TECHNICAL SPECIFICATIONS GOVERNING THE PROCUREMENT OF TECHNICAL TELEMETRY AND GEOLOCATION EQUIPMENT FOR THE PROJECT "REDUCING BYCATCH OF THREATENED MEGAFAUNTA IN THE EAST CENTRAL ATLANTIC" (REDUCE) FOR THE UNIVERSITAT DE BARCELONA

FILE 2025/210

1. Subject Matter of the Contract

The purpose of this document is to establish the technical specifications governing the procurement procedure for the supply of technical telemetry and geolocation equipment required for the project "Reducing Bycatch of Threatened Megafauna in the East Central Atlantic" (REDUCE) of the University of Barcelona.

The REDUCE project is a European project led by the University of Barcelona whose objective is to apply an interdisciplinary scientific approach and to bring together the efforts of relevant stakeholders in order to reduce the incidental capture of marine megafauna by European fishing fleets operating in the western region of the East Central Atlantic.

The project is structured into nine different work packages (hereinafter, WPs). The acquisition of specialised technical equipment is essential for the proper implementation of the project.

Specifically, the different devices described cover a wide range of monitoring needs both on board fishing vessels and for seabird tracking. They include GPS devices of different sizes and weights, some equipped with accelerometers, radar or AIS receivers to detect interactions with vessels, as well as models with solar power supply or 4G or satellite transmission enabling real-time or long-term monitoring.

These devices are suitable for species of different sizes, ranging from storm petrels (Hydrobatidae), petrels (Procellariidae) to shearwaters (Puffinus spp.), and are used in a variety of contexts such as migration studies, breeding periods, foraging trips, and behavioural studies both at sea and in flight.

Overall, the equipment will provide high-resolution spatial and movement data, enabling a better understanding of species ecology, habitat use and interactions with human activities.

The subject matter of this tender is the procurement of the following technical equipment:

- Lot 1: Supply of GPS devices for vessels.
- Lot 2: Supply of lightweight GPS/GNSS devices for shearwaters.
- Lot 3: Supply of solar-powered tracking devices.
- Lot 4: Supply of GPS devices with 4G transmission.
- Lot 5: Supply of GPS devices with accelerometry and radar.
- Lot 6: Supply of ultra-lightweight GPS devices with accelerometer.
- Lot 7: Supply of GPS/GSM devices with satellite transmission and solar power supply.
- Lot 8: Supply of lightweight data logger.
- Lot 9: Supply of compact data logger.
- Lot 10: Supply of medium-sized data logger.

For the proper implementation of the project, it is essential to acquire the equipment described, which must enable the tagging and movement tracking of the species under study, as well as the detection of potential interactions with vessels.

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2. Technical Requirements of the Equipment to be supplied

The minimum technical specifications that must be met by the equipment to be supplied under the different lots are briefly described below.

Lot 1: Supply of GPS devices for vessels.

Supply of forty (40) GPS data-logging devices designed for installation on board vessels, protected within a PVC housing and powered by a high-capacity rechargeable battery allowing position tracking during extended operating periods.

The devices shall incorporate a high-sensitivity GPS/GNSS receiver and shall be compatible with GPS systems and, optionally, GLONASS, providing coordinates in WGS84 format and a typical positional accuracy of between 5 and 10 metres depending on environmental conditions. The recording interval shall be configurable from five seconds up to twenty-four hours, and the internal memory shall be capable of storing up to approximately four hundred thousand (400,000) position records.

Charging and data transfer shall be carried out via USB connection or through a waterproof magnetic connector. The device shall operate with an approximate maximum power consumption of 40 mA and within an operating temperature range from –20 °C to +60 °C.

Regarding the tubular housing system used for devices installed on fishing vessels, it shall be made of impact-resistant plastic material and include watertight end caps, with the option of incorporating a small purge hole to equalise internal pressure.

Lot 2: Supply of lightweight GPS/GNSS devices for shearwaters.

Supply of three hundred (300) lightweight GPS/GNSS data loggers particularly suitable for tracking shearwaters during foraging trips in the breeding season, with integrated antenna, low-mass battery and sealed housing.

The GPS/GNSS data logger shall be enclosed in a sealed ThermoSeal housing ensuring effective protection against pressure and corrosion, and shall weigh approximately between 4 and 6 grams with compact dimensions. The device shall operate with rechargeable lithium-polymer batteries available in different capacities, with an autonomy of approximately up to 160 hours when using 750 mAh batteries.

The device shall incorporate a magnetic switch and magnetic activation interface in order to reduce weight and eliminate external connectors, as well as two status LEDs that can be disabled to reduce energy consumption. GNSS performance shall be compatible with GPS and, optionally, GLONASS, with a typical positional accuracy of between 5 and 10 metres.

The recording interval shall be fully configurable between 5 seconds and 24 hours and shall be programmable to optimise both energy consumption and data acquisition. The device shall be capable of storing up to approximately 400,000 positions and recording information such as timestamp, coordinates, altitude, signal quality parameters, temperature and speed.The device shall operate within a wide temperature range, approximately from –20 °C to +60 °C. It shall include advanced functions such as fix acquisition time management, scheduled recovery modes, compatibility with renewable energy systems, and automatic restart after recharging.

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Lot 3: Supply of solar-powered tracking devices.

Supply of fifty (50) tracking devices for movement and environmental data acquisition powered by integrated solar panels and designed for long-term deployments. The devices shall combine GPS positioning and accelerometry and shall be designed for tracking and behavioural monitoring of wildlife. They shall be suitable for use with shearwaters during the breeding period.

The device shall integrate a GPS receiver, a tri-axial accelerometer, and temperature and pressure sensors, enabling the recording of location, activity levels and environmental parameters. GPS programming shall be activity-based: the accelerometer shall control the initiation of position fixes according to a predefined schedule, reducing battery consumption when the animal is inactive and acquiring data only when necessary.

The device shall connect to a computer via USB for data download and configuration. It shall have an approximate weight of 15 g and allow direct attachment using lightweight materials such as TESA tape, facilitating field deployment.

The integrated solar panel shall allow the extension of battery life and shall be particularly suitable for long-term monitoring deployments. Overall, the device shall be optimised for efficient energy consumption and shall enable extended monitoring of free-ranging animals, particularly species with intermittent activity patterns.

Lot 4: Supply of GPS devices with 4G Data transmission.

Supply of forty (40) wildlife tracking transmitters capable of transmitting GPS and sensor data via a 4G mobile network, enabling near real-time monitoring. The devices shall be designed for use with *Puffinus puffinus* and shall allow data transmission over extended periods, enabling attachment using adhesive tape or a harness.

The devices shall consist of lightweight and compact transmitters designed for detailed monitoring of the movement and behaviour of free-ranging birds. They shall include an aerodynamic and waterproof housing and an external flexible antenna.

The device shall operate using 4G communication (LTE-M) and incorporate a high-sensitivity GPS receiver, with sufficient internal memory to store a large number of records until mobile network coverage is available for data transmission. Both the GPS recording interval and the mobile communication interval shall be fully configurable, as shall geofencing functions and differentiated day and night schedules.

The devices shall include multiple sensors, including an accelerometer, magnetometer and temperature sensor, allowing high-frequency data acquisition when required. Power supply shall be provided by a lithium-polymer battery reinforced with an efficient solar panel contributing significantly to extended field autonomy.

Each record shall include spatial and movement information together with environmental data and battery status. In addition, the devices shall allow remote management, enabling full control of their operational parameters.

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Lot 5: Supply of GPS devices with accelerometry and radar.

Supply of thirty (30) compact GPS/telemetry data loggers designed for medium-term deployments, incorporating an internal battery and onboard memory for storing movement tracks. The devices shall integrate GPS positioning, accelerometry and radar detection, as well as an AIS receiver. They shall be suitable for use with shearwaters during the breeding period.

The devices shall integrate an ultra-low-power GPS/GLONASS receiver, complemented by X-band radar detection and an AIS receiver. Operation shall be controlled by a low-power microcontroller, and power shall be supplied by a lithium-polymer battery. Internal low-power memory shall range between 32 MB and 64 MB.

The devices shall also incorporate a tri-axial accelerometer configurable at different sampling frequencies, ranges and resolutions, as well as a wet/dry sensor and an RGB light sensor allowing estimation of diving depth based on light attenuation.

Activation shall be possible by magnetic switch and the devices shall include a low-power hibernation mode. They shall also include dedicated energy-optimisation modes, such as a nest or colony mode to reduce power consumption when the animal is at the breeding site, and a vessel-proximity mode that increases GPS sampling frequency and activates sensors to detect interactions with vessels.

Lot 6: Supply of ultra-lightweight GPS devices with accelerometer

Supply of fifty (50) location devices combining an ultra-low-power GPS receiver and acceleration sensors for the study of movement and behaviour, powered by a high-capacity battery allowing extended operational periods. The devices shall be very lightweight (approximately 0.5 to 7 g) and suitable for species such as petrels. They shall be used in combination with cameras that do not incorporate GPS, providing complementary positional information. The mini version shall be particularly suitable for storm petrels.

The devices shall include internal memory capable of storing hundreds of thousands of fix attempts and shall incorporate a tri-axial accelerometer with configurable operating modes and sampling frequencies. The devices shall allow the optional addition of depth and temperature sensors.

The housing shall be waterproof and designed to withstand significant immersion. The device shall be attachable to the animal using tape, adhesive or harnesses, and shall allow straightforward configuration and data download from a personal computer.

Lot 7: Supply of GPS/GSM devices with satellite transmission and solar power supply.

Supply of twenty (20) hybrid tracking devices with satellite data transmission and GPS positioning, powered by a solar panel and intended for animals requiring long-distance monitoring without reliance on large batteries. The devices shall be used with Cory's shearwater (Calonectris diomedea) to enable continuous monitoring of movements and behavioural patterns. They shall be attached using a harness to ensure stable fixation over extended periods, thereby ensuring consistent and long-term data collection.

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The devices shall transmit data via the UBILINK X1 satellite constellation, providing global coverage with satellite passes approximately every 25 minutes. The devices shall allow multiple GNSS fixes or sensor records to be encapsulated within each transmission in order to improve transmission efficiency.

The devices shall integrate a high-precision GNSS module and environmental sensors to measure temperature, pressure and battery status, as well as ODBA (Overall Dynamic Body Acceleration) for quantifying activity levels. Data management shall allow the definition of recording intervals, prioritisation of the most relevant records for transmission, and storage of the remaining records in internal memory for subsequent download via Bluetooth. In the event of a transmission failure, the data shall be automatically returned to the transmission queue.

Power supply shall be based on a rechargeable battery reinforced by an enlarged solar panel while maintaining a low total weight of approximately 11 grams. The devices shall operate within a wide temperature range, provide watertight protection, and include sufficient internal memory to retain data prior to transmission.

Finally, the devices shall allow flexible configuration of both recording and transmission intervals.

Lot 8: Supply of lightweight data logger.

Supply of fifty (50) lightweight data loggers for birds combining GPS positioning and light-based geolocation, optimised for small and medium-sized species. The devices shall be suitable for use with larger storm petrels such as Hydrobates castro.

The devices shall consist of extremely compact and lightweight geolocators designed for small-bodied species. They shall combine a low-power GPS or GNSS receiver with activity sensors for movement recording. The devices shall include a battery providing sufficient autonomy for the intended study duration and internal memory capable of storing the required position fixes and activity records.

The devices shall allow flexible configuration of position-fix and recording intervals, enabling adaptation to different study designs and seasonal monitoring requirements.

Finally, the housing shall be designed for secure attachment to the animal (using adhesive, tape or harnesses) and shall provide protection against environmental conditions.

Lot 9: Supply of compact data logger.

Supply of sixty (60) compact data loggers suitable for Bulwer's petrel and Gon-gon petrel, particularly useful for migration studies, as they allow the recording of long-distance movements and the associated movement patterns.

The devices shall consist of compact data loggers with a robust structure, suitable for medium-sized birds. They shall incorporate a high-sensitivity GNSS receiver and an integrated accelerometer to capture detailed movement and activity patterns.

The internal memory shall allow the storage of long data series, facilitating migration studies or extended monitoring periods. The devices shall support the recording of environmental sensor data (temperature, humidity/immersion, etc.), and the housing shall be resistant and waterproof in order to withstand demanding environmental conditions.

Attachment to the animal shall be secure and adapted to the species, and device configuration and data download shall be carried out easily from a personal computer.

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Lot 10: Supply of medium-sized data logger.

Supply of one hundred and twenty (120) medium-sized data loggers. These medium-sized monitoring devices shall be suitable for shearwaters, both during migration and the breeding period, and shall be particularly useful for analysing wet/dry activity patterns, allowing the distinction between periods when the bird is in flight or on the water and thereby improving the understanding of behaviour and habitat use.

The devices shall combine low weight with adequate storage and operational capacity, making them suitable for migration studies or monitoring of small and medium-sized birds. They shall integrate a GNSS receiver and activity sensors, ensuring good spatial accuracy and behavioural information.

The devices shall include internal battery and memory providing sufficient autonomy and storage capacity for medium- or long-term deployments. The devices shall allow configurable recording intervals and operating modes according to project requirements.

The housing shall be resistant and waterproof, and the attachment system shall be versatile and adaptable to different species. Finally, device configuration and data download shall be straightforward from a personal computer.

3. Equipment Update clause (Applicable to Lots 1-10)

The possibility of updating the equipment or devices supplied is expressly provided for in the event that the manufacturer releases a new version or model available at the time each order is placed.

Any such update shall ensure technical equivalence or technical superiority with respect to the specifications initially established, without altering the nature of the supply or increasing its cost.

The successful tenderer shall notify any change of model in advance and shall demonstrate that the new model complies with the technical requirements set out in these Technical Specifications.

4. Technical Support and Maintenance (Applicable to Lots 1-10)

Although maintenance does not form part of the objective scope of this tender, the contractor shall have a technical support and maintenance service provided by qualified personnel in order to resolve any incidents that may arise during the normal use of the equipment.

The minimum required conditions are as follows:

- Supply and replacement of components covered under warranty.
- Coverage of the costs associated with shipping defective equipment to the manufacturer's facilities and returning the repaired or replacement equipment to the University of Barcelona.

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5. <u>Device Warranty</u>

The minimum warranty period for the devices shall be one (1) year from the date of acceptance of the supplies.

The warranty shall cover:

- Material and manufacturing defects.
- Functional failures detected prior to the field deployment of the devices.

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