Xavier Vincent, Global Lead for Fisheries del **Banco Mundial (BM)**

"The fishing sector may suffer an annual loss of $17 billion– $41 billion in landed value due to climate change effects"

What is the World Bank´s estimation of the economic impact of climate change in the fisheries sector at present and the outlook for the future?

The latest World Bank global estimate of the economic impact of climate change in the fisheries sector indicates that, depending on the scenario, the fishing sector may suffer an annual loss of $17 billion– $41 billion in landed value, resulting in a loss in household income of between $4 billion to $6 billion a year.

The Bank recently launched a study on the impact of climate change on African fisheries. Initial results are worrying and in the worst-case scenario, the maximum catch potential could decrease by 7.7% and revenue by 10.4% globally (Lam, Cheung, Reygondau, Sumaila, 2016).

In West Africa, the decrease in landed value and jobs could on average amount to 21% and 50% respectively.

Another study commissioned by the Bank on the impact of climate change on tuna fisheries in the Indian Ocean indicates that tuna biomasses will decrease and some stocks are expected to move to higher latitudes, affecting the economy of Equatorial countries.

Does the World Bank have any estimation of how much funding is needed to tackle the effects on climate change, and particularly on fisheries?

The previously mentioned study indicates that between $419 billion and $1,025 billion would be needed by 2050 to offset the loss in fisheries gross revenue, while $7 billion-$30 billion would be required annually for adaptation purposes.

The new study focusing on Africa will help to identify possible solutions for mitigation of or adaptation to climate changes and implementation cost. The first results are expected by the end of 2018.

What is the economic contribution of the World Bank in combating the effects of climate change, and in the specific case of fisheries?

The World Bank has mobilized around $58 billion in the past seven years to combat the effects of climate change in general. This amounts to 21% of the Bank's total lending over this period.

The current portfolio of projects promoting a sustainable maritime economy or Blue Economy amounts to approximately $2 billion, with about three quarter of that for the fisheries sector.

The majority of fisheries' projects promote fisheries management and adaptive livelihoods for coastal communities, two key answers to climate change adaptation.

What major projects of the World Bank related to the impact of climate change on fisheries and fishing communities?

For the last decade, the World Bank has invested in fisheries programs in West Africa and the South West Indian Ocean, and more recently in the Pacific region. New programs are envisaged in South and East Asia and Central Africa. Individual projects are implemented or being developed worldwide, including in Peru, Jamaica and Indonesia.

As previously stated, fisheries management and adaptive livelihoods are key to mitigate and adapt to climate change. Adaptive livelihoods are also key for coastal communities to accept, adopt and implement fisheries management plans.

These programs also invest in community infrastructure and pave the way for larger infrastructure, such as ports, that should be climate-proof. The Bank also has specific investments in coastal resilience, such as in São Tomé e Príncipe where we supported infrastructure against erosion, voluntary relocation of coastal communities. These approaches are being replicated worldwide.

What are, in your opinion, the most urgent measures to combat climate change at a global level and on fisheries in particular and what is the estimated cost of their implementation?

The most urgent measures are needed in fisheries management. Fish stocks will be much more resilient if they are healthy: more fish means more genetic diversity and option for species adaptation. Fishing would be more profitable and subsequently fishing companies and fishers' households economically resilient.

In addition, investing in fisheries makes good sense overall. This is illustrated in the Sunken Billion Revisited report which found that investing in fisheries management could generate an increase of up to $83 billion in net benefits, 13% in catch, and fish would be bigger and more valuable. Investing in fisheries management is a no-regrets strategy.

What countries and world regions are most affected by the effects of climate change on their economies?

Research shows that countries located in the inter-tropical belt will be affected the most, not only because the impact of climate change will be stronger but also because many have limited resilience due to poor socio-economic and governance conditions.

According to the 2010 study, the impact of climate change on the fishing sector in developing countries may be two to three times higher than in developed countries, requiring higher adaptation costs under all the scenarios considered.

What is your vision on the effects of climate change in the future?

In the short term, mitigation and adaptation to climate change represent an opportunity to invest in a no-regrets strategy.

But the fisheries sector must not be viewed in isolation. There needs to be a holistic approach including all sectors.

Decision-makers should not forget to invest more generally in the sustainability of the coastal and marine environment. For instance, the potential impact of plastic debris and generic pollution on ocean health and food safety are very concerning. We should not address climate change in isolation, the risks are too big.

Do you consider that climate change is properly placed on the agenda of countries with specific weights in fisheries?

Climate change is gaining momentum in all fora, including the fisheries sector. While fisheries management has been on the agenda for decades, we need to see greater action. According to FAO, the exploitation of fish has reached a worrying level and the share of sustainable fisheries declined from 90% in 1974 to 68.6% in 2013 (FAO, 2016

Simon Buckle, head of the Climate, Biodiversity and Water Division (OECD)

"Macroeconomic costs of climate change could range between 2 and 10% by the end of the century"

What are the main OECD data available about the current effects and economic impact of climate change and future forecasts in this regard?

OECD analysis indicates that climate change is likely to have negative economic consequences in almost all regions of the world, with Africa and Asia being the hardest hit. In the absence of new climate policies, macroeconomic costs from selected market impacts alone amount to 1.0 to 3.3% of global annual Gross Domestic Product (GDP) by 2060 and could range between 2 to 10% by the end of the century.

Of these impacts, changes in crop yields and in labour productivity are projected to affect the economy most negatively. This is not a complete picture of the full consequences of climate change, nor does it capture all of the uncertainties and risks.

For example it does not include potential non-market impacts or the risks of damaging non-linear changes if temperatures increase further. In its recent report Investing in Climate, Investing in Growth, the OECD finds that combining strong climate action with investment and structural reforms has the potential deliver low-emissions growth in both the short and long term that is in line with the commitments made by countries under the Paris Agreement to limit average warming to well below 2°C.

Which OECD measures do you consider that are most important to combat the effects of climate change in general and in the fisheries sector in particular?

There are a number of measures that governments can undertake to combat the effects of climate change. Firstly, countries need to put in place core climate policies to address the damages done by emitting greenhouse gases that are not adequately captured in market prices. This involves: accelerating the reform of inefficient fossil-fuel subsidies and putting a price on GHG emissions as well as considering targeted support where other market failures inhibit the take up of low-carbon technologies.

Countries also need to consider the coherence of their overall policy framework, aligning policies such as the tax treatment of company car schemes so that they support, rather than impede, a transition to a low-carbon economy.

Investing in low-emissions and resilient infrastructure is critical over coming decades to avoid being locked-into carbon-intensive infrastructure or facing the cost of stranded assets that cannot pay back their original costs. This requires large scale private investment in sustainable infrastructure and innovative technologies, and will involve the reallocation of investment away from carbon-intensive assets. A good enabling environment will be needed to attract the private finance that will be required.

With regard to sustainable use of the oceans, marine protected areas (MPAs) are one policy instrument that can help protect ecosystems such as seagrass beds and salt marshes, which act as carbon sinks and can also enhance resilience against more localised environmental change. As indicated in the OECD report Marine Protected Areas (MPAs): Economics, Management and Effective Policy Mixes, well-developed and functionally connected MPA networks can also offer "an insurance policy against climate change and other impacts".

MPAs facilitate a range of shifts of populations and ecosystem types as well as the movement of individuals in response to adverse impacts in one MPA, and thus help to reduce risks.

Which OECD projects or initiatives would you highlight in this area?

Climate is increasingly being mainstreamed into the work of the OECD. Recently, in the context of the German G20 Presidency, it undertook a major project on growth and investment opportunities arising from the transition to a low-emission, climate-resilient economy.

The resulting report, Investing in Climate, Investing in Growth, provides an analysis of how climate goals can be achieved while simultaneously spurring economic growth, competitiveness and well-being. Its key message is that a combination of ambitious climate policies and well-aligned structural reforms and fiscal policies will lead to strong and inclusive economic growth for G20 countries and beyond.

In addition, the OECD Centre on green finance and investment, established in 2016, aims to help catalyse and support the transition to a green, low-emissions and climate-resilient economy through the development of effective policies, institutions and instruments for green finance and investment.

Along with our current work on climate mitigation, the Centre contributes to the OECD's aim to support governments and other stakeholders move to low-emissions, climate-resilient development pathways.

There are a couple of initiatives of particular relevance to the fisheries sector that are worth highlighting:

- The OECD Fishery Support Estimate database is the best source of information on fisheries support policies in OECD members and participating non-OECD economies.

  It allows developments in fisheries policy to be monitored and quantified, to establish a common basis for policy dialogue among countries, and to provide economic data to assess the effectiveness and efficiency of policies.

  It collects data relating to fuel subsidies, both budgetary (direct payments) and non-budgetary (e.g. fuel tax concessions).

  This is important for measuring progress (or lack thereof) towards reducing unnecessary fuel consumption (climate change contributing) and work to improve coverage of the FSE database is currently underway.
- The OECD has developed good practice insights for countries to effectively manage marine protected areas (MPAs). MPAs can support more sustainable fisheries and can also provide benefits to counter the adverse impacts of climate change.

Does the OECD have any estimates of the funds that would be needed to combat the effects of climate change, in particular on fisheries?

The OECD estimates that USD 6.3 trillion of investment in infrastructure is required annually on average between 2016 and 2030 to meet development needs globally. An additional USD 0.6 trillion a year over the same period would make these investments climate compatible, a relatively small increase considering the short and long-term gains in terms of growth, productivity and well-being. The additional investment cost is likely to be offset over time by fuel savings resulting from low-emission technologies and infrastructure.

Which role do you think private sector should play in the fight against climate change?

Private sector actors play a number of different roles. Whilst delivering economic benefits, some industries are also major climate polluters. They therefore have a key role to play in developing and adopting new, greener technologies and more sustainable business models.

The public sector alone cannot deliver the levels of finance needed for investment, so the private sector has an important role to play here. There is no shortage of capital available globally. The financial sector encompasses more than €100 trillion of assets and the private sector constitutes 86% of investment and financial flows.

As such, the need to invest in low-emissions, climate-resilient infrastructure assets presents the private sector with a huge business opportunity. Yet, it is important to mobilise and channel the diverse sources of capital (corporates, banks, institutional investors, etc.) toward these investments.

Governments and the public sector more broadly has the responsibility to establish the incentives and broader enabling conditions under which these funds can sustain inclusive, low-emissions growth.

Do you consider that climate change is properly placed on the agenda of countries, and specifically those with specific weight in fisheries?

The Paris Agreement marked an important moment in the fight against climate change and sets out ambitious goals to deliver low-emissions, climate-resilient development pathways for the world.

The key now is to ensure that countries implement their commitments and scale up their action so that it is commensurate with the challenges they face. The Paris Agreement sets out a goal of holding the global average surface temperature increase to well below 2°C and to pursue efforts to limit it to 1.5°C above pre-industrial levels.

Countries' Nationally Determined Contributions to emissions reductions after 2020 are currently not sufficient to achieve this goal. This involves not only decarbonizing energy production and use; it requires significant developments in agriculture, forestry and other land use sectors. Investing in modern, smart and clean infrastructure in the short- to medium-term to avoid a carbon lock-in on the longer-term is also key.

In terms of countries with a specific weight in fisheries, China has put into place some particularly promising economic and climate policies, including the government's announcement to progressively phase-out coal, that allow us to be hopeful for the future.

However climate action needs to be increased at a global scale by all national players: China – like most other countries – has considerable scope to further mainstream climate in its growth agenda.

What is your vision on the effects of climate change in general and on fisheries in particular in the future?

The scale of potential damage from climate change poses a major systemic risk to our future well-being and the ecosystems – including marine ecosystems - on which we depend.

Extreme weather and flooding events (heat waves, storms) are projected to increase in frequency, whilst cropland declines and water stressed populations grow. Average weather and precipitation patterns will continue to change, sea levels will continue to rise, and oceans will continue to acidify.

We need to act now if we are to limit those risks and achieve the goals of the Paris Agreement. Global GHG emissions need to peak as soon as possible and fall to zero or below in net terms in the second half of this century.

Aik Hoe Lim, Director de la División de Comercio y Mediombiente de la Organización Mundial de Comercio (OMC)

"World fish trade and all stages of the seafood value chain could be significantly affected by the effects of climate change"

How do you think climate change is affecting and will affect global trade in general and fishery products in particular in the future?

The WTO does not conduct research and analysis on climate change per se but we have organized a number of events where some leading climate scientists, including representatives from the Intergovernmental Panel on Climate Change (IPCC) have warned that increased carbon dioxide absorption in the world's oceans could, inter alia, lead to warming water temperatures; changing ocean currents; extreme weather events, storm severity and frequency; and ocean acidification.

Climate change is also anticipated to drive the expansion of 'dead zones', in which most marine plants and animals will struggle to survive. The FAO, UNCTAD and others have also underscored that these impacts, exacerbated by IUU and overfishing, could result in changes in fish stocks, productivity and the food web.

Some of the predictions by experts suggest that tropical countries could face up to a 40 per cent drop in the catch potential of traditional and/or commercially valuable species; while high-latitude regions could gain as much as a 30 to 70 per cent increase in catch potential. In short, climate change could have profound consequences for fisheries productivity, impose higher costs on fishers, processors and dependent communities, reduce the availability of fish and constrain fishing activity.

All of these factors would contribute to rising prices as demand outstrips supply. There is uncertainty amongst the scientists on precise scenarios but based on their predictions, world fish trade and all stages of the seafood value chain could be significantly affected and policies to facilitate adaptation may be required.

What measures does the WTO think are important to fight the effects of climate change on world trade in general and fishery products in particular?

There are several ways by which international trade can contribute to combatting climate change. Trade policy can, for instance, significantly reduce the cost of clean energy technologies and improve access and their dissemination. Tariffs on climate-related goods continue to inhibit trade.

For example, important technologies such as renewable energy, cooking stoves, heat pumps, parts of solar cells, and portable solar lamps are subject to applied tariffs of between 10 and 14% on average, and between 35% and 200% in countries with the highest tariffs.

This results in higher prices and slows down the uptake of much-needed climate mitigation technologies. More specifically in the fisheries sector, there might be products, such as monitoring and surveillance equipment, for which greater access should be encouraged. Trade policy can also remove distortions in the market which leads to inefficient production and a misallocation of resources.

It can stimulate investment into the low carbon economy by creating and scaling-up market opportunities. Trade together with environmental policy fosters innovation, encouraging development of environmentally friendly technologies.

We have evidence that trade and innovation in green technologies go hand in hand. Adopting green technologies from abroad can boost innovation at home.

And in the case of fisheries sector?

As a contributor to greenhouse gas emissions, both during capture operations and subsequently during the transport, processing and storage stages, the fisheries sector may also benefit from greater access to these green technologies and to the innovation fostered by trade.

Although not in the context of climate change, we have also heard from WTO members on the need to address fisheries subsidies which contribute to overcapacity, overfishing, and to illegal, unreported and unregulated (IUU) fishing. We have also heard in the WTO Committee on Trade and Environment (CTE) about the importance of supporting international fisheries instruments, for instance the Port State Measures Agreement (PSMA), and tools such as voluntary catch documentation schemes. In recent years, some WTO members have highlighted the significance of standards, labelling and certification to improve traceability, support better conservation of marine resources, and to promote sustainable and responsible fishing practices.

At the same time, because these standards are often the basis for regulations, the more harmonized these standards are across countries, the less room there is for unnecessary divergences to be a cause of trade frictions. Indeed, this is why the WTO Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT) Agreements encourage the use of international standards as the basis for regulation.

Whether we are looking at climate change in general, or more specifically at the fisheries sector, it is important to bear in mind that there is no "one size fits all" solution.

Ultimately, it will be up to each WTO member to decide on the measures that they think would be important, suitable and relevant to combat the effects of climate change and how to use them to lower the cost of adjustment and to facilitate economic diversification, where necessary.

There is also a need for awareness generation, international co-operation, technical assistance and capacity building.

In connection with that subject, which WTO projects or initiatives would you highlight?

Specifically in the area of fisheries, WTO members have since 2001 been negotiating possible disciplines on fisheries subsidies. From the beginning of these negotiations, sustainability has been an important underlying concern.

It was first identified in the WTO Committee on Trade and Environment many years ago that certain subsidies could contribute to unsustainable fishing practices, overcapacity, overfishing and that disciplines could be developed to address the effects on both trade and environment. The fisheries subsidies negotiation is an important part of the on-going WTO rules negotiations.

It has more recently been given a boost by the UN Sustainable Development Goal 14.6, which has set a target for eliminating fisheries subsidies that contribute to overcapacity, overfishing and IUU fishing by 2020. WTO members have intensified negotiations for a concrete outcome on fisheries subsidies at the WTO Buenos Aires Ministerial Conference in December this year.

What is your view on the current and future impact of climate change on import / export trade in developing and developed countries?

Based on the latest available evidence, climate change could have dramatic and far-reaching consequences on the future, including what, with whom, and how countries trade.

Changes in the climate system, not least sea level rise and the increasing frequency of extreme climatic events, could modify transport routes and test the underlying infrastructure, thereby affecting international transport possibilities and costs.

Other types of climatic impacts, such as those on agriculture, labour productivity, and energy demand will be very likely to cause changes in production and specialisation, which will also affect trade. In short, the impacts of climate change on trade patterns and specialization are potential game-changers that could drastically alter current modes of production and consumption, posing big challenges for national development strategies.

If we look at the fishing sector, world fish exports in value terms grew from US$8 billion in 1976 to US$148 billion in 2014, with an annual growth rate of 8.0 per cent in nominal terms and 4.6 per cent in real terms (FAO 2016).

Over 3 billion people depend on the oceans for their livelihoods. But it is a resource which is at risk as we appear to have reached biological limits in wild capture fisheries, with almost 60% of the world's fish stocks estimated as fully fished and over 30% overfished. Aquaculture has thus become increasingly important for both the production and trade in fish.

Overall, fishery trade is an important item in the trade basket of many WTO members, in addition to the sector's important role in income generation, employment, food security and nutrition. Developing countries are among the main exporters with a 54% share of world fishery export value in 2014 (FAO 2016).

Some of the top importers are in Europe, North America and Asia. In terms of market access conditions, the average applied tariffs on fish and fish products are estimated to be around 13%.

This average figure hides some significant cases of tariff peaks and escalation. International trade in fish also faces a proliferation of non-tariff measures in the fisheries sector, not least in response to certain climate-related food safety, animal and plant risks.

With climate change, trade in fish could face further challenges with an adverse impact on global fishing revenues. Developing a better understanding of climate-related trade impacts is thus important.

Ernesto Penas, Principal Adviser on the CFP, DG-MARE (European Commission)

"The EU is committed to continuing as world leader in the fight against climate change"

What are the main lines of action under the Common Fisheries Policy regarding climate change and its effects on the fishing sector?

The main line of action is the structural policy. The European Maritime and Fisheries Fund (EMFF), like all structural funds, must devote a minimum percentage – 20% - to actions that contribute to fighting against climate change.

These actions are clearly identified in Article 41 of Regulation 508/20214 under the EMFF, which is devoted to promoting the required transition of energy so that the fishing sector can also contribute to reducing the effects of greenhouse gas.

Furthermore, numerous other articles in this regulation provide for funding of measures to help mitigate its possible effects.

What measures have been taken and which are provided for in the future at community level on this matter?

The European Council passed a broad-based plan of action in 2013, accompanied by important economic funding to fight against climate change. This plan, funded under the framework of the Union budget for the period 2014-2020, is particularly based on prevention, i.e., on transforming the European economy in order to reduce the emission of greenhouse effect gases.

In other words, prevention is better than cure. And everything that the Union does in this regard will be important for all the economic sectors and, therefore, for the fishing industry too. In terms of the future, the President, Jean-Claude Juncker, in his speech on the state of the Union on 13th September last, made the European Union's commitment clear as regards continuing as leader worldwide in the fight against climate change. Over the next few months, there will be new initiatives appearing, especially in prevention.

The EMFF funds have a provision of 6,400 million euros up to 2020. What funding is provided for by the EU to combat the effects of climate change in fisheries?

20% of these funds must be devoted to that purpose, both through measures to reduce CO2 emissions and through diverse measures that help to mitigate the possible negative effects of climate change.

It should be noted that some of these measures do not appear to be devoted to climate change, but rather to more general objectives.

For instance, one measure under the EMFF makes it possible to fund the improvement of marketing little known species.

If climate change leads to a reduction in the abundance of certain traditional species in certain areas, this mechanism makes it possible to fund promoting alternative species.

Does the European Commission have any estimate of the funding required by the Member States to fight against climate change?

That exercise has already been carried out at the 2013 summit and the result was the package of measures covered by the 2014-2020 budget for structural policy, research and others.

This framework responds to the needs for funding at European level, added to which is the funding for each Member State.

If this important financial package is sufficient or otherwise, only practice will tell: the priority now is to spend that money available on prevention, research and helping the affected sectors and developing countries.

But certainly, in terms of future financing perspectives in the Union after 2020, the economic funding for fighting against climate change will be one of the most important.

What is your view of the effects of climate change today and in the future in fisheries and in the EU fishing sector?

The possible effects on the fishing sector can be diverse. Firstly, we are dealing with a shift in the distribution areas of certain species, which involves changes in economic activity and the need to review some management zones.

Not only that but possible economic effects in certain zones are considered with a possible reduction in the presence in their waters of their traditional species.

Although the possible reduction in marine productivity (at least in temperature waters) is not provided for, there may be reductions of some species in certain zones, which could have a negative effect on certain ports or zones in the Union.

In the case of aquaculture, this could be affected by the change in water temperature, which, in turn, could alter the ideal zones for farming certain species as well as increase the risk of invasion from other foreign species or the increase of epizootic diseases.

Finally, the effect of storms and other meteorological events may increase, causing possible damage to infrastructures in the sector.

What do you consider are the priority measures for combating the effects of climate change in EU fisheries?

To avoid all these effects, the best solution is prevention: by reducing greenhouse effect gases and attempting to ensure that their effects are kept to a minimum. Once again, prevention is better than cure.

In any case, to the extent that there are certain inevitable effects, there is a need to review some aspects of the fisheries management system to adapt it to the new, changing distributions of species; and in the framework of the forthcoming debate on structural funds, it will be necessary to evaluate if the current measures are sufficient or if other new ones are required.

Do you consider that climate change in fisheries is a matter currently on the agenda of the countries with more importance in the EU fishing sector?

I hope so. The matter of climate change is high up in the priorities of the Union institutions and in most Member States.

Whether there is a specific reference or otherwise to the fishing sector, there is no doubt about the fact that the fight against climate change and its effects on the economic sectors in the Union will be a prime priority for all.

What should be the role of fisheries management to combat the effects of climate change on fisheries resources?

There are two key elements here: the zones and management mechanisms need to be updated in terms of the distribution of the species and, on the other hand, governance itself should also develop flexibility and adaptability in order to manage a changing world.

Climate change turns the spotlight on a management system that has not changed over 30 years, alongside the existence of a rigid legislation that is difficult to change and, thus, very difficult to adapt to the unstable, changing situation that is approaching.

John Pinnegar, Director of Climate Change Impacts and Adaptation, CEFAS (UK)

"Seawater temperatures have warmed by around 1°C over the last century, and the distribution of key commercial fish species have changed in response"

Tell us about CEFAS, when it was established, evolution and main objectives

Cefas (the Centre for Environment, Fisheries and Aquaculture Science) is a UK government research institute that was established in 1902 in order to study North Sea fisheries. Cefas currently employs 550 staff at two main sites (Lowestoft and Weymouth).

The agency also employs a small number of fisheries officers based at ports throughout the UK that are responsible for surveying incoming fisheries catches. Over the 115 years of it's existence the work of Cefas has broadened considerably and now includes research on biodiversity, climate change, marine pollution, aquaculture, seafood safety as well as our more traditional work on marine and freshwater fisheries.

Cefas staff work in many different countries around the World, we have a permanent office in Kuwait and we advise the UK Foreign Office with regard to marine and fisheries issues in the UK Overseas Territories.

In recent years efforts have been made to digitize our historical data holdings and to construct long-term time-series. These datasets have

revealed that seawater temperatures have warmed by around 1°C over the last century, and the distribution of key commercial fish species have changed in response.

Which projects developed by CEFAS on climate change and fisheries would you highlight?

Cefas has published several very high profile papers that have described dramatic changes in the distribution of fish and fisheries in response to climate change. One of these papers showed that the centres of distribution for North Sea fish species have generally shifted northwards by distances ranging from 48 to 403 km over the past 30 years and another study showed that North Sea fish assemblages have also deepened by an average of ~3.6 m per decade. In another analysis looking at the 50 most abundant fish species in the waters around UK and Ireland, 70% were shown to have responded to warming in the region by changing distribution and/or abundance. Specifically, warm-water species with smaller maximum body size have increased in abundance while cold-water, large-bodied species have decreased in abundance.

Another study extracted squid catches from Cefas trawl survey data in the North Sea (1980–2014) during late summer (August–September). Squid distribution increased dramatically over the 35-year time series, occurring at only 20% of survey stations in 1984, compared to 60% in 2014.

Significantly positive relationships were found between this increase and climate variables (including seawater temperature etc.). Summer squid fisheries have expanded rapidly off Scotland.

In December 2015, Seafish (the trade body for the commercial fisheries sector in the UK), together with Cefas and MCCIP published a report "Understanding and responding to climate change in the UK wild capture seafood industry" (Garrett et al., 2015) that aimed to support the UK seafood industry and help them adapt to long-term climate change.

What is your view on the effects of climate change on the major fisheries under the investigation that you carry out?

Over the past 10 years the evidence base with regard to understanding climate change impacts on the UK fishing industry has advanced substantially. Analyses of Scottish and English commercial catch data in the North Sea have revealed that the locations where peak catches of target species such as cod, haddock, plaice and sole were obtained have all shifted markedly over the past 100 years, albeit not in a consistent way. For example, peak commercial cod catches have shifted steadily north-eastward and towards deeper water and this reflects both climatic influences and intensive fishing.

According to the most recent stock assessments for cod, stocks around the UK were heavily overfished in the early-mid 2000s and populations were at their lowest ever recorded value. However, in recent years fishing mortality has been significantly reduced through vessel decommissioning schemes and effort controls.

Spawning stock biomass of cod in the North Sea has recovered to a level where exploitation is considered sustainable but this recovery has been very slow.

In the Irish and Celtic Seas, as well as the west of Scotland, cod stocks are still at low levels. Despite the very dramatic and deliberate reduction in fishing mortality, cod stocks have not yet reached the levels recorded in the 1970s, and this is largely a reflection of continued poor recruitment (a reduced supply of juveniles) in all UK cod stocks, probably related to prevailing climatic conditions since the mid-1990s.

And what is your view on the main effects of climate change on aquaculture?

The UK has a sizeable aquaculture industry and in 2012 ranked second within the European Union in terms of production (206,000 t). Of the UK's aquaculture production, finfish comprises around 177,000 t, of which 94% is in Scotland, and 27,300 t of shellfish (14% in England, 31% Wales, 27% Scotland and 28% Northern Ireland).

To date, there has been little published research concerning the effects of climate change on UK aquaculture. Warmer water conditions could, potentially, allow new species to be cultured in the region where the current temperature maxima and minima are marginal for the species, such as seabass, sea bream, turbot, and hake.

This may also include warm-water shellfish (e.g., abalone, Manila clams) and edible seaweed (nori). By contrast, an increase in seawater temperature may well adversely affect some cold-water species currently being farmed in Scotland as the thermal optima for the animal's physiology may be exceeded for long periods of time during the summer months. Aquaculture of species such as Atlantic cod and Atlantic halibut may not be possible in the south of the country or may be limited to areas of deep-water upwelling, where temperatures are typically cooler than elsewhere.

Storm damage is a major concern to the aquaculture industry. Storms are a limiting factor in the distribution of mussel beds in intertidal areas. In addition, a study of fish escapes in Scotland found that of the 2.18 million fish that escaped during the seven years covered by the research, 38% escaped during a single storm event in 2005.

An increase in the frequency of severe storms could have significance for the integrity of aquaculture structures and increase the risk of escapes.

From a disease perspective, an increase in temperature can have many effects. It is possible that some diseases of commercial aquaculture species, which transmit above a minimum temperature, will increase in prevalence, but not all effects on disease will be detrimental. Some viral infections can only occur between narrow temperature ranges, often 10°–12°C, usually during spring and autumn.

Under warmer conditions this temperature window may narrow in the spring, with beneficial consequences for the industry.

Conversely warmer water conditions may allow the establishment of exotic diseases, which are currently excluded as the climate is too cool to permit transmission.

Under a rising temperature regime some bacterial diseases of fish, such as Moritella viscosa and cold water vibriosis, may decline in abundance as these diseases are characteristically seen in winter under cold water conditions.

Warmer conditions may however, favour currently rare bacterial infections such as Mycobacterium marinum and M. chelonae, allowing these pathogens to extend their range further north.

Do you consider that the Administration is taking into account scientific knowledge in due measure?

The UK is relatively unique around the world in that it has introduced a legal obligation to reduce carbon emissions, but also to conduct regular assessments of the risks posed by climate change. Specifically, the "UK Climate Change Act (2008)" establishes a framework for building adaptive capacity, including a requirement for: A UK-wide Climate Change Risk Assessment (CCRA), that must take place every five years; A National Adaptation Programme (NAP) that must be put in place every five years to address the most pressing climate change risks to England, and identifying ways for government, businesses and society to adapt; Powers to direct "reporting authorities" (utilities and large companies) to prepare reports on how they are acting on the risks and opportunities from a changing climate.

The first CCRA document was submitted to the UK parliament in 2012 and included a dedicated sector report on "marine and fisheries" issues. This drew heavily on outputs from MCCIP, including the 2012 report card on fish, fisheries and aquaculture.

The 2012 CCRA report was immediately followed-up by the first National Adaptation Programme, that included seven active commitments of relevance to the seafood sector. The next CCRA report is scheduled to be published in 2017 and preparations are at an advanced stage.

With regard to the "reporting powers" obligation (number III, above), a report were prepared by the Marine Management Organization (MMO), the UK government agency responsible for managing and monitoring fishing fleet sizes and quotas, ensuring compliance with fisheries regulations etc. In addition, a report (Garrett et al., 2015) was prepared by "Seafish", the UK trade body that aims to support a profitable, sustainable and socially responsible future for the seafood industry.

The Seafish report relied on research evidence and industry experience, engaging around 40 stakeholders and concluding that a number of important barriers to climate change adaptation may need to be overcome, including a lack of detailed knowledge about how fleets could be impacted in the future, the fact that climate change is not currently perceived as a priority for the seafood industry, and that both threats and opportunities are anticipated in the future.

What is your view on the position of some NGOs on the effects of climate change in general and on fisheries in particular?

NGOs can play an important role, for example the Marine Stewardship Council (MSC) has incentivised better management of fish stocks globally, and this has increased resilience to climate shocks.

What is your vision on the future effects of climate change on fisheries and the fisheries sector?

In 2013 the UK Department for Environment Food and Rural Affairs (Defra) commissioned its "Economics of Climate Resilience" (ECR) report on "sea fisheries".

This study included a detailed assessment of whether or not the UK fish catching sector could be expected to adapt to the opportunities and threats associated with future climate change. It built heavily upon the analyses of Jones et al. (2012, 2013a), and highlighted increases of habitat suitability for a number of species currently emerging in UK waters that could offer future commercial opportunities.

The ECR report looked for examples of current adaptation by the sector. The UK fishing industry includes operators of vessels of varying adaptive capacity and capability.

The ability of some segments within the sector to adapt is likely more constrained than others, notably for small vessel operators. Such operators typically face constraints on their ability to travel distances to reach their favoured fish stock, the time they are able to be at sea and their access to the rights to catch particular species.

The key adaptation actions highlighted for the UK fishing industry included: Traveling further to fish for current species, if stocks move away from UK ports; Diversifying the livelihoods of port communities, this may include recreational fishing where popular angling species become locally more abundant (e.g., seabass); Enhancing vessel capacity if stocks of currently fished species increase; Changing gear to fish for different species, if new or more profitable opportunities to fish different species are available; Developing routes to export markets to match the changes in catch supplied.

These routes may be to locations (such as southern Europe) which currently eat the fish stocks which may move into the UK EEZ; Stimulating domestic demand for a broader range of species, through joined up retailer and media campaigns.

Citizens in the UK are heavily dependent on imports from elsewhere, most notably northern countries (Iceland and Norway) for cod, haddock and cold-water prawns, warm-water areas of the world for tuna and tropical prawns etc.

By contrast much of the fish and shellfish (mackerel, Nephrops, scallops, etc) that UK fishermen actually catch are exported to countries further south (e.g. Spain and Portugal). I would argue that a re-balancing of consumer tastes and preferences is needed.

UK citizens should learn to broaden their diets – to something more akin to those in Spain or Portugal, eating a wide variety of 'warm-water' species such as squid, mackerel, sardine, anchovy, red mullet etc., as an addition to traditional favourites.

Poul Degnbol, Fisheries Management and Coastal Community Development, Aalborg University (Denmark)

"Society must adapt and can no more be based on an assumption of stable marine ecosystems"

Which are un your opinion the main challenges for governments in the complex objective of combating the effects of climate change on fisheries?

Mainly three. First, to dare to move towards adaptive approaches which may necessitate some fundamental overhauls of governance – including challenging access rights.

Secondly, to use this as an opportunity to fully embrace an ecosystem approach as climate change forcefully reveals that fisheries is operating in dynamic ecosystems.

Third, not to become complacent in periods of less change.

What role should fisheries management play in mitigating the effects of climate change on fisheries resources?

To develop adaptive management which both ensures sustainability for the stocks, ecosystems and people and also mediating changing distributions and equality of access.

However, governments should also see fisheries policy as a field where mitigation should take place, as in all other policy fields. Where is the notion of carbon footprint per kilo consumption fish produced to be found in fisheries policy?

As a former head of the ICES (International Council for the Exploration of the Sea) Advisory Committee, what is your view on the effects of climate change on fisheries?

They are deep and change is now even more than ever a fundamental feature of fish stocks and marine ecosystems. Society must adapt and can no more be based on an assumption of stable marine ecosystems.

Do you consider that climate change is properly placed on the agenda of the major fishing countries?

No, it is largely absent and reactive when too pertinent to ignore.

In your opinion, should there be joint work and cooperation between governments, scientists and stakeholders on climate change and fisheries?

It won't work without such cooperation.

What do you think that are the main challenges for the scientific community in this area?

To continue highlighting how climate change impacts marine ecosystems and fish stocks and to contribute to the development of adaptive management strategies.

Do you consider that the Administration is taking into account scientific knowledge in due measure?

No. In some specific cases and short term, but not in terms of seeing the need for long term change.

"Climate change effects are deep and it is now even more than ever a fundamental feature of fish stocks and marine ecosystems"

"Governments should also see fisheries policy as a field where mitigation should take place, as in all other policy fields"

Nicole Kimball, Vice President Pacific Seafood Processors Association (PSPA)

"The largest climate changes, and fastest rate of change, are expected in the Bering Sea, one of the most productive fisheries ecosystems in the world"

Tell us about the Pacific Seafood Processors Association, when it was established, membership and main objectives.
PSPA is an Alaska seafood industry trade association, founded in 1914, comprised of 9 seafood processing companies that operate 31 shoreside processing plants in 18 coastal communities across Alaska and 3 floating processors to serve remote Bering Sea markets.

PSPA member companies purchase, process, and market hundreds of millions of pounds of Alaska wild salmon, Alaska pollock, crab, cod, halibut, and other species of Alaska seafood, comprising about 60% of the seafood harvested in Alaska.

PSPA was founded to help foster a better understanding of the Alaska seafood industry and to support responsible commercial fisheries policy and management.

PSPA member companies are committed to the sound management and long-term health of fishery resources and the marine environment upon which those resources depend.

What is your view on the effects of climate change on the major fisheries in Alaska?

Scientists in the North Pacific understand ecosystem dynamics sufficiently to understand the possible trends in several major fisheries in Alaska.

It is likely that we will realize changes in stock abundance, distribution, and overall health for several major fisheries, including Alaska pollock, salmon, and crab.

However, there are mixed effects among species; for example, some northern crab and salmon species may fare well under some changing climate scenarios, while others will do poorer in warming conditions.

It is important to note that there are some significant unknowns, and what we know about the effects of a changing climate on commercial fisheries is extremely variable among species across the U.S.

And the effects on activity of the seafood companies?
Seafood companies will pay attention to climate effects as they will directly affect their businesses. The largest changes, and fastest rate of change, are expected in the Arctic, which includes the Bering Sea, one of the most productive fisheries ecosystems in the world.

Even though in most cases we see a fairly gradual fishery response to climate change, changing ecosystems are increasingly the driver in fishery trends and must be considered by both industry and fishery managers in annual and long-term management decisions.

Seafood companies will continue to support and rely on our existing governance systems at the state and national level to inform future investments. There is a strong economic incentive to keep management focused on sustainable practices that include incorporating climate change effects.

Do you consider that climate change is on the agenda of the seafood companies?
Yes, in terms of recognizing that there is an increasing need for continued data inputs, such as marine surveys, stock assessments, and ecological research, in the face of changing conditions.

Seafood companies in Alaska have been strongly supportive of both federal funding and public-private partnerships to maintain and improve these core responsibilities. Their long-term investments and marketing strategies rely on this information.

What do you consider to be the main challenges to combat the effects of climate change on fisheries?
There is a growing demand for information. Potential funding cuts to U.S. federal management agencies (NOAA and USCG) and climate science in particular would limit

our ability to understand the effects of climate change on fisheries. Our ability to build and maintain an adequate science infrastructure is the foundation to allow us to understand the mechanisms of change, track changes, and project future conditions. These reference points can inform a range of adaptive management strategies and harvest limits that can help mitigate climate impacts.

However, it also often takes a long time to translate such ecosystem data into robust, fisheries management policy. Further work is needed to determine how to extend responsive, adaptive management approaches into a complex, rigid, U.S. regulatory framework.

What role can seafood companies play in this regard?

Seafood companies can continue to engage in multiple state, national, and international forums to support coordination and funding for core surveys, stock assessments, and research priorities, and engage in cooperative research projects to collect data.

As more responsive and flexible management strategies become necessary, industry will play a larger role in both data collection and cooperative management. In addition, seafood companies can continue to invest in new technology, specifically in replacing aging infrastructure with lower energy use (and cost) as an objective.

In your opinion, should there be joint work and cooperation between governments, scientists and stakeholders on climate change and fisheries?

Certainly, there should be joint work and cooperation between governments, scientists, and stakeholders on climate change and fisheries. We need to strengthen coordination and cooperation in management of transboundary stocks and particularly in the Arctic, as climate change drives changes in species abundance and distribution across various management jurisdictions. Increased international coordination on assessment programs will be necessary as stocks shift and behaviors change.

What is your opinion about the position of some NGOs on climate change in general and its impact on fisheries in particular?

Some NGOs support and communicate the need to collect ecosystem data to mitigate negative effects on fisheries, recognizing that sustainable, well-managed fisheries are in the best position to adapt to changing environmental conditions.

However, other NGOs appear to want to forego all available sustained yield opportunities in the short-term, based solely on speculative negative effects far into the future for individual species. If a stock population is healthy, does not show a declining trend, and there is no identifiable long-term conservation benefit to limiting harvest, foregoing harvest opportunities in the short-term is harmful to the seafood industry and fishery-dependent communities.

In the U.S., we have a robust governance system which relies on scientific and management expertise to determine appropriate, scientifically supported protections for fish and marine mammals. We have systems in place to continuously assess stocks and fishery impacts and incorporate climate data into those systems. We need to rely on these authorities and avoid an emotional response that dictates overly-precautionary, burdensome regulatory requirements with little to no conservation benefit.

In addition, seafood certification programs promoted by NGOs are at times disruptive to management and research priorities that are established through the transparent, science-based, public process in the North Pacific.

Global seafood certification programs sometimes require evidence of a specific management measure or dictate a monitoring effort that does not meaningfully improve fishery practices and can divert efforts from core conservation needs in the fishery.

Félix Inostroza, Coordinator of the GEF-FAO Project in Chile

"The effects of climate change have affected the migratory patterns of some fish stocks in Chile"

Let's talk about the GEF-FAO Project for adapting fishing to climate change off Chile, its main actions, calendar and objectives.

The GEF-FAO Project sets out to reduce vulnerability and increase Chile's Fishing and Fishfarming sector's capacity to adapt to climate change.

Four pilot artisanal fishing bays (places) in the north, central and south areas of the country have been selected, where diverse innovation initiatives, incorporation of technologies, added value and others are to be developed and implemented. These factors will contribute to strengthening the capacity of the small-scale artisanal and fishfarming sectors to adapt.

Also, this includes actions to strengthen the public and private institutional side in order to secure their support for the adaptation process for fishermen and fishfarmers to make it effective.

All the above will be reinforced with an awareness programme for the coastal communities aimed at increasing knowledge of the real effects of Climate Change.

The project will last for 3.5 years (42 months), and began in April of this year. At is now at the implementation stage, which has meant: formalizing and installing the administrative structure of the project, setting up the work team, joint work with fishermen and fishfarmers, evaluate specific vulnerability for each of the places involved. This installation and launching stage should be completed this year, and it is expected that from 2018 onwards, actions will focus on field work, with fishermen and fishfarmers, the institutional side and communities.

What do you believe are the main changes that the fishing sector will have to adapt to due to climate change?

The fishing sector should take on board that we are facing a different scenario to the one stretching out over the past 40 years – on the one hand – by a loss availability, accessibility and vulnerability of fisheries resources, changes in migratory patterns, reduction of sizes, change in environmental conditions, presence of plagues, mortality rates/strandings, increase in the frequency and magnitude of extreme phenomena and – on the other hand – a sustained increase in demand, improvement of prices and other positive aspects which, in the end, involve an opportunity.

In this context, the sector needs to take on board is that this scenario is not reversible (at least in the short and medium term) and that the criterion of sustainability is the basis of responsible production processes.

With this in mind, the sector should be sufficiently dynamic, innovative, technological and leading edge in order to accept and deal with the challenge of opportunities presenting themselves to the sector through a better use of catches, a better treatment and quality of the raw materials, obtaining products with a higher added value, improvements in the distribution chain, generating ancillary and complementary services, incorporating technology and reducing production costs, among others.

What is your view of the effects of climate change on Chile's main fisheries?

Chile's main fisheries are showing clear symptoms of deterioration, which is usually ascribed to overfishing.

Nevertheless, it is a fact and the Intergovernmental Panel on Climate Change (IPCC) has reaffirmed, with a high degree of trust, that Climate Change is a factor that should be added to the causes for the deterioration of fisheries.

I don't want to take away from the importance that overfishing has in reducing fisheries but, I am clear in my mind that some variations in the environment, generated by the effects of climate change, have affected the migratory patterns of some stocks, as shown by the drastic fall in the presence and availability of species such as horse mackerel and Spanish sardine; and the arrival and permanence of other species such as cuttlefish.

Do you think that climate change is rightly positioned on the agenda of countries with a specific weight in the fishing industry?

In general terms, yes, I think so. Most fisheries worldwide have reached their maximum exploitation level, which increases the sensitivity of stocks to external forces such as fishing and climate change.

On the other hand, the change in environmental and climatic conditions may lead to important negative effects on fishfarming activity.

This affects not only the production chain, but also the distribution chain and markets, and in short, food safety.

I think that these scenarios are already being taken on board and/or considered in the policies and plans in the sector in the main fishing and fishfarming countries.

In your opinion, should there be joint work between governments, scientists and stakeholders on climate change and fisheries?

Of course. Climate change affects us all, and only working in cooperation will allow us to move ahead swiftly, effectively and efficiently to mitigate, adapt and generate the capacity to deal with climate change.

The important thing is that scientists, governments and stakeholders take on their role in generating knowledge, applying policies and plans, while putting in place and adopting good practices.

What are the chief challenges to combat the effects of climate change?

Right now, I think that the main challenge is to recognize and take on board the fact that we are facing different climate scenarios, that current conditions are no longer as they were and that we must, of necessity, adapt ourselves to these new conditions.

In this context and as far as adapting is concerned, it would be important to make headway in strengthening the capacities and coordination between institutions; establish free access public information system which, among other things, will make it possible to have a knowledge base and be able to handle climate change indicators; generate policies and plans at governmental level, have action guides in terms of climate change; work directly with fishermen and fishfarmers in incorporating technologies, innovations, new ways of managing and others, oriented towards increasing the capacity to adapt; incorporate the artisanal fishermen and small-scale fishfarmers in the implementation processes and adopt good practices; and make people aware of the effects of climate change.

From the Administration's point of view, do you consider that there is the appropriate degree of scientific knowledge available?

Yes, I think so, at least to be able to deal with the adaptation processes.

Chile has generated policies and plans on climate change, both at national and sectorial levels, that have made it possible to identify the needs for knowledge and, with that, to orientate research in order to respond to the needs for information and knowledge that we have today.

But however, it is clear that, for the time being, the knowledge mostly required and used are orientated towards sustaining, backing and/or supporting diverse actions involving implementing and applying good practices, aimed at increasing the capacity to adapt coastal communities.

Darío Alvites, director Fisheries, Direct Human Consumption (National Society of Industries of Peru)

"El Niño has led to radical changes in Peru in the marine ecosystem and migrations of fish resources to uncommon grounds for the fleet"

What are the main functions and objectives of the Direct Human Consumption Committee and, specifically, of the Fisheries and Aquaculture Committee that you head at the National Industries Society?

The main functions are to represent the Direct Human Consumption industry of hydrobiological products from Peru to the Peruvian authorities as well as to authorities and associations overseas.

One of the most important objectives is to contribute to overcoming drawbacks and obstacles for the industry, promoting the sustainability of fisheries resources to be able to have raw material in our plants on an ongoing basis.

What is your view of the effects of climate change on the main fisheries off Peru?

My view is that we are moving into an age of change where the historical patterns of the past century are no longer happening in the Pacific Ocean.

In Peru, we are having recurrences of El Niño, which lead to changes in the marine ecosystems in a radical way, and that is giving rise to the lack or abundance of fisheries resources where they migrate to uncommon grounds for Peru´s artisanal fleet, which is what supplies our plants.

What about the activity of companies in the sector in Peru?

As there is no raw material available on an ongoing basis or due to being located in grounds far in the north of Peru, which is where most of the plants are, the industry is having ups and downs in the supply of raw material and, depending on how each plant reacts to this circumstance, this lack is being met to a lesser or greater extent.

What is your evaluation of the effects of El Niño on Peru's fisheries in the first half of this year, and what are the expectations for the second half?

At the start of this year, we had the final stage of El Niño, which has had an impact on the Pacific for over two years, from September/October 2014 to early 2017.

On the one hand, it affected roads in the north of the country, but its effects also reached as far as Lima. As regards the fisheries, the impact of El Niño was significant as it affected the geographic distribution of stocks of small anchovy, giant squid and led to the lack of squid. Temperatures were so high that it also impacted on farmed scallop.

But however, other species were favoured by the climatic conditions due to El Niño, such as octopus or eel, the latter to a lesser extent.

What about the effects of El Niño on giant squid?

Sad to say that the natural grounds for giant squid off Peru, which are in the north of country, were affected, although that is something that we have been noticing since last year when catches were very low and in the south, with a lack of catches in the north.

This has led some companies in the north of the country to move raw material by road from the south.

As regards the evolution of catches this year, in May and June, catches improved but in August they were very low, and

September did not start off well.

Do you consider that climate change is on the agenda for Peruvian companies in the fishing sector?

Some companies have initially dealt with this as a kind of reaction in view of the need to carry on producing in a situation of scarce raw material.

Plants have opted not only for diversifying their products, but also for giving more added value to the products they usually work with as a reaction to the lack of raw material.

This is something that is happening not only in some of the plants because others are being very much affected by the lack of raw material, and are even stopping and turning to other plants to process maquila.

What role do you think companies in the fisheries sector can play in the objective of combating the effects of climate change?

Us industries are a very important link in the production chain, either directly for having a catch concession for extracting resources, or indirectly by purchasing raw material from third parties.

We put pressure on the demand for fisheries resources, so that we as the National Industries Society and specifically, as the Committee on Direct Human Consumption, are forced to ensure that fisheries resources are sustainable.

In the case of giant squid, where I head a Working Committee in the SNI, we are focusing on sustainability and working a good deal on putting the fleet in order, aiming to see that the catching sector and the authorities can reach agreements in the search for solutions as well as working with SFP, with which we have signed a FIP (Fisheries Improvement Project).

We are very involved in achieving an adequate evaluation of giant squid in our waters, so that it is possible to catch on a sustainable basis and be able to have a constant supply of raw material in our plants.

The sustainability of the resource is the sustainability of catches and of our companies.
In this regard, we are also involved with other species such as hake, eel, mahi-mahi, small anchovy and tuna.

We are fully committed to being able to have raw material on a sustainable basis and not have bread for today and hunger for tomorrow.

In your opinion, should there be joint work and collaboration between governments, scientists and stakeholders on climate change and fisheries?

Yes, of course. At the FAO-Conxemar Congress, where I shall be taking part as a speaker representing the SNI, we will be able to see that we are directly involved in this task, not only in expressing an opinion, but also in participating in all the activities being organized in our country on climate change.

What is your opinion of the position taken by some NGOs on climate change in general and its effects on fisheries in particular?

The important thing, beyond any stances taken, is for us to realized that all the bodies involved, from scientists to governments, the industry, marketers and retailers, we are on the one same side.

There should not be differences of opinion, but rather consensus in order to reach objectives. Firstly, that the fisheries are sustainable. Secondly, manage to maximize the benefits and, thirdly, stand up for our fisheries resources from fleets, sometimes foreign, that only come to decrease our resources.

Finally, we should achieve a fair price for our products and look into the impact that climate change is having on fishing communities.

Madoda Khumalo, Strategic Services Executive, Sea Harvest (South Africa)

"There are changes in the ecosystems in South Africa which could potentially affect fisheries in the country in the long term"

What is your view on the effects of climate change on the main fisheries in South Africa?

My overarching view is that it's still too early to tell and differentiate between the effects of climate change and the impact of fish mortality due to fishing. What is currently happening is that there are changes in the current atmospheric conditions which drive the ecosystems in South Africa and this should follow a predicted path and alter the current ecosystem which in turn could potentially affect fisheries in the country in the long term.

And what about its effects on the activity of the companies of the sector?

The current effects on the companies in the sector with changes linked exclusively to climate change are still at their infancy stage and more research is required to establish whether the effects are primarily driven by climate change or other forces.

However that withstanding due to the nature of a large number of species in the region there is inherent variability in their life cycles and spatial distribution, and these are currently very different depending on the target stock.

Do you consider that climate change is on the agenda of fisheries companies in South Africa?

Yes it is. The sustainability of the industries is dependent on 1) companies' being responsible and cognizant of their effects on the ecosystem through fishing practices and thus limiting them and ensuring that scientific research is at the forefront of what is extracted from the ocean and 2) what the potential impact climate change would be on operations.

Therefore companies are looking short and long-term at these two topics with a look at ensuring that scientific research is extended and/or maintained to attain a greater understanding of the ecosystem and adapt to the changes required should climate change effects become pronounced

What do you consider to be the main challenges to combat the effects of climate change on fisheries?

The main challenge is to ensure that fish mortality due to fishing practices is limited and doesn't lead to overfishing. The current regulatory framework in the country does cover this however the processes will need to evolve to take into consideration the effects of climate change on fisheries.

Which role do you think seafood companies should play in this regard?

I think seafood companies should ensure that they are fishing sustainably and support plans which address the potential climate change effects. Fishing mortality will remain the most important and effective lever which can be pulled to limit the effect of climate change on fisheries and seafood operators are at the forefront of this.

In your opinion, should there be joint work and cooperation between governments, scientists and stakeholders on climate change and fisheries?

Yes there should be. All stakeholders in the sector have a part to play to ensure that the impact of climate change on fisheries is limited through adaptation techniques.

What is your opinion about the position of some NGOs on climate change in general and its impact on fisheries in particular?

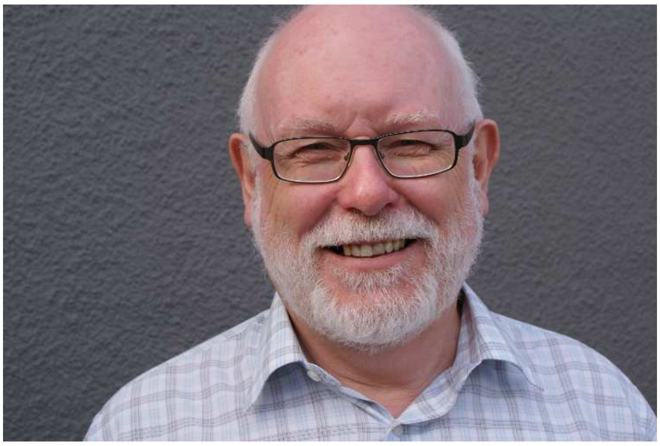
I don't have an opinion on their positions. However I know that NGOs and fishing companies primarily in the commercial sector in the country are aligned on that sustainability practices should be the overarching mandate in fisheries, and that the adaptation to climate change will go hand-in-hand with these practices.

What is your forward-looking view of the effects of climate change on fisheries in South Africa and the country's fisheries sector?

It is too soon to tell what and how exactly the effects of climate change on fisheries in South Africa will manifest themselves. There is currently a lot of work being done in the scientific research community in the country when it comes to investigating potential climate change signals. Good data has come out when looking at the abiotic and biotic signals in South Africa's waters, however further research is required in order to increase the accuracy of the modeled information on the effect of climate change.

Alastair Macfarlane, Executive Secretary, International Coalition of Fisheries Associations (ICFA)

"New Zealand companies are aware of the changes experienced in other fisheries and are remaining vigilant"



Tell us about ICFA, its evolution, objectives and sectors that it represents.

ICFA was formed over thirty years ago between the national level fisheries industry organizations in USA, Canada, Japan and the then USSR to enable more productive industry to industry dialogue on fisheries matters in the north Pacific and north Atlantic.

It has evolved over the years to now becoming a legally constituted, not-for-profit entity in the USA with fourteen members representing at a national level the fisheries sectors of the USA, Canada, Iceland, Norway, Denmark, Netherlands, UK, France, Spain, Japan, Taiwan, Peru, Australia and New Zealand.

ICFA provides a forum for discussion for its members and from that a capacity to engage with the FAO and other United Nations related organizations with an interest and capacity in oceans and fisheries policy. ICFA is the only international non-government organization that specifically represents a voice for the commercial seafood sector in the UN fora.

What is your view on the effects of climate change on the main fisheries in New Zealand?

New Zealand is the exact antipodes of Spain but is very isolated in the South Pacific. It is a long archipelago stretching from the sub-tropics to the sub-Antarctic.

The coastal fisheries are temperate with a similar biodiversity to the Mediterranean, while the oceanic fisheries are in very deep water by European standards and are sub-Antarctic in character.

New Zealand has a short history of significant commercial fishing and lacks a long baseline of experience to accurately judge the impacts of climate change. There are limited indications of southward drift (towards colder Antarctic waters fed by the sub-Antarctic current.

The east Australian current that flows from tropical north-east Australia to the south of that continent has been identified as a reason for the appearance of some more tropical species in the southern waters of Australia.

That current has a branch that takes water across the Tasman Sea to north of New Zealand and down the east coast but there is little evidence that it is having a the same impact on New Zealand fisheries as it is having in Australia.

The New Zealand coastal fisheries seem to be affected more noticeably by the El Nino/La Nina southern oscillation cycle and by the major Pacific wide inter-decadal oscillation that affect Pacific oceanic conditions on a 10 to 20 year cycle.

What about its effects on the activity of the companies in the sector?

As I said earlier, the large scale commercial fishing industry is a relatively new phenomenon that has developed over the last fifty years. A history of over-exploitation in the early years led to the introduction of the Individual, Transferable Quota Management System thirty years ago.

The ITQ system is based on individual tradeable property rights in fish quota and has led companies to value their quota shares as a form of permanent property to be managed and looked after.

The deepwater orange roughy fishery, for example, suffered over-exploitation in the late 1980s to early 1990s that has meant that New Zealand companies have a conservative attitude to the capacity of the fisheries resources.

It is unclear to what extent climate change has affected New Zealand fish stocks, but the evidence of over exploitation coincided with a significant shift in the inter-decadal Pacific climate oscillation from positive to negative. It is likely that the negative phase is now ending (signaled by the major El-Nino event over

2015/2016) and the oscillation is expected to turn positive again. That may bring more oceanic dynamism with more frequent upwellings of nutrient-rich water and lead to some climatically-led improvement in stock abundance.

The variations in abundance have encouraged commercial fishing operators to support conservative quota levels in order to ensure that stock abundance is safeguarded.

Do you consider climate change is on the agenda of New Zealand fisheries companies?

New Zealand companies are aware of the changes that are being experienced in other fisheries, notably in Australia, and are remaining vigilant for signs of similar changes affecting their fisheries in New Zealand.

In the meantime, New Zealand's experience of fluctuation is stock abundance over the last thirty or more years has led companies to support conservative management settings.

And on the agenda of governments of countries with specific weight in fisheries?

I think that climate change effects on fisheries is not getting the same level of government attention round the world as the effects of climate change on land based food production. This may be because the effects can be difficult to identify among other signs of changes in fish stocks.

It also may reflect the poor to absent state of fisheries management in some parts of the world, especially is places where fisheries contribute most to alleviating poverty and hunger and where some of worst impacts of climate change on fisheries are anticipated.

Governments need to be aware of the potential for shifts in stock abundance which may affect different parts of the world and change assumptions of where fish stocks are likely to be found.

The experience of the westward movement of mackerel stocks in the north Atlantic early this century is one example.

What role do you consider seafood companies should play in combating the effects of climate change on fisheries?

This is a difficult question. It is likely that the seafood sector is making only a minor contribution to human-induced climate change. The greenhouse gas contribution from fishing, based on the protein produced, is much less than the contribution from agriculture, especially agriculture that produces animal protein such as beef.

The seafood sector is more likely to be affected by climate change than the sector is likely to be a contributor.

Seafood companies need to be aware that commercial pressure to over exploit fisheries resources will make the resources more vulnerable to external shocks. On the other hand, there are likely to be parts of the world where climate change will encourage greater stock abundance and provide some businesses with new opportunities.

In your opinion, should there be a cooperation between governments, scientists and stakeholders on climate change and fisheries?

Of course there should be cooperation. Climate change is a new and little understood phenomenon. There is a lot of speculation by climate scientists as to what the future changes might be. There is a need for cooperation among all parties to ensure that the productive sectors, including fisheries, can manage negative impacts and also make best sustainable use of any benefits that might arise from climate change.

What do you consider to be the main challenges to combat the effects of climate change on fisheries?

I think the main challenges are finding and maintaining consensus on ensuring that fish stocks are managed conservatively with a recognition of their importance for future generations, as well as for people today.

Conservative management will assist stocks to remain resilient in the face of negative changes. Where climate change brings benefits – and for some there will be benefits – conservation will still remain a key element for sustainable management.

.

Myron Peck, Myron Peck, Professor Biological Oceanography and Fisheries Science, **Hamburg University**

"The areas where the fish stocks are captured could be very different 25 years from now"

Which projects on climate change and fisheries developed by your department would you highlight?

CERES is an EU Blue Growth (H2020) program (2016 to 2020) that I coordinate at the University of Hamburg. There are 26 partners from 12 nations including 7 industry members. The project provides projections of the effects of climate change on key European fisheries and aquaculture targets (fish and shellfish) and is designed to help the aquaculture and fisheries sectors understand the risks and potential opportunity of climate change.

What is your view on the effects of climate change on the major fisheries under investigation that you develop?

Climate change is associated with important shifts in the distribution and changes in the productivity of commercially important stocks of groundfish and pelagics within the NE Atlantic and adjacent seas. Some important examples include shifts in the distribution of Atlantic cod and mackerel and the increase in squid and seabass. In terms of fishery resources, there will be winners and losers and climate change will have direct and indirect effects. New species that enter areas will have low TACs and, because of the landings obligation, could pose a threat to fishing as "choke species". An example of this is hake entering the North Sea.

What do you consider to be the main challenges now and in the future to combat the effects of climate change on fisheries?

The fishing industry as well as regional fisheries management will need to adapt to the projected impacts of climate change on fish stocks. Scientific advice provided to management needs to use a greater range of tools, some of which will incorporate potential climate effects. It is critical that fish stocks are managed in a healthy and sustainable way (now).

A healthy fish stock is likely to be less impacted by climate change (in the future) as opposed to an over-exploited stock. Adaptation measures of fisheries may include being prepared to change target species (changes in gear and/or vessels).

And what about the challenges for the scientific community in this task?

The develop tools incorporating both the biological and economic impacts of climate change on fish stocks and to provide results most relevant for both the industry and policy makers.

Scientists need to better communicate how climate change will have relevant impacts to fisheries. This is challenging because of the inherent uncertainty in predicting the future and the fact that the information needed by industry and management tends to be at a shorter time scale (e.g. 1 to 3 years into the future) compared to projections of climate change effects (10, 20 to 50 years into the future).

Scientists have started to provide shorter-term projections of climate-driven changes in ocean habitats (e.g. temperatures of specific areas in 1 to 3 years) and need to continue to advance these tools.

Do you consider that the Administration is taking into account scientific knowledge in due measure?

Yes and no. EU projects are being funded to advance tools and provide the science needed to understand climate impacts on fisheries. Moreover, there has been a recent upsurge in activity from the European Commission in that they have specifically requesting information on the effects of climate change on the distribution of NE Atlantic fish stocks.

This is partially in response to other political challenges such as Brexit. On the other hand, Europe's annual TACs for most stocks are still obtained using science advice on MSY generated from single species stock assessment models.

A variety of other tools exist that could also be employed to provide a context of future changes due to climate.

In your opinion, should there be joint work and cooperation between governments, scientists and stakeholders on climate change and fisheries?

I already see a lot of joint activities in Europe but more of this is needed. My role as a coordinator of international projects working on climate impacts on fish and fisheries is to foster this cooperation.

A very important element will be to enlist the help of the industry in these activities. Industry's resources can be used extremely effectively to understand climate impacts on their resource.

For example, fisheries sampling can augment traditional surveys of fish to better understand and predict spatial shifts in distribution. Some of this is already underway.

At the same time, industry needs to understand the benefit of working on issues of climate change (e.g. how future changes in storminess or stocks in mixed fisheries will impact their operations) with scientists and the government.

Tight cooperation will be needed to create climate-ready policies for the management of sustainable fisheries.

Do you consider that climate change is properly placed on the agenda of major fishing countries?

Within the EU, yes. Although it is not "front and center", climate change is certainly on the agenda of the EU Commission and, as I mentioned above, they are taking steps to receive advice from their funded research projects (CERES, ClimeFish) as well as their research arm (JRC) on climate change impacts.

Recent political decisions have also forced the EU (and their relative stability national allocation keys) and other countries fishing in NE Atlantic waters (Norway, Iceland, Faroe Islands) to carefully examine how climate change may impact on the distribution and productivity of their historical fishery resources.

What is your view on the position of some NGOs on the effects of climate change in general and on fisheries in particular?

This depends to a great extent on the NGO. Most active NGOs in European fisheries are developing positions on climate change in preparation for the next revision of the CFP.

Some NGO's have a mission to work more hand-in-hand with industry (e.g. EDF) which, personally, I feel is very positive. It is important that NGO's review the information on the negative (as well as the potentially positive) effects of climate change on fisheries resources.

They are actively seeking the advice of climate experts (I recently attended PEW and EDF workshops to provide information on climate change impacts on fisheries).

What is your vision of the future effects of climate change on fisheries?

It is difficult to predict the exact response of stocks but general trends are clear. Some temperate and sub-polar regions will see increasing catch potential as fish stocks shift to higher latitudes (to follow the same water temperature) while some stocks will leave tropical areas and not be replaced by new ones (leading to great reductions in catches).

Fishing operations will need to change - the stocks of fish captured in areas now could be very different 25 years from now, particularly if we stay on the current (high) trajectory of ocean warming.

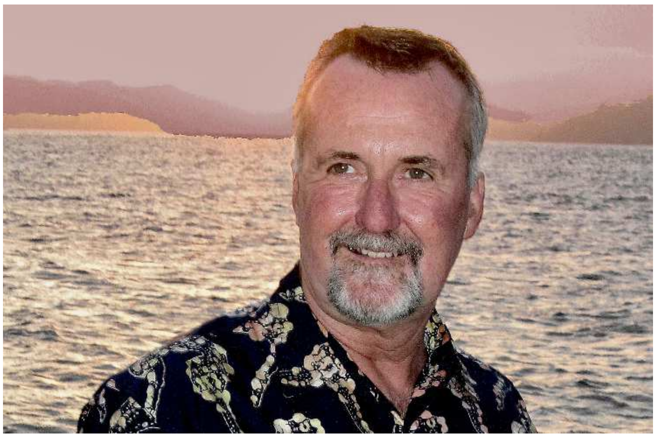
A large unknown is how much fish stocks might be impacted by decreasing ocean pH (a second consequence of increasing carbon dioxide to the world's ocean).

Research on how ocean warming and decreased pH influence fish has reported many, different results. In terms of policy, more flexible arrangements will be needed between nations to cope with shifts in trans-boundary stocks.

Given ongoing efforts by climate / fisheries scientists, I envision more robust projections will available in the future which include both the risks and opportunities for the industry in European waters and elsewhere.

Steve Gaines, Bren & Distinguished Professor at Bren School of Environmental Science and Management, **Santa Barbara University (USA)**

"Climate impacts are still viewed as primarily a future concern in management rather than a driver of many actions today"



What role should fisheries management play in combating the effects of climate change on fishery resources?

The key role for management is to ideally lessen the looming impacts of climate change. On the one hand this could happen through management practices that are adaptive to climate driven demographic changes – for example harvest control rules that are responsive to climate variability even when we cannot forecast the changes that are coming.

On the other hand, one of the easiest ways to offset future negative climate impacts is to increase the range of fisheries globally that are well managed today. The upside from fixing current management shortfalls is often greater than the projected future declines from climate change.

What do you think are the main challenges for governments in the complex objective of combating the effects of climate change on fisheries?

I see the biggest long term challenge of the future impacts of climate change from the movement of fish stocks across management boundaries. Both the looming departure of a stock from an area and the arrival of a new stock into an area create serious management challenges.

The former has to counter incentives to overharvest while the stock is still in your region. The latter has to counter the lack of management for new stocks.

Given that most global fisheries will cross at least one international border in this century, and many stocks will cross multiple boundaries, these transboundary challenges are daunting.

Even stocks that are very well managed today will face serious pressures for overharvesting in the absence of new and effective transboundary institutions.

Which are the main challenges for the scientific community in this area?

Better forecasts of movements of stocks clearly would help nations anticipate looming problems and potentially meet the challenges with new agreements prior to their arrival or departure.

They also allow for managers to make adaptive decisions before impacts rather than after they have occurred. For example, better forecasts on climate driven interannual dynamics could enhance stock management by anticipating stock demographic changes far before they can be measured in the field.

In addition, I think it is just as important for science to explore management strategies that will be robust to future movements of stocks.

For example, rights based systems allocating quotas to vessels have had success in shifting incentives to longer time scales, thereby reduce incentives to overharvest.

Yet, this same management design coupled with a looming loss of a stock to another country magnifies the incentives to overharvest before the stock leaves.

How can we modify the institutional rules governing such individual quota systems to alter these dynamics in ways that do not magnify the negative effects of climate change?

What do you think are the main effects that are occurring in the marine environment and also in the behavior of fish stocks due to climate change?

Changing temperatures, salinities, currents, pH and a myriad of other characteristics relevant to marine species are increasingly being linked to climate drivers. Fish stocks have clearly responded in both their local demographics and geographic distributions in response to shifting climate. The complexities of these responses can be immense, which creates an important need for continued scientific advances.

Do you consider that the Administration is taking into account scientific knowledge in due measure?
I think that scientific knowledge on climate impacts is on the cusp of being very useful to enhance fisheries management actions. The time for better integration is now.

Do you consider that climate change is properly placed on the agenda of the major fishing countries?
Not yet, outside of growing responses to sources of interannual fluctuations such as ENSO and NAO events, climate impacts on fisheries are still viewed as primarily a future concern in management rather than a driver of many actions today.

In your opinion, should there be joint work and multilateral cooperation between governments, scientists and stakeholders on climate change and fisheries?
Absolutely. These issues are complex and multidisciplinary. In addition, options for addressing the changes have both biological and social consequences. Joint work is key to making robust decisions and to learn from successes and failures in other settings around the globe.

What is your opinion about the position of some NGOs on climate change in general and its impact on fisheries in particular?
NGOs have clearly had a strong global interest in issues broadly related to climate change and it impacts, including on fisheries.

In the marine realm, however, with some noteworthy exceptions, most of the NGO attention on climate change and fisheries has focused on this challenge as a motivation for either climate change mitigation or new marine protected areas as a conservation hedge.

There is growing interest among a subset of NGOs on climate adaptation and resilience through new management approaches and institutions that explicitly take climate change into account.

María José Cornax, Policy and Advocacy Director of Oceana

"It is the responsibility of the Administrations to guarantee that our maritime heritage continues for future generations"

What do you think are the main effects occurring in the marine environment and in the behaviour of fish stocks due to climate change?
Clearly, we are living through unprecedented changes in the marine environment that have a direct impact on our fisheries. From alterations in water temperatures, changes in the migratory routes of some species, to the proliferation of invasive species. All this has an impact on fishing activity.

What we are seeing today is only a lead-up to what is in the pipeline since the effects of the emissions that we produce today will not be seen until a few decades' time.

As a scientist, I dare to venture what is coming since there are no specific data on this. But under no circumstance can the prognostic be favourable. We need to be ready.

What do you consider to be the main challenges for combating its effects on fisheries?
The main challenge is to make aware the industry, administration, scientists and the NGOs as to what is happening in general. We can't draft prevention measures for the impacts on the sector if there is still disbelief as regards the effects of climate change.

Conversely, the industry too has a contribution to make to this phenomenon beyond the efficiency of engines and their emissions, for instance.

In general terms, the main challenge is to understand that we have to increase the resilience of our seas to ride out the impacts of climate change. And such a basic principle as this has still not been understood by industry or the administrations.

Do you consider that climate change is duly positioned on the agenda of countries with a specific weight in fishing?
No, not at all. We still have a production-orientated, encapsulated view of fisheries management. To illustrate this, the ecosystemic approach appears in our fisheries policy since 2002. And quite sincerely, I have serious doubts as to if the European Administrations really know just what it is and, even less, as to how to translate it into measures.

A very clear example is fisheries overexploitation. The environmental ministries talk about climate change, but then these same ministries foster the overexploitation of a given species based on an indicator – maximum sustainable yield – which is none other than an economic model for production.

The impact that we are causing through overexploitation is bound to multiply the potential effects of climate change.

And what is on the fishing sector's agenda?
No. In most cases, archaic entrepreneurial models prevail and, at the most, it is considered that measures are taken because paper is being seen to be recycled in the offices.

Oceana has commissioned one of the best economic consultancy agencies worldwide to carry out a study on the economic potential of stock recovery. It's not us saying this, it's them.

Recovering fisheries stocks, the first step to increasing resilience in terms of climate change, in Europe, would generate an additional almost 5,000 million per annum in the GDP, apart from an unprecedented entrepreneurial benefit.

Being aware, sustainable, increasing resilience in terms of climate change, has its compensations at all levels. Continuing with today's dynamics is an error involving incalculable consequences. For everybody.

What is your view of the future of the effects of climate change on fisheries and the activity of the fishing sector?
It is essential to prioritize the resilience of the ecosystem, raise the value of fish products by increasing their market value in order to mitigate the possible impacts of making evaluations on the environmental impact on fisheries.

In short, the industry needs to become the model for the 21st century, not only on the grounds of the resilience of our seas as well as the industry's, but also for confronting other uses of the seas with a greater impact, such as extraction of oil and gas, or the increasing development of deep sea mining.

The latter cases pose a real threat, both for the fishing sector and for the environmental conservation of our oceans.

Which main management measures do you think should be implemented by the Administrations on this matter?
A long-term view is essential, as well as a commitment to sustainable management based on the ecosystemic approach.

So far, we only see cosmetic measures and the progress that we have noted is coming too slow to mitigate the swift deterioration of our seas. Furthermore, they usually use socio-economic impact to justify erroneous decisions when all the figures provided by international experts indicate that they are going in the opposite direction to long-term entrepreneurial development.

It is their responsibility to guarantee to people that our maritime heritage continues for future generations and our fishing sector, whose socio-cultural value and contribution to our society is undeniable, continues and grows.

Do you consider that governments are taking into account scientific knowledge in its just measure?
Of course not. That is definitely the major cause of the crossroads where we are today.

Decades of turning a blind eye to the science in fisheries management, with archaic exploitation models which, furthermore, have not taken the environment into account is what these vital dilemmas put on the table for us.

Turning to the Mediterranean and the status of its resources and the fishing sector, I think that any comment would be superfluous, even more so when taking into account that it is one of the regions in the world where, historically, there has been more scientific research.

In your opinion, should there be joint work, involving cooperation, between governments, scientists and stakeholders on climate change and fisheries?
Of course, and if, as stakeholders, we understand environmental organizations, all the more so. We are all finding it hard to have an overall view of what is going on and, therefore, we continue to have divergent positions. But never have everybody's objectives been more aligned.

There is a very clear example of how the supposed confrontation is not real. We consider that a round table between the sector and administration in terms of the possibility to open gas exploitation in a specific area. Better alliances will not be found in any other context.

Audun Lem, Deputy Director Policy and Resources Division **(FAO)**

"Most countries with a significant fisheries sector are already feeling the impact of climate change and have started implementing measures of adaptation"

What is your vision of the effects of climate change on the availability of raw material at the global level now and in the future?

We are just back from the FAO Sub-Committee on Fish Trade meeting in Busan in the Republic of Korea (September 4-8) where FAO Members for the first time discussed the impacts of climate change on fish trade. And it was clear from the many country interventions that this impact is being felt already, including in Europe for a number of small pelagic stocks.

This has also led to problems of fisheries management because of modifications in their distribution patterns. In the future it is highly likely that we will see more of this, certain areas will see inflows, but other areas could see a number of stocks migrate elsewhere. There will also be some impact for aquaculture but less than for capture fisheries.

And what about import / export trade globally?

Changes in migration patterns of fish stocks will impact catches and supply. And therefore also trade. And so will more extreme weather conditions. We have seen a number of recent cases where storms and floods have destroyed physical infrastructure, ports etc but also aquaculture farms through flooding. The biggest impact however is more likely to be on local food security than for the larger trade and product flows.

For developing countries which depend on exports of fish and fishery products for so much of their foreign earnings, even a moderate decline in trade could have very negative impacts on the national economy as well as on local livelihoods.

What do you consider to be the main changes arising from climate change that the fisheries sector and fishing communities will have to adapt to?

In addition to changes in migration patterns, new invasive species etc, the biggest impact is likely to be felt on the ground, especially by coastal populations whose livelihoods will suffer from more unstable weather conditions, more frequent storms, floods etc.

Unfortunately, many fishing communities suffer already from a number of structural weaknesses, lack of integration in the official economy and frequently also exclusion from national social protection programmes; this makes them more vulnerable to climate changes as well.

We will also see increasing problems related to salinization, pollution and eutrophication. And in inland aquaculture and inland fisheries we will see new challenges arising from modification of current water regimes.

All the more necessary therefore to implement sound and science-based management practices because healthy ecosystems that are able to respond and adapt to changes will be a prerequisite for long-term sustainability.

Adaptation will also mean large investments in infrastructure, in port facilities, in better and more robust equipment, boats, nets etc. Of course, with so many people active in the small-scale sector in developing countries, they are also the most vulnerable from such changes.

What initiatives led by FAO would you highlight in terms of adaptation to the effects of climate change, particularly in the fisheries sector?

FAO has a number of programmes and activities, addressing both specific issues in the fisheries sector but also more cross-cutting programmes, including on social protection aiming to mitigate the impact of climate change.

In the fisheries sector, we have projects in Chile, Viet Nam, Bangladesh, the

Caribbean and West Africa.

What is your vision of the effects of climate change on fisheries and the fisheries sector in developing and developed countries?

They will both be affected of course, the ones in tropical areas probably the most. Whereas developed countries in the northern hemisphere may actually experience some inflow of migrating stocks.

Adaptation and building of resilience will also necessitate large investments, and this will place an extra burden on developing countries who already suffer from a scarcity of capital.

Again, the most effective tool of mitigating adverse impacts is to have in place robust but flexible management systems for both fisheries and aquaculture; this holds for all countries with fisheries resources.

What do you consider to be the main current and future challenges for combating climate change in general and for fisheries in particular?

On the political level as well as in the general public, there is now much more awareness of the need for concerted action.

The Paris Climate Agreement in December 2015 was a milestone, although we know that implementation of the goals and objectives set by the countries will not be easy.

We also will need a lot more information and data about the ongoing changes in order to be able to address them properly and cost effectively prioritizing those actions where the cost-benefit ratio is higher.

Also the approval of the Sustainable Development Goals, where all countries have signed up to a number of specific targets to be implemented by 2030. For fisheries, there is the specific SDG 14 dealing with Oceans, but also several others are relevant for our sector.

In this context, it has been pointed out again and again, that the individual targets under SDG14 cannot be achieved without climate change adaptation.

On the whole, I am optimistic though, both the introduction of better and more climate smart technology as well as specific policies and incentives to deal with negative externalities or market failure, will lead to better outcomes and a reduction of those actions that have contributed to climate change.

Do you consider that climate change is on the agenda of countries with specific weight in fisheries?

I think that depends a bit on the country. Certainly, most countries with a significant fisheries sector are already feeling the impact and have started implementing measures of adaptation. And are trying to consider fisheries within overall climate change policies and programmes.

But I also think it is fair to say that this has highlighted the key function of flexible and robust science-based fisheries management as the main tool in coping with climate and environmental changes in the sector.

The 2017 Congress will be the sixth co-organized by FAO and Conxemar. What is your assessment of this joint collaboration?

The collaboration is excellent. The relationship has also evolved from the original concept of organizing joint commodity conferences to cover more crosscutting issues, such as the one this year on climate change.

I 'd also like to mention the great success of the 20 year Code of Conduct Anniversary Conference in 2015 and the fantastic support we have received from everyone involved, not just from CONXEMAR but from the City of Vigo, the Junta de Galicia and the Ministry in Madrid.

So Vigo has become a natural venue for a number of FAO activities related to fisheries. We are therefore excited about Spain's kind offer to host the next meeting of the FAO Sub-Committee on Fish Trade in Vigo in 2019, back-to-back with the CONXEMAR congress, and under its newly elected Chair, Aurora de Blas from Spain.

Ken Jhom, manager Blue Growth Division, African Development Bank (AFDB)

"Climate Change is a key development issue in Africa because of the continent's special vulnerabilities"

When the African Development Bank (AFDB) was stablished and which are its main lines of action and objectives?

The Agreement establishing the ADB was signed in Khartoum in 1963 and entered into force in 1964. The Bank officially began operations in 1967. Following an amendment to the Agreement in 1982, the capital of the ADB was opened up to non-regional countries.

The purpose of the African Development Bank Group4 – which comprises the African Development Bank (ADB), the African Development Fund (ADF) and the Nigeria Trust Fund (NTF) – is to promote the sustainable economic development and social progress of its regional member countries (RMCs).

To achieve this purpose, the Bank mobilizes resources for the financing of projects and programs; undertakes and participates in the selection, study and preparation of projects, enterprises and activities that contribute to such development; promotes investment of public and private capital in Africa; and provides technical assistance for the study, preparation, financing and execution of development projects and programs.

Tell us about the Blue Growth strategy that you run in the AFDB.

In 2016 the Bank adopted a new agriculture strategy (Feed Africa) with the main vision of transforming African Agriculture into a competitive and inclusive Agribusiness sector that creates wealth, improves lives, and secures the environment. Its main goals are: to contribute to the end of extreme poverty; to ontribute to the end of extreme poverty; to eliminate hunger and malnutrition; to become a net exporter of agricultural commodities and to move to the top of key agricultural value chains.

Blue economy is covered by one of major Feed Africa Strategy flagships. The overall of this Blue Economy Flagship is to implement Feed Africa strategy in Economic sectors using oceans and inland waters include fisheries, aquaculture, biotechnologies, and maritime security.

The specific objectives are to integrate the African costal countries and SIDS into global value chains, expand their access to markets and reduce vulnerability factors.

The programme will work across the spectrum of ocean/inland waters-related industries such as fisheries, aquaculture and coastal management. It is articulated around three major components: fish commodity Value chain development; coastal protection and Ecosystem services and program coordination, monitoring and evaluation.

The indicative cost of the program is around UA 1,136.20 million (170 million USD), of which the Bank will contribute UA 462.60 Million (69 million USD). This cost is part of the African Package for Climate-Resilient Ocean Economies for a total investment estimated at UA 2.5 billion (372 million USD), jointly prepared with the World Bank and FAO. The assistance provided by the 3 Agencies in each country is through new investments from their own resources as well as from the Green Climate Fund (GCF) and the Global Environment Facility (GEF).

What is your vision on the effects of climate change on fisheries and fisheries in Africa now and in the future?

Global climate change is impacting and will continue to impact marine and estuarine fish and fisheries in Africa. Projections of future conditions portend further impacts on the distribution and abundance of fishes associated with relatively small temperature changes.

Changing fish distributions and abundances will undoubtedly affect communities who harvest these stocks. Coastal-based harvesters (subsistence, commercial, recreational) may be impacted (negatively or positively) by changes in fish stocks due to climate change.

Furthermore, marine protected area boundaries, and disease incidence (in aquatic organisms and humans) are also affected by a relatively small increase in temperature and sea level.

It will also poses significant and long- term risks to fisheries in many tropical developing countries in general and Sub-Saharan African (SSA) countries in particular.

With mounting evidence of the impacts of climate variability and change on aquatic ecosystems, the resulting impacts on fisheries livelihoods are likely to be significant, but remain a neglected area in climate adaptation policy.

In your opinion, which are the main funding needs to combat the effects of climate change on fisheries and fisheries communities in Africa?

Adapting fisheries in Africa will require an important investment in some key areas including: adaptation to impacts of climate change on fishery hábitat; adaptation to direct impacts of climate change on fishery stocks; adaptation to impacts on fish stock availability; adaptation to impacts on the harvesting sector; adaptation to impacts on fishing communities and shore-based facilities; development of Aquaculture.

Does the AFDB have any estimates of those funds needed?

No. We don't have global estimations of the funds needed, but the Bank will invest during the next five years UA 1.1 Billion to support Blue Economy in Africa and will continue to work on mobilizing more resources for a sustainable and resilient transformation of Blue economy in Africa.

What is your vision on the impact of climate change in Africa compared to other regions of the planet?

Climate Change is a key development issue in Africa because of the continent's special vulnerabilities.

These include the continent's natural fragility (two-thirds of the surface area is desert or dryland), significant and fragile terrestrial and coastal ecosystems, and high exposure to natural disasters (especially droughts and floods), which are forecast to increase and intensify as climate change progresses.

If nothing is done, the potential impacts of such changes are two-fold: African economies and communities are likely to be severely impacted because of projected increases in extreme weather events, reduced crop yields and livestock productivity, drinking water shortages, reduced potential for hydroelectricity, spread of diseases such as malaria, potential migration and social strife, increased cost of infrastructure maintenance and development, and increased pressure on service delivery and fiscal resources.

The productivity of the natural resource base is likely to decline as a result of watershed erosion, loss of soil productivity, loss of woodlands and forests, desertification, coastal erosion, and loss of aquatic and terrestrial biodiversity with consequent effects on agriculture, forestry, and water resource-based economic activities, fisheries, urban and coastal infrastructure, and tourism.

The AFDB implemented the African Climate Change Fund (ACCF) in 2014. What is this fund about and which part is contemplated for fisheries and the fishing sector?

In an effort to mobilize more resources, the Bank created the African Climate Change Fund (ACCF). The goal of the ACCF is to scale up the climate change activities in the Bank's RMCs, hereby supporting the latter in their transition to climate resilient and low carbon development by increasing the mobilization of international climate finance.

The scope of the ACCF is broad enough to allow for a variety of activities that RMCs need for this critical transition, with the aim of generating transformational change in the medium to long term.

The objectives of the ACCF include helping RMCs prepare to access greater amounts of climate finance , support them in using the funds received more efficiently and effectively and support them in tracking the climate finance flows from which they benefit; through upstream diagnostics and technical assistance, helping RMCs systematically address climate change in their strategies and policies that seek to promote low carbon development, resource use efficiency and resilience building; helping RMCs develop climate resilient and low carbon investment plans and projects; co-financing climate resilient and low carbon projects and programs; gathering, consolidating, analyzing and disseminating information and knowledge on climate resilient and low carbon development; providing capacity building to RMCs and national and regional stakeholders for climate change and green growth;helping RMCs prepare for and contribute with strong arguments to the Conferences of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC); and contributing to the implementation of the Bank's CCAP.

This fund was established with an initial untied contribution of 4.725 million euros from Germany; it is bilateral thematic trust fund but was created with a long term objective to transform it into a multi-donor trust fund.

But now others donors have joined and contributed later to the fund which totalized at this moment more than 11 million euros.

This Fund supports Blue economy in particular for policies and institutional establishment and to develop a portfolio of bankable projects for climate finance mobilization.

.

Arni M. Mathiesen, Assistant Director-General of the Fisheries and Aquaculture Department, FAO

"The response to climate change has to be through adaptation"

What is your vision on the effects of climate change in fisheries at a global level?

The expectation is that climate change will have a limited impact on the productivity of fisheries globally, but a very significant impact at regional and local level. For as long as the Earth turns and the sun shines production in oceans and seas will continue, but where the production occurs will change. In addition, we expect some species – especially those with a capacity to move – to change their distributional ranges, and potentially their seasonality (for example reproducing earlier than currently as a result of a warming ocean).

Some of these effects, by the way, are already observed. For example changes in the distribution and productivity of Atlantic mackerel. They are not expectations but realities.

Which are in your opinion the main challenges to mitigate those effects?

The response to these changes has to be through adaptation. The areas of adaptation are multiple but I would group them in three types: a) Institutional/ Governance, b) Livelihoods and c) Resilience and Risk management. Each adaptation type carries many challenges: how do you reform institutions to take account of the fact that resources may cross boundaries over time, such as the challenges between the EU and Iceland over mackerel? How do you provide alternative livelihoods for ocean-dependent communities who may see their resource "move away"? How do you climate-proof infrastructure to the unidirectional changes caused by sea level rise? How do you coordinate such adaptations with neighbouring countries so that problems are addressed in a coordinated manner rather than transferred to a neighbour? These examples give you a flavour of the challenges we face.

What FAO projects and initiatives on climate change and fisheries would you highlight?

FAO has fieldwork activity in the Caribbean, in South America, in the Pacific and African SIDS, in southern Africa, in Bangladesh, and in other areas, focusing on developing adaptation plans along the lines listed above.

We also work with countries in ensuring they include fisheries and aquaculture in their National Determined Contributions (NDCs), which are the mechanism through which countries fulfil their pledges to the Paris Agreement in fighting climate change, and work with particular countries in raising funds through the Green Climate Fund for adaptation work.

On a normative framework, we are currently preparing a Technical paper to project the impacts of climate change on fisheries (marine and inland) and aquaculture, globally, regionally and nationally, and to present a series of adaptation toolboxes for countries to guide their response to the challenge of climate change.

We also work across Departments because many of the solutions involve coordination across food systems and habitats. For example, inland fisheries are very much affected by availability and competition for precious water resources. You cannot make adaptation plans that do not consider the expectations in the agriculture sector.

What is the role FAO is playing with regards to climate change in general and in fisheries in particular?

The role we play with regards to climate change and fisheries is explained above. In a more general framework I would add that we work with the UNFCCC by contributing and reviewing the IPCC reports that have a focus on oceans, seas, coasts and their resources, as we are one of the main UN technical agencies on these matters.

In particular, we lead the international community through the annual UNFCCC Conference of Parties, by being the main coordinators of the "Oceans Action Agenda".

This agenda guides the international community in

Tomás Gerpe, Subsecretary of Fisheries of **Argentina** and Chairman of **Mar Argentino**

"The red shrimp season is going very well, with 150,000 tonnes landed up to September"

What is your take on the close relationship linking Argentina with Spain?
This link has been very relevant in developing the Argentinean fishery. We linked up well in the mid 1990s and that continues to date.

Spain, and Italy to a lesser extent, have acted as a doorway for Argentinean products accessing the community market. Spain is also an important investor and developer of the red shrimp fishery in Patagonia.

What do you consider that the Conxemar Exhibition means for Argentinean companies?
The Conxemar Exhibition has always been extremely important for Argentinean exporters, in some cases because the parent company is in Spain, and some in Vigo.

Another reason is that it has always been an exhibition that generates new trade links. Over the past few years, it coincides with the end of the red shrimp season.

It is one of the most relevant exhibitions on the trade calendar. While red shrimp is the leading marketed species, illex and hake are important species too.
Trade agreements are signed at the exhibition for

the current fishing season, but there is also an outlook for future seasons.

What is your evaluation of the 2017 red shrimp season?
So far it's very good. By early September, around 150,000 tonnes had already been landed, coming not only from freezers but also from the rest of the fleet.

Freezer outriggers are keeping up their leadership in terms of catches, with about 70,000 tonnes by early September.

Good catch turnovers are continuing, especially for sizes L1 and L2, especially right now. With the presence of INIDEP observers monitoring the fleet, the catch situation and interaction with other fisheries is carried out in real time. The contribution from scientists comes mainly from outrigger freezer ships.

What about the demand on the main markets?
In the first half of the year, we haven't seen any great variations in the destination markets for Argentinean products, although there certainly is an increase in the volumes exported to China, Brazil, Italy, Thailand and South Korea. Markets such as U.S.A. grew in terms of values and volumes. On the other hand, exports to the Spanish market fell in volume and in value.

What is your view of the current and future position of China as importer of Argentinean fish products as opposed to the European market in general and the Spanish in particular?
China will carry on growing and will probably have a greater relevance in Argentinean exports, not only in fish and seafood, but also in other proteins from animal products.

In the short and medium term, I see possibilities for diversifying markets, with some degree of shifting volumes to Asia. Today, growth in red prawn seems to be very focused, but other species are not showing the same level of growth (fish and illex).

It would be interesting if the EU did not apply a scale of tariffs for shelf products. An ambitious, broad-based agreement between the EU and MERCOSUR could improve the performance of Argentinean products on the European market. Work is underway on agreements with Mexico and to make it possible to open up a larger number of premises for Russia. Work is also in progress to lift the precautionary measure blocking exports of red shrimp to Brazil.

What are the expectations for the next illex fishing season and when is it expected to start?
There is still no opening date for the campaign. What happened in 2016 could be repeated,

according to the analysis in the technical reports by the INIDEP, the CFP's scientific advisory body. This body is working in follow-up commissions that include the illex sector, and their suggestions and/or requests are presented to the CFP.

What is your opinion of the recent acquisitions made by Chinese companies of Argentinean concerns? Do you think that this trend will continue in the future?

Foreign investments are positive whenever they generate internal wealth for the country. We have already had waves of foreign investment from other sources in the history of the fishing industry in Argentina.

As far as the fisheries administration is concerned, the important thing is to ensure the ecosystemic sustainability of the resources, employment and companies; and in this regard, they must play by the same rules since, in order to operate as shipowners in Argentina, they must do so as a local corporate body.

What about these companies' competitive leverage as they can export to China with zero customs duties from source as they have capital in Argentinean companies?

We have put this forward through several channels to the PR of China authorities. We understand that as there is no written regulation that they can apply, the product is being discriminated against by the company selling it, leading to unfair competition for the rest of our companies.

We are continuing with discussions with the Chinese authorities to clear up these "grey areas" in marketing products. The only solution is to keep on discussing.

The Federal Fisheries Council promotes the "Mar Argentino" brand to identify Argentinean fish products. Are steps being taken to make this become a public sustainability certificate recognised internationally?

Work is underway on that. We are seeking to

The FAO-Conxemar 2017 Congress will focus on the effects of climate change in fisheries. What is your view on this and, more specifically, in the case of Argentina's fisheries?

This theme is on the national agenda. The INIDEP in conjunction with other scientific bodies are starting to work on the "climate change and its effects" agenda. There is a programme called Pampa Azul where one of the strategic analytical issues is Climate Change. All the information that will be generated and will improve our knowledge of fisheries from the ecosystemic approach will lead us to draft better public policies.

Alejandro Daly, Manager of the **Sociedad Nacional de Industrias (National Industries Society) (SNI) of Perú**

"Giant squid exports from Peru increased by 81% in volume between January and July of this year"

How do you see the participation of the National Industries Society in the last edition of the Conxemar Exhibition, and what are the expectations for this year?

Our participation in the 2016 edition of the Conxemar Exhibition drew together 4 companies, which had the opportunity to exhibit the variety and quality of products offered by our country to their visitors, products from Peruvian waters – one of the richest and most diverse in the world.

In 2017, 6 companies will be taking part, which shows the growing interest of Peru's National Industries Society in being at this event.

What do you think that the Conxemar Exhibition means for Peruvian companies in the sector?

The International Frozen Sea Products Exhibition – Conxemar – is recognized internationally by the processing and marketing sector of sea products, and is considered to be one of the most important in the field of frozen foods.

Companies extend their contact networks, consolidating and launching business with buyers from all parts of the world, in a specially congenial atmosphere. This is why I consider it to be a privilege for any company to take part in this exhibition, which is a showcase to the world and an opportunity for economic development for these and, especially, for Peru.

What is your evaluation of the giant squid campaign in 2017 in terms of catches and availability of raw material for the processing industry?

As is known, giant squid is the second hydrobiological resource in Peru, after small anchovy, and is the main export source for human consumption. 2017 points to an important recovery relative to 2016, which is echoed in increased exports.

What about giant squid exports and demand on the main destination markets?

As regards giant squid exports, the volume has increased by 81% in the period January-July this year at national level.

Today, there is a substantial demand for giant squid and buyers are gradually accepting the increased sales prices in view of the current scarcity.

What have been the effects of El Niño this year in Peruvian waters, and what is the outlook for the last quarter of this year?

Estimates point to a loss of 80% in scallop farming since they reproduce in cold waters.

Likewise, the catch volume for giant squid has been affected by high temperatures causing the migration of this fish resource.

As a result, fishing time was longer and irregular, because fishermen couldn't find the catch area.

The climate models of the international agencies forecast, on average, neutral conditions up to the end of the year.

What are the estimates for the catch volume of giant squid outside the 200 mile limit in 2017 and illegal catches inside Peru's EEZ?

It is hard to estimate a figure since illegal fishing involves undeclared catches. Everything indicates that this is a very considerable volume which, apart from being an illegal activity, involves unfair competition that not only affects the processing plants, but also artisanal fishing.

Resources deriving from illegal fishing access destination countries as having been caught in international waters and, therefore, are exempt of paying customs taxes, which is something that does not occur when the product is sourced in Peru.

What measures should be implemented to fight against illegal fishing in Peru and bolster control over catches?

Via the Ministry of Production, Peru has put in place measures aimed at fighting against illegal fishing inside our territorial sea.

This Ministry has a satellite system that makes it possible to locate vessels catching illegally, in a similar manner to that applied in other countries.

This is very important since the threat of illegal fishing by foreign vessels, especially Asian, is ongoing, not only for Peru but also in general for the entire fishing industry of the region, as shown by the recent shifting of 300 vessels from the Ecuadorian coast to the Peruvian.

It is our hope that these measures and the joint action of the Ministry of Production along with the Navy, via the Coastguard Service, will dissuade illegal vessels and that the corresponding fines will be applied to their catches.

As regards squid (Loligo gahi), what is your evaluation of the 2017 campaign in terms of catch volumes and exports?

Squid is a species appearing for a brief time at any point in the year. Lately, the fish reports obtained point to a very high price and, therefore, it is not possible to export because of the competition from California illex and Patagonian squid, which have lower prices.

What projects or initiatives developed or provided by the SNI focusing on the processing industry would you highlight?

Right now, we are focusing on organizing the 3rd International Fisheries and Aquaculture Symposium, to be held on 25th October at the Hotel Los Delfines.

At this event, we have focused on one of the objectives set by the United Nations' World Food Programme, aiming at "Zero hunger". To achieve this, we will have the presence of the Ministry of Production and distinguished exhibitors and panellists from Peru and abroad.

The World Food Programme via its representative in Peru, the World Bank and a variety of experts presenting human consumption resources.

The FAO-Conxemar Congress 2017 will be dealing with the effects of climate change in fisheries. What is your view, particularly in the case of Peru's fisheries?

My congratulations for the initiative of this issue at the Congress this year. The effects of climate change are devastating on the planet, with serious effects for mankind, nature, the economic environment and for the development of entrepreneurial activities.

Peru, in common with other countries, suffered the effects of the phenomenon known as El Niño early this year, in the form of floods, especially on the north coast, with the loss of human lives, housing, crops and negative effects especially for agriculture and fishing.

EcoCert, Euro Leaf, etc.), providing access to the most demanding market

Alejandro Buvinic, Director of **ProChile**

“The Spanish market accounts for 92% of southern hake exports from Chile in terms of value”

What is your balance of ProChile’s participation at the last edition and what are the expectations for this year?

The 2016 edition was the third in which Chile had taken part in this exhibition where it consolidated its presence as a relevant supplier of sea products for this market and worldwide.

It was also very important for Chile’s image. Over the three days of the exhibition, the Chilean stand was visited by a good number of people and was highly appraised, both for the quality of the exhibition and for its design.

Also, the companies taking part generated numerous contacts, not only on the Spanish market, but also with other important buyers from other continents, which has led to building up new businesses.

For the 2017 edition, once again we have a 100 square metre pavilion where 6 large sized companies will be with their stands. There will also be a space for meetings so that SMEs on trade missions can hold meetings with interested counterparts.

We hope that, once again, Chile’s participation will be a success and our companies can generate new business, as well as making the advantages of this sector known, a sector

that is increasingly better positioned in the world.

Chile is now the leading exporter of mussels and frozen salmon fillet in the world.

What importance do Chilean companies give to their participation in the exhibition as co-exhibitors in the ProChile pavilion?

This year we have 6 companies in the pavilion, with their own stands. These companies are very important in the sectors that they represent. This means that Chile is growing in presence day to day in this exhibition, since we see the interest of the companies to take part, and this also applies to SMEs.

We also see how Conxemar has become a very important venue for Chilean producer companies of sea products.

The Spanish and European market are important destinations for the exports of these products, so that being at this exhibition has become one of the venues where companies want to take part in during the year.

What are the main products that they will be promoting at the exhibition?

The mussel producer company, St. Andrews Smoky Delicacies, Bagasur, clam producer, Invermar, salmon producer, Pesquera Villa Alegra, producing cuttlefish, Pesquera Friosur, bringing hake to the exhibition, and Pesca Cisne, a hake, conger and cod producing company. So as you can see, what we are offering at Conxemar is highly varied and this demonstrates the amount of resources produced in the country, apart from the quality of these products.

During the exhibition, we shall also be launching “Southern Hake Chile” as a Sector Brand country, the aim being to strengthen the value between consumers and increase the preference for this fish, especially in the haute cuisine professional sector and for consumers looking for products of excellence on the Spanish market.

The brand is developed by ProChile along with the Federation of Fish Industries in the South, and will strengthen the unique identity, taste and quality of Chile’s southern hake in Spain.

What is your evaluation of southern hake exports so far this year? What about the demand on the Spanish market?

Southern hake exports worldwide in the period January-June 2017 have amounted to dispatches of US$18 million.

As far as the Spanish market is concerned, dispatches from Chile have reached US$16 million, which means 92% of our exports are for Spain.

As regards giant squid, what is the balance in exports so far this year and how has demand behaved in the main destination countries, especially Spain?

In the case of giant squid or cuttlefish, exports in the period January-June 2017 have amounted to US$100 million, which has meant a 51% increase in terms of the same period in 2016, when dispatches totalled US$56 million.

Our exports for the Spanish market have also increased. In the period January-June 2017, they totalled US$26 million, which is 113% more than in the same period for 2016, when they totalled US$9 million.

What is your evaluation of Chilean salmon exports this year?

Salmon exports amounted to over US$ 3,800 million in 2016, this being one of Chile's most exported food products.

Comparing this with the figures for the period January-June, we see that this industry grew by 35.7%, reaching US$2,414 million in comparison with the US$1,778 million attained in the same period for last year.

There is no doubt about the fact that salmon is a main player in the sea products industry, where it has a share of over 70% in the total exports from this sector.

David Mcclellan, Head of the **Alaska Seafood Marketing Institute** in Spain

"This year we will be at the Conxemar Exhibition with more co-exhibitors from Alaska than ever before"

What are ASMI's expectations for their participation in Conxemar 2017?
Demand for wild salmon and Pacific cod has been high since early this year, and it would seem that this will be the tonic for our 3 days in Vigo.

I also think that we are going to see several importer companies looking for solutions to provide single frozen Alaska Pollock fillet to meet a growing demand.

What importance do you place on the exhibition for U.S. companies taking part?
This year, we have more co-exhibitors from Alaska than ever before. Conxemar offers exporters of Alaska products a good opportunity to see current and potential customers in Spain, Portugal and other European countries around 6 months from the Brussels exhibition.

What are the main products that they will be promoting at the exhibition?
Our sales to Spain are focused on Alaska cod, fillets and Alaska pollock surimi, besides wild salmon.

What projects or initiatives developed by ASMI this year or scheduled for the future would you highlight?

We have a group of chefs with a good deal of experience in products from Alaska to organize training, with demonstrations of preparations and tastings.

One presentation of one of these chefs is a support that has proven to be very useful for distributors, retailers, smokers and restaurants working with Alaska products.

What is your evaluation of the growth last year of the Responsible Fisheries Management (RFM) certificate promoted by ASMI?
As sustainable fisheries management practices gradually become more and more standardized and better understood by retailer buyers, we have noticed an increasing interest in our standards and RFM processes. At the same time, we see less pressure on the retailers and processors/packers to implement any additional programme in the chain of custody and certification.

GSSI granted its public recognition to the RFM Certification last year. What do you think this means for the certification?
The supermarket chains now understand better than before what sustainability represents and how to convey it to customers. The GSSI is helping tremendously in this process.

As representative of ASMI in Spain, what is your view of the current situation on the Spanish market, particularly in terms of demand and consumption of fish products from Alaska?
The demand for top quality fish and seafood from the hotel and restaurant sector never stops growing. As far as the general consumer and catering are concerned for institutions and school canteens, what we are noticing is an increasing demand for healthy, nutritional and sustainable fish and seafood.
This trend favours all our fish products, especially Alaska pollock.

What is your evaluation of the salmon campaign for 2017?
This summer has surprised us with the return of red salmon and keta in considerably larger amounts than expected by our biologists. I hope that this will mean a greater availability of these products in Europe, although in summer there was an increase in sales of wild fresh Alaskan salmon to the supermarkets throughout the U.S.A., and Chinese demand is strong. I hope that Spanish importers at Conxemar will make sure of the wild salmon they will need for this year.

And your evaluation of the Alaska pollock season?
The Alaska Pollock block fillet market has stabilized. We are very happy to see that the Russian fleet is changing towards a higher

production of single frozen pollock fillets which, in turn, reduces the availability of double frozen fillet from China, and will help more consumer to get to know Alaska pollock as a top quality whitefish.

At the same time, we are seeing a marked growth in the demand for block Alaska pollock on the U.S. market.

What is your view of the status of the fisheries stocks in Alaska?

Our fisheries management system in Alaska continues to be the most open, rife with debate, headed by science, robust and effective in the world.

The FAO-Conxemar Congress 2017 will deal with the effects of climate change in fisheries. What is your view on this, particularly on the Alaskan fisheries?

As an industry, we recognize that the only response to the possible effects of climate change is to have more and better scientific research.

Manuel Tarré, Chairman of Gelpeixe and ALIF (Associação da Indústria Alimentar pelo Frio)

"The Association stands up for a single V.A.T. tax rate for all foods doing away with the current differences"

What are the expectations of ALIF in its participation at Conxemar 2017?

ALIF (Association of the Cold Food Industry) has been promoting the presence of the different sectors in fishing for 15 years, at International Exhibitions. This year, it is coming back to Conxemar, bringing a wide range of representative companies with the expectation of being able to consolidate and open up new relations, both with potential customers and with suppliers.

The effort of our Association (ALIF) in this promotion is recognized by its associate members, but also by the rest of the sector since it has already produced a continual increase in Portuguese exports over the last few years.

The dynamic nature in terms of exhibitors and visitors at CONXEMAR 2016 was plain to see, and there are no reasons for this year's edition to be different, so that our expectations are highly positive. I would like to emphasize the work of the Conxemar management in their organization of this Exhibition, which is a world reference in fishing, and I congratulate them on that.

ALIF, along with Docapesca, is taking part in the exhibition. What does the exhibition mean for the Portuguese companies coming to Conxemar?

An opportunity to open up new markets and, at the same time, to be able to contact very important players, ranging from suppliers to large scale distribution chains and customers in general.

It should also be pointed out that the supply of raw materials in Spain, especially in Vigo, has a significant importance for may Portuguese operators.

Which products will they be promoting at Conxemar 2017?

The companies will be promoting a wide and diversified range of products: frozen, fresh, salted, dried and canned, apart from the usual products such as hake, cod, horse mackerel, squid, octopus, sardine, monk, bass, grouper, highlighting pre-cooked and innovative products.

What is your evaluation of the first half of the year for Portugal's frozen sea products?

The first half of this year has been positive for our industry. Domestic consumption has increased slightly, thanks to the improvement in the economy and, as a result, in household incomes. After some very difficult years, there is more trust and less pulling back.

The importance of large scale distribution in Portugal is significant and we can see stability in trade relations between this sector and the suppliers.

Exports in the first half of the year have increased in terms of 2016, whcih is essential for the growth of our companies.

What about the availability of raw material for the industry at present?

Access to raw materials is one of the main conditioning factors for the activity. Apart from the high prices that some species are reaching, the supply of wild fish has fallen quite a lot, which involves a change in consumer habits.

The "new competition" from countries/new economies with buying power has contributed to altering the world consumption panorama, making our access to raw materials harder.

What are the main figures for the frozen fish product processing industry in Portugal in terms of the number of companies, turnover, Jobs, production and exports?

The processing companies are less than one hundred, most of them being technologically well developed and equipped, and with a high degree of know-how.

The industry in Portugal directly employs around 3,000 workers, with a turnover in 2016 of over 900 million euros, while fish exports recorded over 1,200 million euros.

The UNO has opened discussion to look into the Portuguese Government's request to extend its continental platform, which could give rise to a wider EEZ than the current one and a greater availability of fish resources for Portugal.
What is your view on this?
Having more resources available would be important, but the EU framework has limited funding, making fleet modernization unviable for a fleet that is getting old, and this is a conditioning factor on such an opportunity. But certainly, extending the EEZ would make it possible for Portugal to reposition itself in the international arena, in terms of knowledge and scientific-technological capacity in maritime affairs.

What do you think are the main challenges for the processing industry in Portugal?
Standing up for the image and quality of the product put on the market. Fighting for fair competition in terms of the law is, without a doubt, a considerable challenge. But equally important is to continue alerting our Government to injustice, or even to absurdities, as regards continuing to apply a 23% V.A.T. on food products just the same as on prepared or frozen pre-cooked foods, this being more than twice the rate that is applied in Spain. In the case of prawn, which has a 6% tax if is farmed, and 23% if it is wild, this demonstrates the disparity of criterion that is hard to understand. The Association stands up for a single V.A.T. tax rate for all foods, to end the current differences with no grounding that limit growth.

What is your appraisal of the evolution of labour and energy costs in the processing industry over the past few years?
Labour and energy costs are significant and are important in companies' accounts. Energy in Portugal is particularly costly, far more than in other European countries, so that it is a conditioning factor for our industry that is so dependent on this resource.

The current Government, backed by the left-wing parties, has legislated in favour of an increase in taxation, having increased the minimum national wage, announcing a further increase for 2018. Labour costs are higher for facilities located in the large towns and cities, such as Lisbon and Porto, and less relevant inland.

We also have the difficulty that most trade unions are not open to changing the antiquated collective bargaining agreements, as in the case of the frozen foods sector.

What is your evaluation of the functioning of the port of Leixões and what do you think is the reason why it is increasingly absorbing containers from the port of Vigo?
The growth and modernization of the port of Leixões are important for the country's economy. It is mostly used by companies from the centre and north of Portugal, but also by some from the north of Spain, who see in this port a competitive alternative to Vigo. The long drawn out strikes affecting the port of Lisbon made a decisive contribution to the increase in traffic in Leixões.

What is the situation of the ports in Portugal as regards the liberalization of services, such as stevedoring?
Liberalization is desirable. There is no justification for a closed market, with stevedore services acting in a totalitarian manner that jeopardizes the working order of the economy. An infrastructure that is so important for the national economy cannot depend on the interests of the few.

The FAO-Conxemar 2017 Congress will focus on the effects of climate change in fisheries.
What is your view on this and, more specifically, on its effects on Portugal's fisheries?
This topic at the FAO-Conxemar Congress is very timely. The effects of climate change in fisheries are a very serious problem and scientific studies, the diagnostics and debates should be serious with no demagogy so that the appropriate measures can be taken. This problem is also facing Portugal, and attempts are being made to determine what the reason is for the reduction in sardine stocks, which tends to persist. Sardine is a very important species in our waters.

Máximo Hurtado, Commercial Attaché of the **Canadian Embassy in Spain**

"The free trade agreement between Canada and the EU eliminates almost 96% of taxes on fish and seafood"

This year, Canada commemorates its 150th anniversary of its foundation as a country. Is there any special celebration scheduled at the exhibition?

Yes, in fact, we are having a year full of celebrations, either as a country of honour or guest country in numerous events. And we're going to carry on till the year end! We are delighted because it is like celebrating a birthday each month.

At Conxemar, we shall have the invaluable presence of our Ambassador in Spain, Matthew Levin, who will officially open the stand and preside some networking events with companies and representatives of Atlantic provinces that will be attending the exhibition.

What are the expectations of Canada's participation at the Conxemar 2017 Exhibition?

Conxemar is a key event for Canadian companies interested in developing their trade relations, investment and innovation with Spain and the south of Europe, both in the fishing sector as well as processing and aquaculture.

Spain is the main consumer and importer of fish and seafood in the European Union, and one of the most important in the world. Conxemar is a must-attend event.

Which products will be promoted at the exhibition?

Apart from the Canadian Embassy in Spain, the delegation will comprise the Atlantic Association of Processing Companies in Food and Drinks, the Government of New Brunswick and a representation of companies from the Canadian Atlantic.

Although the Association helps in representing the entire sector, and here the products to be presented from the Atlantic coast include Canadian lobster (live and frozen), scallop, hake and white and salted fish; with the high quality that characterizes us, with innovative techniques applied to processing.

What is your evaluation of the free trade treaty between Canada and the EU, and what do you consider it will mean for trade relations between both countries?

As you know, the agreement came into force provisionally at the end of September. Therefore, Spanish and Canadian companies can benefit from the vast majority of provisions in the agreement.

Almost 96% of the customs lines in the European Union regarding fish and seafood have been removed (before, some of these taxes rose to 20%). In seven years' time, complete withdrawal is expected.

Simplification of the border procedures and greater access to suppliers are some of other measures covered by the agreement.

This framework will, undoubtedly, facilitate exchanges and will give an important impetus to trade and entrepreneurial relationships between both economies.

What is your evaluation of fish product exports from Canada?

Last year was a record year, with a growth in value of 10% in exports in terms of 2015.

Our main market is the United States, for which we are the main supplier. This is followed by exports to China (12%) and the European Union (8%).

The importance of aquaculture exports has also noted a significant increase, of over 40%, in terms of 2015.

We think that with the coming into force of the Agreement with the European Union, exports will increase, since the fish and seafood sector is one of the most benefited due to the elimination of the the customs taxes.

What are the main fish products exported by Canada?

The main products are Canadian lobster, Atlantic salmon, snow and queen crab, prawns and shrimp. We mainly export to Spain Canadian lobster, hake, scallop, southern shrimp and Pacific salmon.

What is your evaluation of Spanish imports of fish products from Canada?

Imports from Canada are still limited. Spain ranks in 19th place in the list of Canada's importers of fish and seafood.

As regards the subsector of crustaceans, Canada is the third most important supplier in the world. Spain ranks in sixteenth place as importer of these products from Canada, perhaps due to the high customs taxes in place.

Despite these, from 2012 to 2016, imports increased annually by 26.7% thanks to the improved economic situation and the constant search for quality products.

With the coming into force of the Free Trade Agreement between Canada and the European Union and the removal of customs taxes, we think that Canada is going to become one of the chief suppliers of Spanish companies. This is one of the messages that we intend to put across at Conxemar.

What is the importance of the fishing sector in Canada's economy?

Fishing is a key sector for Canada. It accounts for over 4,000 million euros for the Canadian economy. Sea products were the second most important exporting sector for Canada in 2015. Our country exports fish and seafood to 140 countries around the world.

What do you consider are the main challenges for the future?

Sustainable management of the marine environment and of its is resources is the greatest challenge facing Canada and the international community as a whole.

We collaborate with our partners – including Spain – to improve fisheries management and the protection of the marine environment worldwide.
Our strategy aims at the sustainability of fish stocks, of the fishing industry and of the ecosystems. Our decisions are based on proven scientific information and on the precautionary approach.

The FAO-Conxemar 2017 Congress will focus on the effects of climate change in fisheries. What is your view on this and, more specifically, in the case of Canada's fisheries?

The fight against climate change is a key element in the politics of the Canadian Government, and the Ministry of Fisheries and Oceans of Canada is working to better understand the repercussions of climate change on oceanic conditions and its consequences in the fisheries, ecosystems and coastline of the country. We need scientific analysis to be able to incorporate these considerations into the politics of the Government.

Roisin O'Sullivan, head of Sea Products at the **Bord Bìa-Trade Board (Ireland)**

"Exports to Spain of seafood products from Ireland increased by 12% in value in 2016"

What is your evaluation of Bord Bía's participation in the Conxemar Exhibition?

Bord Bia has always viewed Conxemar very positively, which is why we have been taking part in this exhibition for so many years. This participation shows the good relationship between Ireland and Spain and the strong trade link between Irish exporters and their customers in Spain.

What do you consider the exhibition means for the Irish companies taking part?

For the Irish fishing sector, Conxemar provides the ideal context for holding meetings in person with our usual customers to evaluate the situation on the market and get to know new buyers and companies interested in sustainable, top quality Irish sea products.

What are the main products to be promoted at the exhibition?

The Bord Bia, on stand E-11, will be promoting Origin Green, the priority here being to ensure that our companies are in a cycle of ongoing improvement and follow-up of good environmental practices. Also, our 4 co-exhibitors - Connemara Seafoods, Errigal Bay, Shellfish Ireland and Sofrimar – will mainly be promoting crustaceans and brown crab, Norway lobster, lobster, swimming crab, razor clam and scallop.

What initiatives or projects aimed at the fish products sector has the Bord Bia launched over the past year or is scheduled to launch shortly?

The fishing industry in conjunction with our sister agency – BIM – is currently setting up a series of improvement projects for catching certain species such as brown crab, Norway lobster and whitefish via Fisheries Improvement Projects – FIPs.

What does Spain mean in terms of Ireland's fish product exports?

Irish exports of seafood products gave an excellent result in 2016, with a growth in value of over 12% in terms of the previous year.

The total value for fish exports from Ireland to Spain in 2016 was over 77 million euro.

The main species exported from Ireland to Spain are whitefish, such as megrim and monk, and out of the crustaceans and molluscs, Norway lobster, swimming crab, brown crab, cockles, razor clam, scallops and winkle.

What are the important production figures for Ireland's chief fish products in 2016?

Ireland ranks among the top three producers in the European Union in terms of catching and farming diverse species, and for this reason, it is a reference country on the market.

In tonnes of production, the pelagic species are the most important, with 108,132 mt in total in 2016 (86,426 mt in mackerel and 21,706 mt in horse mackerel). As far as seafood is concerned, the most notable species are Norway lobster (9,572 mt in 2016), brown crab (7,191 mt) and scallop (2,093 mt). The total volume of seafood production in Ireland was 20,560 mt.

As regards whitefish, the main species are hake (7,761 mt in 2016), haddock (3,525 mt) and megrim (3,002 mt).

As far as aquaculture is concerned, production in 2016 reached 41,950 mt, highlighting mussel (16,250 mt), salmon (16,000 mt) and oyster (9,700 mt).

What is your appraisal of Irish fish product exports over the last year?

The total value of fish exports from Ireland in 2016 rose to 563 million euros. The main 7 destinations for exports (in terms of value) for fish products from Ireland in 2016 were France (26%), Spain (13%), United Kingdom (12%), Italy (8%) and Nigeria (7%).

What has been the evolution of the sustainability initiative – "Origin Green" – launched by the Bord Bia last year?

We will continue to work on this programme covering both the processing and catching side. Its cornerstones are supply of raw material, efficiency of resources during processing and Social Sustainability.

On the issue of raw materials, companies are working with the BIM responsible source standard in order to improve fishing practices at sea under the EU fisheries regulations.

What is your view of the effects that Brexit will have on the fishing sector and processing industry of Ireland?

Negotiations are underway, but it is still too early in the day to forecast what the consequences will be. Discussion at EU level is in process with the different fishing states.

In any case, Ireland is staying in Europe and the European market will continue to be a priority for Irish seafood and, more specifically, the Spanish market for many of our species.

The FAO-Conxemar 2017 Congress will deal with the effects of climate change on fisheries. What is your view of this and, more specifically, regarding Ireland's fisheries?

In the context of Origin Green, where the environmental impact is a very important part of our agenda, Irish companies are making ongoing improvements to economize on energy by using efficient management systems, both in the production of raw materials and in processing.