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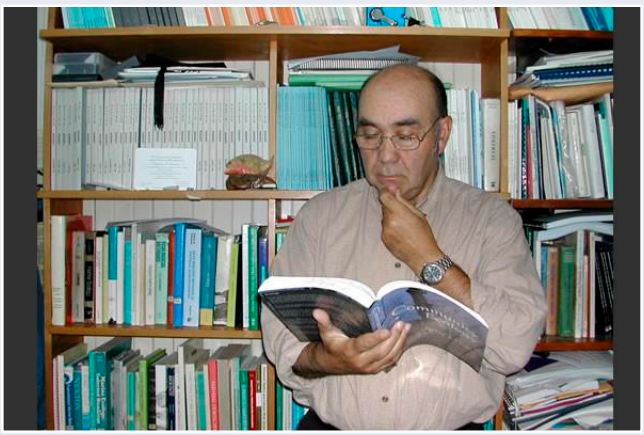
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OBITUARY

Carlos Alfonso Moreno Meier: a devoted master of Marine Ecology

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CARLOS MORENO MEIER
1943 - 2026

Eduardo Jaramillo

Carlos Alfonso Moreno Meier was born in Santiago, Chile on December 22, 1943. From 1954 until 1963 he attended the "Liceo Miguel Luis Amunátegui". Between 1964 and 1969, he studied at the Biology Department of the old Faculty of Philosophy and Education of Universidad de Chile in Santiago; he received his professional title (Biology and Natural Sciences) in 1970, after finishing a seminar thesis with other colleagues. Later on (1971), that thesis was published under the title "Ichthyofauna of the hydrographic system of Maipo river" (Bulletin of the National Museum of Natural History of Chile 32: 227-268). During 1993, he earned his doctoral degree at the Catholic University of Chile in Santiago, defending the thesis "Effect of human intervention on the maintenance of the *Gymnogongrus-Choromytilus* association in intertidal communities of Southern Chile."

The connection of Carlos with Universidad Austral de Chile (UACh), was the axis of his academic life, with 37 years of uninterrupted service since 1974. He served as Director of the Institute of Ecology and Evolution, Director of the Doctoral Program in Systematics and Ecology and faculty member of the Doctoral Program in Marine Biology (graduate programs of the Faculty of Sciences, UACh). After his years of service at the University, Carlos retired in March 2019; after that, he continued as an *Ad-honorem* professor and scientist until 2017, becoming one of the most influential marine ecologists in Chile and South America. Although his research spanned from exposed rocky shore coasts of Chile to the southern Chilean archipelagos and Antarctic coasts, his experimental field work on the coast of Valdivia, specifically in the rocky shore of Mehuín, was -to my view- his foremost contribution to coastal ecology. Mehuín, located about 75 km northwest of Valdivia, was the perfect spot for a coastal marine ecologist; it was relatively close to the main campus of the university in Valdivia, had rocky shore promontories and platforms, as well as exposed and sheltered sandy beaches and two nearby estuaries. During 1977, the University submitted a request for a maritime concession of near 300-m length of a rocky shore promontory of Mehuín (*ca.* 300 m in length) to the Chilean Navy at the Maritime Governor's Office in Valdivia. The requested concession was granted during May 1978 and the requested promontories and

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rocky platforms, began to be called by two names: Reserva Marina de Mehuín (Mehuín Marine Reserve or MMR) and Punta Killian (Fig. 1), in honor of the founding father of the old Institute of Zoology, Dr. Ernst Killian. A couple of years after that, Carlos became interested in the MMR and thus, formal rocky shore experimental ecology begun at Universidad Austral de Chile.

From around 1980 until 2000, Carlos supervised 5 undergraduate and 11 graduate theses, whose field activities were carried out at the MMR. As a result of that, he and some of his master´s students coauthored several papers, most of them considered seminal for the development of the rocky shore experimental ecology in Chile and South America. The experiments carried out in the field by Carlos and his students, were simple and elegant; *i.e*., the common thread was to manipulate benthic invertebrate densities and macroalgal cover and patiently wait for the responses of different benthic components. The first M.Sc. Thesis directed by Carlos was aimed to study biotic interactions at the MMR, and was that of Fernando Jara Senn (1980). Densities of herbivorous gastropods and cover of the most common alga (*Iridaea boryana*) were manipulated for two years at the mid intertidal of the MMR (Jara & Moreno 1984, Ecology 65: 28-38). While the removal of herbivores resulted in high cover of *I. boryana*, the addition of herbivores resulted in a marked decrease of this macrophyte, accompanied by an increase in barnacles and crustose algae. The authors concluded that the high cover of *I. boryana* in control plots was due to the low abundance of herbivorous macroinvertebrates, a fact that these authors attributed to the effect of "high human exploitation" in the area. Within the time window that Fernando Jara used for his field experiments (1978-1980), some of my assistants, the housekeeper of the coastal laboratory and I, used a rock face divided into two sections separated by a wide crack and directly exposed to the waves, to study the effects of limpets on the width of macroalgae belts. From May 1979 to September the same year, limpets (mostly *Fissurella picta*) were fortnightly removed from one of those sections. Sometime later, we wrote a paper with Carlos, showing that herbivorous gastropods limit the cover and vertical distribution of the intertidal rocky shore algae (Moreno & Jaramillo 1983, Oikos 41: 73-76). Years later, Carlos and collaborators published the work that, in my opinion, was the most seminal in understanding the relationship between shellfish harvesting and the structure of the Chilean rocky shore intertidal landscape. Moreno et al. (1984, Oikos 42: 155-160) found that after 1978 (when the MMR was created) the abundance of *F. picta* increased over time, while the cover of the most common intertidal algae decreased and that sites located nearby larger fishing villages, had higher covers of *I. boryana* and lower abundances of *F. picta*. In summary, Carlos and collaborators showed that the marine coastal landscapes are significantly modulated by human use of the marine resources inhabiting them. I am certain that those studies and others, were relevant not only to know the mechanisms that maintain the patterns of abundances and diversity of intertidal macroinvertebrates and macroalgae, but also for the creation in Chile of the Fisheries Management Areas (AMERB), which today regulate artisanal fishing throughout our coasts.



Mehuín Marine Reserve (MMR) or Punta Killian
Aerial view of the former protected rocky shore area of Mehuín (Mehuín Marine Reserve, MMR). This is the area (view from the north) where Carlos Moreno and his colleagues and students, performed most of the field manipulative experiments at the rocky shore in Mehuín.

Carlos did not just love his family, his University (UACh), his Institute -whose academic structure and purpose he had been one of its greatest promoters- and the academic life; he also loved fly fishing in the rivers of southern Chile. Perhaps one of the things that hurt him the most during his last years, was having to start dialysis and give up fishing.

Having in mind what I had said above, I wish to finish with a message to undergraduate and graduate students, as well as to young researchers interested in coastal ecology: *"Go to the open field, go to the coast and take a rest, listen the south wind whistling in your ears, listen what the wind tries to tell you, let the ocean waves wet you, observe those limpets and tiny crabs, feel the kelps touching your bare foots, and ask yourself why you see the landscape you are looking at; by doing that, you will remember the marine ecologist Carlos Moreno and hopefully, you will be able to listen to him, and thus, you will be able to understand better the structure and purpose of that coastal landscape".*

Fabian Jaksic

I met Carlos in the winter of 1976, while I was training as a young bachelor's in biology (University of Chile, Santiago) under Roberto Murúa, a mammalogist in the Institute of Ecology and Evolution of UACh. Carlos hosted me in his home a couple of times, and we had interesting conversations on ecological and academic affairs. By then, he was an associate editor of the journal Medio Ambiente, and he stimulated me to contribute to that outlet. Thus, my very first scientific publication was there in 1977: "Estimación de edad y relaciones biométricas en *Octodon degus* (Age estimation and biometric relationships in *Octodon degus*)," followed by other papers published during 1979-1989. This was my modest beginning as a writer of scientific papers, under the aegis of Carlos as editor. By then, only a handful of journals were willing to accept papers on ecology: Boletín, Noticiario, and Publicaciones Ocasionales del Museo Nacional de Historia Natural (Santiago), Anales del Museo de Historia Natural de Valparaíso, Anales del Instituto de la Patagonia (Punta Arenas), and of course Medio Ambiente. Therefore, I am forever thankful to Carlos for allowing me to start my scientific career as an author.

Surprisingly, Carlos decided to become a student again in 1985, being admitted in the doctoral program in Ecology of the Catholic University of Chile in Santiago, as part of the second admission in that program. That same year I was his teacher in the graduate course "Community Ecology" and in 1986 in the graduate course "Predation." Carlos not only was a motivated student but made my own lectures and discussions enjoyable with his deep knowledge of those topics in the marine realm, complementing mine in terrestrial ecosystems. In my capacity as Director of the doctoral Ecology program in 1988, I was president of his qualifying exam (accompanied by four other colleagues).

Fate would reunite us again in 1991, when together with others (J. Armesto, E. Hajek, P. Ojeda, and D. Soto) we decided to found the Ecological Society of Chile (legally chartered in 1994), in which he served as its first President and was later honored as Eminent Ecologist in 2001 during a binational meeting in Bariloche, Argentina. My only publication with him was: Grez, A. A., F. M. Jaksic, C. A. Moreno & I. Serey. 1995. La enseñanza de la Ecología en Chile a niveles de pregrado y postgrado ("The teaching of ecology in Chile at undergraduate and graduate levels"). Revista Chilena de Historia Natural 68 (1): 139-152. It was a benchmark in the history of teaching Ecology in our country and has never been updated.

Over later years, we met in many meetings and took time to discuss ecological topics but also our respective academic careers and perspectives. We shared confidential comments on the behavior of Chilean ecologists, always under an umbrella of mutual confidence and reserve. I miss him!

Doris Oliva

Carlos's scientific interests extended beyond ecological sciences to include the management and conservation of fisheries resources. In 1989, he joined the Scientific Committee of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), representing Chile and attending the annual meetings in Hobart, Tasmania. He served as Chair of this Committee from 2009 to 2010. Carlos enthusiastically pursued projects such as improving stock assessment processes for krill and the Chilean seabass or Patagonian toothfish fisheries and mitigating incidental mortality of seabirds (petrels and albatrosses) associated with the seabass fishery in Antarctic waters.

In 1996, Carlos was nominated to the National Fisheries Council in his capacity as an ecologist; he served until 2005. Carlos' participation in the Council

was highly significant; he conveyed to representatives of both industrial and artisanal fishing, the importance of scientific knowledge in decision-making, responsible fishing practices, and the understanding that fishing activities impact biological communities. After meetings in Valparaíso, we shared impressions on the council members' positions and the potential for collaboration on sectoral issues where there were agreements, as well as the research needs to implement management measures based on more robust information. His expertise in the Chilean seabass and Chilean abalone ("loco") fisheries, along with his field experience, earned him the intellectual recognition of his peers in the Council. In 2006, Carlos was appointed by CORFO as Chairman of the Board of the Fisheries Development Institute (IFOP). He got the lead to develop of this important fisheries and aquaculture research institution in the country. His time at IFOP allowed him to align the research needs for the country's fisheries and aquaculture management, with the strategic development guidelines and their direction.

I met Carlos as a student, admiring his academic work, and later during Antarctic expeditions, where we shared numerous anecdotes. Our paths crossed in 1986 at the Catholic University of Chile, where we were classmates in the Doctoral Program in Ecology. We later met again at the Undersecretariat of Fisheries, when I was in charge of the Fisheries and Aquaculture Research Fund. During this period and the following 10 years, Carlos made many relevant contributions to the country's fisheries management, for which he is recognized by his peers and by the industrial and artisanal sectors.