

sparos

I&D nutrition in
aquaculture

Tailoring your feeds



AQUAFEED OF THE FUTURE
Webinar, October 30

Unlocking the MAGNIFICENT potential of algae in functional aquafeeds

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MAGNIFICENT



Bio-based Industries
Consortium



Horizon 2020
European Union Funding
for Research & Innovation



AQUAFEED OF THE FUTURE

Urgent need of novel protein sources

Microbial biomasses, yeasts, insects, plant & other by-products protein concentrates

Desperate need of novel n-3 HUFA sources

Microalgae, selected oil crops, mesopelagic fisheries

Constantly seeking novel ingredients that add value

(nutritional or other) to traditional feeds during sensitive periods of the production cycle or specific situations resulting from farming practices



Algae show great potential as functional ingredients

products incorporated in the feed to convey a benefit above and beyond fulfilling the basic nutritional needs

MICROALGAE are growing...

There are now several large-scale production units in EU



Allmicroalgae (PT)



NECTON (PT)



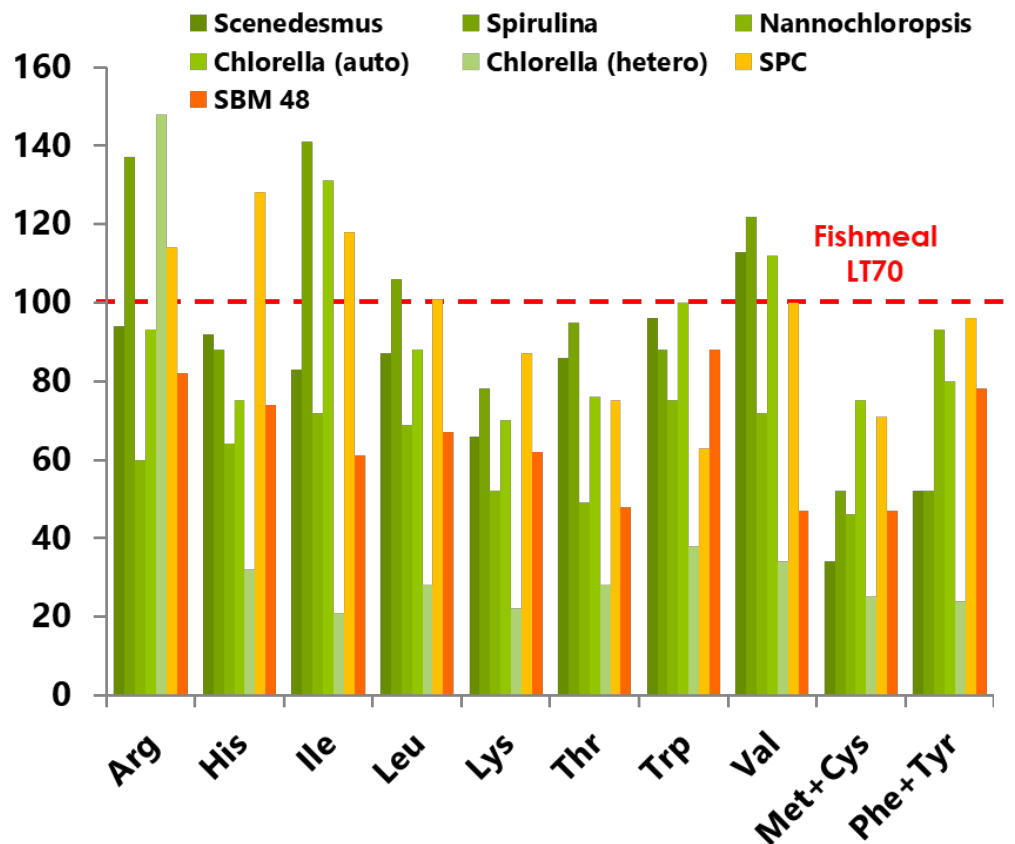
Estimated EU production

500 Ton/year
Dry biomass

As **protein** sources...

Variable crude protein levels (30-55%) depending on algae species
Quite “acceptable” essential amino acid profile

Digestibility can vary with cell-wall type (cellulosic vs silicious)

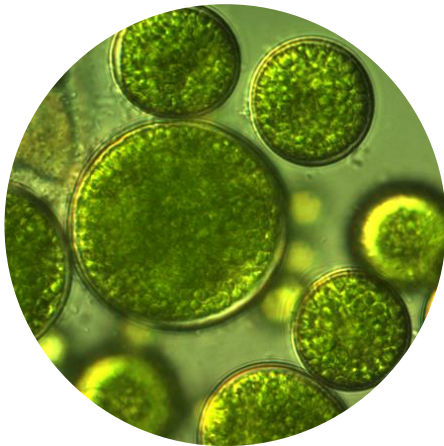


**Cost and
volumes are
still major
constraints for
a wider use**

As n-3 HUFA sources...

DHA-rich *Schizochytrium* biomass and oil (fermentation)

EPA & DHA-rich *Schizochytrium* oil (fermentation)



***Schizochytrium*-derived products are gaining industrial relevancy**

Its sensitive use allows a cost-effective reduction of FO usage

Strong research effort on:

- Algae species with capacity to accumulate high lipids (>60%)
- Metabolic engineering to enhance EPA and DHA levels
- Oil extraction by green technologies (e.g. deep eutectic solvents)

As **FUNCTIONAL** ingredients...

Presence of a wide array of compounds with putative bioactivity

- **Immunestimulation, intestinal health, microbiome modulation**



β -glucans (chrysolaminarin)

Sulphated polysaccharides

Antioxidant compounds

Carotenoids

Phospholipids, glycolipids, oxylipins

Bioactive peptides

Mycosporine-like amino acids

We are still at a knowledge generation stage

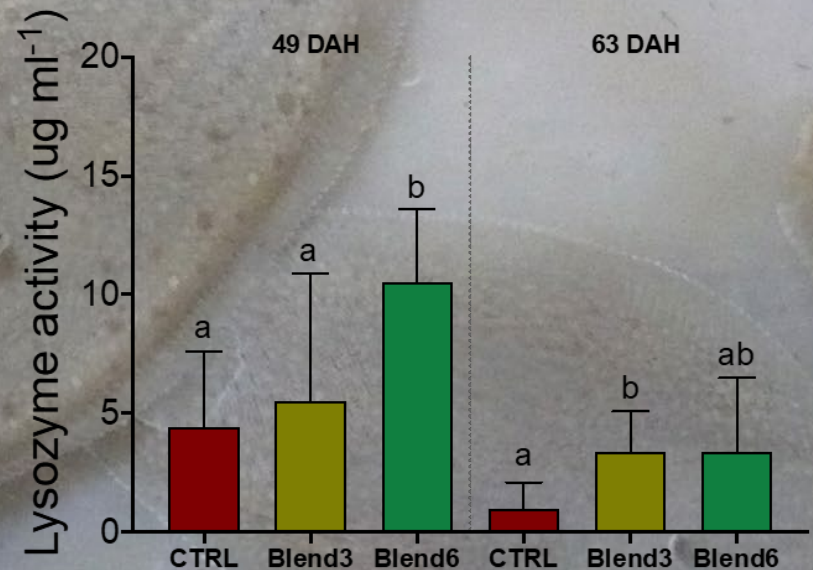
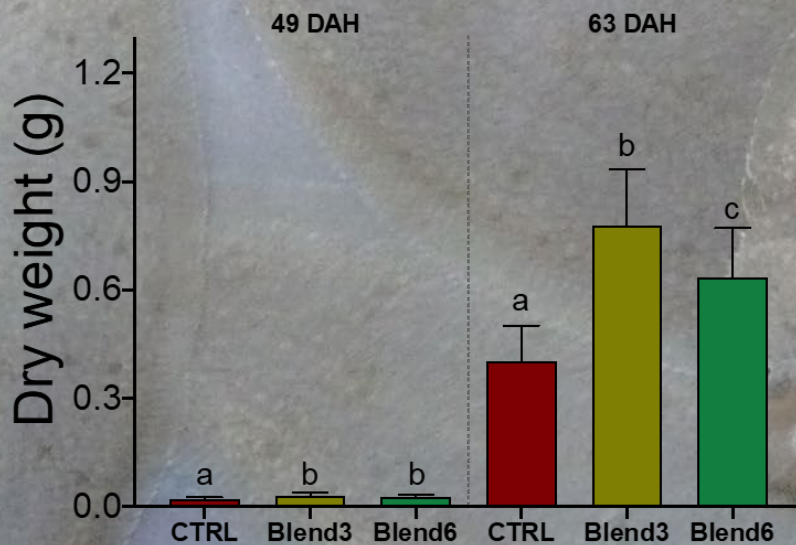
- Cultivation and harvesting conditions can affect “bioactives” content
- Potential to tailor microalgae towards specific functionalities
- Each algae is different and its functionality can also vary

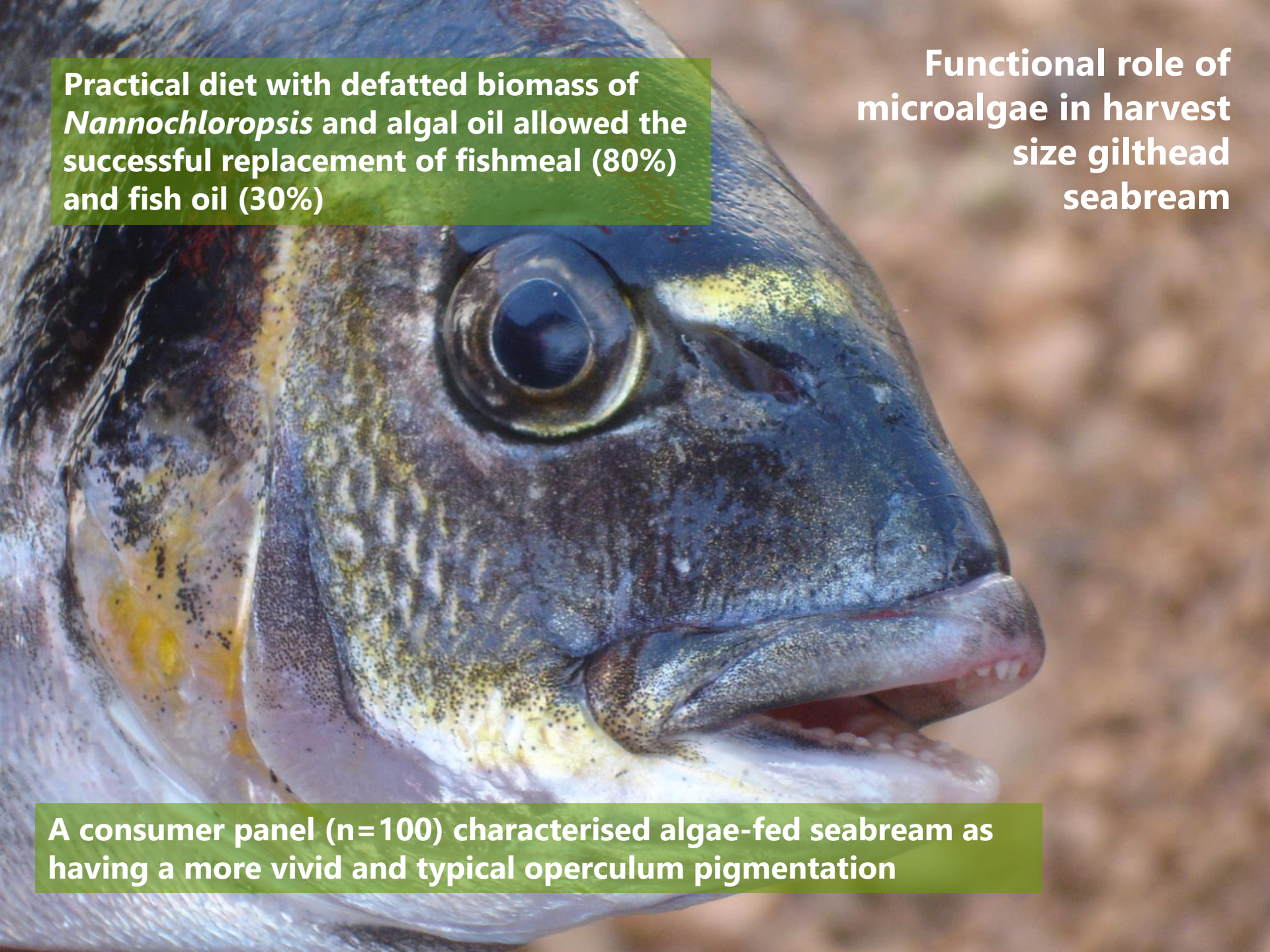
Choose valuable and focused targets

Functional role of algae in Senegalese sole

Diet with 1% *Phaeodactylum tricornutum*, an algae rich in fucoxanthin and β -glucans) improved immune response to stressful events in sole juveniles

Diets with 3 or 6% blend of microalgae (*Nannochloropsis*) and macroalgae (*Gracilaria*) enhanced somatic growth and up-regulated several immune criteria in sole larvae (34-63 days after hatching; DAH)





Practical diet with defatted biomass of *Nannochloropsis* and algal oil allowed the successful replacement of fishmeal (80%) and fish oil (30%)

Functional role of microalgae in harvest size gilthead seabream

A consumer panel (n=100) characterised algae-fed seabream as having a more vivid and typical operculum pigmentation

Other targets for functionality

Incorporation of *Laminaria* (macroalgae) and Se-rich *Nannochloropsis* (microalgae) resulted on the **biofortification** of seabream and trout fillets **with selenium and iodine** (>70% of the DRI)



Preliminary indications that both micro and macroalgae extracts hold potential to reduce the incidence of **skeletal deformities** in marine larvae and juvenile fish

Algae-supplemented feeds during sensitive periods (e.g. vaccination, smoltification) in Atlantic salmon



Algae peptides showed **antimicrobial activity** against some fish and shrimp pathogens (still at *in vitro* stage)



Algae hold a great potential as functional ingredients in aquafeeds



**Contribute to higher welfare status of fish
and enhance quality traits from a
consumer perspective**

A lot remains to be done...

Thank you for your attention

Jorge Dias

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