SUBMARINER

Sustainable Uses of Baltic Marine Resources

Perspectives from the SUBMARINER Blue Biotechnology Cooperation Event

Kiel, Germany | 9–10 May 2012

Blue Biotechnology in the Baltic Sea Region: New Strategies and Future Perspectives

Part-financed by the European Union
(European Regional Development Fund)

Baltic Sea Region
Programme 2007–2013

www.submariner-project.eu

Knowledge transfer from environmental genomic science to marine biotechnology – big data, big challenges

Johanna B. Wesnigk | EMPA Bremen, Germany

Genomic sequence data are increasing exponentially, also for marine organisms and metagenomic data sets. These include information for novel functions and promising variety of known and utilised enzymes. While costs for the sequencing are decreasing, it still constitutes a major effort to obtain and maintain samples. Therefore cooperation between science and industry is necessary.

Several EU-funded projects address how to facilitate access to data, samples and expertise. A dedicated focus on knowledge transfer to industry is provided by the CSA project "Marine Genomics for Users", which deals with training, a knowledge output database and with establishing direct contacts between genomic scientists and marine biotechnologists. Several elements of this knowledge transfer strategy and a short overview on related projects and their outputs are given in the following.

Furthermore, the emerging large collaborative project Micro B3 "Marine Biodiversity, Bioinformatics and Biotechnology" will be presented. It concentrates on integrating genetic and ecological information in one open-access system for linking (meta)genomic prediction to ecosystem biology and to biotechnological aspects. Related training will focus on bioinformatic needs by these two user groups, including also governance and IPR aspects.

The ultimate objective is to learn from marine diversity – from fishing bio-active molecules to cultivating organisms and maybe soon synthesizing genes – to decipher and apply novel functions found in the marine environment.

The aquaculture sector is among the target groups of the "Marine Genomics for Users" project

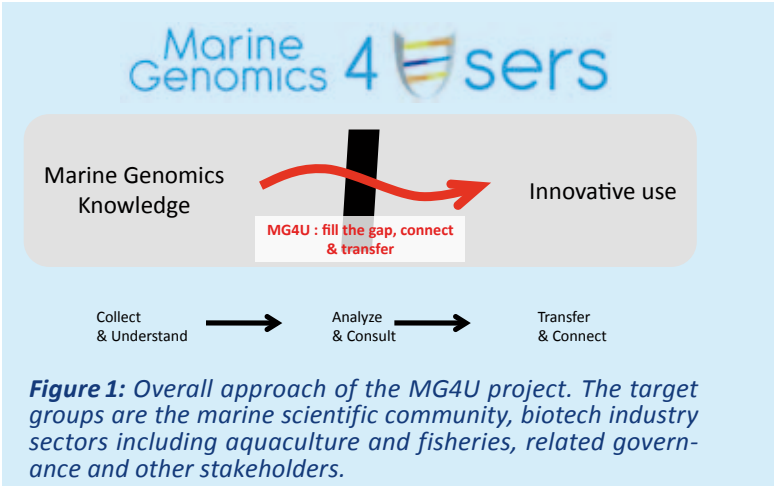

***Figure 1:** Overall approach of the MG4U project. The target groups are the marine scientific community, biotech industry sectors including aquaculture and fisheries, related governance and other stakeholders.*

Marine Genomics for Users

A consortium of seven partners was created to enable wise use of the Marine Genomics potential for innovative socio-economic development. Members are CNRS (Station Biologique de Roscoff), France, as coordinator; UCC (Environmental Research Institute) and AquaTT, Ireland; UGOT (Sven Lovén Center), Sweden; Dr. Johanna B. Wesnigk, EMPA Bremen, Germany; IRTA, Spain; CCMAR, Portugal.

One of the work packages (WP4) focuses especially on the transfer of marine genomics knowledge to industry. It is defining efficient methods to establish contacts and designing products for transfer of MG information to target relevant industrial sectors for (joint) development of marine genomics applications.

Means for the transfer of marine genomics knowledge are direct contacts, (e.g. via partnering), dedicated MG sessions at industry conventions, focussed industry workshops (WP3), and a MG knowledge output database (WP2). Finally uptake of knowledge and its further usage will be evaluated, in WP4 especially in the light of enhanced planning of future industry-academia collaborations.

Methodology (for more detail see www.MG4U.eu):

1. Short questionnaires were distributed electronically and during partnering meetings to industry contacts at several events (BioMarine, Biotechnica) to help define the needs of industry sectors, selected from white, green and red biotechnologies, fisheries and aquaculture.
2. Relevant events were chosen for promoting Marine Genomics in dedicated sessions, for example BioMarine and Biotechnica 2011, Achema June 2012 with a focus on the Bio-Based Economy and BioMarine October 24-25 2012 in London, where marine genomics will be featured in two think tanks (www.BioMarine.org)

Figure 2: *Map of geographical distribution of the 32 partners of Micro B3 large collaborative project*

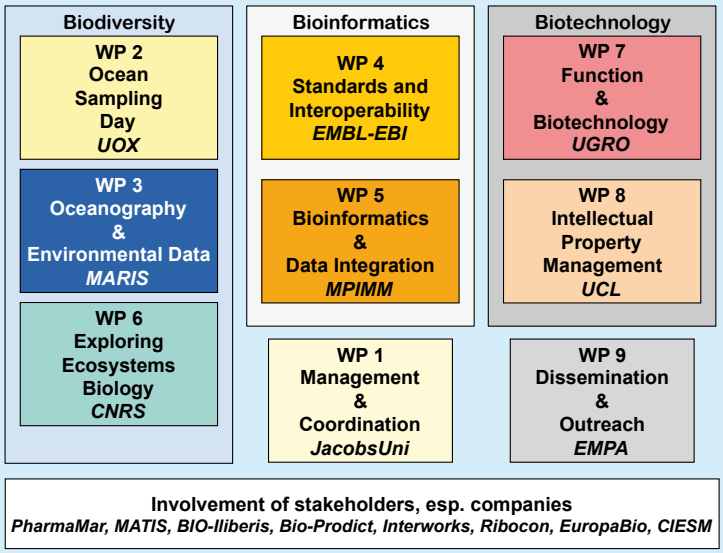

Figure 3: *Work package structure of Micro B3, showing also the three pillars biodiversity, bioinformatics and biotechnology*

Marine Biodiversity, Bioinformatics and Biotechnology (MicroB3)

With a budget of 9 Mio Euro for 4 years (2012–2015) Micro B3 will develop innovative bioinformatics approaches and a legal framework to make large-scale data on marine viral, bacteria, archaeal and protists genomes and metagenomes accessible for marine ecosystems biology and to define new targets for biotechnological applications.

Micro B3 will build upon a highly interdisciplinary consortium of 32 academic and industrial partners, comprising world-leading experts in bioinformatics, computer science, biology, ecology, oceanography, bio-prospecting and biotechnology, as well as legal aspects.

The work package focussing on marine biotechnology will deal with the exploration of integrated datasets looking at genes of unknown functions, as well as biosynthetic gene clusters in marine organisms and new genes from metagenomes. Laboratory experiments will be used to further confirm functions through pre-enrichments, functional screening of large-insert libraries, micro-colonies and micro-cultures as well as heterologous expression and bioassays.

The work package on intellectual property rights will develop documents and run workshops concentrating on

- Model agreements for pre-competitive access to microbial materials and exchange of materials and data within researchers.
- IP model agreements for pre-competitive access to large-scale microbial genomic research databases and
- Outreach workshop on topics like IPR, scientific potential, biotech options, environmental impact to discuss application and protection options with stakeholders from regional, national and international policy-making bodies.

Finally the work-package on dissemination, training and outreach will address the timely dissemination of relevant information via course, workshops and a programme of outreach to an interested public. Three expert workshops with industrial sector including SMEs as well as stakeholder workshops with policy makers & advisors in field of biodiversity protection are planned.

Another aspect of this package is capacity building through training of the next generation of scientists. For more detail including registration to the workshops and courses, follow our tweet and visit the website www.microb3.eu