



**Norwegian University of Science  
and Technology (NTNU)**

**Research Infrastructure Information**

**[www.aquaexcel.eu](http://www.aquaexcel.eu)**

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# 1 NTNU in AQUAEXCEL

## 1.1 Introduction

<b>Operating institution:</b>	<b>Norwegian University of Science and Technology (NTNU)</b> <a href="http://www.ntnu.edu/">http://www.ntnu.edu/</a>
<b>Type Operating Institution:</b>	University
<b>Research Infrastructure(s):</b>	The CodTech laboratory at NTNU Centre of Fisheries and Aquaculture (Sealab)

## 1.2 NTNU Centre of Fisheries and Aquaculture, Sealab

<b>Name of the infrastructure:</b>	<b>NTNU Centre of Fisheries and Aquaculture (Sealab)</b>
<b>Location:</b>	Brattørkaia 17C, 7010 Trondheim, Norway
<b>Web site address:</b>	<a href="http://www.ntnu.edu/marine/sealab">http://www.ntnu.edu/marine/sealab</a>
<b>Contact:</b>	Elin Kjørsvik NTNU, Department of Biology, Centre of Fisheries and Aquaculture, N-7491 Trondheim, Norway. Phone: +47 73596313 Email: <a href="mailto:elin.kjorsvik@bio.ntnu.no">elin.kjorsvik@bio.ntnu.no</a> Mobile: +47 91897578 <a href="http://www.ntnu.edu/employees/elin.kjorsvik">http://www.ntnu.edu/employees/elin.kjorsvik</a>
<b>AQUAEXCEL TNA facility:</b>	YES, the Research Infrastructure is open for Access within the AQUAEXCEL project YES, the facilities are open for Access to external research groups within the framework of the AQUAEXCEL project
<b>Short description</b>	The NTNU Centre for Fisheries and Aquaculture is a multidisciplinary facility (total area 3300 m <sup>2</sup> ), with users from five of the seven faculties at NTNU. There is office space for 60 people. The activity is especially focused around marine fish juvenile and plankton technology, with activities related to aquaculture and environmental studies of effects from pollution and climatic change. The Centre is “home” for the multidisciplinary international Master Programme “Marine Coastal Development”.
<b>Keywords</b>	Marine aquaculture biology and technology, process control and automation, marine fish juvenile and plankton technology, ocean acidification and ecotoxicology.
<b>Technical labs</b>	The aquatic experimental facilities comprise two laboratories (60m <sup>2</sup> ), and seven smaller temperature controlled rooms, with an emphasis on flexibility concerning experimental setups. A laboratory for production of live feed organisms (microalgae, rotifers, Artemia, copepods) is shared with SINTEF Fisheries and Aquaculture. The facility provides different water qualities, accurate environmental control of sea water and fresh water, air temperature, light regimes, and automated feeding. The centre has several analytical laboratories:

	<ul style="list-style-type: none"> <li>* Physiology Laboratory (ecophysiology, ecotoxicology, basic physiology)</li> <li>* Biochemistry Laboratory (GC, HPLC, Coulter Counter)</li> <li>* Histology and Microscopy Laboratory (well equipped for histology and electron microscopy preparations, immunohistochemistry, in situ hybridisations, tissue structure analysis, etc).</li> </ul>
<b>EU projects</b>	<ul style="list-style-type: none"> <li>• <u>PRO-EEL</u> -Reproduction of European Eel: Towards a Self-sustained Aquaculture <a href="http://www.pro-eel.eu">http://www.pro-eel.eu</a></li> <li>• <u>Promicrobe</u> - Microbes as positive actors for more sustainable aquaculture <a href="http://www.promicrobe.ugent.be/">http://www.promicrobe.ugent.be/</a></li> <li>• <u>AQUA-TNET</u> 2008-11 <a href="http://www.aquatnet.com/">http://www.aquatnet.com/</a></li> <li>• <u>LARVANET</u> - Critical success factors for fish larval production in European Aquaculture: a multidisciplinary network (COST Action FA0801) <a href="http://www.larvanet.org/">http://www.larvanet.org/</a></li> <li>• <u>EATIP</u> - European Aquaculture Technology and Innovation Platform <a href="http://www.eatip.eu/content/view/1/2/">http://www.eatip.eu/content/view/1/2/</a></li> <li>• <u>MARAQUAFEED</u> - Preserved zooplankton as a diet for marine aquaculture species (start in 2012)</li> </ul>
<b>Number of researchers</b>	25 Researchers/PhD students
<b>Number of technicians</b>	4
<b>Lodging facilities</b>	No
<b>SERVICES - scientific support</b>	The centre is organised with an emphasis on flexibility concerning use of the facilities. Within marine larval technology and engineering a wide range of disciplines is represented. The scientific staff involved in the ongoing interdisciplinary research and education activities consists of professors, post-doctoral and senior researchers from several departments and faculties. The presence of experts and broad knowledge in first feeding experiments and cultivation of planktonic organisms, fish physiology, larval development and nutrition, microbiology, functional genomics, biotechnology, marine cybernetics, robotics, control systems and ICT tools in intensive aquaculture systems, provides a stimulating research area for external researchers and students visiting the facilities at Sealab. There is a 24 h full technical emergency support. The facility has aquaculture licenses and authorisation to work with most Norwegian aquatic species.
<b>SERVICES - electronic databases</b>	Yes, NTNU electronic databases are available, such as library services etc.
<b>SERVICES – Quality assurance</b>	Quality assurance is implemented through the NTNU HSE system ( <a href="http://www.ntnu.edu/hse">http://www.ntnu.edu/hse</a> ) and separate procedures are developed for the Centre of Fisheries and Aquaculture (Sealab).
<b>Safety and Ethical issues</b>	All activity needs to comply with the Norwegian Animal Welfare Act ( <a href="http://www.lovdato.no/all/hl-20090619-097.html">http://www.lovdato.no/all/hl-20090619-097.html</a> ) and the Regulation on animal experimentation ( <a href="http://oslovet.nvh.no/statue.html">http://oslovet.nvh.no/statue.html</a> ). All laboratory activities and experiments must be risk assessed according to NTNU management procedures.

### 1.2.1 Facility Unit 1 Information: The CodTech Laboratory Unit

<b>Name</b> <b>Unit 1</b>	<b>The CodTech Laboratory Unit</b>
<b>TNA</b>	YES, the Facility Unit is open for Access within the AQUAEXCEL project.
<b>Contact</b> <b>(Researcher)</b>	Elin Kjørsvik NTNU, Department of Biology, Center of Fisheries and Aquaculture, N-7491 Trondheim, Norway Phone: +47 73596313 Email: <a href="mailto:elin.kjorsvik@bio.ntnu.no">elin.kjorsvik@bio.ntnu.no</a> Mobile: +47 91897578 <a href="http://www.ntnu.edu/employees/elin.kjorsvik">http://www.ntnu.edu/employees/elin.kjorsvik</a>
<b>URL</b>	<a href="http://www.ntnu.edu/marine/sealab">http://www.ntnu.edu/marine/sealab</a>
<b>Postal Address</b>	NTNU, Centre of Fisheries and Aquaculture, N-7491 Trondheim, Norway
<b>General description</b>	NTNUs automated start-feeding rig provides a stimulating and integrated environment for applied research in the field of marine aquaculture technology, fish biology and environmentally related issues. It serves as a principal facility for the development of intensive methods for the production of marine fish larvae. There are well established laboratories for experimental studies of fish cultivation, developmental biology, larval rearing and live prey production, and well equipped laboratories for molecular analyses, histology, microbiology, and biochemistry. Since establishment of the laboratory a unique cooperation between the aquaculture group from the Department of Biology, Department of Biotechnology, and the Department of Engineering Cybernetics has resulted in significant contributions in the application of control engineering on the marine larviculture process. These include automatic live feed monitoring equipment, full appetite controlled feeding, and a model based system for estimating larval density from live feed dynamics. The automated start-feeding rig serves as a showcase for these technologies, and offers an experimental environment where more advanced research both on biological and technological aspects of the rearing process can be performed.
<b>Technical description</b>	The automated start-feeding CodTech rig consists of 18 tanks of 160 l each. It is suitable for experiments on a wide range of freshwater and marine species, and the rig is especially designed for controlled experiments with pelagic fish larvae. Continuous in-house cultures of live prey organisms (rotifers, Artemia, copepods) and microalgae provide a good basis for nutritional and developmental studies of marine fish during larval and fingerling life stages. Environmental variables, such as temperature, light, dissolved oxygen, carbon dioxide, and nutrient concentration are monitored and controlled electronically. The installations thus provide a unique degree of flexibility and

	automation, which can guarantee optimal cultivation conditions on a continuous basis. Incoming water undergoes a microbial maturation process whereas effluents are submitted to an advanced disinfection procedure. The latter makes the facilities particularly attractive for experiments with different bacterial communities and possible contaminants. In 2008, the laboratories were upgraded to an experimental facility with automatically controlled feeding, water exchange, light and online measurements of live feed density. All tanks are equipped with underwater cameras for remote observation. This combination makes the facility one of the most advanced cultivation hatchery units in Europe.
<b>Remote monitoring &amp; control</b>	Monitoring and control can be performed through the SSO laboratory (also accessible for TNA through Aquaexcel: SSOlab).
<b>Water and environmental conditions</b>	The water is taken from 70 m depth in the Trondheimsfjord (34 ppt) and filtered through a sand filter. There are different reservoirs from where the water can have different temperatures and salinities. There is no permanent oxygenation and active degassing to avoid supersaturation of nitrogen.
<b>Flowrate</b>	The flow rate range is per unit range between 0 and 10 litres per minute. Flow rate can be monitored manually.
<b>Temperature</b>	Temperature range is between 2 and 25 °C. This parameter can be controlled and monitored automatically.
<b>Salinity</b>	Possible to select between a salinity of 34 ppt and freshwater.
<b>Oxygen</b>	Oxygen is monitored from the inlet water but not in each fish tank. This can be performed manually.
<b>pH</b>	The pH is monitored from the inlet water but not in each fish tank. This can be performed manually from each unit.
<b>Light intensity and wavelength</b>	Close to normal daylight. Light intensity and wavelength can be monitored manually.
<b>Photoperiod</b>	Photoperiod can be manipulated automatically.
<b>Fish measurements</b>	Larval and juvenile measurements are wet weight, dry weight, standard length, biochemical composition (especially lipids), morphology, histology, molecular markers, and behaviour.



**Pictures/videos**



### 1.3 Modality of access

As soon as a proposal for access is approved by the evaluation panel, the group leader will be contacted and be appointed a contact person at the infrastructure. This person will be responsible for the preparation of the planned experiments. Typically, the group leader will be invited to Trondheim to have a first discussion on experimental set-up combined with a visit to the premises, in advance of the start of the project. Details to be clarified with the facility provider are the number of tanks, species, quantity of eggs or larvae, instruments and analytical labs needed. In addition to the contact person, researchers and/or students working in similar field of research may join the group. This will stimulate the interaction between external and internal users of the facilities, resulting in an expansion of the existing collaborative network and eventually in joint publications. All group members will be offered a work space, from where they will have access to all necessary office amenities, such as telephone, internet, copy and printing services.

In addition, they will be given the possibility to access laboratory space where the results can be analyzed. A project will typically last about 7 weeks, including preparations and performance of the experiments. Upon request, guest researchers and students can join different educational elements that are part of the International Master of Marine Coastal Development. We anticipate having 3 projects, with duration of 7 weeks each, adding up to 21 weeks in total. 40 days for the experiment and 1 extra week for preparation/analysis.

The CodTech facilities are organized under the NTNU focus area "Marine Coastal Development". Monitoring and controlling equipment is designed in-house, and therefore, state-of-the-art expertise will also available to external users. During the transnational access project, support will be offered on a scientific, technical and logistic level.

### 1.4 Unit of Access

The unit of access is one week meaning the occupation of the automated start-feeding CodTech rig - which consists of 18 tanks of 160 l each- during five days.

It is anticipated that 3 projects will be granted, with duration of 7 weeks each, adding up to 21 weeks in total. 40 days for the experiment and 1 extra week for preparation/analysis.

The Codtech facilities are organised under the NTNU focus area "Marine Coastal Development". Monitoring and controlling equipment is designed in-house, and therefore, state-of-the-art expertise will also available to external users. During the transnational access project, support will be offered on a scientific, technical and logistic level. Dedicated technical staff will assist with the operation of 18 tanks, instruments, monitoring and sampling gear, adjustment of systems, temperature, water quality, water exchange rate according to experimental design. Researchers will, if needed, be



supplied with live prey organisms (enriched), microalgae necessary for optimal larval conditions and laboratory assistance to perform standard analyses of samples.

All users will be offered an office space, and will be connected to the wireless communication area of NTNU. They will also have the opportunity to use technical workshops, digital meeting rooms and library services. The university's Office of International Relations offers professional services to all guest researchers. Accommodation is offered within the city of Trondheim by NTNU, which has 40 furnished and fully equipped apartments and guesthouses allocated for guest researchers.