

Marino Gatto

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Marino Gatto, born in 1949, graduated in Electronic Engineering in 1972, is Professor of Ecology, School of Civil, Environmental and Land Use Engineering, Politecnico di Milano. His cultural background is engineering and mathematical modelling and his research has entirely focussed on ecology and the management of renewable resources since 1974.

The turning point of his career occurred in 1974 when he became a research fellow in the Ecology Group of IIASA (International Institute for Applied Systems Analysis), Laxenburg, Austria. In 1976 he joined the Institute of Animal Resource Ecology, University of British Columbia, Vancouver, Canada, for about one year to specialize in applied ecology.

Professional Appointments

1978: Assistant Professor of System Theory, University of Naples

1978-1982: Assistant Professor of Optimal Control, Politecnico di Milano and University of Pavia

1983-1987: Associate Professor of Applied Ecology, Politecnico di Milano

1987 - present: Professor of Ecology, Politecnico di Milano

1987: visiting Professor, University of Vienna, Austria

1997-2001 and 2006-2007: visiting Professor, Département de biologie, École Normale Supérieure, Paris, France

2011: visiting Professor, Laboratoire de Ecohydrologie, École Polytechnique Fédérale de Lausanne

1991-1999: chair of the Program in Environmental and Land Use Engineering, Politecnico di Milano

1999-2002: vicepresident of the Italian Society of Ecology.

2003-2006: president of the Italian Society of Ecology.

2007-2010: member of the Academic Senate of the Politecnico di Milano

2009-2013: member of the executive board of the Laboratory on Energy and Environment (LEAP-Politecnico di Milano)

2013-present: member of the scientific committee of the Laboratory on Energy and Environment (LEAP-Politecnico di Milano)

2013-present: member of the executive board of CoNISMa, the interuniversity national consortium for marine sciences

Teaching

Undergraduate course: *Ecology* within the program in Environmental and Land Planning Engineering

Graduate Courses: *Conservation and management of ecosystems* within the graduate program in Environmental and Land Planning Engineering; *Spatial models in Biology* within the Ph.D. program in Information Engineering

Director of the course *Global change and sustainability* within the program of the Alta Scuola Politecnica (Politecnico's School of Excellence).

Professional Affiliations

Società Italiana di Ecologia
Ecological Society of America
American Society of Naturalists

Awards, Honors, National And International Service

1989: NATO Visiting fellow, State University of New York at Stony Brook, Department of Ecology and Evolution
1997: short-term visiting scholar, Department of Ecology and Evolution, Princeton University
1993-2014: associate editor, Theoretical Population Biology
1997-2011: editor, Ecology and Society (formerly Conservation Ecology)
1998-present: editor, Biologia e Conservazione della Fauna
2012: editor, Advances in Water Resources
1997: Anassilaos award for environmental sciences
2002: Focus award for his studies on energy and the environment
2003-present: member of the scientific committee, WWF Italy
2007: elected to the Istituto Lombardo, Accademia di Scienze e Lettere
2008: elected to the Istituto Veneto di Scienze, Lettere ed Arti
2015: winner of the Orange Big Data Challenge in the category Health for modeling schistosomiasis in Senegal

Current research activity

Gatto's main research activity is in the field of ecological modelling and management of biological resources. In the past 7 years he has focused mainly on the following topics

- Disease and parasite ecology

Analysis of the dynamics of microparasitic diseases of the wildlife with particular regard to rabies and its epidemiological features in hosts with different body sizes. Spatiotemporal dynamics of cholera and development of innovative modelling for the spread of the disease along hydrological and human mobility networks. Application to the case studies of Kwazulu-Natal (South Africa), Bangladesh, Democratic Republic of the Congo and Haiti. For the latter case, analysis of the effect of different intervention policies.

- Management of marine biological resources

Development of demographic and dispersal models for the European eel *Anguilla anguilla*, the lobster *Palinurus elephas*, the anchovy *Engraulis encrasicolus* and the white sea bream *Diplodus sargus sargus*. Models have been utilized to assess different management policies such as the planning of new marine protected areas (MPA), the enforcement of new regulations for existing MPA's, the limitation of fishing effort, the adoption of different fishing techniques.

- Alien species dynamics

Development of spatiotemporal models for the dynamics of the zebra mussel *Dreissena polymorpha*, a freshwater bivalve, alien to the water bodies of North America and western Europe, that has been and is causing a significant ecological distress and enormous economic damages. The model explicitly includes the description of the hydrological network and the long-distance dispersal via ballast water due to commercial and recreational boating. The model has been applied to forecasting the spread of the mussel in the Arno river (Italy) and to reconstruct the invasion of Mississippi-Missouri river system, which has entailed damages of billions of dollars in the past decades.

- Impacts of climate change on biodiversity and ecosystems

Critical review of impact models used to forecast the impact of global climate change on population dynamics and ecosystem functioning. Development of static and dynamic models for analyzing the impact on alpine species (hibex, chamois, black grouse, rainbow trout).

- Spatial patterns of vegetation

Development of models for the interaction between seed predators or pathogens and recruitment of seedlings. Analysis of the implications for known patterns of vegetation, with particular regard for the so-called Janzen-Connell patterning (maximal recruitment at intermediate distance from the parent plant).

A good deal of the activity has been conducted in cooperation with other Italian and foreign institutions: University of Parma, Dept. of Environmental Sciences (Italy); École Polytechnique Fédérale de Lausanne, Laboratoire de écohydrologie, ENAC (Switzerland); Princeton University, Dept. of Ecology and Evolutionary Biology and Dept. of Civil and Environmental Engineering, Princeton (USA); Station Biologique de la Tour du Valat (France); Hebrew University of Jerusalem, Department of Evolution, Systematics and Ecology, Jerusalem (Israel); Stanford University, Hopkins Marine Station, Pacific Grove (USA).

General information on M. Gatto's activities

Marino Gatto has been a plenary lecturer in several national and international conferences.

Reviewer for conferences and journals, including Proceedings of the National Academy of Sciences USA, Canadian Journal of Fisheries and Aquatic Sciences, Ecology, Ecological Modelling, Vegetatio, Theoretical Population Biology, Journal of Mathematical Biology, Journal of Theoretical Biology, Acta Oecologica, Marine Ecology, Journal of Applied Ecology and American Naturalist. In his position of president of the Italian Society of Ecology he promoted the visibility of the most brilliant and highly impacting young ecologists in Italy through various initiatives, including the prize for the best annual paper in ecology published by a peer-reviewed journal, fellowships to spend a period abroad for conducting research in qualified foreign institutions, and the collection of the curricula of Italian ecologists which are now available online.

Gatto's research interests have included: dynamics and management of marine resources, models of fragmented populations, extinction risk assessment of wildlife populations, climate change ecology, disease and parasite ecology, ecological economics.

In the past he coordinated several funded research projects as leader or leader of research teams on various topics including: the Italian Natura 2000 biodiversity network, the GIS supported database of protected areas for the Italian Ministry of the Environment, eel and clam population dynamics and management, the assessment of future impacts of climate change on the natural systems of Lombardy, the impact of electrical power grid development on the landscape and the natural systems of Italy, the impacts of gas and coal-fired power plants on greenhouse gas emissions, the international project (Princeton, Stanford, Parma University, Emory, Station Biologique Tour du Valat) "Consequences and impacts of global climate change on the management and conservation of natural resources".

Recent research grants

- Leader of research team conducting biodiversity research in the project "Climate Change Assessment in Small Pacific Islands States" funded by the Italian Ministry of Environment

- Leader of research team conducting research on energy from biomass in the Project ECATE “Laboratorio per l'Efficienza e la Compatibilità Ambientale delle Tecnologie Energetiche” funded by the regional government of Emilia-Romagna
- Leader of Work Package 4 “Climate change and atmospheric pollution: pressures and impacts on mountain ecosystems” in the project SHARE-Stelvio funded by the regional government of Lombardy and by Fondazione Lombardia per l’Ambiente
- Leader of Politecnico’s research team in the H2020 project “Ecopotential”
- Scientist in charge, International Outgoing Marie Skłodowska-Curie Fellowship, Project RAPIDEVO

M. Gatto has authored or coauthored more than 200 articles. About 120 have appeared in peer-reviewed journals including Nature, Proceedings of the National Academy of Sciences USA, Proceedings of the Royal Society, Journal of the Royal Society-Interface, BioScience, The American Naturalist, Ecological Applications, Water Resources Research, Geophysical Research Letters, Canadian Journal of Fisheries and Aquatic Sciences, Environmental Toxicology and Chemistry, Journal of theoretical Biology, Ecohydrology.

A complete publication list is downloadable at
<http://home.deib.polimi.it/gatto/PublicationListGatto.pdf>

Peer reviewed publications since 2009 (reverse order)

1. D. Bevacqua, P. Melià, M. Gatto, G. De Leo “A global viability assessment of the European eel” *Global Change Biology*, 2015, doi: 10.1111/gcb.12972.
2. M. Ciddio, L. Mari, E. Bertuzzo, M. Gatto, A. Rinaldo, R. Casagrandi "The temporal patterns of disease severity and prevalence in schistosomiasis" *Chaos*, 2015, 25: 036405 (2015); doi: 10.1063/1.4908202.
3. L. Mari, E. Bertuzzo, F. Finger, R. Casagrandi, M. Gatto, A. Rinaldo “On the predictive ability of mechanistic models for the Haitian cholera epidemic” *Journal of the Royal Society – Interface*, in press, DOI: 10.1098/rsif.2014.0840.
4. L. Righetto, R. U. Zaman, Z. H. Mahmud , E. Bertuzzo, L. Mari, R. Casagrandi, M. Gatto, S. Islam, A. Rinaldo “Detection of *Vibrio cholerae* O1 and O139 in environmental waters of rural Bangladesh: a flow-cytometry-based field trial” *Epidemiology and Infection*, 2014, in press, doi: 10.1017/S0950268814003252.
5. Schiavina M., D. Bevacqua, Melià P., A.J. Crivelli, M. Gatto & G.A. De Leo “Eel Management Software, a user-friendly tool for the management of European eel fishery and conservation” *Environmental Modelling & Software*, 64: 9-17, 2015.
6. J. Kühn, F. Finger, E. Bertuzzo, S.Borgeaud, M. Gatto, A. Rinaldo, M. Blokesch “Glucose- but not rice-based oral rehydration therapy enhances the production of virulence determinants in the human pathogen *Vibrio cholerae*” *PLOS Neglected Tropical Diseases*, 2014, 8 (12): e3347, doi: 10.1371/journal.pntd.0003347.
7. F. Finger, A. Knox, E. Bertuzzo, L. Mari, D. Bompangue, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo “Cholera in the lake Kivu region (DRC): integrating remote sensing and spatially-explicit epidemiological modeling” *Water Resources Research*, 2014, 50: 5624-5637, ISSN 0043-1397.

8. E. Bertuzzo, F. Finger, L. Mari, M. Gatto, A. Rinaldo "On the probability of extinction of the Haiti cholera epidemic" *Stochastic Environmental Research and Risk Assessment*, 2014, DOI 10.1007/s00477-014-0906-3.
9. L. Mari, R. Casagrandi, E. Bertuzzo, A. Rinaldo, M. Gatto "Floquet theory for seasonal environmental forcing of spatially-explicit waterborne epidemics" *Theoretical Ecology*, 2014, DOI 10.1007/s12080-014-0223-y.
10. L. Mari, R. Casagrandi, E. Bertuzzo, A. Rinaldo, M. Gatto "Metapopulation persistence and species spread in river networks" *Ecology Letters*, 17 (4):426-434, 2014.
11. M. Gatto, L. Mari, A. Rinaldo "Leading eigenvalues and the spread of cholera" *SIAM News*, 46 (7), September 2013.
12. J. M. Pujolar, M. Schiavina, A. Di Franco, P. Melià, P. Guidetti, M. Gatto, G. A. De Leo, L. Zane "Understanding the effectiveness of marine protected areas using genetic connectivity patterns and Lagrangian simulations" *Diversity and Distributions*, 19 (12):1531-1542, 2013, DOI: 10.1111/ddi.12114.
13. G. Fiorese, M. Gatto, G. Guariso "Optimization of combustion bioenergy in a farming district under different localisation strategies" *Biomass and Bioenergy*, 58: 20-30, 2013, DOI: 10.1016/j.biombioe.2013.07.018.
14. L. Righetto, E. Bertuzzo, L. Mari, E. Schild, R. Casagrandi, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "Rainfall mediations in the spreading of epidemic cholera" *Advances in Water Resources*, 2013, in press.
15. M. Gatto, L. Mari, E. Bertuzzo, R. Casagrandi, L. Righetto, I. Rodriguez-Iturbe, A. Rinaldo "Spatially explicit conditions for waterborne pathogen invasion" *The American Naturalist*, 2013, in press.
16. P. Melià, M. Schiavina, M. Gatto, S. Masina, R. Casagrandi "Integrating field data into individual-based models for the migration of European eel larvae" *Marine Ecology Progress Series*, in press.
17. Di Franco A., G. Coppini, J.M. Pujolar, G.A. De Leo, M. Gatto, V. Lyubartsev, P. Melià, L. Zane, P. Guidetti "Assessing Dispersal Patterns of Fish Propagules from an effective Mediterranean Marine Protected Area" *PLoS ONE* 7(12): e52108, 2012, doi:10.1371/journal.pone.0052108.
18. M. Gatto, L. Mari, E. Bertuzzo, R. Casagrandi, L. Righetto, I. Rodriguez-Iturbe, A. Rinaldo "Generalized reproduction numbers and the prediction of patterns in waterborne disease", *Proceedings of the National Academy of Sciences*, 2012, 48: 19703-19708, doi:10.1073/pnas.1217567109.
19. S. Ceola, E. Bertuzzo, L. Mari, G. Botter, I. Hödl, T. J. Battin, M. Gatto, A. Rinaldo "Light and hydrologic variability as drivers of stream biofilm dynamics in a flume experiment" *Ecohydrology*, in press, DOI: 10.1002/eco.1357.
20. A. Mignatti, R. Casagrandi, A. Provenzale, A. von Hardenberg, M. Gatto "Sex and age-structured models for Alpine ibex population dynamics" *Wildlife Biology*, 18 (3): 318-332, 2012, <http://dx.doi.org/10.2981/11-084>.
21. A. Rinaldo, E. Bertuzzo, L. Mari, L. Righetto, M. Blokesch, M. Gatto, R. Casagrandi, M. Murray, S. Vesenbeckh, I. Rodriguez-Iturbe "Reassessment of the 2010-2011 Haiti cholera outbreak and rainfall-driven multiseason projections" *Proceedings of the National Academy of Sciences*, 2012, 109 (17) 6602-6607, doi:10.1073/pnas.1203333109.
22. E. Bertuzzo, L. Mari, L. Righetto, M. Gatto, R. Casagrandi, I. Rodriguez-Iturbe, A. Rinaldo "Hydroclimatology of Dual-Peak Annual Cholera Incidence: Insights from a Spatially Explicit Model" *Geophysical Research Letters*, 2012, 39:L05403, doi:10.1029/2011GL050723.

23. L. Righetto, R. Casagrandi, E. Bertuzzo, L. Mari, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "The role of aquatic reservoir fluctuations in long-term cholera patterns" *Epidemics*, 4:33-42, 2012.
24. L. Mari, E. Bertuzzo, L. Righetto, R. Casagrandi, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "On the role of human mobility in the spread of cholera epidemics: towards an epidemiological movement ecology" *Ecohydrology*, in press, published online: 25 Oct 2011, doi: 10.1002/eco.262.
25. L. Mari, E. Bertuzzo, L. Righetto, R. Casagrandi, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "Modeling cholera epidemics: the role of human mobility and sanitation conditions" *Journal of the Royal Society – Interface*, 2012, 9:376-388, doi:10.1098/rsif.2011.0304.
26. A. Rinaldo, M. Blokesch, M. Murray, E. Bertuzzo, L. Mari, L. Righetto, M. Gatto, R. Casagrandi, I. Rodriguez-Iturbe "A Transmission Model of the 2010 Cholera Epidemic in Haiti" *Annals of Internal Medicine*, 155:403-404, 2011.
27. P. Melià, M. Petrillo, G. Albertelli, A. Mandich, M. Gatto "A bootstrap approach to account for uncertainty in egg production methods applied to small fish stocks" *Fisheries Research*, published online 27 May 2011, doi:10.1016/j.fishres.2011.05.011.
28. E. Bertuzzo, L. Mari, L. Righetto, M. Gatto, R. Casagrandi, M. Blokesch, I. Rodriguez-Iturbe, A. Rinaldo "Prediction of the spatial evolution and effects of control measures for the unfolding Haiti cholera outbreak" *Geophysical Research Letters*, 2011, Vol. 38, L06403, doi: 10.1029/2011GL046823.
29. L. Mari, E. Bertuzzo, R. Casagrandi, M. Gatto, S. A. Levin, I. Rodriguez-Iturbe, A. Rinaldo "Hydrologic controls and anthropogenic drivers of the zebra mussel invasion of the Mississippi-Missouri river system" *Water Resources Research*, 2011, 47, W03523, doi: 10.1029/2010WR009920.
30. D. Bevacqua, P. Melià, G. A. De Leo, M. Gatto " Intra-specific scaling of natural mortality in fish: the paradigmatic case of the European eel" *Oecologia*, 2011, 165(2):333-9, DOI 10.1007/s00442-010-1727-9.
31. L. Righetto, E. Bertuzzo, R. Casagrandi, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "Modeling Human Movement in Cholera Spreading along Fluvial Systems" *Ecohydrology*, 2011, 4(1): 49-55. DOI: 10.1002/eco.122.
32. E. Bertuzzo, R. Casagrandi, M. Gatto, I. Rodriguez-Iturbe, A. Rinaldo "On spatially explicit models of cholera epidemics" *Journal of the Royal Society – Interface* 7:321-333, 2010. doi: 10.1098/rsif.2009.0204.
33. L. Mari, M. Gatto, R. Casagrandi "Central-place seed foraging and vegetation patterns" *Theoretical Population Biology*, 76 (4): 229-240, 2009. doi:10.1016/j.tpb.2009.08.001.
34. L. Mari, R. Casagrandi, M.T. Pisani, E. Pucci and M. Gatto "When will the zebra mussel reach Florence? A model for the spread of *Dreissena polymorpha* in the Arno water system (Italy)" *Ecohydrology*, 2, 428-439, 2009. doi: 10.1002/eco.71.
35. D. Bevacqua, G. A. De Leo, M. Gatto and P. Melià "Size selectivity of fyke nets for European eel (*Anguilla anguilla* L.)" *Journal of Fish Biology*, 74, 2178–2186, 2009. doi:10.1111/j.1095-8649.2009.02243.x
36. Bevacqua D., P. Melià, A. J. Crivelli, M. Gatto and G. A. De Leo "Assessing Management Plans for the recovery of the European eel (*Anguilla anguilla*): a need for multiobjective analyses" Proceedings of the 137th Annual Meeting of the American Fisheries Society 2007. Challenges

for Diadromous Fishes in a Dynamic Global Environment, Halifax, Nova Scotia, Canada, June 18-21, 2007. *American Fisheries Society Symposium*, 69: 637-647, 2009.

37. M. Gatto "On Volterra and D'Ancona's footsteps: the temporal and spatial complexity of ecological interactions and networks" *Italian Journal of Zoology*, 76: 3 - 15, 2009. doi: 10.1080/11250000802364657.