

Sampling scheme identifier: **Azores Demersal Spring Survey - ARQDAÇO**

MS: PRT
Region: North-East Atlantic
Sampling scheme identifier: ARQDAÇO
Sampling scheme type: Research survey at sea
Observation type: SciObsAtSea
Time period of validity: 2025-2027
Short description (max 100 words): Sampling scheme (Work Plan – Table 2.6) aiming at collecting data and samples on demersal fishes caught by set longline. The scheme covers island shelves of all 9 island and 3 seamounts of the Azores archipelago (North-East Atlantic).
Description of the population
Population targeted: The main target species of ARQDAÇO survey are demersal fishes in the Azores region, from surface to around 1200 m depth, around the coasts of all 9 islands and 3 offshore seamounts of the archipelago. Population sampled: ARQDAÇO survey is a multispecies survey targeting demersal fishes. Stratification: Population stratified in 5 geographical areas (western, central and eastern island groups, central and eastern seamounts). Each fishing haul is stratified by depth (50 m intervals).
Sampling design and protocols
Sampling design description: The set longline surveys are conducted annually, during spring time. The surveys follow a stratified random design, to sample demersal fishes around coastal shelves of all 9 islands, and 3 seamounts in the Azores archipelago. Based on their geographical characteristics, a total of 5 areas are sampled, three of which are divided in subareas (Area I: subareas Princesa Alice and Azores banks; Area II: subareas Faial-Pico, Graciosa, São Jorge, Terceira islands; Area III: subareas São Miguel, Santa Maria islands; Area IV: Mar da Prata bank; Area VI: Flores-Corvo islands. Please note that few surveys in the past covered Area V: other Azorean seamounts). The number of fishing hauls - total of 34 - is allocated proportionally to the area/subarea size; the location of fishing hauls is selected randomly within each area/subarea. The survey is stratified by depth, using depth intervals of 50 m each (stratum 1: 1-50m, stratum 2: 51-100 m, etc). The survey mostly covers depths to 600-800m and includes one fishing haul reaching 1200m for each subarea. The fishing sets are deployed perpendicularly to the depth contours, going from the shallower to the deeper depth strata. PSU - Demersal fishes. For each fishing haul and depth stratum all fishes are identified to the lowest taxonomic level (species or genus), the total number and weight of fishes is recorded. All fishes are measured (length). For each fishing haul, a subsample of fishes for each species is randomly selected - up to 30 individuals of different sizes whenever possible - for detailed sampling (length, individual weight, sex, maturation stage, otoliths, portion of tissue for further analyses, i.e., genetic analyses). In the shallower depth strata, fish are tagged with traditional spaghetti tags. Individuals in good conditions - active after retrieval from longline - are randomly selected and measured (length), tagged and released.

SSU - By-catch. All organisms collected as by-catch (such as corals, and other invertebrates) are recorded during hauling, and are preserved for further identification and studies.

Survey annual reports are available for consultation at the Okeanos library.

Is the sampling design compliant with the 4S principle?:

NA.

Regional coordination:

NA.

Link to sampling design documentation:

Please see Sampling Design description above.

Design follows international recommendations:

N. Please see Sampling Design description above.

Link to sampling protocol documentation:

Please see Sampling Design description above.

Protocol follows international recommendations:

N. Please see Sampling Design description above.

Sampling implementation

Recording of refusal rate:

NA.

Monitoring of sampling progress within the sampling year:

NA.

Data capture

Means of data capture:

- Echosounder to map bathymetry before fishing haul;
- Dedicated software to record geographical position and other characteristics (latitude, longitude, time, depth) of longline fishing gear components;
- Tablet with dedicated software for counting hooks for fishing effort calculations;
- Measuring board for fish length;
- Weight balance (for total fish weight/stratum: balance sensitivity to 0,001 kg; for individual fish weight sensitivity to 0,001 gr);
- Dissection tools for determining sex, maturation stages, and for collecting otoliths and pieces of muscle;
- Tools for tagging (spaghetti tags, tag gun);
- Ethanol and formalin to preserve by-catch organisms and pieces of muscle;
- Means for preserving and labelling samples: paper bags (otoliths), plastic bags or plastic tubes/*eppendorf* tubes (pieces of muscle), vegetable paper (labels).

Data capture documentation:

Hook conditions are recorded while the sampling gear is being retrieved, to classify hooks as baited, unbaited, with fish, or ineffective (i.e., missing, broken or tangled). All fish are tallied by species and strata, measured, and weighed. Fish are identified to the lowest taxonomic level (species or genus), following Compagno (1984a, 1984b, 2005), Whitehead et al., (1984, 1986). Body size is measured in

all fishes: total length, or fork length, or pre-anal fin length in teleost fishes; total and pre-caudal length in elasmobranchs. Sex is determined by macroscopic observation of the gonads for teleosts, and based on presence/absence of external copulatory organs for elasmobranchs. Gonadal maturation stages are determined following Holden and Raitt (1974) for teleosts, and Stehmann (2002) for elasmobranchs.

References cited:

Compagno, L.J.V. 1984a. FAO species catalogue. Vol.4, Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1—Hexanchiformes to Lamniformes. FAO Fish Synopses, 125(4(1)): 1–249.

Compagno, L.J.V. 1984b. FAO species catalogue. Vol.4, Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 2—Carcharhiniformes. FAO Fish Synopses 125(4(2)): 251–625.

Compagno L., M. Dando & S. Fowler 2005. Sharks of the world. A field guide. Collins, London, UK. 368 pp.

Holden MJ, Raitt DFS. 1974. Manual of fisheries science. Part 2- Methods of resource investigation and their application. Rome: Food and Agriculture Organization of the United Nations.

Stehmann, M.F.W., 2002. Proposal of a maturity stages scale for oviparous and viviparous cartilaginous fishes (Pisces, Chondrichthyes). Arch. Fish. Mar. Res. 50(1):23–48.

Whitehead, P.J., M. L. Bauchot, J.C. Hureau, J. Nielsen & E. Tortonese (Eds.) 1984–1986. Fishes of the North-Eastern Atlantic and the Mediterranean, vols. I–III. UNESCO, Paris, pp. 1–1473.

Quality checks documentation:

NA.

Data storage

National database:

NA.

International database:

NA.

Quality checks and data validation documentation:

NA.

Sample storage

Storage description:

Pieces of fish muscle are collected and stored in alcohol 96%, at 4°C temperature. Fish otoliths are collected and stored in paper bags at room temperature. By-catch organisms are preserved in ethanol, formalin or frozen at -20°C. The samples are maintained and stored at the facilities of IMAR-Instituto do Mar, Rua Prof. Dr. F. Machado 4, 9901-862 Horta, and can be accessed upon request.

No link available on sample stored.

Sample analysis:

When possible, genetic analyses are performed to clarify taxonomic uncertainties. Muscle samples are processed to extract DNA, and further analyses (i.e., mtDNA sequencing, DNA barcoding, etc) are conducted for species identification.

By catch is identified to the lowest possible taxonomic level and used for reproductive and age analyses through histological analyses and C14 dating analyses.

Data processing

Evaluation of data accuracy (bias and precision):

NA.

Editing and imputation methods:

NA.

Quality document associated to a dataset:

N.

Validation of the final dataset:

Survey data are stored in an institutional database. The hired technician dedicated to demersal fish surveys is responsible for data insertion and correction.