

Thematic Dossier

Protecting Biodiversity



agenda 2030
by aiVP

For 30 years, AIVP has been accompanying port cities to guide them towards a more resilient, more concerted and more sustainable future.

In 2018, AIVP launched the AIVP 2030 Agenda, the 1st global initiative that adapts the 17 UN Sustainable Development Goals (SDGs) to the specific context of City-Port relations. This document, drawn up jointly with AIVP members at the Quebec Conference, sets 10 objectives for 2030.

In February 2020, AIVP signed an MoU with UN-Habitat to disseminate good practices related to this agenda.

Since September 2020, responding to the interest of our members, we focus in-depth on one Agenda goal per month.

In this ninth dossier we focus on "Protecting Biodiversity". We wish you a fruitful reading!

Index

What is the AIVP 2030 Agenda?	04
What is the "Protecting Biodiversity" goal in the AIVP 2030 Agenda?	05
How to restore and protect biodiversity on land and sea in port regions and cities?	06
Port of Vancouver: preserving our natural environment for generations to come	09
Ecocean: concrete solutions to assist nature	17
The city of Pointe-Noire wants to give biodiversity the space it needs	24
Seaboost: turnkey solutions for biodiversity	29
BeeOdiversity: biodiversity as a solution	35
Port Autonome de Strasbourg aims to restore biodiversity to its rightful place	42
ECONcrete®: concrete that enhances biodiversity	47
Ceuta : protection of port biodiversity	51

What is the AIVP 2030 Agenda?

The Agenda is designed to guide the actions and projects of port city stakeholders to ensure sustainable relations between the city and port. Port cities frequently find themselves in the front line when it comes to the most serious consequences of climate change (submersion, flooding, hurricanes, etc.), but they are also best placed to test innovative solutions in the following ten areas:

- 1. Adapting To Climate Change**
- 2. Energy Transition And Circular Economy**
- 3. Sustainable Mobility**
- 4. Renewed Governance**
- 5. Investing In The Human Capital Of Port Cities**
- 6. Port Culture And Identity**
- 7. Quality Food For All**
- 8. City Port Interface**
- 9. Health And Quality Of Life**
- 10. Protecting Biodiversity**

Discover the **AIVP Agenda 2030**

What is the “Protecting Biodiversity” goal in the AIVP 2030 Agenda?

Restoring and protecting biodiversity on land and sea in port regions and cities :

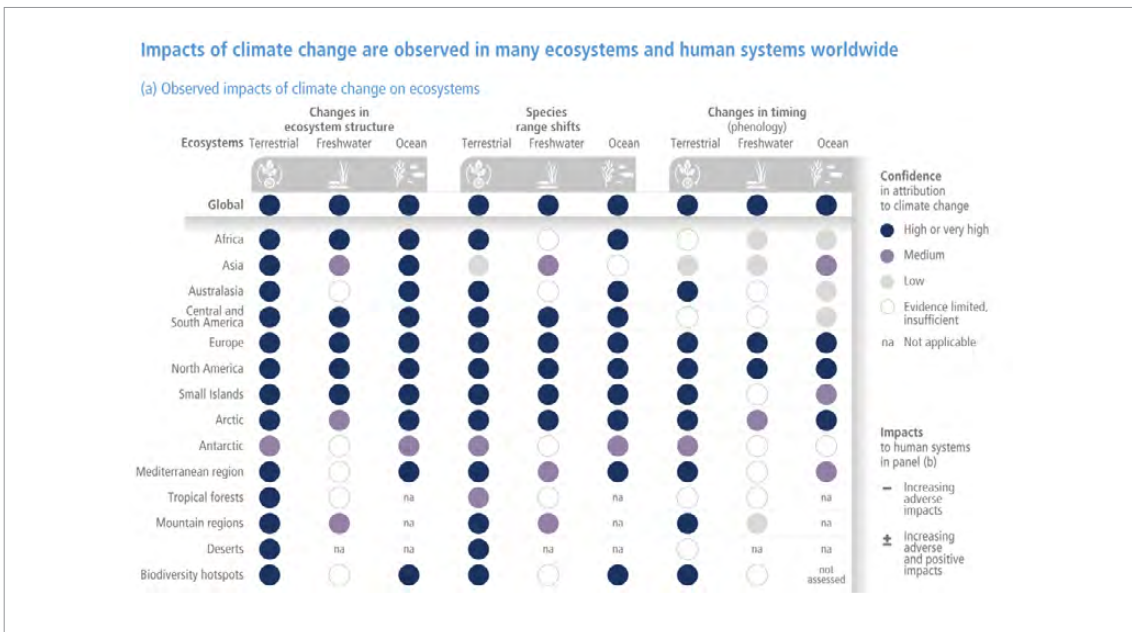
1. Improving and maintaining water quality in the port basins.
2. Conducting regular surveys of biodiversity in the City Port territory and publishing the findings.
3. Preventing the destruction of sensitive natural habitats when developing onshore or offshore port spaces and by regulating ship-generated waves.
4. Supporting the efforts of civil society to protect fauna and flora in the City Port territory.
5. Encouraging programmes aimed at restoring and developing biodiversity in the City Port territory.

More details on **this goal**

How to restore and protect biodiversity on land and sea in port regions and cities?

AIVP Team

The latest report of the IPCC, published in February 2022, highlights the devastating impact of human activity on biodiversity. The predicted loss in biodiversity by 2040, if compared to the levels in 1850–1900, is alarming. With warming of 1.5°C, the disappearance of species and biological diversity on earth is estimated at between 3 and 14%, and with warming of 5°C this would rise to 48%. The estimated risk to coastal ecosystems is no more encouraging, ranging from "moderate" to "very high". And finally, the threat to biodiversity hotspots is greater still, with warming of 1.5°C to 2°C expected to double the losses to biological diversity. Under the disaster scenario of 3°C warming, the losses would be multiplied by ten.



It may be added that climate change is not the only cause of biodiversity loss. Changes in land use (e.g. deforestation, intensive monocultures, urbanisation), massive exploitation (e.g. overexploitation of resources, overfishing) and the introduction of invasive species all add to the risk factors. In all these areas, port cities and port regions can act to counter the "sixth mass extinction", as they are points of contact between marine and terrestrial ecosystems.

Over the years, port stakeholders have become familiar with these challenges. Today, innovative solutions exist to tackle them. In this report devoted to the 10th goal of the AIVP Agenda 2030, we put forward some concrete solutions which are enabling port regions and cities to preserve and restore their biodiversity.

"To become the most sustainable port in the world" is the ambitious project announced by the Vancouver Port Authority. Duncan Wilson Vice-president of Environment and External Affairs at the Vancouver Port Authority talks to us about various projects that have been put in place to preserve the local biodiversity like the endangered Southern Resident killer whale (SRKW).

The interview with Gilles Lecaillon stresses the fragility of coastal marine animals like crabs and shrimps in the face of the artificialisation of the coastline. Using techniques of ecological engineering, Ecocean offers alternative habitats for degraded coastal sea-floors, meeting the reproduction needs of certain species. These solutions have already been implemented in different ports and appear to be bearing fruit.

But restoring biodiversity is a secondary need, and cannot succeed on its own. First of all we must protect our existing resources, and that is precisely the aim of Jean-François Kando, Deputy Mayor of Pointe-Noire (Congo). Managing waste, protecting mangroves and carrying out awareness activities are other topics addressed in this interview.

Port infrastructures have disturbed or artificialised ecosystems, however there is another way of looking at them which will allow us to reconstitute habitats for the reproduction of marine species. This is basically what Martin Perrot, Chief Operating Officer of Seaboost, told us. This French company specialises in restoring marine ecosystems, designing pro-biodiversity coastal structures and adapting coastal areas to the effects of climate change.

The terrestrial biodiversity of port cities is also highly valuable, although it is difficult to measure. In response to this problem, BeeOdiversity, founded by Dr. Bach Kim Nguyen & Michael van Cutsem proposes "BeeOmonitoring" solutions to restore biodiversity and reduce industrial and agricultural pollution.

"Not retreating into a corner, but instead working in partnership with local stakeholders, particularly environmental groups, to define and implement useful measures" is the method applied by Port Autonome de Strasbourg (France) according to Emilie GRAVIER, Director of Development. From differentiated management of green spaces with specific mowing and pruning to the planting of flower meadows and eco-pasture, the Port of Strasbourg is exploring and implementing different solutions, which she presented to us during this interview.

ECONcrete, a company cofounded by Ido Sella, whom we had the pleasure of interviewing, offers innovative technological solutions for the construction of modified concrete marine infrastructures. In addition to improved structural performance, these structures store carbon and enhance biodiversity.

The Port Authority of Ceuta is also very active in protecting port biodiversity, as we heard from Cristina Molina Ferrie, Environment Manager, and Jorge Vidal Madrigal, Head of the Conservation, Security and Environment Department of the Port Authority of Ceuta. In their interview they told us about different initiatives that the Port of Ceuta has put in place, such as the "Sentry Stations" which enable the port to control water quality, and the use of a hawking service to control the proliferation of seagulls.

These initiatives undertaken by our members show that, even if there is no miracle solution to preserve and restore the biodiversity of port cities, stakeholders in the industry are mobilising to tackle the problems.

Port of Vancouver: preserving our natural environment for generations to come

Interview by Denis DAVOULT



Duncan Wilson, Vice-President of Environment and External Affairs at the Vancouver Fraser Port Authority

The Port of Vancouver has the ambitious goal of becoming the most sustainable port in the world. A significant part of the path towards this goal is connected to sustaining a healthy ecosystem for the local biodiversity. The port is developing a myriad of actions to protect the local species and managing the port lands and water in a sustainable way, including a broad Habitat Enhancement Program developed over the past 30 years. In this interview we will learn about the different projects implemented to protect and enhance the local biodiversity.

Interview with **Duncan Wilson, Vice-President of Environment and External Affairs at the Vancouver Fraser Port Authority.**

AIVP | *Vessel traffic is at the origin of some disturbances for animals, such as underwater noise or ship-generated waves. We have heard of your motivation to reduce underwater noise, mostly linked to famous initiatives such as the "ECHO" Program, aimed at reducing such negative effects. Could you tell us more about this program?*

Duncan Wilson, Vice-President of Environment and External Affairs, Port of Vancouver |

The Salish Sea, where the Port of Vancouver is located, is a richly diverse area of the Pacific Ocean that is home to a vast array of marine life including some endangered species like the Southern Resident killer whale (SRKW). With thousands of ships transiting through this area en route to the Port of Vancouver, the Vancouver Fraser Port Authority launched the Enhancing Cetacean Habitat and Observation (ECHO) Program in 2014 to better understand and reduce the cumulative effects of shipping on this local whale population.

Recognizing that underwater noise from commercial ships can interfere with the southern resident killer whales' ability to hunt, navigate, and communicate, the program encourages ships to voluntarily slow down or stay distanced in order to reduce underwater noise while transiting through critical southern resident killer whale foraging areas.

Since the first slowdown in 2017, more than 6,000 ships have participated in the ECHO Program's voluntary underwater noise reduction initiatives, which span across 74 nautical miles of the Salish Sea. In 2020, these initiatives helped achieve a nearly 50% reduction in underwater sound intensity in certain southern resident killer whale foraging areas.



Echo program @ Port of Vancouver

We are tremendously proud of the broad awareness the ECHO Program has helped generate about the issue of underwater noise, and we are especially excited that a sister program – called the Quiet Sound program – is launching in the state of Washington, USA, inspired by our program. We are working to encourage further underwater noise reduction efforts at ports around the world.

AIVP | *Invasive species are one of the most dangerous threats to local biodiversity. It is a common phenomenon in port cities welcoming many ships, carrying ballast waters with foreign species. It has been evaluated that around 30-35% of endangered biodiversity is due to invasive species. What policies are you implementing to prevent such issues?*

Duncan Wilson, Vice-president of Environment and External Affairs | We monitor the lands and waters within our jurisdiction for invasive plants and other aquatic invasive species and conduct management and removal efforts as appropriate, as well as annually contribute to the physical and chemical removal of spartina, an invasive cord grass that has impacted our shorelines.



@ Port of Vancouver

To prevent the transfer of invasive species from ships entering our local waters, we were the first port in North America to prohibit in-port ballast water exchange without prior mid-ocean exchange. This practice has become the basis of the Government of Canada's guidance and has been adopted by many other countries as one of the best available options to reduce the risk of introducing invasive species.

All vessels calling the Port of Vancouver must meet the requirements set out in the International Maritime Organization's (IMO) Ballast Water convention, which requires vessels to have an approved ballast water treatment system onboard or conduct ballast water exchange. In addition, all projects with the potential for invasive species impacts (such as propeller polishing, for example) must undergo a pre-inspection survey to identify the extent of the marine fouling on the propellers.

We're encouraged by the progress the shipping industry has made towards the development of anti-fouling technology that prohibit or limit the growth of marine organisms on vessel hulls. In particular, the IMO 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species provide guidance on anti-fouling. As per Canada's federal Ministry of Transport (Transport Canada), we encourage vessels to voluntarily follow the IMO's biofouling guidelines as best practices for invasive species management.

AIVP | *The Habitat Enhancement Program includes many habitat restoration projects, including the new Brighton Park Shoreline Habitat Restoration Park, which combines new public spaces with restored wetlands. Can you explain a bit more about this project and its reception by the community?*

Duncan Wilson, Vice-president of Environment and External Affairs | Our Habitat Enhancement Program focuses on creating, restoring and enhancing fish and wildlife habitat in order to provide a balance between a healthy environment and future development projects that may be required for port operations.

One such completed project is the New Brighton Park Shoreline Habitat Restoration Project, which enhanced fish and wildlife habitat in an area of the Port of Vancouver called Burrard Inlet, and increased public access to the bountiful nature within it. In partnership with the Vancouver Park Board, the Musqueam First Nation, Squamish First Nation and Tsleil-Waututh First Nation communities, we restored and enhanced a historically filled foreshore and upland area by providing high-value habitat for a broad range of fish, birds, and other wildlife species.



New Brighton Park Shoreline – Before
@ Port of Vancouver



New Brighton Park Shoreline – After
@ Port of Vancouver



New Brighton Park Shoreline @ Port of Vancouver

The creation of a tidal wetland provides critical habitat in Burrard Inlet for juvenile salmon that migrate along the shoreline as they head out to sea, while the planting of various west coast native plant species – approximately 25,000 salt marsh plugs, 200 native trees, and 4,000 coastal shrubs – has reintroduced plant biodiversity at the newly constructed wetland. Construction was completed in 2017 and, as is the case with all habitat enhancement projects, we monitor the site annually to ensure the project continues to meet its biophysical objectives.

AIVP | *Maplewood Marine Restoration Project* is one of the ongoing initiatives in the Port of Vancouver to protect the local biodiversity. This project also includes a broad engagement with different social groups and public discussion. How do you developed this social engagement and how was this project implemented?

Duncan Wilson, Vice-president of Environment and External Affairs | The Maplewood Marine Restoration Project is located in the Port of Vancouver on the north shore of Burrard Inlet in a marine site that was identified as a restoration priority by a local Indigenous group, the Tsleil-Waututh First Nation. In alignment with the Tsleil-Waututh First Nation's Burrard Inlet Action Plan, and due to the site's industrial past, our project focused on restoring the low-diversity marine habitat into a higher-diversity marine habitat for fish, birds and other wildlife.

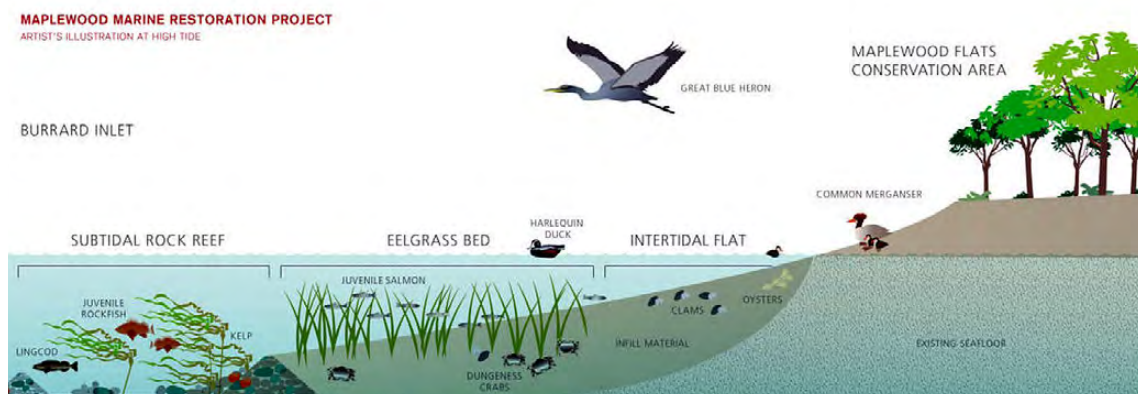


Maplewood Marine Restoration Project @ Port of Vancouver

The project included something that has never been done before in Burrard Inlet: the transplanting of approximately 125,000 eelgrass shoots to create a 1.5-hectare eelgrass bed. This work was completed through ongoing collaboration with Tsleil-Waututh Nation, from project planning through construction, which wrapped up in August 2021. We also thank Musqueam First Nation and Squamish First Nation for their participation and involvement.

Our approach to public and stakeholder engagement is based on two-way communication and open dialogue, working together to ensure the community, the environment and the economy are all considered during project planning. As part of this project, we engaged various stakeholders including local residents and businesses, government, environmental and community liaison groups, and other municipal groups.

The port authority has completed feasibility work on over 100 hectares of potential habitat enhancement. We work with Fisheries and Oceans Canada and consult with Indigenous groups, all levels of government, neighbouring communities, and other regulators on potential projects. This allows us to make sure the interests of all parties are considered, for the benefit of everyone.



Maplewood Marine Restoration Project @ Port of Vancouver

AIVP | *The Port of Vancouver is also planning an ambitious port expansion, with the Roberts Bank Terminal 2 Project. There are several offsetting actions planned, to protect tidal marshes, eelgrass, and salmon populations.*

Can you tell us more about these projects, how you have structured them and what is their importance for the new terminal plans?

Duncan Wilson, Vice-president of Environment and External Affairs | Our approach to offsetting environmental impacts of the Roberts Bank Terminal 2 Project is informed by over a decades' worth of environmental research into the proposed project, including over 77 individual studies resulting in 35,000 hours of fieldwork by over 100 professional scientists and engineers.

This work identified key opportunities for protecting fish and fish habitat from potential project-related effects during construction and operation and has informed a number of mitigation measures to avoid, reduce, or offset project-related effects. In addition to constructing the terminal away from sensitive intertidal habitat in deep waters, we are proposing additional mitigation measures related to juvenile salmon, including a reduction of the terminal footprint and modifications to the project design to facilitate fish passage through north and south ends of the project.

For example, we are proposing to build 86 hectares — approximately 163 football fields — of offsetting habitat developed in collaboration with Indigenous groups to support priority species like juvenile salmon, Dungeness crab, and other wildlife. This includes a variety of habitat types and advances priority habitats identified by Indigenous groups, which are reflective of their vision for habitat enhancement in the area.

AIVP | *The projects developed by the Port of Vancouver to protect the biodiversity are not only relevant for the environment, but they are also an opportunity to work with First Nations/Indigenous groups. How is this collaboration structured?*

Duncan Wilson, Vice-president of Environment and External Affairs | Building relationships with First Nations and Indigenous communities is not only part of our federal mandate — it allows us to learn from their expertise, cultivated over thousands of years of living and prospering along the Salish Sea, Burrard Inlet and Fraser River.

Through our shared interest in protecting the lands and waters within the Port of Vancouver's jurisdiction, we work together with local Indigenous communities to help build and maintain the healthy environment of their territories. As a result, we and local Indigenous communities have been able to undertake mutually beneficial projects within the Port of Vancouver, such as the New Brighton Park Shoreline Habitat Restoration Project, to support the health of the lands and waters we share.

Along with these principles, the port authority recognizes the importance of the United Nations Declaration of the Rights of Indigenous Peoples and is committed to aligning with the federal Principles Respecting the Government of Canada's Relationship with Indigenous Peoples within its mandate provided for in the Canada Marine Act.



South Arm Jetty Tidal Marsh @ Port of Vancouver

Ecocean: concrete solutions to assist nature

Interview by Denis DAVOULT



Gilles Lecaillon, CEO of Ecocean

The pressures exerted by man and his activities on coasts and coastal ecosystems grows stronger year by year. Recent years have certainly seen an awareness of the need to protect biodiversity. But to go further, and thus comply with Commitment 10 of the AIVP Agenda 2030 – Protecting biodiversity, it is necessary to conceive and put into practice concrete, operational solutions. That is precisely the reason for the existence of Ecocean, as we discussed with Gilles Lecaillon, founder and current CEO of Ecocean.

Ecocean has been a member of AIVP since 2017

AIVP | *Pollution, habitat destruction, overexploitation of marine resources, and of course climate change: there are ever more threats to coastal marine biodiversity. Ecocean was founded in 2003 to meet them. What are your objectives and what technical solutions do you propose?*

Gilles Lecaillon, CEO of Ecocean | We decided to concentrate on one part of the life cycle of coastal marine animals. A life cycle that consists of several complicated stages, in each of which high mortality occurs naturally. The latest stages are crucial, and this life cycle is closely connected with shorelines all over the world. However the shoreline has been severely transformed by world populations, and ports and marinas have a real impact and therefore also a role to play. Everybody wants to live by the sea, and the artificialisation of the coast is a direct consequence of this dream. Coastal fish, crabs, shrimps, sea urchins, octopus and other coastal animals all need, at a certain stage of their lives, complex habitats that are little areas of coastal seafloor in good condition. These are essential habitats which provide ecological functions (e.g. nurseries) that are vital for a properly functioning ecosystem. Ecocean's idea was to focus its actions on the post-larval stages when they reach the coast. Helping a fish or a crab that has a one in a thousand chance of survival, by helping it to grow to a refuge size where it has an 80% chance of surviving to adulthood, is a concrete action that can help to change things!

But even if the idea of helping nature may appear absurd, today there are too many of us and we exert too many pressures on these marine ecosystems. As a result, ecological engineering, what you might call engineering to help nature, is one of the solutions. Of course, it is not the only one. We must continue to protect and preserve natural ecosystems in good health as we do with Marine Protected Areas, continue to improve water quality, continue to raise awareness and above all avoid degrading the environment. These actions should always be the guiding principles of all that we do. At Ecocean, we have innovated and looked for practical operational solutions; and of course we have shown their ecological effectiveness (numerous theses and R&D projects) to reduce Man's impact on the coastal marine environment.

We offer two solutions:

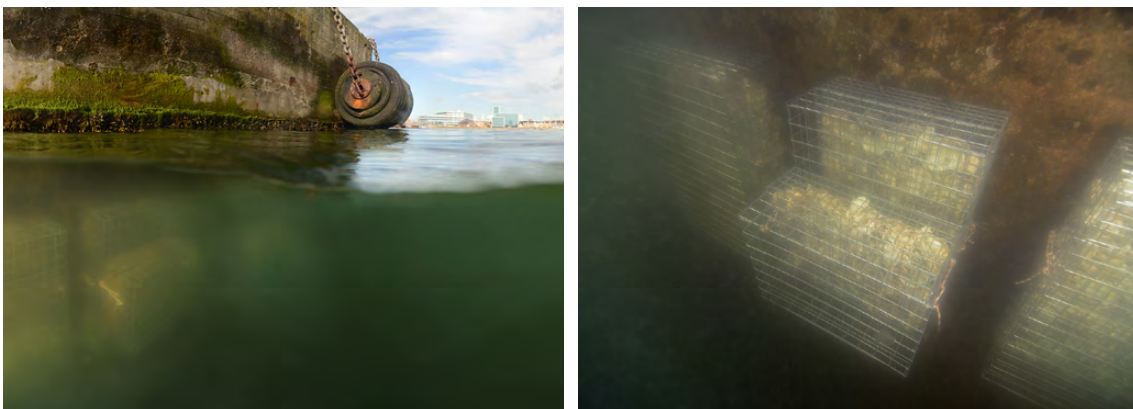
- The Biohut©, which is a patented artificial habitat that provides ecological functions in the heart of port infrastructures. The module is 100% recyclable and contains waste seashells (often oyster shells). It complies with the conditions of the circular economy. [See Video](#)
- BioRestore©, which is a unique procedure for capturing fish larvae at sea before they reach the coast, carried out by professional local fishermen. These larvae are raised in a farm on shore for several months until they are big enough to survive easily when they are released back into the sea.



© Ecocean

AIVP | *You have applied your solutions in France and now throughout the world. Can you give us two or three especially representative examples of this know-how?*

Gilles Lecaillon, CEO of Ecocean | We have installed more than 4,400 Biohuts in 9 countries. Today there are nearly 40 marinas and 4 commercial ports around the world that have been equipped. There are two excellent recent examples of projects with Biohuts® in Denmark: in May 2020 we equipped the commercial port of Aarhus, in parallel with a collaboration agreement with the local university which undertook to follow up the installation with its students. More recently, in summer 2021, 100 Biohuts were installed in 9 different zones of the port of Copenhagen in partnership with the Danish WWF. This is the biggest Biohut project in the world. Ecocean is very proud to see that the WWF believes in our solutions.



Biohut Aarhus © Rémy Dubas – Ecocean

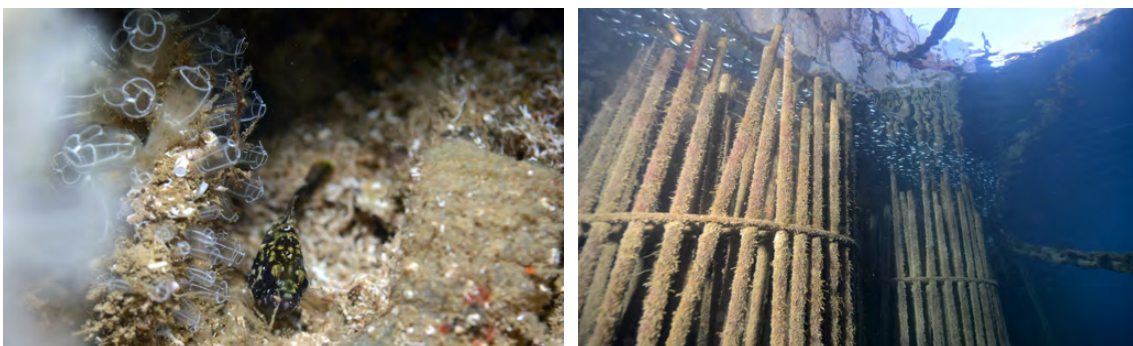
With the BioRestore© repopulation solution, in 6 years we have released nearly 15,000 juvenile fish ready to enter the adult population back into the sea between Marseilles and La Ciotat in the Mediterranean. They belong to more than 100 species of fish, including groupers, porgies, sea bream, etc. Five professional fishermen work with us, and we have created work equivalent to two full-time jobs. See video: [Port of Marseilles – project Casci-omar/solution BioRestore](#).



Repopulation – La Ciotat, April 2021 © Rémy Dubas – Ecocean

AIVP | *Local institutions, ports and industries are the most important stakeholders when addressing these challenges facing marine biodiversity. Are they now more receptive, and how much obstruction and reluctance still exist?*

Gilles Lecaillon, CEO of Ecocean | Of course. Ten years ago, when I started talking to port managers about biodiversity, they just stared. But when they understood that they could play a real, positive ecological role, both in the ecosystem and in the minds of the people, they joined in enthusiastically. The first were the ports of Monaco and Marseillan (in Hérault, France) in 2014.



Monaco © Rémy Dubas – Ecocean



Marseillan © Alizée Frezel – Ecocean



Biotope Marseillan © Lucas Berenger – Ecocean

Today, port and marina managers call us to ask if they can be given equipment, if they can become involved in actions for biodiversity.

You must understand that commercial ports have a real part to play. A scientific publication has shown that Biohuts installed in commercial ports produce even better results than in marinas. The shallow waters of a commercial port really are even more hazardous for the small individuals that arrive there, and when they find refuge in the Biohut, they stay there while they develop. I don't really meet reluctance, but people have their priorities. Today, the priorities are on reducing energy consumption and air micropollutants, and improving water quality. But once people commit to these areas, they should not hesitate to get involved in the issue of biodiversity as well. It is this action on biodiversity which will raise awareness among the inhabitants of port cities and port users. So, it is a super vector for showing the environmental steps being taken by the port.

But please note, it is not worth getting involved in actions for biodiversity if there is not already a commitment – and results – in terms of water quality, or reducing emissions of pollutants. These are essential steps prior to the installation of solutions for biodiversity.

AIVP | *How do you work together with the various stakeholders that we have been talking about when it comes to putting your solutions into practice in real terms?*

Gilles Lecaillon, CEO of Ecocean | We meet the managers directly, or through conferences like the AIVP Congress. You really have to explain to people that operational solutions exist, that they are easy to install and not at all demanding. You have to talk a lot, and also present scientific results. You have to be very careful with biodiversity. It is so easy to do things that are irrelevant. Tyres or cement blocks may attract marine life, but that is not “helping biodiversity”! The solutions implemented need to be validated scientifically, and the materials used must be noble and easy to recycle. We have to be part of the circular economy and stop consuming scarce raw materials (sand for cement) or materials not suitable for the marine environment (plastic). We are sufficiently innovative in France to do better than that. Ecocean uses nothing but raw steel and oyster shells. We have carried out three research theses with the University of Perpignan (CREM), and a fourth is ongoing, on trophic relationships, at the University of Nice. More than 6 publications are available in high-impact journals, as well as reference works co-authored with experts (Agence de l'eau Rhône Méditerranée Corse-AERMC, Universities, Pôle Mer, etc.). These are essential deliverables, because we show that actions for biodiversity really work, and that they can reduce or attenuate impacts.

Because they saw that we have more than 10 years of feed-back from our experience in the coastal marine environment, AERMC launched a plan to recover coastal nurseries in the Mediterranean in October 2021, with a committed budget of 3 M€ for 3 years. There is positive progress, and it is important to highlight what is being done.

AIVP | *Raising awareness in children is also an important part of your activities. What do you do to achieve this?*

Gilles Lecaillon, CEO of Ecocean | It has become a major thrust. To start with, we are ecologists and we have developed ecological solutions which have been validated scientifically. Then, as everything happens underwater, we have worked with professionals to find ways of bringing the information to the surface, to show the results, and the life that exists in the port.

Board games, study tours, open-air games have been created which activate the senses, such as touch, hearing and smell. These trigger emotions which make the children more receptive to our message. We have raised awareness in more than 5,000 children through the port projects that we have carried out. The port-city relation is strengthened by these awareness actions. It is also a source of legitimate pride for the children; because if they understand that a port, traditionally considered a "parking area for ships", is an artificial ecosystem that is home to tiny, fragile creatures, they will also have more respect for natural coastal marine ecosystems.



Raising awareness in children © Ecocean

The city of Pointe-Noire wants to give biodiversity the space it needs

Interview by Denis DAVOULT



M. Jean-François Kando,
Deputy Mayor of Pointe-Noire

Pointe-Noire, the administrative capital of the Republic of the Congo, is also the country's economic lung, with an important contribution made by the deepwater port and the oil terminal. Today it must take steps to meet the threats to its coastline, natural areas and marine resources. In this interview, M. Jean-François Kando, Deputy Mayor of Pointe-Noire, tells us about the measures which will enable the city to respond to these threats and "Protect Biodiversity".

The City of Pointe-Noire has been an AIVP member since 1995

AIVP | A report published recently by UN-Habitat identified a serious challenge created by waste, oil, plastic bags and bottles along the shores of Pointe-Noire. This marine pollution is harmful to the animal and plant species that live on the coastline.

What policies can be implemented to fight coastal pollution?

M. Jean-François Kando, Deputy Mayor of Pointe-Noire | We need to find funding to set up a cleaning and waste management system to organise the collection, transport, storage, sorting, treatment, recycling and re-use of waste within the city limits, to achieve several aims:

- fight against the swamping of nature by waste;
- anticipate, preserve and enhance the city's existing capabilities by creating transit areas for household waste;
- reorganise informal collectors in district inaccessible to waste-collection trucks
- design and implement a new master plan for waste transport routes to landfill sites;
- purchase modern equipment for the desanding and flushing of gutters and channels;
- strengthen law enforcement legislation;
- promote eco-tourism.

AIVP | *According to studies by the National Centre for Forest and Fauna Inventory (CNIAF), concrete constructions are threatening the mangroves of Mazra and Loya. Mangrove swamps are not only an essential breeding ground for fish and crustaceans, but also a carbon sink that absorbs CO² from the atmosphere?*

How can you protect mangroves effectively from urban and/or port expansion?

M. Jean-François Kando, Deputy Mayor of Pointe-Noire | Our objectives are to:

- finalise the city's master plan by implementing a local urbanisation plan as a matter of urgency;
- carry out a census of existing mangroves and put protection measures in place;
- restore damaged mangroves;
- create a safety zone around the mangroves by expropriation of coastal residents;
- set up an inter-ministerial commission including the Port, the City Hall and the Environment Ministry in the framework of monitoring the existing guidelines.



© Renatura Congo

AIVP | *The NGO Renatura Congo is active in the Department of Pointe-Noire. It has organised awareness sessions together with Congo Terminal to educate the population in good practices they can adopt to help biodiversity.*

Could your City Hall associate itself with this initiative, or launch actions with the same objects?

M. Jean-François Kando, Deputy Mayor of Pointe-Noire | Yes; considering the environmental challenges we are facing, it is a good idea to form associations and identify other partners for the conception of a massive programme to educate the population and raise their awareness, based on the principles of conserving the environment and publicising the regulations.



© Renatura Congo

AIVP | *The industrialisation of fishing casts doubt on the good management of marine resources. A project financed by the French Development Agency and the European Commission for the period 2018-2023 is designed to improve the sustainability of fishing on the Congolese coast, thus protecting local fish species.*

Do you have any projects for sustainable fishing, or might you for example associate yourselves with that initiative?

M. Jean-François Kando, Deputy Mayor of Pointe-Noire | No. Nevertheless, we are willing to associate ourselves with this initiative in the framework of one of our coastline preservation projects:

- mangrove reproduction to support the breeding of aquatic species and to contain coastal erosion;
- construction of fishing villages;
- construction of a plant for the processing and sale of marine products;
- creation of fishing cooperatives;
- modernisation of artisanal fishing.

Making space for mangroves

The area of mangroves in the south of the Department of Pointe-Noire fell from 506 hectares in 2000 to 57 hectares in 2014. According to estimates by the National Centre for Forest and Fauna Inventory (CNIAF), 90% of the area of mangroves has been lost since the first decade of this century.

The need to "Rehabilitate and protect the mangroves in a participative effort" was enshrined in the City of Pointe-Noire Urbanisation Plan in 2016. A 5-year strategic action plan for the restoration and sustainable use of mangrove ecosystems and associated wetlands has also been established by the Department of Pointe-Noire.

At a national level, the Congo has set up instruments and strategies such as the inclusion of certain sites on the list of wetlands of international importance. At all events, as the Tourism and Environment Minister, Madame Arlette Soudan-Nonault, stressed on 3 March this year at African Environment Day, efforts must be continued to make a real space for mangroves, as their ecological, biological, economic and sociocultural functions are clear. And according to the Minister, in a country severely exposed to the problems of global warming and rising sea levels, "raising awareness of the vital importance of mangroves in the protection of our coastline is therefore more than ever an imperative.

Renatura Congo and its awareness-raising action

The NGO Renatura Congo was created in 2005 to respond to the threats facing turtles: pollution, poaching, urbanisation, and economic activities like fishing. It has assumed a wider role in protecting biodiversity, particularly the mangroves that we mentioned in this interview. Renatura Congo has carried out numerous awareness-raising activities, especially for children. 270,000 children have taken part in these activities, carried out jointly with the teaching teams of public and private schools in Pointe-Noire and coastal villages.



© Renatura Congo

Seaboost: turnkey solutions for biodiversity

Interview by Denis DAVOULT



Martin Perrot, Seaboost's Chief Operating Officer

Specialising in the restoration of marine ecosystems, the design of pro-active coastal structures for biodiversity and the adaptation of coastlines to the effects of climate change, Seaboost is a French company whose activity in favour of biodiversity, objective number 10 of the AIVP Agenda 2030, takes place in port cities. **Martin Perrot, Seaboost's Chief Operating Officer**, shares with us the motivations that led the company to join the AIVP.

Seaboost is an AIVP member since January, 2022

AIVP | You recently joined AIVP. Can you explain to the other members of our international network how your business was created, and what solutions you provide?

Martin Perrot, Seaboost's Chief Operating Officer | Seaboost is a pioneering company that specialises in ecological engineering applied to port infrastructures. We work to restore aquatic ecosystems in the interface zones where the urban and natural environments meet, in France and around the world.

We saw that coastal development projects were finding it difficult to incorporate the functioning of marine ecosystems into their designs. With that in mind, Seaboost was created from our desire to bring together people with skills in a range of disciplines, from ecology to civil engineering, with the aim of devising solutions for the design and realisation of biodiversity-friendly marine and river installations. With over ten years' experience in this innovative field, our team works every day to help port and coastal infrastructure operators reconcile their technical and economic imperatives with their commitment to preserving marine ecosystems.

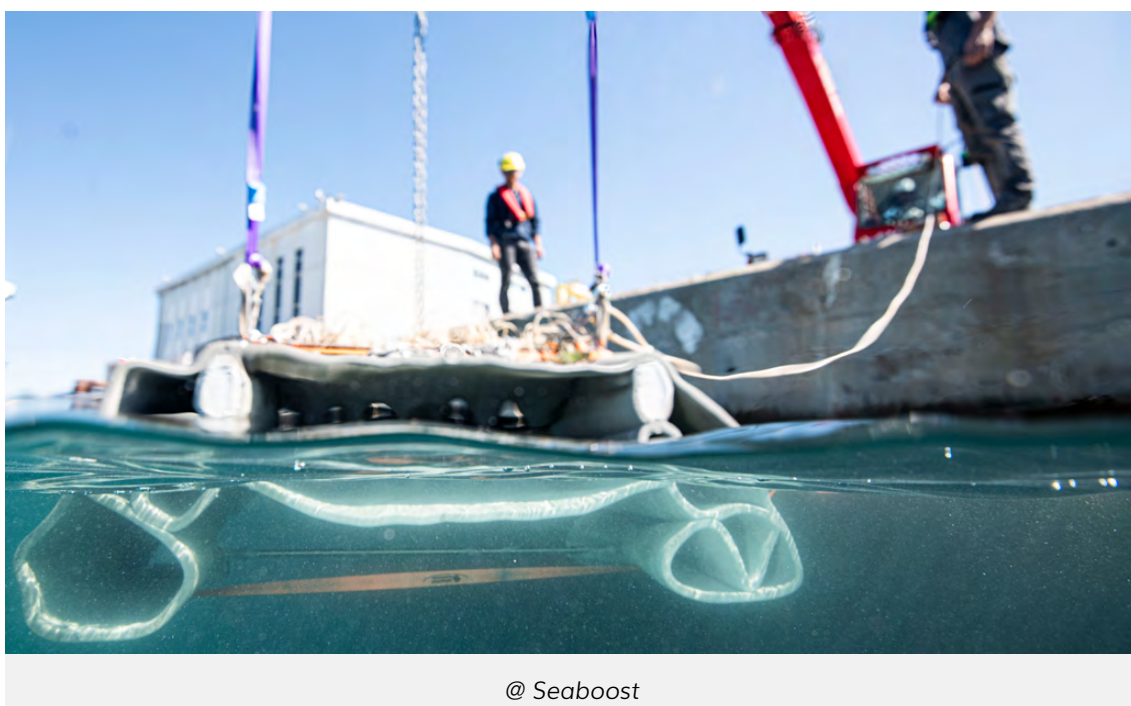
We offer complete solutions in three main areas:

- **Blue infrastructures, for integrating ecological functions into coastal or offshore technical infrastructures.** For ports, we have developed a comprehensive support approach to incorporate optimised biodiversity management into port operation. In 2022, we installed over 5,000 m³ of habitats at around a dozen ports.
- **Ecological restoration of damaged natural habitats:** coral reefs, mangroves, rewilding, and other natural environments.
- **Nature-based and anti-coastal erosion solutions:** adapting to the effects of climate change and making ecosystems more resilient.



@ Seaboost

Seaboost offers a range of solutions for revitalising marine life, in places where it has been – or still is being – heavily impacted by human activity. Thanks to a process of constant innovation, based on numerous academic and industrial partnerships in France and world-wide, we have built up unique expertise in marine ecological engineering applied in temperate and tropical zones. Some of our most recent innovations includes large-scale port nurseries, artificial reefs, 3D-printed ballasts and moorings, and soft solutions to combat coastal erosion...



@ Seaboost

AIVP | *What made you decide to join AIVP, and what are you expecting to get from our worldwide network?*

Martin Perrot, Seaboost | Port cities are comprised of man-made and natural zones, which on a large-scale play a vital role for aquatic biodiversity (corridors, nurseries, shelters, etc.). These are living places that need to be restored and enriched!

AIVP brings together international urban and port stakeholders, and promotes efforts by port cities to put the UN sustainable development goals into practice, through its AIVP 2030 Agenda. We decided to join AIVP in order to reach out to the operators of port environments in France and around the world, take part in working groups, and help to shape a shared approach to the issue of preserving biodiversity in ports. We expect the AIVP will enable us to forge new contacts and build cooperation both with and between port cities.

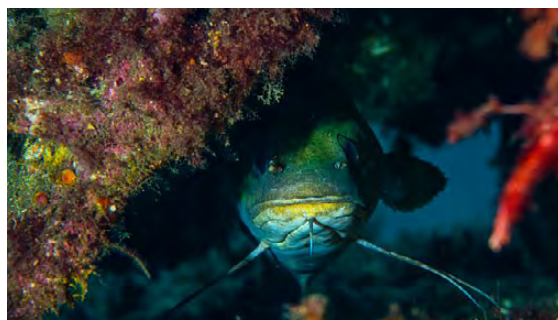
AIVP | *What will you bring to AIVP?*

Martin Perrot, Seaboost | Historically, port installations and facilities have been designed for technical and economic functions. As a result, they promote fewer ecological functions than the ecosystems they have replaced or disturbed.

Our approach involves recreating habitats with the characteristics needed for the development of marine species (coral, mangroves, algae, fish, crustaceans, etc.), taking into account their preferred environment and the different stages in their life (larvae, young, adults, etc.). The aim might be to redevelop rich and diversified communities, more representative of the surrounding natural environments that are in good condition. Alternatively, it might be about developing specific species that are endangered or of scientific or symbolic interest, are important for fish stocks, or are the first links in complex natural ecosystems.



Reefs in Guadeloupe @ Seaboost



Inhabited Reefs @ Seaboost

We want to use our experience to help port cities meet the need to preserve aquatic ecosystems, and share our passion for fighting the erosion of biodiversity together.

AIVP | *You are joining a network that already includes a number of members working to promote biodiversity. Can you tell us more about your vision of how our members can complement one another, around shared sustainable values?*

Martin Perrot, Seaboost | There are several ecological engineering players who today share the goal of developing the ecological functions of coastal installations, thereby reconnecting man-made zones with their environment.

Solutions offered in this field, both those which already exist and those currently in development, are varied and complementary, reflecting the diversity of the habitats found in nature. Scientific monitoring has shown various solutions to be effective, providing a sound common basis for developing port ecological engineering.

Following this initial phase, the priority for tackling the erosion of biodiversity is for us to take fast action that is proportionate to what has been lost, i.e. on a vast, global scale. To achieve that, all the stakeholders concerned need to work together to come up with ambitious, standard-setting new initiatives that show the path to success, inspiring other operators to follow.

We are joining AIVP today with the aim of helping to bring through those synergies and opportunities, driving the ecological restoration of port cities forward into a new phase of development and dissemination.

The task ahead is a huge and urgent one. It is essential to pool our energies and look beyond our individual interests if we are to act effectively.

AIVP | *You provide solutions to protect biodiversity in port cities, such as your RECIF'LAB project, for example. You also work to improve the resilience of coastal areas, as you are doing with your PEGASE project. Based on your experiences, what do you see as the keys to achieving these goals, fully in line with our 2030 Agenda, of protecting biodiversity and resilience?*

Martin Perrot, Seaboost | Proper management of biodiversity in ports helps to improve the state of the environment on a larger scale. Richer man-made ecosystems are more resilient (to climate change, invasive species, etc.). That biodiversity management consists of several stages: gathering information about the existing state of the port (ecological assessment to ascertain its strengths and areas for improvement), then moving into action (planning and deploying actions, such as ecodesign of new and existing installations), evaluating (scientific monitoring of ecological and technical performance), and promotion (training, awareness, communication).



3D Reefs @ Seaboost

By supporting port cities through each of these stages, we are playing our part in achieving goal 10 of the AIVP 2030 Agenda, "Protecting biodiversity – restoring and protecting biodiversity on land and at sea in port regions and cities".

BeeOdiversity: biodiversity as a solution

Interview by Denis DAVOULT



Michael van Cutsem, BeeOdiversity



Dr. Bach Kim Nguyen, BeeOdiversity

BeeOdiversity is a Belgian company specialized in the restoration of biodiversity and the reduction of industrial and agricultural pollution, acting in port cities. Their actions accompany the sustainable development of port cities on three of the objectives of the 2030 Agenda of the AIVP: N°8. City – port interface, N°9. Health and quality of life, N°10. Protecting biodiversity. Dr. Bach Kim Nguyen & Michael van Cutsem, founders of the company, share with us the motivations which led the company to join AIVP.

BeeOdiversity is an AIVP member since January 2022.

AIVP | *You recently joined AIVP. Can you explain to the other members of our international network how your business was created, and what solutions you provide?*

Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity | BeeOdiversity came about as a result of Dr. Bach Kim Nguyen and Michael van Cutsem's commitment to taking action to protect biodiversity, especially bees and their ecosystem. Bach Kim is a world-renowned authority on the issue of bee decline and the loss of biodiversity, and sits on a number of international panels of experts. After completing his PhD on this topic and working as a research and teaching assistant at the University of Liège (Gembloux Agro-Bio Tech), he wanted to translate his findings on paper into reality. After initially working as a lawyer, Michael turned entrepreneur, helping a host of SMEs to expand their business. He decided to devote his skills to a project that would provide a positive impact for future generations.

In 2012, they founded BeeOdiversity in a concrete demonstration of their belief in the cause of social entrepreneurship – making business work for nature and humanity. Since its inception, many who share and are committed to these same values have joined their team.



Dr. Bach Kim Nguyen & Michael van Cutsem, founders de BeeOdiversity

BeeOdiversity is a consultancy and environmental design agency. We create value by re-generating biodiversity and reducing pollution (industrial and agricultural). We offer invaluable support to our public and private-sector clients, in the form of innovative tools that combine nature-based solutions and technology, to build sustainable strategies that can be deployed in the field. We work in ten EU countries and in the United States. Our solutions have earned several awards – in 2020: the Solar Impulse foundation and the European Investment Bank (EIB) Institute. We work for clients in various sectors: Public authorities (from municipal to regional level), Committed brands, Water, Food and Agriculture, Real Estate, Industry, Energy, Healthcare...

Focus on BeeOmonitoring

Referred to as 'biomonitoring' or 'biosurveillance', this is a tool for measuring biodiversity and pollution using the pollen collected by bees, which act like natural drones and bio-indicators. It is the only tool that lets us collect qualitative and quantitative data, continuously and over large areas:

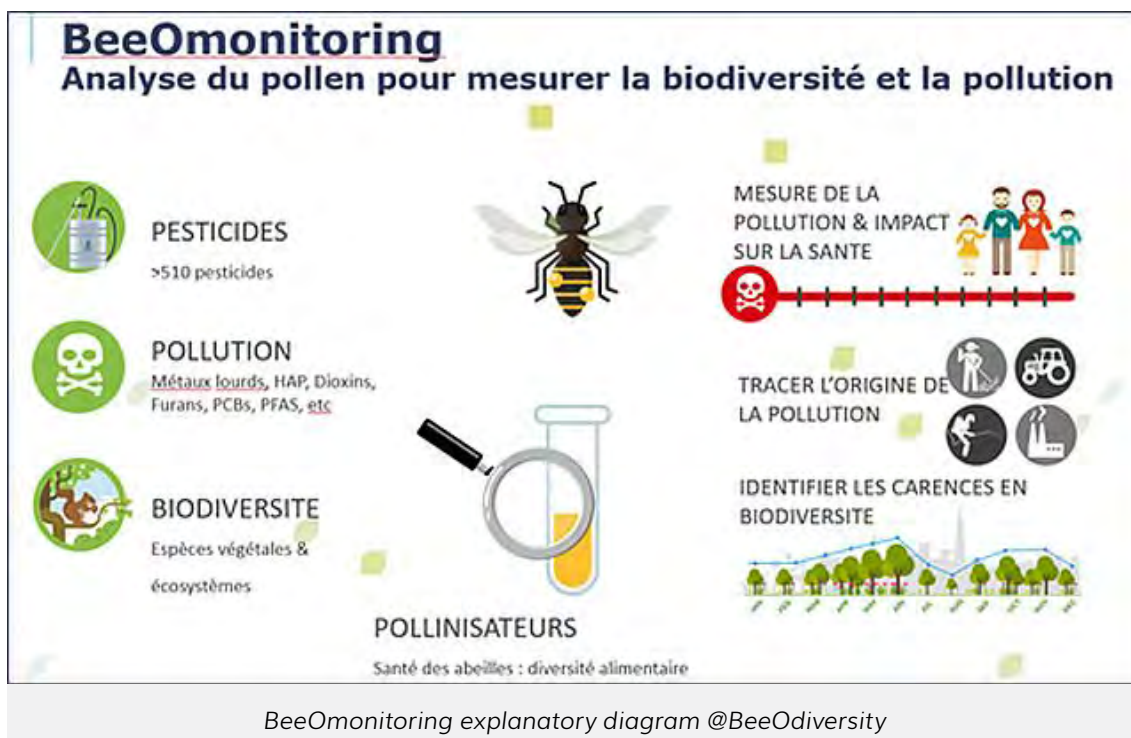
- **biodiversity:** the number and type of plant species present, whether their numbers are declining, and the impact on the wider ecosystem.
- **pollution:** the type, concentration, and impact of industrial and agricultural pollution (pesticides, heavy metals, PAH, benzene, dioxins, furans, PCBs, PFAs, nitrates, etc.).

The measurements taken by this biomonitoring are then used to take targeted action, where appropriate by working or communicating with the local community, and to assess the impact of the measures taken, based on statistical scientific indicators

We have our own bee keepers and hives, but we aim to work with local apiculturists where possible. Our system can be installed on any hive, anywhere in the world.



BeeOmonitoring explanatory diagram @BeeOdiversity



AIVP | What made you decide to join AIVP, and what are you expecting to get from our worldwide network?

Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity | Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity – We already work with cities and ports to preserve and regenerate biodiversity and air quality. So it was a natural choice to join AIVP. Like AIVP, we believe that (i) the solution is collective, (ii) regenerating biodiversity and promoting regions and territories creates economic and social value. We are therefore committed to building the sustainable cities and ports of the future.

Local and regional authorities. BeeOmonitoring is of interest to them for various reasons: detecting pollution and loss of biodiversity, scientific indicators providing detailed feedback on actions already taken and monitoring, advice on possible targeted improvements based on results, biodiversity and air quality, the well-being of citizens, and the way the area is perceived, attractiveness.

- identification, source, and impact of heavy metals and pesticides
- identification of different pollens/honey resources = quantity (including any deficiencies) and quality of plant biodiversity – over the four periods analysed

- proposals for a strategy and/or action plan (based on data collected), including stakeholders:
 - planting by citizens, giving them an active role in the local authority's biodiversity project;
 - targeted planting, to address any plant shortages observed at certain times;
 - creation of test areas with farmers in the area or its periphery, with more environmentally-friendly alternatives, while maintaining the quality and economic value of production.

Port stakeholders (public institutions, State and local authorities, economic operators). BeeOmonitoring is of interest to them, in the same way as local and regional authorities. Ports also have the advantage of being the interface point where numerous different sectors meet: industry, logistics, river and coastal transport, territorial development. In addition, their political and legal structures involve public and private sector stakeholders.

AIVP | *What do you believe you can bring to AIVP?*

Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity | Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity – We can help to improve relations between cities and ports even further, by establishing and developing dialogue and cooperation. Our advisory role and strategic and operational solutions can support AIVP members in their efforts to find pro-environment, pro-biodiversity solutions, to build port cities that reflect the aspirations of their residents.

In line with the AIVP Agenda 2030 for sustainable development of port cities, BeeOdiversity will support the actions of cities and ports in three key areas: "8. City port interface", "9. Health and quality of life", "10. Protecting biodiversity". Our aim is to play an active role within AIVP, to promote improved understanding of the importance, solutions, and services provided by biodiversity, in order to encourage and support programmes and projects aimed at preserving, restoring, compensating, and developing biodiversity in City Port territories:

- Improving the water quality of dock basins. Developing green infrastructures.
- Assessing existing biodiversity in the City Port territory. BeeOmonitoring.
- Avoiding any destruction of sensitive natural habitats when developing the terrestrial or aquatic footprint of ports. Advising on the development and management of sites.
- Supporting civil society's actions to prevent biodiversity in City Port territories. Communicating data and raising awareness to actively involve citizens.

AIVP | *You recently highlighted the threat posed by invasive species to local biodiversity. We have previously drawn attention to this issue in relation to sailing. What are the prospects on land, and what solutions does BeeOdiversity propose?*

Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity | Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity – Japanese knotweed, Asian hornets, beavers, bullfrogs... Invasive species are the third biggest cause of biodiversity loss worldwide. According to the red list of the International Union for Conservation of Nature (IUCN), they are at least partly responsible for half of all known extinctions, and represent a threat to nearly a third of rare terrestrial species. It is a concerning problem, given how difficult it is to do anything about it once these species are established.

Our indigenous species, meanwhile, are highly vulnerable to the development of these invasive species, as in many cases they have no effective defence mechanisms and no longer have sufficient space in which to develop, as the areas they might otherwise expand into are already occupied by the invaders. In addition, invasive species are usually more competitive and voracious. Some can carry new pathogens that may be dangerous, both for indigenous species and for humans. They may also alter the balance of existing ecosystems by changing the properties of soil or water, or disrupting natural habitats. Every year, the damage caused by invasive species costs the world 26.8 billion dollars.

How can we protect against invasive exotic species? BeeOdiversity helps to choose the right solution for protecting the environment from invasive species. We carry out environmental analyses, including via BeeOmonitoring: by identifying the species present at a site, we can then diagnose the existing state of biodiversity in that area. Next, we analyse practices, requirements, and constraints, in order to recommend specific, bespoke actions to protect plant and animal species that are beneficial to the ecosystem and the territory. By identifying invasive species and the way they develop, an appropriate management approach can be adopted. For example, mechanical control is an effective method for combatting invasive species locally. Awareness and educational activities and events can also be organised.

AIVP | *We see that you have collaborated with other AIVP members like Suez and developed projects in Brussels near the port, like Docks Brussel. Can you tell us more about these projects, and what they were designed to achieve?*

Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity | Dr. Bach Kim Nguyen & Michael van Cutsem, BeeOdiversity – Suez operates sites that produce and process water (potable water, waste water) and waste, on behalf of local and regional authorities. Suez is keen to promote sustainable practices that positively impact the preservation of water resources, and maintain and improve air quality. BeeOdiversity is helping Suez to achieve its objectives at its sites and across the territory. We are deploying BeeOmonitoring in those locations to diagnose the existing state of biodiversity and pollution, in order to then recommend ways of improving the environment. We have proposed actions designed to improve biodiversity at sites, and encouraged the sharing of findings and indicators with stakeholders (the city, farmers, residents, etc.) to generate a “local project”. Communications actions have also been deployed at the local mayors and communities exhibition.



*Mathias Blot (CEO of Docks Bruxsel) and William Donck (BeeOdiversity)
in front of the beehives – D.R. @Sudinfo*

Docks Bruxsel is a shopping mall with several retail chains, a cinema, and restaurants. The project aimed to create a major sustainable real estate development with a positive impact in the centre of Brussels. BeeOdiversity conducted environmental monitoring at the site, and across the wider area, with dual aims: to improve the site's environmental quality and bring stakeholders on board. Finally, actions to raise awareness among customers and residents were carried out, focusing on the need to preserve biodiversity and bees, and the products sold – for example, by explaining how pollination by bees contributes to the production of foodstuffs and cosmetics sold in the shopping centre.

Port Autonome de Strasbourg aims to restore biodiversity to its rightful place

Interview by Denis DAVOULT



Emilie GRAVIER, Director of Development, Port autonome de Strasbourg, PAS

The various sites operated by Port Autonome de Strasbourg are all located in the Rhine valley, an environment rich in biodiversity. Eager to sustain and develop its activities over the long term, the operator is also committed to preserving that local biodiversity through numerous initiatives. The strategy is fully in line with Commitment no. 10 of our AIVP 2030 Agenda.

Interview with Emilie GRAVIER, Director of Development at Port Autonome de Strasbourg.

Port Autonome de Strasbourg has been a member of AIVP since 1994

AIVP | *Ten years ago, you committed to a pro-active, pro-biodiversity strategy. What are the main lines and objectives of that strategy?*

Emilie GRAVIER, Director of Development, Port autonome de Strasbourg, PAS | Since 2011, PAS has been committed to preserving biodiversity. When shaping our corporate social and environmental responsibility policy in 2018, we identified biodiversity as a priority part of the ecological and energy transition aspect. In 2019, we were keen to acquire a genuine biodiversity strategy to structure our different actions, take things to the next level, and be accountable. That led us to work with Strasbourg's Urban Planning Agency (ADE-US), which highlighted the very rich woodland environment around the port, the important heritage trees in the port itself, and the species found on our land.

Our strategy is focused on two key objectives: preserving and improving environmental continuities to ensure that ecological functions can continue, and preserving biodiversity while striking a healthy balance with our sites' economic activities.



AIVP | *Can you give us some examples of the actions you have taken?*

Emilie GRAVIER, Director of Development | As early as 2011, we enlisted the help of an association to conduct an assessment of the way we maintained our different spaces, and identified actions for improvement, all of which have been implemented. These includes differentiated management of green spaces with specific mowing and pruning, planting flower meadows, integrating best practices right from the design stage of landscaping and installations, and testing the use of alternative methods and products to chemicals. Thanks to these measures, we earned "Two Dragonfly" certification in 2014, a label awarded by the Water Office and the Grand Est regional authority to recognise the use of biodiversity-friendly techniques to maintain green spaces. That initial contact with an environmental protection association was very positive, and led to other productive exchanges.

In 2016-2017, we established links with Haies Vives Alsace, which led to hedgerows including local species being planted on port land. At the request of fishing federations, PAS has been clearing weeds at a distance from the river banks since 2017, to encourage the reproduction of fish while keeping the waterway open for shipping. In April 2021, teams from Alsace Nature spoke to the port's staff about how to maintain grassy areas in an environmentally responsible way.



© Port Autonome de Strasbourg – PAS

At PAS's own initiative, bee hives and insect hotels have also been installed across the port's land.



Insect hotels, Port of Strasbourg
© Bartosch Salmanski



Beehives - Port of Strasbourg
© Bartosch Sal

More recently, we joined forces with the association "Les éco-pattes" to create eco-pastures on our land in Lauterbourg, with a flock of Heidschnucke sheep, which will soon be joined by Galloway cattle and Camargue horses. The measure is designed to re-establish biodiversity and restore an extensive Ried-style prairie landscape, as a bulwark against invasive exotic species that harm plant biodiversity on the land concerned. That action was part of our strategy.



Eco-pasture © PAS

AIVP | *What are the results of your actions so far, and how do you see them developing in the future?*

Emilie GRAVIER, Director of Development | It's still a little early to draw any conclusions on the eco-pasture that was only launched last September, but we have plans for close scientific monitoring, to learn lessons and improve our knowledge of ecological biodiversity management.

However, the various actions we have taken since 2011 have produced very positive outcomes. They have also changed people's thinking, whereas for a long time, a lawn that wasn't kept trimmed down the last millimetre was seen as neglected.



© PAS

Beyond the actions themselves, it actually serves to prove the benefits of the method: not retreating into a corner, but instead working in partnership with local stakeholders, particularly environmental groups, to define and implement useful measures. And that's is exactly what our strategy is all about: establishing this partnership-based territorial approach for the long-term.

AIVP | *What do you do to ensure that existing businesses, or those looking to set up bases on port land, are included in your strategy to promote biodiversity?*

Emilie GRAVIER, Director of Development | The involvement of enterprise is very important to creating a biodiversity-friendly port. If the port's workers don't use phytosanitary products in public spaces, but companies on the other side of the fence don't adopt the same practices, the goal can't be achieved.

We have just launched a new biodiversity project dubbed "Es'PAS" in partnership with the Naturalistic Data Agency of the Grand Est region, the Planning Agency, and Eurométropole de Strasbourg, the city's metropolitan authority. The project will enable us to model the movements of species in the port, identify obstacles, and determine the development work needed to overcome them. In fact, a very important part of this project is precisely about involving port enterprises in this issue through workshops. We are optimistic about their involvement, as a recent survey found that many companies are keen to work with us on this issue.

AIVP | *Finally, how are you cooperating with other stakeholders concerned by these biodiversity issues, such as the City and Eurométropole de Strasbourg, or associations and experts?*

Emilie GRAVIER, Director of Development | As I mentioned, cooperation is central to our biodiversity actions. On this issue, we never want to be going it alone. The port is part of blue-green infrastructures that extend far beyond our territory, and if we want to be relevant, we need to work with the local people who know, and on the right scale. The new Es'PAS biodiversity project is set to be crucial going forward, for our future actions, and local stakeholders have been included right from the outset.

ECONcrete®: concrete that enhances biodiversity

Interview by Denis DAVOULT



Dr. Ido Sella, CEO and Co-Founder
ECONcrete

ECONcrete has just joined the AIVP network. This company offers innovative concrete technology solutions for marine infrastructures: they not only provide superior structural performance, but also store carbon and enhance biodiversity. The preservation and restoration of biodiversity is precisely one of the 10 commitments of the AIVP 2030 Agenda. Therefore, we were delighted to discuss with them.

An interview with Dr. Ido Sella, CEO and Co-Founder, ECONcrete.

ECONcrete is a member of AIVP since September 2021.

AIVP | *You have just joined AIVP. Can you explain to the other members of our international network how your company was born and the issues you intend to address?*

Dr. Ido Sella, CEO and Co-Founder ECONcrete | ECONcrete was founded to bridge development and sustainability. Co-founded by myself and my dear friend and research partner Dr. Shimrit Perkol-Finkel, who passed away early this year. ECONcrete developed a concrete technology that allows to build concrete infrastructure that complies with coastal construction standards and can support diverse marine ecosystems, decarbonisation, and greening goals. We provide environmentally and ecologically sound concrete technology for constructing green port infrastructure, to support port authorities needs for sustainability in working waterfronts.

AIVP | *What reasons led you to become a member of AIVP and what do you expect from our worldwide network?*

Dr. Ido Sella, CEO and Co-Founder, ECOConcrete | We were initially impressed by AIVP's new website and its focus on Agenda 2030, and therefore started to pay attention to its content. In this process, it was a nice surprise when we read about ECOConcrete in an interview about Climate adaptation of Michael Zucchet, the Chairman of the Port of San Diego Board of Port Commissioners, following a project we recently finished with the port. We realized there's so much value, scientific information, data and experiences we can bring to AIVP members and the best way to do it is to be part of the community and share best practices.

AIVP | *"Restoring and protecting biodiversity on land and sea in port regions and cities": this commitment of the AIVP 2030 Agenda fully reflects what constitutes the heart of your activity. Can you give us one or two examples to better understand the solutions you are developing?*

Dr. Ido Sella, CEO and Co-Founder, ECOConcrete | ECOConcrete has developed a concrete technology that can transform any concrete marine infrastructure to ecologically enhanced. By changing three properties of concrete, the composition via admix, the micro surface via surface agents and the macro design via moulding, we enable a diverse community of marine species to grow on the infrastructure, thereby storing carbon, increasing biodiversity, and strengthening the structure via bio-protection.

As an example of the wide range of applicability for the solution, at the [Port of Vigo](#), ECOConcrete's unique technology is being applied across different types of infrastructures, from revetment construction from our new interlocking single-layer concrete armour, the COAST-ALOCK system, to large port seawalls, and port mooring.



Coastalock – Port of San Diego © ECOconcrete

Another great example of the biodiversity our technology can regenerate are the images we just received from an installation at the Port of San Diego that was done just six months ago. They were simply astonishing: bivalves, lobsters, canopy forming algae, large and small fish, and even octopuses and this is just few months after installation.



Coastalock – Port of San Diego © ECOconcrete

AIVP | *Your technological solutions are now implemented in more than 40 locations. What are the main challenges you had to face?*

Dr. Ido Sella, CEO and Co-Founder, ECOconcrete | For stakeholders to choose environmental technologies, incentives imposed by environmental policies are often the key. Legislative frameworks that don't sufficiently promote sustainable construction, create challenges for the adoption of green- blue technologies.

More recently, although COVID-19, created a huge rise in demand for our technology, travel limitations of our teams to project sites has been a significant challenge. We've actually taken this as an opportunity to optimize our processes and utilize local teams which enabling us to provide our global partners' the service they deserve.

AIVP | *For some of these projects, have you carried out a monitoring and biodiversity impact assessment?*

Dr. Ido Sella, CEO and Co-Founder, ECOconcrete | Monitoring is a core part of our operations. ECOconcrete's marine biologists with project and academic partners, have monitored almost all ECOconcrete's installations to date, with results informing over 10 published scientific papers. It was found that implementing the technology resulted in more than doubling local biodiversity and species richness, and reducing the dominance of invasive species. On top of that, the ability to improve local water quality and sequester carbon dioxide was found in both tropical and temperate waters.

We're looking forward to getting back in the water and monitoring almost two years of ecosystem growth on our projects as soon as possible considering COVID-19 restrictions.



Neptune project – Shark River Island, Neptune, New Jersey – Before © ECOconcrete



Neptune project – Shark River Island, Neptune, New Jersey – After © ECOconcrete

Ceuta : protection of port biodiversity

Interview by José SANCHEZ



Cristina Molina Ferrie @Port of Ceuta



Jorge Vidal Madrigal @Port of Ceuta

There are areas of high ecological value, belonging to the European Natura 2000 Network, within a radius of 3 km in the territory of the Port of Ceuta. Protecting terrestrial and marine biodiversity is a major challenge for the port, which has undertaken various actions to tackle it. The port is also in total agreement with Objective 10 "Protecting biodiversity" of AIVP Agenda 2030, to which it is a signatory. We have therefore arranged an interview to discuss it with Cristina Molina Ferrie, Head of Environment y Jorge Vidal Madrigal, Head of the Conservation, Safety and Environment Division of the Ceuta Port Authority.

CEUTA Port Authority has been a member of AIVP since 2019

AIVP | *In 2005, the Spanish State Ports organisation established a programme of recommendations to encourage ports to minimise the impact of maritime infrastructure on the water quality in port zones. Can you tell us more about this methodological tool and how you apply it to your infrastructure?*

Cristina Molina Ferrie and Jorge Vidal Madrigal, CEUTA Port Authority | Since 2008, Ceuta Port Authority has been carrying out studies and analyses of the water quality in the port area. This work started with the "Ceuta Port Water Quality Study".

The study laid down the basis for the "Sentry Stations" that now exist. Six stations were established, in locations that have been maintained over time, and a methodology has been applied of continuous monitoring of bioindicators, principally macrobenthic components, in order to evaluate their ecological structure, composition and abundance of species, and associations; and also oceanographic values, principally temperature and chlorophyll A in suspension.

These studies received a boost in 2009, when a series of Environmental Vigilance Programmes were introduced with the aim of controlling impacts on the environment resulting from dredging and construction operations. Furthermore, in addition to controlling port waters, we started controlling other variables such as microbiological characterisation, turbidity, and shoreline dynamics parameters; and in 2010 we added oceanographic study of physical and chemical variables in both Zone I and Zone II with continuous measurement probes. We also detect points where tipping and pollution are occurring.

These actions, carried out constantly to achieve continuous improvement, allowed us to generate a methodological basis on which to start rapid adaptation to the ROM 5.1-13 Maritime Works Recommendations (Quality of shore waters in port areas) as early as 2013. That same year, the port developed a system of UGAPs (Port Water Management Units) based on the methodology described in the Recommendations document, and a cartographical database to which environmental data continue to be added.

Since then, the controls described previously have been supplemented by periodic controls of the chemical quality of the water and sediment; and improved equipment has been installed for continuous capture of physical and chemical data.

In recent years, our port water quality controls have been more stringent than the ROM recommendations; using remote detection by satellite with very high resolution, we have started control of port waters for parameters like temperature, chlorophyll in suspension and turbidity, and we have added sensors for continuous measurement of dissolved oxygen.



Cruise ship moored at the Spanish quay @ Port of Ceuta

AIVP | *Your organisation has started a programme of "Sentry Stations" to control and monitor port water quality. What are its objectives and contents?*

Cristina Molina Ferrie and Jorge Vidal Madrigal, CEUTA Port Authority | The Sentry Stations system consists of the establishment of a pioneering environmental monitoring methodology based on control of bioindicators. These bioindicators include species whose ecological characteristics, uniqueness and sensitivity to disturbance are such as to enable them to demonstrate the conditions existing in the medium.

The benthic sampling at each station is based on a count of all the species included in ten sampling squares; five for each zone (photophilic or sciaphilous esciáfica). From these we obtain a series of data which are subjected to statistical analysis at the end of each year. Furthermore we measure the population stability based on the Relative Dominance Index (RDI), which gives a weighting of the losses and gains of the species evaluated in the benthic territory. This index gives a result in a range from -1 to +1 and serves to show significant changes in the stations over time which may be related with variations in the capacity for growth of one species in comparison with another. The index is only applicable to the most representative and easily measured encrusting species in terms of ecological cover.

Station number 5, in Zone II, receives different treatment as it is included in the Mediterranean coral monitoring programme, which establishes the methodology for evaluating coral communities.

The analyses carried out also combine descriptions of the benthic bionome and the general ecology of port seabeds with a series of indices and numerical proportions based on the species, habitats, abundance and degree of naturalness that they present, following the guidelines laid down in the scientific project to create marine protected areas all round the Mediterranean coast.

The wealth of species, or taxonomic diversity, is calculated by adding up the totals of all the species found. Those found in very small areas are separated from those found along the whole length of the transect. The abundance of species in very small areas is estimated from the percentage cover of the different species photographed in the square used for our ecological study.

The diversity of species is calculated using the Margalef Index, which especially favours the number of species present in a habitat $Mindex = S - 1 / \ln N$. In other words, it is a quotient whose numerator is the total number of species recorded at a station, minus one, divided by the Napierian logarithm of the total abundance of the individuals. However, to achieve better comparison of the zones we need to find a quotient between the Margalef Index and the number of habitats.

Tables are also included of interesting species, assessing their abundance at each station and estimating a stable value of 3 (the maximum) for each. These are species that are considered of special value on account of their heritage value (inclusion in international agreements, the Spanish or European catalogue, relict status, structural capacity or rarity value). They include, for example, *Patella ferruginea*, *Elisella paraplexauroides*, *Charonia lampas* and *Astroides calycularis*, which are present in abundance in some of the stations in the Port of Ceuta.

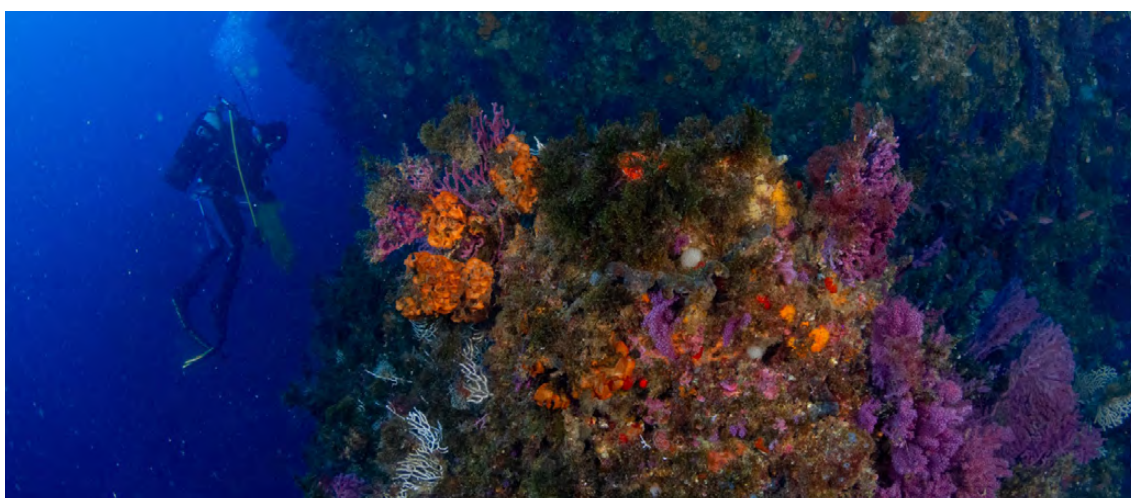


Monitoring the quality of port waters @DavidBedia, picture given by the Port of Ceuta

AIVP | *Four years after the start-up of these sentry stations, how are they rated? And what actions have they led you to introduce or plan for the short or medium term to protect and/or restore Biodiversity?*

Cristina Molina Ferrie and Jorge Vidal Madrigal, CEUTA Port Authority | Since we started the sentry stations, they have provided very important information for management of the port surroundings, as they are indicators of disruptive phenomena occurring in aquatic habitats that might otherwise pass undetected. They also enable us to monitor specific actions, such as construction and dredging.

Our port contains high quality benthic communities that deserve to be treated properly. We are achieving this with the use of these stations and the control and monitoring programme that I mentioned before. Nevertheless, despite the undeniable quality of the port medium, we have detected problems derived from sedimentation and contamination with faecal matter. These major impacts vulgarise the benthos of the port in Zone I and raise the level of benthic stress, as is reflected in our analyses of data from the stations, and the conclusions and recommendations that we extract. To improve this situation, it is the city that needs to become aware of these impacts and encourage programmes for separating sewage from rainwater. This separation, and investment in their old pumping stations and infrastructure, will prevent the escape of faecal matter every time it rains in the city, and reduce problems of silting, pollution and deterioration of the benthos in port seabeds. Thanks to the sentry stations, we know that the ecological quality of the whole of Zone I is in a stationary condition, with a few setbacks in the conservation of benthic communities; and that to improve the quality of the seabed in Zone I, we need to invest in the clean-up infrastructure described previously.



Corals @DavidBedia, Picture given by the port of Ceuta

AIVP | *Apart from protecting the local fauna, it is sometimes necessary to control the presence of certain species. In the last two years the Port Authority has used a hawking service to control the presence of seagulls, which has been necessary for reasons of health and safety. Can you comment on how this service has worked and how it helps to improve port-city relations?*

Cristina Molina Ferrie and Jorge Vidal Madrigal, CEUTA Port Authority | In the Meeting of Experts with the Fauna Committee held on 14 March 2019, the aircraft pilots who attended expressed their concern over the presence of seagulls in the area of España Wharf. This zone, which is within the area of responsibility of Ceuta Port Authority, is part of the aircraft approach and departure circuit. It is also likely to harbour large numbers of birds, creating an air safety risk around the Heliport.

At the same meeting it was also expressly commented that it would be a good thing to establish a series of agreements and reactivate the defence measures for the Heliport, and assess their effectiveness after a period of around 6 months. The agreements referred to are based mainly on evaluation of two measures: EXP5 Hawking flights, and CAP1 Selective culling of yellow-legged gulls. In addition to these actions, it was also agreed to strengthen requirements for notification and reporting of fauna-related incidents at the Heliport; to pass on information about the Port Authority's actions to mitigate the seagull problem; and to maintain coordination with the City of Ceuta on any actions that it takes in response to aviation risks in critical areas for operations.

On completion of the evaluation period, on 24 October 2019, an extraordinary meeting of the Fauna Committee was held in Ceuta Heliport, at which new agreements were established in view of the ineffectiveness of the reactivated measures. One of these was to work on coordination between the Heliport and the Port Authority to use a hawking service in the areas where a risk to operational safety exists, extending from España Wharf to Levante Wharf, with the Heliport as its epicentre. This would allow a single authorisation by the Autonomous City to cover the whole service properly, either exclusively by the Heliport (AENA), or by two fully coordinated services (one contracted by AENA and the other by the Port Authority). The Authorisation would be in the name of AENA.

Finally, in view of the problem of the yellow-legged gull (*Larus michahellis*), and given the involvement of port areas for which Ceuta Port Authority (APC) is responsible, as they do not form part of the heliport concession, APC proposed to assess an initial pilot scheme for a period of 5 months using a hawking service simultaneously, and in coordination, with the service used in the Heliport.

Now that we are close to the end date of the test period established initially, the service has proved to be fully effective from the moment it was introduced. The result has been a reduction in the number of notifications and reports of fauna-related incidents at the Heliport, and therefore in the risks to operating safety. Furthermore, the problem in the area of España Wharf of dirt, persistent smells and unhygienic conditions caused by these birds has disappeared. These problems required the constant presence of cleaning staff which will no longer be necessary.

In view of the results, it is considered indispensable to continue the hawking service for a longer period, in order to promote the permanent removal of the species, which will also minimise the air safety risks around the Heliport. At present the service is contracted for two years, with the possibility of two extensions of one year each, so it is covered until 2025.



Falconry service @ Port of Ceuta

AIVP | *Protecting biodiversity also means raising public awareness. Your organisation supports the "Museum of the Sea Foundation" in Ceuta. What is the main motivation for this cooperation? Can you give us one or two examples of actions that have been carried out with the Foundation?*

Cristina Molina Ferrie and Jorge Vidal Madrigan, CEUTA Port Authority | Ceuta Port Authority has a close relationship with the Ceuta Museum of the Sea Foundation, as an entity that forms the backbone of the principal conservation measures, studies and public information actions about Ceuta's marine environment.

APC supports the Foundation in its awareness activities, including dissemination of the port's environmental values, but also those of neighbouring environments. The activities include particularly visits by schools, institutes and university students to the Foundation's premises in the port, and visits by Foundation personnel to schools. Another important area of awareness activities is providing information about the marine tetrapods of Ceuta; these activities are much appreciated by the population and include exhibitions of the skeletons of big cetaceans in the city, and the preparation of books and guides.

In the area of conservation, APC collaborates with the Ceuta Museum of the Sea Foundation and other local conservation bodies to protect our marine environment. These collaborations have translated, during recent decades, into the creation of a Community Interest Site (LIC) in port waters, called LIC del Monte Hacho, and a proposal to create two more Protected Areas inside the Port Services Zone, related with the INTEMARES Project.

Finally, APC collaborates with the Foundation to support marine research for the Ceuta region, with special emphasis on science for the conservation of marine species and habitats.



Fundación Museo del Mar @ Port of Ceuta

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