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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Título:**

Understanding phytoplankton diversity and community assembly in the ocean

**Resumen de la Memoria:**

Marine phytoplankton play a fundamental role in ocean ecology and global biogeochemical cycles, sustaining marine food webs and contributing roughly half of primary production on Earth. These microscopic algae are vital to the functioning of Earth's ecosystems, yet, our knowledge about the structure and dynamics of their communities is still very limited. Traditionally, the study of microbial plankton community assembly has focused on niche-based models wherein species tradeoffs and habitat conditions determine the structure of communities. However, much evidence shows that microbial plankton communities contain a large pool rare species that make their way to each habitat through passive dispersal. These species may become dominant if environmental conditions turn favorable critically altering community structure and the functioning of ecosystems. My main research line attempts to understand the mechanisms underlying the structure of marine phytoplankton communities and their impact on marine food webs and global biogeochemical cycles. To do so, I use both modeling and experimental approaches to i) mathematically describe community dynamics, ii) investigate the linkage between individuals, dispersal, community structure and ecosystem functioning, and iii) predict the impact of climate change on this fundamental component of Earth's biosphere. In a genuine extension of this work, I link this body of ecological research with the analysis of microfossil records in order to explore the response of microbial plankton communities to abrupt climate changes in the geological past and to understand the mode and tempo of microbial evolution.

**Resumen del Curriculum Vitae:**

B.S. Biology, University of Salamanca, 1998. B.S. Marine Science, University of Vigo, 2000. At present I am Juan de la Cierva postdoctoral fellow at the Department of Ecology and Animal Biology (University of Vigo, Spain). Previously, I had an appointment as postdoctoral associate at the Environmental Biophysics and Molecular Ecology Program (Rutgers University, USA) supervised by Prof. Paul G Falkowski. I have established research collaborations with colleagues at Plymouth Marine Laboratory, Southampton Oceanographic Centre, St. Andrews University (UK), Lamont-Doherty Earth Observatory (Columbia University), Massachusetts Institute of Technology and Scripps Institution of Oceanography (USA). I was granted with a postdoctoral fellowship from the MEC-Fulbright (2006-2007), and the European Union through the Marie Curie Outgoing International Program (2007-2009). I am principal investigator of a research project awarded by Xunta de Galicia within the program INCITE and co-PI of a project funded by the Spanish Ministry of Science and Technology. I am also PI of another project currently under consideration (Plan Nacional I+D+I 2008-2011). I have participated actively in more than 11 research projects related to phytoplankton physiology and ecology, and in 7 oceanographic cruises over equatorial, tropical, subtropical, temperate and coastal waters. I have published 19 papers (15 in SCI journals and in 10 as first author) in some of the most influential journals including Science, PNAS, PLoSone or Ecology Letters, in all them as first author. 80 % of these papers are within the 25% highest impact journals in marine ecology and oceanography. I have four additional SCI papers now under consideration. My research has been highlighted three times in Faculty 1000, highlighted in Science magazine, featured in Projects magazine (British publishers) and covered by the public media (including El Pais, Publico, La Voz de Galicia, Europa Press and others). I have presented my results at 26 national and international conferences, meetings and talks (in 4 as invited speaker). Currently, I am co-advisor of a PhD student and advisor of a MsThesis. I teach practical courses in Phytoplankton, Marine Ecology and Ecology I, and am enrolled as invited lecturer in Postgraduate courses of Oceanography and Fisheries. I have acted as reviewer about 30 times for journals such as PNAS, PLoSone, Ecology Letters, Global Change Biology or Limnology & Oceanography and for funding agencies including US-National Science Foundation and the US-Israel binational Science foundation.



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**Título:**

The evolution of polyandry and sexual conflict

**Resumen de la Memoria:**

Sexual selection is a key evolutionary force that underlies the expression of numerous morphological, physiological, and behavioural traits, mediates complex coevolutionary interactions between the sexes, and facilitates speciation. Polyandry (females mating with more than one male in the same reproductive episode) typically allows males to compete beyond mating for the fertilization of the ova and it allows females to bias paternity after copulation. Polyandry, therefore, has enormous evolutionary implications because it allows sexual selection to continue after mating. However, there is considerable controversy surrounding the evolutionary basis for polyandry. I propose a research program that will address some of the most pertinent questions relating to the adaptive significance of polyandry. First, I will carry out a timely comprehensive evaluation of the genetic benefits of polyandry by implementing new theoretical developments and by using innovative methods and model systems that allow exceptional experimental control. Second, I will use appropriate experimental designs to accurately estimate the genetic variance (the raw material for evolution through natural and sexual selection) in male quality and male reproductive success. Third, I will examine the role played by genetically determined but environmentally transmitted effects (i.e., indirect genetic effects) in the evolution of female choice. In addition, I will investigate the evolutionary causes and consequences of the divergent reproductive interests across the sexes. Sexual conflict is known to drive the interaction between males and females at all levels but one critical component that has been largely neglected is how sexual conflict and ageing affect and interact with each other. My research plan will address this question and other key unresolved aspects in relation to the evolution of sexual interactions. In summary, I propose an integrated research plan that will utilize innovative methods, will challenge conventional paradigms, and will improve fundamental knowledge on evolutionary processes. In addition, the projects that I propose will provide results that will be applicable to other areas of knowledge (e.g., conservation biology). I anticipate that this research will yield results at the forefront of research in the field, thereby having a significant international impact. This work will also provide excellent research opportunities for students.

**Resumen del Curriculum Vitae:**

I completed my PhD thesis, which focused on postcopulatory sexual selection and the evolution of parental care, in 2002. During my doctorate I spent nearly nine months at research centres in the UK, Australia, and the US. After the completion of my thesis I moved to Australia thanks to a two year Postdoctoral Fellowship from the Spanish Ministry of Education. Later on, I was awarded a three-year Australian postdoctoral fellowship and associated Discovery Project grant from the Australian Research Council. Subsequently, I was awarded a 5 year Australian Research Fellowship (ARF) plus associated Discovery Project with funding commencing in 2009. Currently, I am an Australian Research Fellow / Assistant Professor at the Centre for Evolutionary Biology (University of Western Australia). Since the end of my PhD I have been the sole responsible for the intellectual development of my research program. My research has primarily focused on the study of sexual selection, sexual conflict, the evolution of female multiple mating, and the study of genetic variation in traits that determine reproductive success. This research has yielded numerous contributions in leading journals such as *Current Biology*, *Evolution*, *Proc. Roy. Soc. B* and *J. Evol. Biol.*, including three theoretical sole-authored papers published in *Am. Naturalist*, *Evolution* and *BMC Evol. Biol.*. I have 35 publications of which 33 are peer-reviewed scientific contributions, including 25 articles in SCI journals, 2 book chapters and 1 article for an encyclopedia. I have had a leading role in most of my published work. I am the first author in 23 (70%) of my peer-reviewed publications. The average impact factor of my SCI publications is 4.38 (range 1.251-10.992), and over 95% of these publications (all but one) are in journals ranked within Quartile 1 of their corresponding discipline fields. Despite the fact that my contributions to these fields are recent, my work has already attracted over 400 citations, excluding citations in books. My h-index is 11 and it will rapidly increase as many of my published papers are recent contributions. The average citations per article (articles in international journals excluding 2009 onwards to allow for a two-year time lag between publication and citation) are over 20. I routinely participate in leading international meetings (e.g. European Society for Evolutionary Biology). Some of my research has attracted the media or has been highlighted or reviewed (e.g., in *Faculty of 1000 Biology*). I was a member of the organizing committee of the most recent congress of the International Society for Behavioural Ecology, held in Perth in 2010, which attracted over 700 delegates. My scientific responsibilities have included reviewing for a broad array of journals, including *Am. Naturalist*, *Behav. Ecol.*, *Behav. Ecol. Sociobiol.*, *Biol. Rev.*, *Biol. Letters*, *BMC Evol. Biol.*, *Evolution*, *J. Evol. Biol.*, *PLoS Biol.* and *Proc. Roy. Soc. B*, among others, plus reviewing for funding agencies such as the US National Science Foundation (NSF), the Natural Environmental Research Council (NERC, UK) and the Austrian Science Fund (FWF). I was named *Biology Letters* Top Referee in 2008, and I am a member of the Editorial Board of *Journal of Ethology*. I have participated in numerous research projects and I have been Principal Investigator in five of them.



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**SUBPROGRAMA RAMON Y CAJAL  
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**Título:**

GENETICS OF NATURAL VARIATION FOR THE STUDY OF PLANT ADAPTATION TO DROUGHT STRESS

**Resumen de la Memoria:**

Changes in temperature and precipitation associated with continued emissions of greenhouse gases will bring changes in land suitability and crop yields. This environmental scenario will lead to particularly complex consequences in the Mediterranean region, where a higher frequency of extreme climate events like heat waves and droughts is expected. The development of plants which can cope with drought conditions is, therefore, a major goal. The use of natural variation as source of genetic diversity is a powerful tool for the study of local adaptation to drought in plants. During my postdoctoral research at the Universitat de Barcelona (Spain, 2004-2006) and Max Planck Institute for Plant Breeding Research (Germany, 2006-2011) I have contributed to 8 projects dedicated to the study of abiotic and biotic stress responses in plants, with a special dedication to drought stress and QTL-by-environment interactions. I have a total of 14 first-author publications in the field of plant stress, some in prestigious journals Nature Genetics (impact factor, I.F: 34,2), PNAS (I.F: 10,3) and Plant Journal (I.F: 7,34) and the mean impact factor for my first-author publications of 8,56. My research has revealed metabolic pathways conferring enhanced drought tolerance, cross-talks between ABA and polyamines in the regulation of drought tolerance and epistatic networks governing cross-talks between abiotic and biotic stress responses. I have also contributed to a better understanding of evolutionary adaptive mechanisms to abiotic stress responses. Following my line of research and expertise, I plan to gain a novel multidisciplinary insight into the adaptation of plants to drought by combining molecular biology, genetics of natural variation and population genetics to identify QTLs and underlying alleles, molecular mechanisms and the evolutionary basis of plant adaptation to drought. The last goal of my research is to transfer knowledge of drought adaptation mechanisms to close-related and evolutionary distant crop species for its potential application in plant breeding.

**Resumen del Curriculum Vitae:**

Degree in Pharmacy by the University of Barcelona (1999) with an average of Excellent (2.75, max 4.0). My interest in the genetics and molecular biology of plant abiotic stress tolerance motivated my decision to initiate my PhD under the supervision of Prof. Antonio F. Tiburcio and Prof. Teresa Altabella in 2000, at the University of Barcelona (Spain). I was granted with a FI/FIAP Fellow (Generalitat de Catalunya). In 2004, I was appointed postdoctoral researcher in the abiotic stress EU project 'Regulation of Osmotolerance' (ROST) under the direction of Prof. Antonio F. Tiburcio (Spain). In 2006, I joined the Department of Plant Breeding and Genetics of the Max Planck Institute for Plant Breeding Research (Germany) under the supervision of Prof. Maarten Koornneef. Since then, I am postdoctoral researcher at this institute investigating the genetics of natural variation in response to environmental fluctuations. During my 5-years postdoctoral research in Germany I have been granted with a Beatriu de Pinós Postdoctoral Fellowship (2006-07), and Max Planck Postdoctoral Fellowship (2008-09). Since 2010, I am hired on contract as postdoctoral researcher by the German Research Foundation (DFG) at the same Institute. I have a total of 23 publications in the abiotic and biotic stress field that accumulate 257 citations. 14 publications are first-author in journals with a mean impact factor of 8,56. 11 of my first-author publications are in journals listed in SCI, such as prestigious scientific journals: Nature Genetics, PNAS, Plant Journal. I am first-author of 3 book chapters, some in academic books. I am also co-author of 9 additional publications including top journals listed in SCI: Plant Cell, Plant Physiology, PLoS One and co-author of 2 book chapters in abiotic stress. I have been invited to write reviews for prestigious journals in plant biology: Current Opinion in Plant Biology and Trends in Plant Science. I have been reviewer of 7 SCI journals, remarkably PNAS and PLoS One. Since 2009, I am member of the International Network of Plant Abiotic Stress (<http://cost-inpas.org/>) in which I am enrolled as German partner PI of a bilateral collaboration with Spain. In 2009, I acquired the accreditation for Tenure-track Lecturer by the Agency of University Quality Assurance (AQU, Spain). I am co-director of Thesis at the University of Barcelona (Spain) and Master supervisor at the Max Planck Institute (Germany).



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**SUBPROGRAMA RAMON Y CAJAL  
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**Título:**

Towards an Ecosystem-based Approach of Marine Resources: Linking Biodiversity, Food Webs, Ecosystem Functioning and Drivers

**Resumen de la Memoria:**

The main aim of my research is to investigate important relationships between changes in marine diversity and abundance of marine resources due to cumulative stressors or drivers and how they translate in changes in the structure and functioning of marine food webs and ecosystems. With this research line I want to provide a better scientific basis to quantify what are the consequences of the ecological changes we are witnessing at the ecosystem level, and thus how they translate into the services and products that marine ecosystems provide to humans. Therefore, I aim at describing and quantifying the structural ecosystem changes due to changes in marine resources (both biodiversity but also abundance), and develop an understanding of how these changes have impacted marine ecosystem functioning. These changes are due to fishing activities, especially on highly exploited ecosystems such as the Mediterranean Sea, but also due to other human stressors such as eutrophication, pollution, habitat loss, invasive species and climate change. They can also be linked with environmental dynamics and act synergistically, so it is essential to investigate the cumulative impact of various drivers simultaneously. Therefore, this research will contribute with scientific knowledge to the ecological component of the Ecosystem-based Approach of Marine Resources. To accomplish my objective I will use an interdisciplinary approach combining analysis of historical and recent biological data, food-web and ecosystem modelling, and laboratory experiments, which I developed during my postdoctoral stay in Canada. This trial approach provides complementary information on how biodiversity and abundance changes due to different anthropogenic disturbances affects marine food webs and ecosystems at different temporal and spatial scales. The investigation on how the spatial scale of studies conditions results and macro-ecological patterns will be a special focus of my future work and I'm planning to combine data at local, region and global scales. Although this subject has been given much attention in terrestrial ecology, it is far less studied in marine environments. I will also pay a special attention on how uncertainty on available data conditions results. Finally, I'm also interested in investigating if documented changes are likely reversible or not. To do so I will collect empirical data on populations and ecosystem recoveries, and develop specific modelling simulations and laboratory experiments to tackle this scientific question. I will primarily base my research on the Mediterranean Sea (both on coastal and deep sea ecosystems), but I will also include other ecosystems with abundant data, or subject to different human stressors. This will be possible due to my previous collaborations with colleagues from these regions (see curriculum vitae).

**Resumen del Curriculum Vitae:**

During the third year of my undergraduate program on Environmental Sciences at the Autonomous University of Barcelona (Spain), I was awarded a scholarship to visit the Centre for Marine and Limnology Research at the University of Costa Rica (1999-2000). In 2002 I joined the Institute of Marine Science (ICM-CSIC, Barcelona, Spain) under the supervision of Dr. Palomera and Dr. Tudela. At ICM (2002-2006) I developed my PhD degree on Biological Science with the main goal of characterizing the structure and functioning of exploited Mediterranean marine ecosystems using food-web modelling and ecosystem indicators. A total of 14 publications on international journals were published. Meanwhile I collaborated with (i) Dr. Sardà from the ICM-CSIC on ecosystem indicators of the deep-sea, (ii) with Dr. Ameri, Dr. Santojanni and Dr. Libralato from the Istituto di Scienze Marine (ISMAR-CNR), Sede di Ancona, and from the Istituto Nazionale di Oceanografia e di Geofisica Sperimentale in Trieste on modelling techniques in the Adriatic Sea, (iii) with Dr. Mackinson from the Centre for Environment, UK, in modelling comparisons, and (iv) with Dr. Shannon from University of Cape Town in South Africa. During my PhD I visited the Fisheries Centre, in University of British Columbia (FC-UBC), in Canada, where I collaborated with Dr. Christensen and Dr. Pauly. In 2007 I was offered a two-year postdoctoral contract by Dr. Lotze at the Dalhousie University (Canada) (DAL) and I continued my research on comparing ecological modelling approaches and using ecosystem indicators. In 2008 I changed to two-year postdoctoral contract funded by the Spanish government that allowed me to continue my research at DAL and combine it with research at the FC-UBC. In 2008-2009 I also collaborated with Dr. Mora and Dr. Worm in a global assessment of marine management effectiveness that was recently published in PLoS Biology. During 2007-2009 I was also involved in (i) the EU project  $\zeta$ SESAME $\zeta$ , (ii) in applying ecological modelling techniques to the Aegean sea (Hellenic Centre of Marine Research, Greece), and (iii) in the project  $\zeta$ IndiSeas $\zeta$ . In 2009 I had my first scientific project  $\zeta$ ECOFUN $\zeta$  funded through the EU program PEOPLE and the fellowship program Marie Curie. This project has enabled me to extend my expertise on modeling techniques, develop extensive laboratory skills, and expand my skills on data collection and data analysis. ECOFUN is developed between DAL, FC-UBC, and ICM-CSIC. Under this project, several publications have been developed and numerous collaborations have been established as partial research activity that falls into ECOFUN objectives, such as collaboration with projects: (i)  $\zeta$ BIOFUN $\zeta$ , (ii)  $\zeta$ Seagrass Ecology and Functioning in Atlantic Canada $\zeta$ , (iii)  $\zeta$ The Future of Marine Animal Populations $\zeta$ , (iv)  $\zeta$ The Sea Around Us $\zeta$  and  $\zeta$ Nereus: Predicting the Future Ocean $\zeta$ , (v)  $\zeta$ Nutrients, Hypoxia, Fisheries and Fishes $\zeta$ , and (vi) the  $\zeta$ Census of Marine Life $\zeta$ . A recent collaboration with the Leibniz Institute for Marine Science, Germany, allowed me to participate on research regarding jellyfish and plankton dynamics in the Mediterranean. In 2010 I joined the FC-UBC as teaching assistant during 3 months and the Scientific Steering committee of the  $\zeta$ History of Marine Animal Populations $\zeta$  project. In the new phase of IndiSeas (2011-2013) I will lead Task Group II regarding Biodiversity and Conservation-based indicators. During my career, I participated in oceanographic, an



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**SUBPROGRAMA RAMON Y CAJAL  
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**Título:**

EVOLUTION OF INVASIVENESS IN EXOTIC SPECIES: MECHANISMS AND IMPLICATIONS

**Resumen de la Memoria:**

Biodiversity has its origin in variation among individuals. It is well known that the natural processes that drive divergence strongly involve the individual level. Yet it is remarkable that studies of divergence of populations (leading to local adaptation or even speciation) still have not fully embraced and exploited the importance of individual variability, and especially fail to do so when considering the exact mechanisms of divergence. Throughout my research I have acquired and promoted such a view, and have shown it to be important in explaining a variety of phenomena, such as the behavioural trade-off between foraging and predation, the differentiation and adaptation of populations, the choice of optimal habitats, and sympatric speciation. Lately I am also moving into the area of individual variation in genetics, both in neutral markers (theory of  $Q_{st}$ - $F_{st}$  comparisons, Approximate Bayesian Computation to reconstruct the historical demography of ecological divergence) and in functional loci (candidate gene approaches). I am currently investigating the implications of individual variation for our understanding of biological invasion, an area where individual variation has been particularly ignored. Invasive species are one of the main causes for the loss of global biodiversity, and annually cause some 1.5 trillion (!) US dollar in economic damage. The rate of biological invasion is increasing, and Mediterranean countries have been found to be especially vulnerable. On the other hand, biological invasions provide excellent opportunities to test ecological and evolutionary theories because each invasion acts as a long-term experiment in the wild, often with replication. This suggests there is great scope for novel findings and meaningful, applicable insight. Yet the evolutionary aspects of invasion and the role of individual variation have been largely neglected in invasion biology. It is especially pertinent to establish if, when, how, and to what extent the invasive capacity of populations can change, since this will have effects on their probability to establish and/or become invasive. Integrating observational, experimental, comparative and theoretical approaches, I am investigating a range of topics related to the evolution of invasive capacity. (i) What effect does selection during the uptake, transport and introduction stages of invasion have on invasiveness? (ii) What is the role of sexual selection in speeding up the rate of local adaptation and niche diversification in newly introduced populations? (iii) How important is Matching Habitat Choice in coupling the characteristics that determine the invasiveness of exotic species and the invasibility of environments? (iv) What is the relationship between invasiveness and genetic diversity (as impacted upon by e.g. bottlenecks, multiple introductions, or captive breeding)? (v) Can we use candidate gene approaches to find signatures of adaptive evolution in invasive populations? By attacking such outstanding questions together with a selection of national and international collaborators, I expect that my research will provide fundamental and applied insight into the evolution of invasive species. In addition, it addresses a number of novel and important ecological and evolutionary processes more generally related to the generation and conservation of biodiversity.

**Resumen del Curriculum Vitae:**

Education: MSc at Leiden University (The Netherlands - 1997), PhD at the University of Groningen (The Netherlands - 2002). Post-doctoral experience: funded by a one-year TALENT stipend (2002-2003), a two-month Honorary Fellowship (2003-2004), and a three-year Marie Curie International Outgoing Fellowship (2004-2009). I benefited from research stays (combined with a total of 13 months of paternal leave) at several internationally renowned institutes - New Mexico State University (USA - Dr. Craig Benkman, Biology Department), University of British Columbia (Canada - Dr. Dolph Schluter, Zoology Department), University of Groningen (The Netherlands - Dr. Franjo Weissing, Theoretical Biology), University of Arizona (USA - Dr. Alex Badyaev, Dept. of Ecology and Evolutionary Biology), Texas A&M University (USA - Dr. Thomas DeWitt, Dept. of Wildlife and Fisheries), and University of Uppsala (Sweden - Dr. Mats Björklund, Dept. of Animal Ecology). Currently post-doctoral fellow at the Estación Biológica de Doñana (JAE-Doc, Spain - Dr. José Luis Tella, Dept. of Conservation Biology). I participated in 19 research projects (4 ongoing), of which I was Principal Investigator on 7 (personally obtaining all necessary funding for my post-doctoral fellowships). Communicating research: I have published over 40 papers, some in major journals such as *Science* (first author), *Trends in Ecology and Evolution*, *Evolution*, *Molecular Ecology*, and *Proceedings of the Royal Society - B* (twice). Of these papers, 24 were published in SCI-listed journals which belong to the top quarter of their field in 70% of the cases, and with an average journal impact factor of 4.19 (6.29 for the most recent half of my publications). I am first or sole author on 63% of these papers. I have presented my work at 27 international conferences, obtaining prizes for best talk and best posters, and organised three international symposia (4th Conference of the European Ornithologists' Union - 2003, 11th Conference of the European Society for Evolutionary Biology - 2007, 8th Conference of the European Ornithologists' Union - 2011). I also interact frequently with schools and the media (TV and radio). Fluent in English and Spanish. Academic service: member of editorial board of *Zoological Research* (Chinese Academy of Sciences, 2008-2011), reviewer for many international, peer-reviewed leading journals incl. *Molecular Ecology*, *American Naturalist*, *Evolution*, *Journal of Animal Ecology*, *PLoS One*, *Journal of Avian Biology*. Directed 6 MSc theses, with a 7th ongoing, and member of a PhD committee (Max Planck Institute, Germany). Future: I continue to improve and broaden my research skills by means of advanced courses in e.g. modern statistics and genetics. Due to my extensive experience in international research, funding, collaboration and training, and aided by strong current collaborations (various labs in USA, Canada, Sweden, Germany, Spain), I am in an excellent position to continue my research on evolution of invasiveness in exotic species, to set up exciting additional multidisciplinary lines that include candidate gene approaches, invasion genetics, (stress)physiology, individual personalities and matching habitat selection, and to set up my own research group.



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**SUBPROGRAMA RAMON Y CAJAL  
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**Título:**

Geographical structure of behavioural syndromes in ectothermic species: integrating Behavioural Ecology and Biogeography

**Resumen de la Memoria:**

The study of behavioural syndromes, suites of correlated behaviours across time, situations or contexts, is receiving an increasing attention. Examples across taxa are correlations between individual exploration and aggressiveness, boldness, voracity or dispersal propensity (Aragón et al 2006, *Funct Ecol*). The importance of behavioural syndromes is rooted in: 1) their link with fitness components (Sih et al 2004, *TREE*), 2) they can show a spatially structured inter-population variability as a result of adaptive evolution (Dingemanse et al 2007, *J Anim Ecol*), 3) they can be governed by environmental changes (Bell *J Appl Ecol*). Most of these models use the response variable of georeferenced species, presences as a function of environmental gradients. However, the holistic nature of these types of models can only give partial pictures on the underlying mechanisms that generate the spatially structured inter-population variation. The main aim of this project is readjust modelling techniques of Biogeography to predict at various scales the spatial structure of behavioural syndromes of Iberian ectothermic species, focusing on Conservation and Applied Ecology. Project phases: 1) Sampling and experimentation. To quantify behavioural traits to characterize behavioural syndromes from individuals of different populations representative of the species, geographic range/niche. Measurements of environmental variables for each population (landscape structure, population density, temperature, humidity). Laboratory and mesocosmos experiments reflecting gradients of relevant environmental factors to disentangle the variation of behavioural syndromes explained by selection, phenotypic plasticity or stochasticity, 2) Building models to predict the spatial structure of syndromes as a function of the gathered environmental variables and those coming from GIS data, 3) Independent evaluation and calibration of models comparing extrapolations with populations not included in the model building with the information obtained from direct sampling, 4) Integration with spatial analyses of genetic lineages. This protocol will allow predicting which populations 1) would be more susceptible to environmental changes in landscape, biotic interactions, climate, 2) would have invasive potential, 3) would be adequate for reintroductions to novel environments for threatened species. My multidisciplinary experience (Behav Ecol, Ecophysiol, Dispersal, Macroecol, Biogeogr, Phylogeogr) guarantees the project quality.

**Resumen del Curriculum Vitae:**

I got my PhD in Biology (2001, sobresaliente cum laude) from the Madrid Complutense Univ. I have participated in 14 research projects founded by the ASAB, MEC, MCyT, CAM, MICINN, MARM, SNSF and the European Commission, two of them as principal investigator and founded by international official organizations. I participate in research lines encompassing a huge range in Ecology (Behavioral Ecology, Ecophysiology, Dispersal, Population Biology, Landscape Ecology, Biogeography, Macroecology). My multidisciplinary experience allowed fruitful collaborations with researchers from a variety of areas and countries. I was awarded with 7 research postdoc fellows through competitive applications. Firstly a postdoc contract associated to the MODLIFE project and then the Marie Curie Individual Fellowship to study the evolution of dispersal and its role for conservation of fragmented populations (founded by the European Commission at Ecology Lab, Paris VI Univ, 2001-2003). A postdoc fellow to work on the impact of climate change and habitat fragmentation on the extinction risk of threatened species (founded by CAM at Dept. Ecology, Alcalá Univ, 2005). A FCT postdoc fellow to study factors involved in the evolution of reproductive systems in vertebrates (FCT at Environmental Biology Centre, Lisbon Univ, 2006). An I3P postdoc fellow to work on the influences of environmental factors on the geographical distribution of vertebrates (CSIC, MNCN, 2006-2009). Prof Ayudante Dr Interino continuing with my research activities while teaching (UCM, Dept. Ecology, 2010). I currently hold a research contract to study the evolutionary processes governing diversification, using a multidisciplinary approach (SNF, Dept. Ecology and Evolution, Lausanne Univ, Switzerland, 2010-present). To date I have 33 scientific publications (28 indexed in the SCI and 3 book chapters with ISBN), other 4 in the last editorial phase and 5 in preparation. I am the first or single author in 24 papers (75%) and second author in 5 (16%). I am single author of 5 publications (3 in the SCI, 1 with an impact >4.5). The average number of co-authors in my publications is 2.9. Sixteen of my papers are published within the first quartile of ranking in the area (2 with an impact >5.5, 5 with impact >4 and 13 with impact >2). To date my articles have been cited 333 times (H index = 11), including citations from leader journals (PNAS, *Ecol Lett*, *Ann Rev Physiol*, *Biol Rev*, *Phil Trans B*, *Glob Ecol Biogeogr*, *Am Nat*, *Mol Ecol*, *Glob Change Biol*, *Proc R B*); and 9 articles with more than 15 citations (one with 51 citations). I supervised students at all levels (undergraduate, graduate, doctorates and postdoc). Invited speaker in different departments and countries. I am a regular reviewer for leader journals (*Glob Ecol Biogeogr*, *J Appl Ecol*, *Funct Ecol*, *Div Dist*, *Oecologia*, *Anim Behav*, *Biol J Linn Soc*). I acted as external reviewer of DEA for the Dept Ecology, Alcalá Univ. I reviewed a proposal for a project-postdoc contract (155000 eur) for the Austrian Science Fund. I collaborated with the CSIC press office, EFE agency, etc. to communicate my results, which transcended to many national and international media. Awarded in 2009 by the ANECA for the positions Prof Contratado Dr, Prof Univ Privada and Prof Ayudante Dr. Listed in -Top 100 Scientists 2010- by the award board of the International Biographical Centre of Cambridge. Since 2010 I am editorial board member of the peer-reviewed journal *ISRN Ecology*.



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**SUBPROGRAMA RAMON Y CAJAL  
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**Título:**

Effect of antibiotics on the diversity and resistome of aquatic microbial communities

**Resumen de la Memoria:**

Antibiotic resistance has become a major public health concern because the organisms that cause infections are becoming less sensitive to antibiotic treatment. Traditional approaches to antibiotic resistance have involved extensive research of bacterial pathogens, limiting efforts to only clinically identified mechanisms. However, antibiotic resistance genes can also occur in nonpathogenic bacteria, which can then be spread by horizontal gene transfer. Moreover, antibiotics are released daily into the natural environment with treated wastewater effluent and through use in animal husbandry. In this way, aquatic bacteria could serve as a reservoir of resistance genes. The aim of this research line is to generate more information about the presence of antibiotics in aquatic environments, their ability to exert a selective pressure on bacterial populations, and to analyze the potential impact of the anthropogenic inputs on the prevalence of resistance genes and the emergence of new resistant strains. The proposed research will focus on determining the presence of antibiotics in rivers (water and sediment) influenced by wastewater treatment plant effluents and aquaculture activity. The work will involve both culture-dependent and -independent approaches to study the diversity and prevalence of resistance genes in aquatic bacteria, the aquatic antibiotic resistome, and the effect of antibiotic residues on aquatic bacterial community. Finally, mesocosm experiments will be conducted to examine how bacterial communities respond to the presence of antibiotics. Considering the growing evidence that clinical resistance is intimately associated with antibiotic resistance genes from the environment, it is necessary to understand the environmental distribution of such genes and how anthropogenic inputs affect their spread.

**Resumen del Curriculum Vitae:**

Dr. Balcázar began his research activity at the Technical University of Machala (Ecuador) in 2001 and was invited to join the research group headed by Dr. M.A. Sotomayor at the National Center for Aquaculture and Marine Research after completing his B.Sc. During this period, he worked on the characterization of probiotic strains for enhancing the growth rate and disease resistance of farmed shrimp. In 2003, he received a graduate fellowship to enter the Ph.D. program in Animal Pathology at the University of Zaragoza under the supervision of Prof. I. de Blas and Prof. I. Ruiz-Zarzuola. His Ph.D. thesis focused on the study of host-microbe interactions and innate immunity in salmonids. These studies were funded by the Spanish Ministry of Agriculture, Fisheries and Food. Dr. Balcázar completed his doctoral degree in the fall of 2006 and obtained the Extraordinary Ph.D. Award (University of Zaragoza) and the International Award on Animal Health (Laboratories SYVA). Subsequently, he received a contract supported by the research program "I3P Doctors" from the Spanish Government. In 2007, he joined the Institute of Marine Research at the Spanish National Research Council, where his postdoctoral studies were concerned with the role of microbial communities in marine environments. He carried out the research phase in the Department of Microbiology at the Technical University of Munich (Germany) and in the Chesapeake Biological Laboratory at the University of Maryland Center for Environmental Science (United States of America). He has been involved in several research projects, participated in several national and international conferences and has published 28 scientific papers in SCI journals (17 as a first author; total citations: 275; h-index: 10) as well as three book chapters. He has also been serving as reviewer for international funding agencies (4 project proposals) and peer-reviewed journals (82 manuscripts). He is currently working as Researcher at the Catalan Institute for Water Research, and is supervising 2 Ph.D. students within the area of aquatic microbial ecology. The experience gained during these years has given him the necessary background to develop the research line proposed.



**Nombre:** DEL BARCO TRILLO, JAVIER

**Referencia:** RYC-2011-07943

**Area:** Biología Vegetal, Animal y Ecología

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**Título:**

Sperm competition: influence on energy production, sperm function, and oxidative stress

**Resumen de la Memoria:**

The origin of new species involves the emergence of reproductive barriers between previously interbreeding populations. Little is known about the selective forces promoting reproductive barriers, although evidence suggests the involvement of sexual selection. Sperm competition is an important facet of sexual selection that occurs when ejaculates from rival males compete to fertilize the ova. Sperm competition leads to an enhancement of sperm traits that results in an increased risk of polyspermy (multiple fertilization of an egg); females respond by increasing defensive mechanisms in their ova, which will in turn favour even more competitive ejaculates. This process promotes rapid changes in reproductive traits that could lead to speciation. The first evolutionary response to increased levels of sperm competition seems to be an increase in sperm swimming speed, which could be attained by increasing sperm energy production. This increase in energy production may result in a harmful increase in reactive oxygen species (molecules that produce oxidative damage) in sperm. To better understand the role of sexual selection in speciation, I will examine the influence of sperm competition on energy production, capacitation (a sperm maturational process essential for fertilization), sperm function, and oxidative stress in 20 rodent species with different levels of sperm competition. Specifically, I will study (a) whether sperm competition leads to shorten capacitation time and/or a higher proportion of sperm capable of undergoing capacitation, (b) whether an increase in energy (ATP) production is the first evolutionary step towards increasing sperm swimming speed, (c) which is the degree of oxidative stress experienced by sperm depending on different levels of sperm competition, (d) what are the negative consequences of increasing energy production in terms of sperm DNA damage and oxidative stress, and (e) what are the cellular and biochemical mechanisms aimed at protecting the sperm membrane and DNA integrity from oxidative stress.

**Resumen del Curriculum Vitae:**

After finishing my Licenciatura degree at the Universidad de Barcelona (major in Biology of Systems and Organisms), I started a long, diverse, and productive academic career in the USA. I started working as a fieldwork biologist with an emphasis on rodent ecology for the US Geological Survey's Biological Resources Division (2001) and Purdue University (2002). In 2002 I started my Ph.D. in Biology (major in Vertebrate Zoology) at the University of Memphis. My Ph.D. dissertation (entitled "Sperm Competition and Post-partum Estrus Studies in the Meadow Vole, *Microtus pennsylvanicus*) involved several questions on sperm competition with a focus on mammals. One of my main findings was that male voles increase the number of sperm that they allocate within the reproductive tract of a female when they smell the presence of a competing male (first author in a Nature paper in 2004). By studying an emergent area of research (sperm competition) from a new perspective (chemical communication), I was able to publish several papers in leading journals such as Nature and Behavioral Ecology. My publication in Nature has been cited 54 times so far and it was also highlighted in Nature Milestones. My research was covered by popular media, including The New York Times and National Geographic. I used preliminary results from my sperm competition studies to write a proposal ("Sperm Competition and Olfactory Communication in Meadow Voles") for a 3 year National Science Foundation grant, which was awarded in the first submission. I was also awarded several small research and travel grants, including a prestigious Sigma Xi Grant-in-Aid of Research. I received the University of Memphis Society Fellowship, which is awarded to the best Ph.D. student in the university. I completed my Ph.D. in 2006, then started a postdoctoral position at Cornell University to learn neurobiological techniques that can be applied to the study of animal behaviour. I focused my research on interspecific interactions between two closely-related species of hamsters. My research at Cornell University resulted in several publications in such journals as Animal Behaviour, Evolutionary Ecology, and Behavioral Neuroscience. In 2009, I started a second postdoctoral position at Duke University with the intention of completing my training in evolutionary biology. I am comparing the chemical composition of scents in several primate species, using GC-MS techniques associated with multidimensional statistics. This research has resulted in an extensive and novel contribution to the field of Evolutionary Biology that was recently published in the Journal of Evolutionary Biology. In summary, so far my research has resulted in 27 publications (19 as first author) and 147 citations; I have 3 more publications being peer-reviewed. I have published in most of the SCI top-ranking journals in my field, resulting in an average impact factor of 3.79 for all my publications. I have presented in 7 congresses, given 4 invited talks, and reviewed manuscripts for 14 journals. I have conducted research at high-ranking institutions abroad, received comprehensive training in animal behaviour, reproductive biology, and evolutionary biology, and established many long-term collaborations. The scientific skills and experience that I have acquired have prepared me to successfully develop the proposed research.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** VALLINA FERNANDEZ, SERGIO

**Referencia:** RYC-2011-08943

**Area:** Biología Vegetal, Animal y Ecología

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**Título:**

Complexity and stability of marine ecosystems: self-organization, species-trait evolution and robustness to climatic fluctuations

**Resumen de la Memoria:**

The self-organized structure, evolutionary dynamics, and stability to climatic fluctuations of marine food webs are the main focus of my current and mid-term future research. Oceanographers have only recently started to address this key aspects of theoretical ecology, with a more rigorous and mathematically formal approach, to marine ecosystems. Until very recently, most of the effort has been mainly directed towards more general biogeochemical modelling based on simple ecosystem models. However, simple models cannot resolve the complex dynamics observed in real food web networks. The level of species diversity, the sign and strength of interaction between the species, the adaptive evolution of species-traits and interactions, are all going to affect the structure, functioning, productivity, and stability of ecosystems. My research aims at studying these fundamental aspects of the dynamics of marine ecosystems by using complex food web models built on first principles and trade-off rules. Specifically, my research is structured along 3 complementary lines of ecological theory. First, how marine ecosystems self-organize due to biophysical constraints and niche partitioning, and how the resulting food web structure affects the functioning and overall production of the ecosystem. Second, how changes in food web complexity will affect ecosystem stability to climatic perturbations. Third, how the evolution and adaptation of species-traits affects the fitness of the species present (or newcomers) in the community, and therefore to assess the impact of adaptive dynamics on food web structure, functioning and stability. I am addressing this questions for the global marine environment using state-of-the-art mathematical models of complex food web networks, coupled to the ocean general circulation, being developed at the Massachusetts Institute of Technology (MIT).

**Resumen del Curriculum Vitae:**

# Education: [1995-2000] BSc "Marine Sciences", Univ. Las Palmas de Gran Canaria (ULPGC)[2001-2002] MSc "Oceanography and Marine Environment", Univ. P. Marie Curie (ParisVI)[2002-2003] MSc "Applied Physics", Polytechnical Univ. Catalonia (UPC)[2002-2006] PhD "Marine Sciences" (cum laude), Polytechnical Univ. Catalonia (UPC).# Research interests: Marine ecosystem dynamics, Global biogeochemical cycles, Food web complexity and stability, Evolutionary biology and fitness landscapes.# Academic Positions: [2007-2009] Research Associate, University of East Anglia (UEA/ENV), Norwich, UK [2009-2011] Research Associate, Mass. Institute of Technology (MIT/EAPS), Cambridge, USA. # Academic Awards: [2009] PhD Extraordinary Award, Polytechnical University of Catalonia.[2009] Marie Curie Fellowship (IOF), European Union.# International Research Stays: [2001] Lab Oceanographie et climat (LOCEAN), Paris, France [2002] Lab Oceanographie Villefranche-sur-Mer (LOV), Nice, France [2003] National Oceanography Centre Southampton (NOCS), Southampton, UK [2004] Griffith University, Faculty of Environmental Sciences, Brisbane, Australia [2005] University of East Anglia (UEA), School of Environmental Sciences, Norwich, UK [2010] McGill University, Department of Theoretical Biology, Montreal, Canada. # Research experience: I have 9 years of multi-disciplinary research, with a high international dimension.# Publications: - Number of publications: 15 in total; 14 of them in leading ISI journals and 9 as first author: Science, Proceedings of the National Academy of Sciences, Global Biogeochemical Cycles, Journal of Geophysical Research, Environmental Chemistry, Ecological Modelling, Journal of Theoretical Biology - Number of citations: 120- Average Impact Factor: 7.5# Referee of ISI journals: Antarctic Science, Atmospheric Science Letters, Deep Sea Research, Global Biogeochemical Cycles, Geochemistry Geophysics and Geosystems, Geophysical Research Letters, Journal of Geophysical Research, Progress in Oceanography. # Teaching Experience: [2004] Introduction to MATLAB programming, ICM/CSIC (Barcelona, Spain) [2008, 2009] Ecosystem modelling using MATLAB, ULPGC (Canary Islands, Spain) [2008, 2009] Ecosystem modelling using MATLAB, UEA (Norwich, UK). # Supervision of visiting PhD students: [2008] Aranzazu Lana (ICM-CSIC of Barcelona) at UEA (Norwich, UK) [2008] Sandra Martinez (Univ of Vigo) at UEA (Norwich, UK) [2010] Sofia Sal-Bregua (IEO of Gijon) at MIT (Cambridge, US).# Computer Skills: MATLAB, FORTRAN, LaTeX, HTML, OS Unix/Linux.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** SANCHEZ ORDOÑEZ, MARTA

**Referencia:** RYC-2011-09382

**Area:** Biología Vegetal, Animal y Ecología

**Correo electrónico:** marta.sanchez@ebd.csic.es

**Título:**

Trophic interactions, parasitism and biological invasions: a multidisciplinary approach to the study of aquatic ecosystems

**Resumen de la Memoria:**

My general field of interest concerns trophic interactions and dispersal processes in aquatic ecosystems, with the ultimate goal of better understanding the factors and processes regulating ecosystem functioning. I started studying the complex influence of waterbirds on the structure of aquatic ecosystems, an interdisciplinary field known as ornitholimnology (PhD, Line 1). One overarching question driving this line is how birds affect invertebrate communities via predation and dispersal of their propagules. Later, I integrated parasites in bird-invertebrate interactions to explore the general question of how parasites manipulating host behavior interfere with key ecological processes, and what are the proximal mechanisms explaining ¿parasite manipulation¿? (Postdoc 1, Line 2). In addition I¿m interested in biological invasions (main subject of Postdoc 2, Line 3) which is transversal to the above research lines: e.g. what is the role of birds as vectors in the spread of invasive species? What is the role of parasites in the competitive success of invasive species?. In the following years I plan to continue developing these topics by applying new conceptual approaches. In the area of ornitholimnology, and in connection with lines 2 and 3, I will conduct further research into the role of birds dispersing invasive invertebrates. I will also study the relationships between the genetic structures of parasites, their invertebrate intermediate hosts and their avian final hosts, especially in relation to the dispersal ability of the birds. In the area of parasite manipulation I would like to work in 4 main lines: a) interactions between intermediate and final hosts, b) interactions and conflicts between manipulative parasites, c) influence of parasites on the trophic value of ecosystems and d) proximal mechanisms using parasitoproteomics. In the area of biological invasions I plan to investigate the role of enemy release and physiological tolerance in the success of two invasive crustaceans of commercial interest in Europe, using the emerging approach of eco-genomics. I expect this research will ultimately improve our understanding of key ecological processes sustaining aquatic ecosystem functioning, as well as mechanisms and ecological consequences of biological invasions increasingly threatening the structure and function of aquatic ecosystems.

**Resumen del Curriculum Vitae:**

Graduate in Biology (University of Seville, 1998), Master Science in Conservation Biology (University of Huelva, 2002) and PhD in the multidisciplinary field of Ornitholimnology (University of Huelva-CSIC, 2005); ¿Unanimous Sobresaliente Cum Laude¿; National Prix for the best PhD thesis in Ornithology, 2004-2006, SEO/Birdlife). Current position: ¿Juan de la Cierva¿ contract (EBD-CSIC). My research is multidisciplinary using a range of techniques, methodological approaches and biological models. My entire research career has been uninterruptedly funded by national public competitive calls (6 grants, 3 research contracts and 1 teaching contract). I have worked in 5 different high level research centers (2 national and 3 international) and developed constructive research relationships with more than 20 scientists. I have actively participated in 14 projects, being in charge of the parasitological part of 6 (3 of them are in course). I have taught 300 hours in the University as associated professor and I¿m qualified as ¿Maitre de Conférences¿ (Ministry of Science in France) to teach in Universities in France. I have participated in the jury of 1 PhD thesis and supervised 2 Masters and 3 undergraduate students. I¿m a regular reviewer for at least 9 journals in my field. My scientific production includes 32 publications (27 in SCI journals, 13 of them as first author and 5 as second). The IF of my publications have been consistently increasing along my research career (70% of my articles during the last 3 years are in the first quartile of the area). Total citations of all SCI articles = 277, and H index = 9. I have also presented the results of my research in 14 conferences. During the course of my research career I have fully matured as an independent scientist and feel ready to start my own research programme.



**Nombre:** NAVAJAS PEREZ, RAFAEL

**Referencia:** RYC-2011-08653

**Area:** Biología Vegetal, Animal y Ecología

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**Título:**

Estudio de los Mecanismos de Determinación Sexual y de los Cromosomas Sexuales en Especies Vegetales: Aplicaciones e Implicaciones

**Resumen de la Memoria:**

Al contrario de lo que ocurre en la mayor parte de los animales, se ha demostrado que la aparición de cromosomas sexuales en plantas es más reciente evolutivamente hablando, lo que permite el acceso a etapas iniciales del proceso de su formación. Por ello, diversos grupos de plantas dioicas (con sexos separados en distintos pies de planta) y con cromosomas sexuales, son excelentes modelos para el estudio del origen y la evolución de los cromosomas sexuales y la determinación genética del sexo. A pesar de los esfuerzos realizados en este sentido, el modo exacto en que se determina el sexo en vegetales y la totalidad de los genes implicados son aún incógnitas. En este contexto, y utilizando como modelo especies de los géneros *Rumex*, *Carica* (*C. papaya*, la papaya) y *Pistacia* (*P. vera*, el pistacho), desarrollo una línea de investigación principal mediante la que intento aportar nuevos datos que ayuden a una mejor comprensión de la Biología Reproductiva vegetal. A corto-medio plazo, la implicación de estos estudios incluye la caracterización de los genes determinantes del sexo y su utilización en proyectos de selección y/o mejora con intereses productivos. Las aproximaciones que he seguido para realizar estos estudios se pueden resumir en: 1) Aproximación citogenético-molecular, mediante la que es posible observar el comportamiento mitótico y meiótico de los cromosomas sexuales, así como el grado de degeneración molecular que presentan mediante la localización física de las secuencias presentes en los mismos. 2) Utilización de técnicas moleculares, para el aislamiento de secuencias involucradas en el origen y la evolución de los cromosomas sexuales -fundamentalmente secuencias repetidas de ADN satélite o retrotransposones-, así como secuencias candidatas a controlar o servir de marcadores para la determinación sexual en vegetales, y secuencias usadas con fines filogenéticos. 3) Aproximación genómica, usando marcadores moleculares microsatélites para la construcción de mapas genéticos y la caracterización de marcadores relacionados con el sexo.

**Resumen del Curriculum Vitae:**

Licenciado en Biología por la Universidad de Granada (2001). Doctor europeo (sobresaliente cum laude por unanimidad y Premio Extraordinario de Doctorado, 2005). Becario FPU del Ministerio en el Departamento de Genética de la Universidad de Granada. Durante la realización de mi Tesis Doctoral investigué sobre el origen y la evolución de los sistemas de determinación sexual y de los cromosomas sexuales en el género *Rumex*, un modelo de estudio en este campo. Hasta este periodo disfruté de varias estancias en los grupos de investigación de la Dra. Ernestina Valadez (Universidad Autónoma Chapingo, México), el Dr. Juan Luis Santos (Universidad Complutense de Madrid), el Dr. Rafael Lozano (Universidad de Almería) y de la Dra. Trude Schwarzacher (University of Leicester, UK). En mi etapa postdoctoral, disfruté de una ayuda puente en el mismo centro donde realicé mi Tesis, y posteriormente de un contrato Fulbright en la University of Georgia (EEUU), donde continué trabajando en la determinación sexual vegetal -entre otros aspectos-, esta vez en el modelo vegetal *Carica papaya*, la papaya. Esto último me valió para participar en la secuenciación del genoma de dicha especie -primer organismo transgénico en ser secuenciado y quinto genoma vegetal completado- publicado en la portada de la prestigiosa revista *Nature*. Posteriormente, regresé a mi centro de procedencia (Dpto. de Genética, Univ. de Granada) gracias a dos contratos consecutivos, uno asociado a mi grupo de investigación y finalmente con un contrato de reincorporación de doctores financiado por la misma Universidad y que disfruto en la actualidad. Los resultados de mi actividad científica hasta la fecha se han visto reflejados en publicaciones en revistas de reconocido prestigio internacional: *Nature*, *Bioinformatics*, *Molecular Biology and Evolution*, *Journal of Molecular Evolution*, etc... He participado en seminarios y conferencias organizados por distintas organizaciones y/o Universidades. He sido galardonado con el I Premio Andaluz del Futuro en el área de ciencia (grupo Joly y Caja Madrid). Mis actuales líneas de investigación se centran en el análisis del determinismo sexual y de los cromosomas sexuales en especies vegetales (*Rumex* spp., papaya, pistacho) -siendo investigador principal de un proyecto del plan nacional para la mejora del cultivo del pistacho- y animales (especialmente peces planos) -adscrito a un proyecto INGENIO CONSOLIDER de Genómica de peces planos. Dirijo además varios trabajos de investigación y tesis doctorales. Imparto docencia en las Licenciaturas de Biología y Bioquímica. Participo como docente en el Máster Interuniversitario de Genética y Evolución y en el Máster Universitario en Biotecnología. Participo activamente en distintos Proyectos de Innovación Docente, Planes de Acción Tutorial, Proyectos de Mejora de la Calidad Docente Vinculados a Contratos Programa y a la implantación del crédito ECTS. He realizado múltiples cursos de formación orientados a mejorar la calidad docente y promover la innovación. He desarrollado material docente (Guías Docentes) relacionado con mi área. He recibido excelentes calificaciones tanto en las encuestas realizadas a mis alumnos como en las evaluaciones realizadas por mis mentores en los distintos cursos de formación realizados.



**Nombre:** LINARES PRATS, CRISTINA

**Referencia:** RYC-2011-08134

**Area:** Biología Vegetal, Animal y Ecología

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**Título:**

Marine benthic communities in a changing world: ecological responses and conservation needs

**Resumen de la Memoria:**

Nowadays, a major challenge in ecology is to predict how ecosystems will respond to local and global environmental changes. The Mediterranean Sea offers a unique opportunity to address the complexity of cumulative impacts caused by multiple stressors. Using long-term series data, experimental studies and modeling tools, my research program will elucidate the ecological responses of marine benthic communities in a changing world in order to contribute to the conservation of these communities. Most of my research focus on: first, marine coastal ecosystems due to the increased pressure from human activities; second, long-lived sessile species as model species given their fragility face to increasing disturbances and their role providing structural complexity to the communities; and third, marine reserves, which are the pivotal tools for the conservation of marine ecosystems. As a RyC researcher I plan to work on 4 main research lines. My research activities will combine approaches for which I am familiar (Lines 1 and 2) with the application of novel methodologies which I consider key to improve our understanding of the impacts of global change on marine coastal ecosystems (Lines 3 and 4). (1) Long-term demographic monitoring in order to analyze the influence of environmental variability on population dynamics and how life histories evolve in ways that buffer environmental change. (2) The resistance and resilience of marine benthic communities to disturbances and the synergies among global and local threats to answer relevant questions as: i) what is the resilience of marine communities?; ii) how will multiple stressors interact to affect marine ecosystems?; and iii) are marine ecosystems within reserves more resilient?. (3) Given that one of the major threats affecting benthic communities is the occurrence climate-induced mortalities at regional scales, the third research line will focus on the assessment of the sublethal effects as well as the factors and mechanisms driving these disturbances. (4) Finally, the last research line will intend: first, to assess the level of connectivity among populations due to its importance for their persistence and recovery from disturbances, and second, to examine restoration activities to maintain and restore ecological connectivity given that most of threatened species are long-lived, slow-growing with limited recruitment, all of which will limit natural recovery rates. This research is expected to generate the scientific understanding needed to anticipate the consequences of environmental changes for marine biodiversity and to provide managers with better tools to halt the decline of marine communities.

**Resumen del Curriculum Vitae:**

My experience in marine research began just after graduating in the UB (1999) as a researcher in the biological monitoring program in the Medes Islands MPA. Between 2001 and 2006, I developed my PhD on the study of the structure and dynamics of long-lived marine species to assess their resilience in face of the escalating threats (Excellent cum laude). The seven chapters of my thesis were published in leading journals in the field of Ecology, Biodiversity conservation and Marine and Freshwater Research, such as Ecology, J Applied Ecology, Biological Conservation, Coral Reefs, Marine Ecology Progress Series, and Invertebrate Biology. At the same time, I participated in many other projects about population ecology and conservation in several Mediterranean MPAs. I collaborated in different projects studying the reproduction and feeding ecology studies on gorgonians, the ecology of the juvenile phases of the spiny lobster and the movement patterns of exploited species using acoustic tracking techniques. After finishing my PhD, I was working for two months with Daniel Doak in California on demographic modeling and in May I began to work in the Centre d'Océanologie de Marseille under a postdoctoral contract. In September 2007, I received funding from the MEC for continuing my postdoctoral stage in this research centre. During this period, my work focused on two topics: 1) understanding the effects of global change on marine benthic communities and, 2) the demography and conservation of overexploited red coral populations. In September 2009, I started working as a Juan de la Cierva postdoctoral researcher at the Department of Ecology (UB), in which has been my position until the present. From November 2009 to May 2010, I was working in the ARC Centre of Coral Reef Studies invited by Professor Terry P. Hughes on understanding the resilience of marine benthic communities and collaborating in different multi-disciplinary programs developed by the Australian laboratory. In summary, in the last 11 years I have worked as a researcher in 6 different centers from Spain, USA, France and Australia. I have participated in 10 research projects and 20 research contracts. I have been the principal investigator of one project and I will be the PI of another project funded by Environmental, Rural and Marine Affairs Ministry. I have published 20 papers (16 in journals listed in the SCI), most of them in peer reviewed high quality international journals such as Ecology, Global Change Biology, J Applied Ecology, Biological Conservation, Biological Invasions, Coral Reefs, Marine Ecology Progress Series. At present I have 6 manuscripts submitted to journals listed in the SCI and I am the first author on 12. I have participated in 27 presentations in international congresses and in 7 invited conferences. Regarding to my academic experience, I have participated as assistant professor of undergraduate and postgraduate courses and as a professor in a master course ¿Marine Reserves¿ (UB). I have been jury member at one PhD defense (2010, UB) and presently, I am the co-supervisor of one PhD student and three master students. I am a reviewer for 9 scientific journals (e.g. Ecology, J Applied ecology and Marine Ecology Progress Series) and I have reviewed grant proposals for the Australia's Marine National Facility research vessel.



**Nombre:** SAN MAURO MARTIN, DIEGO

**Referencia:** RYC-2011-09321

**Area:** Biología Vegetal, Animal y Ecología

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**Título:**

Filogenética molecular y evolución mitogenómica en anfibios

**Resumen de la Memoria:**

Soy un biólogo evolutivo interesado en filogenética molecular y evolución mitogenómica en anfibios, y en particular en cecilias (orden Gymnophiona), un grupo altamente especializado, de cuerpo alargado y anillado, sin patas y con tentáculos sensitivos a ambos lados del hocico. A lo largo de mi carrera científica, he usado genomas mitocondriales completos y genes nucleares para investigar la filogenia y sistemática de los principales linajes de cecilias, así como su posición filogenética con respecto a los otros dos órdenes de anfibios modernos (ranas y salamandras). Esta gran cantidad de información molecular ha servido para inferir hipótesis filogenéticas y cronológicas (tiempos de divergencia) que estoy usando para estudiar tendencias evolutivas, así como patrones de diversificación en este pequeño (unas 180 especies descritas), pero diverso e importante grupo de anfibios tropicales. Mi línea principal de investigación también comprende el estudio de la dinámica evolutiva y molecular del genoma mitocondrial (mitogenómica comparada). En este contexto, mi investigación está centrada en el estudio de la estructura del genoma mitocondrial y de la evolución de sus variaciones genómicas, tales como reordenaciones de genes, duplicaciones genómicas, pérdidas de genes, presencia de pseudo-genes, y cambios en los orígenes de replicación, así como en la estructura de la región control (implicada en la regulación de la replicación y transcripción). Aunque mi investigación mitogenómica se ha desarrollado principalmente en anfibios (fundamentalmente cecilias y ranas), mi competencia se extiende al genoma mitocondrial de vertebrados en general. Además, estoy también muy interesado en diseño experimental en filogenética (cuestiones relacionadas con el muestreo de taxones y la elección de marcadores moleculares), principalmente aplicados a sistemática de cecilias, pero extensibles a toda la vida en general. En este contexto, he llevado a cabo análisis comparados del rendimiento filogenético de genes y genomas mitocondriales frente a genes nucleares usando tasas de evolución de las secuencias, y, más recientemente, he aplicado novedosas metodologías basadas en la estimación de información esperada en un marco de verosimilitud. Mis planes futuros abarcan la secuenciación del genoma nuclear completo de una cecilia usando tecnología de secuenciación de próxima generación. Este ambicioso proyecto permitirá llevar a cabo genómica comparada con otros anfibios (la secuencia del genoma nuclear completo de una rana ya está disponible) y vertebrados en general, así como la búsqueda de genes y/o elementos reguladores responsables de los rasgos que hacen a las cecilias tan distintivas (tales como genes involucrados en el desarrollo de las patas, los ojos, escamas, órgano vomeronasal y tentáculos, y elongación corporal).

**Resumen del Curriculum Vitae:**

Tras la licenciatura en Biología (especialidad Zoología) por la Universidad Complutense de Madrid (2001), y una etapa como estudiante de doctorado en el Museo Nacional de Ciencias Naturales de Madrid (CSIC) bajo la dirección de Rafael Zardoya, obtuve el doctorado por la Universidad de Autónoma de Madrid (2006). He realizado dos estancias postdoctorales en el Natural History Museum de Londres (Reino Unido) con Mark Wilkinson y David Gower. La primera de ellas con una beca postdoctoral MEC/Fulbright del antiguo Ministerio de Educación y Ciencia que tuvo una duración de 24 meses. La segunda con una beca Marie Curie IEF de la Comisión Europea (Séptimo Programa Marco) que tiene una duración total de 23 meses (de los cuales 12 meses han transcurrido ya desde el inicio). Mi línea principal de investigación es la filogenética molecular y evolución de los principales linajes de anfibios, y en especial de cecilias, usando genomas mitocondriales y genes nucleares. Asimismo, mi línea principal también comprende el estudio de la dinámica evolutiva y molecular del genoma mitocondrial (mitogenómica comparada), así como el diseño experimental en filogenética y metodología para reconstrucción eficiente de filogenias a gran escala. Hasta la fecha he producido 18 publicaciones científicas (más otras 4 actualmente en revisión), de las cuales 16 son artículos en revistas SCI (8 de primer autor), la mayoría de ellas con factor de impacto superior a 2.5 (promedio de todos los artículos: 3.0, promedio de los artículos como primer autor: 4.2), que incluyen las siguientes: Molecular Phylogenetics and Evolution (3 artículos), American Naturalist, Gene (3 artículos), Molecular Biology and Evolution, Journal of Morphology (2 artículos), Systematic Biology, Cellular and Molecular Biology Letters, Mitochondrial DNA, Zootaxa (2 artículos), Journal of Natural History. Además, he sido revisor para revistas como American Naturalist, BMC Evolutionary Biology, Gene, Journal of Molecular Evolution, Molecular Biology and Evolution, Molecular Phylogenetics and Evolution, y Proceedings of the National Academy of Sciences of the USA, entre otras, y soy Associate Faculty Member de *¿Faculty of 1000¿*. He presentado los resultados de mi investigación en 12 congresos y 7 ponencias invitadas en diversos países, y he sido co-organizador de un simposio en un gran congreso internacional.



MINISTERIO  
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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Título:**

Human impacts on plant-consumer interactions in seagrass ecosystems

**Resumen de la Memoria:**

Seagrass beds are one of the most productive and widespread coastal ecosystems worldwide, providing critical ecosystem services (e.g., global carbon sequestration, water quality, fisheries). Due to their coastal location, seagrasses are exposed to numerous anthropogenic threats and are declining worldwide. Understanding how human activities modify the ecological functioning of seagrass systems is crucial for basic and applied ecology, since it will have crucial consequences on ecosystem services as well as for management and conservation efforts. I mainly focus on human effects on plant  $\zeta$  herbivore interactions, because they are a fundamental process governing food web processes and hence will have strong consequences for ecosystem structure and functioning. My approach combines strong quantitative field and laboratory experimentation with large-scale comparisons and fine-scale chemical and molecular analyses. Carbon flux in seagrass ecosystems has traditionally been considered to mainly go through the detrital pathway, while the impact of herbivores on seagrasses has generally been considered modest and with little ecological effects. Low rates of herbivory have generally been attributed to the loss of large seagrass consumers (e.g. sirenians, sea turtles) and seagrass unpalatability (e.g. high C/N). I have therefore focused a lot of my work on two major human disturbances (eutrophication and overfishing) which can potentially modify seagrass herbivory processes. The results obtained from my Ph.D. and subsequent work shows that herbivory is substantial in seagrass ecosystems, challenging the paradigm that seagrasses mainly maintain detritus-based food webs. In fact, seagrasses are a critical trophic and habitat resource for herbivores. Changes in herbivore populations associated with fishing activities can have paramount effects on the composition, structure, and functioning of these ecosystems, such as shifting carbon flow through the ecosystem or mediating competitive interactions amongst herbivores. Eutrophication (nitrogen loading) is another widespread human impact on coastal systems. My research shows that nitrogen availability limits sea urchin abundance and plant consumption rates. Eutrophication, by increasing nitrogen availability, increases the nutritional quality of primary producers (epiphytes, seagrass), enhancing herbivore feeding rates, performance, and populations, which cause severe overgrazing and seagrass habitat loss. In addition to overfishing and eutrophication, seagrass ecosystems are exposed to several other anthropogenic threats. Since many of these human disturbances can be present at the same time, I am interested in understanding the independent and interactive effects of these different disturbances, which could have direct effects on the plants but may also modify trophic linkages within the food web, with potentially important consequences for ecosystem structure and function.

**Resumen del Curriculum Vitae:**

I am marine biologist mainly interested on how human activities modify the function of coastal ecosystems, particularly seagrass beds. After graduating with highest honors from the Faculty of Biology of the University of Barcelona (UB), in 2000 I was awarded a Graduate Fellowship from the Generalitat. This fellowship allowed me to conduct a PhD in the Ecology Dept. UB, where I initiated my study on how human activities modify plant  $\zeta$  herbivore interactions in seagrass ecosystems. During my PhD and postdoc, I have also conducted research in other prestigious national and international research institutions (e.g. Scripps Institution of Oceanography, Center for Population Biology UC Davis, University of Western Australia), establishing an enriching network of collaborative research. Throughout my career I have been awarded numerous awards and competitive fellowships (e.g. Postdoctoral Fulbright Fellowship, Juan de la Cierva, José Castillejo), and I have participated in more than 20 research projects on different aspects of human disturbances (e.g. invasive species, eutrophication, fishing) in marine communities. So far, my research has resulted in 17 SCI peer reviewed articles (8 as first author) in leading journals in marine biology, ecology and conservation (e.g. Ecology, Marine Ecology Progress Series, Biological Invasions). The impact of my work can be summarized with 130 citations (average of 11.8), and h-index = 6. I have presented 5 communications in international and national conferences and have given 9 invited talks. I have acted as an external reviewer for 12 specialized journals in the field (e.g. Ecological Applications, Oecologia, Marine Ecology Progress Series, Journal of Experimental Marine Biology and Ecology, Marine Environmental Research), and have reviewed grant proposals for the ANEP (Agencia Nacional de Evaluación y Prospectiva). I have supervised the research activities of numerous undergraduate and graduate students and have lectured in marine biology, ecology and conservation at the undergraduate and graduate levels nationally and internationally.