

ATRIBUTOS
RELEVANTES EN LA
CLASIFICACIÓN Y
ECOLOGÍA DE DE
HUMEDALES





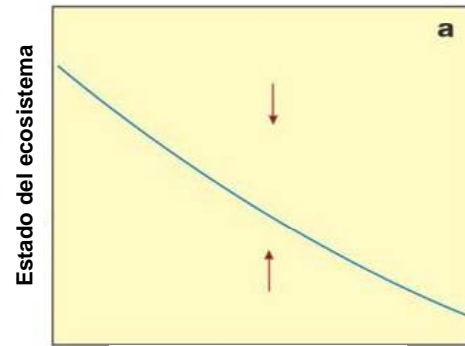
- SALGA
- HUMEDALES
- ALGUNOS ATRIBUTOS CLAVES

South American Lake Gradient Analysis Project SALGA

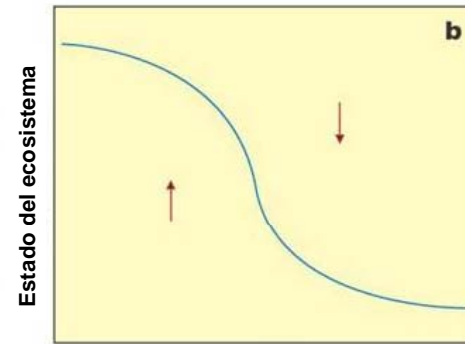


TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009

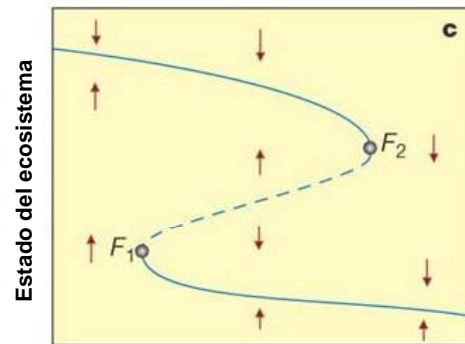
ESTADOS ALTERNATIVOS EN ECOLOGIA



Condiciones externas

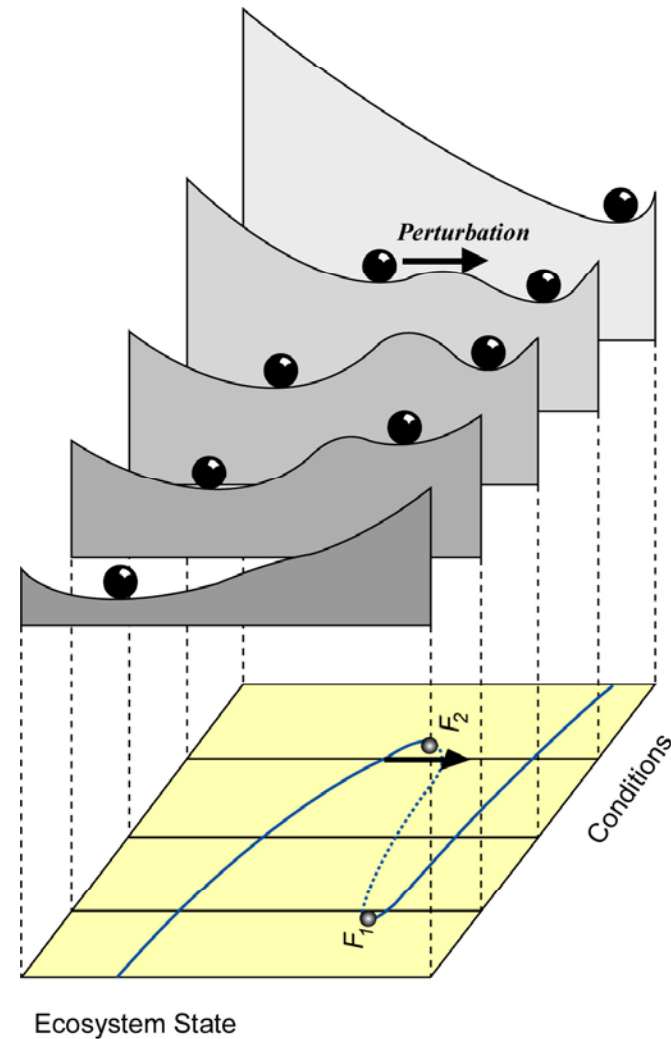


Condiciones externas



Condiciones externas

- Los impactos de las actividades humanas sobre los ecosistemas frecuentemente demoran en manifestarse.
- Algunos cambios son difíciles de predecir porque son graduales hasta que alcanzan un umbral, a partir del cual los cambios ocurren bruscamente.

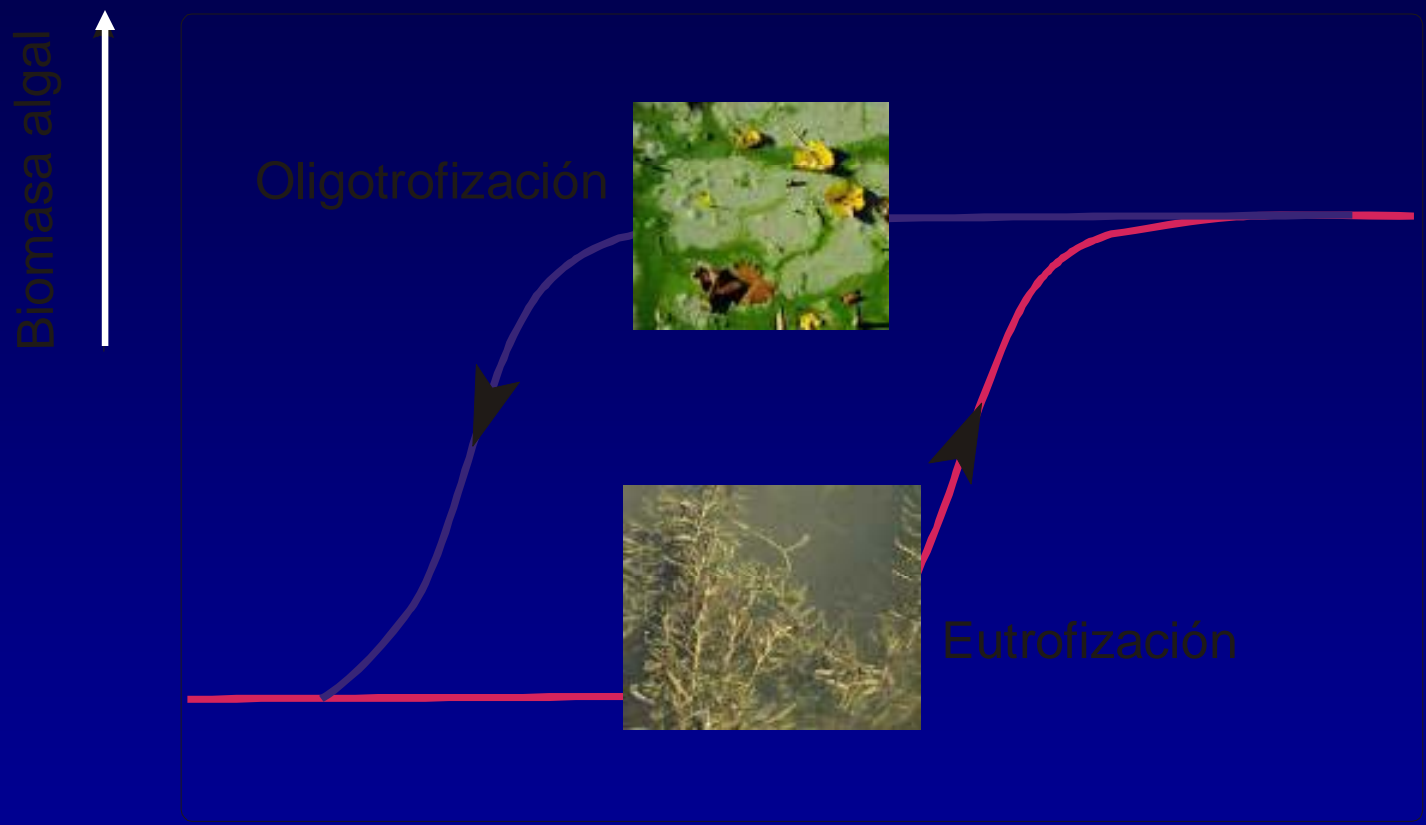


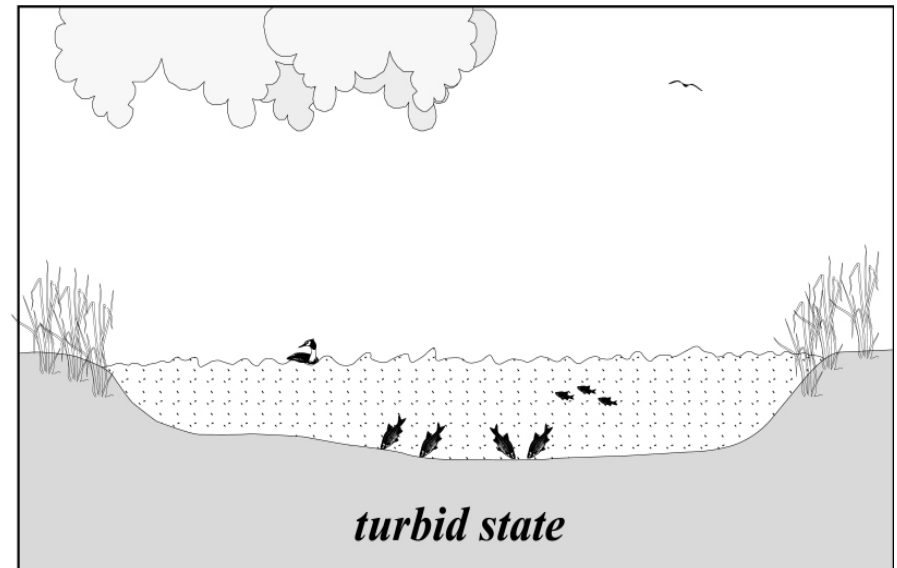
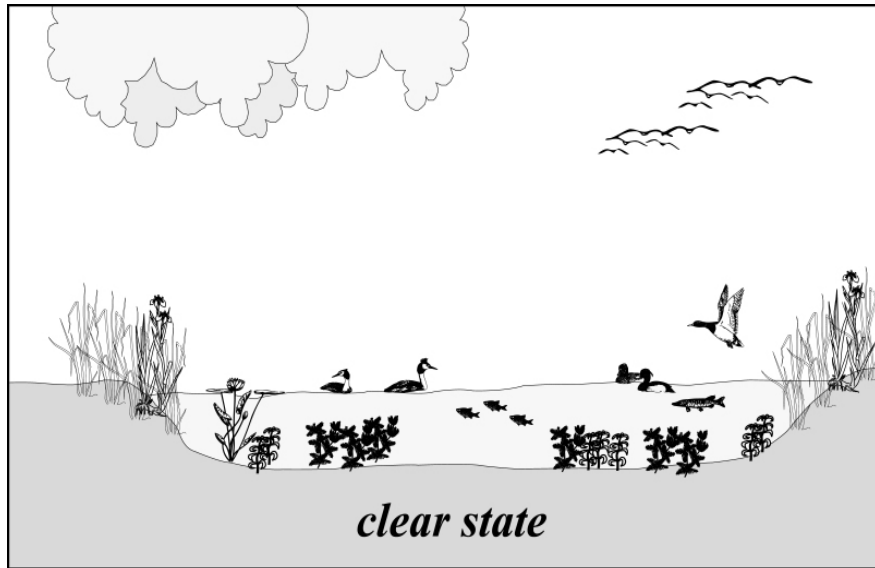
Los ambientes acuáticos someros (profundidad media < 4m) son uno de los ecosistemas mejor comprendidos en términos de estabilidad y dinámica de sus principales comunidades bióticas.



Una de las propiedades más destacables de estos ecosistemas es que presentan dos estados muy diferentes: un estado dominado por plantas acuáticas o un estado turbio debido a resuspensión del sedimento y/o aumento de la biomasa algal.







El estado turbio suele presentar una menor biodiversidad de aves, peces e invertebrados, y varios problemas de calidad del agua que reducen su utilidad. En particular, el crecimiento no controlado de cianobacterias en largo turbios provocan serios problemas de sabor y olor en el agua, y puede causar en algunas circunstancias toxicidad.

Sample sites





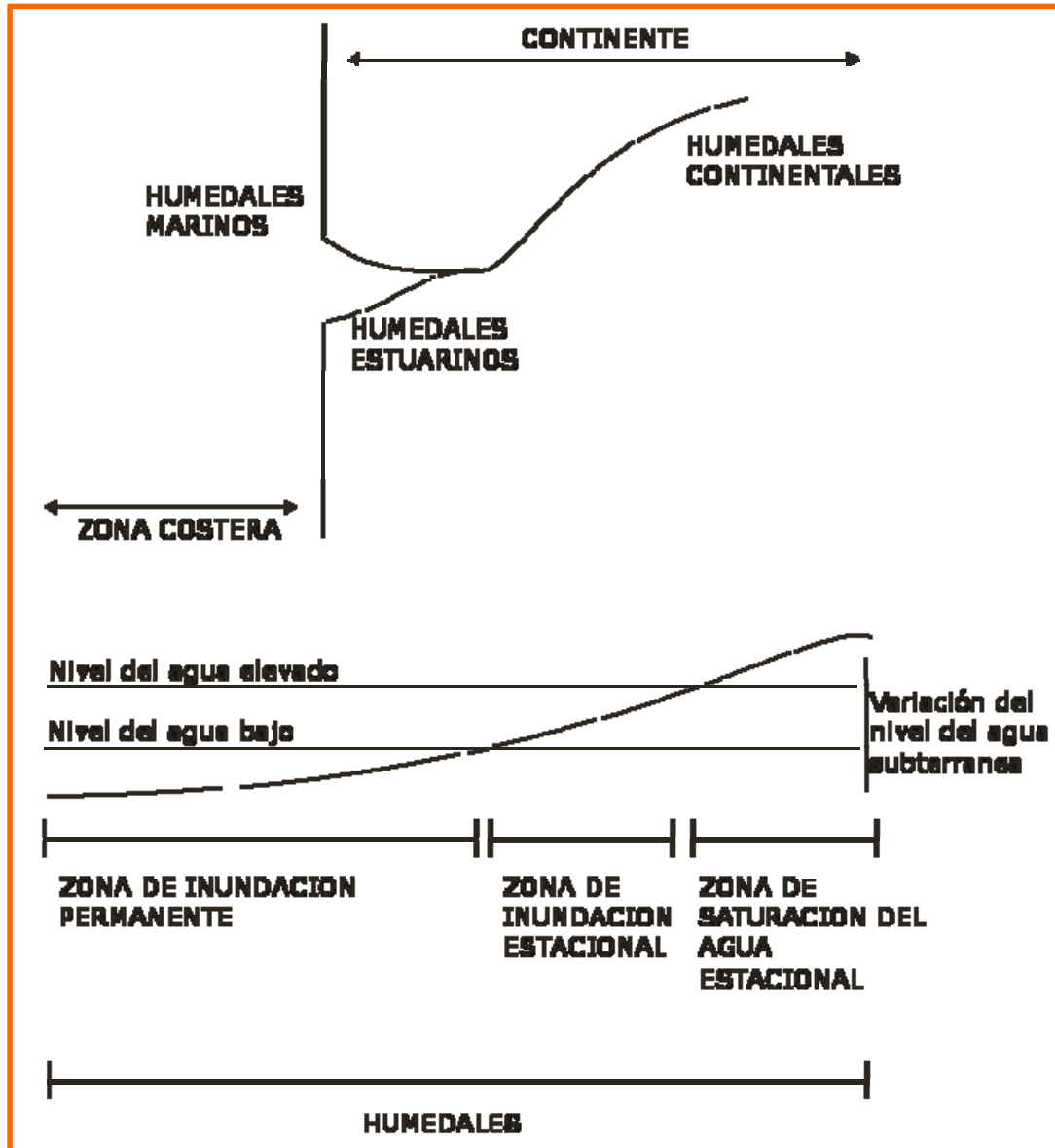
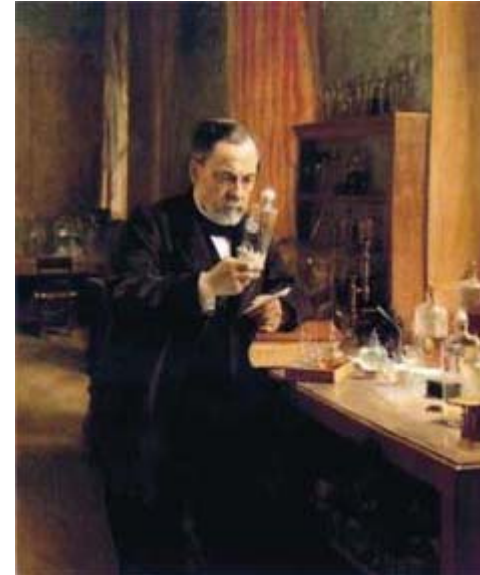


Table 3-5 Comparison of terms used to describe similar inland nonforested freshwater wetlands

North American terminology	← Marsh or fen →		← Bog →	
European terminology	← Swamp →	← Marsh →	← Fen →	← Bog →
Characteristics				
Vegetation	← Reeds →	← Grasses and sedges →	← Mosses →	
Hydrology	← Rheotrophic →		← Ombrotrophic →	
Soil	← Mineral →		← Peat →	
pH	← Roughly neutral →		← Acid →	
Trophic state	← Eutrophic →	← Mesotrophic →	← Oligotrophic →	

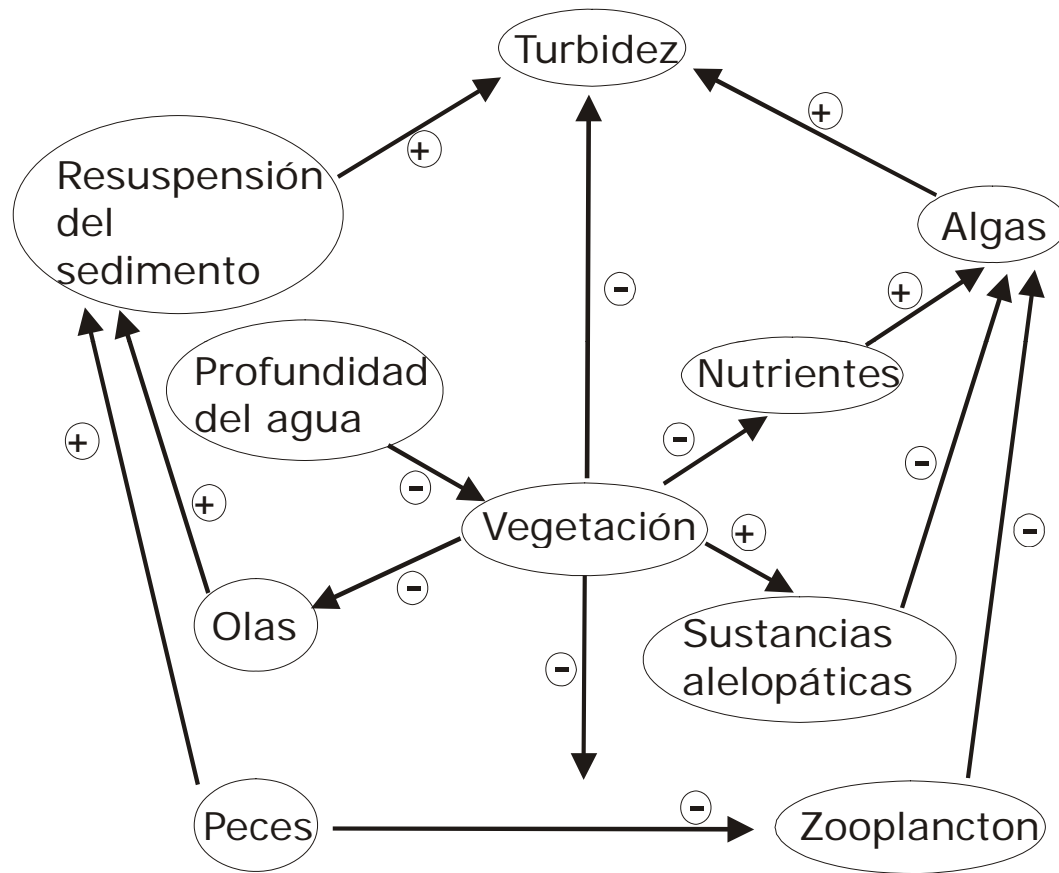


Las ciencias aplicadas no existen,
sólo las aplicaciones de la ciencias.
Pasteur



- La vegetación acuática juega un rol clave en el funcionamiento de los ecosistemas.





TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009

¿Qué atributos de la vegetación
relevar?

- Composición específica
- Distribución espacial
- Cobertura
- PVI
- Información categorizada por
formas de vida



Tabla 2. Formas de vida de las hidrófitas. Esquema tomado de Sculthorpe (1967).

A. Hidrófitas fijas al substrato

1.- **Hidrófitas emergentes.** Ocurren en suelos sumergidos o expuestos donde el nivel de la napa freática se encuentra a 50 cm o más de la superficie del suelo. En caso de estar cubierto la columna de agua puede superar 1.50 m. En general son plantas rizomatosas, y las hojas sumergidas o flotantes preceden a la aéreas maduras. Todas cuentan con órganos reproductivos externos.

Ejemplos: *Eleocharis*, *Ludwigia*, *Phragmites*, *Schoenoplectus*, *Typha*, *Zizaniopsis*.

2.- **Hidrófitas de hojas flotantes.** Habitan suelos sumergidos en donde la profundidad de la columna de agua alcanza desde los 25 cm hasta los 3.5 m. En las especies con heterofilia, las hojas sumergidas preceden o acompañan las hojas flotantes. Algunas especies cuando la densidad es muy alta forman hojas emergentes. Organos reproductivos flotantes o aéreos.

Rizomatosas. Las hojas flotantes se disponen en largos pecíolos flexibles.

Ejemplos: *Nuphar*, *Nymphaea*.

Estoloníferas. Tallos ascendentes en la columna de agua que producen hojas flotantes sobre pecíolos relativamente cortos.

Ejemplos: *Potamogeton natans* y *Nymphoides*.

3.- **Hidrófitas sumergidas.** Habitan suelos sumergidos en donde la profundidad de la columna de agua puede alcanzar hasta los 10 o 11 m. Follaje enteramente sumergido con hojas filiformes, fenestradas o finamente divididas. Organos reproductivos aéreos, flotantes o sumergidos.

Caulscentes. Tallos flexibles con raíces que nacen de algunos de sus nudos. Con o sin rizomas.

Ejemplos: *Elodea*, *Egeria*, *Hydrilla*, *Potamogeton*.

Roseta. Hojas que nacen de un tallo condensado o rizoma, frecuentemente especies estoloníferas.

Ejemplos: *Aponogeton*, *Isoetes* y *Vallisneria*.

Taloide. Cuerpo de la planta extremadamente reducido y condensado, sin diferenciación clara entre tallo y hoja.

Ejemplos: Podostemaceae.

B. **Flotantes libres.** Ocurren en lugares con escaso movimiento de la columna de agua. Morfología variables, plantas estoloníferas con hojas aéreas o flotantes (*Eichhornia crassipes*, *Limnobium*, *Pistia*) o plantas pequeñas con una extrema simplificación de su anatomía (*Lemna*, *Spirodela*, *Wolffia*).

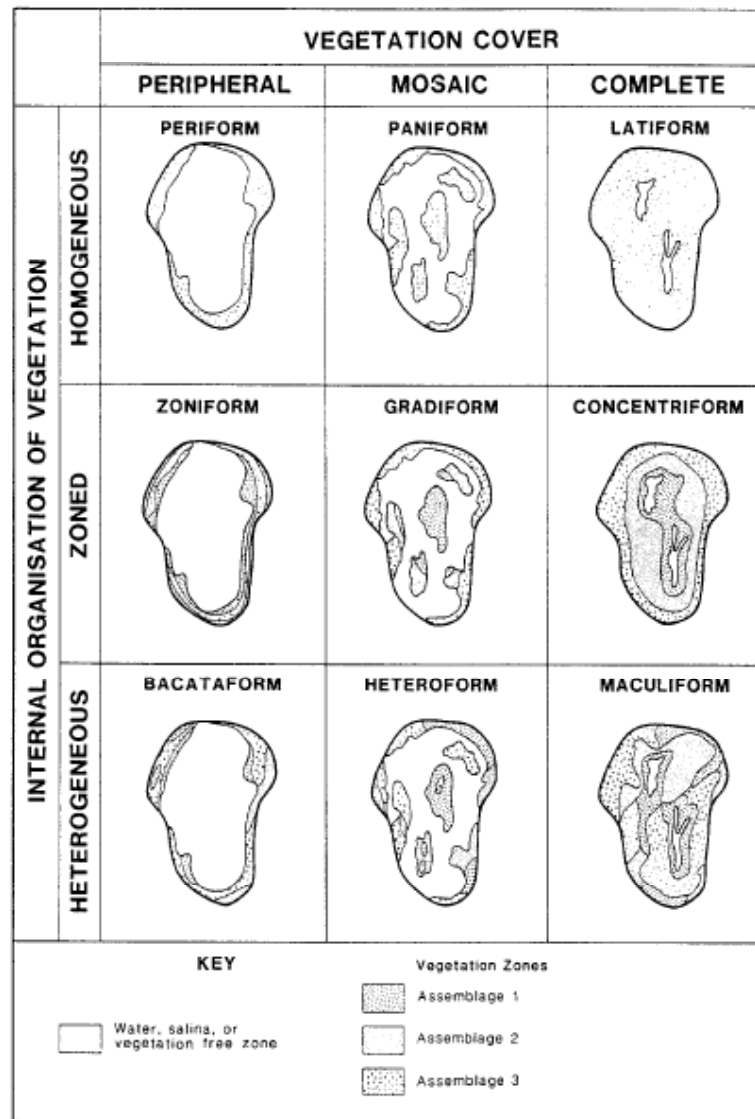


Fig. 9. The nine categories of vegetation organisation within basin wetlands as proposed by Semeniuk *et al.* (1990).

Climate-related differences in the dominance of submerged macrophytes in shallow lakes

SARIAN KOSTEN*, AMY KAMARAINEN †, ERIK JEPPESEN †§, EGBERT H. VAN NES*, EDWIN T. H. M. PEETERS*, NÉSTOR MAZZEO ¶, LAURA SASS ||, JENNIFER HAUXWELL **, NICOLE HANSEL-WELCH † †, TORBEN L. LAURIDSEN †, MARTIN SØNDERGAARD †, ROGER W. BACHMANN † †, GISSELL LACEROT *¶ and MARTEN SCHIEFFER *

**Department of Aquatic Ecology and Water Quality Management, Wageningen University, PO Box 47, 6700 AA Wageningen, The Netherlands, †Center for Limnology, University of Wisconsin, 680 N. Park St, Madison, WI, 53706, USA, ‡Department of Freshwater Ecology, National Environmental Research Institute, Aarhus University, Vejlsovej 25, 8600 Silkeborg, Denmark, §Department of Plant Biology, Aarhus University, Ole Worms Allé 135, 8000 Aarhus, Denmark, ¶Facultad de Ciencias, Universidad de la República, Iguá 4225, CP 11400, Montevideo, Uruguay, ||Illinois Natural History Survey, University of Illinois at Urbana-Champaign, One Natural Resources Way, Springfield, IL 62702, USA, **Wisconsin Department of Natural Resources, Science Operations Center, 2801 Progress Road, Madison, WI 53716, USA, † †Shallow Lakes Program, Minnesota Department of Natural Resources, 1601 Minnesota Drive, Brainerd, MN 56401, USA, † † †Department of Fisheries and Aquatic Sciences, University of Florida 7922 NW 71st Street, Gainesville, FL 32653, USA*

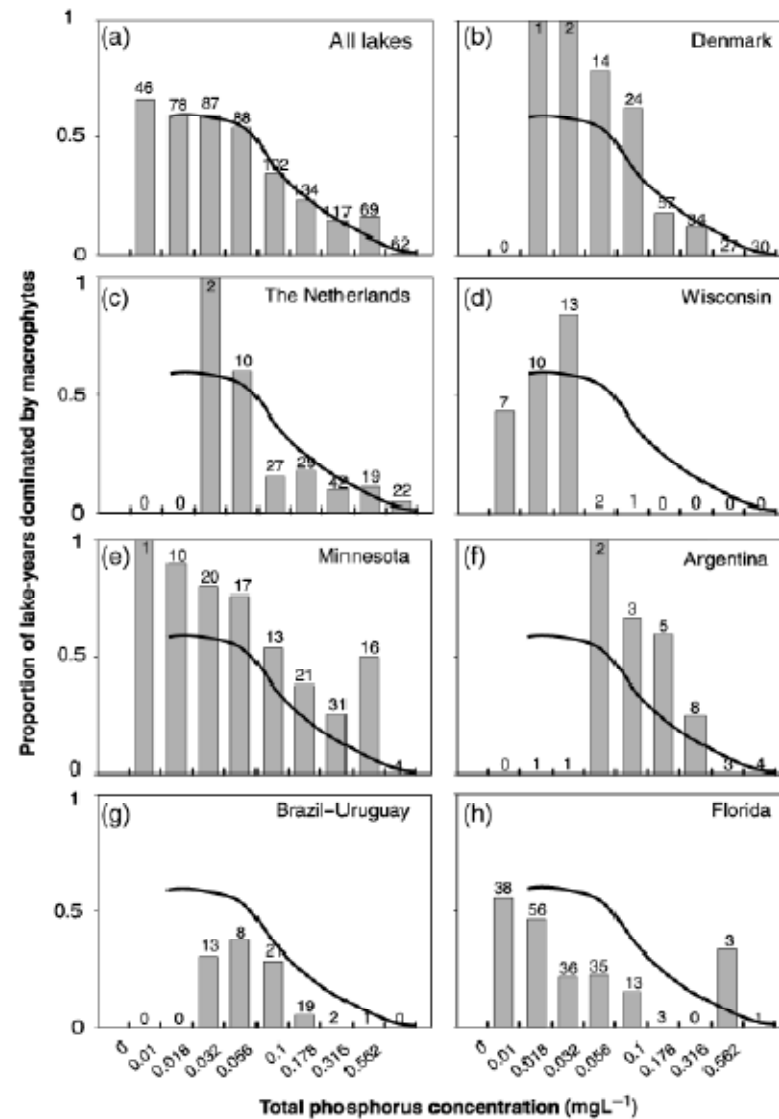


Fig. 2 Proportion of lakes dominated by macrophytes (coverage >30%) at different total phosphorus (TP) concentrations. The curve represents the average proportion of lakes dominated by macrophytes in the different regions (panel A) and is reproduced in the other panels to facilitate comparison only. Class widths are equal on a logarithmic scale. The number of lakes in a certain TP class are represented on top of the bars.

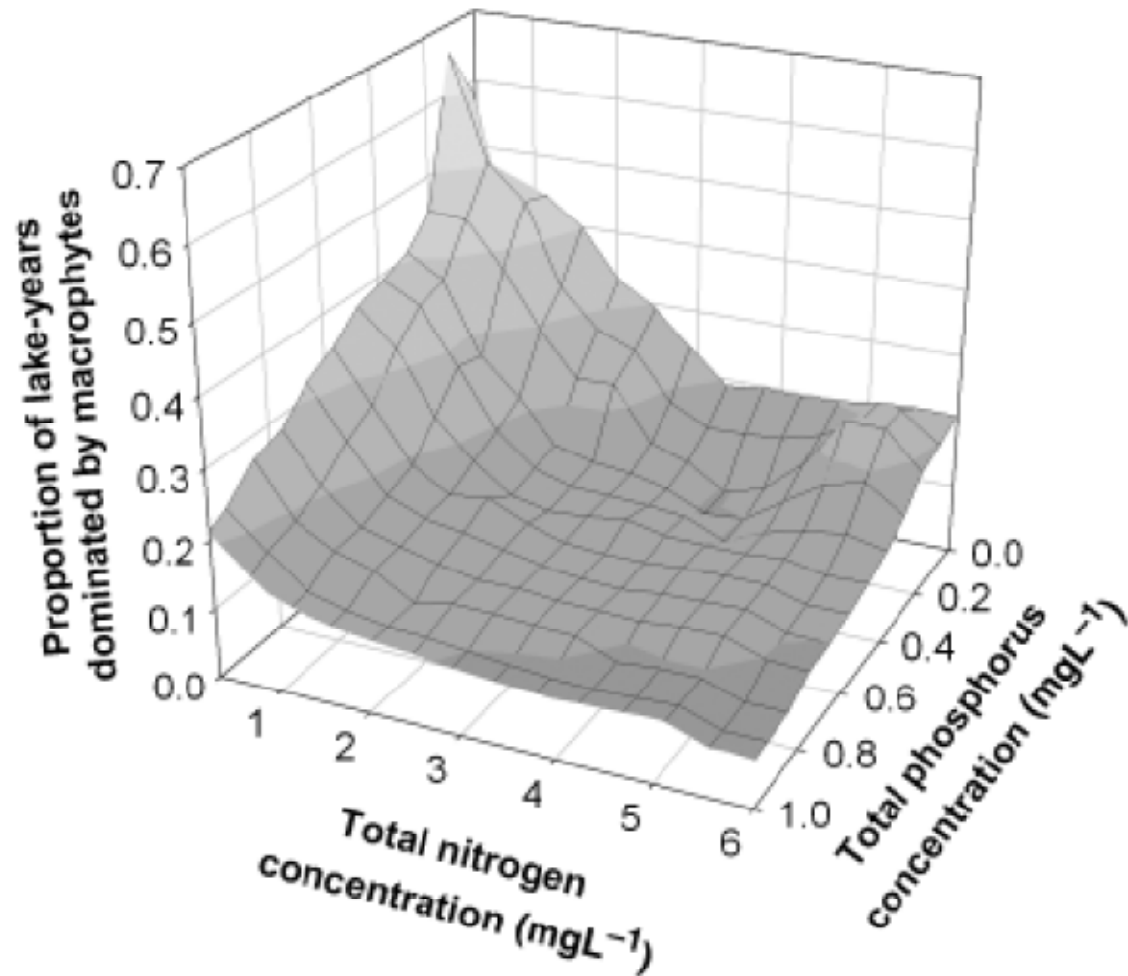
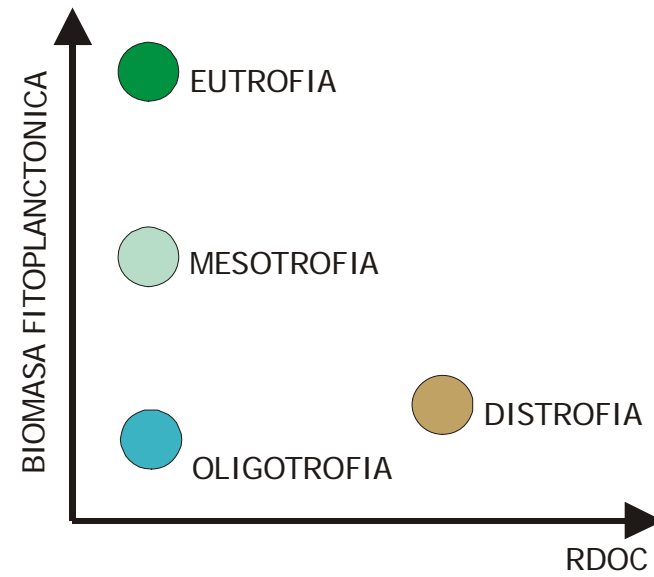
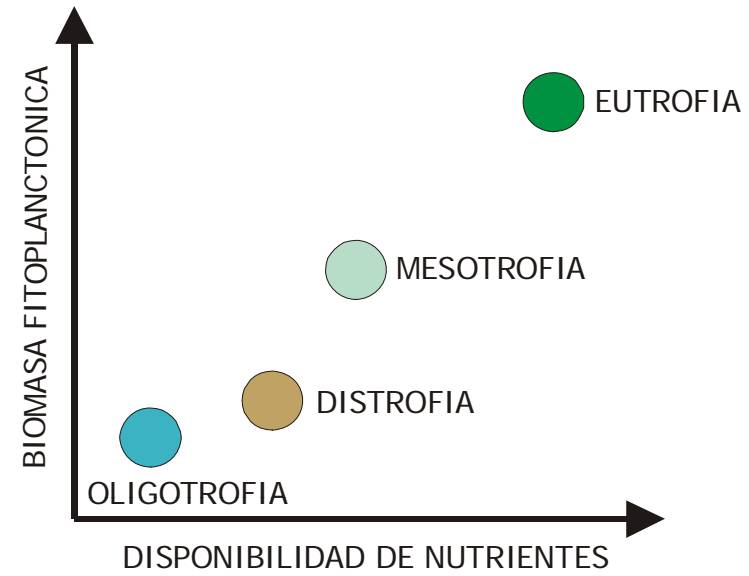


Fig. 4 Proportion of lakes in the combined data set dominated by macrophytes at different total phosphorus and total nitrogen concentrations.

Evaluación del estado trófico





Aspectos cruciales a considerar:

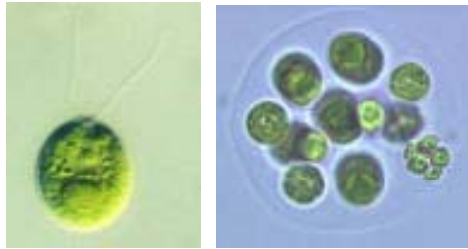
- Solamente una parte de la carga de nutrientes se encuentra en la columna de agua.
- La mayor parte de la carga de nutrientes se encuentra asociada a los sedimentos y a la biomasa de plantas acuáticas.



Los humedales presentan tres grupos principales de productores primarios:

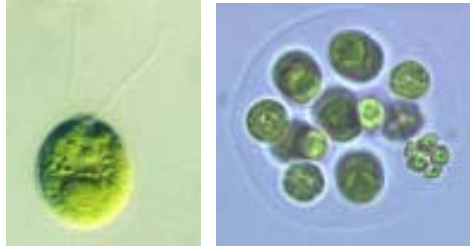
- Fitoplancton
- Perifiton
- Macrófitas acuáticas

¿En la evaluación del estado trófico incluimos sólo un componente o todos?

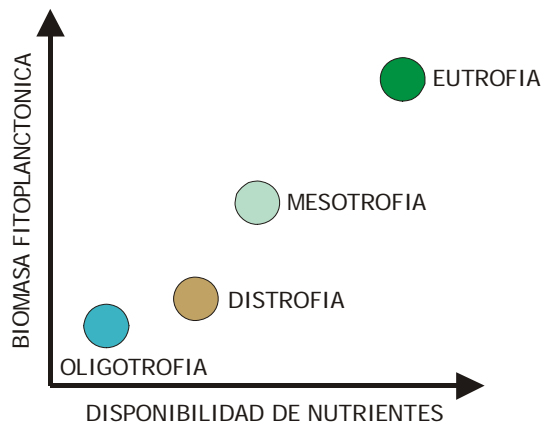


Los controles de la biomasa microalgal (libre o fija) son duales:

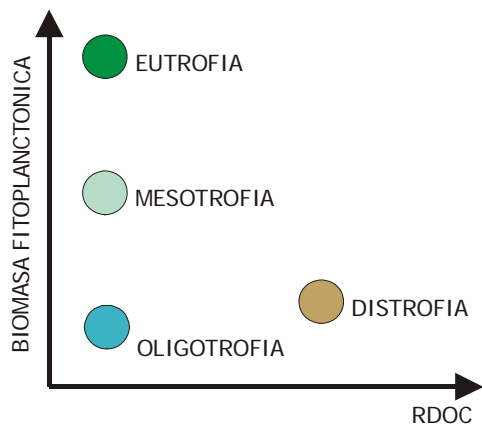
- Recursos (luz y nutrientes)
- Pool de sustancias húmicas
- Presión de consumo (tasa de herbivoría)



Transparencia del agua y disponibilidad de luz en humedales



¿Cómo cuantificar el pool de sustancias húmicas?



- DOC
- Color del agua

Lake and watershed characteristics rather than climate influence nutrient limitation in shallow lakes

SARIAN KOSTEN,^{1,6} VERA L. M. HUSZAR,² NÉSTOR MAZZEO,³ MARTEN SCHEFFER,¹ LEONEL DA S. L. STERNBERG,⁴
AND ÉRIK JEPPESEN⁵

¹*Department of Aquatic Ecology and Water Quality Management, Wageningen University, P.O. Box 47,
6700 AA Wageningen, The Netherlands*

²*Departamento de Botânica, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ 20940-040 Brazil*

³*Departamento de Ecología, Facultad de Ciencias, Universidad de la República, Iguá 4225 Piso 9 Ala Norte,
CP11400, Montevideo, Uruguay*

⁴*Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33124 USA*

⁵*Department of Freshwater Ecology, National Environmental Research Institute, University of Aarhus, Vejlsovej 25, 8600 Silkeborg,
Denmark and Department of Plant Biology, University of Aarhus, Ole Worms Allé 135, 8000 Aarhus, Denmark*

TABLE 5. Models of stepwise multiple regressions; only normally distributed (Shapiro-Wilks $P > 0.05$) nutrient limitation indicators are shown.

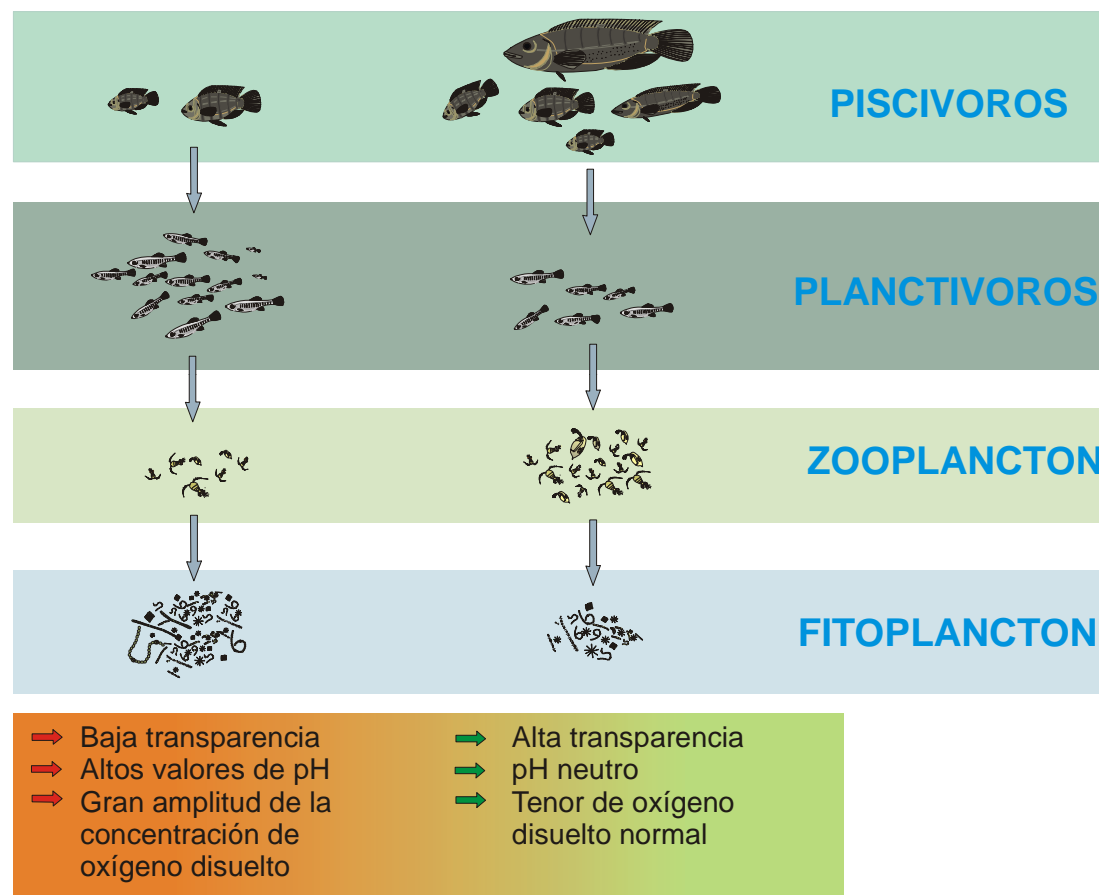
Model	R^2_{adj}
log(TN:TP) lake water	
0.17 + 0.85 log(DOC)	0.50
0.29 + 0.95 log(DOC) + 0.01LATITUDE	0.58
log(N:P) seston	
1.67 - 0.26 log(DOC)	0.16
1.67 - 0.34 log(DOC) - 0.15 log(GRAZING)	0.27
1.91 - 0.45 log(DOC) - 0.16 log(GRAZING) - 0.04(INL:EVAPO)	0.32
1.85 - 0.35 log(DOC) - 0.19 log(GRAZING) - 0.03(INL:EVAPO) - 0.01SHADE	0.36
log(DIN:SRP)	
0.65 + 0.08(INL:EVAPO)	0.15
log(chl a :TP)	
0.14 - 0.48 log(GRAZING)	0.25
0.64 - 0.47 log(GRAZING) - 0.13(INL:EVAPO)	0.47
0.35 - 0.51 log(GRAZING) - 0.13(INL:EVAPO) + 0.05SOILCARBON	0.50

Notes: GRAZING, potential grazing pressure; (INL:EVAPO), inlet : evaporation ratio. See Table 4 for an explanation of other abbreviations.



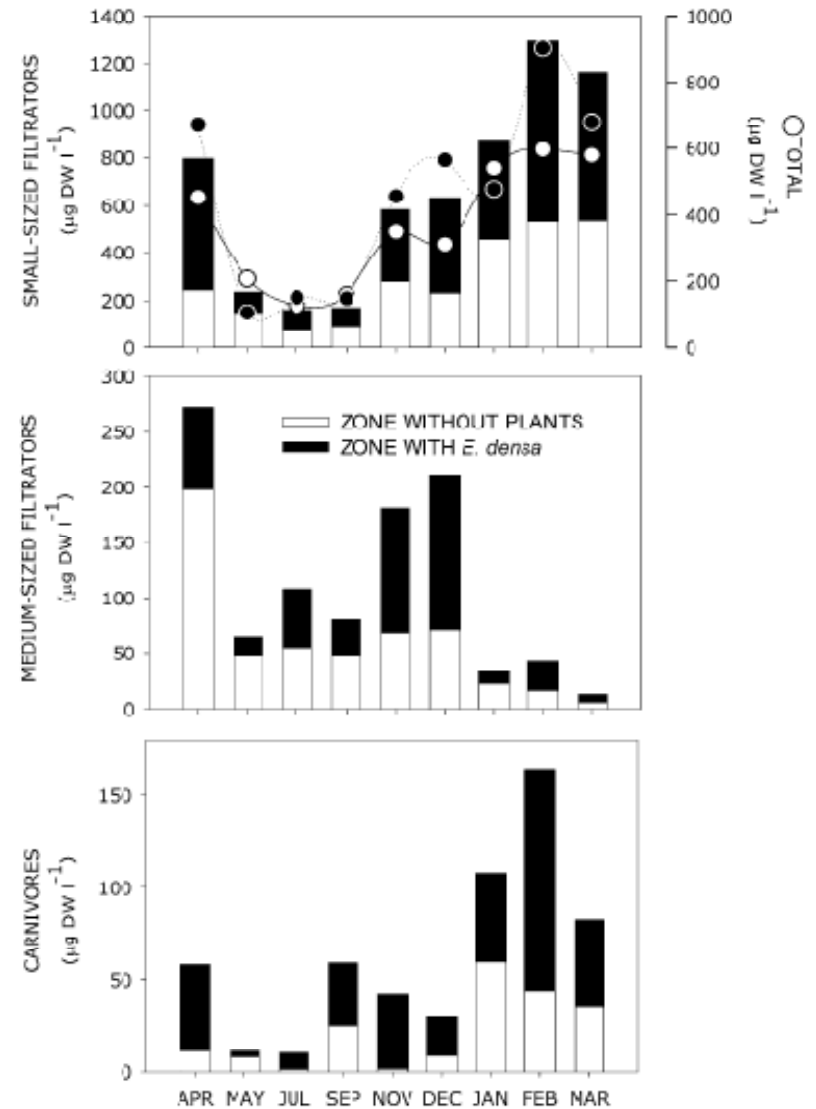
¿Cómo cuantificar los aspectos básicos de la trofodinámica?

- Estructura del zooplancton
- Estructura de bivalvos y gasterópodos
 - Estructura de peces

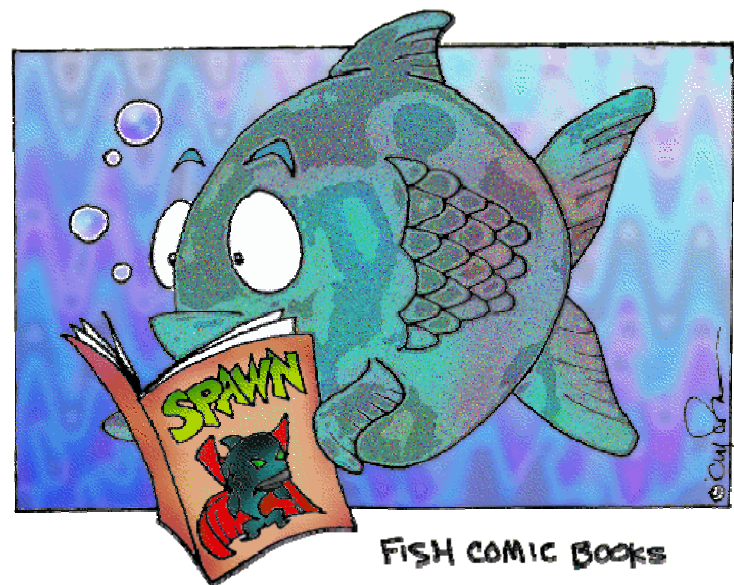


La estructura del zooplancton resulta muy útil analizarla de acuerdo a los principales grupos funcionales.

- Microfiltradores
- Mesofiltradores
- Omnívoros-carnívoros (ciclopoides)



La estructura de la comunidad de peces: el gran dolor de cabeza!!!



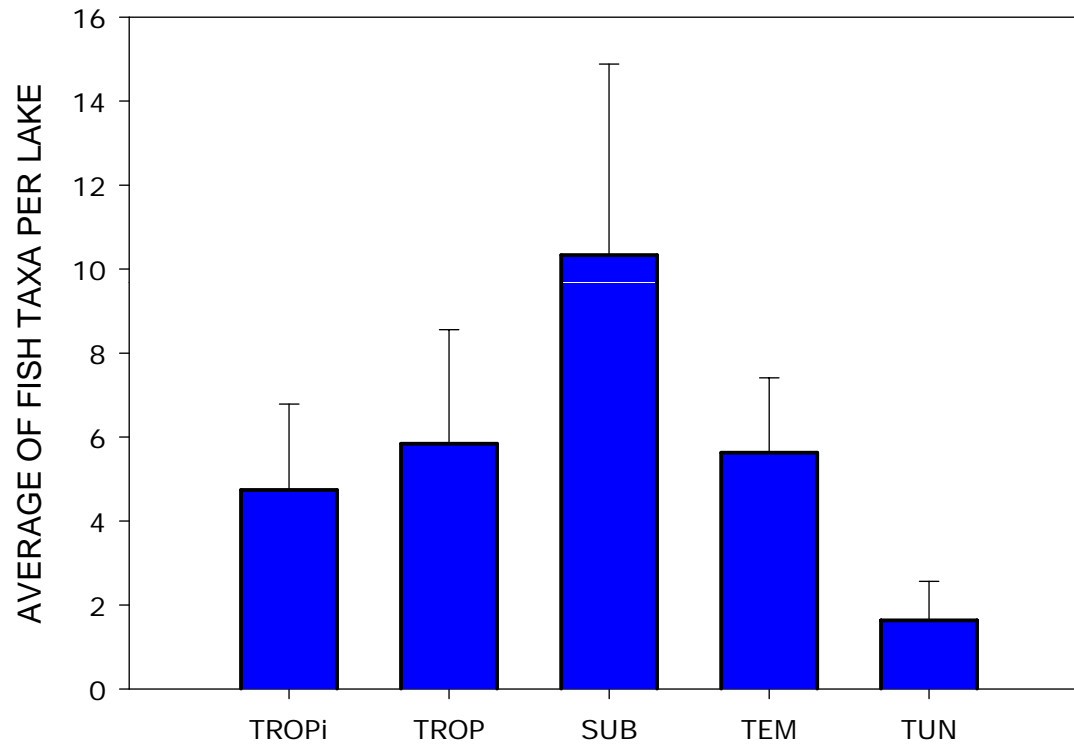
Swedish standard methods for sampling freshwater fish with multi-mesh gillnets

Table 1. Mesh-size distribution (knot to knot) and thread diameter in the NORDIC multi-mesh gillnets

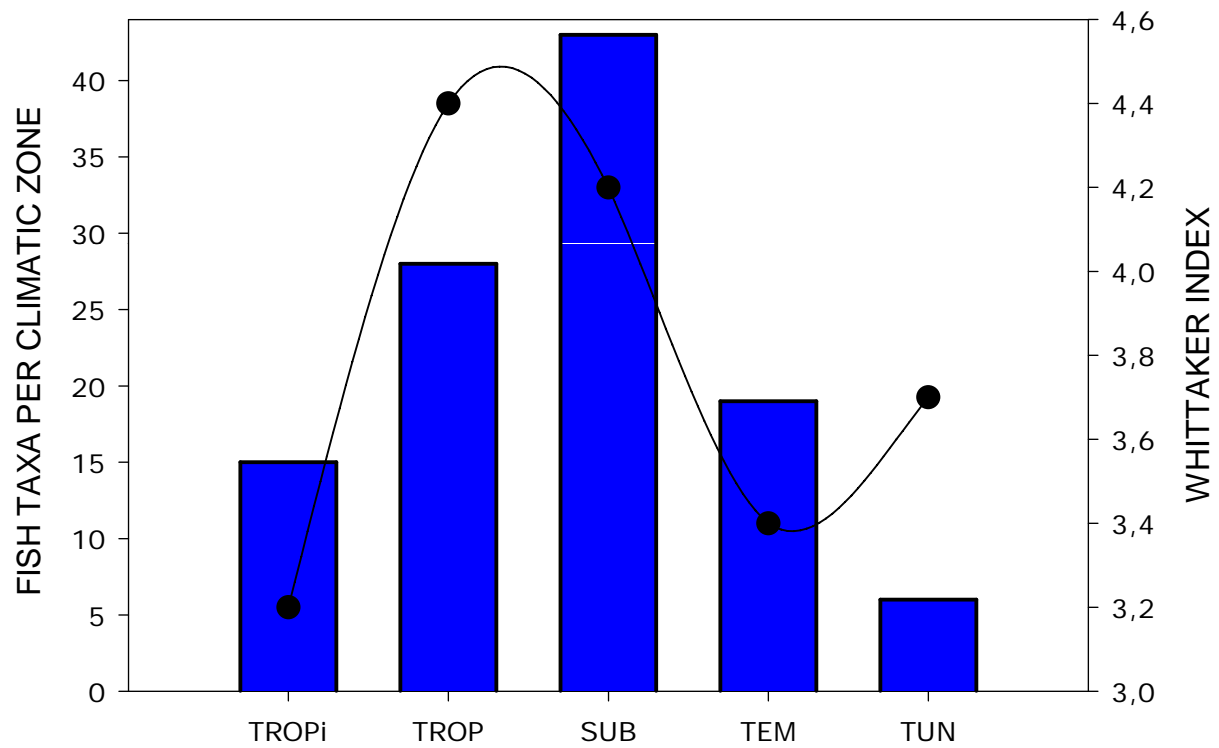
Mesh no	Mesh size (mm)	Thread diameter (mm)
1	43	0.20
2	19.5	0.15
3	6.25	0.10
4	10	0.13
5	55	0.23
6	8	0.10
7	12.5	0.13
8	24	0.16
9	15.5	0.15
10	5	0.10
11	35	0.20
12	29	0.16

Stratified random sampling with Nordic multi-mesh gillnets provide reliable whole-lake estimates of the relative abundance and biomass of freshwater fish in temperate lake

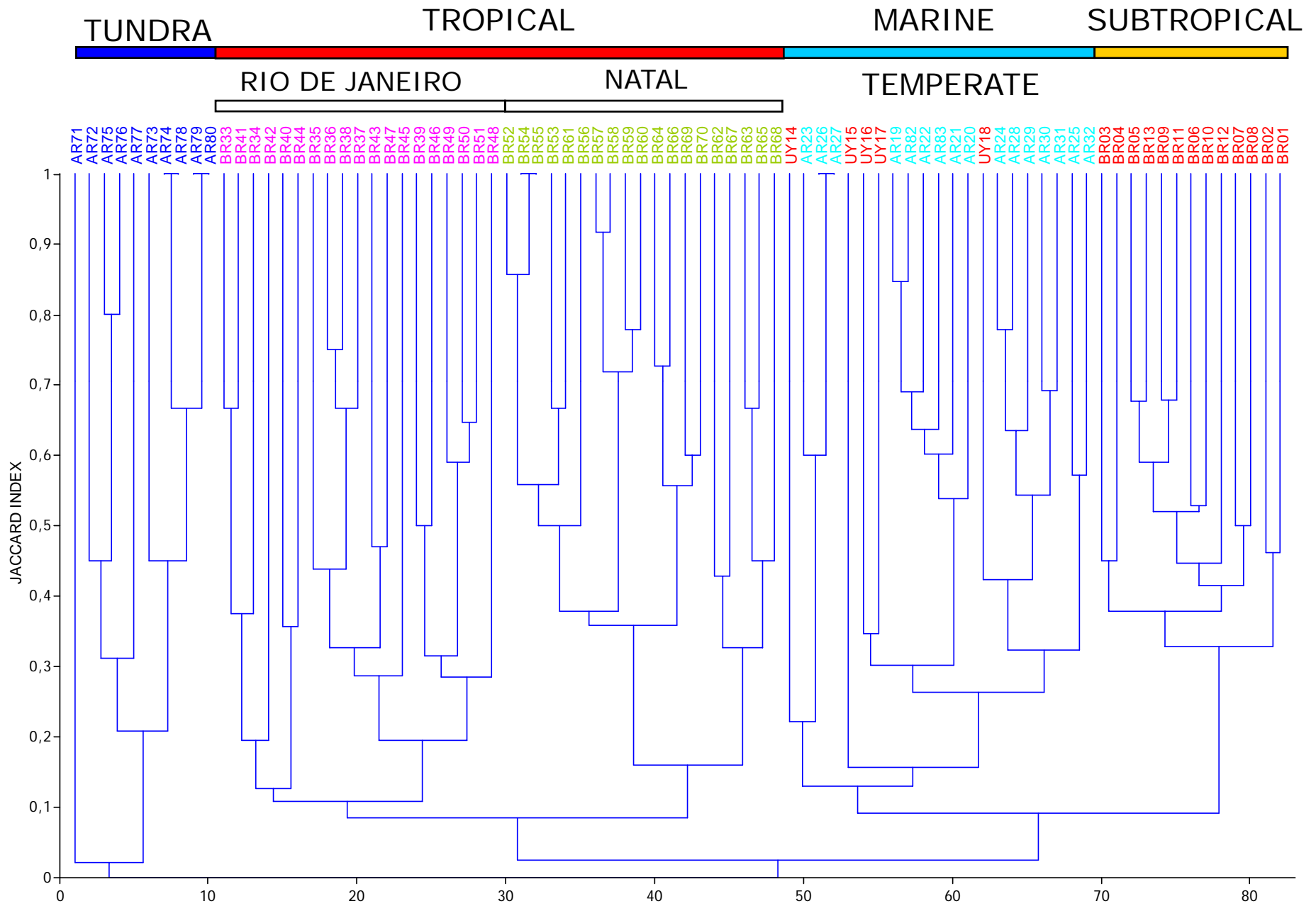
Edited by
MAGNUS APPELBERG
Institute of Freshwater Research
SE-178 93 Drottningholm
Tel: 08-62 00 435
E-mail: magnus.appelberg@fiskeriverket.se



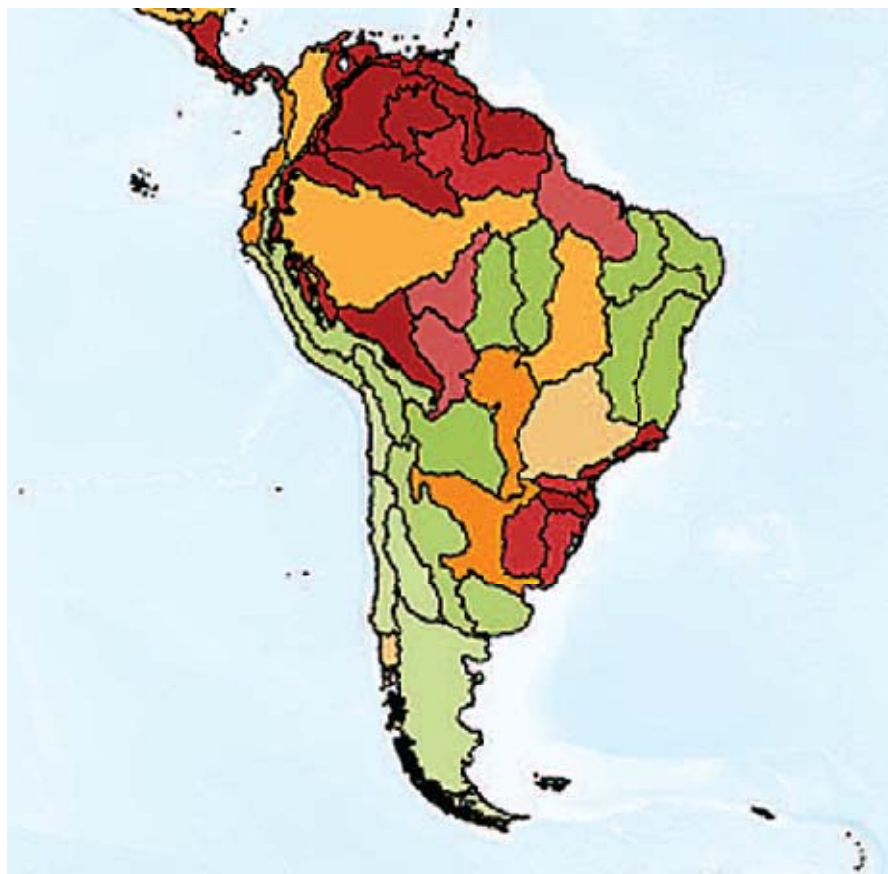
TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009



TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009



Similarities among lakes according with the presence-absence of taxa. Cophenetic correlation= 0.90



Freshwater fish species per ecoregion area



Number of species per 10⁴ square kilometers

Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation

ROBIN ABELL, MICHELE L. THIEME, CARMEN REVENGA, MARK BRYER, MAURICE KOTTELAT, NINA BOGUTSKAYA, BRIAN COAD, NICK MANDRAK, SALVADOR CONTRERAS BALDERAS, WILLIAM BUSSING, MELANIE L. J. STIASNY, PAUL SKELTON, GERALD R. ALLEN, PETER UNMACK, ALEXANDER NASEKA, REBECCA NG, NIKOLAJ SINDORF, JAMES ROBERTSON, ERIC ARMUO, JONATHAN V. HIGGINS, THOMAS J. HEIBEL, ERIC WIKRAMANAYAKE, DAVID OLSON, HUGO L. LÓPEZ, ROBERTO E. REIS, JOHN G. LUNDBERG, MARK H. SABAJ PÉREZ, AND PAULO PETRY

We present a new map depicting the first global biogeographic regionalization of Earth's freshwater systems. This map of freshwater ecoregions is based on the distributions and compositions of freshwater fish species and incorporates major ecological and evolutionary patterns. Covering virtually all freshwater habitats on Earth, this ecoregion map, together with associated species data, is a useful tool for understanding global and regional conservation planning efforts (particularly to identify outstanding and imperiled freshwater systems); for serving as a logical framework for large-scale conservation strategies; and for providing a global-scale knowledge base for increasing freshwater biogeographic literacy. Preliminary data for fish species compiled by ecoregion reveal some previously unrecognized areas of high biodiversity, highlighting the benefits of looking at the world's freshwaters through a new framework.

Keywords: freshwater, ecoregions, biogeography, fish, mapping

Growth of the human population, rising consumption, and rapid globalization have caused widespread degradation and disruption of natural systems, especially in the freshwater realm. Freshwater ecosystems have lost a greater proportion of their species and habitat than ecosystems on land or in the oceans, and they face increasing threats from dams, water withdrawals, pollution, invasive species, and overharvesting (MEA 2005, Revenga et al. 2005). Freshwater

ecosystems and the diverse communities of species found in lakes, rivers, and wetlands may be the most endangered of all (MEA 2005).

These stressed systems support an extraordinarily high proportion of the world's biodiversity. In terms of area, freshwater ecosystems occupy only 0.8% of Earth's surface, but they are estimated to harbor at least 100,000 species, or nearly 6% of all described species (Dudgeon et al. 2006). Each year,

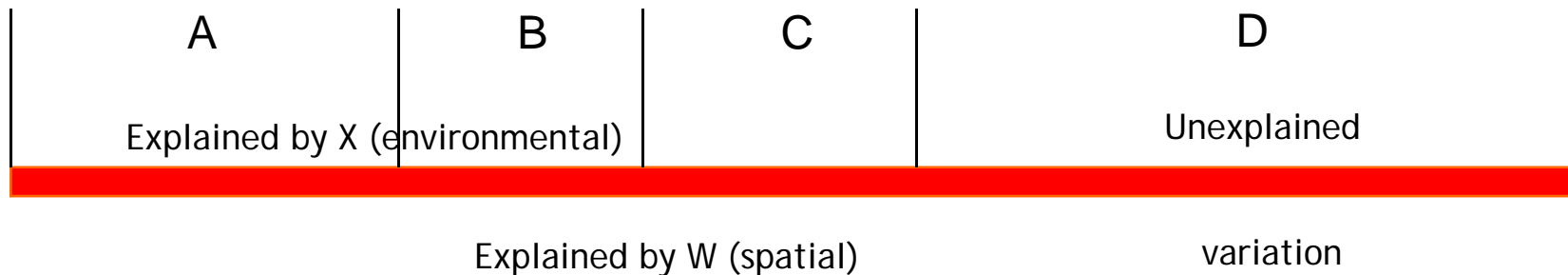
Robin Abell (e-mail: robina@worldagroforestrycentre.org), Michele L. Thieme, Rebecca Ng, Nikolaj Sindorf, and Eric Wikramanayake are with WWF in Washington, DC; Carmen Revenga, Mark Bryer (Belthanda), James Robertson, Eric Armijo (Belicia), Jonathan V. Higgins (Chicago), Thomas J. Heibel, and Paulo Petry (Buenos Aires) are with the Nature Conservancy Headquarters in Arlington, Virginia. Paulo Petry is also an associate in ichthyology at the Museum of Comparative Zoology at Harvard University in Massachusetts. Maurice Kottelat is an independent consultant in Switzerland and an honorary research associate at the Raffles Museum of Biodiversity Research at the National University of Singapore. Nina Bogutskaya and Alexander Naseka are senior researchers at the Zoological Institute of the Russian Academy of Sciences in St. Petersburg. Brian Coad is a research scientist at the Canadian Museum of Nature in Ottawa. Nick Mandrak is a research scientist at the Great Lakes Laboratory for Fisheries and Aquatic Sciences, Fisheries and Oceans Canada, Burlington, Canada. Salvador Contreras Balderas is professor emeritus at the Universidad Autónoma de Nuevo León in Monterrey, Mexico. William Bussing is professor emeritus at the Universidad de Costa Rica. Melanie L. J. Stiasny is the Austral Research Curator of Ichthyology at the American Museum of Natural History and an adjunct professor at Columbia University in New York City. Paul Skelton is managing director of the South African Institute for Aquatic Biodiversity and professor at Rhodes University in Grahamstown, South Africa. Gerald R. Allen is a research associate at Western Australian Museum in Perth. Peter Unmack is a postdoctoral associate in the Department of Integrative Biology at Brigham Young University in Utah. David Olson is director of science and stewardship at Irvine Ranch Conservancy in California. Hugo L. López is head of the vertebrate zoology department at the Museo de La Plata, assistant professor in the Facultad de Ciencias Naturales y Museo, and researcher at CONICET (Buenos Aires) in Argentina. Roberto E. Reis is a professor at Ceilán de São Gonçalo de São in Porto Alegre, Brazil. John G. Lundberg is chair and curator of ichthyology, and Mark H. Sabaj Pérez is collection manager, at the Academy of Natural Sciences in Philadelphia. © 2008 American Institute of Biological Sciences.

www.blackwell-sydney.com

May 2008 / Vol. 58 No. 5 • BioScience 403

PARCIAL CCA ANALYSIS

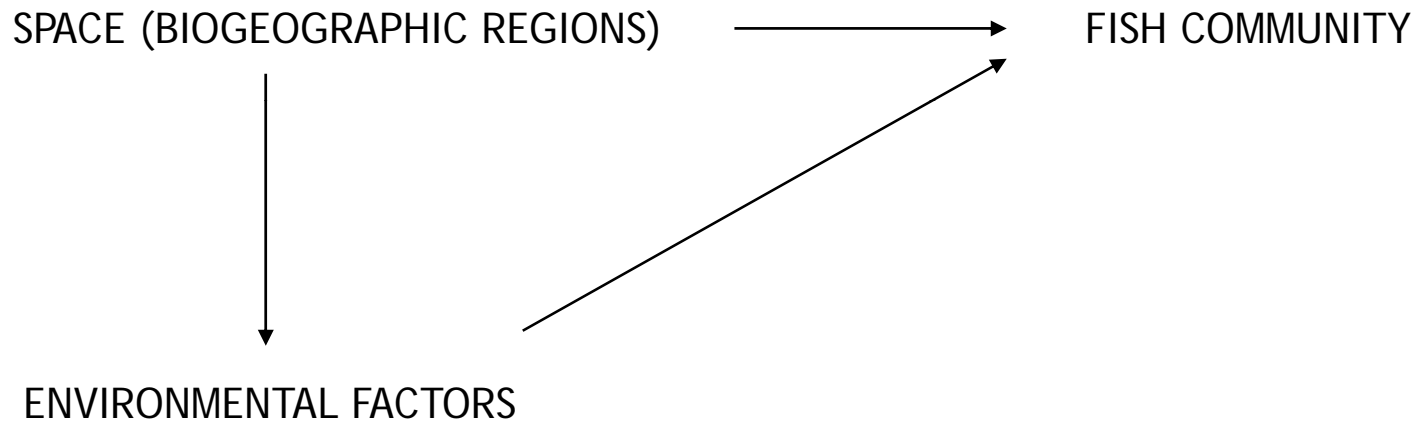
This approach is related to regression and path analysis, in which a large number of plausible relationships may be tested and sorted out by statistical analysis.



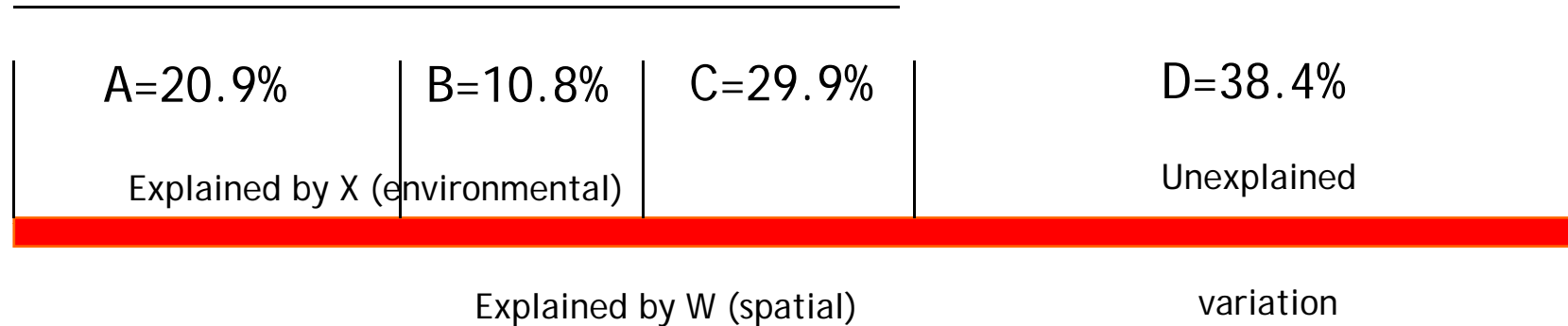
A: Purely environmental fraction.

B: Spatially-structured environmental effect.

C: Spatial structure of the response data, which is not explained by the explanatory variables in the model.



61.6%



Y matrix: Fish community structure

X matrix: Temperature, trophic state, aquatic plant coverage (spatial heterogeneity) and density of aquatic ecosystems around the lake (10 km)

W matrix: PCNM (spatial matrix)

8 functional groups were identified:

Herbivores

Detritivores

Benthic omnivores

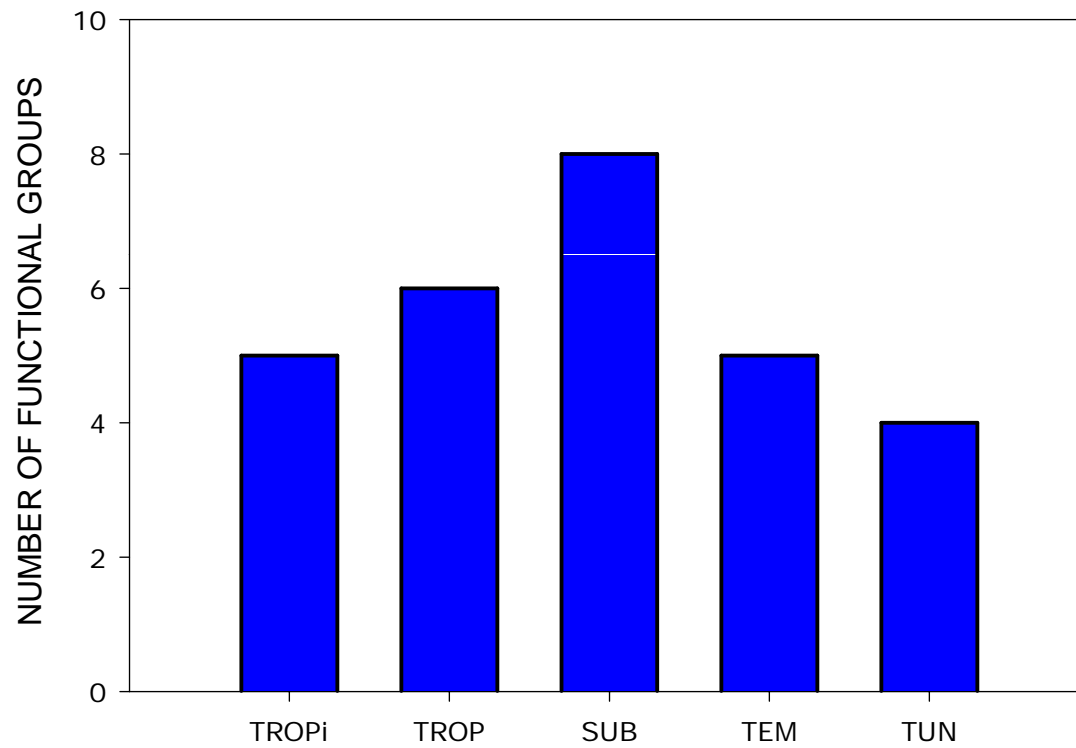
Benthic-pelagic omnivores

Pelagic omnivores

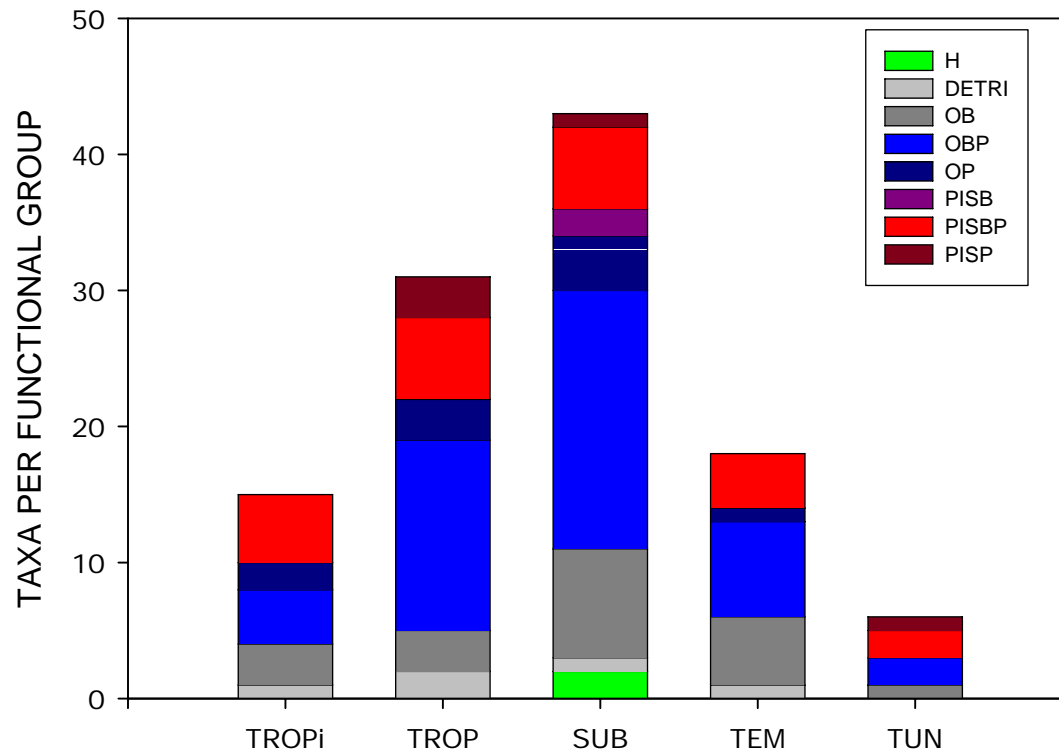
Benthic piscivores

Benthic-pelagic piscivores

Pelagic-piscivores

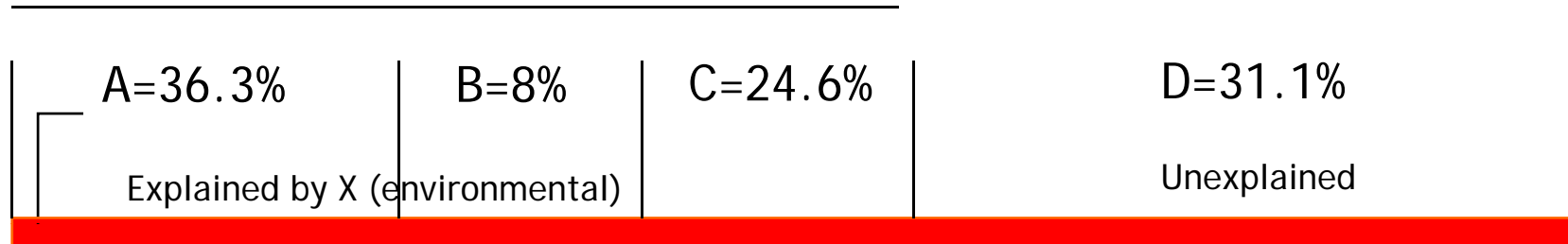


TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009



TALLER SOBRE INTEGRACIÓN DE INVENTARIOS DE HUMEDALES
MÉXICO/2009

68.9%



Explained by X (environmental)

Unexplained

Explained by W (spatial)

variation

Temperature=1%

Trophic state and water physico-chemicals

attributes=28%

Plant coverage=6.3%

Area of aquatic ecosystems around 10 km=1%



Dr. Néstor Mazzeo Beyhaut
Prof. Agregado Depto. Ecología
Investigador Grado 4 PEDECIBA
mazzeobeyhaut@yahoo.com