

A photograph of a rocky coastline with seaweed. The water is calm, reflecting the sky and the surrounding landscape. The text is overlaid on the water and seaweed.

**Aquaculture Research
Technology Transfer
Alfred-Wegener-Institute**

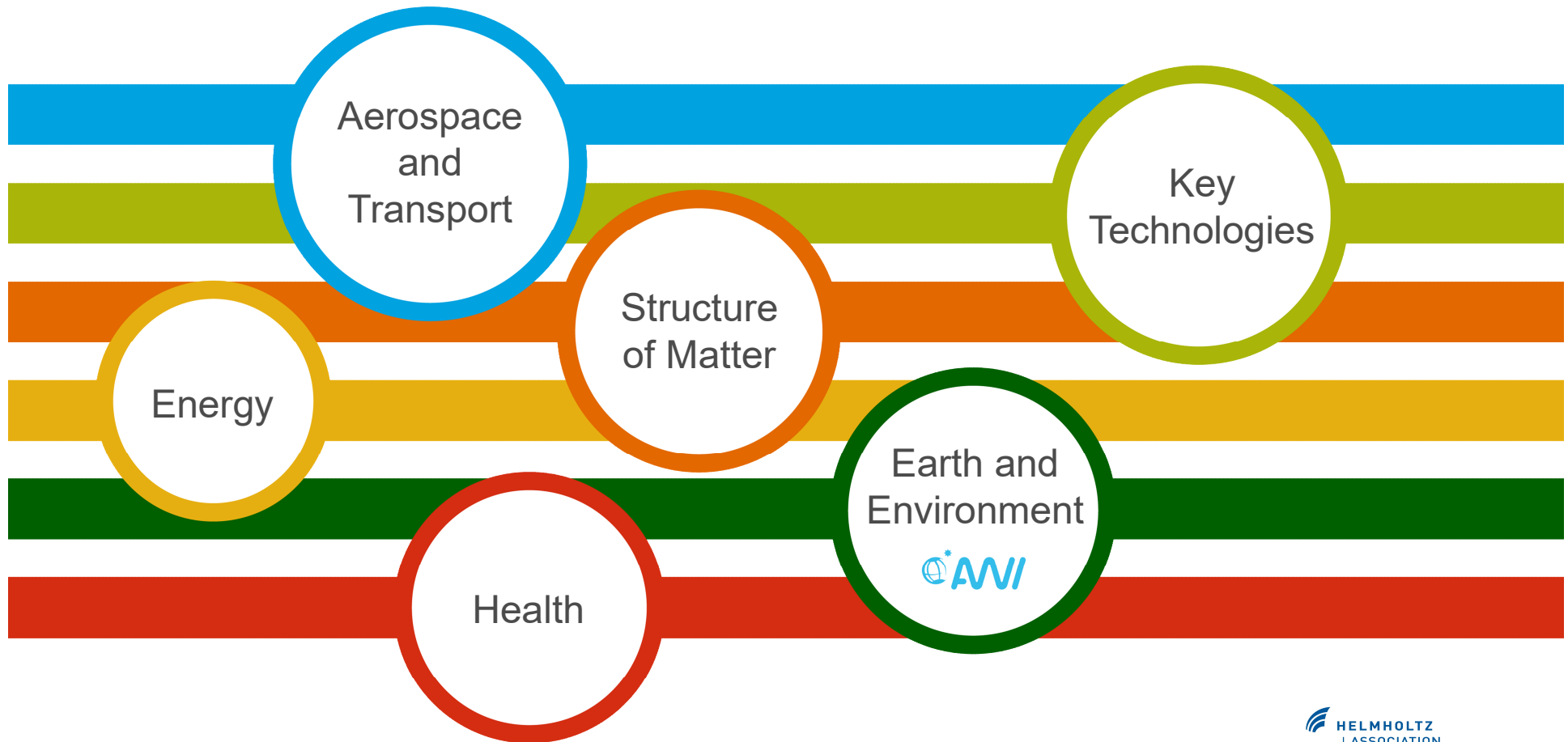
Alfred-Wegener-Institute,
Helmholtz Center for Polar und Marine Research

Matt Slater

The Helmholtz Association

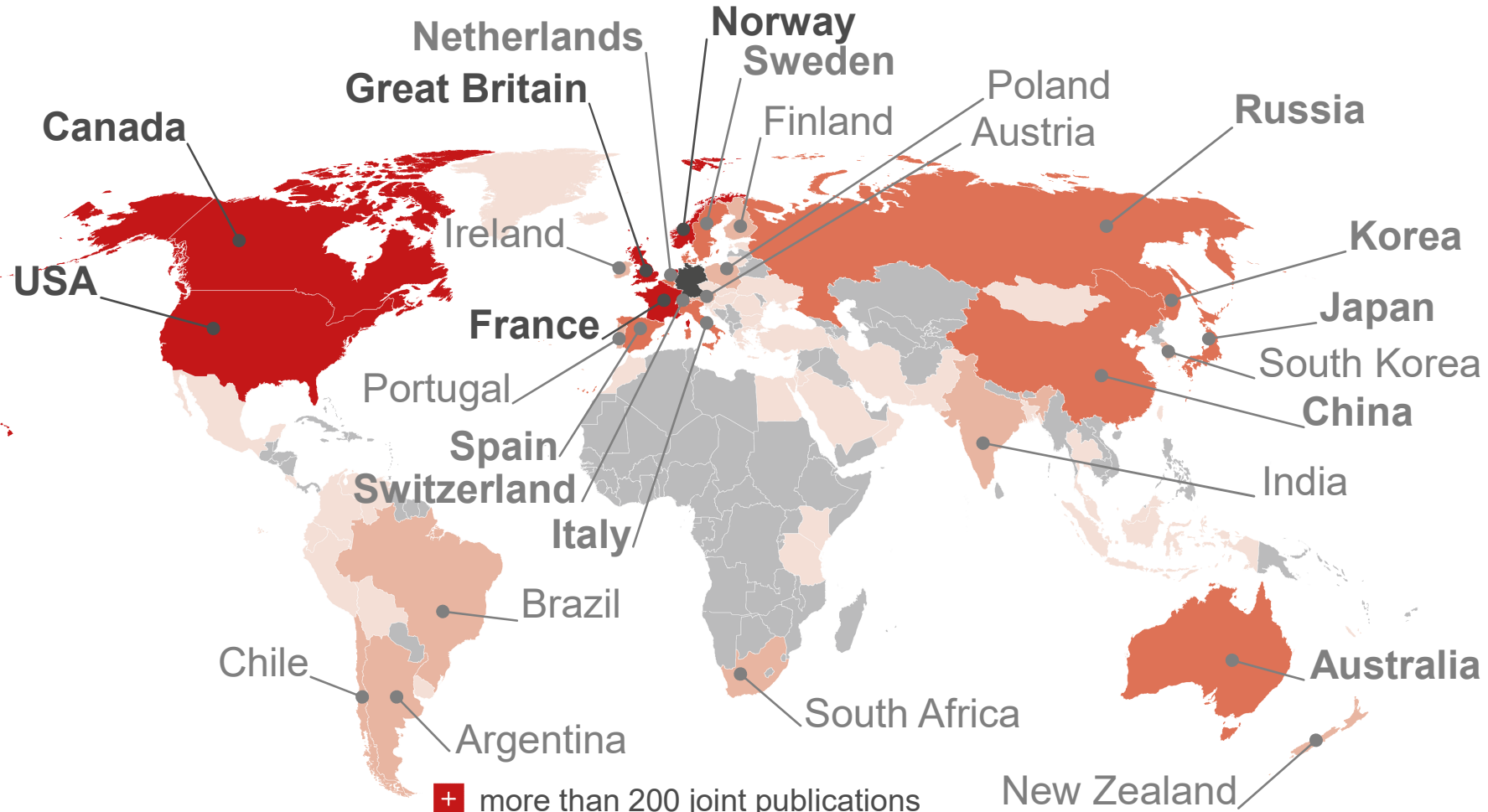
18 research centres throughout Germany

Combining resources to explore complex questions of social, scientific and technological relevance





Cooperation Partners



- + more than 200 joint publications
- + 101 to 200 joint publications
- + 21 to 100 joint publications
- + 1 to 20 joint publications

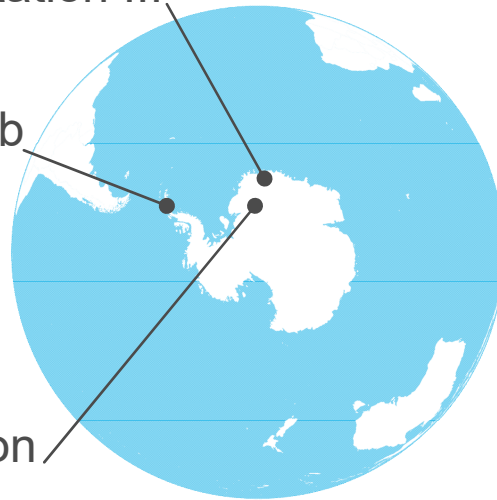
Research infrastructure

Polar 5 | Polar 6 >



> Neumayer Station III

> Dallmann Lab



> Kohnen Station

Samoylov Station >



AWIPEV >

Alfred-Wegener-Institut



> RS Polarstern



> RS Mya II



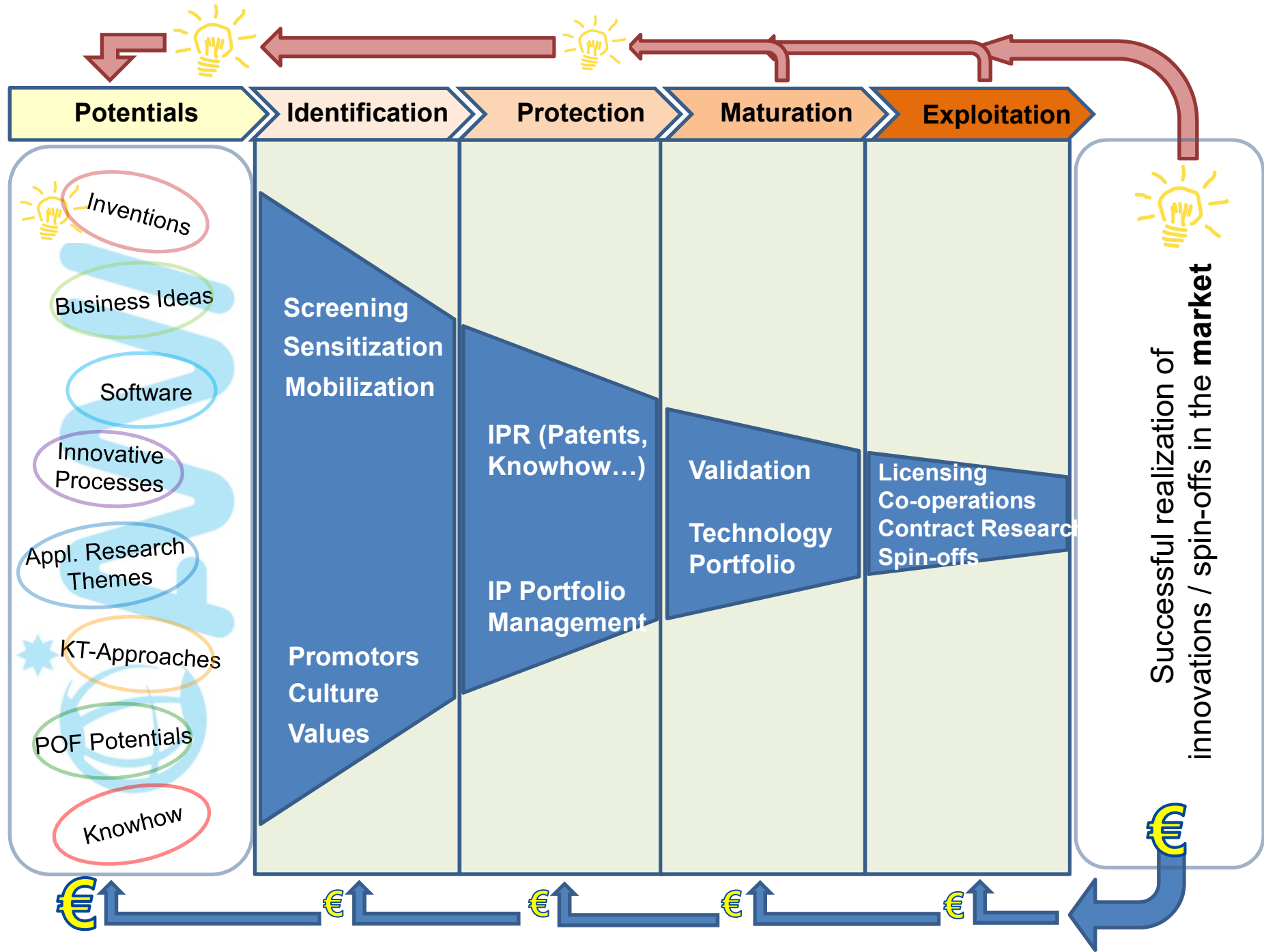
> MB Diker & Aade




> RC Uthörn



> RV Heincke



A solid blue horizontal rectangular bar is positioned in the upper left quadrant of the slide.

Aquaculture Research – infrastructure, research areas and technology transfer projects

Aquaculture Research

- **AQF conducts research for industry partners**
 - Service provider in the area of biology technology
 - Product (co-)developer and tester



- **Research areas / Expertise**

1. Development of new technologies for recirculating aquaculture systems
2. Nutrition (and new candidate species)
3. Integrated-Multi-Trophic-Aquaculture (IMTA)
4. Invertebrates and microalgae in aquaculture



Centre for Aquaculture Research

- 140 m³ recirculating aquaculture systems (RAS) photobioreactors/bag systems, glass-house/tropical
- Technical and biological support
- Breeding, technology and know-how from microalgae to finfish
- Laboratories



RAS-Technology

- **Innovative technology development and testing**
- Filtration systems
- Modular transport units
- Improved skimming (fresh water)
- Microalgae production systems



RAS-Technology

Current industry projects:

- **NiKoDe**
 - Nitrate Controlled Denitrification

- **ACoMacs**
 - Activated Solid Waste as a Carbon Source for denitrification

- **FiT**
 - New Technologies for Live Fish Transport



Nutrition (feed and additives)

➤ Feed design, production and testing

- Functional feeds
 - Increases acceptance
 - Attractant colouring and movement
 - Transports probiotics



➤ Preselection of additives, partner selection, production and testing

- Partner companies for minerals, pre- and probiotics, plant extracts and animal proteins
- Proof of bioactivity
 - health / immune effects
 - Improvement of water quality etc.



Nutrition (feed and additives)

Current industry projects:

- **Optimisation of Lupins for Aquaculture**

Development of a process to improve the digestibility and acceptance of lupin seed meal in aquaculture feeds.



Industry partner:

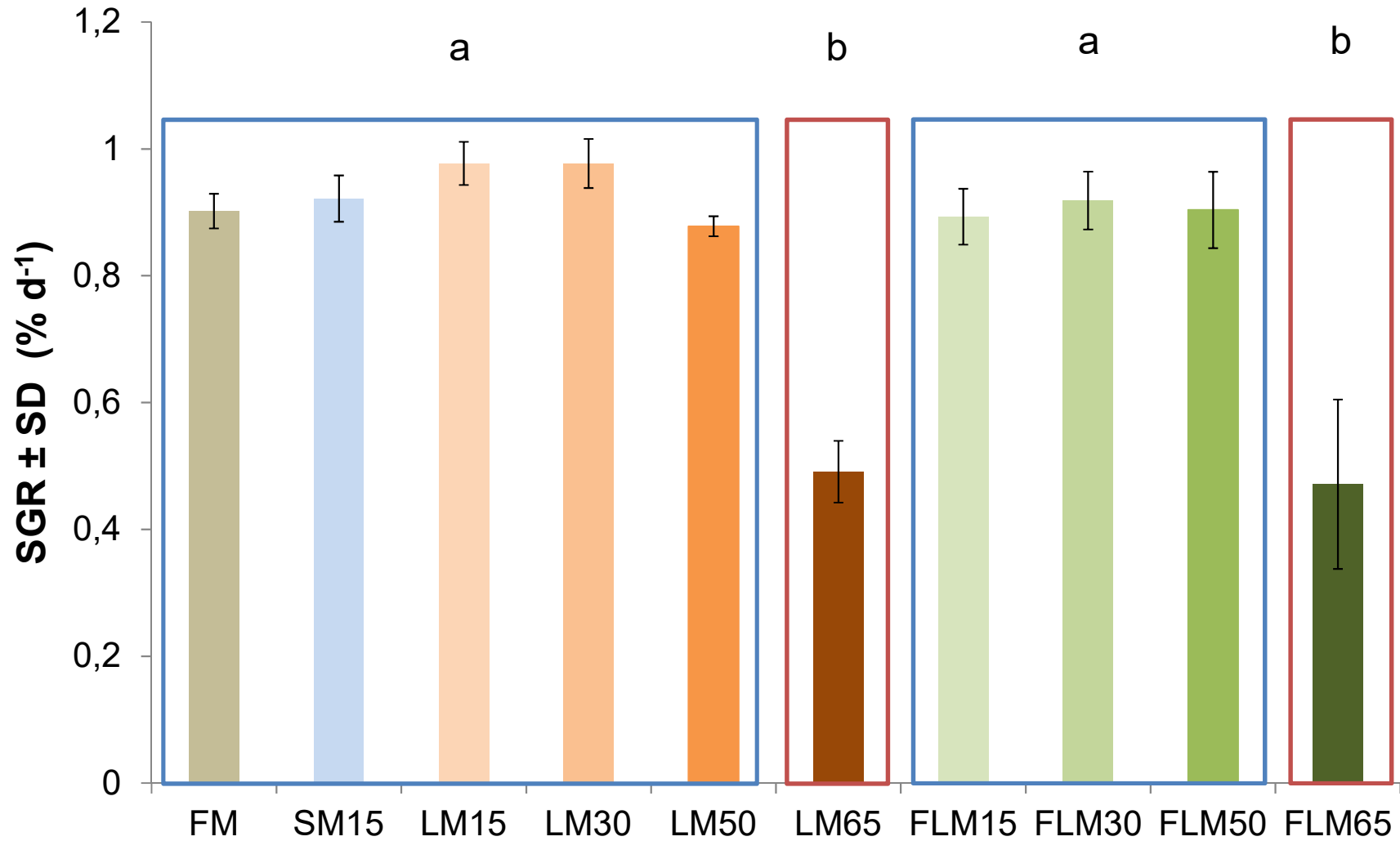
- **Subcontractor BASF** (enzymatic solutions)
- **TTZ Bremerhaven** (diet formulation and extrusions)

- **TRansition paths to sUstainable legume-based systems in Europe**

Develop novel feed formulations for major aquaculture production systems

Novel formulated feeds will be assessed for Salmon, Seabass and Shrimp

Nutrition – Lupin inclusion - Seabass



n = 3, One-Way-ANOVA, p < 0,001

Polyculture & IMTA

- **Testing species combination & integrated multitrophic aquaculture approaches**
- Species combination / compatibility tank systems and ponds (recommendations)
- Integration of invertebrates and microalgae
- Immune / stress response of co-cultured species



Invertebrates & Microalgae

Current projects:

- **MaNaKa**

Development of guidelines for restocking measures for the European Noble Crayfish

- Regional fisheries departments and associations



- **CaMaFan**

Characterisation and industrial use of Marennine as a diet additive in aquaculture and as a Nutraceutical

- Russian nutraceutical manufacturer (iPhar)
- German pigment producer (MIAL)



Polyculture & IMTA

Current industry projects:

- **AquaMoNa / InSuZa**

Development of integrated FW polyculture and aquaponic systems (FW Crayfish, Pike Perch, Striped Bass, Microalgae, Watercress)

- **bell vital GmbH** (pond system development)
- **algatec** (microalgae production systems)
- **Ratz Aquakultur** (tank cage development)



- **Tilapia Shrimp**

Integrating whiteleg shrimp and Nile Tilapia in RAS Systems effects on shrimp immune status

- **Egypt National Institute of Oceanography and Fisheries**



IMTA – Shrimp and Tilapia

	Tilapia OF	Shrimp OS	Tilapia FS	Shrimp FS	Tilapia FSD	Shrimp FSD
IBW (g)		0.024±0.001		0.024±0.001		0.024±0.001
FBW (g)		9.62±1.06 ^c		11.32±1.48 ^b		13.02±2.38 ^a
SR (%)		81.5±2.50 ^a		78.50±4.50 ^b		46.00±7.00 ^c
WG (g)		9.60±1.21 ^c		11.30±3.25 ^b		13.00±5.27 ^a
SGR		6.60±0.06 ^b		6.76±0.17 ^b		6.90±0.38 ^a
FCR		1.31±0.12 ^a		1.20±0.01 ^{a*}		0.81±0.23 ^{c**}

*Estimated based on body gain **Calculated based on shrimp data only (2.5 % of their body regardless to leftover tilapia feed and feces effect)

IBW: initial body weight; FBW: final body weight; SR: survival rate; WG: weight gain;

SGR: Specific growth rate; FCR: feed conversion ratio

IMTA – Shrimp and Tilapia

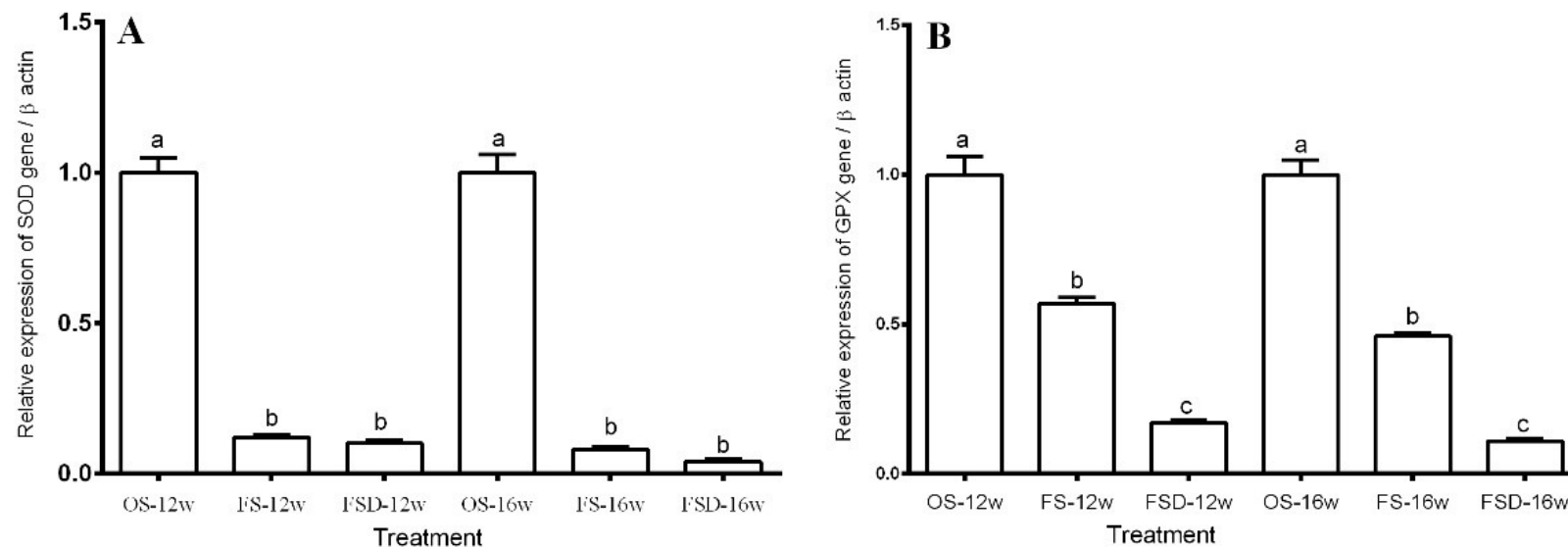


Fig. 1. Relative expression of *cMnSOD* (A) and *GPX* (B) genes in shrimp after 12 weeks (12w) and 16 weeks (16w) in monoculture (OS) fed commercial shrimp diet (10% body mass), shrimp in co-culture but unfed (FS), shrimp in co-culture co-fed on commercial shrimp (2,5%) diet (FSD). Data are mean \pm SEM ($n= 9$ in triplicate).

Summary

- **Aquaculture Research within
Technology Transfer at AWI**

Applied research across four main topic areas

Strong infrastructure

Product development for future (land-based) aquaculture





Thanks:

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