XII Edición
Premios Fundación BBVA Fronteras del Conocimiento
BBVA Foundation Frontiers of Knowledge Awards
12th Edition

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Press release
4 February, 2020

The BBVA Foundation recognizes ecologists Duarte, Hughes and Pauly for their fundamental contributions to our understanding of marine ecosystems and the challenges facing their conservation

- The three marine biologists have made "seminal contributions to our understanding of the world's oceans," said the committee deciding the award. They have also proposed solutions that apply this knowledge in order to "protect and conserve marine biodiversity and oceanic ecosystem services in a rapidly changing world"

- Carlos Duarte has shown that coastal ecosystems like seagrass meadows have a huge capacity to absorb carbon from the atmosphere. His work was a catalyst for the Blue Carbon Initiative, a global program focused on mitigating climate change through the conservation and restoration of these threatened habitats

- Terence Hughes not only revealed "the global loss of fragile coral reef ecosystems as a result of widespread warming, acidification, pollution and disease," but has also led the implementation of measures to conserve and restore their incomparable resources

- Daniel Pauly has documented "the decline in global fisheries," and the alarming scale of marine biodiversity losses in the world's oceans by means of computer-based tools like the FishBase encyclopedia, an online database containing information on 34,000 species

The BBVA Foundation Frontiers of Knowledge Award in Ecology and Conservation Biology has gone in this twelfth edition to marine biologists Carlos Duarte, Terence Hughes and Daniel Pauly for "their seminal contributions to our understanding of the world's oceans, and their efforts to protect and conserve marine biodiversity and oceanic ecosystem services in a rapidly changing world," in the words of the award citation.

The three laureates, through their independent efforts, have transformed our vision of the ocean, revealing its potential as an intense and effective carbon sink, while drawing the world's

attention to the fragile state of coral reefs, and providing critical tools to ensure the sustainability of global fisheries.

For committee chair Emily Bernhardt, Professor of Biology at Duke University (United States), they are "at the absolute forefront" of the scientific drive to understand and confront three of the biggest threats to the world's oceans; threats that they were the first to highlight and around which they would help to launch a global research enterprise. "Their work is cross-disciplinary and cross-border," she adds, "and does not stop at certifying the damage, but goes beyond that to seek and propose solutions."

Spaniard Duarte, currently Tarek Ahmed Juffali Chair in Red Sea Ecology at the King Abdullah University of Science and Technology (Saudi Arabia), has experimentally established that coastal ecosystems such as seagrass meadows and mangroves have a striking capacity to absorb atmospheric carbon, exceeding even that of the Amazonian forest. The committee noted that his research was at the roots of the Blue Carbon Initiative, a global program focused on mitigating climate change through the conservation and restoration of coastal and marine ecoystems.

Hughes, Director of the Centre of Excellence for Coral Reef Studies at Australia's James Cook University, is recognized for "his efforts to describe and draw attention to the global loss of fragile coral reef ecosystems as a result of widespread warming, acidification, pollution and disease."

Pauly, University Killam Professor and founder of the Sea Around Us Project at the University of British Columbia, in Canada, has spent his long career exploring the worldwide decline in fish stocks. His method for obtaining records of global fish catches includes data at times overlooked in the official statistics, such as artisanal fishing or discards, which turn out to have far more weight than first suspected to the extent that they have significantly worsened the global tally of overfishing. "Professor Pauly's research," the citation reads, "demonstrates the interdependencies between fisheries science, marine ecology and conservation around the world."

The three scientists stand out, says the committee, for their contributions to our "fundamental understanding" of marine ecology, and their leadership in applying such knowledge to guide "effective conservation management of critical marine habitats and fisheries."

"Blue Carbon" to mitigate climate change

Carlos Duarte, who spent part of his career in Spain – at the Institute of Marine Sciences in Barcelona, the Blanes Centre of Advanced Studies and the Mediterranean Institute for

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Advanced Studies in Mallorca (all CSIC) – expressed his satisfaction yesterday at joining the list of awardees in this category, which he described as "practically a genealogy of worldwide research in ecology."

His longstanding interest in the impact of environmental change on marine ecosystems led him to the discovery, reported in a seminal 1996 paper, that seagrass meadows, mangroves, macroalgae and salt-marshes are heavily vegetated coastal ecosystems that, through photosynthesis, absorb large quantities of atmospheric CO_2 and bury it in seabed sediments.

These ecosystems, which Duarte has termed "the hidden forests of the biosphere" accordingly act as powerful carbon sinks. "For the first time," he explains, "we were able to calculate that, globally, these ecosystems produce major carbon surpluses, and these surpluses have to find their way into sediments."

A decade later, his research would produce the first global estimate of the effectiveness of these sinks based on real rather than inferred data, leading to the conclusion that "despite accounting for just 0.2% of the ocean's surface, they are responsible for 50% of the burial of carbon in marine sediments."

It was this finding that led Duarte to coin the term Blue Carbon in 2005, in reference to these ecosystems. The United Nations invited him to lead a report into the utility of vegetated coastal habitats as a possible solution to climate change, a strategy that has since won the attention not just of scientists but also of political leaders and conservation managers.

"When people talk about nature-based solutions to climate change, they are talking about blue carbon," Duarte insists, adding that "I have been contacted by lots of countries interested in estimating their blue carbon resources, so they can mitigate climate change with mangroves and seagrasses."

The reef sentinel

Terence Hughes is a world authority in the study of coral reef ecology and the damage being done to it by climate change and other threats like pollution and overfishing. By the mid-1990s, various papers of his authorship in high-impact journals had alerted the world to the degraded state of reefs in all quarters of the globe.

"Coral reefs," he explained yesterday after hearing of the award, "are not just beautiful places where wealthy people can enjoy a holiday. We should not forget that 400 million people depend on them for their livelihoods and their food security."

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Hughes' research has focused on the coral bleaching caused by climate change. Bleaching occurs when reefs are exposed to stressors such as warming ocean waters and, if it is severe and prolonged enough, many of the corals will die. It will then take at least a decade to replace them.

Studies he led have shown that mass coral bleaching was unknown until the 1980s, but that since then repeated bleaching episodes at the regional scale and large-scale coral death have become something of a norm as temperatures continue their advance.

There is no doubt that Australia's Great Barrier Reef, the planet's largest, is in a critical state due to rising temperatures. In fact, it has suffered four bleaching events since 1998, two in the consecutive years of 2016 and 2017, causing damage on an unmatched scale. Last year, a paper by Hughes appearing in *Nature* showed that coral larvae births on the Great Barrier Reef slumped by 89% in 2019 with respect to the historical average, due to the unprecedented dying-off of adult corals after the temperatures spikes of 2016 and 2017.

"Although overfishing and pollution also cause deterioration, the greatest threat facing reefs today is without doubt climate change," affirms Hughes. "And this is not a risk that might affect them in future, but something that is harming them right now."

While it is obviously vital to understand the relationship between climate change and coral reef degradation, Hughes believes that part of the challenge is a "crisis of governance" involving factors to do with politics, the economy and, definitively, "how society conducts its decision-making." For this reason, he works alongside economists, political scientists and other researchers in the social sciences to develop strategies to combat the reef deterioration being driven by climate change.

"It is still not too late. The window of opportunity to save reefs remains open, but it is closing rapidly, so we have to act now to reduce pollutant emissions and stop wasting time."

The largest fish database

Among Daniel Pauly's signal achievements is the creation, in 1990, of the world's largest online fish database, FishBase; an ecological resource setting out information on some 34,000 species that is consulted and cited by researchers around the globe. Not only that, Pauly has led the introduction of new data-gathering methods on worldwide fisheries, and developed equations and models to assess the fishing stress suffered by a given population and draw up reliable estimates.

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His work, reported in numerous papers in top scientific journals, has shown that fisheries are the major driver of change in the marine ecosystem. "They are the most important factor, more than pollution, although this may change in the future with global warming," said the new laureate yesterday after hearing of the award.

Others contributions singled out by the committee are his development of a powerful computer-based method to estimate the population dynamics of fishes, and "a demonstration of climate-change induced fish migrations." One conclusion of this work is that fishes are moving around five kilometers closer to the poles each year.

For Pauly, "the degradation of marine ecosystems is extremely serious, we are losing the ability of the oceans to supply us with food." However, he too is confident that humanity can save the situation if we make the decision to act.

Bio notes

Spaniard Carlos Duarte (Lisbon, Portugal, 1960) holds a PhD in Limnology from McGill University in Canada. His research career began at the Institute of Marine Sciences of Barcelona. He then moved on to the Blanes Center for Advanced Studies and next to the Mediterranean Institute for Advanced Studies, where he was appointed a research professor with the Spanish National Research Council (CSIC). From 2011 to 2015, he was Director of the UWA Oceans Institute at The University of Western Australia, and from 2012 to 2015 held the post of Distinguished Adjunct Professor in the Faculty of Marine Sciences at King Abdulaziz University in Saudi Arabia. Adjunct Professor at Trømso University (Norway) between 2014 and 2016, in 2015 he joined the King Abdullah University of Science and Technology in Saudi Arabia, where he is currently Tarek Ahmed Juffali Chair in Red Sea Ecology. He also holds a professorship at Aarhus University (Denmark) and is an Adjunct Professor at the University of Western Australia.

Duarte has authored over 680 scientific papers and published three books, and has served as principal investigator on more than 50 projects, including the Malaspina 2010 Circumnavigation Expedition, an oceanographic project involving over 400 scientists from 18 countries.

Terence Hughes (Dublin, Ireland, 1956; of Irish and Australian nationality) completed a BA in Zoology at Trinity College, Dublin then went on to earn a PhD in Ecology and Evolution from Johns Hopkins University in the United States. After some years as a postdoctoral research fellow at the University of California, Santa Barbara, in 1990 he moved to the James Cook University in Australia, where he was appointed a full professor in 2000 and is now a Distinguished Professor. In 2005 he established the Centre of Excellence for Coral Reef Studies there, under the auspices

of the Australian Research Council.

Hughes is author of more than 140 published papers. A former executive board member with the Resilience Alliance – an international, multidisciplinary research organization that explores the dynamics of social-ecological systems – he currently serves on the advisory board of One Earth and the board of the Red Sea Research Centre in Saudi Arabia.

Daniel Pauly (Paris, France, 1946; of French and Canadian nationality) obtained a PhD in Fisheries Biology from the University of Kiel in 1979. That same year he took up a research position at the International Center for Living and Aquatic Resources Management (ICLARM) in Manila, where in fifteen years he would rise to the rank of Senior Scientist and Program / Division Director. In 1994 he was appointed a tenured professor in the Fisheries Centre (now Institute for the Oceans and Fisheries) at the University of British Columbia in Canada, where he is now University Killam Professor, the highest academic rank the institution can bestow.

Since 1999 he has also been Principal Investigator of the Sea Around Us, a project based at the Institute for the Oceans and Fisheries devoted to studying the impact of fisheries on the world's marine ecosystems. Pauly is the author of over one thousand publications, between books, papers and reports, and is also co-developer of such widely-used software and modeling resources as Ecopath, the online encyclopedia FishBase, and the catch time series of the Sea Around Us.

Ecology and Conservation Biology committee and evaluation support panel

The jury in this category was chaired by Emily Bernhardt, James B. Duke Professor in the Department of Biology at Duke University (United States). The secretary was Pedro Jordano, Research Professor in the Department of Integrative Ecology at the Estación Biológica de Doñana, CSIC (Spain). Remaining members were Paul Brakefield, Professor of Zoology and Director of the University Museum of Zoology at the University of Cambridge (United Kingdom); Anna-Liisa Laine, Professor of Ecology in the Department of Evolutionary Biology and Environmental Studies at the University of Zurich (Switzerland); Joanna Lambert, Professor of Environmental Studies, Ecology and Evolutionary Biology at the University of Colorado Boulder (United States); and Rik Leemans, Professor in Environmental Systems Analysis at Wageningen University (the Netherlands).

The evaluation support panel of the Spanish National Research Council (CSIC) was coordinated by M. Victoria Moreno, Deputy Vice President for Scientific and Technical Areas,

and formed by: Miguel Bastos Araujo, research professor at the National Museum of Natural Sciences (MNCN); Xavier Bellés Ros, research professor at the Institute of Evolutionary Biology (IBE); Esteban Manrique Reol, research professor and Director of the Royal Botanical Garden (RJB); Daniel Oro de Rivas, research professor at the Mediterranean Institute for Advanced Studies (IMEDEA); and Anna Traveset Vilaginés, research professor at the Mediterranean Institute for Advanced Studies (IMEDEA).

About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation centers its activity on the promotion of world-class scientific research and cultural creation, and the encouragement of talent.

The BBVA Foundation Frontiers of Knowledge Awards, established in 2008, recognize and reward contributions of singular impact in diverse fields of science, technology, social sciences and the humanities that have demonstrably expanded the frontiers of the known world, opening up new paradigms and knowledge fields. Their eight categories are reflective of the knowledge map of the 21st century, encompassing basic research in Physics, Chemistry and Mathematics, Biology and Biomedicine, Information and Communication Technologies, Humanities and Social Sciences, Economics, Finance and Management, Ecology and Conservation Biology, Climate Change, and, within the arts, the supremely creative realm of music.

The BBVA Foundation is aided in the evaluation process by the Spanish National Research Council (CSIC), the country's premier public research organization. The Foundation and CSIC jointly appoint the evaluation support panels charged with undertaking an initial assessment of the candidates proposed by numerous institutions across the world and drawing up a reasoned shortlist for the consideration of the award committees. CSIC is also responsible for designating the chair of each committee, formed by eminent authorities in the subject area.

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A video recording of the new laureate's first interview on receiving news of the award is available from the Atlas FTP with the following coordinates:

Server: 5.40.40.61

Username: AgenciaAtlas4

Password: mediaset17

The video is in the folder labelled:

"PREMIO ECOLOGÍA Y BIOLOGÍA DE LA CONSERVACIÓN"

In the event of connection difficulties, please contact Miguel Gil at production company Atlas:

Mobile: 619 30 87 74

E-Mail: mgil@mediaset.es

Calendar of announcement events

Information and Communication Technologies (ICT)	Wednesday, 19 February, 2020
Basic Sciences	Tuesday, 3 March, 2020
Economics, Finance and Management	Tuesday, 17 March, 2020
Music and Opera	Tuesday, 31 March, 2020
Humanities and Social Sciences	Wednesday, 15 April, 2020

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For more information on the BBVA Foundation, visit: www.fbbva.es