

Annex «equipment inventory by services »

XPO FACILITIES.

EXPERIMENTATION STATION OF SAINT-SEURIN/ ISLE

The Saint-Seurin experimentation station is set up to receive and support a wide range of experimental protocols for vegetation and fauna. The station is certified for animal experimentation under certificate N° A33-478-001. Since 1996, it is part of the GDSAA ('Groupement de Défense Sanitaire Aquacole d'Aquitaine'), and also adheres to the AquaREA convention created through the GDSAA and based on the AREA program (Agriculture Respectueuse de l'environnement en Nouvelle-Aquitaine). All personal working at the station have empowerment certifications for working with living animals. Historically, most experimental work conducted at the station targeted diadromous fishes, in particular sturgeons (for which a worldwide unique cryobank of European sturgeon seeds is available at the station), shads, eels and lampreys. Research programs more recently developed within the research unit have however enlarged, so that more estuarine and freshwater fishes, invertebrates and primary producers are now being handled at the station. Water supply at the station is supported by the nearest river with a 1000 m³/h debit and temperatures ranging from 5 to 26 °C. Deep water pumping can also be achieved at 200 m³/h debit and temperature of 18 °C. Marine water can be stored too at the station for designed experimentations (90 m³ capacity).

The station is constituted of 8 experimental buildings and technical halls. The two first are dedicated to the French ex situ stock of the European sturgeon *Acipenser sturio*, and rely on recirculated aquaculture systems.

« **Sturio 1** » is composed of 9 tanks for a total of 80 m³ water volume, and is divided in two parts. One for rearing of juveniles and one for the reproduction.

« **Sturio 2** » includes 11 tanks for a total volume of 330 m³, and hosts the adults and subadults sturgeon.

Other spaces are dedicated to experimentations:

« **Alosa** » is a technical hall equipped with an open water circuit connected to the nearest river, and composed of 20 circular basins of 2 to 6 m diameters ;

« **Anguilla** » is an experimentation building including 3 experimentation rooms, a prey production area, a surgery room and a quarantine room ;

« **Palaemon** » is an experimentation building set up with the SCOLA device specifically designed to study larval behaviour, and made up of 3 aquatic mesocosms and a technical control area for robotics ;

« **Lampetra** » is a technical hall made up of 9 river-water basins;

« **Liza** » is the main building, it includes a versatile hatchery equipped with incubators allowing for larval rearing and several 2-m diameter tanks, two automatic rearing devices and 2 ZebTEC active blue stands; two reproduction laboratories and one water analysis laboratory;

« **Salmo** » is a technical hall including three artificial rivers, a raceway dedicated to natural prey production and 8 concrete raceways hosting fish species under study.

WATERCRAFT SERVICE

This service provides the only French oceanographic vessel dedicated to operate on estuaries and large rivers, the 'Esturial'. This vessel is a 13.7 meters long catamaran, designed for experimental fishing and environmental monitoring campaigns. In addition to the 'Esturial', the 'Shifumi' (8.3 m) is dedicated to sampling campaigns using small fishing gears (beam trawls, supra-benthic trawl, plankton nets, sediment grab). The 'Ouestu' (6.1 m) is dedicated to acoustic telemetry and echointegration campaigns. The 'Exo7' is a zodiac used for multiple purposes including environmental monitoring and electric fishing campaigns, or the use of small fishing equipment like fyke-nets. Canoes are also available for sampling in small water reaches and shallow areas with small equipment.

AQUATIC VEGETATION SERVICE

This service aims to assess and monitor the structure and dynamics of aquatic primary producers communities (algae, macrophytes, biofilms) and micro-meiofauna in situ and under controlled conditions (mesocosm, cultivation). It includes dedicated rooms for sampling, collecting, observing and implementing experimentations (controlled temperature room). In this laboratory, different types of equipment and techniques are commonly used such as microscopy, algal biomass measurement and photosynthesis activity assessment, related to in- and ex-situ measures associated with the characterization of community and population responses to natural and anthropogenic pressures (chemical stress, biological interactions).

Sample preparation and analysis rooms are dedicated to the preparation, observation, measurements and taxonomic determination of freshwater aquatic flora (phytoplankton, phytobenthos and macrophytes) and

micro-meiofauna. These analyses are implemented by using micro/macro-scopic equipment (six microscopes including two with fluorescence and two inverted, all equipped with numeric cameras), a flux cytometer combined to a photonic microscope (FlowCam®). A holistic taxonomy books collection is available in these rooms. Interesting samples are also stored in a plant specimen collection.

Culture and experimental room, an air-conditioned room, is dedicated to the culture of aquatic algae/macrophytes and micro-meiofauna, and to experimental setups in controlled conditions (germination, growth test, photosynthetic activity, grazing, etc.). It contains two thermostatic chambers with light/day scheduling as well as a fluorimeter (Phyto-Pam®).

The biometry room is used to perform morphometric analyses and biomass measurements, equipped with high precision weighing scales and ventilated ovens.

The thermostated experimental room is dedicated to experiments/exposure in controlled conditions with accurate temperature control. In particular, it is used for passive samplers calibration and ecotoxicity tests focusing on the impact of aquatic chemical contaminants (pesticides and metals) on biofilms (diatoms, micro-meiofauna, etc.).

Safety / Quality Assurance and miscellaneous equipment

- Activated charcoal-based ventilated storage facilities for acids, bases, and organic solvents
- Shower and eye rinser
- Fridges and freezers for the storage of analytical standards, samples, etc ...

AQUATIC FAUNA SERVICE

Sampling gears and probes

Among the fishing gears already mentioned, simple, double and winged fyke nets, push nets, beam trawls and an otter trawl are routinely used in the estuary and associated habitats. Electro fishing is mostly used for inventories of the diversity of fishes or for monitoring particular species of interest (e.g. eels) in freshwater reaches. The team is equipped with four different and complementarity electro fishing devices: the 'Martin Pêcheur' and the 'Aigrette' are used in small to medium-sized freshwater areas, and operated either on foot or from a small boat. The 'Heron' is adapted to sampling in deep freshwaters (> 5m). The 'Albatros' allows for electro fishing in brackish or marine waters. Those equipment are regularly lend to research and operational partners conducting routine fishing surveys in areas of interest for the team, such as the Fédération des Associations Agréées de Pêche et Protection des Milieux Aquatiques de Gironde (FDAAPPMA33). For environmental monitoring purposes, the team has acquired a set of diverse multiparameter probes (YSI, HOBO, Hanna) allowing for the measurement of water temperature, salinity, turbidity and dissolved oxygen in estuarine and freshwater environments.

Telemetry equipments

XPO is also equipped for studying fish mobility traits in aquatic environments (obstacle passability, habitat reconexion, diel or seasonal migratory patterns, home ranges, spatial niches or habitat preferenda) using multiple radio and acoustic telemetry tools. VHF radio telemetry instruments are used in shallow continental waters (<10-15 m), allowing for fish movement monitoring using either mobile or stationary receivers during periods ranging from weeks to months with a fine spatial reach (< 300 to 800 m). Acoustic telemetry instruments are used in marine and estuarine environments as well as in deep continental waters (>15 m), allowing for fish movement monitoring using anchored or towed hydrophones during periods ranging from weeks to months with a few hundred meters reach. More recent RFID telemetry tools can be used in any aquatic environment for unlimited periods of time thanks to passive microchips (pit-tags HDX 32 mm) directly injected under the fish skins, and sending signals to either mobile or stationary receivers with limited reach (a few meters). Each method is used alternatively depending on the study objectives and targeted species and environments.

Freeze drying room

This room is used to prepare desiccated fish and macroinvertebrate samples for long-term archiving, after species sorting and identification. It is equipped with 2 Bench Top Pro 8-liters freeze-driers, one Bench Top Pro 3 liters freeze-drier, a Haier 718 liters -80°C freezer, a CCM Bora 300 vacuum machine, and a Sartorius Quintix microbalance (0-3100 g, d: 0,01 g). A specific cabinet was built in order to receive desiccated samples, which are all identified through specific QR codes, entered in the secured sample collection database of the research unit.

SCLEROCRONOLOGY SERVICE

This service is composed of three rooms dedicated to specific tasks, the « wet room », the « dry room » and the « white room ». All of them are connected to high-speed internet and local network. All can be darkened for specific needs including image processing or fluorescence-based work.

The « wet room » is dedicated to the reception, sorting, dissection or macroscopic observations of fresh, preserved or frozen fish and crustacean samples. Two 1400 L freezers and a 700L fridge allow for short term storage of samples. An extractor fan and two articulated and mobile smaller extractors allow for secure sorting of preserved samples. A fume chamber permits the preparation of specific chemicals used for some particular protocols. A programmable sterilizer can dry samples for up to 8 hours at 250 °C. The room also includes a distilled water dispenser, 10 m of laboratory benches, 2 sinks and taps, 3 binoculars, 2 magnifying lamps, a cold-light generator, cell counters, dissection kits, mortar and pestles, sorting sieves, and other small material dedicated to the primary processing of biological samples.

The « dry room » is dedicated to microscopic observations, data acquisition and precision measurements. A precise microbalance (0-120 g, d: 0.1 mg) is used for the weighting of dry and grounded samples for stable isotope analysis. Two microscopic imagery stations are available. The first is equipped with a numeric Nikon 90i camera, set up with x1 x10 x20 x50 x100 motorized lenses with tetracycline, alizarine and calceine fluorescence filters, and an Intensilight fluorescence generator. The second imagery station is equipped with a Nikon SMZ 1500 camera, set up with x1 and x0.5 lenses with a 0.75 to 11.25 zoom. This station allows for tripolar outputs with coloured high-resolution images. Both imagery stations are connected to the NISD software for the acquisition and analyses of high-resolution pictures and videos.

The « white room », Iso8 classified, is dedicated to the preparation of clean samples in controlled atmospheric conditions. The room is mostly used for microscopy and microchemistry studies of fish otolith, scale and fin ray samples. It is associated with a specific storage room designed to guarantee the optimal long-term storage of these samples. The « white room » is equipped with two microscopic imagery stations. The first is set up with a Nikon SMZ 25 camera, with x1 and x0.5 motorized lenses with tetracycline, alizarine and calceine fluorescence filters, and a 0.63 to 15.75 zoom. This station allows for large-scale image acquisition and is connected with the NISD software for the processing of high-resolution full or mozaic-structured pictures and videos. The other microscopic imagery station is equipped with a Nikon Eclipse camera with x10, x20, x50 and x100 lenses, and allows for large-scale images acquisition with the NISD software. The « white room » also includes equipment required for the preparation and sorting of sterile otolith and scale blades, such as an ATM Brillant 221 chainsaw, an ESCIL W3400 horizontal diamond wire saw, a Struers polishing machine, a Retsch crusher, a hotplate reaching 450 °C, a sterilizer, an Iso5 streamline flow fume cupboard, a Sartorius M-Power microbalance (0-4100 g, d : 0,01 g), an Eppendorf 5424 centrifuge, a LSCI 6L bain-marie (0-110 °C), a Vortex Stuart SA81 stirrer, a Fisher Bioblock warming stirrer, and four desiccator cabinets.

SHARED FACILITIES

An air-conditioned **metrology room** is dedicated to metrology and maintenance of equipment in order to ensure the reliability of the measurements. It is also used as a storage room for metrology instruments.

Storage rooms of materials dedicated to investigation on the field

These rooms allow the optimized storage of the instruments and equipments used for observations, measurements and sampling on the field. This encompasses automatic water samplers, sediment skips, physico-chemical probes, accurate centimetric GPS, current meters, benthic chambers, echosounder, etc.

Outside storage facilities, one for acids, bases, and organic solvents and others of waste and recycling