



## SUMMARY

Gilthead seabream (*Sparus aurata*) is a carnivorous marine species whose optimal diet consists of fish meal, and oil from wild fish. Due to the high and fluctuating costs of these raw materials, and the overexploitation of wild fish stock, there is an ongoing need for alternative feed formulations when culturing this species. Vegetable substitutes often lack essential nutrients leading to health problems in fish, which can subsequently impact human health. This knowledge output consists of a novel fish feed blend for gilthead seabream that is biofortified using various sustainable ingredients derived from macro and micro algae, and yeast. The blend has been formulated, manufactured and tested at pilot scale. Nutritional value, safety, economic viability, and legal compliance for use in animal feeds were assessed. Results show improved nutritional value of gilthead seabream fillets farmed using this novel feed, and high market acceptance and comparable production costs of the blend, which complies with legal and safety standards.



## KNOWLEDGE NEED

Fish is a rich source of important nutrients including trace minerals such as iodine and selenium. Biofortification of fish through nutritional enhancement of their feed is a potential strategy to ensure better intake of these essential elements in human diets, and to overcome nutritional deficiencies. To establish farmed fish as a future successful functional food, there is a need to know the effect of enriching fish feeds with iodine and selenium on the final product, in terms of nutritional value, safety and legal compliance.



## RESULTS

This knowledge output concerns the effects of a fortified fish diet with iodine-rich seaweed and selenised-yeast on essential and toxic elements levels in gilthead seabream (*Sparus aurata*). The fortified diet resulted in increased iodine, selenium and iron, and lower copper and bromine in biofortified seabream muscle. The reduction of fish meal and fish oil in the fortified diet resulted in lower mercury and cadmium levels in seabream muscle. The consumption of 150 g of fortified seabream enabled a significantly higher contribution to the daily recommended intake (DRI) of iodine (8%) and selenium (58%) than non-fortified fish. Moreover, the exposure to lead decreased with the consumption of biofortified seabream (23% - 32% BMDL01). These results support the strategy of developing eco-innovative biofortified seabream using sustainable, natural, safe and high-quality ingredients in feeds, to enable consumers to overcome nutritional deficiencies without significantly increased feed costs.



## IMPACTS

Availability of fortified farmed fish may enable consumers to overcome nutritional deficiencies, which could contribute to an improved health profile of the European population. Reducing the need for fish meal and oils, this knowledge also contributes towards improving ecological and social sustainability of fish feeds. It has the potential to reduce the environmental impact of fish farming and improve consumer perception of the industry.

**Contributes to the UN Sustainable Development Goal 12:** Responsible consumption and production.

## END-USERS & APPLICATIONS

➔ **Gilthead seabream feed producers:** can use this knowledge to develop and produce novel feed formulas for gilthead seabream as a functional food, improving DRI of iodine and selenium in human diets, using sustainable ingredients and reducing the environmental impact of aquaculture while lowering costs

➔ **Gilthead seabream farmers and producers:** can use the functional feeds to improve the quality and nutritional value of their fish, while at the same time maintaining production levels and promoting aquaculture as a sustainable and environmentally friendly sector

➔ **Scientific community:** aquaculture researchers and those working in the area of seafood sustainability can use the validated datasets and new knowledge to support further Research and Development on the effects of sustainable fish feeds on fish production and welfare

## DISSEMINATION AND EXPLOITATION

### Exploitation activities for seafood industry:

- Project newsletter and news articles
- Promotion on Twitter and LinkedIn
- Horizon Results Platform: [seafoodtomorrow.eu/horizon-results-platform](https://seafoodtomorrow.eu/horizon-results-platform)
- IPMA, SPAROS and ZUT, have reached fish farmers in Denmark, Poland and Portugal and shared this knowledge through pilot trials of the feed.

### Exploitation activities for policy makers:

- Managers, regulators and policy makers will be reached through the final **SEAFOOD<sup>TOMORROW</sup>** event, EC info session, and a dedicated EU policy event.

### Scientific publications:

- Scientific publication: Barbosa V et al. (2020). Enriched feeds with iodine and selenium from natural and sustainable sources to modulate farmed gilthead seabream (*Sparus aurata*) and common carp (*Cyprinus carpio*) fillets elemental nutritional value. *Food and Chemical Toxicology*, 139, 111330. DOI: [doi.org/10.1016/j.fct.2020.111330](https://doi.org/10.1016/j.fct.2020.111330).
- Open access version of publication: [zenodo.org/record/4282825#.YFCN4J37TIV](https://zenodo.org/record/4282825#.YFCN4J37TIV)
- Open access validated data sets: [seafoodtomorrow.eu](https://seafoodtomorrow.eu)

### Dissemination activities for society / all users:

- Project newsletter and news articles
- Promotion on Twitter and LinkedIn



## INNOVATION STATUS

Technology Readiness Level 7 – system prototype demonstration in operational environment

**Patents and IPR:** Not applicable. Knowledge generated in the project has been widely disseminated and is open to industrial use.



## FUTURE RESEARCH

Further studies are necessary to determine the effects of fortified feeds at farm scale and further studies on fortified nutrient bioaccessibility and bioavailability. Biofortified seabream have been positively evaluated by consumer panels in various EU countries. To complete and qualify the system, the benefits of iodine biofortified fish must be showcased to the retail sector in terms of human nutrition.

## CONTACT AND CONTRIBUTORS

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