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# Research for anticipating and facilitating change in fisheries management

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In this article, I am considering the changes that occurred in fisheries science during the last three decades from a personal scientific point of view and as a woman in science. The contribution and visibility of women in this field has increased, though further progress is possible.

KEYWORDS

**fisheries science and management, abundance estimation, modeling, indicators, observation methods, genetics**

## 1 Introduction

I have been working in applied fisheries science since the late 1990s, arriving there more or less by chance after having studied biology and applied statistics (Trenkel, 2024). Pondering the special topic "'Working in fisheries—fish and aquaculture: a celebration of women's contribution and experience", I was wondering whether in 2024 it was pertinent to focus specifically on women's contributions and experiences in the field of fisheries science. I believe everybody's talents should be encouraged and all contributions are worth our valuation. Gender or any other attribute has never played any role for my work. Hence, to get some quantitative insights into the state of affairs in fisheries science, I gathered a few statistics. I started with the section "Food for Thought: Luminaries Collection" of the ICES Journal of Marine Science. This series of articles was initiated with the aim to invite senior members of the fisheries and marine-aquatic science community to offer insights and lessons from their careers. Since 2017, 45 men and 10 women (18%) have written an article. Next, I had a look at the recipients of the outstanding achievement award, which is awarded by the International Council for the Exploration of the Sea (ICES) since 2008: 13 men and four women (24%). The ICES "Prix d'Excellence" which "recognizes the highest level of achievement in marine science" has so far been given to six male scientists (0% women). Considering these (non-representative) examples, I conclude that there seems to be room for progress in the recognition of the contributions of women to fisheries science, assuming that the actual contribution of women to the field is larger than suggested by these figures.

During my university studies in three European countries (Germany, France, and United Kingdom), as well as in my research projects and managerial roles, I have always worked with women and men, old and young. When I arrived at the university in 1986 to study biology, the sex ratio of the students was roughly equal, but most lecturers and professors were male, with the exception of the microbiology lecturer. I think this was one reason why I became much interested in microbiology and even envisaged specializing in this field, before deciding not to do so after a summer job in a microbiology laboratory. From my studies, I remember a few instances where the comments from male lecturers or professors were clearly lacking respect for women in general or myself in particular, and I even walked out of a lecture because of this disrespect. I am intolerant to disrespect, so my response to inappropriate comments or behavior has always been immediate, and still is.

Regarding the potential barriers for women in science today, I have the impression that the biggest and most hindering barriers can be in our heads, though this clearly depends on the country and the context. It can be a lack of imagination of what we could achieve which can stop us from stepping outside a familiar environment, though again context matters. I recently learned the term "first-generation student". When I attended university, most of us were the first generation in their family to have the opportunity to go to university, so I did not perceive going to university as stepping outside a familiar environment, though in many respects it was. We are subjected to experiences that are not of our own making. It is how we respond and how these shape our perspectives that matter. For me, the beauty of science is that in most cases it does not require any specific physical attributes or a particular sex. To evaluate the situation in my personal scientific environment with some data, I had a look at the scientists that were listed as key personal or lead scientists in the EU research proposals I have participated in since 1999 (scatterplot in Figure 1). The numbers suggests that some progress has been made over the years, with an increasing number of female participants in the projects. Part of the explanation for the increasing proportion of female project members could however be that the reporting of gender has become mandatory in EU projects.

Carrying out fisheries research has led me to embark on various research and fishing vessels. A formative and challenging experience for me has been being cruise leader of several scientific cruises. A cruise leaving the harbor for several days or weeks feels a bit like a mission to the moon. Tools or consumables that have been forgotten on land cannot just be purchased, though it helps to have a skilful crew, which I was always lucky to have. Being the chief scientist on board often gave me the impression of being under special scrutiny. It helped being well prepared and having supportive colleagues, which is also a lesson for other situations.

## 2 Anticipate and facilitate change in fisheries management

My research activities in fisheries science have been driven by a desire to contribute useful information and tools for sustainable fisheries management. Anticipating and facilitating change in fisheries management has meant for me to try developing methods and approaches ahead of policy implementations. The first topic I worked on after arriving at Ifremer was fisheries discards, which is the unwanted part of the catch that is returned to the sea. As we found out, the quantity of discards varied strongly in space and time, with many factors coming into play, from fishing method to environmental conditions and local factors (Rochet and Trenkel, 2005). We concluded that it would not be easy to devise general strategies for reducing discards. Despite introduction of the landings obligation by the European Union in 2013 banning discarding for species under quota management (and some exceptions), how to effectively reduce discards remains an issue in Europe [European Commission Joint Research Centre Scientific Technical and Economic Committee for Fisheries (STECF), 2024]. Continued scientific research on avoiding unwanted catch is thus needed. A related issue is the environmental footprint of fisheries. Looking at it from a cost-benefit perspective, we found that the ratio between fuel energy used for fishing and energy contained in landings varied strongly in the Bay of Biscay in the early 2000s, from 0.3 for purse seiners to 9.7 for trawlers in Trenkel et al. (2013). Both ecological impacts and socio-economic benefits are multidimensional and require quantitative indicators to inform decision makers and society, as well as practical proposals for improving them. Here scientists can contribute.

In the early 2000s, we started working on indicators for evaluating the impact of fishing on exploited fish and invertebrate communities (Rochet and Trenkel, 2003; Trenkel and Rochet, 2003). This was the start of numerous studies on what data to use, and how to calculate, combine and interpret indicators in support of fisheries management. The topic offered opportunities for many collaborative studies and cross ecosystem comparisons. It also meant we were ready to contribute to the initial evaluation of marine ecosystems when the EU introduced the Marine Strategy Framework Directive in 2008 (European Union, 2008). While developing indicators is relatively straightforward, given the data exists, the crunch lies in the setting of reference points.

Another issue I have been working on steadily during my fisheries science career is how to provide pertinent scientific advice for the sustainable exploitation of marine resources for which standard assessments methods are not applicable, generally due to lack of data. The demand for scientific advice has been increasing over time, reflecting the increasing recognition among parts of society, the fishing industry and managers of the necessity to aim for sustainability. I am using the expression "aim for" as population dynamics are not physical processes and the increasing change in environmental conditions as well as the strong randomness of recruitment processes hinder the precise projection of stock biomasses. France exploits a multitude of species with different biology in the waters around its coasts, which means one approach cannot fit all cases. I have approached the issue from two sides, new data and new models, in certain cases a combination of both. Looking for new data and new ways to collect data has led me to explore the use of different observation methods, from video to acoustics, to genetics (Figure 1). For blue ling, a deep-water species, we developed a novel stock assessment model using only proportions-at-age and total catches (Trenkel et al., 2012), which is used by the International Council for the Exploration of the Sea (ICES) for providing advice. Most recently, I started to use genetic data for gaining insights into population genetics (e.g., Marandel et al., 2019), but also for estimating population abundance (close-kin mark-recapture, Trenkel et al., 2022). The estimates of absolute abundance obtained in this way for thornback ray feed into the advice provided by ICES for this stock. I have also started to explore the use of environmental DNA for studying biodiversity (e.g., Veron et al., 2023) and for creating abundance indices. This was a logical step, given that I have always had a keen interest in exploring non-invasive observation methods for demersal species, from video and acoustics to eDNA. Indeed, reducing the negative impacts of carrying out science has increased in importance for me over time. Recent technological progress has made it possible

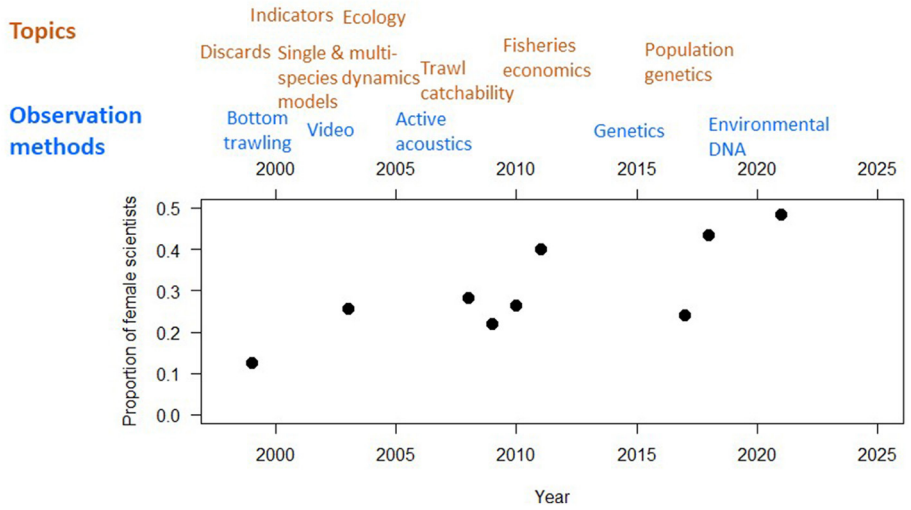


FIGURE 1
Scatter plot of the proportion of female key scientists in EU proposals I participated (year of submission). The starting period of different research topics and observations methods is noted above the plot.

to rethink how we collect the data that are crucial for fisheries management and conservation (Trenkel et al., 2019). The challenge is to find the right balance between maintaining long-term time series and embracing new approaches.

## 3 Sharing science

Educating the next generation of scientists is part of every researcher's job. Over the years, I have supervised Ph.D. and master students, and worked with several postdocs. My motivation is to share knowledge and assist young scientists in their first steps in carrying out research. For me, scientific knowledge needs to be evidence based and logically coherent. This requires a rigorous approach and a critical mind. Asking critical questions and not taking statements for facts has always been part of my way of doing science. More recently, I have started to communicate more frequently to a non-scientific audience about our research and the scientific approach in general. When encountering the public, I am marveled by the keen interest many children and teenagers show in marine topics. They are the future of marine science and I hope that gender will not play any role for choosing their career. Both female and male scientists have made important contributions to fisheries science and have helped to advance sustainable fisheries management. The implication and visibility of women has clearly increased in recent decades, but there is still room for progress.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the author, without undue reservation.

## Author contributions

VT: Writing – original draft, Writing – review & editing.

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The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# References


European Commission Joint Research Centre Scientific Technical and Economic Committee for Fisheries (STECF) (2024). *Evaluation of Joint Recommendations on the Landing Obligation and on Technical Measures Regulation (STECF-23-04 and 23-06)*. (Luxembourg: Publication Office of the European Union).

European Union (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 Establishing a Framework for Community Action in the Field of Marine Environment Policy (Marine Stategy Framework Directive). Official Journal of the European Union, 25.6.2008 L164*. (Brussels: European Union), 19–40.

Marandel, F., Lorance, P., Berthelé, O., Trenkel, V. M., Waples, R. S., Lamy, J-. B., et al. (2019). Estimating effective population size of large marine populations, is it feasible? *Fish Fisher*. 20, 189–198. doi: 10.1111/faf.12338

Rochet, M. J., and Trenkel, V. M. (2003). Which community indicators can measure the impact of fishing? A review and proposals. *Can. J. Fisher. Aquatic Sci*. 60, 86–99. doi: 10.1139/f02-164

Rochet, M-. J., and Trenkel, V. M. (2005). Factors for the variability of discards: theory and field evidence. *Can. J. Fisheri. Aquatic Sci*. 62, 224–235. doi: 10.1139/f04-185

Trenkel, V. M. (2024). Contributing to ecosystem-based management: a personal scientific journey. *ICES J. Mar. Sci*. 81, 1187–1194. doi: 10.1093/icesjms/fsae065

Trenkel, V. M., Bravington, M. V., and Lorance, P. (2012). A random effects population dynamics model based on proportions-at-age and removal data for estimating total mortality. *Can. J. Fisher. Aquatic Sci.* 69, 1881–1893. doi: 10.1139/f2012-103

Trenkel, V. M., Charrier, G., Lorance, P., and Bravington, M. V. (2022). Close-kin mark-recapture abundance estimation: practical insights and lessons learned. *ICES J. Marine Sci*. 79, 413–422. doi: 10.1093/icesjms/fsac002

Trenkel, V. M., Daures, F., Rochet, M-. J., and Lorance, P. (2013). Interannual variability of fisheries economic returns and energy ratios is mostly explained by gear type. *PLoS ONE* 8:e70165. doi: 10.1371/journal.pone.0070165

Trenkel, V. M., and Rochet, M-. J. (2003). Performance of indicators derived from abundance estimates for detecting the impact of fishing on a fish community. *Can. J. Fisher. Aquatic Sci*. 60, 67–85. doi: 10.1139/f02-163

Trenkel, V. M., Vaz, S., Albouy, C., Brind'Amour, A., Laffargue, P., Romagnan, J.-B., et al. (2019). We can reduce the impact of monitoring on marine living resources. *Marine Ecol. Progr. Ser.* 609, 277–282. doi: 10.3354/meps12834

Veron, P., Rozanski, R., Marques, V., Joost, S., Deschez, M. E., Trenkel, V. M., et al. (2023). Environmental DNA complements scientific trawling in surveys of marine fish biodiversity. *ICES J. Marine Sci.* 80, 2150–2165. doi: 10.1093/icesjms/fsad139