M@n@gement
2019, vol. 22(2): 297-315

Unplugged - Society

Management should be above all a societal concern if we want to avoid management practices getting out of control. Society is a sub-section of Unplugged which aims to publish some provocative essays addressing or renewing our understanding of the relation between society and management. These essays may also highlight theoretical "boundary objects" between society and management or suggest a theoretical perspective to approach new empirical phenomena.

The urgency of Sustainable Ocean Studies in management

Héloïse Berkowitz ● Margi Prideaux ● Sarah Lelong ● François Frey

Edited by Héloïse Berkowitz

Abstract. Seemingly infinite, and above all so far away from our daily worries, the ocean may look like it can put up with all anthropic pressures: plastic, warming, acidification, resources overconsumption, novel entities, biodiversity and habitat loss. But science keeps showing it cannot. There is an urgent need to address these pressures that threaten both natural and human ecosystems. In this context of urgency, it appears crucial to develop *Sustainable Ocean Studies*, whose keystone could be management science. Unfortunately, while natural sciences have largely contributed to our understanding of marine issues and their solutions, management scholars on the contrary have rather neglected the ocean. In this special issue, we focus on the need for *Sustainable Ocean Studies* through three original highlights: scuba diving, marine wild meat consumption and interdisciplinary ocean research.

Keywords: ocean, sustainable development, sustainable ocean studies, interdisciplinarity, scuba diving

Héloïse Berkowitz
CNRS TSM Research,
France
heloise.berkowitz@tsm-education.fr

Margi Prideaux
OceanCare, Bern
Switzerland
mprideaux@oceancare.org

Sarah Lelong
Esprit de VELOX, La Rochelle
France
sarahl@espritdevelox.org

François Frey
Esprit de VELOX, La Rochelle
France
francoisf@espritdevelox.org

THE OCEAN, AN ENDANGERED ECOSYSTEM FORGOTTEN BY MANAGEMENT STUDIES

La mer,

Leconte de Lisle

La mer est grise, calme, immense,
L'œil vainement en fait le tour.
Rien ne finit, rien ne commence :
Ce n'est ni la nuit ni le jour.
Point de lame à frange d'écume,
Point d'étoiles au fond de l'air.

Héloïse Berkowitz
CNRS TSM Research,
France
heloise.berkowitz@tsm-education.fr

Rien ne s'éteint rien ne s'allume :
L'espace n'est ni noir ni clair.

Albatros, pétrels aux cris rudes,
Marsouins, souffleurs, tout a fui.
Sur les tranquilles solitudes
Plane un vague et profond ennui.

Nulle rumeur, pas une haleine,
La lourde coque au lent roulis
Hors de l'eau terne montre à peine
Le cuivre de ses flancs polis ;

Et le long des cages à poules,
Les hommes de quart, sans rien voir,
Regardent en songeant, les houles
Monter, descendre et se mouvoir.

Mais, vers l'Est, une lueur blanche,
Comme une cendre, un vol léger
Qui par nappes fines s'épanche,
De l'horizon semble émerger.

Elle nage, pleut, se disperse,
S'épanouit de toutes parts,
Tourbillonne, retombe et verse
Son diaphane et doux brouillard.

Un feu pâle luit et déferle
La mer frémit, s'ouvre un moment,
Et dans le ciel couleur de perle
La lune monte doucement.

A gentle swaying. The sun softly shining on your face. Feeling the impatience in the air. The elastic sound of swimsuits being stretched out with effort. The minted smell of toothpaste that you're carefully putting inside your mask. As a ritual, the tube religiously passes from hand to hand. Tasting the salt that the sea has lightly sprayed on your lips.

The director moves forward for her briefing. She announces dive teams. Duos and groups acknowledge each other. Call one another out. Divers start shifting places in consequence and the boat is reconfigured. You step over some diving tanks to reach your team. The director describes the diving site's features. She pulls out some device – a notebook, a small whiteboard, or a slate – on which she has drawn the path to follow and highlighted points of interest. Here, a beautiful coral head, there a sloping reef with spirographs. You try to mentally record these underwater points of reference. She reminds everyone about the local regulation; details the current's direction and strength; describes entry, exit and emergency procedures. Parameters of security, profile, depth, maximum immersion time, recommended ascent rate, use of parachutes.

When the ritual is over, you complete your equipment. Weight belt around the waist. Fins. The computer well tied to the arm. One is helping another, someone else lifts the tank to let a fellow kit herself out. Security tests. The air is freely flowing, the buoyancy compensator is slowly

inflating. You pull the last straps to tighten the jacket. Placing the mask on your face.

Heaviness. Discomfort. The heat quickly becomes oppressive. The swimsuit, dry and stiff, prevents you from properly breathing. Sweat starts dripping under your neoprene. The boat's swaying aggravates it all by making you nauseated: the frogman is no longer fit for surface and needs to literally take the plunge. Backward roll entry. Backward roll outside of the boat, outside of the human space, outside of time, into marine space, into another world.

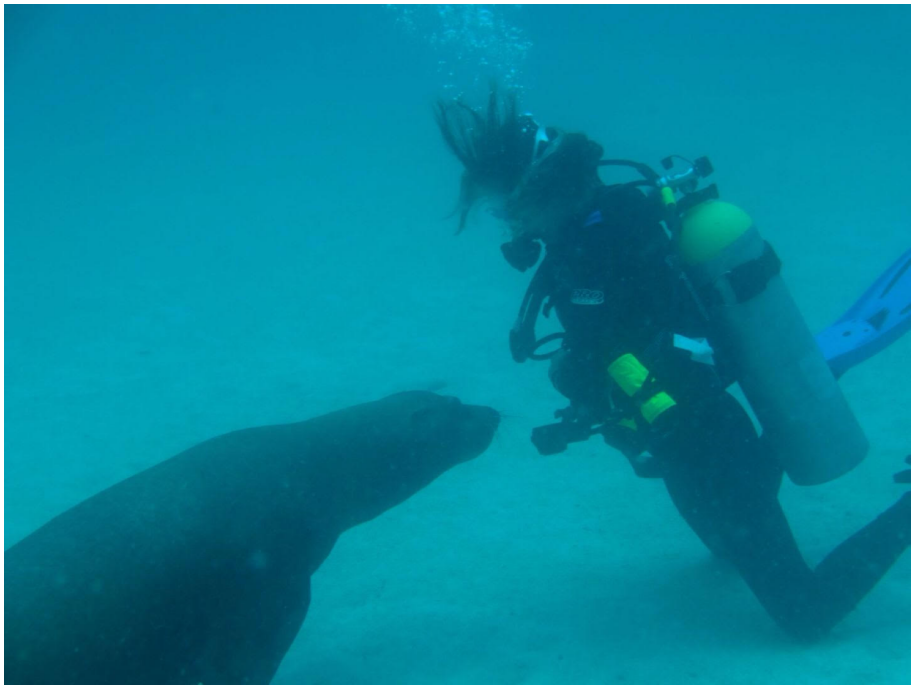
Immersion. The hybrid being, which has at last joined the element it longed for, disappears in a bubbly whirlpool. The water enters everywhere, freely circulates in your swimsuit and refreshes you in a welcomed delight. You're swallowed by the ocean. "All good", you gesture towards your diving team. And then you begin your controlled free fall into the depths. Like an angel gliding over the abysses. Ridiculous and clumsy at the surface like a penguin, you become marvelous and agile underwater. Years of technological innovations meet in the devices that allow you to conquer this new universe. You check your team, in a constant watch. You're aware that far from being a triumphant conquest, this dive is just a parenthesis, brief and fabulous, which a wonderful and dangerous Ocean has barely granted you.

5 meters. While diving deeper, silence becomes overwhelming as meters are rapidly piling up on your dive computer. Being underwater makes you forget about the rest of the world. Only remains the majesty of this ocean that seems to be swallowing you, wrapping you, cherishing you to better lure you into the abyss, into oblivion. Pressure rises and if you're not careful, diving speed as well, until you will feel like you are dropping like an elevator towards the bottom of the sea. You need to – pfffft – breathe into your jacket to slow down the inevitable fall and find your balance.

10 meters. After a first feeling of deep silence, your body is getting used to this new environment. It slowly becomes aware of all the noises that fill this so-called "world of silence". Fish feeding. Corrals cracking. Waves washing over posidonia. Team members' breathing, your own respiration, the disturbing sound that your pressure regulator can sometimes make[1] when temperature decreases and the air has trouble flowing through. Are these the only anthropic sounds? Hardly so. Cavitation[2] around propellers may cover whales' songs or dolphins' mocking whistles. Pile driving to implement an off-shore wind farm produces underwater acoustic waves that may travel over hundreds of kilometers. Air guns that serve for seismic exploration also constitute a source of underwater noise pollution. But please focus on your dive. Your swimsuit is compressing your body, keeping the water that flowed in at body temperature. This is a discreet reminder of the water volumes above your head, separating the diver from its human environment – the surface. But can we really consider the ocean as a natural space that escapes the influence of 21st century humans, or "homo detritus"?

20 meters. A glass bottle, covered by moss, maybe inhabited. First evidence of a human colonization operating in the ocean. A sea lion gets close to you, trying to nibble on your gear. This supposedly wild animal is now fully accustomed to humans' presence.

1. As its name indicates, a pressure regulator helps regulate pressure to allow divers to breathe at whatever depth (and pressure).
2. Formation of bubbles around boat propellers due to speed in a liquid.



Source: Authors' picture

30 meters. A pathetic green turtle tries to swim away – she has been disturbed by these strange monsters full of rubber and steel and making so many air bubbles. During its growth, the turtle got stuck in a plastic six pack ring, which prevented its shell from normally developing, making it look like an 8. On top of this, the turtle will soon die of hunger due to an intestinal occlusion provoked by the plastic bag it ate, mistaking it for a jelly fish.

https://www.youtube.com/watch?time_continue=1&v=ArYLGNe-jCA

40 meters. A wreck. At first sight, nothing dire about it. A magnificent wall of blue and orange gorgonian coral covers the hull. You smile upon seeing a moray eel nonchalantly floating, its head rising from a pipe. But this wreck may be slier than it looks. May it hide something more insidious, such as radioactive waste[3]? Has the Mediterranean Sea become a wide radioactive graveyard, which epicenter would be located close to Italian Calabria[4]? Will the Mediterranean survive another summer[5]?

55 meters. The light of the surface barely reaches you at this depth. The “deep blue” is dark, sometimes fraught with particles, sometimes opaque and intense. 55 meters above your head weight about 5.5 liters of water on each cm^2 of your skin, which amounts to an absolute pressure of 6,5 bar. At this depth, nitrogen partial pressure is high, following Henry’s law. Each moment spent underwater aggravates a little your body’s intoxication as it fills up with azote. You are risking a narcosis, which is a more or less extended disruption of the doors of perception. It can be felt as early as 20 or 30 meters and follow a “Martini’s law”: for each 10 meters, another Martini glass. You could begin to feel highly euphoric or immensely sad. Then you would start losing your sense of orientation in

3. www.lapresse.ca/environnement/pollution/200909/18/01-903141-la-mediterranee-convertie-en-cimetiere-de-dechets-toxiques-par-la-mafia.php
4. See this Arte documentary www.arte.tv/fr/videos/062283-000-A/le-poison-de-la-mafia-et-la-loi-du-silence/
5. See this Arte documentary www.arte.tv/fr/videos/075834-000-A/la-mediterranee-va-t-elle-passer-l-ete/

space and time, mistaking up for down, thus going deeper while you think you are going back up. If panic takes a hold on you, this drunkenness may briskly drive you to the surface and the tragedy is inevitable: pulmonary barotraumas and decompression accidents are the most frequent risks.

60 meters. That's the unsurpassable limit of air recreational dive. The deepest point in the oceans is located in the Mariana Trench, at 11 020 meters. Only three humans have explored this deepest point. The ocean covers about 361 million of square kilometers of the earth, i.e. 70,8% of the planet's surface. Truth be told, the ocean remains little known or understood. While the terrestrial surface has been mapped – its mountains, its rivers, flora and fauna, cities, i.e. its oecumene – the bottom of the ocean remains a mystery. We still know relatively little about the abyssal fauna that lives in oceanic ridges, or about phytoplankton blooming and its interconnection with climate change, or effects of ocean acidification. Barely 5% of the ocean has been charted and less than 0.05% in high definition. We possess almost no understanding, albeit basic, of the biodiversity in 99% of the marine environment. And it is estimated that still 1 million of species have yet to be discovered.

https://www.youtube.com/watch?v=DbECGk-sFXY

The complexity of marine ecosystems is such that we only begin to understand the interactions and interdependences that are occurring there, or even the extent of the effects of anthropic pressures. As a matter of fact, any measurement whatsoever becomes increasingly more complex in the ocean than on land or in the air – whether it is about temperature, salinity, acidity, noise. Sound for instance does not move in the same way and its propagation varies depending on water parameters. Storms, extreme conditions like pressure, salinity or waves, rapidly deteriorate measurement instruments. Their maintenance is all the more difficult when they are located far from the coasts. Yet, to understand the ocean and to control for stress factors, it is necessary to correctly measure them. But it is not yet possible to scientifically measure or evaluate the cumulative and potentially chain effects of climate change (or tipping points), of pollution (plastic, sound, industrial), and of the loss of biodiversity: models of ocean data science using big data could bring solutions to that but they are only beginning to emerge.

The awareness of the ocean's importance, or ocean *literacy*, is itself largely emergent. As evidence of this, management science has pointedly ignored the ocean as a research object. If notions of *blue economy* and *blue growth* do exist, there is no standardized and internationally accepted methodology to estimate the value of the ocean and the services it provides. Yet our lives are deeply connected to the ocean. Life appeared in the ocean. Ocean feeds us and facilitates trade; it gives us hobbies, trips and discoveries. It never seems out of new resources to provide us with: new fish species, ores, genetic resources, employment… Nevertheless, most of the time we live our lives in ignorance of the ocean's importance, or of the impact of our practices on its health.

Coastal zones constitute particularly fragile interfaces and display very visible marks of catastrophes: cliffs collapsing, land flooding, soil salinization, and so on. The ocean, because it seems so vast and so far away from us, may seem to resist to all these changes. We would think it is capable of absorbing everything. And indeed, the ocean absorbs 80% of carbon emissions, resulting in an acidification which long term

consequences are unpredictable, both on the environment and our societies.

Increasingly acid waters threaten species that cannot adapt: from zooplankton in the bottom of the food chain, to fish and mammals at the top of it. Ocean warming could accelerate the effects of climate change that we are already experiencing, such as the aggravation of natural catastrophes' frequency and strength. Ice melt is threatening coastal communities, a risk that is increased by warm water dilatation as well. Whole ecosystems are threatened, as well as humans that depend of ecosystems' services, such as protein from seafood, tourism's revenues, or coastal protection permitted by coral reefs[6].

Acidification and ocean warming come at the end of a long list of anthropic pressures. These issues constitute many management problems that concern not only marine industries or coastal communities, but also broader economic actors on the value chain, public powers, multi-level governance actors and citizens in general. Plastic pollution threatens biodiversity as well as human and ecosystem's health. Increased maritime shipping, ballast waters or fouling (marine fauna taking over the hull of a boat) all contribute to the dissemination of invasive species. Underwater noise pollution from boats, from wind farms' pile driving or seismic explorations hurt marine fauna. Agricultural fertilizers and nutrients draining drive the multiplication of dead zones[7] - places where organisms cannot live. Overfishing pushes several species on the brink of extinction. Fishing practices destroy habitats. Nuclear waste pollution condemns entire regions like the Mediterranean Sea. Biopiracy results in marine genetic resources plundering.

Reflecting upon the principles of a sustainable ocean management is not only a necessity but also an urgency. It requires to move beyond the concepts of blue growth or blue economy. These concepts remain ill-fitted for sustainable ocean management because they consist in a transposition of the same (over)production and (over)consumption systems that have resulted in the threats currently bearing on the ocean. In this issue dedicated to ocean, Margi Prideaux's article takes up the task of linking together consumption behaviors and the disappearance of certain wild species, highlighting the responsibility of citizens and institutions in this matter.

We need to rethink human communities' place in relation to the ocean at a local and regional scale, from governance modes to fishing practices, tourism and other resources extraction, in a circular and collaborative approach to the ocean that would take into account ecosystems' complexities and the interconnectedness of activities and services. Developing tools and solutions for sustainable ocean management also requires to dialogue with other disciplines, like marine biology that studies marine fauna behaviors and characteristics, political science that develops new legal framework for high seas, or geography that integrates reflections about space and landscapes. Sarah Lelong and François Frey describe such an interdisciplinary project: *Esprit de Velox*. We need to develop new frameworks and systemically interdisciplinary and integrative research projects to study sustainable ocean management.

Héloïse Berkowitz is a researcher at CNRS (UMR5303) and TSM-Research. She has a Phd in management from Ecole Polytechnique and she graduated from Sorbonne in history, HEC Paris in the Programme

6. Nippon Foundation-Nereus Program. "Restored ocean will alleviate poverty, provide jobs, and improve health, finds report." ScienceDaily. ScienceDaily, 31 May 2017. www.sciencedaily.com/releases/2017/05/170531133326.htm.

7. earthobservatory.nasa.gov/IOTD/view.php?id=44677

Grande Ecole and CEMS Alliance in International Management. She was a visiting scholar at Columbia University, Stanford Center for Ocean Solutions, and Institut Barcelona d'Estudis Internacionals. Her research deals with transitions to sustainability, with a focus on sectoral governance and collective action among organizations (meta-organizations), in various empirical settings from natural resources to collaborative economy or ocean sustainability. Her work has been published in the *Academy of Management Review*, the *Journal of Business Ethics* and *European Management Review*.

PLEASED WITH THE PRICE: EUROPE'S SHARED RESPONSIBILITY FOR AQUATIC WILD MEAT HARVEST IN WESTERN AFRICA

Margi Prideaux
OceanCare, Bern
Switzerland
mprideaux@oceancare.org

It's winter in Europe. A woman leans on the cabinet and points to a fish lying on ice behind the frosted window. Her warm woollen coat pulled up around her ears is a welcome buffer from the cold of the glass. The fishmonger cheerfully wraps the fish in paper and passes it to her. She's *pleased with the price* and contemplates the night's meal.

Nearly five thousand kilometres south a young man stands on the prow of a dugout canoe in an inlet near the sea. Years ago, it was painted by his uncle in bright reds, blues and yellows, and once braved the waves of the open ocean–carrying the last generation of men who fished for their village. The fish are gone. The day is hot and parched dry. Sweat forms on the boy's brow and his toughened bare feet stand on now faded paint. He silently coils his body and readies his spear. With a sharp thrust, it shoots through the air, and thuds into the shape of the manatee that has just surfaced. His aim was true, and blood pools in the shallow water, as he pulls the canoe towards the animal. He's *pleased to survive, today,* and contemplates the night's meal.

These stories may appear worlds apart, but they are tied together by a third entity, the fishing vessel that can be seen on the distant horizon from where the young man now stands–a ship that is part of a fleet that has strip-mined the traditional fishing grounds of his once proud and self-sufficient community. A vessel that sells its fish into the European market through a series of loopholes and slights so that European consumers can be *pleased with the price*.

THE RIGHT TO FOOD SECURITY

To have food to feed your family, to have the security of knowing where your next meal will come from, to know your children are nourished and can thrive, is surely the most basic of our universal human rights, and the fundamental principle of food security. Within the safety and buffer of our wealthy, developed world cities it's common to take these rights for granted. Judgements are effortless, from the ignorance and lofty distance of the developed world, about actions taken for sheer survival in other parts of the world. Heads and hearts shake at the cruelty of someone killing a wild animal for food. The judgement is hollow and fails to recognise how linked the developed world is to the problem–how we share the responsibility for the problem and its solution.

Jacob Vakkayil (2017) opened his M@n@gement article with the bare truth that indigenous people currently live in some of the poorest and

the most vulnerable communities in the world. Marginalized by colonialism and subsequent state-building efforts, traditional and indigenous communities suffer alienation from their land and sea rights. Often, corporations have moved in, provoking enduring conflicts. Their communities face discrimination in established socio-economic systems, and even well-intentioned efforts such as those aimed at sustainable development do not always work to their advantage.

Generations of these societies, in West and Central Africa, South and Southeast Asia, the Pacific Islands and around Latin and Central America, have harvested meat from the forest and fish from the sea, instead of farming livestock for their nutritional needs. This harvest has long been called wild meat or bushmeat (Hoffman & Cawthorn, 2012). Wild meat is most often defined as any non-domesticated terrestrial wildlife–mammals, birds, reptiles, and amphibians–that have been harvested for food, medicine or other traditional uses. Very often wild meat is locally traded for income or to access other goods needed by the community (Milner-Gulland & Bennett, 2003; Nasi et al., 2008). Much of this traditional practice has survived colonialism, yet as the forest empties and fish stocks decline, communities have turned to hunting additional species from rivers, estuaries and the sea.

For hundreds of years, wild meat consumption was likely sustainable, but community displacement by mining, oil drilling, commercial forestry, palm oil plantations and foreign fisheries, as well as localised population growth, has tipped the balance. Forced into marginal regions, community dependence on meat from the forest has increased (Milner-Gulland & Bennett, 2003). Low disposable incomes of many people reliant on wild meat (Hoffman & Cawthorn, 2012) and the limited capacity of many governments to import food to fulfil the protein requirements of their citizens make alternative meat sources unviable. This new 'aquatic wild meat' of dolphins and porpoises, dugong and manatee, turtles, crocodiles and even seabirds is proliferating and should be included in all policy discussions about wild meat sustainability and management. As a consequence, wild meat harvesting has become a significant and immediate threat to the future of wildlife in many regions (Milner-Gulland & Bennett, 2003; van Vliet, 2011; van Vliet & Mbazza, 2011).

Governments have responded by declaring the hunting of certain wildlife illegal, but this has not stopped the hunts. People need to eat. Instead, it has driven the activity underground and spawned an illicit network trading.

While numerous factors can lead to the unsustainable harvest of wild meat, Nasi and colleagues (2008) provide a useful grouping of six different categories:

1. Ecological factors: the number of animals that can be harvested sustainably is limited in the first place by their biological supply (production) and the continuing availability of habitat.
2. Demographic factors: increases in human population density lead to increased pressure on wild meat resources.
3. Technological factors: changes in traditional hunting and fishing practices through the use of improved hunting technology (e.g., shotguns, flashlights, outboard motors) increase pressure on wild meat resources.
4. Cultural factors: hunting of wild meat and the use of wildlife artefacts remain integral parts of cultural heritage, closely linked to social status, or believed to provide special or 'magic' forces, maintaining demand for various types of wildlife products.

5. Economic factors: remaining, relatively undisturbed habitats become 'frontier zones', because of low forest land value and easy access. This situation leads to the degradation of the forests and the wildlife found within them.
6. Institutional and governance factors: insufficient attention to the role of wild meat as an important contributor of local livelihoods by development agencies, non-governmental, inter-governmental organisations and national governments contributes to unsustainable hunting.

This paper focuses on the economic factors surrounding the rise and mismanagement of aquatic wild meat harvests. Food security is being undermined by the 'frontier zone' attitude of distant fishing fleets. Local communities are turning the aquatic wild meat to supplement their protein sources, and in so doing are opening themselves to zoonosis (diseases transmitted between humans and animals) and pollutants. There is a link between fish stock decline and aquatic wild meat growth, but the research is rarely combined, rendering the cause and effect less visible.

UNDERMINING FOOD SECURITY IN WESTERN AFRICA

Overfishing in the world's oceans is at the centre of a crisis of sustainability and nowhere is that crisis more visible than in western Africa. In this region, fish resources represent up to fifty percent of the total food supply (Watson & Brashares, 2004). In the Gulf of Guinea, over nine million people are dependent directly or indirectly on the fisheries sector for income (Okafor-Yarwood, 2017). While the importance of these fisheries is generally well-documented, safeguarding their availability for communities is often overlooked in regulatory frameworks and development assistance (Nasi et al., 2008). The harvest of fisheries is grossly imbalanced towards distant water fleets who export the fish from the region.

Nigeria, Guinea-Bissau, Ghana, Guinea, and Senegal rely on fisheries for foreign direct investments as they seek to generate millions of dollars through exports, license fees, and a Fisheries' Partnership Agreements with Distant Water Fishing Nations such as those in the European Union (EU), and other countries like China, South Korea and Russia (Belhabib et al., 2015; Okafor-Yarwood, 2017; Standing, 2017). As a consequence, distant water industrial fishing vessels from Europe, China and Japan already out-perform local artisanal fishers by at least 20:1. The rapid expansion of foreign fishing in African waters has simultaneously caused declining availability of fish in local markets. It is also driving several species towards extinction while jeopardising the livelihoods of artisanal fishing communities across a broad group of countries, including Senegal, Ghana, Sierra Leone, Liberia and Mauritania.

Traditional rural and remote communities have been alienated from aquatic resources they should rightfully control, manage and benefit from. This is an acute problem with many of the Fisheries Partnership Agreements signed between western African governments and Europe. Funding and access, rather than communities, have been the priorities (Antonova, 2016; Belhabib et al., 2015; Gegout, 2016; Kaczynski & Fluharty, 2002). In essence, Distant Water Fishing Nations sanction their own fishing vessels to continue this unbalanced harvest.

If all distant water fishing was legal and monitored, the issue might be quickly resolved. In reality, illegal fishing amounts to the equivalent of 65 percent of the legal reported catch. Offences of distant water fleets include fishing without a license, fishing in protected areas, using banned fishing

gear, catching beyond limits, or catching protected species, also have a severe impact on small-scale communities. This is compounded by criminality in Africa's own commercial fishing industry (Belhabib et al., 2014; Doumbouya et al., 2017; Okafor-Yarwood, 2017; Standing, 2017).

Illegal, unreported, and unregulated (IUU) fish catch comes into the market as either transhipment at sea, in port and in controlled harbours near to shore. The EU has regulations to control fish being loaded onto reefers (deep freeze factory ships) requiring tracking and establishing the legality of the catch, but transhipments at sea can make it harder for port authorities or the flag authorities to monitor how by whom and where transferred fish were caught. Daniels and colleagues (2016) estimated that reefers transported a total of 142,471 Mt of fish out of western Africa in 2013. They further determined that most of the remaining eighty-four percent of fish transported from western Africa was exported in refrigerated containers. Container vessels are exempt from inspection and, in fact, EU regulation explicitly excludes container vessels from the scope of the definition of fishing vessels. For the EU and the international community, illegal catch profiting in end markets contributes to maintaining illicit activity. Supporting West and Central African governments to prohibit transhipments at sea, following the leadership of Senegal and Côte d'Ivoire, and supporting West and Central African authorities to allow transhipments under carefully monitored conditions where reefers cannot be accommodated are essential steps for Europe to make. Vessels and operators that violate this ban should be added to a blacklist to prevent repeated offences and to deter non-compliance. Europe's leadership could then pressure other Distant Water Fishing Nations to follow their example.

Europe should also work to close the IUU container loophole in EU regulations. Container ships carrying fish should be subject to the same scrutiny and reporting requirements as reefers and fishing vessels, requiring container ships to inform port authorities of their intention to unload their catch several days ahead of their arrival and to fully disclose and document details of their catch.

THE NEW AQUATIC WILD MEAT HARVEST

People who depend on wild protein will substitute wild fish and wild meat for one another as the need arises. This means that a decline in one wild resource tends to drive up unsustainable exploitation of the other (Nasi et al., 2008). Using thirty years of data from Ghana to link mammal declines to wild meat trade, Brashares and colleagues (2004; 2011) have made the firm connection that years of inadequate fish supply coincide with increased hunting in nature reserves and sharp declines in biomass of forty-one wildlife species. Local market data provide evidence of a direct link between fish supply and subsequent wild meat demand in villages (Brashares et al., 2004). The correlation between overfishing and aquatic mammal and bird hunting has more recently been established around the Gulf of Guinea, including Ghana, Côte d'Ivoire, Guinea, Nigeria, Cameroon, São Tomé, and Togo (Carvalho et al., 2015; de Boer et al., 2016; Van Waerebeek et al., 2015; Van Waerebeek et al., 2017).

The link is clear. The decline of fisheries resource throughout the region, caused by IUU and overfishing, is driving wild meat demand.

The Convention on Migratory Species (CMS) Aquatic Mammals Working Group presented a summary of the known extent of aquatic wild meat harvest to the CMS Scientific Council in early 2016 and again in 2017 (Aquatic Mammals Working Group, 2016, 2017). The working group detailed at least twenty countries across West and Central Africa where

West African manatees (*Trichechus senegalensis*) are hunted for food and other uses, and provided evidence of the use of small cetaceans in most countries in the region. In Ghana alone sixteen cetacean species are caught and over a thousand animals landed each year, including Clymene dolphins (*Stenella clymene*), pantropical spotted dolphins (*Stenella attenuata*), melon-headed whales (*Peponocephala electra*) and common bottlenose dolphins (*Tursiops truncatus*), short-finned pilot whales (*Globicephala macrorhynchus*), a long-beaked form of common dolphin (*Delphinus sp*.) and rough-toothed dolphins (*Steno bredanensis*). Consumption of dolphin meat is now known in Togo, Benin, Cameroon and Nigeria. Smoked dolphin meat is traded as far away as northern Togo, Burkina Faso, Niger and Mali. Through these examples, the working group gave a picture of the scale of the problem.

Reports reveal alarming growth. Fifteen years ago the volume of the terrestrial wild meat trade in West and Central Africa was thought to be between one and five million tonnes per year. At this time, in Gabon, wild meat accounted for more than half of meat sold in local markets, with a value of US$50 million. In 2014 researchers estimated terrestrial wild meat consumption had grown to around five million tonnes for the Congo Basin alone. Aquatic wild meat consumption is likely growing at a proportionate rate, and in many areas is driving localised extinctions (Aquatic Mammals Working Group, 2016, 2017).

THREATS TO HUMAN HEALTH

Consuming aquatic wild meat not only risks wildlife but human health as well, spreading serious diseases from animals to humans (zoonosis).

The association between infectious diseases and terrestrial wild meat trade is well established in the research community. Traders and meat preparers are more at risk zoonotic pathogens compared to those that primarily engaged in bushmeat/wild meat hunting (Subramanian, 2012). Exposure to foodborne pathogens, such as *Trichinella spp., Toxoplasma gondii, Salmonella* and *Leptospira spp*. Also, *Mycoplasma spp. parapoxvirus* and *Mycobacterium spp.* are risked during handling of marine mammals and marine mammal products (Tryland et al., 2014). The consumption of raw or undercooked pinniped or cetacean meat has resulted in bacterial (e.g. *salmonellosis* and *botulism*) and parasitic (*trichinellosis* and *toxoplasmosis)* diseases in humans (Tryland et al., 2014; Van Bressem et al., 2009).

Similarly, biological risks associated with the consumption of products from wild reptile meat and eggs (turtles and crocodiles) include infections caused by bacteria (*Salmonella spp., Vibrio spp*.), parasites (*Spirometra, Trichinella, Gnathostoma, pentastomids*), as well as intoxications by biotoxins. For crocodiles, *Salmonella spp*. constitutes a significant public health risk due to the high intestinal carrier rate which is reflected in an equally high contamination rate in their fresh and frozen meat (Magnino et al., 2009).

Moreover, many marine species carry heavy contaminant burdens. Persistent organic pollutants (POPs) – such as organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs) – and heavy metals have been reported in sea turtles at various stages of their life cycle. These levels have been shown to exceed international food safety standards and could result in toxic effects including neurotoxicity, kidney disease, liver cancer, and developmental effects in foetuses and children (Aguilar et al., 2002; Aguirre et al., 2006;

Aquatic Mammals Working Group, 2017; van de Merwe et al., 2009; Warwick et al., 2013).

INTERNATIONAL FOCUS FALLING SHORT

The ripple effect of the consumer in Europe (or elsewhere in the world) seeking competitively priced fish, rather than sustainably sourced produce, impacts whole communities in Western Africa. This problem can only be tackled by looking at the wider economic and institutional context within which such hunting occurs. This can only happen if the economic factors surrounding the rise and mismanagement of aquatic wild meat harvests are addressed, including acknowledging shared responsibility.

To date, the issue has gained some traction in biodiversity-related international processes. In 2008, the Conference of the Parties (CoP) to the Convention on Biological Diversity (CBD) identified the unsustainable hunting of wild meat, and its effect on non-target species, as a priority to be addressed by Parties (Decision IX/5). Based on Articles 10(c) on customary sustainable use rights, and 8(j) on traditional ecological knowledge, the CBD has sought to incorporate the cultural, nutritional, medicinal and economic values of wild meat for indigenous people in any strategy to reduce the ecological impact of hunting. In October 2009, the CBD Liaison Group on Bushmeat held its first meeting and elaborated *National and International Recommendations Towards the Sustainable Use of Bushmeat*, based on information contained in CBD Technical Series No. 33, *Conservation and Use of Wildlife-Based Resources: The Bushmeat Crisis*. The Collaborative Partnership on Sustainable Wildlife Management was established in 2012 by CBD, CMS, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and UN Food and Agricultural Organisation (FAO) as well as research and knowledge organisations. CBD CoP12 (2014) endorsed a draft Action Plan and agreed to progress analysis of the impacts of subsistence use of wildlife on the survival and regeneration of wild species (Aquatic Mammals Working Group, 2017).

Specific to western Africa, the Abidjan Convention CoP12 (2017) considered the direct consumption and other uses of endangered, threatened or protected coastal and marine species and invited international multilateral environment agreements, civil society, and donors to develop an *Abidjan Convention Action Plan to Combat Trade, Direct Consumption, Illegal Logging, and Other Uses of Endangered, Threatened or Protected Coastal and Marine Species*, for consideration at ABC CoP13 in 2020 (Abidjan Convention, 2017). Key among the Action Plan priorities will be how to address aquatic wild meat in the region.

CMS CoP12 (2017) also addressed this issue, recognizing aquatic wild meat as a significant and immediate threat to at least 33 CMS-listed aquatic species– cetaceans, sirenians, turtles, and crocodiles. They established the new cross-taxa Aquatic Wild Meat Working Group within the structure of the CMS Scientific Council, to build an online repository of papers and other information (knowledge base) on aquatic wild meat relating to CMS-listed cetaceans, sirenians, turtles, and crocodiles; share information with other international bodies; and input aquatic wild meat information to the Abidjan Convention Endangered, Threatened or Protected Coastal and Marine Species Action Plan; and serve as an expert resource for CMS Parties and the CMS Secretariat about aquatic wild meat issues (Convention on Migratory Species, 2017).

These are all critical steps and provide robust recognition of the problem, but the agencies and actors directly involved in the economics of

overfishing have not been engaged to date. Fisheries management agencies of western Africa and the Distant Water Fishing Nations have not considered the cause and effect link between massive fisheries resource extraction from the region to serve markets in Europe and Asia, and the overharvest of aquatic mammals, reptiles and birds driving localised extinctions. Nor have these agencies considered the ripple effect of IUU fishing in compounding the problem for coastal communities and local wildlife now targeted by hungry people. Instead, there is an air of accusation that emanates from civil society in Europe and elsewhere in the developed world that responsibility lies with western African environment agency failures to crack down on illegal hunting and local trade.

EUROPE'S DEBT OF RESPONSIBILITY

Europe has an obligation to the people and wildlife of western Africa to reduce its legal and illegal fisheries impact in the region. The EU must recognise its responsibility for driving greater wild meat demand, through the significant legal and illegal fisheries harvests from the region, destined for the European market.

As a significant fisheries extractor from this region, Europe should ensure that activities regulated by the EU do not negatively impact local community efforts.

Europe should support West and Central African authorities to prohibit transhipments at sea and to monitor conditions where reefers cannot be accommodated. Europe should close the IUU container loophole in EU regulations.

Importantly, European consumers should be educated about the real cost of the cheap fish they buy from Western Africa. It is possible to make a significant and equitable impact on the problem of wild meat and the wellbeing of the people of the region if there is the political will to do so. Being *pleased with the price* is a failure of responsibility.

***

This paper has been commissioned by OceanCare.

***

REFERENCES

Abidjan Convention (2017), CP 12/14: Illegal trade, illicit trafficking, consumption and other uses of protected, endangered and/or vulnerable marine and coastal fauna and flora Conference of Parties to the Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region, Abidjan Abidjan Convention.

Aguilar, A., Borrell, A. & Reijnders, PJH. (2002), Geographical and temporal variation in levels of organochlorine contaminants in marine mammals. *Marine Environmental Research,* 53(5), 425-52.

Aguirre, A. Alonso, Gardner, Susan C., Marsh, Jesse C., Delgado, Stephen G., Limpus, Colin J. & Nichols, Wallace J. (2006), Hazards Associated with the Consumption of Sea Turtle Meat and Eggs: A Review for Health Care Workers and the General Public. *EcoHealth,* 3(3), 141-53.

Antonova, Anna S. (2016), The rhetoric of "responsible fishing": Notions of human rights and sustainability in the European Union's bilateral fishing agreements with developing states. *Marine Policy,* 70, 77-84.

Aquatic Mammals Working Group (2016), UNEP/CMS/ScC-SC1/Doc.10.2.2: Aquatic Bushmeat, Bonn: 1st Meeting of the Sessional Committee of the CMS Scientific Council.

Aquatic Mammals Working Group (2017), UNEP/CMS/COP12/Doc.24.2.3/Rev.1: Aquatic Wild Meat, Bonn: 2nd Meeting of the Sessional Committee of the CMS Scientific Council.

Belhabib, D., Koutob, V., Sall, A., Lam, VWY. & Pauly, D. (2014), Fisheries catch misreporting and its implications: The case of Senegal. *Fisheries Research,* 151, 1-11.

Belhabib, D., Sumaila, UR., Lam, VWY., Zeller, D., Le Billon, P., Abou Kane, E. & Pauly, D. (2015), Euros vs. Yuan: Comparing European and Chinese Fishing Access in West Africa, *PLoS ONE,* 10 (3), e0118351.

Brashares, JS., Golden, CD., Weinbaum, KZ., Barrett, CB. & Okello, GV. (2011), Economic and geographic drivers of wildlife consumption in rural Africa. *Proceedings of the National Academy of Sciences,* 108(34), 13931-36.

Brashares, JS., Arcese, P., Sam, MK., Coppolillo, PB., Sinclair, ARE. & Balmford, A. (2004), Bushmeat Hunting, Wildlife Declines, and Fish Supply in West Africa. *Science,* 306(5699), 1180-1183.

Carvalho, M., Rego, F., Palmeirim, JM. & Fa, JE. (2015), Wild Meat Consumption on São Tomé Island, West Africa: Implications for Conservation and Local Livelihoods. *Ecology and Society,* 20(3).

Convention on Migratory Species (2017), UNEP/CMS/COP12/Resolution 12.15: Aquatic Wild Meat, Bonn: 12th Convention on Migratory Species Conference of the Parties.

Daniels, A., Gutiérrez, M., Fanjul, G., Guereña, A., Matheson, I. & Watkins, K. (2016), *Western Africa's missing fish: The impacts of illegal, unreported and unregulated fishing and under-reporting catches by foreign fleets,* London: Overseas Development Institute.

de Boer, MN., Saulino, JT., Van Waerebeek, K. & Aarts, G. (2016), Under Pressure: Cetaceans and Fisheries Co-occurrence off the Coasts of Ghana and Côte d'Ivoire (Gulf of Guinea). *Frontiers in Marine Science,* 3(178).

Doumbouya, A., Camara, OT., Mamie, J, Intchama, JF., Jarra, A., Ceesay, S., Guèye, A., Ndiaye, D., Beibou, E., Padilla, A. & Belhabib, D. (2017), Assessing the Effectiveness of Monitoring Control and Surveillance of Illegal Fishing: The Case of West Africa. *Frontiers in Marine Science,* 4(50).

Gegout, C. (2016), Unethical power Europe? Something fishy about EU trade and development policies. *Third World Quarterly,* 37(12), 2192-2210.

Hoffman, LC. & Cawthorn, DM (2012), What is the role and contribution of meat from wildlife in providing high quality protein for consumption. *Animal Frontiers,* 2(4), 40-53.

Kaczynski, VM. & Fluharty, DL. (2002), European policies in West Africa: who benefits from fisheries agreements? *Marine Policy,* 26(2), 75-93.

Magnino, S., Colin, P., Dei-Cas, E., Madsen, M., McLauchlin, J., Nöckler, K., Maradona, M. P., Tsigarida, E., Vanopdenbosch, E. & Van Peteghem, C. (2009), Biological risks associated with consumption of reptile products. *International journal of food microbiology,* 134(3), 163-175.

Milner-Gulland, E. J. & Bennett, E. L. (2003), Wild meat: the bigger picture. *Trends in Ecology & Evolution,* 18(7), 351-357.

Nasi, R., Brown, D., Wilkie, D., Bennett, E., Tutin, C., van Tol, G. & Christophersen, T. (2008), Conservation and use of wildlife-based resources: the bushmeat crisis. *Technical Series no. 33*, Montreal: Secretariat of the Convention on Biological Diversity and Center for International Forestry Research (CIFOR).

Okafor-Yarwood, I. (2019), Illegal, unreported and unregulated fishing, and the complexities of the sustainable development goals (SDGs) for countries in the Gulf of Guinea. *Marine Policy*, In press, 99, 414-422.

Standing, A (2017), Criminality in Africa's Fishing Industry: A Threat to Human Security. *Africa Security Briefs,* 33(1).

Subramanian, M. (2012), Zoonotic disease risk and the bushmeat trade: assessing awareness among hunters and traders in Sierra Leone. *EcoHealth,* 9 (4), 471-482.

Tryland, M., Nesbakken, T., Robertson, L., Grahek-Ogden, D. & Lunestad, BT. (2014), Human pathogens in marine mammal meat–a northern perspective. *Zoonoses and public health,* 61(6), 377-394.

Vakkayil, J. (2017), Resistance and integration: Working with capitalism at its fringes. *M@n@gement* 20(4), 394-417.

Van Bressem, MF., Raga, JA., Di Guardo, G., Jepson, PD., Duignan, PJ., Siebert, U., Barrett, T., Santos, MCO., Moreno, IB., Siciliano, S., Aguilar, A. & Van Waerebeek, K. (2009), Emerging infectious diseases in cetaceans worldwide and the possible role of environmental stressors. *Diseases of Aquatic Organisms,* 86, 143-157.

van de Merwe, JP., Hodge, M., Olszowy, HA., Whittier, JM., Ibrahim, K. & Lee, SY. (2009), Chemical Contamination of Green Turtle (Chelonia mydas) Eggs in Peninsular Malaysia: Implications for Conservation and Public Health. *Environmental Health Perspectives,* 117(9), 1397-1401.

van Vliet, N. (2011), Livelihood alternatives for the unsustainable use of bushmeat: Secretariat of the Convention on Biological Diversity.

van Vliet, N. & Mbazza, P. (2011), Recognizing the multiple reasons for bushmeat consumption in urban areas: a necessary step toward the sustainable use of wildlife for food in Central Africa. *Human Dimensions of Wildlife,* 16(1), 45-54.

Van Waerebeek, K., Uwagbae, M., Segniagbeto, G., Bamy, IL. & Ayissi, I. (2015), New records of Atlantic humpback dolphin in Guinea, Nigeria, Cameroon and Togo underscore fisheries pressure and generalised marine bushmeat demand. BioRxiv, (2015 Jan 1:035337).

Van Waerebeek, K., Uwagbae, M., Segniagbeto, G., Bamy, IL & Ayissi, I. (2017), New records of Atlantic humpback dolphin (*Sousa teuszii*) in Guinea, Nigeria, Cameroon and Togo underscore pressure from fisheries and marine bushmeat demand. *Revue d'Écologie*, N°2.

Warwick, C., Arena, PC. & Steedman, C. (2013), Health implications associated with exposure to farmed and wild sea turtles. *JRSM Short Reports,* 4(1), 1-7.

Watson, I. & Brashares, J. (2004), The bushmeat trade and fishing licence agreements in West Africa., *ODI Wildlife Policy Briefing*, 4.

Margi Prideaux, Ph.D., an international wildlife policy specialist, has been involved in policy relating to international species conservation, regional agreement development, protected areas and the role of global civil society in international diplomacy for more than 25 years.

INTERDISCIPLINARITY, VITAL FOR A RENAISSANCE

I AM A HUMAN BEING

Sarah Lelong
Esprit de VELOX, La Rochelle
France
sarahl@espritdevelox.org

François Frey
Esprit de VELOX, La Rochelle
France
francoisf@espritdevelox.org

Independent and a part of an unlimited system, my balances swing between infinities and cooperation that engender life. I face the challenges my endangered species has to take. I pledge to further my ancestors' oldest thoughts and to quickly produce a renewed contract with the world that allows my existence.

I am roughly 55 litres of salt water.
I am a drop of the ocean, on earth.
I feel like I'm connected.

In another reality, I am built with a hundred thousand billion cells, which host themselves three to ten times other cells, alien organisms, as much alive as interdependent.
Without this community, I do not exist.

From another point of view, I can become an incredible assemblage of trillions and trillions of atoms, some of which are as ancient as the universe.

I feel like being a connected and constantly renewed world, living in a connected and constantly renewed envelope.
Unique, changing and ephemeral edifice, I am definitely My edifice.

Each of my atoms spins its own trajectory ... so I may look like a river, running in the rain that feeds it over and over. I feel like being this river that grows bigger rivers.
I am a living system.

Organic fractal of larger systems to which I contribute, and to which I am deeply bound... I cannot see nor completely understand them.

I feel like being concurrently all these realities, dimensions and connections.

Yet, neither any of the scientist's vision, nor the artist's, the engineer's or philosopher's ones, are sufficiently complete, or accurate

enough, to define and understand who I am or the links I have with the world.

I need their cross approaches to lead me closer to my composite reality, and to let me understand more clearly the place I have in a universe that becomes closer too.

While reading this, you produced images that have possibly moved forward your representation of humanity. Perhaps you also changed the course of another question that was growing before, in your head or in your heart. Perhaps again, this new perception or this « butterfly » will make its way from you, far beyond, growing and spreading into the dimensions of our common system: The Earth System. Its balance has been keeping the vital harmony of planet for more than three billion years and from the moment when the very first bacterium moored on this spaceship.

Our links with this system are as complex, permanent as vital. They evolve and change continuously. We do not completely see or understand them. Our interactions have become more and more violent during the last centuries. They undermine the finesse of its balances. As a paradox, the multiple crises we've been going through - climate, economy, culture, society and diplomacy ... can generate a perfect moment to awake consciences, to let us reconsider our links to the Earth System and to engage, understand, preserve and transmit to the youngest our most precious message:

The end of this world does not mean the end of the world.

The ocean is our origin and our hope for a reconnected future. It is the heart of a possible Renaissance, carried out by several generations and complementary cultures. During the 21st century, the stakes of its exploration and preservation are more than ever as important as Mars' conquest. Because our place on Earth continues to question us and our presence impacts its System.

OUR WAY TO AN ENVIRONMENTAL NEUTRAL AND BIO-INSPIRED FLEET

Esprit de VELOX is a Research and Development programme whose innovations lead to a dedicated ship that unites, at sea, with the Earth System. It gradually and resolutely tends, from available technologies to the design, the construction and the exploitation of a Zero Impact vessel with energy autonomy, important means of exploration, research and transmission.

In keeping with our collective commitments, we develop an approach that implements and improves reachable possibilities from today: transporting and working without impact on the ocean and on the climate, understanding and innovating together.
Long established dogmas throw necessary ruptures a little further every day, while our minimized or denied impacts seem to accelerate and amplify effects: warmed and disrupted climate, major biodiversity collapse, well-real climate migration...

We've been listening and understanding merging scientific needs to create a generation of offshore working platforms that would fit our times' challenges:

. studying the Earth System from the inside out,
. disturbing less and less the Ocean and its biodiversity,
. collating the collective knowledge on board, in a largely shortened time scale, well beyond the boundaries that freezes both disciplines and time while passing information from one circle to another.

The Esprit de VELOX programme does not open a way to consciously united co-working with the Earth System, but this is its rule, its daily life and its commitment to the benefit of the researchers and solution producers. They can serve the joint effort that has become an absolute necessity to fight the very visible changes that already impact the environment.

ANCHORING INTERDISCIPLINARITY AND BUILDING TRANSDISCIPLINARITY

Following on from the 18th century major maritime expeditions or Commander Charcot's campaigns, Esprit de VELOX will welcome on board both confirmed and younger researchers from earth and life sciences as well as human and social sciences. They will share the embarked programmes with artists, engineers and diplomats. The vessel will give them access, as closely as possible and in symbiotic conditions to the same environmental system they will all focus on.

On board, interdisciplinary research will become the rule and transdisciplinarity an ambition, leading to new cooperative partnerships, joint protocols and audacious concepts. This laboratory of the modern world aims to reveal possibilities by studying ecosystems from the inside out. It re-establishes human and scientific bonds.

Both scientific base camp and navigating Residence, the Esprit de VELOX programme develops its roots in a holistic approach of maritime researches. Eventually, successive generations of ships will contribute as well to individual research platforms as they will develop interdisciplinary projects on large ecosystems.

Scientific discoveries, knowledge improvement and artistic expression will become some visible faces of a common and ageless adventure.

Diplomats will then be able to impact our social and political environments, from the very inside of the research process.

Esprit de VELOX will pioneer a non-invasive research of the Earth System, at sea. It will share and disseminate its knowledge all along its routes. The ship, as a crucible of intuition, individual and collective experiences, will facilitate links and promote innovation.

FROM AN ERA OF COMMITMENTS TO FOCUS ON MEASUREMENT AND ACTION TIME

As long as a nation's, a territory's or a continent's wealth will be simply assessed with their GDP or wealth growth; as long as their renewable and zero impact- energy production, understanding of their own environmental system and biodiversity vitality won't be neither visible goals nor measures impacting the social or political success of a ruling minority,

then the world that supports our vital community will go on collapsing under our feet. And a few major players will go on taking short-term benefits, amongst general indifference.

The Esprit de VELOX programme relies on the development of technological solutions that will enable generations of research, working and maritime transport platforms to emerge. Being the first, the Esprit de VELOX Research Vessel will initially come from an assembly of available technological bricks, if not already associated.

The programme is about to deploy an environmental impact monitoring system at sea. It has become urgent to clarify how we have reached such states close to governance schizophrenia. As an example from 2018, why does an all-electric car benefit in France from the super ecological bonus, while it is penalized with the ecological super malus in Singapore? The way its electricity is produced, and the environment cycle of its batteries gives a first explanation. But the technological questioning may grow when transposed to the maritime transport market which is far less secure.

What kinds of logic, most of them visibly based on economic, strategic or political criteria, skew our attempts to understand and reduce our impacts?

How could we give both governments and consumers objective means to let them target short and medium-term actions that would impact the course of our collective environmental and vital impacts?

The Esprit de VELOX programme aims to contribute to such an objective understanding. For that purpose, it's been developing complementarities between scientific, industrial, artistic and diplomatic circles.

LET'S BET ON INTELLIGENCE AND UNDERSTANDING

Our collective maturity of environmental issues approach as well as the actual increase in environmental risks themselves require that we move from a world of commitments, neither measured nor evaluated, to a framework that generates, proposes and shares regular and sustainable indicators to support our ecological and societal transition approach.

The Titanic is on its way, the coal keeps burning below. The navigation binoculars are locked inside a bridge trunk, the key was left ashore... Our generations have the responsibility to face the situation, mourning emotional reactions and miracle solutions, identifying our effective impacts perimeters. We are expected to and co-build transition pathways, conscientiously.

This will not emerge without scientists, artists, engineers or philosophers' vision and skills, all together. This cannot be built without diplomats. They are the ones to impact on human organization and political balance: those preeminent stakeholders of the Earth System's evolution.

The Esprit de VELOX programme offers them all an innovation maritime centre, both residence and joint workplace, embarked on at the heart of the Ocean, our last border: building, sharing and disseminating within upstream and downstream networks, to educational world and the public.

Let's engage in Pascal's wager for individual consciousness development, because the Earth System's respect results ultimately in individual behaviour choices that are much stronger than laws or collective commitments:

> « *people love what marvels them, and people protect what they love »* Jacques-Yves Cousteau.

Finally, we individually face the intimate choice to catch or not a protected marine species, no matter if a law exists or not on that point...

Sarah Lelong has a PhD in Maritime and oceanic's law/biology. She is associate researcher at Centre de Droit Maritime et Océanique, Université de Nantes. In 2013, she founded Consult'Ocean, a consulting firm on issues of governance and management of maritime activities and marine resources. Since 2016, she has been the scientific coordinator of 1.618 Esprit de VELOX Programme

François Frey has a diploma of engineer from Ecole Nationale Supérieure d'Arts et Métiers (ENSAM) in Industrial System Engineering and New Product Design. He also possesses a Company Management and Business Skills Certificate, IGS Paris. Naval Officer, bridge navigator, he is a member the Steering Committee, CORICAN. Since 2014, he has been team leader for 1.618 Esprit de VELOX Programme. He has also acted as senior consultant, expert and international auditor for Management Systems (Environment, Quality, Security, Sustainable Development and Lean). Founder and Honorary Commodore of the Yacht Club Classique, La Rochelle, he has 40 years of sailing in international regattas.