

**Alessandro Ludovisi, Ph.D.**

**Mailing and Office Address**

Dipartimento di Chimica, Biologia e Biotecnologie  
Università degli Studi di Perugia  
Via Elce di Sotto, 06123 Perugia,  
ITALY  
Tel. +39 075 585 5712, Fax +39 075 5725  
E-mail: [alessandro.ludovisi@unipg.it](mailto:alessandro.ludovisi@unipg.it)



**Areas of specialisation:** system ecology, ecological modelling, thermodynamics, spatial analysis, ecological succession, biodiversity measures, plankton ecology.

**Current Position**

Researcher at the Dipartimento di Chimica, Biologia e Biotecnologie, Università degli Studi di Perugia, Italy.

After having attained the M.S. in Chemistry (1992) and the PhD in Chemical Sciences (1998), the research activity has been focused on several aspects related to the complexity, functioning and development of freshwater ecosystems, with particular reference to lakes. The main focuses have been:

- Environmental modelling in the field of population dynamics, hydrological and thermodynamic balances of lake systems;
- Use and development of thermodynamic indices for the analysis of the ecological succession in aquatic communities and as indicators of trophic conditions;
- Study of habitat selection by vegetal (phytoplankton, macrophytes) and animal organisms (zooplankton, bryozoans);
- Use and development of geostatistical procedures for the study of distribution patterns of plankton organisms;
- Use and development of biodiversity measures;
- Analysis of hazardous substances (chlorinated pesticides, PAH, heavy metals) in waters and sediments, and metabolic responses to water pollutants;
- Evaluation of the impact of environmental and climate changes on lake communities.

Author in 26 articles in International journals and other publications of a National or local diffusion. Member of the Editorial board in the “African Journal of Agricultural Research” and in the Journal of “Natural and Environmental Sciences”. Referee for several International journals: BioSystems, Geophysical Research Letters, Ecological Modelling, Ecological Indicators, Environmental Engineering Science, Aquatic Ecology, Ecological Economics.

Participation, as a member, in the activities of the Italian Society of Ecology (SIte) and the International Society of Ecological Modelling (ISEM).

Participation, as a contract researcher, in several scientific project of a European, National and local relevance focused on emergent issues in inland water research and management. Reference person for the University of Perugia in the international networks LTER and LIFEWATCH.

Since 1999, teaching in Ecology courses in the Bachelor of Science in Biology, Natural Sciences, Technical Management of Landscape, Civil Defence Activities at the University of Perugia

**Alessandro Ludovisi****Education**

University of Perugia, Perugia, Italy: Ph.D. Chemical Sciences, 1998. Title of the thesis: "Applying holistic approaches to study lake ecosystems: the case of Lake Trasimeno".

University of Perugia, Perugia, Italy: M. S. Chemistry, 1992. Title of the thesis: "Lewis's acids in asymmetric Diels-Alder reactions".

**Experience***Research*

- Department of Chemistry, Biology and Biotechnology, University of Perugia, Italy, 2014 – to present. Researcher position;
- Department of Cellular and Environmental Biology, University of Perugia, Italy, 2008 – 2013. Researcher position;
- Department of Cellular and Environmental Biology, University of Perugia, Italy, 2008. Research contract in the National project FISR MICENA. Object: Statistical analysis and modelling of environmental data;
- Department of Cellular and Environmental Biology, University of Perugia, Italy, 2007. Research grant in the National project FISR MICENA. Object: Benthic organisms as paleo-limnological indicators of climate change;
- Department of Cellular and Environmental Biology, University of Perugia, Italy, 2005. Research contract in a National project MIUR. Object: developing an integrated framework based on benthic organisms for analysing the eco-climatic evolution of freshwater biotopes.
- Department of Cellular and Environmental Biology, University of Perugia, Italy, 2004. Research contract in a National project MIPAF. Object: geostatistical modelling of the distribution of bryozoans in Italy in relation with PKD (Proliferative Kidney Disease);
- Department of Chemical Sciences and Technology and of Biosystems, University of Siena, Italy, 2003. Post-doctoral fellowship. Object: modelling metabolic processes in stressed aquatic key species.
- Department of Animal Biology and Ecology, University of Perugia, Italy, 2000. Responsible for the "Project for young researchers" titled: Genetic diversity of key aquatic plants in freshwater biotopes of Central Italy";
- Department of Animal Biology and Ecology, University of Perugia, Italy, 1998-2002. Research contract. Object developing multi-varied methods for analysing the spatial distribution of aquatic species (research joined with the European Project *LAKES – Long-distance dispersal in aquatic Key species*);
- C.N.R. Institute of Hydrobiology, Pallanza, Italy, 1999. Visiting researcher: Developing a model of habitat utilisation by macrophytes in River Po catchment basin lakes (Italy);
- Department of Analytical and Pharmaceutical Chemistry, Royal Danish School of Pharmacy - Section of Environmental Chemistry, Copenhagen, Denmark, 1997. Visiting researcher developing holistic thermodynamic-based indicators of ecosystem health.
- C.N.R. Institute of Atmospheric Physics, Rome, Italy, 1996. Visiting researcher: Calibrating procedure of T.I.R.O.S.-N.O.A.A.. data treatment for lake ecosystems. Participation to the oceanographic campaign ERS-SYMPLEX on board of the oceanographic boat Urania (C.N.R.).

*Teaching*

- Faculty of Sciences University of Perugia, Perugia, Italy, 2010-2012: teacher in the Ecology course for the Bachelor in Civil Defence Activities;
- Faculty of Agriculture, University of Perugia, Italy, 2009: teacher in the Ecology course for the Bachelor in Science in Technical Management of Landscape;
- Faculty of Agriculture, University of Perugia, Italy, 2004-2008: assistant teacher in the Ecology course for the Bachelor in Science in Technical Management of Landscape;

- Faculty of Sciences University of Perugia, Perugia, Italy, 2001–2005: assistant teacher in the Ecology course for the M. S. in Biological Sciences;
- Faculty of Sciences, University of Perugia, Perugia, Italy, 1999: lecturer of *Fundamentals in ecosystem analysis* and tutor of project students in the M. S. in Natural Sciences.
- Professional School of Formation, Ferrara, Italy, 1996: teacher of *Chemistry* in the course of Expert in Environmental Protection.

## Publications

### Journal Articles

- **Ludovisi A.**, Rossi R., Paracucchi R., Selvaggi R., Fagotti A., Simoncelli F., Pascolini R., Di Rosa I., 2014. The delayed effects of meteorological changes on the water frogs in Central Italy. *Hydrobiologia* (in press).
- **Ludovisi A.**, 2014. Effectiveness of entropy-based functions in the analysis of ecosystem state and development. *Ecological Indicators* 36: 617–623.
- **Ludovisi A.**, Castaldelli G., Fano E. A., 2013. Multi-scale spatio-temporal patchiness of macrozoobenthos in the Sacca di Goro lagoon (Po River Delta, Italy). *Transitional Waters Bulletin* 7(2): 233-244.
- Roselli L., Stanca E., **Ludovisi A.**, Durante G., Souza J.S.D., Dural M., Alp T., Bulent S., Gjoni V., Ghinis S., Basset A., 2013. Multi-scale biodiversity patterns in phytoplankton from coastal lagoons: the Eastern Mediterranean. *Transitional Waters Bulletin* 7(2): 202-219.
- **Ludovisi A.**, Gaino E., Bellezza M., Casadei S., 2013. Impact of climate change on the hydrology of the shallow Lake Trasimeno (Umbria, Italy): history, forecasting and management. *Aquatic Ecosystem Health & Management*, 16(2):190–197.
- **Ludovisi A.**, Roselli L., Basset A., 2012. Testing the effectiveness of exergy-based tools on a seasonal succession in a coastal lagoon by using a size distribution approach. *Ecological Modelling* 245:125-135.
- **Ludovisi A.**, 2012. Energy degradation and ecosystem development: theoretical framing, indicators definition and application to a test case study. *Ecological Indicators* 20: 204-212.
- Gaino E., Scoccia F., Piersanti S., Rebora M., Bellucci L.G., **Ludovisi A.**, 2012. Spicule records of *Ephydatia fluviatilis* as a proxy for hydrological and environmental changes in the shallow Lake Trasimeno (Umbria, Italy). *Hydrobiologia* 679: 139-153.
- **Ludovisi A.**, Rebora M., Goretti E., Scoccia F., Piersanti S., Gaino E., 2011. L'ecosistema del Trasimeno tra passato e futuro. In: A. Martinelli (Ed.): *Tutela ambientale del Lago Trasimeno – Libri Arpa Umbria*: 337-345.
- Jørgensen S.E., **Ludovisi A.**, Nielsen S.N., 2010. The free energy and information embodied in the amino acid chains of organisms. *Ecological Modelling* 221: 2388–2392.
- **Ludovisi A.**, Gaino E., 2010. Meteorological and water quality changes in Lake Trasimeno (Umbria, Italy) during the last fifty years. *Journal of Limnology* 69: 174-188.
- Gaino E., **Ludovisi A.**, Rebora M., Piersanti S., Scoccia F., Fiore P., 2009. Sponge spicules in sedimentary records as proxies of climate-environmental changes in Lake Trasimeno (Umbria, Italy). In: T. Sediari & R. Riccini (Eds), *Atti Convegno “La ricerca italiana sui cambiamenti climatici”*, Deruta, 13-14 Novembre 2008, Ali&no Editrice: 53-54.
- Gaino E., Scoccia F., Lancioni T., **Ludovisi A.**, 2009. Invasive molluscs in Umbrian inland waters: ecological and reproductive aspects. *Studi Trentini di Scienze Naturali - Acta biologica* 86: 99-104.
- **Ludovisi A.**, Jørgensen, S.E., 2009. Comparison of exergy found by a classical thermodynamic approach and by the use of the information stored in the genome. *Ecological Modelling* 220 1897–1903.
- **Ludovisi A.**, 2009. Exergy vs information in ecological successions: Interpreting community changes by a classical thermodynamic approach. *Ecological Modelling* 220: 1566–1577.
- Gaino E., Scoccia F., Lancioni T., **Ludovisi A.**, 2008. The invader mudsnail *Potamopyrgus antipodarum* in the Tiber River basin (Central Italy). *Italian Journal of Zoology* 75: 253-26.
- **Ludovisi A.**, Todini C., Pandolfi P., Taticchi M. I., 2008. Scale patterns of diel distribution of the copepod *Cyclops abyssorum* in a regulated lake: The relative importance of physical and biological factors. *Journal of Plankton Research* 30: 495-509.

- **Ludovisi A.**, 2006. Use of thermodynamic indices as ecological indicators of the development state of lake ecosystems: specific dissipation. *Ecological Indicators* 6: 30-42.
- **Ludovisi A.**, Taticchi M. I., 2006. Investigating beta diversity by Kullback-Leibler information measures. *Ecological Modelling* 192: 299-313.
- **Ludovisi A.**, Pandolfi P., Taticchi M. I., 2005. The strategy of ecosystem development: specific dissipation as an indicator of ecosystem maturity. *Journal of Theoretical Biology* 235: 33-43.
- **Ludovisi A.**, Minozzo M., Pandolfi P., Taticchi M.I., 2005. Modelling the horizontal spatial structure of planktonic community in Lake Trasimeno (Umbria, Italy) using multivariate geostatistical methods. *Ecol. Model.* 181: 247-262.
- **Ludovisi A.**, 2004. Biotic and abiotic entropy production in lake ecosystems. *Ecol. Model.* 179: 145-147.
- **Ludovisi A.**, Pandolfi P., Taticchi M. I., 2004. A proposed framework for the identification of habitat utilisation patterns of macrophytes in River Po catchment basin lakes (Italy). *Hydrobiologia* 523: 87-101.
- **Ludovisi A.**, Minozzo M., Pandolfi P., Taticchi M.I., 2003. Multivariate spatial analysis of plankton count data from Lake Trasimeno (Italy). In: V. Capasso (Ed.), *Mathematical Modelling & Computing-in Biology and Medicine* (5<sup>th</sup> ESMTB Conference 2002), M.I.R.I.A.M. (the Milan Research Centre for Applied and Industrial Mathematics) series 1: 593-599. Esculapio Press, Milano.
- **Ludovisi A.**, Poletti A., 2003. Use of thermodynamic indices as ecological indicators of the development state of lake ecosystems: 1. Entropy production indices. *Ecol. Model.* 159: 203-222.
- **Ludovisi A.**, Poletti A., 2003. Use of thermodynamic indices as ecological indicators of the development state of lake ecosystems: 2. Exergy and specific exergy indices. *Ecol. Model.* 159: 223-238.
- Elia C., **Ludovisi A.**, Taticchi M.I., 2001. Study of seasonal variations of Glutathione and detoxificant enzymes in *Lophopus cristallinus* Pall. (Bryozoa) from Piediluco lake (Umbria, Italy). *Ital. J. Zool.*, 68: 291-297.
- Poletti A., Proietti G., Murgia S.M., Selvaggi, Poletti L., **Ludovisi A.**, 2000. Interference from sulfur in chlorinated pesticides gas Chromatographic analysis in lake sediments. *Annali di Chimica - J. Anal. and Env. Chem.* 90: 503-507.
- **Ludovisi A.**, Poletti A., 1999. Use of exergy and structural exergy as ecological indicators for the development state of homogeneous lake ecosystems. In: Rossi C., Bastianoni S., Donati A., Marchettini N. (Eds.): *Tempos in Science and Nature: structures, relations and complexity.* *Ann. N.Y. Acad. Sci.* 879: 406-411.
- Poletti L., **Ludovisi A.**, Proietti G., Poletti A., 1997. Explorative statistical analysis of PAH pollution in some compartments of Lake Trasimeno, *Annali di Chimica - J. Anal. and Env. Chem.* 87: 777-788.

#### Presentations (\* invited speaker)

- Scharler U., **Ludovisi A.**, 2013. Comparison of the response of structural and food web entropy-based indicators in real cases studies representing natural as well as extreme spatio-temporal variability. 19<sup>th</sup> biennial ISEM Conference, Toulouse, France, 28-31 Ottobre 2013.
- **Ludovisi A.\***, 2013. Lake Trasimeno: a historical laboratory of science and management. Workshop "Science, Cultural and Human Wellbeing in Lake Areas: Trasimeno Lake case study" (15<sup>th</sup> World Lake Conference Meeting), Castiglione del Lago (PG), 18 Settembre 2013.
- Boggero A. et al., 2012. Case study Lifewatch sulle specie aliene: risultati preliminari relative ad alcuni laghi italiani. XXII Congresso Nazionale S.It.E., Alessandria 10-13 Settembre 2012.
- Corriero G. et al., 2012. Ecosystem fragility to alien and invasive species. XXII Congresso Nazionale S.It.E., Alessandria 10-13 Settembre 2012.
- **Ludovisi A.**, 2012. Impact of climate change on the shallow Lake Trasimeno (Umbria, Italy): history, forecasting and management. Sesta Assemblea Nazionale LTER-ITALIA. Roma, 29-30 Marzo 2012.
- **Ludovisi A.\***, 2011. The second law of thermodynamics as a paradigm for understanding a changing world. XVIII International ISEM Conference "Ecological Modelling for Global Change and Coupled Human and Natural Systems". Beijing (China), 20-23 Settembre 2011.
- **Ludovisi A.**, Gaino E., Casadei S., Bellezza, M., 2011. Impact of climate change on the hydrology and the sponge population of the shallow Lake Trasimeno (Umbria, Italy): history, forecasting and management. X

- International Conference AEHMS “The aquatic ecosystem puzzle: threats, opportunities and adaptation”. Siena 13-15 Giugno 2011.
- **Ludovisi A.**, 2011. Exergy and information-based tools in system ecology analysis. VII International ECEM Conference “Ecological hierarchy from the genes to the biosphere”. Riva del Garda 30 maggio - 2 giugno 2011.
  - **Ludovisi A.**, Basset A., 2010. Use of entropy-based functions in the analysis of the state and development of transitional water ecosystems. XX Congresso Nazionale S.It.E., Parma 27-30 Settembre 2010.
  - **Ludovisi A.\***, 2010. Use of entropy-based functions in the analysis of ecosystem state and development. International Conference “Problems in Ecology”, Irkutsk (Russia) 20-25 September 2010.
  - **Ludovisi A.**, 2007. Exergy and biodiversity. The 6th European Conference on Ecological Modelling. Trieste (Italy) 27-30, 2007.
  - **Ludovisi A.**, 2004. The strategy of ecosystem development: measuring ecosystem maturity by entropy-based thermodynamic orientors. Ecosystem Complexity Workshop, Bled (Slovenia), September 25-26, 2004.
  - **Ludovisi A.**, Pandolfi P., Taticchi M.I., 2003. Interpreting the Schrödinger ratio to analyse the ecological succession of plankton communities in lakes. Workshop “Ecological indicators: theoretical fundamentals for consistent applications in environmental management”, Como (Italy) September 7-10, 2003.
  - **Ludovisi A.**, Minozzo M., Pandolfi P., Taticchi M.I., 2002. Multivariate spatial analysis of plankton count data from Lake Trasimeno (Italy). V Conferenza della European Society for Mathematical and Theoretical Biology. Milano (Italy), July 2-6, 2002.
  - Minozzo M., **Ludovisi A.**, 2001. Multivariate analysis of spatial heterogeneity of plankton communities. International Conference of the Royal Statistical Society. Glasgow (UK), July 4-6, 2001.
  - **Ludovisi A.**, Poletti A., 1998. Entropy production indices as ecological indicators for the trophic state of lake ecosystems: the Lake Trasimeno. International Workshop Tempos in science and nature: structures, relations and complexity. Siena (Italy), September 23-26, 1998.
  - **Ludovisi A.**, Poletti A., 1998. Structural exergy as ecological indicator for the trophic state of lake ecosystems: the Lake Trasimeno. International Workshop Tempos in science and nature: structures, relations and complexity. Siena, September 23-26, 1998.

### Workshops/courses

- Ecosystem Complexity Workshop. Bled, Slovenia, September 25-26, 2004.
- Summer School “Terza Scuola di Modellistica Ambientale ed Ecodinamica”, Sabaudia (LT), Italy, 3-11 September 2001.
- National School “I rifiuti – Chimica, Valorizzazione, Smaltimento, Controllo Ambientale”, Assisi, Italy, 27 September - 3October, 1998.
- Advanced Course in Ecological Modelling, Royal Danish School of Pharmacy, Copenhagen, Denmark, September 1997.
- Advanced course “Modelling nella Scienza e nella Tecnica”, Perugia, Italy, February 19-21, 1997.
- Summer School “I Scuola di Chimica Fisica Ambientale” Ingurtosu (Cagliari), Italy, September 24-30, 1995.
- Summer School “Laboratory and Numerical modelling of Geophysical Flows”, Gignod, Italy, June 25-30, 1995.