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2019, Wild Project Editions, 348 p.**

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## Daniel Pauly. Un océan de combats

David Grémillet

2019, Wild Project Editions, 348 p.

With more than to 100,000 citations on Google scholar, Daniel Pauly (DP) is rightly considered as one of the most influential fishery scientists in the world. In his biography (in French, to be published in English this year), David Grémillet (Research director at the CNRS) aimed at describing the work as well as the personal life of DP while outlining some historical events and key scientific facts. Altogether, this allows for an edifying glimpse behind the scenes of DP's scientific career and a true understanding of the impact of his work on science and society (see also Pauly, 2016). Following 34 pages of personal pictures, the book is divided into four main parts, entitled: "Origins" (p. 1-42), "Constructions" (p. 43-176), "Global" (p. 177-314), and "Epilogue" (p. 315-322). The book ends with four appendices ("Notes", "Daniel Pauly in a few dates", "Acronyms", and a "Selective bibliography"), and "Acknowledgements". In the present review, I selected some key elements of DP's personal and professional life because, as perfectly described in the book, both are tightly linked and essential to truly understand how he became not only one of the most influential scientists in the world but also one of the greatest whistle blowers of our time.

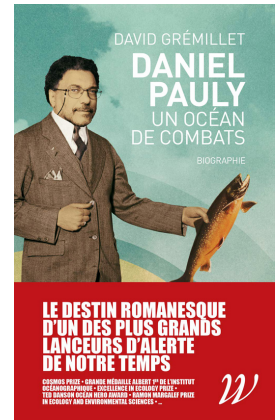
### Origins

Born on 2 May 1946 in Paris from the union of a black GI (Winston R. McLemore) and a French white woman (Renée Clément), Daniel Marc Roger Clément had very tough beginnings. After spending his first two years constantly sick with his single mother in Paris, in 1948 he was sent to La Chaux-de-Fonds (Switzerland), hoping to have a better life there. Yet, DP was ill-treated throughout his childhood and as soon as he was old enough to work, he was considered as a resource; he describes this adoptive family as Victor Hugo's "Thénardier". Fortunately, a few people, including the Rognon and Barbier families, took care of him occasionally, which saved DP. Besides, even though he was not a "very good" student, he had already developed a passion for reading, an escape from his hard life. At the age of 17, he left for Germany where he worked for several months in a psychiatric asylum and a hospital before deciding to pursue his education during the evening while still working during the day. On January 1967, he went to Paris to meet his biological mother, i.e. 18 years after their separation. Only one line is discreetly dedicated to the reunion between Daniel and his mother, but one can only imagine the emotion between the two. Daniel also met his step-father (Louis Pauly, who had adopted him and gave him his family name) and three half-sisters and four half-brothers; he spent several months in Paris (regularly seeing his family thereafter). He went back to Germany in September 1967 and obtained his *Abitur* (baccalaureate) at Wuppertal in the spring of 1969 before leaving for the US that summer to meet his biological father; a man

whose convictions were far from his own.

### Constructions

In September 1969, DP was back in Kiel, Germany, to start university. The second day of class, he met another student, Cornelia Nauen, with whom he continues to share a common scientific and policy quest. He also met his mentor Professor Gotthilf Hempel, the director of the Institute of Oceanography, who played a crucial role in his early career. Still penniless, DP continued to work in a hospital before starting a project in the early 1970s with Wolf Arntz. He invented a device for presorting benthos samples from mud, which resulted in his first scientific paper in 1973 (see DP's website for his publications: <https://oceans.ubc.ca/daniel-pauly/>). In 1971, he left for Ghana to spend six months on a holistic analysis of the socio-ecological system of the Sakumo Lagoon. Back in Germany, he obtained an excellence scholarship from the Protestant Church, allowing him to focus only on studies. In 1972 and 1973, he learned Russian and read the monumental works of fish biologists from Ukraine and Russia on fish physiology that had a decisive impact on his scientific thinking. Meanwhile, in 1973 he made several journeys, among which included three weeks in Russia, six months in the US and he participated to an oceanographic mission on the *Walther Herwig* along the east coast of Canada up to Greenland. Throughout these different journeys, DP witnessed horrible things that affected him enormously for the rest of his life. After his oral defence of his diploma in Fisheries Science and Zoology (equivalent to a Master's degree) in February 1974, he was hired as a civil servant at the German Agency for Technical cooperation (GTZ). His first mission abroad was in Java Island, where he started working in June 1975 with an Indonesian colleague, Purwito Martosubroto. The first trawls were a revelation and stimulate the necessity to invent a completely new fishery biological science for tropical regions. Back in Germany, he started his PhD thesis in January 1977. His aim was to find a general model of growth for all fish species for which he compiled the available information for 978 different populations for 515 species. Impressed by the results, DP decided to never perform any field or lab work in his career. Based on this "database", he was able to calculate the Holy Grail of fishery science, natural mortality rate "*M*", using only maximal body size/mass, growth rate, and mean temperature in their distribution range, which would become one of his most cited articles. Meanwhile, DP worked on the relationships between gill surface



area and growth performance in fish and develop his Gill-Oxygen Limitation Theory (GOLT), which was the core subject of his PhD thesis, defended in May 1979. During his PhD, Sandra Wade entered his life (first met eight years before during his first trip to the US) and they got married on 8 December 1978.

After a first trip to Manilla (Philippines) in mid-June to mid-August 1978, DP and his wife moved to Manilla to join a brand new institute the International Centre for Living Aquatic Resources Management (ICLARM) in July 1979. In 1980, DP brought back his son Ilya, born in Jakarta, whose mother was his former girlfriend in May 1977. In 1981, the couple had a girl: Angela, named after the famous Afro-American activist. He started giving classes on the “Dynamics of fish populations” at the University of the Philippines. He performed a systematic study of San Miguel Bay, which he considered as a decisive step in his career because he understood the link between fisheries and politics, equity, justice, as well as the difficulty to access data, and to analyse it within an interdisciplinary framework. He teamed up with Noel David and José Ingles to develop ELEPHAN (Electronic Length Frequency Analysis in BASIC). On 1 April 1982, Maria Lourdes “Deng” Palomares was hired at ICLARM and became one of his closest collaborators (“guardian angel”) to this day. Together, they improved ELEPHAN and trained hundreds of students and colleagues in Asia, Africa, South America and the Caribbean Islands in the 1980s. The program was also extended to many other animal taxa. Meanwhile, he also worked with Roger Pullin on aquaculture and Jay Maclean on many reports. Yet, in 1983-1984 ICLARM went through a serious financing crisis, and DP became unemployed. Thanks to a 6-month contract, he was able to go back to Kiel alone in mid-1984, allowing him to prepare his Habilitation. Fundings improved in Manilla, and DP was back to Manilla at the end of 1984. While learning Spanish, he continued to go to Peru to work on the Peruvian Anchovy, coedited two large volumes on the Peruvian anchovy in 1987 and 1989 by Isabel Tuskayama, which still remain the references today. In parallel, along with Alan Longhurst, he published a book on the Ecology of Tropical Oceans in 1987. He started working on Ecopath in the late 1980s, an approach (software now) that allows the rigorous description of aquatic ecosystem modelling; but it is only when Villy Christensen arrived in Manilla in early 1990, mainly because he had met DP the year before, that ECOPATH II was improved in July 1990. Ever since, this method has been much enhanced (notably by Carl Walters and became “Ecosim with Ecopath” or “Ewe”) and used in thousands of articles. In 1988, Rainer Froese, met in 1985 in Kiel, arrived at Manilla and based on the data assembled during DP’s PhD, they decided to develop a new database: FishBase. Thanks to Cornelia Nauen, they were able to secure a succession of large grants to implement FishBase and they hired Susan Luna and Belen Acosta and dozens of people in the 1990s, including Nicolas Bailly; the FishBase team then moved to Los Baños. Throughout the 1980s, DP worked relentlessly building strong collaborations with numerous colleagues while travelling all the time (and misplacing things along the way), often absent eight months a year (he recorded stories on tape and sent them to his two kids. The time spent away from his family is probably DP’s biggest regret).

## Global

In the early 1990s, strong changes occurred at the top management of ICLARM, and all the people working with DP progressively left. Thanks to Tony Pitcher, DP postulated for a new professorship position at the University of British Columbia (UBC), Vancouver (Canada). He started in 1994 at UBC as professor of fisheries and negotiated the possibility to work 7 months there, working all the time, mostly alone, and 5 months in Manilla with his family. One of his key undertakings was to demonstrate along with Villy Christensen that the primary production required to sustain global fisheries amounted to 8% of global aquatic primary production, ranging from only 2% for open ocean systems to 24 to 35% in fresh water, upwelling and shelf systems. This article was published in *Nature* in 1995 and constituted the first big achievement of DP’s career close to the age of 50. A few months later, he wrote an article in one day, which became one of his most-cited papers, the “shifting baseline syndrome” in *Trends in Ecology & Evolution*. Three years after, his second very important contribution: “fishing down the trophic level”, based on the analysis of the evolution of the trophic level of the fisheries of 1200 species around the world, was published in *Science*. Following this, DP understood that communicating was important (the drawing of “fishing down the food web”, performed by Rachel “Aque” Atanacio became even better known than the article), and he started to regularly answer journalists (e.g. Nancy Baron). It is also following that article that DP became much more aggressive with the industrial fishing industry and started working more closely with several NGOs (e.g. Oceana, Bloom) in order to try to truly change fishing globally.

In the fall of 1997, following a one-day scoping workshop organized by Joshua Reichert (Pew Charitable trust) in Philadelphia with five other renowned senior US scientists, DP was the only one who accepted to develop a research program to demonstrate human impact on global oceans. The program *Sea Around Us*, named after Rachel Carson’s (one of DP’s heroes along with Charles Darwin) third book, began in mid-1999. He obtained a grant of over 1 million dollars per year, hired dozens of masters and PhD students and postdoctoral fellows (e.g., Dyhia Belhabib, Frédéric Le Manach, Jennifer Jacquet, William Cheung) and worked with many colleagues, among whom Villy Christensen, Reg Watson, Rachid Sumaila, Philippe Cury, and his right-hand man Dirk Zeller. One of the first main outcomes was a book published in 2002, co-authored by Jay Maclean that summarized how fisheries had evolved in the North Atlantic Ocean in the past decades. For over 20 years, the *Sea Around Us* team thoroughly reconstructed capture fisheries for 273 countries and territories, with the help of hundreds of colleagues throughout the world, to highlight how much fish has truly been taken from the oceans (and not only official “landings” data disseminated by the Food and Agriculture Organization), including discards, illegal, unreported, and unregulated fishing (particularly from the European Union and China in African waters), and recreational fisheries. The main results were published in the *Global Atlas of Marine Fisheries* as well as in *Nature Communication* in 2016. True captures are on average 1.5 more important than official statistics (particularly in China, as previously demonstrated in an article published in *Nature* in 2001) and global captures have been actually decreasing since 1996 by about 1 million tons per year. This project allowed highlighting overfishing on a global scale with its

threefold expansion (geographic, bathymetric, and taxonomic), the role of subsidies in maintaining overfishing, the role of women in fisheries, and the importance of developing marine protected areas as well as an ecosystem approach to fisheries management, to reconcile exploitation and conservation. More recently, based on DP's lifetime obsession (GOLT) which he considered as the best piece of science he had ever done (and his biggest regret because it did not get as much attention as his other work), he was able along with William Cheung and other colleagues, to predict the impact of global warming on fish distribution and fisheries. Meanwhile, in 1996, FishBase was released on-line and in recent years has received more citations per year than any other fisheries reference. It was complemented by SeaLifeBase in 2006, which covers marine tetrapods (i.e. marine mammals, reptiles, and birds) and invertebrates.

### Conclusions

David Gremillet spent two years on four continents to write this vibrant tribute to DP's personal life and career. The book is very interesting and most often easy to read. Yet one must concentrate because of the numerous people cited and the constant switch between DP's personal life, science and comments of the author, particularly in the third part "Global". Nevertheless, it provides some clues for those who would like to know how science works, and why and how DP became one of the 50 most influential scientists in the world according to *Scientific American*; one of the greatest whistle blowers of our time. Arguably, the main reason is that DP always tried to follow Peter Medawar's "Advice to a Young Scientist": "Any scientist who wants to make important discoveries must study an important problem". Despite a stroke (CVA) in late January 2005 and some after-effects (particularly when he is tired), at the age of 74 DP remains a very hard-worker. He defines himself as a workaholic who discusses only science and has no hobbies

to speak of (Pauly, 2003). Nevertheless, after this tragic event, he became more sensitive and prone to listen to others (in his early days, he was much more provocative and pushy). For over more than five decades, DP travelled or lived in more than 100 countries, published hundreds of articles, wrote or co-edited 30 books, co-developed several global databases, and received over 40 prestigious awards. Along the way, he developed true friendships (some over decades long), which are indefectible according to Kostas Stergiou, and was able to convince hundreds of colleagues to work with him. He was always keen to help others, particularly people in developing countries (I can testify to this personally as well as to his kindness, simplicity, and sense of humour). Perhaps his tough beginnings and the fact that he is biracial give him the courage and eagerness to tirelessly fight against lobbies, politics, and other colleagues to demonstrate "that the effect of fisheries on marine life is equivalent to that of a large meteor strike on terrestrial life" (Pauly, 2003). During his long journey, Daniel could count on his incredible wife, Sandra, who took care of nearly everything while having her own extraordinary career and life.

This book review will fittingly conclude with DP's favourite song,

R.E.S.P.E.C.T.

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