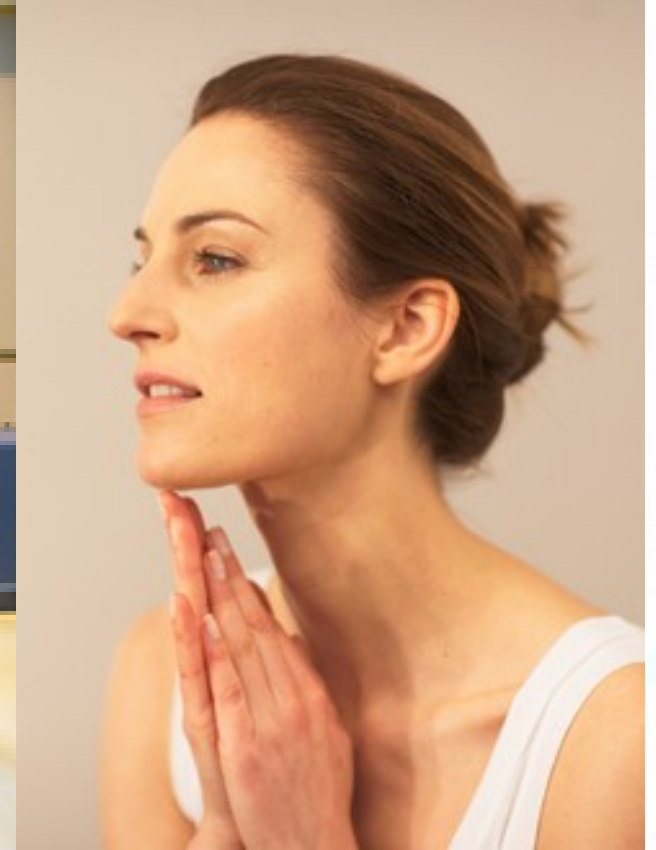


From Science to the Shelves

- and: how buds may not burst

Levent Piker, CRM – Coastal Research & Management / oceanBASIS GmbH, Kiel



Mission

"Common Heritage of Mankind"

**Sustainable
Use of the Sea**

Development / Marketing
of innovative products
"Made from the sea"

Research on Marine
Living Resources

oceanBASIS
sea.science.solutions.

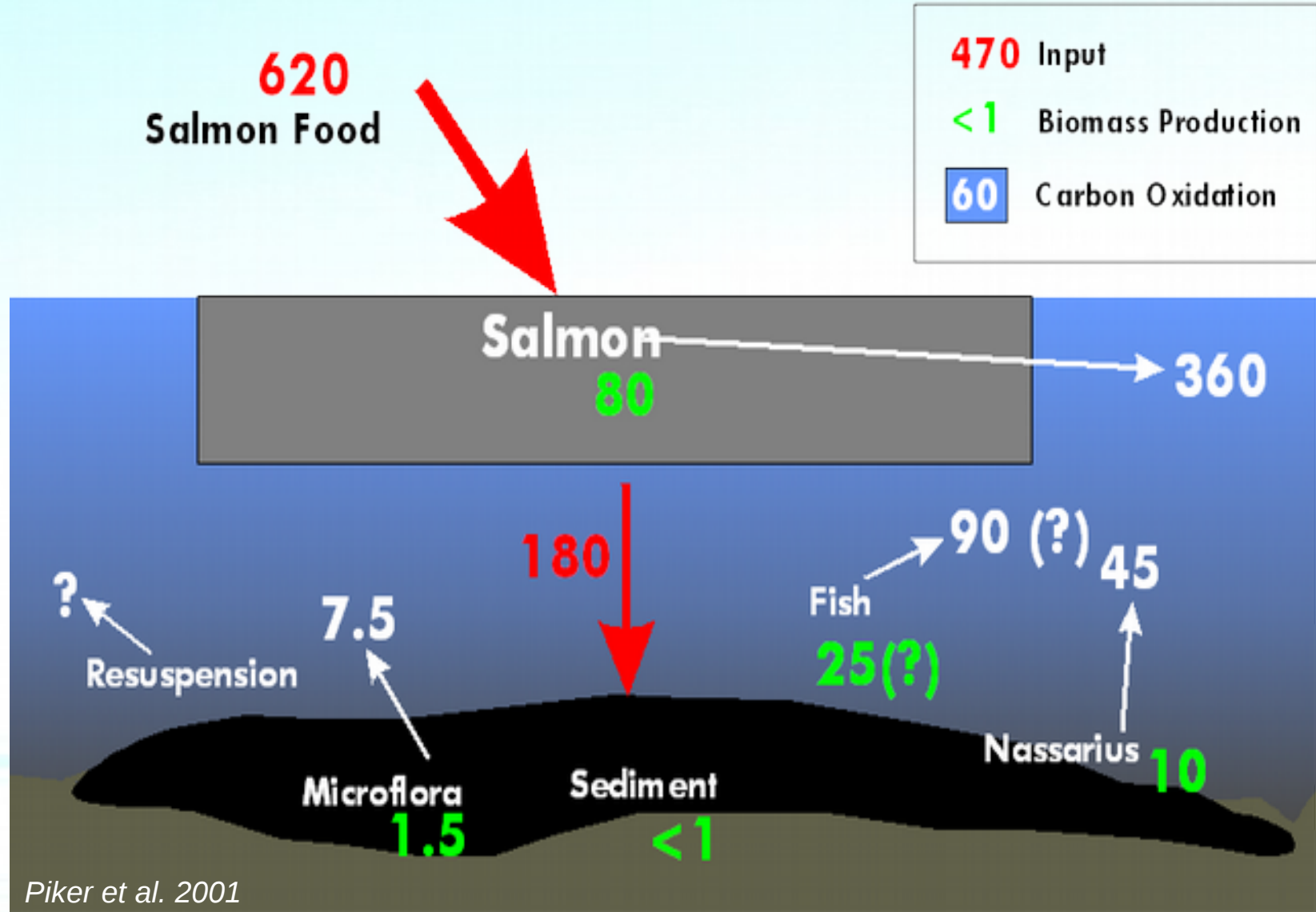


Coastal Research & Management

Innovation potential

- predominantly **unexplored** oceanic regimes
→ expectation of a vast amount of new natural substances
- highly developed **(bio-)chemical mechanisms** for defense and reproduction ($2,7 * 10^9$ years more „experience“)
- **Congruences** of mineral and trace element composition in human cell fluid and ocean
- **Biodiversity**: all 33 animal clades live in the sea, 15 on land

[t C]



Key Topic Aquaculture

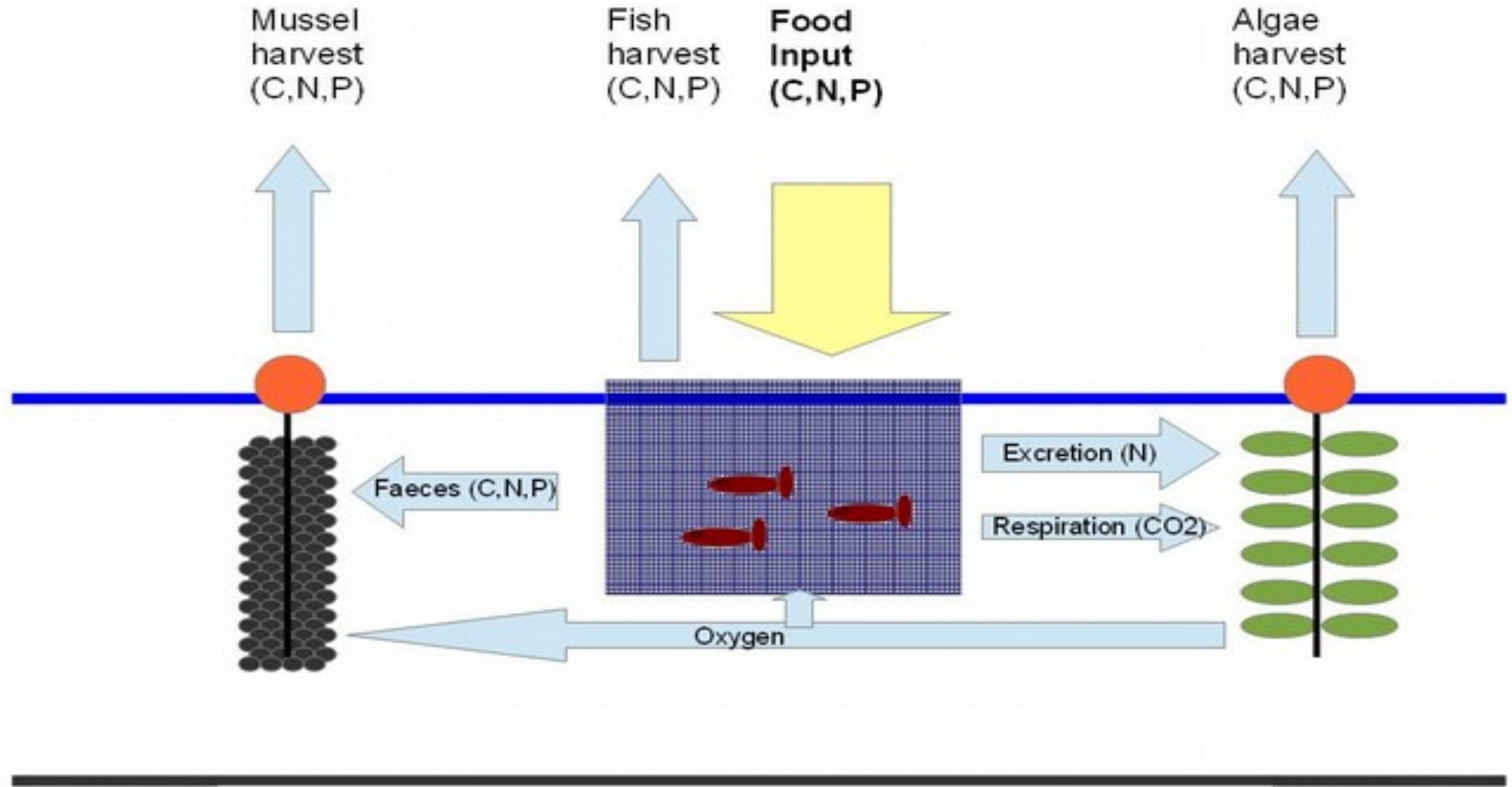
→ Aquaculture studies in Germany, ...



→ ...in Chile, Greenland, Indonesia, Gulf of Aqaba



Alternative: Integrated Extractive Aquaculture



Development of a Sustainable Mariculture



- Sustainable Biomass Production !
- Products !
- Valorisation ?

What is the Monetary Value of Ocean's Biodiversity ?

Ecosystem service value:

***US \$ 563 billion – 5.69 trillion
for anti-cancer drugs of marine origin***

(Erwin *et al.* 2010)

Turning knowledge into products: oceans are a treasure trove for innovations

Structures / functions
in nature

Consumer's / society's
demands



Erich Haeckel: Kunstformen der Natur, 1899-1904

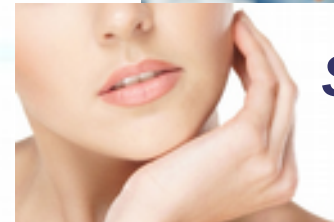
For example:



**Biological
pest control**

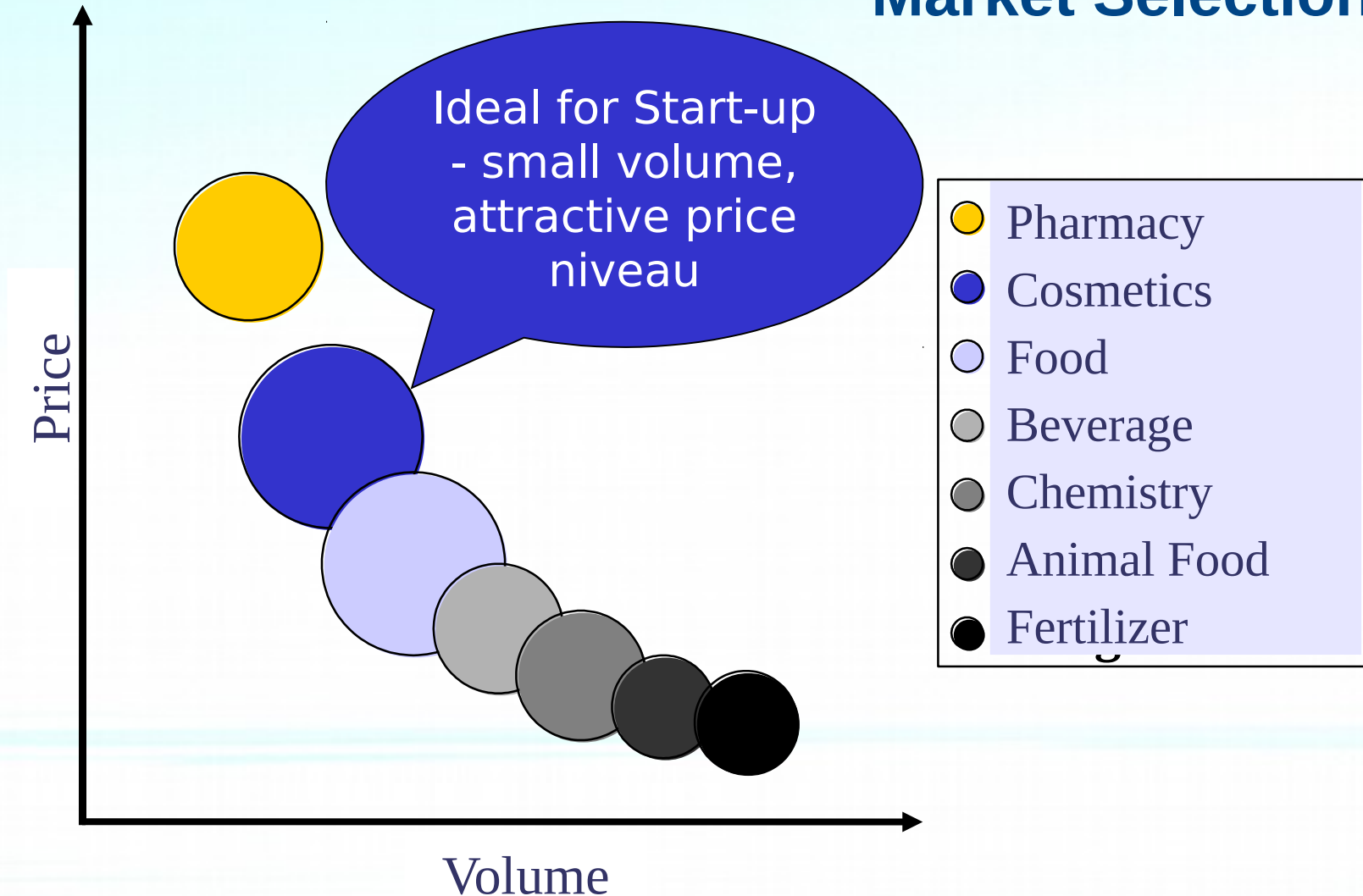


Food

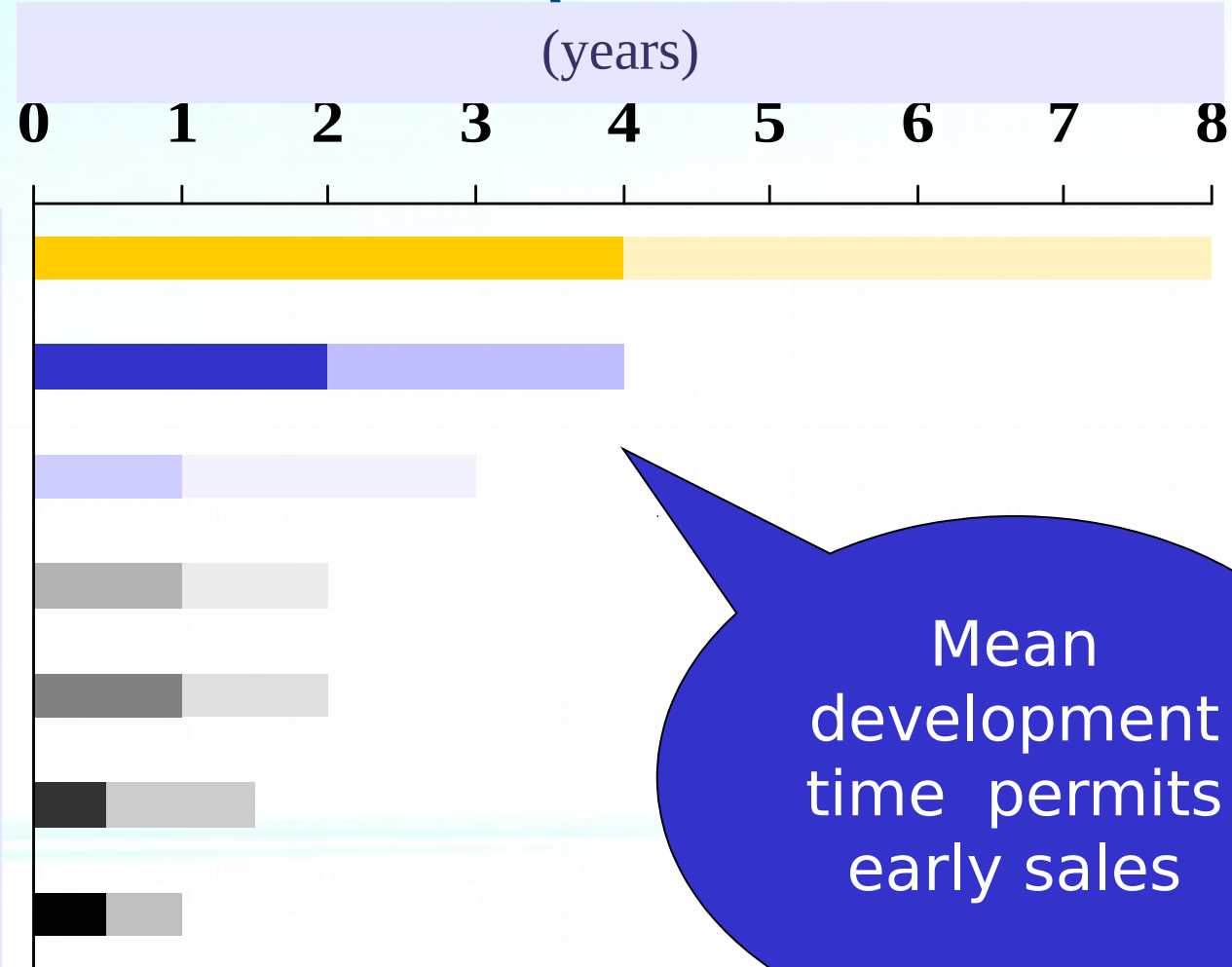


Skin care

Market Selection

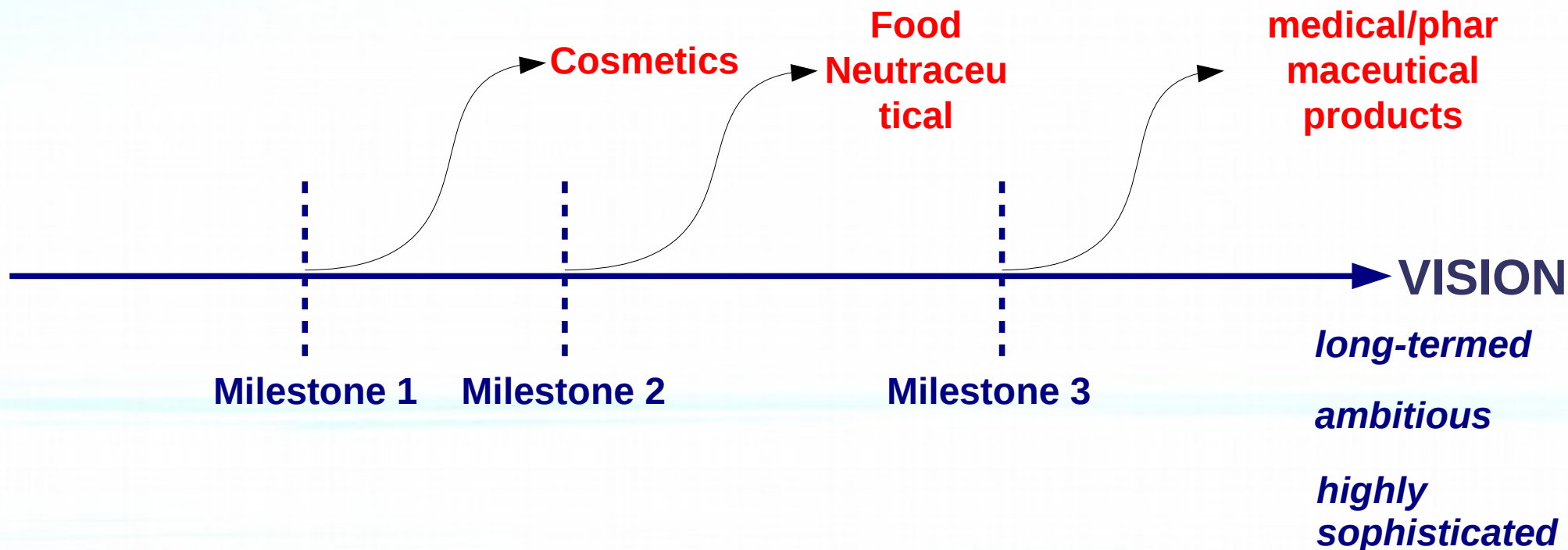


Product Development Time



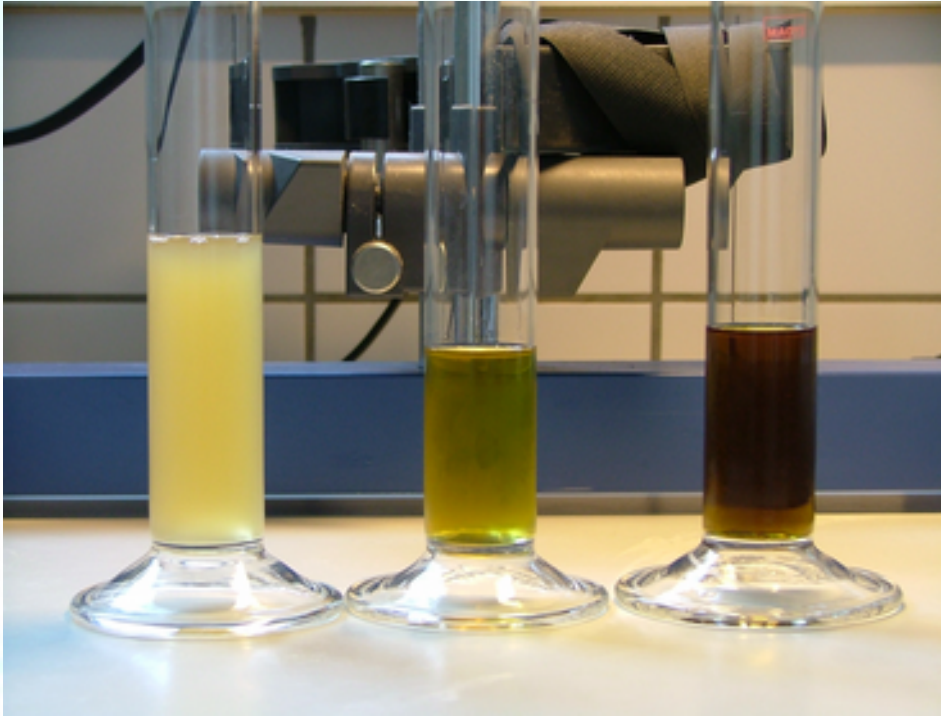
Mean
development
time permits
early sales

Innovation horizons and diversity of product portfolio



Development, production and marketing of:

Bioactive Seaweed Extracts



Technology: Seaweed Processing, Extraction



Development, production and marketing of:

Natural Cosmetics

- effectively moisturizing, protecting, regenerating, revitalizing





Healthy diet and refining cuisine

→ **Seaweed flakes**



→ **Natural algae relish**
(„umami“)

Demands and trends

Consumer study by Mintel:



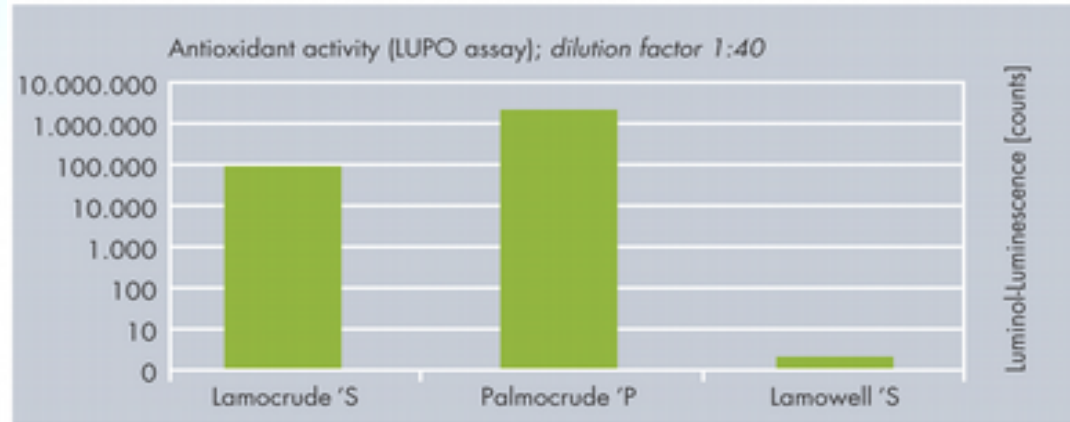
OECD 2017:

healthy living is one of the most important global megatrends

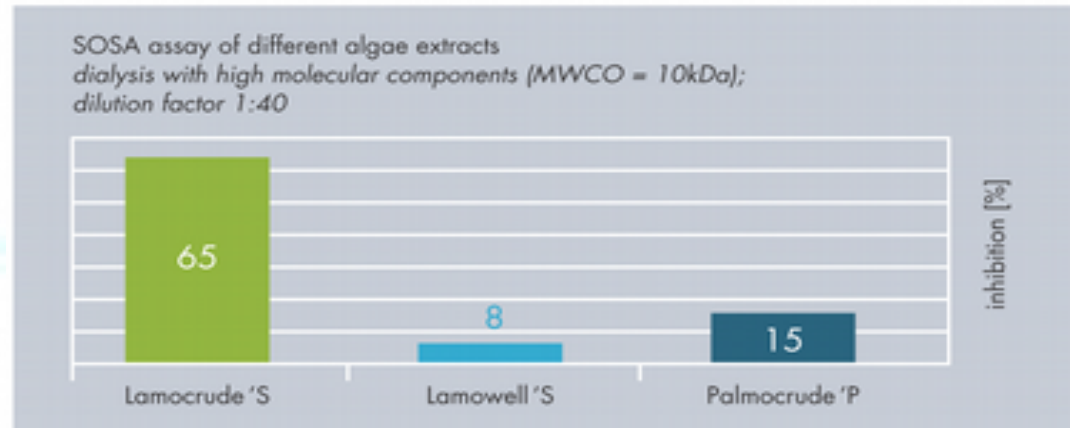
Products and developments from CRM / oceanBASIS – Examples:

Prevention and protection → Antioxidant activities

**Antioxidant
capacity (LUPO)**

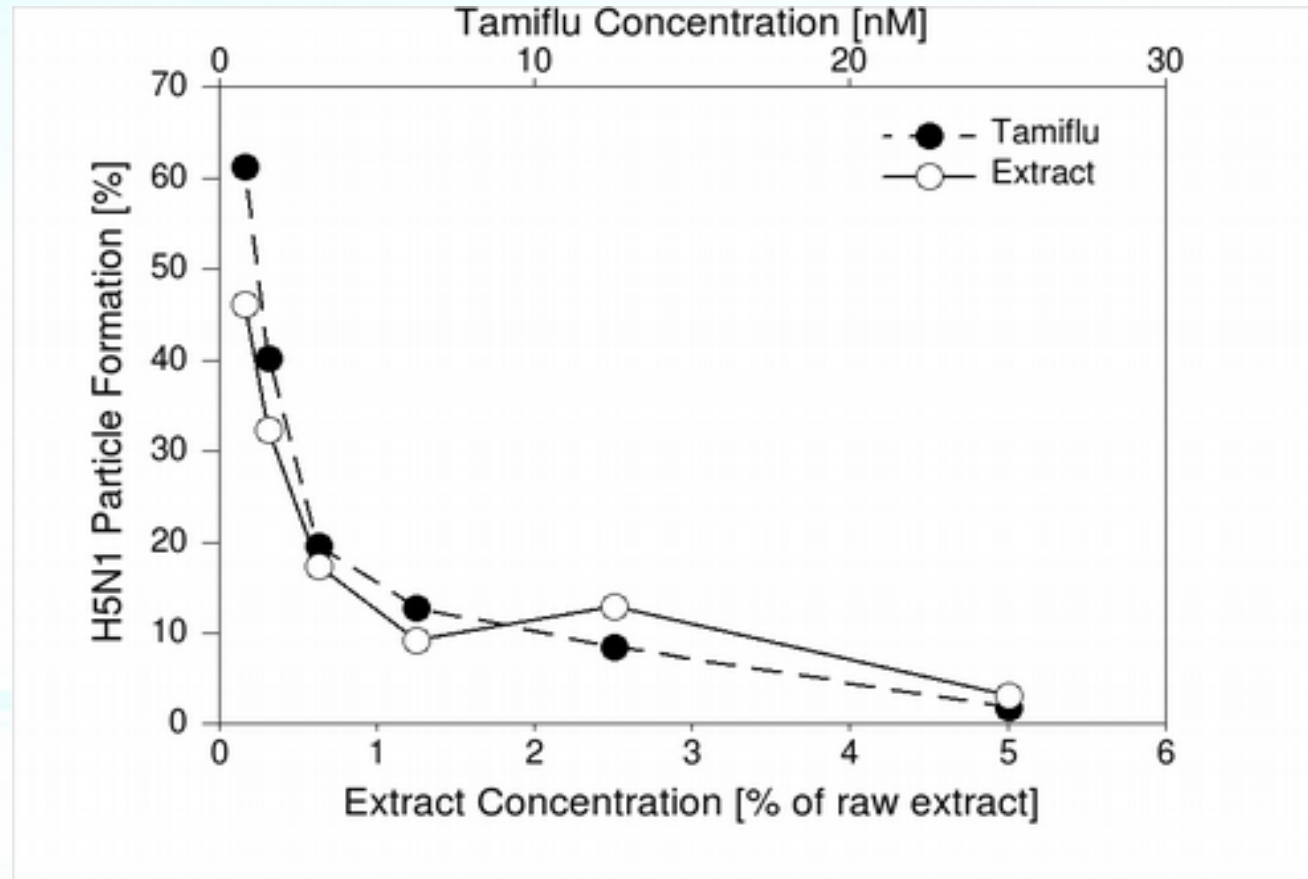


**Radical scavenger
activity (SOSA)**

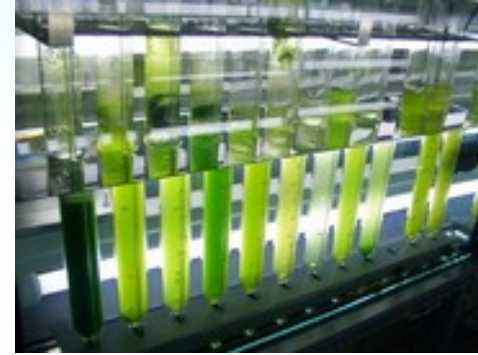
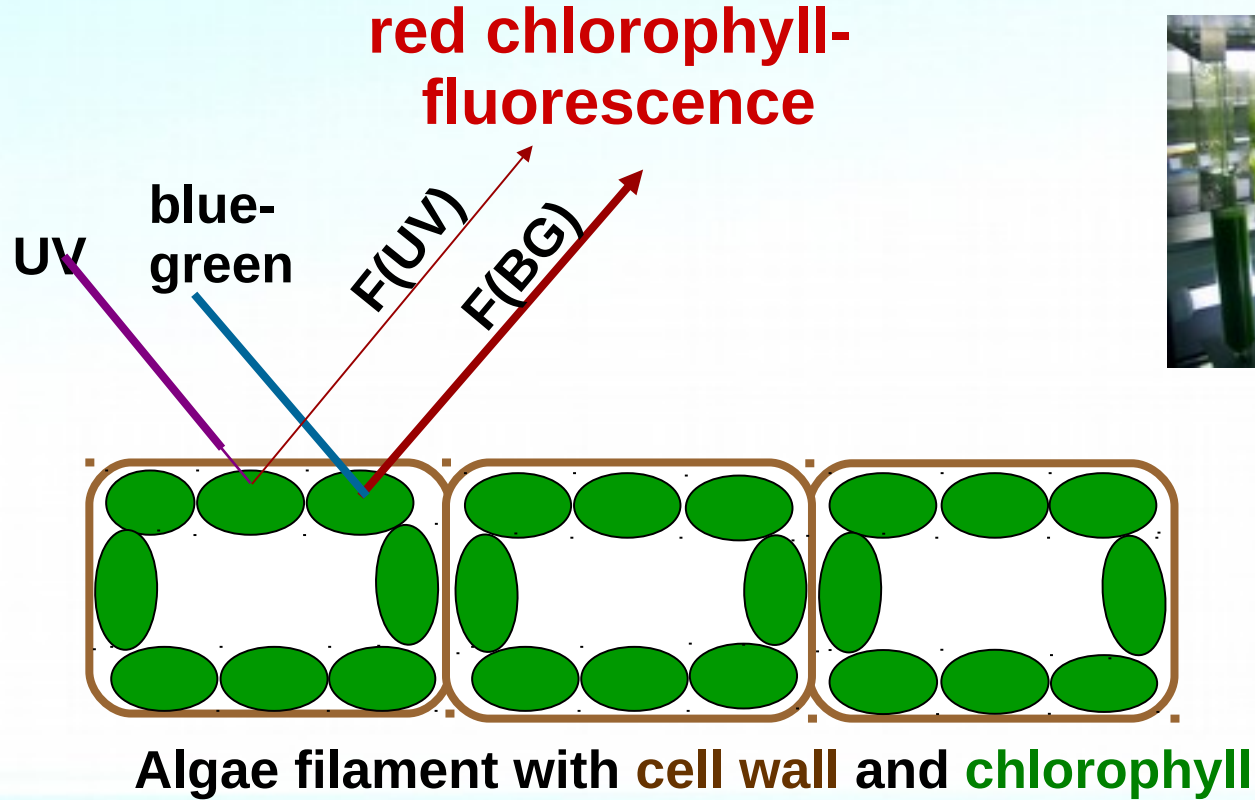


Prevention and protection

→ Antiviral activities



Protection against UV-B-radiation



Wir fördern Wirtschaft



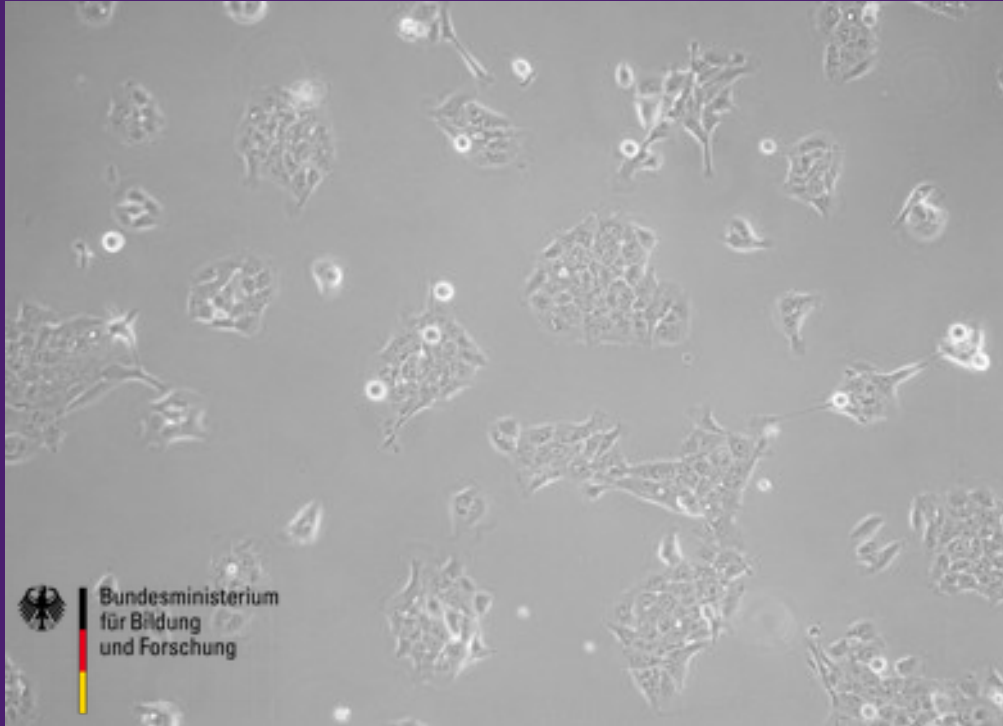
Landesprogramm Wirtschaft: Gefördert durch die Europäische Union - Europäischen Fonds für regionale Entwicklung (EFRE), den Bund und das Land Schleswig-Holstein

$F(UV)/F(BG)$ → UV- transmittance

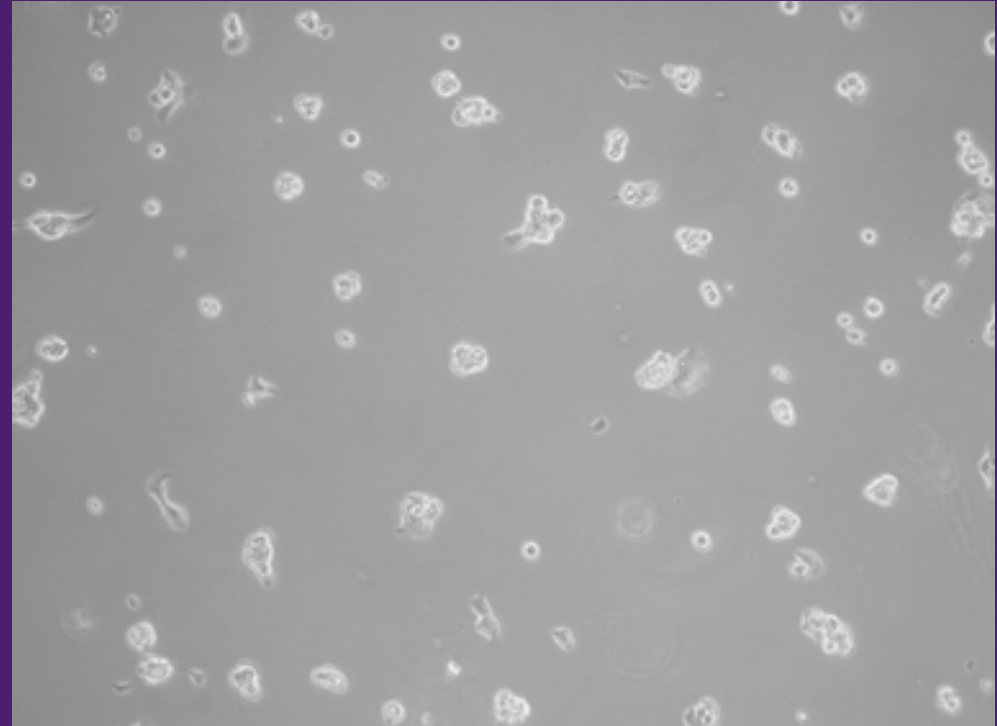
Blue Biotech in the BSR – From Science to Business, 22.-24.8.2018, Greifswald

Extract from *Fucus vesiculosus* inhibits growth of pancreatic cancer cells

Control



KF1 extract



(after 24 h incubation)

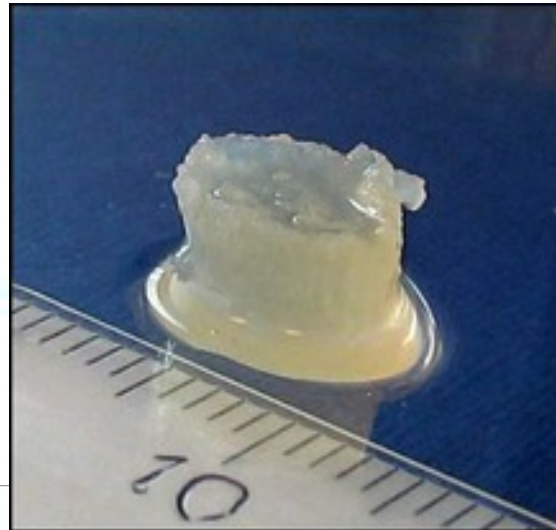
Geisen et al. 2015
Zenthoefer et al. 2017

Oceanic collagen

Wound healing



Cartilage regeneration



Organic cosmetics
(NATRUE)



Project „FucoSan“



Establishment of a **fucoidan**-based value chain using endemic seaweed



- ➔ **Sustainable harvest (sampling/cultivation)**
- ➔ Controlled quality of endemic algae
- ➔ Innovative and sustainable processing
- ➔ New compound quality
- ➔ New products (cosmetics, pharma)

Bioinformatics / „Algaeomics“:

oceanBASIS's first level Algae-Enzyme catalog

EC-number	Algae species/ Contig	orient.	homolog. protein	score	perc.ident.	description
EC=1.10.2.2	Eremosphaera 3607	rev	F6H425 VITM	414	77.78	RecName: Full=Ubiquinol-cytochrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.2.2	FucusVesiculosus 1382	rev	I027G8 9CHLO	750	53.82	RecName: Full=Ubiquinol-cytochrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.2.2	Polysiphonia 12913	for	A8J126 CHIRE	662	59.61	RecName: Full=Ubiquinol-cytochrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.2.2	Saccharina 5966	rev	A8J126 CHIRE	617	56.00	RecName: Full=Ubiquinol-cytochrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.2.2	SaccharinaNori					chrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.2.2	Ulva 4904					chrome c reductase iron-sulfur subunit; EC=1.10.2.2
EC=1.10.3.3	Polysiphonia 2					idase; EC=1.10.3.3; Flags: Fragment;
EC=1.10.3.9	FucusVesiculosus					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.3.9	Polysiphonia 2					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.3.9	Porphyridium 5					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.3.9	Saccharina 579					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.3.9	Spirulina 1318					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.3.9	Ulva 897					(B) protein; EC=1.10.3.9; AltName: Full=32 kDa thylakoid
EC=1.10.9.1	Ulva 11514					f complex iron-sulfur subunit, chloroplastic; EC=1.10.9.1
EC=1.10.99.1	Eremosphaera					f complex iron-sulfur subunit; EC=1.10.99.1
EC=1.10.99.1	FucusVesiculosus					f complex iron-sulfur subunit; EC=1.10.99.1
EC=1.10.99.1	Polysiphonia 2					f complex iron-sulfur subunit; EC=1.10.99.1
EC=1.10.99.1	Ulva 6218					f complex iron-sulfur subunit; EC=1.10.99.1
EC=1.1.1.100	Eremosphaera					hydrogenase, putative; EC=1.1.1.100
EC=1.1.1.100	FucusVesiculosus					-carrier-protein] reductase, putative; EC=1.1.1.100
EC=1.1.1.100	Polysiphonia 23806	rev	B9TN94 RICCO	225	41.60	SubName: Full=3-oxopac-[acyl-carrier-protein] reductase, putative; EC=1.1.1.100
EC=1.1.1.100	Saccharina 23600	rev	B9TAF7 RICCO	448	40.40	SubName: Full=3-oxopac-[acyl-carrier-protein] reductase, putative; EC=1.1.1.100

Proteins

1639

Based on green plant
homologous proteins only

EC-numbers

610

Conclusion:

1. The economic **potential** of marine living resources **is tremendous**
2. Marine Biotechnology created first businesses with **minor** economical **importance** within a **low-risk** business environment
3. The **integrity of the marine ecosystem is the basis** for innovations
4. **Pollution and climate change** are gnawing on ocean's integrity and thereby **shrinking the innovation potential**
5. There is **no one right way** to develop business from innovations – every case/innovation/submarket is different

We add value to Marine Biodiversity

