studies), ash-free dry mass, carbon mass, biovolume, percent cover and prin Many studies in forests and other systems dominated by woody plants and a small percent of marine benthos studies reported increme height or radius) rather than standing biomass. Inclusion of these studies did not qualitatively change the results of our analyses, and s from the larger inclusive data set. Studies involving organism counts were excluded because of the orders-of-magnitude discrepancies among systems, and the expected inverse relation between organism size and abundance (Cohen et al. 1993; Cyr et al. 1997).

We defined a study as a temporally and spatially distinct experiment with internally consistent controls. Multiple studies could be reporte publication, for instance, if the same experimental treatments were performed in multiple streams with differing water quality or for wate from different stations along an oceanographic transect. When multiple measures were reported over time in a single experiment, we g temporal sample to avoid phases of transient dynamics in order to capture measures closer to when the system approached a potential added nutrients. Exceptions were made to standardize duration within systems or to avoid excessively long incubations (mainly for bioa freshwater or marine phytoplankton). Data for multiple sampling dates in extended studies were averaged if phenological changes nece mean values over all samples instead of the final value in order to be more ecologically relevant. In these cases, we used the most robu deferring to the working knowledge and intuition of the original authors.

We used the ln-transformed response ratio as our primary effect size metric RRX = ln (Eâ C), where E is the measured value of the res enrichment treatment X (N or P or N P) and C is its value in the unenriched control treatment. RR is one of the most frequently used eff ecological meta-analysis (Hedges et al. 1999; Lajeunesse & Forbes 2003). Unlike Hedge s d, the ln-response ratio does not require a m variability. Moreover, in comparisons across systems where response variables and experimental designs can differ considerably, the a relative to the control is more meaningful than standardized absolute differences between means.

For each study, we used a unique study identifier linked to the citation of the publication and obtained the following information whereve categorized the system as marine, terrestrial, or freshwater and the stratum within each system by assigning aquatic studies to either p subcategories and the terrestrial to either aboveground or belowground. Some studies in wetlands and salt marshes were difficult to ca we used the operational approach that studies addressing submersed or floating macrophytes, or microalgae growing on them, were cl (marine or freshwater), whereas studies on above-water rooted plants were termed terrestrial. For studies involving submersed macrop nutrients were added to the sediments, only responses of the macrophytes were included. When nutrients were added to the overlying responses of the epiphytes were included. Finally, we also created a standardized set for habitat subcategories consisting of: grassland forest â shrubland; wetland; stream; lake pelagic; lake benthos; marine benthos (hard bottom), marine benthos (soft bottom); or marine entered supporting data about incubation conditions and the local environment, including concentrations of available nutrients (nitrate, a reactive phosphorus).

Data Set Usage Rights

Obtain permission from data set owner(s)

Access Control:	
Auth System:	knb
Order:	denyFirst