

# Lady Freethinker

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## ***-About "your company will be using ice slurry to kill octopus":***

- We work under the highest levels of welfare requirements both with octopus and with any other species. There is a regulation of the activity and in the Nueva Pescanova Group we strictly comply with it. The sacrifice, likewise, will entail proper handling that avoids any pain or suffering, strictly complying with European Union regulations, specifically Council Regulation EC 1099/2009 on the protection of animals, as well as with the Spanish Standard AENOR UNE 173300:2016, as a guide to good practices.
- As far as the sacrifice process is concerned, even though it may be striking for those unfamiliar with the sector, the technique mentioned above **is the most commonly applied in the industry and is the option that seeks precisely to avoid suffering in the animal.**
- In this regard, at this moment **we are also developing**, together with researchers from the University of Las Palmas de Gran Canaria, with the authorization of the General Directorate of Livestock of the Ministry of Agriculture, Livestock, Fisheries and Food of the Government of the Canary Islands, and under the supervision of the Ethical Committee of Animal Experimentation of the University of Las Palmas de Gran Canaria, **a Protocol of Good Practices for the Sacrifice of Octopus Breeding according to Animal Welfare Requirements.**

## ***-About "keeping them in tanks at a density of 10-30 kg/cubic meter"...***

- This is completely wrong. The quantity of water per animal is much higher.
- Depending on the stage the octopuses are at in their life cycle, they will live **in different types of pools with different sizes**, designed to provide the optimal conditions they need at each stage of their lives.

## ***and "exposing them to light to 24 hrs/day during the reproductive period"...***

- **The light conditions developed are optimal in each phase of the life cycle of the octopus** to promote welfare conditions, avoiding any kind of stress.

## ***-About "plan to feed them fishmeal":***

- Octopus feeding will follow maximum sustainability criteria. To this end, based on the conclusions obtained in the development of diets for octopus maya, new diets adapted to the industrial process of octopus vulgaris are being developed. This diet uses discards and by-products, the parts of the fish, already caught, that are not destined for human consumption. Its efficacy and assimilation has already been demonstrated and it is a circular economy solution that helps to avoid having to resort to fishing wild animals to feed the octopus.

- The Pescanova Biomarine Center is also researching the replacement of animal raw materials with others of vegetable origin, as is the case of microalgae, whose protein component, in some of them, represents up to 70% of their biochemical composition.
- The index recommended by the ASC (Aquaculture Stewardship Council, founded by WWF) to measure the fish needed for the production of aquaculture fish is the FFDR (Fish Feed Dependency Ratio: kg of wild fish per kg of farmed fish). The current feed we are testing for feeding octopus has a FFDR for fish meal of 2.5. The strategy is to achieve the evolution that has been achieved with salmon, which 20 years ago had values similar to those we have today in octopus, which is totally normal given that it is an incipient species in full development. The plan is to reduce this index in carnivorous species such as octopus, as well as in salmon, by applying technology in the development of diets and substitutions with vegetable or sustainably sourced ingredients.

***-About "these plans are not aligned with the EU Commission's guidelines for sustainable aquaculture..."***

- That's completely untrue. Pescanova's aquaculture project fully complies with the guidelines issued by the European Commission for a balanced convergence between the growth of the aquaculture sector and the green transition.
- Nueva Pescanova's commitment to aquaculture comes as a way to protect wild fishing grounds, guarantee the sustainability of species and respond to a growing demand for seafood products. Furthermore, the success of the fishing and aquaculture activity depends, to a large extent, on the productivity of the natural ecosystems, so that responsible action is a priority objective of the company. Under this premise, we dedicate great efforts to promote responsible and sustainable performance throughout the value chain to ensure that best practices are adopted. In fact, in 2021 alone, we implemented 1,295 responsible actions in 17 countries, contributing to the UN Sustainable Development Goals.
- Octopus is a high-protein, low-fat food that has been in increasing demand in recent years. The global octopus market is forecast to grow by 21.5% by 2028 compared to 2022 and in Spain alone, 80% of the octopus consumed comes from imports and only 20% is native.
- In this sense, **aquaculture is the solution to ensure the sustainable yield of a food with extraordinary health and nutritional properties**. According to the latest Sofia 2022 report, published by FAO, sustainable aquaculture development remains essential to meet the growing demand for aquatic food. It also contributes to better nutrition for the population, while at the same time safeguarding the food safety of the product. It eliminates the possibility of the quality of the product being undermined by foreign compounds that may be present in rivers or seas and that may affect the composition and toxicology of certain marine species. All these aspects are directly related and contribute to the UE's [Farm to Fork Strategy](#) that aims to accelerate our transition to a sustainable food system, ensuring food security and making sure that everyone has access to sufficient, safe, nutritious, sustainable food while preserving its affordability.
- Furthermore, a recent research carried out by the [University of Melbourne](#) speaks of the ecological benefits of aquaculture activity, including the recovery of species, restoration, rehabilitation and protection of habitats.

- **Through this project we will be able to help to repopulate the octopus species in the future while ensuring animal welfare** by applying species-specific conditions in the wild to the farming process.

***- About concerns on octopus welfare and how the project "...could result in serious welfare issues – including cannibalism, aggression, disease, injury, and psychological distress for the octopus":***

- That's not true. At Nueva Pescanova our priority is **to guarantee animal welfare by applying to the cultivation process the conditions of the species in the wild**. Recent studies carried out by Biomarine personnel and collaborators specialized in octopus (IEO, CSIC, fattening pond, among others) are demonstrating that by providing optimal culture/fattening conditions (light, temperature, salinity, etc.) and an adequate diet for each of their stages, octopuses adapt normally to group living environments without territorial aggression.
- We are doing this by analyzing methods and strategies to assess animal welfare according to life stages (fry, juvenile or adult) and the time of year in which the crop is grown. For example, in earlier phases, such as breeding and hatching, systems are being developed to control parameters with 360° monitoring (water, light, space, etc.). This adaptation of the octopus to the pool habitat has been achieved by applying an advanced zootechnical solution, called EcoBiological Production System (EBPS\_O), which applies the specific natural conditions of the species in the wild to the productive culture.
- Within the cultivation we do not only focus on reproduction, feeding, etc., but we seek to encompass all processes from the point of view of animal welfare. Priority lines are, for example:
  - **Identification of the octopus microbiome.** That is, the determination of the set of bacteria that contribute to a good state of health due to their functions in nutrition, protection and immunomodulation. In this sense, after the research of the past two years we have characterized the microbiota of the octopus skin in two groups that differ in the method of production: aquaculture and wild. According to the results obtained from the amplicon sequencing methodology, the aquaculture production method does not seem to have a significant impact on the composition of the main microbiota associated with the skin of the common octopus. The phyla Bacteroidetes and Proteobacteria appear to compose the core microbiota of *O. vulgaris* skin, with no difference in abundance between the wild and aquaculture groups. **This seems to indicate that the stable and controlled, pathogen-free environmental conditions of aquaculture facilities avoid stress to the animals and may positively influence their health and well-being.**
  - **Identification of stress biomarkers in octopus**, that is, the identification of stress-related hormones that will allow us to demonstrate that the culture is in a healthy condition. We have shown that octopuses, like other mollusks, have the capacity to absorb some sex steroids that may be present in the environment they come from, such as 17β-Estradiol; however, we have not observed that they have the capacity to absorb corticosteroids present in the environment, such as cortisol. This, coupled with the fact that key enzymes required for vertebrate steroid biosynthesis and nuclear

receptors that mediate hormonal effects do not appear to be present in molluscs, calls into question the claims of some studies that glucocorticoid concentrations are functionally linked to stress response and can be used as biomarkers in molluscs. Therefore, **our results indicate that these animals do not synthesize or take up corticosteroids and therefore measuring vertebrate glucocorticoids in octopuses as biomarkers of stress is meaningless and of no value.** We have also validated a specific protocol for the extraction of circulating miRNAs (C-miRNAs) from octopus hemolymph and biofluid that has allowed us to isolate circulating miRNAs (C-miRNAs) from total hemolymph and octopus biofluid with an extraordinary purity and quality and therefore valid for characterization by massive sequencing techniques of the repertoire of C-miRNAs (C-miRNAome) that this species has, and that later will have the potential to be used as bioindicators of stress in this species.

- Our research team has achieved an environment inside the pool with optimal conditions for octopus culture that **ensure their wellbeing and whose behaviors are evidence of this.**