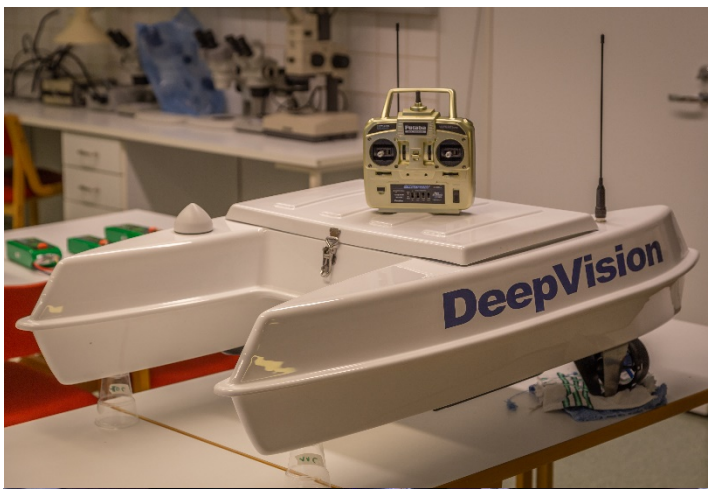


List of equipment at Husö biological station (as of 04/2021)



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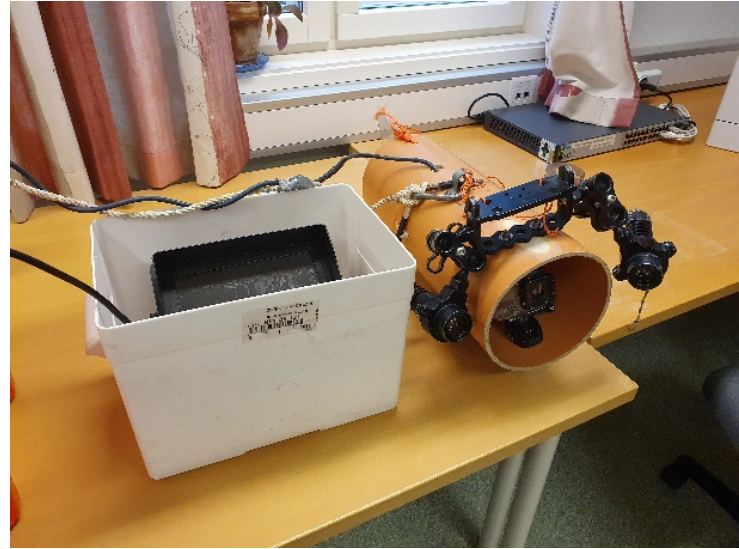
1 Field equipment

1.1 Drop-video system

Year of purchase: 2014 & 2017

Features, possible uses, etc.:

- Two systems available
- “Home built”-system, with parts found online
- Gopro Hero4 camera (up to 4k resolution)
- 30m cable, two 900 lumen dive lights
- Rain proof monitor
- For mapping underwater vegetation and habitats



1.2 MX Aquatic Habitat Echo sounder

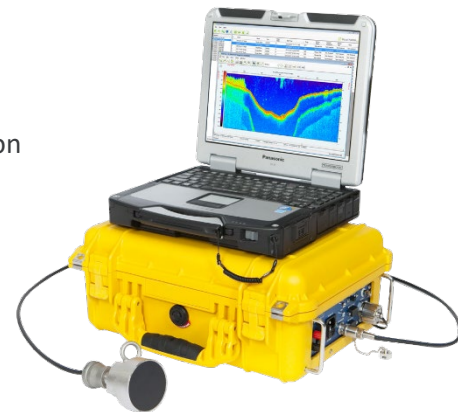
Year of purchase: 2015

<https://www.biosonicsinc.com/products/mx-aquatic-habitat-echosounder/>

https://www.youtube.com/watch?v=T-Hvr_kYr4k

Features, possible uses, etc.:

- Map submerged aquatic vegetation (SAV): area, coverage, height of vegetation
- Map macrophytes and other habitat areas
- Monitor invasive aquatic weeds
- Delineate areas of sand, mud, rock
- Generate contour profiles
- Shallow water mapping
- Works best with bow mounted electric motor (Minn Kota Riptide 55lb)



1.3 DT-X Extreme Autonomous Portable Scientific Echosounder

Year of purchase: 2020

<https://www.biosonicsinc.com/products/dt-x-extreme/>

<https://www.youtube.com/watch?v=cwkUJTzP4zs>

Features, possible uses, etc.:

- Equipped with **one** split beam, 200 kHz-transducer. Can be equipped with both Single and split beam transducers: 38, 70, 120, 200, 420, & 1000 kHz
- Fish Stock Assessment
- Population Estimates
- Size Distribution
- Total Biomass Estimates
- Vertical and Horizontal Distribution
- Behavioral Studies
- Predator / Prey Relationships

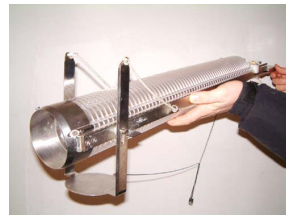


1.4 Limnos sediment corer

Year of purchase: 2016

Features, possible uses, etc.:

- One available
- Makes it possible to extract sediment in 1cm slices



1.5 RBRsolo PAR

Year of purchase: 2017

<https://rsaqua.co.uk/wp-content/uploads/2016/09/RBRsolo-revK.pdf>

Features, possible uses, etc.:

- Five available
- The ones at Husö equipped with:
 - o Licor PAR 192SA sensor
 - o Anti-fouling wiper set
- Possibility to upgrade these for either turbidity or dissolved oxygen measurements



1.6 Minn Kota Riptide 55lb

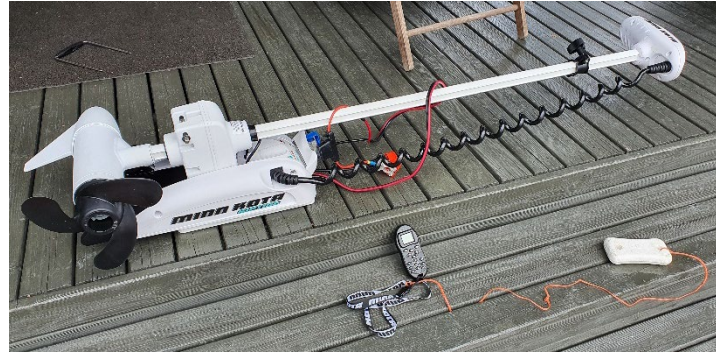
Year of purchase: 2016

<https://www.minnkotamotors.com/support/manuals/trolling-motors/riptide-terrova>

<https://minnkota.com.au/wp-content/uploads/2014/07/i-pilot-manual-rev.pdf>

Features, possible uses, etc.:

- Can easily be mounted in the bow of **Esox**
- Controlled via remote control
- Built in GPS allows for:
 - o Lock of heading
 - o Recording of tracks that can be revisited
 - o "Sky anchor"
- Allows for slow and precise movement
- Equipped with upgraded, three blade propeller
- Has its own battery that last for many hours
- Very handy when using the **MX Aquatic Habitat Echo sounder**



1.7 EXO3 Multiparameter Sonde

Year of purchase: 2019

<https://www.y.si.com/EXO3>

Features, possible uses, etc.:

- Two available
- Multiparameter Water Quality Sonde with 5 sensor ports
- Cond/Temp., pH, Turbidity, DO & Sensor wiper (on those at Husö)
- One of the sondes is equipped with 0-100m depth sensor.
The other one is without depth sensor
- Also available at Husö: handheld display and 33m field cable
- Works also as a stand-alone unit that can be programmed prior to deployment
- Many different sensors available



1.8 DeepCat by DeepVision

Year of purchase: 2019

<https://deepvision.se/products/autonomous-survey-systems/>

<http://deepvision.se/wp-content/uploads/2018/10/DeepCat.pdf>

<https://www.youtube.com/watch?v=5bomtSvveg8>

Features, possible uses, etc.:

- Generate contour profiles autonomously
- Generate 3D-models of the environment under the surface based on the contour profiles
- Calculate volumes of water at different depths
- Equipped with side scan sonar technology



1.9 DJI Phantom 4 RTK

Year of purchase: 2020

<https://www.dji.com/fi/phantom-4-rtk>

Features, possible uses, etc.:

- Map underwater vegetation from air in shallow areas (ca. 0-3m)
- Map drifting algae on shallow beaches
- Geo-referenced pictures with centimeter accuracy
- Map seasonality in vegetation coverage in shallow water
- Map the spread of vegetation on land
- Generate 3D-models of above surface environment
- Possibility to program flight paths in advance as well as having the drone fly the same paths multiple times for e.g. studying seasonal changes



1.10 DTG3 ROV by Deep Trekker

Year of purchase: 2020

<https://www.deeptrekker.com/products/underwater-rov/dtg3>

Features, possible uses, etc.:

- 200m depth rating, up to 8h battery life
- Highly customizable, check: <https://www.deeptrekker.com/shop/categories/rov-add-ons-all>
- Husö ROV has:
 - 75m tether
 - SENSOR PACKAGE | DEPTH, HEADING, TEMP & MORE
 - BLUEPRINT SUBSEA SEATRAC USBL POSITIONING SYSTEM
 - CONTROLLER GPS | BRIDGE SYSTEM
 - AUXILIARY LIGHTING - DTG3
 - TOOLLESS BALLAST KIT - DTG3
- Map waters deeper than possible with divers (i.e. mussel beds, red algae, etc.)
- Thanks to the GPS: possibility to plot routes and drop points of interest along the way.



1.11 P-Log3021 Water Level and Wave Logger

Year of purchase: 2020

<https://www.driesen-kern.com/products/water-analysis/water-level/water-level-and-wave-logger-plog3021.php>

Features, possible uses, etc.:

- Four available at Husö
- Water level and wave measurements
- High resolution of 1.5 mm and accuracy of 20 mm at 40 m water column
- Capacity for up to 500 million readings
- Battery life 1/2 year at 5 Hz sampling rate
- Logging interval 32 Hz to 24 hours



1.12 P-Log3020-baro High-Precision Barometric Logger

Year of purchase: 2020

<https://www.driesen-kern.com/products/water-analysis/water-level/waterproof-barometric-pressure-logger-p-log3020.php>

Features, possible uses, etc.:

- One available at Husö
- Barometer and thermometer in a single device
- IP68 protected (fully submersible!)
- Measurement range -30..+80°C
- Memory for up to 4 million readings
- Battery life up to 4 years (interval Of 10 minutes)
- Can be used together with P-Log3021 water level and wave logger to compensate for barometric pressure



1.13 YSI Professional plus - Multiparameter instrument

Year of purchase: 2008 & 2012

<https://www.ysi.com/proplus>

Features, possible uses, etc.:

- Two available at Husö
- 30m cable
- Temperature, salinity and pH



1.14 YSI ProODO - Optical Dissolved Oxygen Instrument

Year of purchase: 2010

<https://www.ysi.com/proODO>

Features, possible uses, etc.:

- One available at Husö
- 50m cable



1.15 ONSET HOBO Pendant data logger

Year of purchase: 2015

<https://www.onsetcomp.com/products/data-loggers/ua-002-08>

Features, possible uses, etc.:

- Six available at Husö
- Measures temperature and light intensity (lux)
- 30m depth rating
- One year battery life during typical use
- Stores approx. 3.5K combined temp. and light readings or events



1.16 LICOR LI-1400

Year of purchase: 1999

<https://www.licor.com/documents/2ipkf5a195b1djdcojoe>

Features, possible uses, etc.:

- 30m cable
- LI-193 Spherical underwater sensor: <https://tinyurl.com/y2l4zofk>
- LI-190SA Quantum sensor as reference sensor to the underwater sensor: <https://www.licor.com/env/pdf/light/190.pdf>
- For spot measurements of PAR-radiation in the field



1.17 Other field equipment

- Limnos water samplers (5 in total)
- Ekman sediment samplers (7 in total)
- Sieves in different mesh sizes (including 0,5mm and 1mm as well as some sieve series, e.g: 32µm-4mm)
- Both "Nordic" and "Nordic coastal" multi mesh gillnets
- Beach seines (2 available)
- Plankton nets (25, 50 and 65 µm)
- Handheld depth meters (4 in total)
- Handheld GPS (4 in total)

2 Aquarium equipment

NB! To conduct experiments with vertebrates (fish) a permit is needed according to Government Decree on the Protection of Animals Used for Scientific or Educational Purposes 564/2013.

2.1 The Aquarium Container

Year of purchase: 2017

Features, possible uses, etc.:

- Size c 15 m²
- 36 flow-through aquariums in three racks
- Temperature can be regulated in the container
- Light can be programmed (18pcs. **Radion XR30w**)
- Water circulated / cleaned by: mesh screen, UV-light and protein skimmer
- Internet connection (ethernet and WiFi)
- To be installed (2020): quieter air condition unit



2.2 Climate room

Features, possible uses, etc.:

- Size: c 20 m²
- Updated during 2018-2019
- **Three** racks with **two** flow through aquariums in each rack
- Internet connection available (ethernet and WiFi)
- 3pcs. **Apex Fusion** aquarium control centers, one for each rack
- Light can be programmed (6pcs. **Radion XR30w**)
- Programmable water pump in the sump of each rack (**Abyzz 200**)
- Water can be cooled with **Aqua Medic Titan 500** as well as cooling unit that cools the whole room
- **For heating of specific aquariums:** smaller heating units can be used. Husö has five 300W 18-34°C units available
- Connected to a central air line for aeration of aquariums
- Some work bench space as well as floor space available for custom experiment setups



2.3 Aquarium hall

Features, possible uses, etc.:

- Size: c 70 m²
- Updated in 2019 with internet (ethernet and WiFi)
- The space can be adapted for a wide range of setups
- A list of available sizes on aquariums and mesocosms can be found below
- Connected to a central air line for aeration of aquariums



2.4 Outdoor aquariums/mesocosms

Features, possible uses, etc.:

- Size: 6 x 8 m, 48 m²
- Until spring 2021 equipped with four mesocosms. From 2021 on there will instead be 20 smaller mesocosms available. For sizes see list below.
- The space is easy to adapt, 26 taps with Sea water in total.
- Electricity outlets available, no ethernet or WiFi.
WiFi-signal is weak.
- Sizes of previously installed mesocosms (LxWxH):
 - o 2 pcs: 2000x2000x400 mm
 - o 2 pcs: 1900x1900x400 mm
- Sizes of the mesocosms installed in spring of 2021 (LxWxH):
 - o 1120x920x600 mm (600l) – 20 in total available



2.5 Water filtration system for aquariums

Year of purchase: 2012

Features, possible uses, etc.:

- Two independent systems:
 - o System 1: for the aquariums in the aquarium hall, climate room and climate container
 - o System 2: for the outdoor aquariums and for flushing the sand filters
- Water filtration through sand filters to remove algae and other impurities (about 50% reduction in chlorophyll a on average)
- The filtration can be bypassed if needed



2.6 SQ-520: Full spectrum Smart Quantum Sensor (USB)

Year of purchase: 2017

<https://www.apogeeinstruments.com/sq-520-full-spectrum-smart-quantum-sensor-usb/>

Features, possible uses, etc.:

- Real-time spot measurements with computer
- Can also work as a stand-alone logger
- Handy when setting light levels in aquariums



2.7 Apex Fusion

Year of purchase: 2019

<https://www.neptunesystems.com/apex-fusion/>

Features, possible uses, etc.:

- Three systems available at Husö
- A control center for aquarium systems, possible to monitor and control via internet
- Probes for temperature, salinity, pH and ORP
- Customizable system with many options



2.8 Radion XR30w G3 and G4 by Ecotech (24 in total)

Year of purchase: 2016, 2019

https://ecotechmarine.com/radion_legacy

Features, possible uses, etc.:

- 24 lights available in total at Husö
- Programmable aquarium lights, possible to mimic a wide range of different scenarios and wave lengths
- Possible to connect to **Apex Fusion**, works well also as stand alone units
- Both standard and pro versions available at Husö



2.9 Abyzz 200

Year of purchase: 2019

<https://abyzz.de/en/shop/pumps/abyzz-a200-2/>

Features, possible uses, etc.:

- Three available at Husö
- Programmable aquarium pump
- Installed in the sump of the racks in the climate room



2.10 Aqua Medic Titan 500

Year of purchase: 2019

<https://aquamedicdirect.co.uk/product/temperature-lighting/temperature>

Features, possible uses, etc.:

- Three available at Husö
- Aquarium cooler, that is possible to connect to **Apex Fusion**



2.11 All available aquariums / mesocosms

Sizes given as: Length x Width x Height in millimeters

- 44 pcs.: 300x220x220 mm
- 36 pcs.: 350x300x300 mm (in the climate container racks)
- 7 pcs.: 700x300x300 mm
- 6 pcs.: 930x450x500 mm (in the climate room racks)
- 5 pcs.: 600x400x300 mm
- 5 pcs.: 480x380x350 mm
- 5 pcs.: 1000x1000x600 mm
- 3 pcs: 500x300x300 mm
- 3 pcs.: 400x350x350 mm
- 2 pcs.: 450x300x180 mm
- 2 pcs: 2000x2000x400 mm (Outdoor mesocosm)
- 2 pcs: 1900x1900x400 mm (Outdoor mesocosm)
- 20 pcs: 1120x920x600 mm (Outdoor mesocosm)
- 2 pcs.: Y-aquarium, details in picture right
- 1 pcs.: 500x400x350 cm

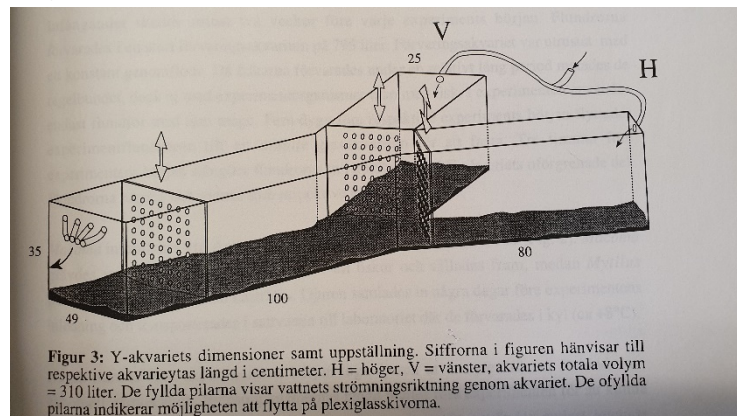


Figure 1. Y-aquaria (Westberg 1997)

3 Boats

3.1 Tinca (Faster 560 (2011), 90hp)

- Length/Width: 5,9m/2,2m
- Seats up to 7 people
- Has its own trailer
- Equipped with plotter/echo sounder
- Dive ladder in the aft
- Plenty of space for equipment
- Sturdy in rough sea
- High sides = Hard wind might make maneuvering in low speeds harder



3.2 Mya (Rönnqvist 590 (2009), 60hp,)

- Length/Width: 5,9m/2,2m
- Seats up to 9 persons
- Has no own trailer, trailer for "Tinca" can be used if needed
- Equipped with plotter/echo sounder
- Dive ladder in the aft
- Plenty of space for equipment, middle bench can be removed to free up more floor space
- Handles rough sea pretty well
- Relatively low sides = wind does not affect the boat as much as Tinca at low speeds



3.3 Esox (Buster RS (1996), 40hp)

- Length/Width: 4,5m/1,72m, motor changed in 2017
- Seats up to 6 persons
- Has its own trailer
- Equipped with plotter/echo sounder
- Moderate space for equipment, middle bench can be removed to free up more floor space
- All-rounder when it comes to usage
- Can be equipped with a bow mounted electric motor (**Minn Kota Riptide 551b**) when slow and precise course navigation is needed



3.4 Sigrid Maria (Rönnqvist RR 16 (2005), 25hp)

- Length/Width: 4,80m/1,77m
- Has its own trailer
- Seats up to 5 persons, very slow with that kind of load
- Equipped with plotter/echo sounder
- Moderate space for equipment, middle bench can be removed to free up more floor space
- All-rounder when it comes to usage. Good choice for survey fishing with gill nets and benthos sampling
- Low sides = good maneuverability in windy conditions when driving slowly



3.5 Sprattus sprattus (Buster XS (2010), 15hp)

- Length/Width: 4,15m/1,65m
- Seats up to 4 persons
- Has its own trailer
- No plotter/ echo sounder
- Relatively compact boat, middle bench can be removed to free up more floor space
- All-rounder when it comes to usage



3.6 Perca (Terhi 385 (2015), 4hp)

- Length/Width: 3,8m/1,5m
- Seats up to 4 persons
- Has its own trailer
- Compact rowboat, that can be equipped with a 4hp motor if needed



3.7 Zodiac cadet alu 270 (2019)

- Length/Width: 2,7m/1,53m
- Seats up to 3 persons
- Can be transported inflated on a regular trailer (not a boat trailer)
- Can be carried by two persons, weighs only 37kg
- Aluminium flooring
- 4hp motor can be mounted in the aft if needed
- Sturdy in the water



4 Laboratory equipment

4.1 Thermo Scientific Forma 991

Year of purchase: 2019

<https://www.thermofisher.com/order/catalog/product/991#/991>

Features, possible uses, etc.:

- Operating temperature -80°C
- CO₂-backup system (keeps temperature at about -60°C for 12h)



4.2 Nikon SMZ1500

Year of purchase: 2003

Features, possible uses, etc.:

- One available at Husö
- Magnification: 0.75-11.25x



4.3 Novex RBZ

Year of purchase: 2013

Features, possible uses, etc.:

- Two available at Husö
- Magnification: 0.65-4.5x



4.4 Nikon SMZ660

Year of purchase: 2013

Features, possible uses, etc.:

- Three available at Husö
- Magnification: 0.8-5.0x



4.5 Nikon Diaphot

Year of purchase: 1986

<https://www.microscopyu.com/museum/diaphot-inverted-tissue-culture-microscope>

Features, possible uses, etc.:

- Can be equipped with the **Nikon DS camera system**
- Can be equipped with the **Olympus OM-D E-M1 camera**



4.6 Nikon DS-L2 camera control unit & DS-2Mv camera

<http://www.coherent.com.au/content/media/Nikon/Digital%20Sight.pdf>

<https://www.nikonusa.com/fileuploads/pdfs/Digital%20Sight%20Series%20062005.pdf>

Features, possible uses, etc.:

- Can be connected to **Nikon Diaphot**
- Photos can be used for measurements
- Live-view can be sent to external monitor or projector



4.7 Olympus OM-D EM-1

Year of purchase: 2016

<https://www.getolympus.com/us/en/e-m1.html>

Features, possible uses, etc.:

- Can be connected to **Nikon Diaphot**
- Battery grip with plug for external power = battery time is no issue
- Currently no lens for use without microscope
- No live-view. Photos and videos taken on camera can however, be showed on external source via HDMI



4.8 Amscope MU1403B camera

Year of purchase: 2016

<https://www.amscope.com/14mp-high-speed-usb-3-0-digital-camera.html>

Features, possible uses, etc.:

- Fits microscopes with 23mm, 30mm and 30.5mm eye pieces
- Can also be mounted on C-mount threads
- Calibration slide included
- Included software makes it possible to calculate lengths, areas, angles, etc.
- Measurement data can be exported as text file
- Needs to be connected to a computer/laptop



4.9 Hettich Mikro Rapid - Centrifuge

Year of purchase: 1989



4.10 Hach 2100P Turbidimeter

Year of purchase: 1998

<https://www.hach.com/2100p-portable-turbidimeter/product?id=7640450099>



4.11 TD-700 Laboratory Fluorometer

Year of purchase: 2001

<https://www.turnerdesigns.com/td-700-labratory-fluorometer>



4.12 ThermoSpectronic Aquamate Spectrophotometer

Year of purchase: 2001

<https://www.masterflex.com/p/thermospectronic-aquamate-uv-and-uv-visible-water-analysis-spectrophotometers/20259>



4.13 Other laboratory equipment

- pH-Meter: Metrom 827 pH lab (2008)
- Conductivity meter: Methrom 712 Conductometer (2006)
- Autoclave: CertoClav CV-EL 10LGS (2002)
- ~~Milli-Q Water ultrapure water system (2010) – To be replaced in 2021.~~
- ~~RiOs Type 3 Reverse Osmosis (RO) Water system (2006) – To be replaced in 2021.~~
- RiOs Type 5 Reverse Osmosis (RO) Water system (2021)
- Milli-Q EQ 7000 Ultrapure water system (2021)
- Miele PG8583 laboratory glassware washer (2021)
- One oven for burning organic samples (500°C)
- Three drying ovens (60-100°C)

5 Molecular lab

5.1 Porkka KF 45 flake ice machine

Year of purchase: 2021

<https://porkka.com/product/porkka-kf45-flake-ice-machine/>



5.2 Selecta MED 20 autoclave

Year of purchase: 2021

<https://grupo-selecta.com/catalogo-2019/en/04-autoclaves.pdf>

Features, possible uses, etc.:

- Capacity: 20l
- Temperatures 121 and 134 °C



5.3 PHCbi MLR-352-PE Climate Chamber

Year of purchase: 2021

<https://www.phchd.com/eu/biomedical/incubation/mlr-climatic-test-chambers/mlr-352>

Features, possible uses, etc.:

- Programmable temperature:
 - o 0°C to 50°C – Lamp off
 - o 10°C to 50°C – Lamp fully on
- Programmable lighting:
 - o 0 to 20.000 lux



5.4 VX-200 Vortex Mixer

Year of purchase: 2021

Features, possible uses, etc.:

- Speed: 0-2850 rpm
- Start up by touch or continuously on
- Circular orbit for effective vortexing
- Optional head attachment for 24 x 1.5/2.0 mL tubes, 24 x 0.5 mL tubes and 32 x 0.2 mL tubes (or 4 PCR strips)



5.5 Labnet microcentrifuge C1601

Year of purchase: 2021

<https://www.labnetinternational.com/products/laboratory-centrifuges/mini-centrifuges/labnet-mini-microcentrifuges-c1601>

Features, possible uses, etc.:

- Maximum speed: 6000 rpm / 2000 x g
- Capacity: 8 x 1.5/2.0 mL or 4 x 0.2 mL strips



5.6 Eppendorf Centrifuge 5425 R

Year of purchase: 2021

https://www.eppendorf.com/product-media/doc/en/924568/Centrifugation_Operating-manual_Centrifuge-5425-R.pdf

Features, possible uses, etc.:

- Refrigerated, temperature control range: -10 °C to +40 °C
- Maximum speed: up to 21300 x g (depending on rotor used)
- Maximum capacity: 10 x 5,0 mL



5.7 PCRmax Alpha Cyclor 1

Year of purchase: 2021

<http://www.pcrmax.com/alpha-cyclor-1>



5.8 Thermo Scientific MSC-Advantage 1.2 Laminar hood

Year of purchase: 2021

<https://www.thermofisher.com/order/catalog/product/51025411#/51025411>

Features, possible uses, etc.:

- Exhaust air filter: HEPA H 14 EN 1822, 99.995% at 0.3µm particle
- 120 cm wide work area



5.9 DS-11 FX Spectrophotometer / Fluorimeter

Year of purchase: 2020

<https://www.denovix.com/products/ds-11-fx-spectrophotometer-fluorimeter/>



6 Diving equipment

6.1 Bauer PE-TE 300

Year of purchase: 2019

<https://www.bauer-kompressoren.de/products/breathing-air-sports/pe-tepe-tb-200-300-lmin/>

Features, possible uses, etc.:

- Possible to fill both 200 and 300 bar tanks
- Equipped with add-on that keeps track of remaining filter capacity
- Filling a bottle from 50 to 300bar: about 10 minutes
- Decent filter capacity due to large filter (P41)
- Runs on 400V = “stationary” (140kg)



6.2 Lenhardt & Wagner 100 E1 ECO

Year of purchase: 2017

<https://www.lw-compressors.com/index.php/en/node/6>

Features, possible uses, etc.:

- Possible to fill both 200 and 300 bar tanks
- Filling a bottle from 50 to 300bar: about 30 minutes
- Runs on 230V, “portable” (42 kg) – can be transported by car/boat if needed
- Filter capacity relatively low, need to change filters relatively often, depending on usage



6.3 Other diving equipment

- 200 bar diving tanks: 11 in total (10l + 8l)
- 300 bar diving tanks: Two 12 liter ones
- Diving wests: Four wests in Sizes S to L
- Diving regulators: Five in total
- Wetsuits: in sizes S to XL
- Dry suits: One available (L/XL)
- Three diving computers available (two Suunto Zoop, one Mares Puck Pro)
- Diving masks, fins, gloves, etc.



7 Link to picture gallery of equipment

In the following link you will find more pictures of our equipment here at Husö:

<https://abofi.sharepoint.com/:f:/s/Team-FNT-EMBpersonnel/Eppcl7teVnBMIXmWnq3B084Bcd1gsr98GsAlbnQec7CCwQ?e=Z8B1ba>

The pictures are free to use if needed, no citation needed.