

IRIS & Akvamiljø

Akvamiljø is an aquatic environmental research centre. The three affiliated companies: International Research Institute of Stavanger (IRIS), Akvamiljø a/s and Akvamiljø Caspian AS with 50 scientists and engineers provide advanced research and services within ecotoxicology, environmental risk assessment, monitoring, field- and laboratory experiments and analyses. Akvamiljø Caspian performs environmental analyses and consultancy in the Caspian region and operates an accredited laboratory in Baku, Azerbaijan

Measuring the pulse of the Svalbard Crab



On September 15th, the new remote online research facilities connecting Akvamiljø in Mekjarvik and the new marine laboratory in New Ålesund in Svalbard were opened.

State of the art conference facilities related to new, remote online information technology have been installed at the two locations. This creates unique possibilities for remote monitoring of

environmental experiments and other arctic research activities in New Ålesund. - Research, such as monitoring the behaviour and heart rate in crabs, will contribute to a better understanding of Arctic animals in their natural environment. Advanced, hand held, wireless cameras at both sites will contribute towards effective distance training and learning for personnel at each end of the line.



The IT-equipment and project is financed by Rogaland County and ConocoPhillips.

- The opening took place at IRIS & Akvamiljø in Mekjarvik

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Commercial lobster farming on Kvitsøy near Stavanger



The first production module at Norwegian Lobster Farm AS. Photo by A. Drengstig



A lobster passing through the size grading robot. Photo by A. Drengstig

After years of comprehensive small-scale R&D activity on farming of European lobster, the company **Norwegian Lobster Farm AS** is now about to start commercial rearing on the island of Kvitsøy.

The highly advanced technology is based on recirculation of heated seawater (ca. 20 degrees C).

Lobster is an aggressive, territorial species and thus has to be kept in individual boxes. Besides, the high-tech system even makes possible tracing of individuals through robots and image processing. The new system is based on automatic individual feeding and self-cleaning of tanks and cages. The farming concept is relatively inexpensive to construct and operates and maintains ideal water quality conditions. Moreover, it utilises space in three dimensions and thus enables high densities, conserves water at high temperatures (RAS), and permits easy access to the livestock for inspection and feeding.

The first production module will be ready for stocking by the end of this year. Perfect lobster market size is about 300g or so-called plate-sized. The quality of the farmed lobster has been tested and well rated at Culinary Institute in Stavanger. From stocking, the animals can be harvested after 24-26 months. In this first

module, Norwegian Lobster Farm plans to produce 2 tons of lobster for the market in 2008. The company however plans to produce as much as nearly 50 tons over the next three years in additional constructed modules.

Among the most troublesome biological challenges to be solved in order to commercialise lobster have been to achieve a naturally coloured shell, how to avoid cannibalism and development of a well-balanced diet. IRIS has been involved since 2002 mainly focusing on water quality matters of the recirculation system at different intensification levels (recirculation rate, lobster biomass). A vital part of the recirculation system is the biofilter oxidising ammonia to nitrate in order to avoid sub-toxic concentration levels of the highly risky unionized ammonia (NH_3). **Norwegian Lobster Farm and IRIS** will continue the collaboration at the large-scale, commercial farm on Kvitsøy in the years to come.

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Environmental indicators in the Arctic

In view of increasing resource exploitation activity within the Arctic marine region the importance of monitoring possible impacts on this previously largely unexplored environment is clear. - It is essential that an effective system is developed that is capable of providing an unambiguous gauge of the condition of biota within the regions influenced by these new activities. Key to this process is the establishment of a suite of environmental indicators to serve as reference parameters. Substantial progress, however, remains to be made in identifying and validating specific indicators for this purpose.

Environmental indicators should, in our opinion, not be limited to the presence or absence of particular key species, but should also include biological parameters at the molecular, biochemical or physiological level in organisms (biomarkers). Research based at our laboratory, examining biomarker responses in Arctic organisms exposed to chemicals and effluents associated with the oil industry, has generated results promoting their further use in the development of a monitoring strategy for the Arctic. Carefully selected biomarkers have the potential to provide more rapid and detailed information on the nature of harmful chemical exposures compared with a monitoring strategy based solely on indicator species. They also have

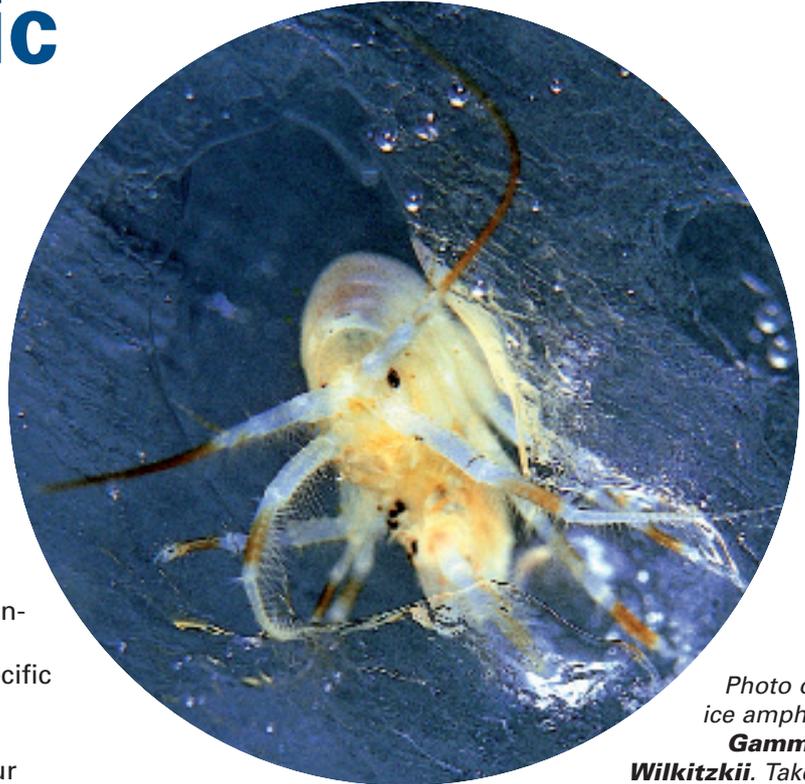


Photo of the ice amphipod, **Gammarus Wilkitzkii**. Taken by Erling Svensen

the potential to indicate early deviation away from a healthy condition in individual organisms, providing an *early warning* of later, more serious, consequences. Monitoring of indicator species does, however, have a valuable role to play in providing essential input into the weight of evidence approach to environmental monitoring. We think that a combination of these two approaches would provide the best solution to the problem of how to effectively monitor marine life in the Arctic.

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Students' Corner:



Claudia Lucas, from the University of Applied Sciences in Dresden (Germany), spent five months at Akvamiljø as a student-trainee. Claudia was supported by the *EU programme Leonardo da Vinci* and by *Total E & P Norge AS* who sponsored Akvamiljø with supervisor resources.

Claudia focussed on the quality of our protein analyses – and the establishment of the Lowry assay and quality comparison of this method to

the Bradford assay were among the issues she addressed. Although these assays for protein are rather basic, their quality is highly relevant for many other analytical topics, such as measurements of the catalytic activity of biomarker enzymes. In the last part of her stay, Claudia initiated the development of a quantitative ELISA method for better measurements of specific biomarker proteins. After Claudia's departure, this important work will be followed up by others in our research group..

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Akvamiljø Caspian has achieved ISO 17025 accreditation



From April 5th 2006 Akvamiljø Caspian (AmC) - Caspian Environmental Laboratory was formally accredited to the ISO 17025 standard for laboratory analyses.

AmC is a company partly owned by IRIS, operating from Baku in Azerbaijan. AmC is offering a wide and increasing range of locally conducted environmental services to customers in the Caspian region. Services range from off-shore environmental surveys, taxonomic identification, chemical and microbiological analyses of water and solids, toxicological testing of

drilling mud and chemicals, ambient and occupational air monitoring, and environmental consultancy services. Most customers are from the oil industry in Azerbaijan, but customers are also found in other countries in the Caspian region, like Georgia and Kazakhstan. An extensive amount of time and effort have been invested to set up and implement procedures in order for the laboratory to comply with the requirements of the ISO 17025 standard. This accreditation secures that the company complies with overall quality requirements as laid down in ISO 9001, and additional requirements that are specific to analytical laboratories. The accreditation currently covers 24 different organic and inorganic chemical analyses as well as microbiological analyses in waste water, drinking water, surface water and sea water, sediments, and soil. AmC aims to add more parameters to this list with time. For our customers this will mean a further increased guarantee for the quality of the analytical results AmC produce.

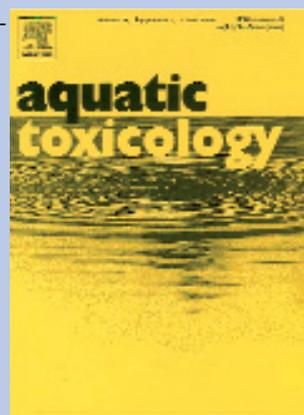
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The **BEEP special issue** was published in *Aquatic Toxicology* in May.

- This issue (supplement to volume 78, <http://www.sciencedirect.com/>) contains articles related to the laboratory exposures performed at Akvamiljø (Stavanger, Norway) during the project : **B**iological **E**ffects of **E**nvironmental **P**ollution in Marine Ecosystems..

BEEP was a 3-year European Research project with the objective to evaluate the use of biomarkers determined in marine organisms as a means of assessment of chemical contamination. This integrated multidisciplinary, multisite and multimarker research project combined European expertise in biology, biochemistry, ecotoxicology, environmental chemistry and data analysis. Joint studies were

organised at the laboratories of Akvamiljø where 30 BEEP participants co-operated during several weeks, performing complementary pollution experiments. The special issue was funded by IRIS (International Research Institute of Stavanger and Akvamiljø a/s).



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