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Ocean whistleblowers: women's contributions to maritime knowledge and conservation

by

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Abstract. – This article focuses on the stories of key women scientists – Rachel Carson, Anita Conti, Alette Geistdoerfer, Elinor Ostrom and Elisabeth Mann Borgese – who had a major impact on ocean conservation. Through these portraits of women scientists from the Western world, we study their trajectories in the professional world of the sea, an environment dominated primarily by men, and we explore the legacy of these courageous pioneers, to understand their impact on today's generations of ocean scientists. Their work has allowed to develop a better understanding of marine ecosystems and of the coastal communities that live off the sea and to raise awareness to the impacts of overexploitation and the need to better preserve the ocean. Each contributed to making the protection of the marine environment an international political issue. The authors thus contribute to a necessary historical and sociological reframing of the epistemology of ocean sciences. The aim of this article is not to provide a sociological gender analysis, but rather to give an overview of women leaders in ocean science who have paved the way for new ways of thinking about the ocean and its governance.

Résumé. – Les lanceurs d'alerte de l'océan : les contributions des femmes à la connaissance et à la conservation de la mer.

Cet article se concentre sur les parcours de femmes scientifiques – Rachel Carson, Anita Conti, Alette Geistdoerfer, Elinor Ostrom et Elisabeth Mann Borgese – qui ont eu un impact majeur sur la conservation de l'océan. À travers ces portraits de femmes scientifiques du monde occidental, nous présentons leur trajectoire dans le monde professionnel de la mer, un milieu largement dominé par les hommes. Leurs travaux ont contribué à mieux connaître les écosystèmes marins et les communautés côtières qui vivent de la mer, tout en alertant sur les dangers de la surexploitation et la nécessité de mieux préserver l'océan. Elles ont toutes contribué à faire de la conservation de l'environnement marin un enjeu politique international. Dès lors, il convient d'explorer le patrimoine immatériel de ces courageuses pionnières, afin de comprendre leur impact sur les générations de scientifiques d'aujourd'hui. Les auteurs visent à contribuer au recadrage historique et sociologique de l'épistémologie des sciences océaniques. L'objectif de cet article n'est pas de fournir une analyse sociologique de genre, mais plutôt de donner un aperçu des femmes leaders dans les sciences océaniques qui ont ouvert la voie vers de nouvelles façons de penser l'océan et sa gouvernance.

INTRODUCTION

The uses of the ocean have multiplied due to technological advances, scientific breakthroughs, and the impact of globalization. Marine biologists have highlighted the extent to which the entire marine environment is now affected by human activities (Halpern *et al.*, 2008). Anthropogenic pressures on the ocean are numerous, the degradation of marine ecological systems is accelerating, and socio-environmental conflicts in coastal communities are multiplying (Pauly *et al.*, 2005; Lazzari *et al.*, 2021). Marine “resources” are being exploited through extractive practices such as overfishing, leading to increased inequality due to poorer countries' limited fisheries management capacity (Bednik, 2019). The boundaries of this industrial exploitation continue to expand, as illustrated by plans to start mining the seabed by 2023 (Gilron and Smith, 2021).

As co-chairs of the first Franco-Canadian congress of aquatic sciences, on which this article is based, Pr. Daniel Pauly (University of British Columbia) and Dr. Fabrice Teletchea (University of Lorraine) are among the scientists and other actors working to ensure the sustainability of marine- and especially coastal socio-ecosystems. Within this framework they allowed us to honour the women involved in research on the conservation of ocean biodiversity. By locating women's major contributions within the history of science and the sociology of conservation, marine scientists such as Daniel Pauly has demonstrated the effects of overfishing on the ocean and refuted the ideology that ocean resources are inexhaustible. Indeed, he used the term “aquacalypse” to describe how industrial fisheries are emptying the oceans (Pauly, 2009). His commitment to ocean conservation and his work to denounce overfishing has been largely inspired by female whistleblowers who have brought atten-

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tion to the negative impacts of human impacts on ecosystems, notably Rachel Carson (Mazé, 2020; Grémillet, 2021).

Since the 1950s, pioneering female figures exposed the ocean's overexploitation (Conti, 1953, 1957; Geitsdoerfer *et al.*, 2003). Female scientists have had pivotal roles in creating knowledge about the ocean on ships and in laboratories, marine biological stations, or museums. Female scientists have contributed to the conservation of marine ecosystems and the protection of biodiversity and coastal communities whose livelihoods depend on the ocean (Gissi *et al.*, 2018), leaving behind a legacy, which serves today's women marine scientists. The women of science in the 20th century still had to overcome gender-based barriers, such as the difficulty of accessing scientific careers and doing fieldwork (Toulouze, 2014). Moreover, women who have contributed to the development of marine sciences do not have the same visibility as their male counterparts, *e.g.*, Commander Jacques Cousteau. Jeanne Baret, Anita Conti, Helen Battle, Rosa Smith Eigenmann and Jeanne Villepreux-Power are women scientists who were mostly unknown to the general public (Lefebure, 1995; Ridley, 2010; Debaz, 2012; Arce *et al.*, 2021). Even Rachel Carson, whose work achieved considerable exposure in the US, has been often dismissed, and her identity as a marine biologist was denied. Having been relegated to the shadows, the careers of these scientists now warrant wide recognition.

This paper draws upon the stories of five women scientists in Europe and the United States. They were actively engaged in the protection of marine ecosystems through their work in natural and social sciences. From their production of knowledge on the ocean to their activism against overfishing, we explore the professional trajectory of these women who shaped today's perceptions. We highlight their role as whistleblowers to warn public opinion about the degradation of marine ecosystems, in a political context where the growth of the fishing sector was very often set as a critical objective for international development (De Schutter, 2014).

WOMEN PIONEERS: FROM SCIENTIFIC OBSERVATION TO WHISTLEBLOWING

At the beginning of the 20th century, in western countries, the level of participation of women in sciences fluctuated widely (Kohlstedt, 2004). However, while the recruitment of women in strategic scientific areas such as physics and chemistry increased during the Second World War, they were expected to take back their duties at home when the war ended. Female scientists were under-recognized, paid less than men, and had limited prospects for upward mobility. They were excluded from entering universities and academic institutions, especially concerning natural or "hard" sciences such as mathematics, medicine, biology, and phys-

ics (Kohlstedt, 2004). Marine biology and oceanography were no exception; for instance, access to the marine environment was made difficult, and women were only granted access to research vessels and expeditions during the late 20th century (Proutière-Maulion *et al.*, 2016). Thus, acquiring research positions and achieving recognition in marine sciences required considerable perseverance and courage (Lefebure, 1995). Rachel Carson and Anita Conti are two major figures who overcame societal barriers to achieve successful scientific careers that had lasting impacts. Although they never met, they shared the same quest for sustainability.

The American marine biologist Rachel Carson (1907-1964) was a pioneering figure in conservation biology who highlighted the damage caused by human societies to terrestrial and marine environments (Kohlstedt, 2004). Her first book, *Under the Sea Wind* (1941), was based on her research on marine life in the Chesapeake Bay. It aimed at narrating the stories of the species living on the ocean floor for the general public. She did her most courageous work in the post-WWII period, with the publication of her two best sellers: *The Sea Around Us* (1951) and *Silent Spring* (1962). *The Sea Around Us*, a synthesis of the most up-to-date knowledge on the ocean at the time, won two awards in the US, the National Book Award in the non-fiction category and a John Burroughs Medal for outstanding work in the field of natural history. Carson continued to contribute to the dissemination of ecological thinking with *Silent Spring* (1962). The book was heavily criticized in the year following its publication in both chemical and agricultural trade journals as well as in the popular press, where journalists attacked her personally, accusing her of being "unscientific" and "hysterical" (Brooks, 1989). The hysteria diagnosis was used to pathologize a wide range of behaviours in women, and it was criticized for asserting gender and social control (Arnaud, 2015). Yet, the same year, the book prompted a Congressional hearing in the US, and President John F. Kennedy stated that the book had raised public concerns about pesticides in a press conference (Stoll, 2020). Eventually, the Environmental Protection Agency's (EPA) creation in 1970 and the Toxic Substances Control Act of 1976 led to the ban or severe restriction of all six compounds indicted in *Silent Spring* (Stoll, 2020).

Another natural scientist who explored the interrelations between human activities and their ecosystems is Anita Conti (1899-1997)¹. She was the first French oceanographer to board coastal and deep-sea trawlers in expeditions ranging from the polar seas to Northwest Africa. She observed, photographed, noted, and recorded data about

¹ Her archives, deposited in Lorient (FR), have been indexed and partly digitized (see: <https://anitaconti.lorient.bzh/fr>). At the reference number 30Z126 (1934-1939), there is a mention of "the impoverishment of the fishing grounds".

the lives of fishers and the state of ecosystems and fishery resources (see Leton, 2014). She boarded the ship *Ville d'Ys*² in 1932 to document its activities. In 1935, she was hired as a journalist at the *Office scientifique et technique des pêches maritimes* (OSTPM) and assigned to the first French oceanographic vessel, the *Président Théodore Tisserier*. Using documentary photography, she recorded the work of fishers and alerted them and the public to the dangers of overfishing (Cardi, 2014). She joined the French Navy during the Second World War and embarked on minesweepers, although it was only in 1983 that the French Navy authorized for the first time female officers on its ships (Reverzy, 2006). In 1952, she embarked for six months on the trawler *Bois-Rosé* in Newfoundland and documented her experience in the book *Racleurs d'océan* ('Ocean scrapers'), in which she described the life of Newfoundland fishing communities (Conti, 1953).

She then decided to fight against the "state of industrial barbarism" that she witnessed onboard, by dedicating herself to seeking to "solve the problems of catching and conserving fish on a local scale" (Garnier, 1960). In her book *Géants des mers chaudes* ('Giants of warm seas'), she describes her experience on the coasts of Mauritania, Senegal, Guinea and the Côte d'Ivoire, where she mapped fishery resources, notably those based on research aboard the trawlers *Volontaire* and *Tatiana* (Leton, 2014), and participated in the launching of new fisheries and the establishment of smokehouses to preserve the catch (Conti, 1957). Yves La Prairie, who was director of CNEXO³ (the organization which later became Ifremer⁴), expressed his admiration for Conti's work and supported experiments on coastal aquaculture based on "Conti's certitude" (Blengino *et al.*, 2020).

Starting in the early 1960s, Anita Conti worked on aquaculture as a possible solution to overfishing; notably, she explored new techniques for Atlantic cod (*Gadus morhua* Linnaeus, 1758) fish farming and even presented herself as the "shepherd of the ocean." This metaphor recalls the name

of the NGO created by Paul Watson in 1977: Sea Shepherd. Towards the end of her life, Anita Conti was able to witness the progress made to establish marine protected areas, and she continued to sail the world and protested against oil spills. In 1984, Yves La Prairie applied for Anita Conti to be admitted into the prestigious French Marine Academy, created in the 18th century. His proposal was rejected because no women had ever been admitted (Girault-Conti, 2021), attesting of the gender bias in maritime institutions. It was not until the 1990s that she received public honours. She left a valuable and lasting impact in a world dominated by men. She was a pioneer in analysing the relationship between fishers and their environments, based on ethnographic observations from multi-site fieldwork (Clouette, 2021). She wrote that her biggest conquest was the freedom to dare to think and speak up (Reverzy, 2006).

Anita Conti and Rachel Carson represent a larger movement of female marine scientists who observed, denounced, and fought against the drivers of anthropogenic pressures on marine ecosystems. With perseverance and conviction, they overcame the risk of retaliation arising from their activism and the difficulties routinely encountered by being women scientists. Beyond the commercial and popular success of their stories, books, films and photographs, they both had a lasting impact on marine research and science in general. They were a major inspiration to contemporary fisheries scientists such as Daniel Pauly, as well as other marine biologists, and researchers in environmental humanities.

SOCIAL SCIENCE APPLIED TO MARINE ISSUES BY POWERFUL, DYNAMIC WOMEN

To achieve the objective of conserving the ocean, its ecological functions, and its biodiversity, a body of knowledge from many different disciplines is needed as well as keeping in the collective historical memory the warnings and scientific breakthroughs by women scientists. Implementing interdisciplinarity and enhancing social and human sciences' value in ocean conservation is essential. Each discipline needs the others to grow and evolve: the law is complementary to oceanography, political science to marine biology, maritime economics to marine geosciences. Dr. Aliette Geistdoerfer, Pr. Elinor Ostrom, and Pr. Elisabeth Mann Borgese are examples of social sciences researchers who have contributed greatly to raising awareness about ocean conservation.

Dr. Aliette Geistdoerfer (1943-2015) contributed to the anthropology of "fishing systems" and is indeed a French and European key figure on this topic (Geistdoerfer, 2007). Mixing approaches in the anthropology of techniques and social anthropology, she built the conceptual framework used in French maritime anthropology. She founded the CETMA,

2 This aviso (dispatch boat) was owned by the French Navy and dedicated to fisheries surveillance in Newfoundland as well as used simultaneously for research by the OSTPM (see Forest, [this volume](#)).

3 The Centre National pour l'Exploitation des Océans (CNEXO; National Center for the Exploitation of the Ocean) is the ancestor of the current Ifremer. CNEXO was founded in 1967 under the presidency of General de Gaulle as one of several research organizations such as ANVAR (Agence Nationale de Valorisation de la Recherche) and INRIA (Institut National de Recherche en Informatique et Automatique).

4 The Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), created in 1985, aims to promote fundamental and applied research along the French coastline and on the ocean. Notably to evaluate ocean resources, encourage socio-economic development in the maritime sector, implement surveillance methods, and protect the marine environment.

Centre d'ethno-technologies en milieux aquatiques, hosted at the *Muséum national d'Histoire naturelle* (MNHN) in Paris (Mariat-Roy and Sécula, 2018). Now called CETMA-Anthropologie Maritime, this centre manages and develops a multidisciplinary documentation centre, within which Dr. Geistdoerfer insisted on integrating disciplines and activities related to the aquatic environment (Mariat-Roy and Sécula, 2018).

Sponsored by important names of French oceanographic sciences, particularly in ichthyology, such as Dr. Théodore Monod (then director of the Overseas Fisheries Laboratory of the MNHN), the CETMA published a journal, the *Cahiers d'anthropologie maritime*. Dr. Geistdoerfer structured research in French maritime anthropology at the centre, which also houses an extensive library. She advocated for researchers to make contacts within coastal communities, conduct immersive surveys, and board fishing boats. Her main objective was to understand better the specificities of seafaring populations and their relationship with the marine environment, fished species, and fishing practices. She also worked on the relationships between fishing societies and their environments and related the need to protect the fish to the needs of small-scale fishers. Using a social sciences approach, she questioned fish consumption given their decline in the wild while focusing on communities of small-scale fishers. She was the editor of a book based on articles on this topic entitled: *La mer dévorée. Le poisson bon à manger, le poisson bon à penser* (Geistdoerfer et al., 2003), i.e., “The devoured sea: fish that is good to eat, fish that is good to think [about]” and whose title evokes works of the anthropologist Claude Lévi-Strauss (Hénaff, 2004). She also intervened in conferences with the question: “Can we still eat fish?”. In a now well-known exchange among French fisheries and maritime anthropology specialists (Ifremer, 2013), she debated these issues with Dr. Alain Biseau, a researcher in charge of stock assessment at Ifremer. In this talk, they discussed the contemporary evolution of stocks and the mutations of the fishing profession in a context of crisis.

Aliette Geistdoerfer never stopped defending fishing communities through her activities (Mariat-Roy and Sécula, 2015; Mariat-Roy, 2016). She passed away in 2015, but her work allowed the emergence of a unique French school of maritime anthropology, which still inspires many anthropologists today through its methods, tools, references, concepts, and way of doing fieldwork. The school is now engaged in different approaches, which are a tribute to her legacy and innovative ideas, to face challenges threatening the ocean and its communities.

Elisabeth Mann Borgese (1918-2002) is recognized for her passionate defence of the ocean and especially for her important contributions to the development of the 1982 United Nations Convention on the Law of the Sea (UNC-

LOS) (Meyer, 2022). Her commitment to the ocean earned her some evocative nicknames: “mother of the oceans,” “ambassador of the seas,” or “the invisible hand in ocean governance.” Born in Munich in 1918, Elisabeth Mann Borgese saw the ocean as an excellent laboratory for the development of a genuinely new international/national political, legal, and social order (Mann Borgese, 1998). Supporting the idea of an ocean without borders, she advocated a new form of cooperative governance that would protect precious marine resources and move towards equitable uses of the ocean. Concerned by overfishing and ocean pollution, Mann Borgese started to advocate for its conservation in the 1960s (Dalhousie University, 2022). She was particularly interested in and inspired by the speech of the Maltese diplomat, Arvid Pardo, on 1 November 1967, which argued for a new principle, for a new law of the sea, the common heritage of humankind, perceived as “the overriding common interest of mankind in the preservation of the quality of the marine environment and in the rational and equitable development of resources lying beyond national jurisdiction” (Taylor, 2018).

During the UNCLOS negotiations, Elisabeth Mann Borgese defended the concept of a common heritage of humankind, and worked toward its application to all deep-sea resources: mineral resources and living resources (Mann Borgese, 1975). During these long years of negotiations, her knowledge and personality provided her with opportunities to influence the decision-making process. To consolidate this influence, she created the International Ocean Institute (IOC) in 1972 and organized the *Pacem in Maribus* (Peace in the Oceans) conferences, both of which were considered a “bully pulpit” for her arguments (Behnam, 2018). She published fifteen books, including *The New International Economic Order and The Law of the Sea*, *The Drama of the Oceans*, and *The Ascent of Woman*, as well as many essays and short stories. A German oceanographic research vessel has been named after her.

Elinor Ostrom (1933-2012), an American political economist, is another major social scientist who largely contributed to marine resources knowledge. Ostrom's immense contribution to economic governance, especially her analysis of the commons, was recognized when she became the first woman to receive the Economic Science Nobel Prize in 2009 (Dunhill, 2021). Her work greatly influenced the way we think about natural resources management. In her book *Governing the Commons* (Ostrom, 1990) she showed that when local communities, e.g., fishers, manage fishing waters and collective marine resources, they develop rules to care for and use those resources to maintain economically and ecologically sustainable ecosystems and livelihoods. Ostrom challenged the idea that collective use of resources would naturally self-destruct because of individual interests. Her pioneering fieldwork and original methodologies inspired

research on coastal communities' vulnerabilities and fisheries management globally, and fostered debates about biodiversity conservation on the high seas (Acheson, 2011).

By establishing long-lasting institutions, Alette Geistdoerfer, Elizabeth Mann Borgese, and Elinor Ostrom paved the way for social scientists to become increasingly involved in interdisciplinary research projects and to build bridges with policy makers and NGOs to contribute to evidence-based decisions regarding ocean conservation.

A LASTING HERITAGE

Pioneering women scientists have had to fight against prejudices and criticism to work on the ocean, very often being the only woman on board. They have faced the challenges of unequal access to higher education, employment, and proper recognition. These women did not necessarily identify as feminists but they certainly paved the way for future generations to have better access to scientific curricula and careers. Recognizing their work's immense value and impact is our contribution to establishing a fairer science history. Maritime history is saturated with male-dominant figures and archetypes of powerful captains and seafarers able to survive, *e.g.*, violent storms, thanks to their masculinity (Grövel and Stevanovic, 2016).

Women scientists developed new approaches and ways of seeing, using different media to make their voices heard, and created their own path in the academic landscape of ocean sciences: books, articles, sea logs, poetry, paintings, drawings, photographs, conferences, seaweed herbariums, etc. They created linkages between people, the land, and the sea, passing on their knowledge and expertise to society. Through their testimony and the expression of their journeys, the ocean became better known to those who stayed on land.

Since the 1980s, the academic sector has changed thanks to research exploring the "masculinisation of science" (Watts, 2007) and evaluating the benefits of taking in consideration the gender dimension for the communities in which research projects operate. The feminist approach in research involved focusing on scientific methodologies and concepts through a gendered lens, integrating the dimensions of social identities, power relations and forms of oppression, and questioning assumptions around gender. Such approach can leverage reciprocity, *e.g.*, ethical relationships with studied communities rather than extractive relations. This can help, for example, to identify long-term strategies of resilience and adaptation for vulnerable communities (Iniesta-Arandia *et al.*, 2016).

Today, women have increased access to powerful positions in the academic landscape of ocean sciences, but the gender gap remains a challenge to be addressed (Brooks and Deniz-Gonzalez, 2021). For example, in "Eating the

Ocean," the anthropologist and eco-feminist Elspeth Probyn investigates the profound importance of the ocean, the gendered politics of "sustainability," and the future of fish and human entanglement (Probyn, 2016). Another woman committed to ocean conservation is Aulani Wilhelm, Senior Vice President for Oceans at Conservation International. Through her work, she addresses critical issues for the future of ocean health, from fisheries and aquaculture, protecting coastal ecosystems, creating "blue carbon" markets, local conservation, and effective ocean management and governance (GEF, 2020).

Similarly, the ongoing negotiations at the United Nations to develop a new treaty on the conservation and sustainable use of biodiversity beyond national jurisdictions (BBNJ), of global significance, are chaired by a woman, Rena Lee. An Ambassador for Oceans and Law and Special Envoy of the Minister for foreign Affairs of Singapore, Lee was appointed President of the Intergovernmental Conference in 2018, the arena for official negotiations of the future treaty. This appointment demonstrates the evolution of women in positions of high responsibility in ocean conservation, in this case as negotiators and even leaders of international negotiations.

International governance institutions are starting to integrate gender dimensions into their actions for ocean conservation. In 2019, UNESCO set the theme "Gender and the Ocean" for World Ocean's Day. The Decade of Ocean Sciences for Sustainable Development (2021-2030) also celebrated women's empowerment, including on March 8th, 2021, with an international online conference organized on women leaders in ocean sciences. The Intergovernmental Oceanographic Commission, which is implementing the Decade of Ocean Sciences, has included in its priority actions the identification of levers to enable women to access ocean sciences and to support female researchers in their careers. These institutional symbolic actions illustrate a continuing and long-lasting momentum, and an enduring legacy from the early pioneers portrayed here.

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