

# JOINT NWWAC/SWWAC WORKSHOP ON HAKE

*in collaboration with AZTI and in the framework of VarMer Project*

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**DATE:** 29 April 2026

**LOCATION:** Hotel NH Collection, Seville & Online

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## 1. Welcome & Introductions

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**Serge Larzabal**, Chair of the SWWAC Working Group for benthic species ICES areas 8&9, opened the joint workshop by welcoming all participants. He expressed his thanks to the NWWAC and SWWAC Secretariats for organising the joint workshop. He informed participants that the session would be co-chaired by himself and Jean-Marie Robert, representing the NWWAC. He outlined the structure of the session, explaining that the programme would have envisaged a series of presentations by AZTI followed by a question-and-answer session at the end.

**Jean-Marie Robert** expressed his appreciation for the organisation of a joint meeting between two Advisory Councils who share similar concerns regarding the decline in the biomass of this stock, which is of significant importance to many fleets operating both within the southern and north-western waters.

To access the slides: [Hybrid Joint NWWAC/SWWAC Workshop on Hake](#) (Please note that the graphs and maps included in the report are sourced from these slides.)

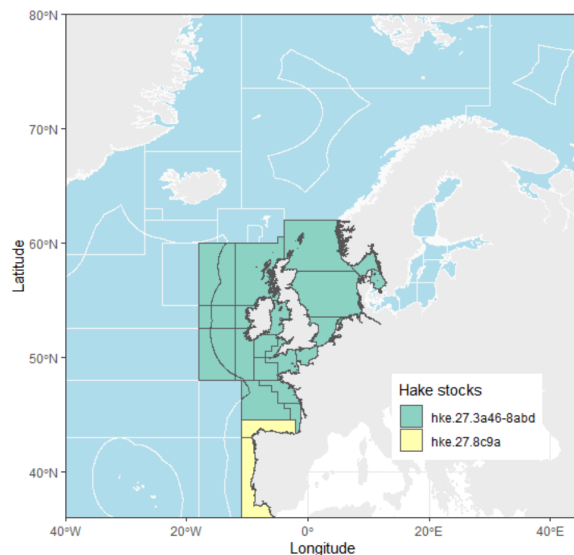


## 2. Stock dynamics of both stocks of North East Atlantic European Hake – Dorleta Garcia, AZTI

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**Dorleta Garcia** thanked the chairs and participants for the opportunity to present the work, noting that it was valuable to share relevant information in such a forum to support ongoing research. She explained that the work presented had been carried out within AZTI and ICES working groups and had been funded through two projects, one of which is the VarMer project.

D. Garcia recalled that hake assessment considers two stocks (northern and southern), with a third in the Mediterranean. She highlighted that the northern stock accounts for the majority of the biomass, approx. 85%, although this proportion varies annually. She noted that while the southern stock had shown a gradual increase in biomass since the mid-2000s, the northern stock had been experiencing a steady decline in both biomass and catches.



She emphasised that the decline in biomass of the northern stock was largely driven by persistently low recruitment levels, which are currently below historical averages and below levels associated with maximum sustainable yield (MSY). She stressed that these low recruitment levels are a key concern and are consistently reflected in both model outputs and observed indices of abundance. She clarified that the observed trends are not considered an artefact of the assessment model, as independent survey indices also indicate historically low abundance levels.

While a slight positive signal had recently been observed in the Porcupine survey, she explained that this may reflect earlier recruitment peaks, given the lag between recruitment indices and surveys targeting larger individuals.

Turning to geographical comparisons, D. Garcia noted that recruitment indices for the southern stock appear relatively more favourable, with values consistently above historical minima. This suggests that, in terms of recruitment and productivity, the southern stock is currently in a better condition than the northern stock.

She further examined whether regional differences within the northern stock area might explain the observed trends, comparing the Celtic Sea and the Bay of Biscay. She indicated that, despite some interannual variability, no clear or consistent differences were observed between these regions, suggesting that the issue is likely more widespread rather than localised.

D. Garcia then presented additional analyses focusing on biological parameters of the northern stock. She reported a significant increase in the length at maturity (L50) around 2013–2014, likely linked to higher stock abundance at that time. More recently, however, there has been a declining trend in maturity, with updated 2024 data indicating a marked decrease. She noted that the maturity parameters currently used in the assessment are outdated and should be revised in future work.

Regarding fish condition, she explained that weight-at-length remained relatively stable for smaller individuals but declined for larger individuals until around 2010, after which it stabilised and showed a slight increase in recent years. She also noted that incorporating updated weight data into the assessment had only a limited effect on the results, although it did influence certain reference points.

D. Garcia highlighted that current assessment methods assume constant weight, whereas observed patterns suggest density-dependent processes may be at play. She informed participants that ICES is currently developing more flexible tools that could incorporate such biological processes into future reference point calculations.

In conclusion, Ms Garcia raised several questions for reflection with stakeholders. (See slides)



### 3. Spatial distribution of North East Atlantic European Hake – Marina Santurtun, AZTI

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**Marina Santurtun** introduced the second part of the presentation, focusing on the fishery spatial distribution. She explained that the analysis would consider fisheries data using long-term time series to ensure robust interpretation of trends.

She presented catch data by ICES areas (3, 4, 6, 7 and 8) over the period 2013–2024,

including year-to-year percentage variations. She noted that ICES area 3 represents a relatively small component of the overall stock, with limited catches despite some increases in recent years. In contrast, ICES 4, 6, 7 and 8 showed a consistent decline in catches since approx. 2017–2018. When comparing 2024 catches with those from 2013, M. Santurtun highlighted significant reductions across most areas, particularly in ICES 6 and 7, where decreases reached approximately 71%. ICES 4 also showed a decline of around 61%, while ICES 8 (Bay of Biscay) experienced a smaller but still notable reduction of approximately 28%.

She then presented a breakdown of catches by fishing gear. She explained that while trawling plays a role in certain areas (notably ICES 4), longlines and gillnets represent the dominant gears in ICES 6, 7 and 8. Across these areas, longline catches have declined significantly, particularly in ICES 6 and 7, where they historically accounted for a large share of the catches. In parallel, gillnet fisheries have shown a relative increase in some areas, partially compensating for the decline in longline catches, while trawl fisheries have generally remained at lower levels or declined. M. Santurtun emphasised that overall catch trends broadly mirror stock biomass trends previously presented, with increases up to around 2014–2016 followed by a sustained decline.

She then compared reported catches with Total Allowable Catches (TACs). She noted that in recent years, TACs have consistently exceeded actual catches across all areas, indicating that available fishing opportunities are not being fully utilised. For 2024, she reported relatively low uptake rates of quotas, with catches representing approximately:

- 23% of TAC in ICES s 3,
- 78% in ICES 2 and 4,
- 59% in ICES 5, 6 and 7,
- 50% in ICES 8,
- and around 44% for the southern stock.

She also outlined the relative contribution of each area to the overall stock, noting that ICES 5, 6 and 7 together account for the largest share (approximately 58%), followed by ICES 8 (around 32%), whereas ICES 3 has a negligible contribution.

Turning to environmental analysis, M. Santurtun explained that modelling work had been undertaken to explore the relationship between hake distribution and environmental variables. These variables included depth, temperature, phytoplankton biomass, salinity and oxygen levels. The results indicated that environmental factors could explain approximately 51% of the presence of juveniles and around 47% for adults, while reasons for abundance trends are less clear. She highlighted clear depth preferences, with juveniles typically found between 100 and 200 metres and adults occupying a broader range, reaching depths of up to 500 metres. Temperature ranges were also identified, with juveniles occurring between 0°C and 21°C, and adults exhibiting a wider tolerance of up to 23°C.

She explained that this work is particularly relevant in the context of climate change, as it aims to support predictions of future distribution patterns. Model projections comparing 2015 conditions with those expected by 2030 suggest a potential northward expansion of the stock, particularly into northern areas, while no significant contraction is expected at the southern edge of the distribution. In conclusion, M. Santurtun raised several discussion points for stakeholders.

**Julien Lamothe** noted that the presentations contained a substantial amount of information. He emphasised the importance of ensuring that the correct elements are being compared, noting that the stock is divided into multiple management units.

J. Lamothe highlighted that, under EU regulations, there are mechanisms allowing for quota transfers between areas. While he agreed that the catch data presented likely reflected actual catches accurately, he pointed out that comparisons with TAC levels may be more complex. In particular, he indicated that the utilisation of quotas by Member States may not align straightforwardly with catches due to such inter-area transfers. He stressed that this makes it difficult to fully reconstruct a clear and consistent picture when comparing catches and TACs across areas. Nevertheless, he acknowledged that the overall trends presented were consistent, with decreasing yields reflecting the decline in stock abundance. He noted that this reduction in catch rates likely explains why available quotas are not fully utilised. He further indicated that, at least in the French context, fishing effort – measured in terms of the number of vessels – has remained relatively stable, suggesting that the decline in catches is not driven by reduced effort but rather by lower stock availability.

Finally, J. Lamothe noted that in 2025 catch rates in the Bay of Biscay appeared to be better than those observed in the Celtic Sea. He explained that this had led to a shift in fishing activity, with vessels operating more intensively in the Bay of Biscay during that period, particularly in late spring. He added that preliminary indications for 2026 suggest vessels may have returned more quickly to ICES 7, although this would require further confirmation as more data become available.

**Juan Carlos Corras Arias** provided additional comments on the factors influencing catch levels and the utilisation of TAC. He noted that TAC & quota distribution alone do not fully explain the observed trends and suggested that additional variables should be taken into account. In particular, he highlighted that TAC levels have been significantly reduced in recent years, estimating a decrease of approximately 50% over the past five years, which has contributed to the decline in catches. He also pointed to the introduction of measures related to Vulnerable Marine Ecosystems (VMEs), which have affected fishing activity. He explained that these measures have limited access for part of the longline fleet, thereby reducing catch rates and prompting some vessels to shift towards other fishing gears, such as gillnets. This, in his view, helps explain the relative increase in catches observed for passive net fisheries.

Furthermore, he underlined the ongoing structural decline in the European fishing fleet as an additional factor. He stressed that a reduction in fleet size inevitably leads to lower overall catches, including for hake. He suggesting that these elements should be incorporated into the analysis in order to provide a more comprehensive understanding of the observed trends.

In relation to the interpretation of 2024 data, **Sergio López** emphasised that 2024 represents a year of full implementation and impact of the VME regulation, which has had a significant effect on fishing activity, especially for the longline fleet, leading to a substantial reduction in catch volumes.

In response to the AZTI questions, he expressed the view that comparisons between the southern and northern hake stocks should be treated with caution, as they represent fundamentally different situations, both in terms of stock characteristics and catch volumes. Similarly, he noted that comparisons between ICES areas (e.g. 3 and 4 versus 7 and 8) are difficult due to their differing scales and levels of importance.

Regarding stock assessments, he indicated that they do not always fully reflect reality. He suggested that one of the main limitations lies in the relatively small sample sizes used to represent a large and widely distributed stock. In his view, this can lead to biased results, with estimates potentially being over- or underestimated depending on the quality of the sampling. He stressed the need for larger and more representative datasets, particularly as these assessments directly inform decisions on fishing opportunities and TAC levels.

He noted that, rather than clear signs of recovery, there appears to have been a shift in fishing activity, with part of the fleet moving from ICES 6 and 7 towards ICES 8. He indicated that the reasons for this shift remain uncertain and may be linked to factors such as environmental change, stock distribution, or other operational considerations. Focusing on the longline fleet, he reiterated that the impact of recent measures since 2022 has been significant, contributing to fleet displacement, vessel withdrawal, and changes in fishing practices. In this context, he suggested that analyses based solely on total catch volumes may be misleading. Instead, he recommended that assessments should also consider indicators such as average catch per vessel, given the structural changes in the fleet. He further underlined that fleet reductions and shifts in fishing methods (including changes of gear type) complicate direct comparisons over time, as the data are no longer fully comparable. He also referred to the role of quota swaps and other management practices, which can influence how TACs are utilised.

In conclusion, he stressed that a more comprehensive analytical approach is needed, incorporating a wider range of variables and improved sampling, in order to support more robust recommendations for fisheries management.

**Santiago Folgar Gutierrez** expressed his agreement with the points raised by previous speakers, particularly those made by J. C. Corras Arias and S. López, emphasising that multiple important variables need to be considered when analysing the situation. He added

that he intended to highlight an additional issue affecting the gillnet fleet ("volanta"), which has recently been observed in the north-western Cantabrian area, and noted that he would elaborate further on this point during the later discussion.

In response to the point raised regarding the use of management units, **D. Garcia** and **Naiara Rodríguez-Ezpeleta** clarified that, in the table presented earlier, quotas correspond to the official management units as defined in EU regulations. They explained that the quota figures shown are those formally published, while the catch data reflect actual catches in the respective fishing areas. They acknowledged, however, that quota swaps and transfers between areas are not captured in their analysis and may therefore complicate direct comparisons between quotas and catches. Nevertheless, they stressed that the trends observed in actual catches, including their decline across areas, are robust.

Regarding the suggestion to analyse catches on a per-vessel basis, they agreed that such an approach would be highly informative. However, they explained that this level of detailed data is not currently available to them. The most detailed information accessible is at the level of métier, which already provides useful insights, including effort data, but still aggregates different fleet segments that may be affected in different ways. They added that in the southern stock more detailed data approaches are used, including survey data combined with catch-per-unit-effort (CPUE) information, which can provide a more refined understanding of fishing activity and stock perception.

#### **4. Genetics/Population structure of European Hake – Naiara Rodriguez-Ezpeleta, AZTI**

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**Naiara Rodríguez-Ezpeleta** explained that the objective of the study was to assess whether the current division between northern and southern hake stocks – primarily an administrative boundary – has a biological or genetic basis.

She presented the results of a large-scale genetic study covering a broad part of the species' distribution, including samples from the Atlantic (from the Norwegian sea to the North African coast) and, for comparison, from the Mediterranean Sea. Using genetic analyses, the team examined the genetic similarity between individual fish sampled across different regions. The results indicated a high level of genetic connectivity across much of the study area. In particular, hake sampled in the regions near the boundary of current northern and southern stocks were found to be genetically indistinguishable, suggesting substantial mixing between these populations.

She explained that the observed pattern is consistent with a process known as "isolation by distance", whereby genetic differences increase gradually with geographical distance, rather than reflecting clear-cut population boundaries. While some differentiation was observed in

more distant or environmentally distinct areas (such as the Mediterranean), no clear genetic separation was identified between the northern and southern Atlantic stocks.

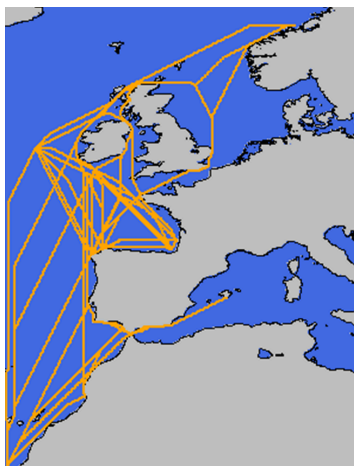
N. Rodríguez-Ezpeleta concluded that the current stock division is not supported by genetic evidence. She suggested that, if any biological structuring exists, it may occur at different spatial scales than those currently used for management (towards the North Sea and Portuguese coast), although no clear alternative boundary could be identified.

## 5. Hake dynamics from an ecosystem perspective – Dorleta Garcia, AZTI

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### a. Separate (current) vs joint (one single stock) assessment

**D. Garcia** explained that, in light of the genetic results suggesting a high level of connectivity between northern and southern hake, an exploratory exercise had been undertaken to assess the implications of treating the two as a single stock. She noted that, since the same assessment model is applied to both stocks, combining them into a single assessment was technically feasible. The results indicated that recruitment estimates obtained from the combined model were broadly consistent with the sum or average of the two separate stock assessments. She further explained that key parameters, such as recruitment in the absence of fishing ( $R_0$ ), were also comparable when combining the two stocks, effectively reflecting the aggregation of the two populations.



In terms of biomass, she observed that the combined assessment was largely driven by the northern stock, given its significantly larger size. However, some notable differences emerged, particularly in historical biomass estimates, where the combined model tended to produce lower values than the simple sum of the two stocks. Importantly, she highlighted that, despite recent declines in the northern stock, the combined assessment showed a slight overall increase in biomass in recent years. This was attributed to stronger recruitment signals from the southern component, which, when incorporated into a unified model, influence the overall stock dynamics.

D. Garcia emphasised that this raises important modelling considerations. She explained that the current assessment framework, which is not fully spatially explicit, applies information from one part of the stock to the entire population. Assessing a very large and spatially extensive stock using a single model presents significant challenges, particularly when available survey data only cover limited areas and time periods. She referred to similar experiences in other fisheries, such as mackerel, where broader survey coverage is required to adequately capture stock dynamics. In the case of Hake, where there is an "isolation by

distance pattern”, the connectivity across different regions should be studied to evaluate the trade-offs between: a non spatial model that covers the whole stock distribution, an spatial explicit model that covers the whole stock distribution or separated regional stock assessment models that aligns with the data available (surveys) and movements across areas.

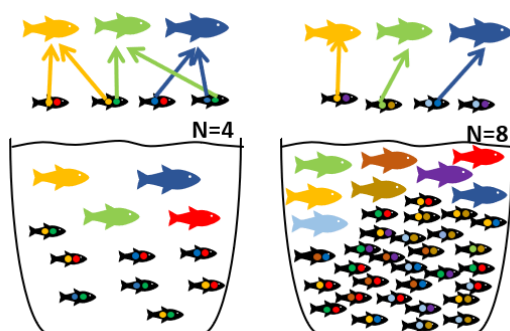
Regarding fishing mortality, she indicated that patterns in the combined assessment largely follow those observed for the northern stock due to its dominant contribution.

She then outlined the potential implications for management advice. She cautioned that the analysis presented was preliminary and had not yet undergone full scientific review. Nevertheless, initial results suggested that combining the stocks could lead to changes in reference points and potentially higher advised catch levels (TAC), although this would require thorough evaluation.

D. Garcia stressed that any formal change to stock structure would need to follow the established ICES benchmark process, including external review and validation of both the genetic analyses and the assessment modelling.

**N. Rodríguez-Ezpeleta** added that, while a single-stock approach represents one possible pathway, alternative configurations could also be considered. For example, a three-stock structure might better reflect biological patterns, although this would require defining new boundaries and acknowledging that mixing would still occur between areas. She noted that a further avenue for development would be to incorporate spatial structure more explicitly into assessment models, in order to better capture the biological and ecological dynamics of the species.

#### b. Close Kin Mark Recapture



**N. Rodríguez-Ezpeleta** introduced an emerging methodological approach known as Close-Kin Mark-Recapture (CKMR), explaining that it is increasingly being applied in fisheries science and may be relevant for hake assessment. She outlined that the method is designed primarily to estimate spawning stock biomass and is conceptually related to traditional mark-recapture techniques.

However, instead of identifying the same individual at different points in time, CKMR relies on identifying genetic relationships (e.g. parent-offspring or sibling pairs) within a sampled population.

She explained that, in essence, the proportion of related individuals identified within a given sample is inversely related to population size: a higher frequency of related individuals suggests a smaller population, whereas fewer related individuals indicate a larger population. She noted that, while the conceptual basis is straightforward, practical implementation requires careful adjustment to species-specific biological traits, such as growth, maturity, fecundity and migration patterns.

N. Rodríguez-Ezpeleta emphasised that the method offers several advantages:

- it provides direct information on population size;
- it allows estimation of biological parameters such as natural mortality;
- it gives insights into demographic connectivity and movement between areas;
- it is robust to spatial redistribution of populations (e.g. due to climate change);
- and it is independent of fishery-dependent data.

She noted that the method is already being applied operationally in some fisheries, particularly for southern bluefin tuna, where it contributes directly to management frameworks.

Turning to hake, she explained that preliminary work has begun to assess the feasibility of applying CKMR. Initial steps have included simulations to estimate the required sampling effort, suggesting that very large sample sizes (on the order of tens of thousands of samples annually) would be needed. She acknowledged that this represents a significant logistical and analytical challenge.

She reported that initial pilot studies, based on approximately 3,000 samples, had not identified any related individuals, which is consistent with expectations for a large population. She noted that detecting related pairs would require substantially increased sampling effort.

N. Rodríguez-Ezpeleta concluded that the approach appears technically and logistically feasible, but further work would be required to determine whether the benefits justify the costs.

**D. Garcia** added that, even if hake were considered as a single biological population, assessing such a large and spatially extensive stock presents significant challenges. She emphasised that the choice between a single-stock or multi-stock assessment framework depends critically on understanding the degree of connectivity between different areas. She noted that methods such as CKMR could provide valuable insights into population exchange rates and movement patterns, which are currently uncertain but crucial for informing appropriate assessment and management strategies.

### c. Ecosystem Perspective

**D. Garcia** introduced the final part of the presentation, focusing on an ecosystem-based perspective of the hake stock, with particular emphasis on recruitment and SSB dynamics. She explained that recruitment has long been recognised as a key driver in fisheries management, yet remains extremely difficult to predict due to its high natural variability. While recruitment can be estimated retrospectively using survey data, forecasting future recruitment remains particularly challenging, as it is influenced by a complex interaction of multiple environmental and biological factors.

She noted that, for hake, large recruitment peaks were observed between approximately 2008 and 2012, followed by a period of relatively low and sustained recruitment levels. Although consecutive years of similar recruitment levels are not unusual due to temporal correlation, the persistence of low recruitment in recent years remains a concern and warrants further investigation.

D. Garcia presented an analysis of recruitment success, defined as recruitment relative to spawning stock biomass (SSB). She highlighted that, despite periods of high biomass, recruitment success has been relatively low in recent years. This suggests the presence of density-dependent processes, whereby higher stock biomass does not necessarily lead to increased recruitment. She indicated that such processes may be linked to biological factors including cannibalism within the hake population.

To better understand recruitment variability, she described a modelling exercise incorporating a wide range of environmental variables (including temperature, chlorophyll levels, wind patterns and oceanographic indices). Results indicated that spawning stock biomass explains a significant proportion of recruitment success trends, but environmental variables – particularly wind patterns – play an important role in explaining deviations, including observed peaks and troughs.

She highlighted that easterly winds in the Bay of Biscay during certain periods (e.g. summer months) appear to have a positive effect by retaining eggs and larvae over the continental shelf, while similar wind patterns at other times of the year may have negative effects by reducing upwelling and primary productivity. Northern wind patterns were also associated with negative impacts, potentially due to effects on larval dispersion.

D. Garcia noted that, based on environmental conditions alone, recent years might have been expected to show higher recruitment than has been observed, suggesting that additional mechanisms are influencing outcomes.

She then expanded the analysis to consider ecosystem interactions, examining correlations between hake and other stocks in the Celtic Sea and Bay of Biscay. She explained that, while recruitment correlations between species were not evident due to high variability, clearer patterns emerged for biomass.

In particular, she highlighted notable similarities in biomass trends between hake, mackerel and certain anglerfish stocks, which may suggest shared environmental drivers or ecosystem linkages. Other correlations between species were also identified, although she cautioned that these relationships are not yet well understood and may not reflect direct causal links.

She acknowledged that, while these findings are scientifically interesting, their implications for fisheries management remain unclear. Further work is required to determine how such ecosystem relationships can be integrated into management frameworks.

## 6. Discussion & Feedback from AC members

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**J. M. Robert** introduced the second part of the meeting, which was intended to be more interactive and based on exchanges between participants and the scientific team. He began by reflecting on the complexity of hake stock dynamics, noting that multiple factors contribute to variability and complicate assessment. He referred in particular to:

- biological variability within the stock, including observed changes in maturity and biomass over time;
- environmental influences, including climate change and factors such as wind patterns;
- and ecosystem interactions, highlighting that hake is part of a broader food web where species interactions may influence stock dynamics.

He further emphasised that, in addition to these three major dimensions, the data used in stock assessments also introduce complexity. These include both scientific survey data and fisheries-dependent data derived from fishing activity, which may themselves have changed over time due to evolving practices and external constraints.

J. M. Robert proposed structuring the discussion around three main thematic blocks:

### 1. Regulatory factors:

- the impact of measures related to VMEs, particularly spatial closures and their effects on fishing activity;
- broader regulatory changes, including those associated with Brexit, which have altered access conditions and fishing practices, especially in areas such as the Celtic Sea and West of Scotland.

### 2. Fleet dynamics and operational changes:

- shifts in fishing practices, such as transitions from longline to gillnet fisheries;
- and other structural adjustments within fleets that may influence catch patterns and data interpretation.

### 3. Biological and operational observations at sea:

- changes in the spatial distribution of hake;
- shifts in depth distribution;
- and variations in fish size or condition.

He emphasised that this structured approach would help ensure a comprehensive and coherent discussion, linking scientific findings with practical observations from the fishing sector.

**S. Folgar Gutiérrez** provided an observation linked to the discussion on environmental changes, particularly in relation to possible climate-related effects. He reported that, within the gillnet ("volanta") fleet operating in the Cantabrian Sea, significant changes in sea conditions have been observed over approximately the past eight months. In particular, he noted the presence of unusually strong and highly variable currents in areas along the Cantabrian coast. He explained that these observations are widely shared among vessel skippers operating in this fishery, who have reported increasing difficulties linked to current strength. As the gear used is static, the intensity of currents has a direct impact on fishing operations, including the positioning and behaviour of nets in the water. Despite these operational challenges, he indicated that the areas experiencing the strongest currents currently appear to correspond with higher catch rates, suggesting a possible relationship between current patterns and hake distribution or availability.

**J. Lamothe** noted that the presentations explored a wide range of hypotheses and perspectives, which he considered valuable in helping stakeholders reflect on a situation that remains difficult to fully understand, and which has clear implications for fishing activities.

Turning to regulatory factors, he explained that, in the French context, constraints differ somewhat from those faced by other Member States. While quota management can present some limitations at a more detailed level, he considered that, overall, quota availability

remains broadly compatible with standard fishing operations. He reiterated that the observed reduction in quota uptake is primarily linked to declining catch rates rather than regulatory constraints.

However, he noted that, over a longer time frame, certain regulatory changes have influenced fishing effort and spatial distribution. In particular, he referred to:

- the removal of access restrictions in ICES area 7 following the 2019 Technical Measures Regulation, which allowed a greater number of vessels to operate in that area;
- and changes in access conditions in ICES area 6 (west of Scotland), including the removal of specific authorisation requirements following the end of the cod recovery plan.

He indicated that these developments have likely contributed to some redistribution of fishing effort, although he emphasised that, overall, there has been no major change in the number of French vessels targeting hake, particularly in longline and gillnet fisheries.

J. Lamothe also raised a broader point concerning other fleet segments, particularly trawl fisheries operating in the Bay of Biscay. He noted that these fleets can catch juvenile hake and recalled that, in the past, improvements in gear selectivity, aimed at reducing catches of small hake, were considered an important factor contributing to improved recruitment. He suggested that further attention should be paid to these fisheries when analysing recruitment trends. In particular, he questioned whether the current assessment framework, which relies primarily on scientific survey data, could be complemented by data from commercial fisheries (e.g. catch-per-unit-effort data), particularly in areas important for juvenile hake (nursery grounds). He concluded that incorporating such data could provide additional insights into recruitment dynamics and help improve the understanding of recent trends.

**J. M. Robert** proposed a more flexible approach to the discussion, suggesting that participants could provide broader, cross-cutting interventions rather than limiting themselves strictly to the predefined thematic blocks. He emphasised that the primary objective of the session was to support the scientific team by sharing practical insights and observations from the fishing sector. He noted that, given the wide range of changes affecting the hake stock and fisheries, stakeholder contributions, particularly empirical knowledge from fishing operations, could help clarify outstanding questions and improve the interpretation of scientific analyses.

**S. Folgar Gutiérrez** indicated that representatives of the longline fleet operating in the Cantabrian Sea are willing to support ongoing research efforts. In particular, he highlighted their readiness to collaborate by providing access to information from their fishing operations, including data on hake size, fishing depths, and other relevant operational observations. He emphasised that the sector remains open to contributing actively to the research process and to providing any data or insights that may assist the scientific team in improving their analyses

and understanding of the stock.

**J. Lamothe** confirmed that a reduction in the French longline fleet has been observed in recent years, largely linked to declining catch rates and the resulting difficulties in maintaining economic viability. He noted that some vessels have transitioned from longline operations to gillnet fisheries as part of this adaptation process. He suggested that these structural changes have already been documented in previous studies, including work carried out by national institutes such as IFREMER, and proposed that such information could be further formalised and integrated into the current analysis. In his view, this would help provide a clearer picture of trends in fishing effort and fleet behaviour over time.

J. Lamothe also reiterated the willingness of industry stakeholders to contribute to ongoing scientific work. He emphasised that vessel operators are directly affected by changes in stock dynamics and are therefore well placed to provide valuable insights and operational data.

He pointed to several potential sources of additional information that could enhance scientific understanding, including:

- biological observations related to hake maturity and reproductive condition (including roe, which has commercial value);
- detailed commercial size classifications available through fish auction systems, which could help refine analysis of size composition;
- and other operational data collected by vessels.

He noted, however, that further clarification would be needed regarding the specific data requirements and how such information could be systematically collected and integrated into assessments. He highlighted the potential for improved collaboration between scientists and the fishing industry, particularly through more structured data-sharing initiatives, which could help address existing gaps and improve the robustness of stock assessments.

**J. M. Robert** complemented the previous intervention by providing further observations concerning hake reproduction, particularly in relation to roe. He noted that his members have also observed changes in reproductive patterns, specifically a widening of the spawning period compared to approximately ten years ago. In his view, this extension of the production period represents a noteworthy development that could be of scientific interest. He suggested that such observations could potentially be documented and analysed more systematically, provided that appropriate data collection arrangements are established in cooperation with the fishing sector.

Regarding regulatory aspects, **Aurélien Henneveux** noted that spatial closures introduced since 2024 have had a tangible impact on fishing activity. In particular, he highlighted the effect on French offshore gillnet fleets targeting hake in the Bay of Biscay, which traditionally operated throughout most of the year. The loss of approx. one month of fishing activity due to closures has, in his view, had a direct impact on both catch performance and overall

production. While some vessels attempted to relocate to ICES area 7 during these periods, this proved difficult due to operational constraints, including unfavourable weather conditions. He emphasised that these regulatory constraints should be taken into account when interpreting recent trends in quota uptake and catch reductions, although he acknowledged that declining catch rates across all métiers (longline, gillnet and trawl) also play a significant role.

Turning to fleet behaviour and spatial dynamics, A. Henneveux observed that, during the 2010s, hake in ICES area 7 was perceived as larger than in area 8. However, he noted that subsequent analyses suggested that this perception may instead reflect greater variability in size distribution in the Bay of Biscay rather than a consistent difference between areas. He suggested that such factors may have influenced fleet movements and fishing strategies. He also drew attention to the role of parasitism as a potential factor affecting stock distribution and fleet behaviour, particularly for offshore fleets, and indicated that this should be considered in future analyses. From a broader fisheries perspective, he confirmed that catch rates have generally been declining since around 2016, although hake remains present both in coastal and offshore areas.

From an ecosystem perspective, A. Henneveux raised the potential influence of prey availability, particularly small pelagic species such as sardine. He suggested that declines in these resources could affect hake distribution and behaviour, given the species' trophic interactions. He referred to ongoing work in this area and questioned whether such ecosystem dynamics could partly explain observed changes in hake distribution and abundance.

Finally, he raised a specific question regarding biological parameters, notably the variability observed in length at maturity (L50). He queried how these fluctuations might influence recruitment dynamics and whether they could have a significant effect on stock productivity.

**S. López** acknowledged the depth and complexity of the presentations delivered and noted that the volume of information and range of factors involved made immediate interpretation challenging. He emphasised that one of the main difficulties lies in disentangling the multiple, interrelated drivers affecting hake dynamics. In his view, factors such as stock abundance, spatial distribution, fishing activity, regulatory changes and environmental influences are closely intertwined, making it difficult to isolate individual causes. From his organisation's perspective, he highlighted a clear geographical shift in fishing activity, indicating that catches in ICES areas 6 and 7 have declined significantly, while the majority of fishing effort is now concentrated in ICES area 8. This reflects a broader north–south redistribution of the fishery in recent years.

He also pointed to substantial changes in fleet structure, particularly within the Spanish fleet, including:

- a shift between fishing gears, notably from longline to gillnet fisheries;
- a significant reduction in overall fleet size;
- and differences in catch capacity between métiers, noting that gillnet vessels typically land significantly higher volumes than longliners.

S. López stressed that these structural changes complicate the interpretation of catch trends, as variations in total landings may reflect changes in fleet composition as much as changes in stock abundance. He further noted that historical fishing grounds have been partially closed due to regulatory measures, which has contributed to changes in fishing patterns and may explain part of the observed redistribution.

In addition, he highlighted socio-economic factors, including ageing within the fleet and vessel withdrawals, which further influence fishing activity and effort over time.

Reflecting on the southern stock, he referred to the long-term recovery plan for hake and Norway lobster, which led to a sustained reduction in fleet capacity over approx. two decades. He suggested that this created a feedback loop, where declining fleet activity and catches influenced perceptions of stock status. He also noted that more recent improvements may partly reflect methodological changes in assessment rather than solely biological recovery.

In conclusion, S. López underlined that:

- there has been a clear recent decline in catch volumes;
- there has been a redistribution of fishing effort (particularly towards southern areas);
- and multiple interacting factors – biological, environmental, regulatory and socio-economic – make it extremely difficult to isolate the drivers behind observed trends.

He suggested that the complexity of the issue requires further analysis and possibly a dedicated follow-up workshop, where additional data could be shared and findings discussed in greater depth to improve collective understanding.

**J. M. Robert** reiterated the high level of interconnection between the different factors influencing hake stock dynamics. He emphasised that these interdependencies significantly complicate the work of the scientific team, as it becomes difficult to distinguish between causes and consequences. He stressed that, in this context, stakeholders have a clear responsibility to contribute constructively by documenting aspects that can be reliably described from the fisheries perspective. In particular, he highlighted the importance of improving documentation of fleet evolution.

He suggested that practical steps could include:

- identifying vessels that have changed fishing gear (e.g. transitions from longline to gillnet fisheries);
- compiling structured information on fleet transformations over time;

- and tracking changes in fishing practices and effort distribution.

He remarked that such information is relatively accessible and could provide valuable input for improving the interpretation of stock assessments, even if it does not fully explain all observed trends. J. M. Robert concluded that better documentation of fleet dynamics could help refine scientific analyses and should therefore be considered a priority area for collaboration between stakeholders and scientists.

**D. Garcia** thanked participants for their contributions, acknowledging that the volume of information presented may have been substantial but explaining that the objective had been to provide an overview of the main lines of work currently being undertaken on hake assessment.

She emphasised that, although the analyses presented covered a wide range of topics, they all share a common objective: to improve stock assessment and, ultimately, fisheries management advice. She underlined that increasing expectations from institutions and stakeholders require the integration of broader factors, including environmental variability and ecosystem interactions, into assessment frameworks.

D. Garcia clarified that the incorporation of these elements into formal assessment and advice follows a gradual and rigorous process within ICES, including validation and review stages. While some developments – such as the inclusion of environmental drivers – may improve short-term forecasts, their application in advice requires robust evidence and careful evaluation.

She confirmed that stakeholder inputs received during the discussion were highly valuable, particularly those relating to:

- fleet dynamics and reductions in fishing capacity;
- changes in fishing practices and spatial distribution;
- and regulatory constraints affecting fishing activity.

She noted that these factors help explain why catches may remain below TAC levels without necessarily indicating an overestimation of stock size. In particular, reduced fleet capacity and lower catch rates were identified as key explanatory factors.

Regarding biological aspects, she acknowledged the importance of observations on reproductive patterns, including roe production. She indicated that such data could be highly valuable for improving understanding of recruitment dynamics and encouraged collaboration to explore the potential integration of these datasets into analysis.

On the question of variability in length at maturity (L50), she explained that it could indeed influence recruitment but highlighted that there remain significant uncertainties. She noted

that differences in reproductive output and egg quality between individuals of different sizes may play a role, although robust data to incorporate these effects into assessments are still lacking.

She also addressed points related to size composition and fleet-specific catches, clarifying that the current assessment model already incorporates differences between métiers (e.g. longline, gillnet, trawl), particularly through size distribution data, which are a critical component of the model.

In response to questions on data sources, she explained that catch data from trawl fleets, including juvenile catches, are already implicitly included in the assessment through size composition inputs. While the development of standardised CPUE indices from commercial data could be beneficial, previous attempts have not always provided substantial additional insight beyond existing survey data.

She further confirmed that ongoing work is being conducted to better disentangle the effects of regulatory measures, fleet changes and stock dynamics, although results are not yet available.

Regarding collaboration with other institutes, she confirmed that key developments – such as genetic analyses and connectivity studies – are regularly presented within ICES working groups, including those involving partners such as IFREMER. Additional results, including on maturity and weight, are in the process of being incorporated into future assessments following review procedures.

She concluded by reiterating that all presented work forms part of a collective and iterative effort across institutes, and that continued collaboration with stakeholders will remain essential to improve understanding and management of the hake stock.

**J. M. Robert** referred to cooperation and information exchange between Norway, the United Kingdom and the European Union, notably in the context of hake stock management and scientific assessment responsibilities. He noted that, based on the presentation, the area considered extends broadly and involves multiple jurisdictions. He suggested that having robust, peer-reviewed scientific evidence – particularly regarding stock connectivity and the absence of clear genetic separation – could be highly relevant beyond the immediate working context.

In this regard, he raised the question of whether the results presented, particularly the genetic and connectivity analyses, are being formally published or planned for publication. He emphasised that such publication could strengthen the credibility and uptake of these findings at an international level, including within ICES processes and other institutional frameworks.

**José Beltrán** highlighted that the decline in catches in ICES area 6 must be understood in the context of reduced fishing effort, particularly as a consequence of Brexit. He explained that, in previous years, vessels commonly carried out extended fishing campaigns in northern waters (e.g. north of Scotland), sometimes lasting several months. However, under current access conditions, such operations are no longer economically viable, leading to a significant reduction in fishing activity in these areas. As a result, fishing effort has been redistributed towards ICES areas 7 and increasingly 8, a shift further reinforced by spatial constraints linked to VME closures. He stressed that this redistribution has altered fishing practices, including increased competition for space and changes in operational behaviour, which may affect catch performance.

J. Beltrán also reiterated that the reduction in fleet size has contributed directly to lower overall catches, noting that fewer vessels naturally result in reduced production levels. Reflecting on historical context, he raised the question of whether the current situation is comparable to that of the late 1990s. He suggested that past management measures, particularly recovery plans, may have been influenced not only by biological considerations but also by broader policy decisions. He recalled that hake was managed alongside cod, which was in a more critical state at the time, and therefore may have been subject to measures that were not fully proportionate to its own biological condition.

He further noted that, particularly for the southern stock, changes in scientific methodology, such as revised assumptions on natural mortality, have significantly altered the perception of stock status in recent years. This, in his view, underlines the importance of considering methodological changes when interpreting long-term trends.

Regarding the potential unification of northern and southern stocks, he cautioned that such a change could have important management implications. In particular, he noted that the current structure may support certain fleet segments (e.g. small-scale fisheries), and that any modification could affect relative stability and quota allocation mechanisms.

He emphasised that regulatory and access constraints, including those related to international arrangements (e.g. Norway and post-Brexit frameworks), play a critical role in shaping fishing activity. He suggested that improved access or changes in spatial management could influence both fishing performance and the perception of stock status.

He concluded by noting that, while stock assessments likely reflect underlying biological trends, continued reductions in fishing effort under current conditions could lead to further declines in catches in the future, reinforcing the need to consider both biological and operational factors in analysis.

**J. Lamothe** recalled previous work on the southern hake stock, which had historically been assessed as being in a deteriorated state but subsequently showed improved recruitment. He suggested that this could partly explain the positive dynamics observed in the Bay of Biscay

and raised the possibility that this recruitment may contribute to the northern stock through stock connectivity mechanisms. He emphasised that such developments must be carefully considered from a management perspective. In particular, he highlighted that any changes in stock structure or dynamics could have significant implications for quota allocation and international arrangements, especially given interactions with neighbouring countries, including Norway. He stressed that these issues extend beyond purely scientific considerations and require careful handling, given their potential impact on the balance between different fleets and management frameworks.

Turning to the ecosystem-based analysis presented, J. Lamothe expressed strong interest in the approach used to explore relationships between different stocks, particularly in terms of recruitment and biomass trends. He noted that traditional management approaches, largely based on single-stock assessments, often struggle to incorporate ecosystem considerations in a practical way. While ecosystem models exist, he pointed out that they are frequently complex and rely on numerous assumptions, making them difficult to interpret and apply operationally.

In this context, he considered the approach presented, identifying correlations and shared trends between species, as a more pragmatic and accessible way to explore ecosystem relationships. He suggested that such analyses could help identify common environmental drivers affecting multiple stocks, or potential competitive or trophic interactions between species.

He concluded that this line of work appears promising and encouraged further development, expressing interest in more detailed results and analysis to better understand the potential applications of these findings for fisheries management.

**J. M. Robert** endorsed the previous intervention, expressing full agreement with the points raised by J. Lamothe. He informed participants that all presentations delivered during the workshop would be made available by the Secretariats of the two Advisory Councils. He noted that a number of questions had been identified during the session and emphasised that these would require further analysis and written follow-up. He encouraged all participants to contribute to this process, with the aim of supporting the scientific team in advancing their work.

Turning to the ecosystem discussion, he reflected on the comparison drawn between hake and mackerel. While acknowledging the parallel highlighted in the presentation, he stressed that the underlying drivers for these stocks may differ significantly. In the case of mackerel, he suggested that overexploitation is a clearer explanatory factor, whereas the situation for hake appears more complex and less directly attributable to a single cause. He further observed that similar declining trends in biomass have been noted across several EU-managed stocks, not limited to hake. He highlighted what he perceived as a broader pattern:

- a period between approximately 2014 and 2018 characterised by reduced fishing effort and improvements in stock biomass, in line with the objective of achieving Maximum Sustainable Yield (MSY);
- followed, since around 2018–2019, by a period of declining biomass for several stocks, sometimes markedly so.

He noted that such trends appear to be present in other fisheries, including western Channel sole and potentially saithe stocks in the North Sea and west of Scotland. He suggested that these recurring patterns warrant further investigation.

In this context, J. M. Robert stressed that these observations raise important questions regarding the application and interpretation of MSY-based management. In particular, he suggested that:

- density-dependent processes and ecosystem interactions may need to be more explicitly considered;
- and that current approaches may not fully capture the complexity of stock dynamics across multiple species.

He emphasised that improving understanding of these mechanisms is essential for refining management approaches and ensuring their robustness.

Finally, he returned to the earlier question regarding dissemination of scientific work and asked whether the studies presented are already publicly available or published, or whether further time would be needed before they can be formally released.

**AZTI representatives** clarified that the intention is to publish the results in scientific journals, either through peer-reviewed publications or within ICES working group outputs. They explained that working documents have already been prepared and submitted within ICES working groups, where they have been shared with participating institutes; and that a scientific publication is currently under preparation. Initially, the intention had been to publish exclusively the genetic analysis. However, it was later decided to integrate the stock assessment component into the same publication in order to provide a more comprehensive and coherent scientific output. As a result, although the genetic data have been ready for some time, publication has been postponed to incorporate this additional analysis. In the meantime, AZTI confirmed that working papers can be shared and have already been circulated within relevant scientific groups.

**J. M. Robert** referred to the observed inverse relationship between spawning stock biomass and recruitment success shown in the presentation. He summarised this as an indication that, beyond a certain level, higher biomass may be associated with lower recruitment, suggesting the presence of density-dependent processes within the hake population. He contrasted this

with current EU fisheries management objectives, which strongly emphasise the rebuilding and maintenance of high biomass levels, notably within the framework of multiannual management plans and the objective of achieving and maintaining MSY. He questioned whether, when these two elements are considered together, a potential contradiction may arise, namely, whether efforts to maximise biomass could, under certain circumstances, contribute to reduced recruitment performance.

He stressed that this was an exploratory and open question rather than a definitive conclusion, acknowledging that the issue may be more complex and not necessarily specific to hake alone. Nevertheless, he indicated that the juxtaposition of these two dynamics raises important questions for both scientific understanding and management approaches.

**J. Lamothe** emphasised the importance of considering temporal dynamics when interpreting the relationship between biomass and recruitment. He cautioned against viewing the observed inverse relationship as a simple or immediate causal link. Instead, he stressed that stock dynamics operate over different timescales, which must be carefully distinguished. In particular, he noted that changes in biomass do not translate instantaneously into changes in recruitment, as biological processes unfold over multiple years. He suggested that the key issue lies in the mismatch between ecological and management timescales:

- fisheries management frameworks, particularly those based on MSY objectives, tend to operate on relatively short, annual decision cycles;
- whereas fish populations evolve over longer periods, requiring time to adjust and reach equilibrium.

He further observed that hake stock dynamics appear to follow longer-term cycles, with pronounced phases of increasing abundance followed by declines and subsequent stabilisation. He noted that recent data may already indicate the beginning of a new upward trend in recruitment, suggesting that the system could be moving towards a new equilibrium.

In this context, he argued that the apparent contradiction highlighted by J. M. Robert may be partly explained by temporal lag effects, whereby the biological response of the stock does not align with the shorter-term expectations embedded in management frameworks.

He concluded that effective management should take into account the natural variability and cyclic nature of stock dynamics; and the time required for populations to respond to both environmental conditions and management measures.

## 7. Final Remarks

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**J. M. Robert** thanked participants for the exchange, noting that the emphasis placed on temporal dynamics provided a particularly valuable perspective. He underlined the high quality of the discussion, remarking that it is relatively rare at this level of interaction to engage so deeply in reflections on stock dynamics and fisheries management. He expressed his appreciation to the AZTI scientific team for their contributions and for the breadth of work presented, as well as to all participants for their active involvement.

He reminded attendees that:

- all presentations would be made available through the Secretariats of the Advisory Councils;
- the questions raised during the meeting would require further reflection and written input.

He encouraged stakeholders, particularly those representing fleets targeting hake, to review the presentation materials carefully and contribute responses to the questions raised. He emphasised that such contributions – especially regarding fleet evolution, vessel conversions (e.g. from longline to gillnet), and operational changes – could be documented and would provide valuable input to ongoing scientific work. He reiterated the importance of continued collaboration between stakeholders and scientists and encouraged all participants to engage in follow-up work to support improved understanding and management of the stock.

**D. Garcia** responded to the Chair's reflection on the apparent inverse relationship between biomass and recruitment success. She clarified that this relationship should not be interpreted as an argument against maintaining high biomass levels. Rather, she explained that the observed relationship relates specifically to recruitment success (i.e. the proportion of eggs surviving to recruitment), not to recruitment in absolute terms. She emphasised that:

- maintaining a sufficiently high spawning stock biomass remains essential to ensure the long-term sustainability of the stock;
- however, at higher biomass levels, density-dependent processes may reduce the survival rate of eggs and juveniles.

She explained that such density dependence, likely linked to mechanisms such as cannibalism in hake, must be explicitly considered in stock assessment models. In particular:

- recruitment models need to reflect the relationship between biomass and recruitment success;
- and these dynamics should be incorporated when estimating reference points, including those used for MSY.

She further noted that, when such relationships are taken into account, projections of future stock dynamics may no longer converge towards a stable equilibrium. Instead, biomass may fluctuate within a range over time. A key area of ongoing research is therefore to determine:

- the expected amplitude of such fluctuations;
- and whether recent variability falls within normal bounds or reflects more exceptional conditions.

She stressed that current knowledge does not support the conclusion that lower biomass would be preferable for recruitment and cautioned against such interpretations.

D. Garcia then expressed her appreciation to both Advisory Councils for the opportunity to present their work, noting that this was the third such exchange within the framework of the project. She acknowledged that the material presented is complex and may not immediately translate into clear management implications but reiterated that the ultimate objective is to improve scientific understanding; and contribute to more effective fisheries management. She encouraged continued engagement with stakeholders, including follow-up questions and data sharing, highlighting in particular the potential value of data on roe (egg) production, which she considered promising for further analysis. She concluded by reaffirming the importance of ongoing collaboration between scientists and the fishing sector.

In conclusion, **S. Larzabal** and **J. M. Robert** first expressed their sincere thanks to the scientific team from AZTI for the quality of their work and their engagement throughout the session. They emphasised the value of the exchanges and the depth of analysis presented. They also extended their appreciation to the Secretariats for their role in organising the meeting, as well as to the interpreters for ensuring clear communication and facilitating participation from all attendees. They thanked all participants for their contributions and engagement. They noted that the meeting had provided an important opportunity for dialogue between scientists and stakeholders, and highlighted the importance of continuing such collaborative efforts in the future.



## Participants

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